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RESEARCH ARTICLE

Persistence of High Health Care Costs among VA Patients

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Objectives. To examine high-cost patients in VA and factors associated with persistence in high costs over time.

Data Sources. Secondary data for FY2008–2012.

Data Extraction. We obtained VA and Medicare utilization and cost records for VA enrollees and drew a 20 percent random sample ($N = 1,028,568$).

Study Design. We identified high-cost patients, defined as those in the top 10 percent of combined VA and Medicare costs, and determined the number of years they remained high cost over 4 years. We compared sociodemographics, clinical characteristics, and baseline utilization by number of high-cost years and conducted a discrete time survival analysis to predict high-cost persistence.

Principal Findings. Among 105,703 patients with the highest 10 percent of costs at baseline, 68 percent did not remain high cost in subsequent years, 32 percent had high costs after 1 year, and 7 percent had high costs in all four follow-up years. Mortality, which was 47 percent by end of follow-up, largely explained low persistence. The largest percentage of patients who persisted as high cost until end of follow-up was for spinal cord injury (16 percent).

Conclusion. Most high-cost patients did not remain high cost in subsequent years, which poses challenges to providers and payers to manage utilization of these patients.

Key Words. High cost, utilization, chronic disease

A small proportion of patients account for the majority of health care expenditures; this is true across various populations and health systems (Garber, MaCurdy, and McClellan 1997; Berk and Monheit 2001; Monheit 2003; Zulman et al. 2015). Health care systems are increasingly interested in managing the care of their high-cost patients as they are being asked to share financial risk with payers. For example, accountable care organizations are creating financial incentives to encourage clinicians to manage patients' utilization and reduce unnecessary or inefficient care. Therefore, patients with high health

care utilization and costs, and especially those who persistently incur high costs over multiple years and are also continuously enrolled in a delivery system, are good candidates for providers seeking to improve outcomes and reduce spending.

Many patients have high costs in the short term that decrease without any particular intervention, while other patients do not. In prior research, the percent of patients in the top decile of annual health care costs that remained in the top decile in a subsequent year ranged from about 15 percent in the Medicare population to 43 and 45 percent in employer-based coverage patients and the U.S. general population, respectively (Monheit 2003; MaCurdy and Geppert 2005; Hirth et al. 2015). The high mortality rate among elderly patients contributes to a lower rate of high-cost persistence in elderly than in non-elderly patients. Conditions such as mental health disorders, diabetes, infectious disease, and cancer have been associated with persistently high costs (Monheit 2003).

While many studies have examined high-cost persistence in Medicare, privately insured, and general U.S. populations, no prior studies have looked at this issue in Veterans Health Administration (VHA). Veterans using care in VHA provide a unique opportunity to examine patients who remain high cost for multiple years for several reasons: Once enrolled in VHA, veterans stay enrolled for many years; their VHA utilization can be linked to Medicare utilization to follow them if they switch providers once they are eligible for Medicare; and many have service-related physical and mental health conditions that contribute to them being a sicker population overall. It is unknown

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whether VHA patients have greater persistence of high costs compared to other populations and what sociodemographic and health conditions predict their persistence. Patterns in high-cost persistence found among VHA patients may be similar to patterns in non-VHA patients, especially more complex patients.

In this study, we identified patients in the top decile of combined VA and Medicare health care costs and describe their persistence over a 4-year follow-up period. We compared the sociodemographic characteristics, health conditions, and health care utilization in the baseline year by the length of high-cost persistence. We also predicted persistence of high costs for those who were high cost at baseline in multivariate analysis to determine whether certain health conditions or characteristics were associated with higher rates of persistence. Differentiating between patients who have high costs that persist over time and those who have high costs for shorter periods can help determine whether clinical and policy interventions can be tailored specifically for these different high-cost groups, especially for conditions or care amenable to high-cost interventions.

