The Cost of Treating the 10 Most Prevalent Diseases in Men 50 Years of Age or Older

Thomas C. Fenter, MD; Michael James Naslund, MD, MBA; Manan B. Shah, PharmD, PhD; Michael T. Eaddy, PharmD, PhD; and Libby Black, PharmD

Abstract

Objective: Costs of treating the 10 most prevalent diagnosed diseases in men ≥50 years of age were examined in hopes of identifying areas for better medical management and opportunities to decrease healthcare costs.

Methods: A retrospective analysis of a large national managed care database was utilized to assess the costs of treating the 10 most diagnosed diseases in aging men. All men initiating pharmacy treatment between July 1, 1997, and January 31, 2003, for (1) hypertension; (2) coronary artery disease (CAD); (3) type 2 diabetes; (4) enlarged prostate; (5) osteoarthritis; (6) gastroesophageal reflux disease; (7) bursitis; (8) arrhythmias; (9) cataracts; and (10) depression were included. Patients were continuously followed 6 months before and 12 months after initiating treatment. Costs of treatment and likelihood of experiencing a significant event were examined.

Results: One-year total disease-specific medical costs were highest for arrhythmias, osteoarthritis, cataracts, and CAD. Total medical costs for bursitis, type 2 diabetes, and enlarged prostate were between $400 and $500. Inpatient costs as a percentage of total medical costs were highest for CAD (75%), osteoarthritis (61%), arrhythmias (57%), and enlarged prostate (40%). For most diseases, pharmacy charges were <50% of the total cost. The likelihood of experiencing a significant clinical event within 1 year of initiating treatment was highest in men with bursitis (23%, surgery) and enlarged prostate (19.2%, acute urinary retention and/or surgery), hypertension (13.5%), and diabetes (9.5%).

Conclusion: The most costly conditions in the 10 most prevalent diseases in men ≥50 years of age were typically those that required substantial inpatient care. Conditions such as enlarged prostate, diabetes, and hypertension demonstrated a high likelihood of a clinical event within 1 year of initiating treatment. These conditions are therapeutic areas with the greatest likelihood of improvement, given what is known about the use of appropriate pharmacotherapy and the likelihood of treating to goal. Proactive patient management (eg, initiating/maximizing pharmacotherapy) may have the potential to positively impact clinical and economic outcomes for aging men.

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Despite having most of the social determinants of health in their favor, men have higher mortality rates for all 15 leading causes of death and are more likely to die than women at every stage of life.[1,2] This imbalance has been associated with men exhibiting one of the most precarious health behaviors: a delay in seeking medical treatment in response to physical symptoms.[1,3-5] Male-related factors, such as stoicism and an inability to leave the workforce to seek medical care, have been some of the challenges associated with this behavior.

In addition to these challenges, the attention given to men's health has been considerably less than that of women's health. As such, the value of sex-specific medicine has not been as greatly realized for men as it has been for women.[6] This is disturbing, because the aging male population is one of the fastest growing segments in the United States. There is now a definite need to proactively address health challenges in aging men,[7] because early detection of health issues is often paramount in preventing clinical and economic consequences, including death.[5]

A crucial first step in minimizing morbidity and mortality in the aging male population is to identify opportunities for improvement in outcomes of care for the diseases that are most prevalent. A recent retrospective assessment by the authors identified the 10 most prevalent disorders in men older than 50 years of age. This list includes hypertension, type 2 diabetes, coronary artery disease (CAD), enlarged prostate (also known as benign prostatic hyperplasia), osteoarthritis, prostate cancer, arrhythmias, cataracts, bur-

Address correspondence to: Michael Eaddy, PharmD, PhD, Applied Health Outcomes, 4114 Woodlands Parkway, Suite 500, Palm Harbor, FL 34685; E-mail: meaddy@applied-outcomes.com.

sitis, and gastroesophageal reflux disease (GERD). In addition, depression was 15th on the list of the most prevalent disorders in men older than 50 years of age, despite the underreporting of this disease.[8] As such, depression was included in this analysis. The purpose of this article is to assess the cost and associated outcomes for men older than 50 years of age who were given pharmacological treatment for the 10 most prevalent non–cancer-related disorders.

METHODS

Data Source

Medical and pharmacy claims data were abstracted from the Integrated Health Care Information Solutions National Managed Care Benchmark database (Waltham, Mass).[9] The database is nationally representative and includes data from 30 health plans covering more than 25 million lives.

