Costs Associated With Multimorbidity Among VA Patients

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Background: Multimorbidity (the presence of multiple chronic conditions) is associated with high levels of healthcare utilization and associated costs. We investigated the association between number of chronic conditions and costs of care for nonelderly and elderly Veterans Affairs (VA) patients, and estimated mean VA healthcare costs for the most prevalent and most costly combinations of 3 conditions (triads).

Methods: We identified a cohort of 5,233,994 patients who received care within the VA system in fiscal year 2010. We estimated the costs of VA care for each patient using established methods and aggregated costs for inpatient care, outpatient care, prescription drugs, and contract care. Using ICD-9 diagnosis fields from all inpatient and outpatient records, we determined the prevalence of 28 chronic conditions and all condition triads. We then compared the condition-cost gradient, most prevalent triads, and most costly triads among nonelderly (below 65 y) and elderly (65 y and above) patients.

Results: Almost one third of nonelderly and slightly more than a third of elderly VA patients had ≥ 3 conditions, but these patients accounted for 65% and 67% of total VA healthcare costs, respectively. The most common triad of chronic conditions for both nonelderly and elderly patients was diabetes, hyperlipidemia, and hypertension (24% and 29%, respectively). Conditions that were present in the most costly triads included spinal cord injury, heart failure, renal failure, ischemic heart disease, peripheral vascular disease, stroke, and depression. Although patients with the most costly triads had average costs that were 3 times higher than average costs among patients with ≥ 3 conditions, the prevalence of these costly triads was extremely low (0.1%–0.4%).

Conclusions: Patients with multiple chronic conditions account for a disproportionate share of VA healthcare expenditures. Interventions that aim to optimize care and contain costs for multimorbid patients need to incorporate strategies specific to the most prevalent and the most costly combinations of conditions.

Key Words: chronic conditions, multimorbidity, healthcare costs, expenditures, veterans

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The number of people with multiple chronic conditions has steadily increased over the past decade and is projected to continue rising by >1% per year until 2030.[1,2] Patients with multiple chronic conditions account for a disproportionate share of healthcare costs,[3,4] a pattern that is well documented among older adults. For example, in 1999, the mean Medicare expenditures were $1154 among those with 1 condition and $13,973 among those with ≥ 4 conditions.[5] These high costs are attributable, in part, to high rates of hospitalization, many of which may be avoidable.[5]

Although the positive association between number of chronic conditions and healthcare expenditures is well established, there is a need for greater understanding about specific combinations of conditions contributing to high costs. Recent analyses of Medicare data identified high rates of high cholesterol, hypertension, diabetes, and ischemic heart disease in the most prevalent disease combinations and high rates of stroke and chronic kidney disease in the most costliest disease combinations.[2] However, there are a number of reasons why these findings may not be generalizable to other health systems such as the Veterans Affairs (VA). Multimorbidity is more common among patients receiving care within the VA system compared with the general population.[6] This is especially true among younger patients within the VA, many of whom have comorbid mental health conditions such as depression, anxiety, posttraumatic stress disorder, and substance use disorders.[7–9] These comorbidities can complicate the care of other chronic conditions and increase healthcare utilization and overall costs of care.[10–12]

Recent evidence showed that close to 90% of older adults receiving care within the VA had ≥ 3 chronic health

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conditions in 2007–2008, and that the most prevalent triads (combinations of 3 conditions) among this population included hypertension, hyperlipidemia, coronary heart disease, diabetes, gastroesophageal reflux disease, and benign prostatic hypertrophy.[13] The costs associated with these various condition triads were not examined.

The objective of this study was to advance our understanding of multimorbidity within the VA healthcare system by: (1) estimating mean costs per patient and across the population by number of chronic conditions, (2) identifying the most prevalent triads and associated costs, and (3) identifying the most costly comorbidity triads among nonelderly (below 65 y) and elderly (65 y and above) patients. Examining mean VA healthcare costs for the most prevalent triads can identify a specific, large group of veterans who may benefit from efforts to develop clinical guidelines that address multimorbidity because they account for a disproportionate share of VA healthcare costs due to their sheer numbers. Examining VA healthcare costs for the most costly triads can identify veterans who would directly benefit from intensive primary care interventions to coordinate the care that best addresses their needs.