METHODS

Cohort and Data Sources

We identified all users of VA care from VA utilization records ($N = 5,289,260$) in fiscal year (FY) 2008 (October 1, 2007–September 30, 2008), which was chosen to have at least 4 years of follow-up based on data availability at the time of data analysis. Inclusion criteria included patients with any VA inpatient or outpatient utilization who were veterans. Exclusion criteria included VA patients who were not veterans or were enrolled in VA but did not use any VA care. For a 20 percent random sample ($N = 1,028,568$), we obtained all VA and Medicare cost records for FY2008–2012. From the VA National Patient Care Database and VA Community Care files, which reported utilization, we obtained patients' sociodemographic characteristics, diagnoses, all inpatient (acute, long-term, and observation stays) and outpatient utilization, costs of these services during the study period, and whether the care was provided or paid by VHA. From the Medicare Beneficiary Annual Summary Files (BASF) for calendar years (CY) 2007–2010 and the Master Beneficiary Summary Files (MBSF) for CY 2011–2012, we obtained their total annual Medicare costs. We also obtained VA Vital Status records for mortality

information. This analysis was conducted for the purposes of quality improvement and was exempted from IRB approval.

Costs and Utilization Measures

Costs of VA care for each patient were obtained for inpatient and outpatient care, outpatient 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 2008–2012 Average Costs files, which estimate VA health care costs based on Medicare relative value units (Phibbs et al. 2003; Wagner, Chen, and Barnett 2003; Yu et al. 2003). VA inpatient care costs were obtained for specific categories of care defined by the treating specialty of the inpatient unit and categorized as medical/surgical, behavioral, long-term, or residential/domiciliary care. VA outpatient care costs were obtained for specific categories defined by the clinic location as primary care, subspecialty (e.g., gastroenterology, cardiology), procedure-based specialty (e.g., GI endoscopy, cardiac catheterization), surgical specialty (e.g., general surgery, cardiac surgery), emergency department, urgent care, mental health, homeless-related, laboratory, or other care.

VA purchases some care from non-VA providers. We obtained these payments from the 2008–2012 Community Care files. Medicare costs were estimated from Medicare BASF and MBSF data from 2007 to 2012 based on Medicare payments to providers and beneficiary cost-sharing payments and summed for each FY. These costs included costs for inpatient and outpatient services (Part A and Part B) and were not assigned to specific categories used for VA costs. Total annual costs of care were estimated for each patient as the sum of all inpatient, outpatient, and contract care received from VA and Medicare providers during each FY. We report all costs in 2014 dollars, using the Consumer Price Index for All Urban Consumers from the U.S. Bureau of Labor Statistics.

VA inpatient utilization was measured by number of inpatient stays and length of each stay for each admission to an inpatient treating specialty unit. Transfers between treating specialties were considered multiple stays. Number of stays and length of stay were measured overall and by each inpatient category. VA outpatient utilization was measured by number of visits, which was counted by a unique combination of the clinic location and visit day for a patient. A number of visits across all categories and by specific outpatient category were estimated for each patient.

Patient Measures

We measured several sociodemographic and other characteristics of the cohort. We obtained patients' age, gender, service-connected disability, means test eligibility, geographic region, marital status, race/ethnicity, whether they left VA care, and whether they had died during the year. We indicated whether veterans were below the means test if they met an income-based means test. The VA rates the degree of patients' service-connected disabilities (for injuries or illness incurred during active duty) from 0 to 100 percent, so we created an indicator for any service-connected disability >0 percent or none. Patients who did not have any VA inpatient or outpatient utilization in a follow-up year were categorized as having left VA care. Date of death, if available, was obtained from the VA Vital Status file and used to identify anyone who died during each study year.

We obtained all diagnoses from VA inpatient and outpatient records in each study year, and we coded 53 clinical condition groups based on AHRQ's clinical classification system (Agency for Healthcare Research and Quality 2006–2009). Each VA inpatient record included fields for up to 13 conditions, while each outpatient encounter included fields for up to 10 conditions. A full list of condition groups is reported in the Appendix SA2. Conditions were indicated for each patient if they had a diagnosis coded during at least one inpatient or outpatient encounter during the period of investigation.