Sample Selection

Men aged 50 years or older who initiated pharmaceutical treatment for a disease of interest between July 1, 1997, and January 31, 2003, were identified and placed into the respective disease cohorts (**Table 1**). Disease cohorts were not mutually exclusive, because each disease assessment was conducted separately. The index date for a patient in each disease cohort was the date of the first prescription for the drug of

Table 1. List of Diseases, Associated *ICD-9-CM* Codes, and Associated Pharmacotherapy

Disease state	*ICD-9-CM* code	Pharmacotherapy
Arrhythmias	427.61,427.81,427.41,427.0x,426.7x, 798.1x,427.32,427.69,427.2,427.60, 426.81,427.89,427.1x,427.31,427.4, 427.9,427.5	Class I-IV antiarrhythmic agents
Bursitis	726.xx	Nonsteroidal anti-inflammatory agents, corticosteroids
CAD	N/A	HMG-CoA reductase inhibitors
Cataracts	366.xx,743.3x	N/A
Depression	N/A	Selective serotonin reuptake inhibitors
Enlarged prostate	600.xx,222.2x	5-alpha reductase inhibitors, alpha blockers
GERD	530.85,530.81,530.82,530.2x,750.6x, 530.21,530.3x,551.3x,530.20,530.11, 552.3x,756.6x,553.3x	H_2 antagonists, proton pump inhibitors
Hypertension	401.1x,404.92,403.90,402.01,402.11, 403.10,403.91,404.03,362.11,403.11, 401.0x,402.00,404.13,404.00,437.2x, 404.10,403.00,404.91,401.9x,403.01, 402.90,404.12,404.01,404.11,402.10, 404.02,404.90,404.93	Beta blockers, angiotensin-converting enzyme inhibitors, diuretics, angiotensin II inhibitors
Osteoarthritis	716.18,716.17,716.16,716.14,716.13, 716.12,716.10,715.98,715.96,715.95, 715.94,715.92,715.91,715.90,715.89, 715.80,715.38,715.37,715.36,715.35, 715.33,715.32,715.31,715.30,715.28, 715.27,715.25,715.24,715.23,715.22, 715.21,715.20,715.17,715.16,715.15, 715.13,715.12,715.11,715.10,715.09, 715.04,715.00,715.26,715.18,715.14, 715.34,715.93,721.42,721.1x,716.11, 716.15,716.19,715.97,716.15,716.19, 715.97,722.6x,722.52,722.51,722.4x, 721.91,721.90,721.7x,721.41,721.3x, 721.2x,721.0x	Nonsteroidal anti-inflammatory agents, corticosteroids, analgesics
Type 2 diabetes	N/A	Oral antidiabetics

ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*; CAD, coronary artery disease; N/A, not applicable; GERD, gastroesophageal reflux disease.

interest within the time frame specified. The pharmacotherapy selected for each disease represents the therapeutic classes that are primarily given to patients initiating treatment for the corresponding disease state. The cataract cohort was the only cohort without pharmacotherapy options; therefore, the index date for these patients was defined as the date of first diagnosis within the time frame specified. Patients in certain disease cohorts were required to have a diagnosis during the 6 months before or 6 months after the index date to ensure that the pharmacotherapy options were utilized for the particular medical condition. These cohorts include arrhythmias, bursitis, enlarged prostate, GERD, hypertension, and osteoarthritis. Diagnoses were determined using the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*[10] codes listed in Table 1. Patients were also required to have been continuously eligible for medical and pharmacy services during the 6 months before and 12 months after the index date. All patients with cancer were excluded, because the high clinical and economic consequences associated with these diseases would mask the issues facing the majority of men in the general population.

Table 2. Definition List of Significant Events After Initiation of Pharmacotherapy for Each Disease

Disease	Significant events
Arrhythmias	Cardioversion
Bursitis	Removal or drainage of the bursa sac
CAD	Acute MI, stroke
Cataracts	N/A
Depression	Depression-related inpatient hospitalization
Enlarged prostate	Prostate-related acute urinary retention, surgery
GERD	Endoscopy, upper GI surgery
Hypertension	Stroke, acute MI, congestive heart failure, ischemic heart disease
Osteoarthritis	Arthroscopy, knee replacement
Type 2 diabetes	Nephropathy, neuropathy, retinopathy, lower extremity amputation

CAD indicates coronary artery disease; MI, myocardial infarction; N/A, not applicable; GERD, gastroesophageal reflux disease; GI, gastrointestinal.