METHODS

Data Sources and Measures

We identified a cohort of 5,233,994 patients who received VA inpatient or outpatient care in fiscal year 2010 (October 1, 2009–September 30, 2010) from the VA Medical SAS files that record all VA utilization. We obtained patients' age, sex, diagnoses, all inpatient and outpatient utilization, and costs of VA-provided and VA-sponsored services during fiscal year 2010.

Using ICD-9 diagnosis fields from all inpatient and outpatient records, we coded 28 chronic conditions that have been the focus of quality improvement efforts and research within the VA because of their prevalence, management challenges, and costs.[14–16] Each inpatient stay included fields for up to 13 conditions, whereas each outpatient encounter included fields for up to 10 conditions. The study conditions included: acid-related diseases [gastric, duodenal, peptic, gastrojejunal, and esophagus ulcers, gastritis, esophageal reflux (GERD), and dyspepsia], alcohol/drug use disorders, Alzheimer disease, arthritis, asthma, cancer, chronic renal failure, chronic obstructive pulmonary disease, depression, diabetes, headache, heart failure, hepatitis C, HIV/AIDS, hyperlipidemia, hypertension, ischemic heart disease (including coronary heart disease), low back pain, multiple sclerosis, other psychiatric conditions (including schizophrenia and manic depression), osteoporosis, Parkinson disease, posttraumatic stress disorder, prostatic hyperplasia, peripheral vascular disease, spinal cord injury, stroke, and thyroid disorder. Conditions were indicated for each patient if they had at least 2 separate instances of a diagnosis in inpatient or outpatient (including primary care and specialty care) encounter records to avoid counting conditions recorded to rule out diagnoses.

The overall cost of VA care for each patient was estimated by aggregating costs for inpatient care, outpatient care, prescription drugs, and contract care from several sources as there are no billing records in the VA. The costs of VA outpatient visits and inpatient stays were obtained from the 2010 Average Costs files, which generate VA healthcare costs based on Medicare payments for similar care using information such as DRG codes in inpatient records and procedure codes in outpatient records.[17–19] Prescription drug costs were obtained from the 2010 Decision Support System Pharmacy files that report the supply and dispensing costs per each prescription filled in the VA. The costs of contract care provided by non-VA providers was obtained from 2010 Fee Basis files, which report the actual payments per service made to providers.

Analysis

We stratified the sample into elderly (age, 65 y and above) and nonelderly (18–64 y) subgroups to examine whether the cost-condition gradient, most prevalent triads, and most costly triads were similar for elderly and nonelderly.[20] For both age cohorts, we report the number and proportion of patients by number of study conditions, unadjusted mean costs by number of conditions, and proportion of total VA healthcare costs by number of conditions.

For patients with ≥ 3 of the study conditions, we coded all possible combinations of 3 coexisting conditions (triads) as in previous research[13] and determined which triads had the greatest prevalence and costs by age group. When determining the highest cost triads, there were triad combinations that had very low rates (< 0.1% of patients), hence we report only the highest cost triad combinations where the prevalence was at least 0.1%. We report the prevalence of triads and the mean costs of patients within triads for the top 5 most prevalent and top 5 most expensive triads. As some patients had >3 conditions, the triads do not represent mutually exclusive groups of patients.

RESULTS

The Cost-Condition Gradient for Elderly and Nonelderly Patients

Among the 2,888,989 nonelderly VA patients, 35% had none of the 28 chronic conditions examined, 18% had only 1 condition, 16% had 2 conditions, and almost a third had ≥ 3 conditions (Fig. 1). The unadjusted mean cost for nonelderly patients with 3 conditions ($10,809) was twice the mean cost for patients with only 1 condition and >5 times the cost for patients with no documented conditions. Nearly all (92%) VA healthcare costs were spent on patients with ≥ 1 chronic conditions. Nonelderly patients with ≥ 3 conditions accounted for 65% of total VA healthcare costs although they made up only 32% of the nonelderly VA population.

Among the 2,345,005 elderly VA patients, 36% had none of the study conditions, and 35% had ≥ 3 conditions (Fig. 2). The same pattern of costs by number of chronic conditions was observed in patients 65 years and older although the mean cost per patient was lower than for patients under 65 (as would be expected because dual eligibility for Medicare tends to result in decreased use of VA care).