Analysis

In our sample of patients, we identified high-cost patients as those with the 10 percent highest costs during the baseline year based on the distribution of costs for a total of 105,703 high-cost patients. We focus on the top decile of patients as prior evidence found that this group accounted for the vast majority of expenditures in the health care system (Monheit 2003; Hirth et al. 2015; Lee et al. 2017). We similarly identified high-cost patients in each follow-up year and indicated whether patients who were high cost at baseline were also high cost in each year. We counted the number of consecutive years that patients who were high cost at baseline persisted in the high-cost group in each follow-up year, and in bivariate analysis, we compared the sociodemographic characteristics and clinical conditions in the baseline year by the number of consecutive years that patients were identified as high cost using chi-square tests. We also compared the annual rate of mortality for each study year and across all follow-up years combined by the number of consecutive high-cost

years. We compared mean VA health care utilization in the baseline year by the number of consecutive years that patients were identified as high cost using one-way ANOVA.

Among patients who were high cost at baseline and survived to the end of the baseline year ($N = 92,821$), we conducted a discrete survival model using logistic regression where “failure” was not persisting as high cost, and estimated hazard rates for remaining high cost across all clinical conditions over the four follow-up years. One regression model was used to simultaneously adjust for study year, patients’ sociodemographic characteristics, and 53 clinical conditions. As some observations had missing values at baseline for several variables (age 0.5 percent, gender 0.5 percent, marital status 38 percent, and chronic conditions 3 percent) but not others (VA eligibility category, race/ethnicity, service connection), we conducted multiple imputation based on a multivariate normal distribution with 20 imputations.

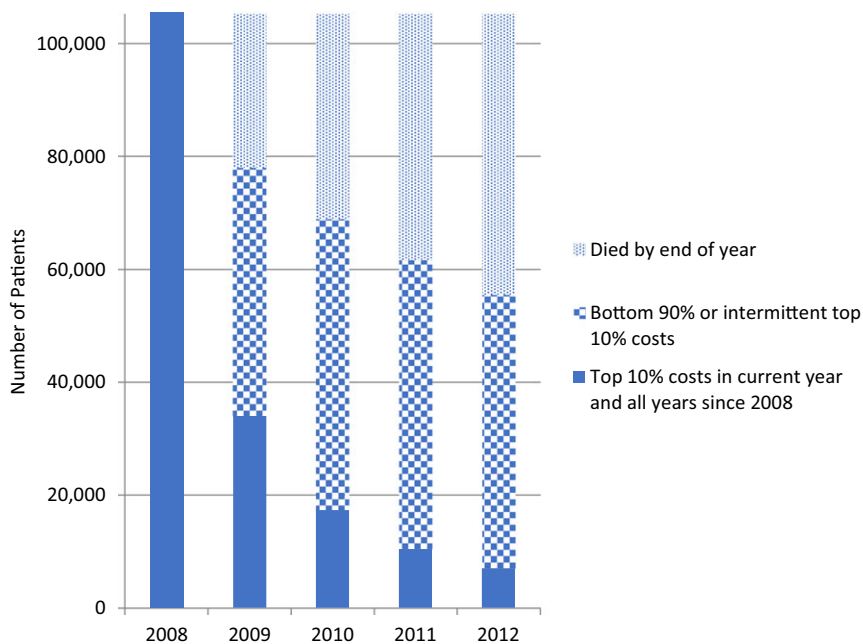
RESULTS

VHA patients with the top decile of health care costs at baseline had at least \$25,368 in total annual inpatient and outpatient costs from VA and Medicare providers with a mean of \$67,755 ($SD = \$64,074$). Among these high-cost patients, 26 percent died, 32 percent of them remained high cost, and almost half were no longer high cost in a subsequent year (Figure 1). By the end of the four-year follow-up period, almost half (47 percent) had died, and only 7 percent of the original cohort remained high cost.

Baseline health care costs were highest among those who persisted as high cost for a longer period (Figure 2). Patients who persisted as high cost for all 4 years of follow-up had mean annual costs of \$95,659 ($SD = 93,737$) at baseline compared to \$65,585 ($SD = 60,848$) for those who did not remain persistently high cost after the baseline year. Regardless of the length of high-cost persistence, there was a similar pattern in mean costs with a sharp decrease in costs in the year that patients dropped out of the top decile of costs and a modest increase in their costs the subsequent year. All of these high-cost groups had mean costs throughout the follow-up period that were significantly higher than the bottom 90th percentile of patients.