Disease-specific Outcomes and Clinical Events

Patients meeting all selection criteria were followed over a 12-month period to assess disease-specific economic and clinical outcomes. Disease-specific economic outcomes were defined as the sum of charges for medical claims with a primary diagnosis for the disease of interest and the disease-specific pharmacy costs. Medical costs identified by medical claims were classified as physician visits, inpatient hospitalizations, outpatient hospital care, emergency department (ED) visits, and other ancillary services. Disease-specific clinical outcomes are shown in **Table 2**, and were defined from a literature assessment of studies evaluating relevant outcomes in the specified disease state. Significant events were identified after initiation of pharmacotherapy for the specified disease state. Because pharmacotherapy does not exist for cataracts, significant events were not evaluated for this disease. Costs were deemed disease specific when the primary reason for the visit contained an *ICD-9* diagnostic code for the disease of interest.

Comorbidity Assessment

To assess comorbidities in each disease cohort, a unique count of disease states beyond the ones used to classify patients into disease cohorts was calculated for each patient. Additionally, the total number of non–disease-specific prescriptions received and a unique count of each prescription drug category were assessed.

RESULTS

Demographics

There were 259 480 patients identified that met the selection criteria for the specific diseases. The mean age of the entire sample was 60.48 years, with an age range of 50 to 79 years. Patients with cataracts were the oldest, followed by patients with arrhythmia and enlarged prostate. Overall, men had an additional 5.91 diagnoses beyond their disease state, with arrhythmia patients having the highest number of additional diagnoses (11.3), followed by CAD (8.32) and enlarged prostate (7.63).

Table 3. Age, Diagnoses, and Prescription Drug Use by Disease State

Disease*	N	Mean age (SD)	Non–disease-specific prescriptions	Prescription categories	Diagnoses
Arrhythmias	13 202	63.63 (8.48)	9.9 (10.72)	4.07 (3.52)	11.31 (7.87)
Osteoarthritis	26 835	60.39 (7.7)	7.64 (8.91)	2.91 (2.75)	6.61 (5.22)
Cataracts	68 866	65.46 (7.9)	10.29 (11.53)	3.77 (3.47)	5.97 (5.21)
CAD	21 074	61.78 (8.1)	5.65 (7.98)	2.46 (2.74)	8.32 (6.15)
Bursitis	26 449	58.01 (6.59)	8.26 (9.66)	3.2 (3.03)	5.81 (4.76)
Type 2 diabetes	22 476	60.16 (7.42)	8.93 (10.48)	3.45 (3.25)	6.12 (4.97)
Enlarged prostate	25 886	63.56 (8.02)	9.56 (10.59)	3.83 (3.34)	7.63 (5.74)
GERD	23 575	59.29 (7.37)	8.55 (9.58)	3.49 (3.12)	7.48 (5.88)
Depression	25 838	58.92 (7.62)	10.48 (11.04)	4.17 (3.61)	7.2 (6.78)
Hypertension	59 084	59.6 (7.46)	4.47 (6.56)	2.04 (2.37)	5.79 (5.03)
Overall	259 480	60.48 (7.86)	7.77 (9.78)	3.04 (3.09)	5.91 (5.08)

*Categories are not exclusive; patients may exist in more than 1 cohort.
SD indicates standard deviation; CAD, coronary artery disease; GERD, gastroesophageal reflux disease.

Patients with bursitis had the fewest number of additional diagnoses.

On average, 7.77 non–disease-specific prescriptions were filled over the 1-year time period, covering approximately 3 prescription categories (**Table 3**). Patients with depression filled the most prescriptions (10.48) over the greatest number of categories (4.17), whereas patients with hypertension filled the least prescriptions (4.47) over the smallest number of categories (2.04) (Table 3).

Resource Utilization

To put the diseases in perspective with disease-specific resource use, 1-year disease-specific costs were assessed. Results indicated that arrhythmias were the most costly ($1699) of the 10 most prevalent diseases in aging men (**Figure 1**), followed by osteoarthritis and cataracts ($989 and $885, respectively). Of the 10 most prevalent diseases, hypertension, depression, and GERD ranked lowest, with disease-specific medical costs less than $320 annually.