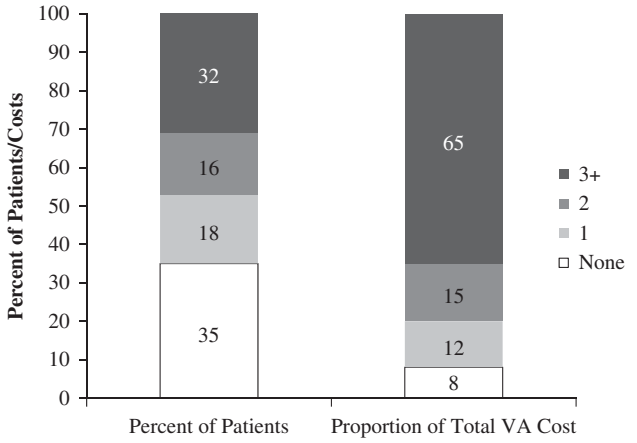

FIGURE 1. Costs of nonelderly VA patients by number of chronic conditions.

Patients with ≥ 3 conditions incurred 67% of total VA healthcare costs among the older cohort.

The Most Prevalent Condition Triads Among Nonelderly and Elderly Veterans

Among the 897,614 nonelderly patients with ≥ 3 conditions, the most common triad of chronic conditions was diabetes, hyperlipidemia, and hypertension, which affected 24% of nonelderly patients with an unadjusted mean cost of $15,856. These 3 conditions along with ischemic heart disease, depression, PTSD, and low back pain in various combinations accounted for the 5 most prevalent triads (Table 1). Total costs of patients in any of the top 5 triads represented 37% of costs of all patients with ≥ 3 conditions.

In the cohort of 832,300 elderly VA patients, the most prevalent triad was also diabetes, hyperlipidemia, and hypertension, which affected 29% of elderly patients and had an unadjusted mean cost of $13,174. These 3 conditions along with ischemic heart disease and acid-related diseases composed the 5 most prevalent triads. Contrary to our expectations, mental health conditions were not implicated in the most prevalent conditions for elderly patients. For the elderly, the total costs of patients in any of the top 5 triads were 50% of total costs of all patients with ≥ 3 conditions.

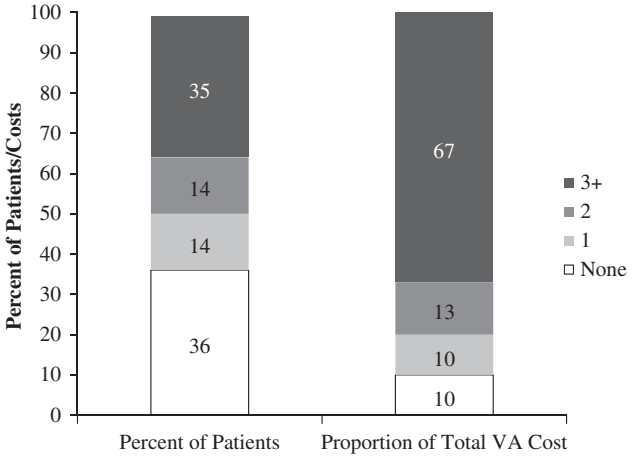

FIGURE 2. Costs of elderly VA patients by number of chronic conditions.

The Most Costly Condition Triads Among Nonelderly and Elderly Veterans

Chronic heart failure, chronic renal failure, and chronic obstructive pulmonary disorder was the most costly triad for nonelderly patients, which affected only 0.2% of patients but was associated with an unadjusted mean cost of $81,685 (Table 2). The total costs of patients in the most expensive triads represented 3% of total costs among patients with ≥ 3 conditions. Diabetes, hypertension, and spinal cord injury was the most costly triad for elderly patients, affecting 0.1% of patients but was associated with an unadjusted mean cost of $65,905, and the total costs of elderly patients in the most expensive triads represented 4% of costs of all patients with ≥ 3 conditions. The combination of chronic heart failure and chronic renal failure was included in 3 of the 5 most costly triads for both age cohorts. The other conditions involved in the most costly triads in both age cohorts included ischemic heart disease, peripheral vascular disease, stroke, depression, and other psychiatric disorders. None of the prevalence rates for these triads was $> 0.4\%$ of patients with ≥ 3 chronic conditions.