Patient characteristics by number of consecutive high-cost years exhibited a gradient effect where characteristics such as black race, unmarried status, higher service-connected disability, higher rate of being below the means

Figure 1: Persistence of High Health Care Costs among 10 Percent Highest Cost VA Patients, FY2008–2012, $N = 105,703$ [Color figure can be viewed at wileyonlinelibrary.com]

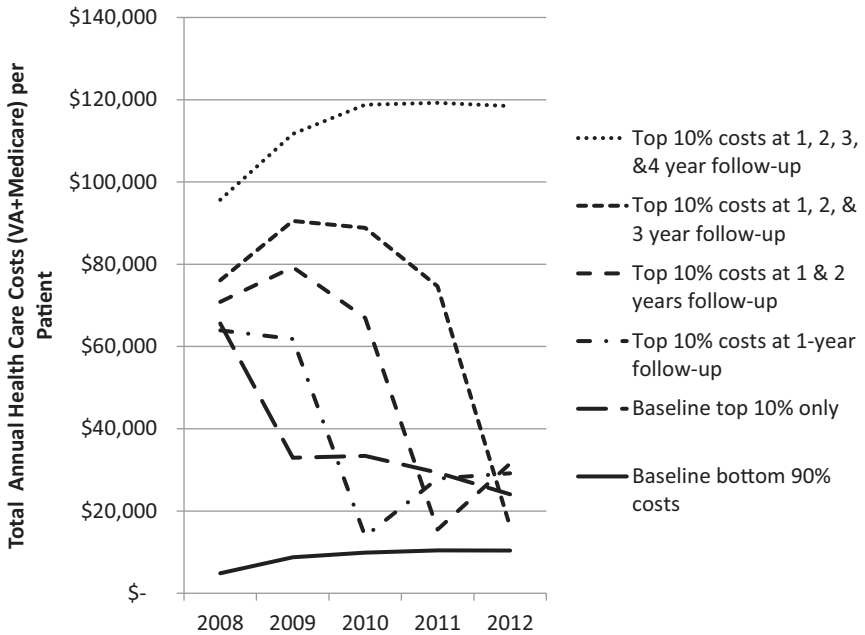


Note. Patients categorized as intermittent top 10 percent costs had costs in top 10 percent in the baseline year, did not have costs in the top 10 percent in the first follow-up year, and may have stayed in the bottom 90 percent of costs or returned to the top 10 percent of costs in later follow-up years.

test, and higher rate of unstable housing were more prevalent for the groups that remained high-cost for a longer period ($p < .01$); these characteristics were also more prevalent for all groups that were high cost at baseline compared to the group that was in the bottom 90th percentile of costs at baseline (Table 1). Most patients who did not persist as high cost after the baseline year (70 percent) were elderly compared to less than half of patients (45 percent) who were high cost for all 4 years of follow-up ($p < .001$).

A greater proportion of patients who were high cost at baseline had six or more chronic conditions in the baseline year compared those who were not, and patients with six or more chronic conditions also had more years of high-cost persistence ($p < .001$). Many health conditions occurred at higher

Figure 2: Mean Health Care Costs per Patient by Persistence of High Costs, $N = 1,028,568$



Note. Patients were assigned to mutually exclusive groups based on the number of consecutive years that they remained high cost.

rates among all high-cost groups compared to the group that was in the bottom 90th percentile of costs at baseline (data not shown in table). Patients who had longer high-cost persistence had higher rates of many health conditions; the largest differences were for injuries, alcohol use disorders, anxiety, depression, and obesity (all $p < .001$). A few conditions such as CAD and heart failure were present at higher rates among patients with fewer years of high-cost persistence (all $p < .001$).

Health care utilization at baseline was high among all patients with high costs at baseline, and there were several types of utilization that had substantially higher rates among those who were high cost for longer follow-up periods. Patients who were high cost for all years of follow-up had a mean number of 2.8 mental health intensive case management encounters and 27.2 mental health encounters per patient compared to 0.3 and 4.9, respectively, for

Table 1: Patient Characteristics and Health Care Utilization in Baseline Year by Consecutive Follow-up Years of High Health Care Costs