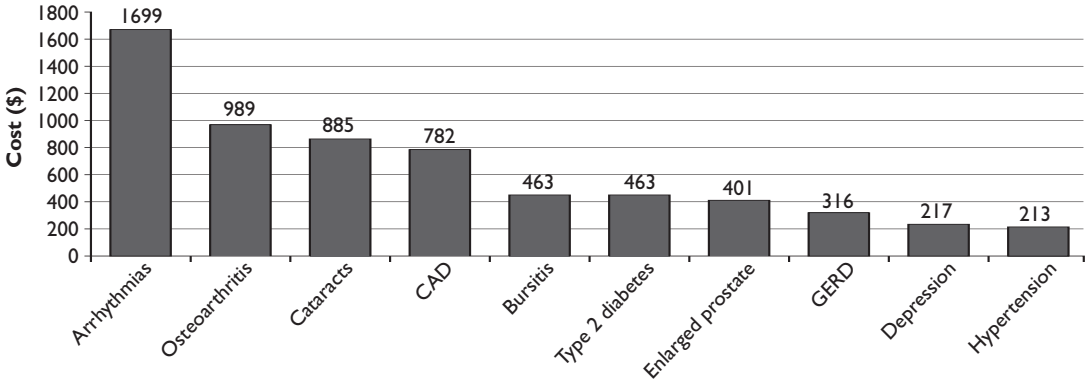
Medical costs for all conditions were further assessed to determine the relative contribution of specific aspects of care to the total medical cost of treatment (ie, inpatient costs, outpatient costs, ED costs, physician costs, and other costs). Patients with conditions such as CAD (75%), osteoarthritis (61%), arrhythmias (57%), and enlarged prostate (40%) tended to incur most of their costs from an inpatient setting (**Figure 2**). Outpatient costs were highest for cataracts (81%), GERD (64%), and bursitis (52%), whereas physician costs were the highest for hypertension (62%), depression (56%), type 2 diabetes (49%), and bursitis (42%).

In 6 of the 10 most prevalent disorders, pharmacy costs were less than 50% of the total cost of care. Depression ($529) and GERD ($655) had the highest percentages at 71% and 67%, respectively, whereas arrhythmias ($312) and osteoarthritis ($131), at 16% and 12%, respectively, had the lowest. By design, the cataract cohort did not have any specific pharmacotherapy (**Figure 3**, **Table 4**).

Likelihood of Significant Event

An examination of the likelihood of men experiencing significant events in the 1 year after treatment initiation was also completed (**Figure 4**). For each condition, significant events were defined as reported in the methods section (Table 1). Patients

Figure 1. One-year Disease-specific Medical Costs for the 10 Most Prevalent Diagnoses in Men ≥50 Years of Age



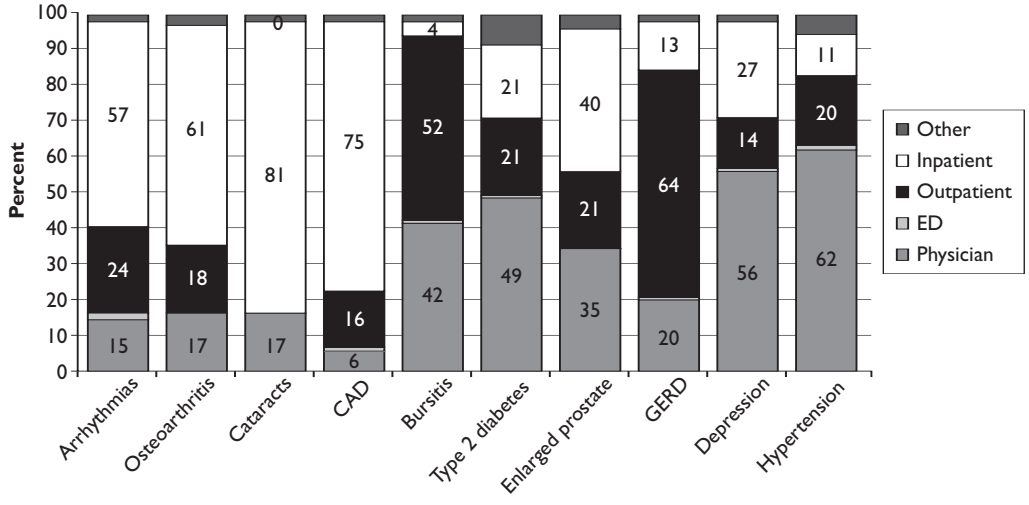
CAD indicates coronary artery disease; GERD, gastroesophageal reflux disease.