DISCUSSION

Multimorbidity is highly prevalent among elderly and nonelderly veterans using the VA healthcare system, and patients with multiple chronic conditions incurred a disproportionate share of resources. Hypertension and hyperlipidemia were the most frequent conditions occurring in the 5 most prevalent triads for elderly and nonelderly veterans, highlighting the need for preventive services to encourage dietary changes and physical activity. Hypertension and hyperlipidemia are considered concordant conditions in terms of treatment, hence effective treatment of one condition can positively affect the outcomes of the other.[21] As a result, clinical guidelines responsive to multimorbidity may reasonably place greater emphasis on the joint management of these conditions.

Unlike a recent paper by Steinman et al[13] that found hypertension, hyperlipidemia, and coronary heart disease to be the most prevalent triad among elderly veterans in 2007–2008, we found that hypertension, hyperlipidemia, and diabetes was the most prevalent triad in 2010. The consequences of comorbid diabetes and hypertension and/or hyperlipidemia in older age is demonstrated by the high rates of ischemic heart disease co-occurring with these conditions in 3 of the 5 most common condition triads for the elderly cohort. Preventing diabetes onset and managing diabetes symptoms when they develop is a major issue in reducing morbidity and adverse outcomes as patients age. We also found that mental health conditions (depression and PTSD) occurred frequently in triad combinations in nonelderly patients. Finding innovative ways to comanage mental health and medical problems for these patients will continue to be

TABLE 1. Most Prevalent Triads Among VA Patients With at Least 3 Chronic Conditions

Most Prevalent Condition Triads*	Patients With Conditions (%)	Mean Cost per Patient (SD) ($)	Median Cost per Patient ($)
< 65 y (N = 897,614)			
Diabetes, hyperlipidemia, hypertension	24.4	15,856 (31,191)	6716
Depression, hyperlipidemia, hypertension	11.5	21,552 (33,903)	10,466
Hyperlipidemia, hypertension, ischemic heart disease	10.6	22,347 (37,348)	9205
Hyperlipidemia, hypertension, low back pain	10.0	17,692 (29,584)	8616
Hyperlipidemia, hypertension, PTSD	8.5	19,736 (31,657)	10,241
≥ 65 y (N = 832,300)			
Diabetes, hyperlipidemia, hypertension	29.1	13,174 (28,257)	4868
Hyperlipidemia, hypertension, ischemic heart disease	21.4	15,911 (31,844)	5089
Diabetes, hypertension, ischemic heart disease	12.7	19,630 (37,221)	6874
Diabetes, hyperlipidemia, ischemic heart disease	11.1	18,172 (34,345)	6366
Acid-related disease, hyperlipidemia, hypertension	10.0	14,593 (30,454)	4795

*Three-way disease combinations were created for patients with at least 3 (of a possible 28) chronic conditions.

an area of priority for VA providers given the high rates of mental health conditions in recent veterans and substantial evidence that adults with mental health comorbidities have greater difficulty managing chronic medical conditions and have higher rates of hospitalizations and higher costs.[12,22,23] Mental health conditions did not arise in the most prevalent triads for elderly patients, possibly due to undercoding of mental health diagnoses.[24]

Unlike the most prevalent condition triads, the most costly condition triads included many discordant conditions affecting multiple organ systems. The co-occurrence of chronic heart failure and chronic renal failure in many of the top 5 most costly triads for both age cohorts highlights the high costs associated with managing complex and discordant conditions. This finding builds on literature describing challenges to self-management and quality of care as well as adverse health outcomes that arise in the presence of discordant conditions.[25–29] For example, patients with discordant conditions often face challenges adhering to multiple drug prescriptions, experience adverse drug interactions, and have difficulty coordinating care with multiple specialists.[30–33] In addition, patients in some of the most costly triads had 7–8 total chronic conditions, on average, compared with patients in less costly triads who had 5–6 total chronic conditions, hence their costs also reflect a greater total comorbidity burden (consistent with literature describing the association between number of chronic conditions and overall costs of care).[5]

Although relatively few patients were in the most costly triads, their mean costs were almost 3 times the costs of patients in other triads. These findings highlight the need for interventions that target the sickest patients who have high resource use to provide more cost-effective care. In recent years a number of innovative healthcare delivery models have emerged with the goal of improving outcomes and containing utilization in these complex and high-risk