<i>Patient Characteristics at Baseline</i>	<i>Bottom 90% Costs</i>	<i>High Cost at Baseline Only</i>	<i>High Cost at 1 year</i>	<i>High Cost 1–2 years</i>	<i>High Cost 1–3 years</i>	<i>High Cost 1–4 years</i>
<i>N</i>	922,865	83,382	10,211	3,596	1,515	6,999
Percent of patients						
Age group						
<55	30	9	18	23	26	22
55–64	29	20	27	31	35	34
65–79	29	35	32	29	25	29
80+	12	35	22	17	13	15
Gender						
Male	91	97	95	94	93	94
Female	9	3	5	6	7	6
Race/ethnicity						
White	74	82	78	76	72	65
Black	14	14	17	20	22	29
Hispanic/Asian/ Other	12	4	5	4	6	6
Marital status						
Married	56	55	48	43	39	43
Single	13	11	16	20	23	21
Separated/ divorced/ widowed	31	34	36	37	37	36
Service connection						
0	68	64	61	58	53	47
10–40	17	13	13	13	12	10
50–100	15	23	26	30	35	43
Below means test	58	73	75	77	81	85
Unstable housing	2	6	12	16	17	12
Number of chronic conditions						
0	11	6	4	4	4	6
1–2	16	6	4	3	4	4
3–5	38	20	16	13	12	14
6+	35	67	76	80	80	75
Mean number/patient						
VA outpatient utilization*						
Primary care	2.7	4	4.9	5.4	5.5	5.3
Subspecialty	1.3	2.7	3.7	4.2	4.9	5.2
Procedure-based specialty	0.3	1.5	1	1.1	1.3	5.2
Surgical	1	2.2	2.8	3	2.9	2.8
ED	0.4	1	1.2	1.4	1.6	1.6
Urgent care	0.1	0.1	0.2	0.2	0.3	0.2
Laboratory	3.1	5.6	6.7	7.6	8.2	8.7
Mental health	1.9	4.9	13	20.1	27.2	17.9

continued

Table 1. Continued

Patient Characteristics at Baseline	Bottom 90% Costs	High Cost at Baseline Only	High Cost at 1 year	High Cost 1-2 years	High Cost 1-3 years	High Cost 1-4 years
Mental health intensive case management	0.1	0.3	0.8	1.6	2.9	2.8
Homeless program	0.1	0.2	0.5	0.6	0.7	0.4
VA inpatient utilization*						
Acute stays	0.11	0.7	0.69	0.73	0.73	0.75
Nursing home stays	0.01	0.06	0.06	0.07	0.06	0.09
Other hospital stays	0.02	0.13	0.34	0.45	0.53	0.43
Acute hospital days	0.48	4.6	4	4.1	3.9	4.2
Nursing home days	0.47	6.3	6.1	8.8	13.7	25.4
Other hospital days	0.46	4.8	13.3	17.4	19.3	14.8

Notes. We conducted chi-square tests to compare characteristics by number of years of high-cost persistence. All comparisons had chi-square *p*-values < .001 except for outpatient encounters for Homeless program visits where *p* = .023.

*VA utilization was categorized into mutually exclusive types of care. Medicare utilization was not categorized and is not reported here.

patients not high cost after the baseline year (both *p* < .001). Procedure-based specialty visits (e.g., GI endoscopy, cardiac catheterization) were much higher among those high cost for the entire 4-year follow-up period (*p* < .001). For inpatient stays, mean number of acute care stays was mostly similar for those with 4 years of persistence (0.75) and those with no persistence (0.70) (*p* = .02), but the proportion of patients with a nursing home admission and the number of nursing home days was substantially higher among those with longer persistence of high costs (both *p* < .001).

We examined persistence of high costs after accounting for those who died or left VA care (for those under age 65) in survival models and estimated rates of persisting as high cost in the top decile at the end of follow-up for all health conditions (Table 2). All patients combined, regardless of the number of high-cost years, had a rapid decline in the rate of high-cost persistence, and several conditions had a slower rate of decline. The rate of persisting as high cost at the end of follow-up was highest for patients who had spinal cord injury (16 percent), multiple sclerosis (14 percent), thrombocytopenia (13 percent), hematologic/immunologic disorders (13 percent), renal failure (11 percent), coagulation/hemorrhagic disorders (11 percent), and tuberculosis (10 percent) (Figure 3). Several other conditions had higher rates of high-cost persistence (6 percent or greater) at end of follow-up: traumatic brain