with bursitis and enlarged prostate were most likely to have a significant clinical event, with draining/surgery occurring in 23% of patients with bursitis and acute urinary retention (AUR)/surgeries occurring in 19.2% of patients with enlarged prostate. Patients with GERD, depression, and CAD were least likely to have a significant clinical event. The likelihood of stroke, acute myocardial infarction (MI), congestive heart failure (CHF), and/or ischemic heart disease in men with hypertension was 13.5%.

DISCUSSION

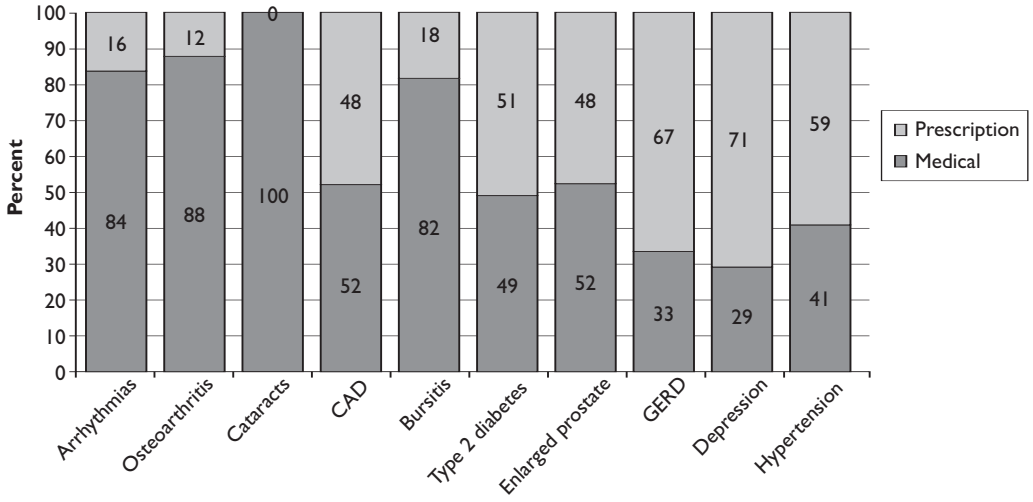
The primary objective of this investigation was to examine the economic and clinical outcomes associated with treating non–cancer-related diseases that were the 10 most prevalent disorders in men ≥50

Figure 2. Percent Contribution of Disease-specific Medical Costs Classified by Outpatient, Inpatient, Physician, ED, and Other Costs



CAD indicates coronary artery disease; GERD, gastroesophageal reflux disease; ED, emergency department.

Figure 3. Percent Contribution of Disease-specific Total Costs Classified by Medical Versus Prescription Costs for Each of the 10 Most Prevalent Diagnoses in Men ≥50 Years of Age



CAD indicates coronary artery disease; GERD, gastroesophageal reflux disease.

years of age. The results indicated that arrhythmia and osteoarthritis were the most expensive diseases in this population, costing more than $2011 and $1120 per year in disease-specific total costs, respectively. The majority of the costs were attributable to medical resource utilization; pharmacy costs were 16% of total costs for arrhythmias and 12% of total costs for osteoarthritis. Medical costs for these conditions were driven by inpatient and outpatient hospitalizations. When evaluating the 4 diseases that incurred more than $500 in medical resource use, all incurred inpatient and outpatient costs contributed at least 79% of their medical resource use, with CAD having the highest percentage at 91%.