TABLE 2. Most Costly Triads Among VA Patients With at Least 3 Chronic Conditions

Most Costly Condition Triads*	Patients With Conditions (%)	Mean Cost Per Patient (SD) ($)	Median Cost Per Patient ($)
< 65 y (N = 897,614)			
Chronic heart failure, chronic renal failure, COPD	0.2	81,685 (82,154)	58,071
Chronic heart failure, chronic renal failure, depression	0.2	77,834 (83,326)	50,860
Chronic renal failure, ischemic heart disease, peripheral vascular disease	0.2	77,598 (89,775)	47,374
Diabetes, hypertension, spinal cord injury	0.1	77,546 (107,936)	35,401
Chronic heart failure, chronic renal failure, ischemic heart disease	0.4	77,076 (84,674)	50,817
≥ 65 y (N = 832,300)			
Diabetes, hypertension, spinal cord injury	0.1	65,905 (91,829)	30,393
Chronic heart failure, chronic renal failure, peripheral vascular disease	0.4	62,348 (69,499)	40,237
Chronic heart failure, chronic renal failure, stroke	0.2	59,138 (68,565)	38,794
Chronic heart failure, chronic renal failure, depression	0.3	57,586 (63,786)	37,588
Chronic heart failure, ischemic heart disease, other psychiatric condition†	0.1	57,005 (68,788)	34,053

Triads with < 0.1% patients are not reported here.
*Three-way disease combinations were created for patients with at least 3 (of a possible 28) chronic conditions.
†Other psychiatric condition includes: borderline, manic depression, other personality disorder, other psychosis, and schizophrenia.

patients. This strategy has been tested in a number of settings,[34–36] including clinics serving older adults.[37,38] Some models, such as CareMore (a for-profit corporation that provides intensive management for frail and chronically ill members) and the Ambulatory-Intensive Care Unit (developed for Boeing employees and later disseminated to other settings such as Atlantic City and rural Humboldt County in California), report savings as high as 15%–20% in nonpeer-reviewed observational studies.[36,39] These savings are generally attributed to lower spending for emergency care and hospitalizations.

Limitations

This analysis is subject to several limitations. We presented the mean costs of patients in different triads, but we did not determine how each condition separately attributed to the total costs of triads. As patients in some of the most costly triads had a greater number of total conditions than patients in less costly triads, the high costs may be due to specific conditions in the triad, or the total burden of conditions in addition to the triad, or another, more costly but rarer condition.

We identified chronic health conditions from diagnosis fields in inpatient and outpatient utilization records, hence there may have been underreporting of diagnosed conditions. We focused on the 28 conditions that are common or a focus of VA quality improvement efforts, and results may have changed if we considered a broader array of conditions. Steinman et al[13] considered 23 conditions among elderly veterans in 2007–2008 including atrial fibrillation, anemia, epilepsy, gout, and chronic renal insufficiency, which were not included in our study and obtained a significantly higher estimate of elderly patients with ≥ 3 conditions. Steinman also used only 1 instance of a diagnosis to identify a condition, hence our estimates using 2 instances are more conservative. We did not have access to Medicare data to supplement VA diagnoses for Medicare-eligible veterans, hence we may have undercounted conditions in older patients, especially those who were less reliant on VA care. If we had used Medicare data, then the prevalence of conditions would have increased, and the proportion of elderly patients with ≥ 3 conditions would likely have been higher. Steinman and colleagues also included patients with at least 2 VA visits or hospitalizations, whereas we did not, hence we may have more casual VA users than the cohort of Steinman and colleagues.

Non-VA healthcare costs were excluded from these comparisons, and results might have changed if Medicare and Medicaid costs had been included. These results also may not generalize to non-VA samples because veterans are predominantly male. In addition, the most prevalent and most costly triads may differ in nonveteran samples, which would be useful to compare in future research.

CONCLUSIONS

The rise in reported chronic conditions in US adults suggests multimorbidity will pose a growing challenge for healthcare systems including the VA system. Currently, $>90\%$ of VA healthcare resources are devoted to patients with chronic conditions. We found a significant cost-condition gradient among elderly and nonelderly veterans, which is consistent with findings from similar studies in Medicare beneficiaries. As patients with multiple chronic conditions account for a disproportionate share of VA healthcare expenditures, targeted treatment guidelines and interventions focused on this population are critical to managing the growth of healthcare costs. Greater efforts around prevention, guidelines for joint management of comorbid conditions, and intensive management of high utilizing and high cost patients may benefit multimorbid patients and healthcare systems overall.

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