Table 2: Discrete Survival Model Predicting Nonpersistence of High Costs among Patients High Cost at Baseline FY2009–2012, N = 92,821

<i>Patient Predictors</i>	<i>Odds Ratio (SE)</i>
Year 1 follow-up	9.1* (0.52)
Year 2 follow-up	12.0* (0.69)
Year 3 follow-up	13.8* (0.79)
Year 4 follow-up	15.1* (0.86)
Age (in years)	1.0* (0.001)
Gender	
Male	Ref
Female	1.0 (0.03)
Race/ethnicity	
White	Ref
Black	0.86* (0.01)
Hispanic	1.02 (0.03)
Other	0.97 (0.04)
Marital status	
Married	Ref
Single	0.89* (0.02)
Divorced/separated/widowed	0.97* (0.01)
VA means test/eligibility	
Above means test, co-pay	Ref
Below means test, co-pay	0.99 (0.01)
Service-connected disability	
None	Ref
Yes	0.80* (0.01)
Unstable housing	
No	Ref
Yes	0.59* (0.01)
Clinical condition groups	
Hypertension	1.1* (0.01)
Coronary artery disease	1.0 (0.01)
Heart failure	0.76* (0.01)
Cerebrovascular disease	0.87* (0.01)
Diabetes mellitus	0.82* (0.01)
Overweight/obesity	1.04 (0.02)
HIV/AIDS	0.70* (0.03)
Depression	0.88* (0.01)
PTSD	0.97 (0.02)
Drug use disorders	0.82* (0.02)
Dementia	0.66* (0.01)
Arrhythmia/conduction disorder	0.89* (0.01)
Vascular disease	0.88* (0.01)
Valvular disease	1.11* (0.03)
Cardiovascular conditions	0.76* (0.01)
Lipid disorders	1.27* (0.01)