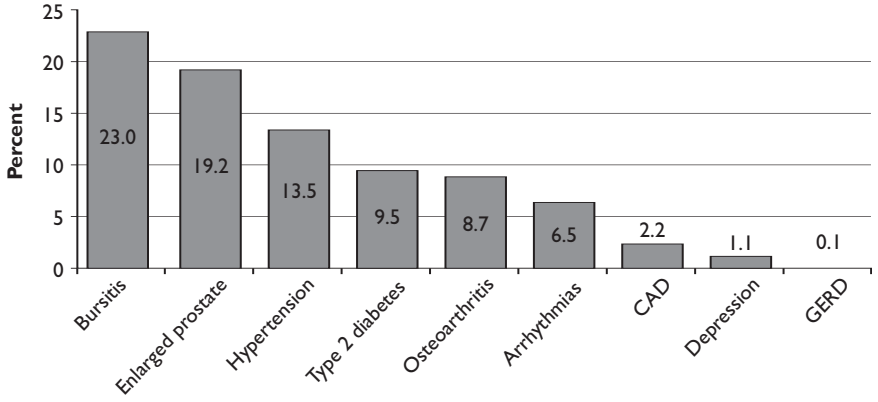
All 4 diseases in the highest cost group generally rely heavily on surgical and procedural interventions as a primary method of care, which would account for the high inpatient and outpatient hospitalizations component. Patients with CAD frequently require surgical procedures that include coronary artery bypass graft surgery and angioplasty,[11] whereas patients with serious arrhythmias require implantable cardioverter defibrillator devices.[12-14] Patients with osteoarthritis may require interventions, such as knee or hip replacement and arthroscopy.[15] In fact, the most common indication for elective total hip and knee arthroplasty in the United States is osteoarthritis.[16,17] For some disorders, such as arrhythmia, the use of medications (eg, warfarin for atrial fibrillation) warrant extensive costs in the form of laboratory tests and monitoring.[18] In terms of pharmacy costs, all of the 4 most prevalent disorders ranked lowest, except for CAD, which incurred $710 per year in pharmacy costs, the highest of all diseases.

Table 4. One-year Disease-specific Medical and Prescription Costs

Disease	Medical cost ($)	Prescription cost ($)
Arrhythmias	1699	312
Osteoarthritis	989	131
Cataracts	885	0
CAD	782	710
Bursitis	463	101
Type 2 diabetes	463	474
Enlarged prostate	401	371
GERD	316	655
Depression	217	529
Hypertension	213	310

CAD indicates coronary artery disease; GERD, gastroesophageal reflux disease.

Figure 4. Likelihood of Experiencing a Significant Event Within 1 Year Classified by Diagnosis



CAD indicates coronary artery disease; GERD, gastroesophageal reflux disease.

The next tier of disorders from a medical cost perspective ranged between $400 and $500 and consisted of bursitis, type 2 diabetes, and enlarged prostate. Based on this study, patients in this middle layer are most likely to have significant clinical events, with patients with bursitis being most likely to have an event (draining bursa/bursa surgery), followed by patients with enlarged prostate (AUR/prostate surgery) and patients with type 2 diabetes (amputation, nephropathy, or neuropathy), which ranked fourth in this category. These data indicate that as few as 1 in 10 men and as many as 1 in 5 men may have a significant clinical event within 1 year of initiating treatment for these disorders. The finding of increased clinical events with bursitis was especially surprising given the usual treatment paradigm, which includes controlling inflammation and pain, rehabilitation, and prevention of reinjury. This disease is generally treated with rest, application of ice, compression, elevation, and medications, such as nonsteroidal anti-inflammatory drugs or corticosteroid injections.[19] Surgery is generally reserved for the most severe and refractory cases.[20] With the absence of detailed clinical data, this study cannot confirm the severity of the cases or assess the appropriateness of surgical interventions. The findings may suggest that this elderly population has a greater incidence of refractory bursitis, requiring more extensive treatment.

Enlarged prostate was the second most likely disease to have a clinical event. The treatment of enlarged prostate is highly focused on the management of lower urinary tract symptoms. For such symptom control, alpha blockers are used in 85% of patients initiating treatment, because the onset of symptom relief is faster with alpha blockers than with 5-alpha reductase inhibitors (ie, dutasteride and finasteride). Although alpha blockers are the mainstay of treatment, only 5-alpha reductase inhibitors have been shown to affect the risk of adverse events, such as AUR and prostate surgery.[21] The likelihood of an adverse clinical event (as defined in this study) in patients with enlarged prostate may be reduced if more patients were placed on 5-alpha reductase inhibitors. However, as described with bursitis, the absence of detailed clinical data precludes our ability to describe the severity of the cases or the appropriateness of pharmaceutical interventions in this population.