continued

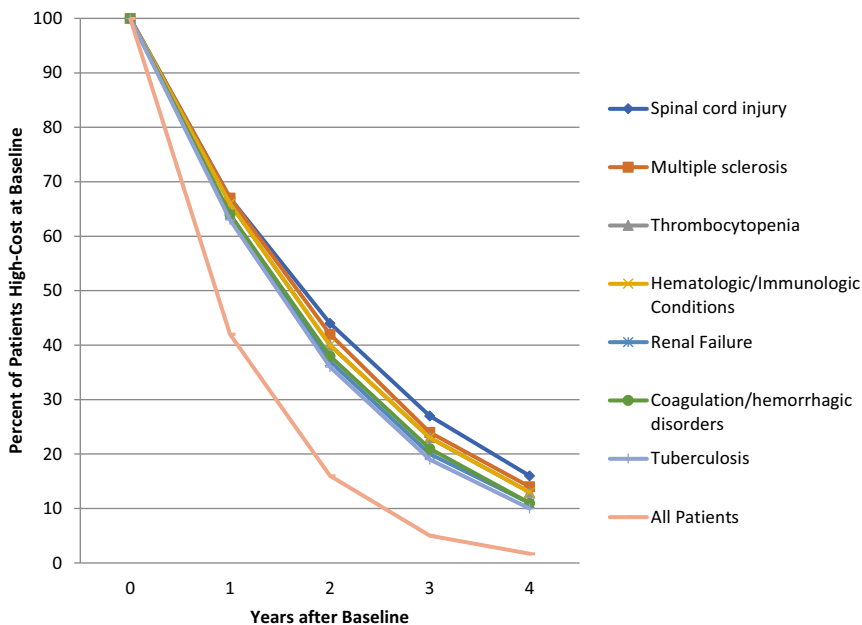
Table 2. *Continued*

<i>Patient Predictors</i>	<i>Odds Ratio (SE)</i>
Thyroid disorders	0.98 (0.02)
Endocrine, metabolic and nutritional disorders	0.84* (0.01)
Esophageal/gastric/duodenal disorders	0.89* (0.01)
Liver disease or Hepatitis C	0.86* (0.01)
Gastrointestinal system disorders	0.87* (0.01)
Tuberculosis	0.76* (0.07)
Infections	0.78* (0.01)
Anxiety disorders—other	0.89* (0.01)
Personality disorders	0.63* (0.02)
Alcohol use disorders	0.90* (0.02)
Cancer, all types	0.82* (0.01)
Serious mental illness	0.59* (0.01)
Rheumatologic/autoimmune disorders	0.78* (0.03)
Spine disorders	1.13* (0.02)
Joint disorders	1.16* (0.02)
Musculoskeletal conditions	0.86* (0.01)
Multiple sclerosis	0.39* (0.03)
Parkinson's disease	0.71* (0.03)
Traumatic brain injury	0.71* (0.03)
Spinal cord injury or paralysis	0.39* (0.02)
Peripheral nerve disorders	0.97* (0.02)
Epilepsy/convulsions	0.71* (0.02)
Nervous system symptoms/disorders	0.89* (0.01)
Chronic pain syndromes	0.69* (0.01)
Tobacco use disorder	0.97 (0.01)
Injuries, poisoning, external conditions	0.73* (0.01)
Renal failure or nephropathy	0.45* (0.01)
Kidney/Ureter/Urinary conditions	0.88* (0.01)
Chronic obstructive pulmonary disease	0.79* (0.01)
Asthma	0.90* (0.03)
Allergic and other chronic sinusitis/rhinitis	1.19* (0.02)
Respiratory conditions	0.84* (0.01)
Anemia	0.72* (0.01)
Thrombocytopenia	0.73* (0.02)
Coagulation and hemorrhagic disorders	0.69* (0.02)
Hematologic/immunologic conditions	0.62* (0.01)

* $p < .01$.

injury, epilepsy, dementia, injuries, chronic pain syndrome, kidney/ureter/urinary conditions, anemia, tuberculosis, and serious mental illness. Other significant predictors of long-term persistence included black race, not being married, having a service-connected disability, and unstable housing (all $p < .05$).

Figure 3: Percent of Patients Persisting in Top 10 Percent of Health Care Costs [Color figure can be viewed at wileyonlinelibrary.com]



Note. Percent of patients remaining high cost at follow-up were estimated from survival models adjusting for year, patient sociodemographic characteristics, geographic region, and 52 clinical condition groups.

DISCUSSION

Most high-cost patients do not persist in the top decile of costs among all patients for over 1 year. Many high-cost patients experience a costly event, such as heart bypass, that flags them as high cost during a year but does not result in ongoing costly care. This is especially true for patients older than 80, in part, because of their higher mortality rate. This finding has major implications for providers and insurers trying to manage these patients. Over the past 5 years, there have been a growing number of clinical interventions such as care or care management aimed at reducing costs among high-cost or high-need populations (Bodenheimer 2013; Williams et al. 2014; Bell et al. 2015; Zulman et al. 2017). Many people exhibit patterns that are analogous to “regression to mean” in subsequent periods without any intervention,

highlighting the need for rigorous evaluation of programs intervening on high-cost patients.

One explanation for the low rate of persistence is the high mortality rate among costly patients. Almost half of the high-cost patients in this study died within 5 years. Overall, the rate of high-cost persistence in our study was between estimates from past studies of working-age adults and elderly adults (Monheit 2003; MaCurdy and Geppert 2005; Hirth et al. 2015). As our study population included both elderly and nonelderly adults, the rate of persistence that we found is consistent with other research. A minority of patients continued to be high cost after several years, and there were several characteristics that were associated with longer persistence of high costs. Veterans who were from a racial/ethnic minority group, unmarried, had service-related disabilities, or housing instability were more likely to have high costs for a longer period; most of these factors, however, are not easily modifiable or are proxies for unmeasured variables (e.g., unmarried as proxy for lacking social support). Similar to prior work, patients with more comorbidities and higher costs had longer persistence of high costs (Hirth et al. 2015). In contrast to our results, Monheit found that black race and poverty were associated with less high-cost persistence (Monheit 2003), although these factors are commonly associated with poor health outcomes. In our study, patients who had greater persistence also had higher utilization of mental health, procedure-based specialty care, and nursing home care at baseline. Utilization of these services may not, by itself, suggest opportunities to provide more efficient care and may, more likely, indicate the presence of health conditions that are associated with high costs.