Patients initiating treatment for type 2 diabetes were also likely to have an adverse clinical event. This may result from the high proportion of patients that fail to achieve therapeutic standards. Treatment for patients with type 2 diabetes should aim to achieve glycosylated hemoglobin levels of less than 7%[22]; however, literature has shown that only approximately 36% to 37% of patients achieve this level of control.[23,24] This may reflect the high percentages of adverse outcomes in this population.

The remaining disease categories include diseases with relatively low medical cost components. Patients with GERD, depres-

sion, and hypertension incurred $316, $217, and $213 in medical costs per year, respectively. These patients also tended to have a high pharmacy component, with the exception of those with hypertension. Patients with hypertension incurred the third lowest pharmacy costs. However, these patients also ranked third in terms of the likelihood of a significant clinical event, with 13.5% of patients having a stroke, acute MI, CHF, and/or ischemic heart disease. The goal of hypertensive treatment is to achieve blood pressure ≤120/80 mm Hg; however, only 34% of patients meet this requirement.[25] Inadequate control of hypertension may result in the increase in clinical events seen in this study.

Although this study highlights the economic and clinical implications of these prevalent noncancer diseases in men ≥50 years of age, there are some limitations that should be noted. First, this article focused on the rankings of these diseases based on the medical management of disorders. These rankings may be substantially altered if medical and pharmacy costs were analyzed in aggregate or if the primary ranking was based on pharmacy costs. Of the 4 most costly disorders from a medical perspective, only cataracts would fall in ranking. Type 2 diabetes would replace cataracts in the 4 most costly disorders.

This study focused on disease-specific costs. However, the amount reimbursed for medical claims may be associated with the disease coding used. Therefore, disease-specific costs for diseases that are reimbursed at lower levels may be underreported. Additionally, the definition of disease-specific costs could be expanded to include additional disease states beyond those assessed in this study, such as CHF or stroke for hypertension or anxiety for depression, because of the comorbid nature of these disorders. However, to maintain the most parsimonious assessment, definitions were kept straightforward. Finally, all costs covered by Medicare in the population of men ≥65 years of age were not examined. Cost estimates provided in this study may be conservative in nature without the inclusion of these costs.

The use of claims data limits the demographic and clinical information available for analysis; therefore, the level of patient severity cannot be determined. From a clinical perspective, some patients may have been omitted due to the lack of an *ICD-9* code for the disease of interest, although the patient would have been included if all diagnostic information were available. This is especially true in diseases such as depression, where 50% of patients initiating treatment do not have a coded diagnosis of depression.[8,26] Because of this limitation, data presented here are not an exact representation of the incidence and prevalence of the disorders identified.

Despite these limitations, this study provides valuable insight into the economic and clinical outcomes associated with the most prevalent noncancer disorders in middle-aged and elderly men. Based on the data, opportunities for improvement exist in patients with enlarged prostate, hypertension, and type 2 diabetes, because these patients are most likely to have significant clinical events. The outcomes of these diseases could be greatly enhanced with the selection of therapies that are disease modifying while providing the best level of control. Finally, given the high rate of clinical events with bursitis, educative methods for prevention may be necessary in this aging population.

This study also highlights therapeutic areas that demand more focus, specifically osteoarthritis. Osteoarthritis was the second most costly disease and is among the most frequent and symptomatic health problems for middle-aged and elderly men. Additionally, osteoarthritis is associated with significant morbidity[27] and is estimated to disable 10% of those older than 60 years of age.[27,28] Financially, osteoarthritis costs the US economy more than $60 billion per year. The disease is second only to ischemic heart disease as a cause of work disability in men older than 50 years of age.[27] The majority of treatments used do not prevent or modify the progression, but rather they treat the symptoms of the disease.[27,28]

CONCLUSION

The most costly conditions in the 10 most prevalent diseases in aging men were typi-

cally those that required a high level of inpatient care. Prescription costs were not a significant percentage of total costs for the majority of the 10 most prevalent diseases. Conditions such as enlarged prostate, type 2 diabetes, and hypertension demonstrated a high likelihood of a clinical event within 1 year of initiating treatment. These conditions have been identified as the therapeutic areas with the greatest likelihood of improvement, given what is known about the use of appropriate pharmacotherapy and the likelihood of treating to goal. Osteoarthritis also demands particular focus, because therapy is generally symptomatic in nature, but the economic implications of medical management are significant.

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