The highest rates of persistence occurred among patients with spinal cord injury (SCI), renal failure, multiple sclerosis (MS), thrombocytopenia, tuberculosis (TB), coagulation/hemorrhagic disorders, and hematologic disorders. Many of these conditions are associated with considerable disability and require frequent and intensive use of health care services such as inpatient care, dialysis, rehabilitation, and home caregiving (Lee et al. 2002; French et al. 2007; Van Asselt et al. 2007), and conditions such as TB and MS require expensive medications to treat them (Kobelt et al. 2006; Marks et al. 2014), so there may be limited opportunities to provide more efficient care for these patients. To the extent that institutionalized care for these conditions can be substituted by outpatient care or care in the home, some persistence of high costs may be preventable. For example, home dialysis and peritoneal dialysis have been shown to be much less costly than outpatient dialysis (Lee et al.

2002), so there may be potential to reduce costs for patients when this care is appropriate.

Some health care systems are piloting new programs to manage the care of sicker patients that commonly involve intensive management and care coordination based in primary care. The high rates of primary care and other outpatient utilization that we found in the population of patients with persistently high costs suggest some patients may benefit from these types of programs, especially programs that coordinate care across multiple specialties and providers. Patient sociodemographic characteristics that were related to greater persistence among veterans—poverty, marital status (leading to less social support), and housing instability—also suggest important resources can be added in primary care-based programs that may ultimately impact patients' utilization. Providing social services to veterans can connect them with resources for nutrition, housing assistance, and caregiving. These resources may provide benefits to patients that lead to lower reliance on medical services. Programs providing social support for patients with chronic disease may lower health care costs (Cronan, Groessler, and Kaplan 1997), and housing for homeless patients may also contribute to lower health care costs (Basu et al. 2012), although more evidence is needed that these services can impact costs in the long term.

Patients who are primarily managed in mental health or specialty care may benefit less from programs based in primary care. The VA currently provides alternative models such as case management in mental health and home-based health care programs, and some of these programs may contribute to lower costs (Edes et al. 2014). For patients who had high costs in the baseline year only, their rates of acute medical/surgical hospital stays and nursing home stays were similar to patients with greater persistence, and their rates of other types of stays such as psychiatric stays were much lower. This suggests that interventions to prevent avoidable hospitalizations for ambulatory care-sensitive conditions or medical/surgical readmissions may be sufficient to address the needs of patients who are briefly high cost.

LIMITATIONS

These data do not include costs from Medicare Part D (prescriptions), Medicaid, or Medicare Advantage, due to data unavailability. Our findings may not generalize to VA patients covered by those programs. We used location codes to categorize VA services into different types of care, but the analogous

information does not exist for Medicare services. While we categorized patients based on the number of consecutive years that they remained high cost, some patients may have had high costs in years that were not consecutive, so our categorization may bias differences between groups toward the null. Finally, we identified chronic conditions based on a patient having one diagnosis recorded in utilization data. This is highly sensitive and captures many people who have mild conditions or who are managed well with medications and rarely seek care. Other methods to identify chronic conditions are based on at least one diagnosis in discharge records and at least two diagnoses in outpatient records which prevents errant diagnosis codes that lead to an overestimate of chronic conditions. We did not use the more conservative method as our study goals included, in part, identifying conditions that flare up intermittently and may be an important driver of utilization and costs in a high-cost population, whereas an overly restrictive definition has less ability to capture these cases. Our results may not be generalizable outside the VA as VA patients are often sicker than the general population (Rogers et al. 2004); however, some of the factors that were related to longer persistence of high costs may be observed in other medically and socially complex patients.

CONCLUSION

This study highlights patient characteristics and health conditions associated with persistence of high costs and may inform interventions aiming to identify patients with modifiable risk factors for long-term costly care. The severity and types of illness associated with persistence of high costs suggest there may be limited opportunities to reduce high costs for patients, although some patients may benefit from coordination of multiple chronic conditions, as well as social services and noninstitutionalized care. These issues should be considered when developing clinical interventions targeting high-cost populations.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the supporting information section at the end of the article:

Appendix SA1: Author Matrix.

Appendix SA2: List of Clinical Condition Groups.