

# Diabetes-Related Utilization and Costs for Inpatient and Outpatient Services in the Veterans Administration

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**OBJECTIVE** — The purpose of this study was to calculate the total number of inpatient hospitalizations, outpatient clinic visits, and total direct health care costs associated with veterans with diabetes receiving care in Veterans Administration (VA) facilities.

**RESEARCH DESIGN AND METHODS** — The number of inpatient hospitalizations is tracked for years 1994–1998, and outpatient clinic visits are tracked for years 1997 and 1998. Trends in utilization across different age and racial groups, as well as total direct inpatient and outpatient costs for 1998, are presented.

**RESULTS** — Between 1994 and 1998, hospitalization rates decreased from 1.68 to 1.61. The average number of outpatient visits was 4.5 in 1997 and 4.6 in 1998. VA incurred \$214.8 million in outpatient expenditures and \$1.45 billion in inpatient expenditures for veterans with diabetes receiving VA care.

**CONCLUSIONS** — Health care delivery systems and payors track the cost and utilization of services by specific patient groups to support disease management, quality improvement, external reporting, and cost containment. Tracking the utilization and cost of diabetes care is necessary to understand the financial impact of diabetes on health care systems and the overall burden of diabetes on individuals.

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Health delivery systems and payors track the cost and utilization of services by specific patient groups to support disease management, quality improvement, external reporting, and cost containment. In the U.S., managed care organizations have been at the forefront of this effort. Three factors contribute to the overall cost of diabetes: diabetes prevalence, health care utilization, and the price of services. In 1994, 139,646 of 1,180,260 veterans who were seen at least once at 62 Veterans Administration (VA) medical centers were identified as having

diabetes, representing 11.8% of all such veterans (1). This prevalence is slightly lower than a national estimate, based on 1992 inpatient data, of 16% in the general population (2). More recent estimates of diabetes prevalence in VA are provided in other articles in this supplement.

Several estimates of inpatient care, total cost, and excess cost from diabetes in the U.S. have been generated in the past decade. A study by Jiang et al. (3) found that adults with diabetes from five states averaged 1.5 hospital stays in 1999. In a recent study, the American Diabetes As-

sociation (ADA) estimated that total cost of care for all Americans with type 1 and type 2 diabetes in 2002 was \$132 billion (4), up from \$98 billion in 1997 (5). Direct costs for institutional (hospital and nursing home) and noninstitutional (outpatient) care totaled \$91.8 billion, and indirect costs for lost job productivity due to short-term morbidity, long-term morbidity, and mortality were estimated to be \$39.8 billion. Finally, per capita medical expenditures were estimated at \$13,243. A recent study of VA health care use by veterans with moderate-to-severe diabetes found that these veterans had six primary care visits per year, 8 days in the hospital, and a 1-year mortality of 6% (6).

The purpose of this study was to calculate the total number of inpatient hospitalizations for years 1994–1998, outpatient clinic visits in 1997 and 1998, and the 1998 total direct health care costs for veterans with diabetes who sought care in VA facilities between 1994 and 1998. Trends in utilization across different age and race groups are also presented.

## RESEARCH DESIGN AND METHODS

Veterans were defined as having diabetes if they had three or more outpatient clinic visits with at least one visit containing a diagnosis of diabetes (ICD-9-CM 250.xx) or an inpatient hospitalization with a diagnosis of diabetes. This definition yielded a cohort of 429,918 veterans with type 1 or type 2 diabetes in 1998, which represents a larger, more representative sample of veterans with diabetes than an earlier study that identified veterans with diabetes via hospitalizations only (6). Cross-sectional cohorts were also constructed for years 1994–1997 to capture all inpatient utilization of veterans who might not have appeared in the 1998 cohort because of death or use of care outside the VA.

## Methods for determining utilization of VA services

Utilization for veterans with diabetes was identified using VA administrative databases that capture all inpatient stays and

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**Abbreviations:** DSS, Decision Support System; VAPSHCS, VA Puget Sound Health Care System; VA, Veterans Administration.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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outpatient services obtained at all VA medical facilities. This approach yields an upper bound on total utilization and cost associated with diabetes because the percentage of a visit attributable to diabetes is not calculated. National estimates of inpatient utilization were generated from the Patient Treatment File for years 1994–1998. These files are comparable to hospital discharge abstracts and contain demographic; facility; and bed section information; length of stay; the primary, principal, and nine secondary ICD-9 codes; surgical procedure codes; and other procedure codes. The primary diagnosis refers to the condition that accounted for the majority of the hospital stay, and the principal diagnosis refers to the condition leading to the hospitalization.

The outpatient utilization data were obtained from the VA Outpatient Care File for years 1997–1998. Data in this file include demographic, date of visit, clinic stop codes, number of ambulatory procedures, one primary and nine ICD-9 diagnosis codes, and CPT-4 procedure codes. Race is underreported in this dataset, resulting in up to 20% of visits with no race identified. Utilization by veterans with unknown race is excluded from the tables below to simplify interpretation. Outpatient pharmacy and nursing home utilization are not included in these estimates because these data were not available on a national level and did not include reliable utilization and cost information (7).

### Methods for determining cost of VA services

To address the total cost for inpatient and outpatient utilization, costs were based on period prevalence to generate costs for existing and new cases of disease that were observed over varying time intervals (8,9). Most cost-of-illness studies take this approach to report a cross-sectional perspective on costs for a specific population, as we did in this study. Costs and utilization were aggregated across patients who have had their illness for varying amounts of time. This study measures the total direct costs for inpatient hospitalizations and outpatient clinic visits, specifically costs directly associated with patient care, as well as administrative and overhead costs in support of patient care (e.g., janitorial services).

The costs of an inpatient hospitalization and an outpatient clinic visit are gen-

erated from data obtained from the Decision Support System (DSS) at the VA Puget Sound Health Care System (VAPSHCS). DSS captures costs for supplies, equipment, physician labor, nursing labor, contract labor, and all other labor (10). A unit cost for an outpatient visit was generated as the average cost of care for veterans with a primary diagnosis of diabetes in an outpatient clinic in FY1998. This unit cost was estimated at \$112.54 when adjusted to a national average with the medical current price index from the U.S. Bureau of Labor Statistics (11). A comparable unit cost for an inpatient hospitalization with a primary diagnosis of diabetes was calculated in a similar manner. The average cost per hospitalization was \$11,524 when adjusted to a national average. This method is comparable to generating an average cost for Diagnosis-Related Groups (DRG) 294 (diabetes age >35 years) for veterans hospitalized at the VAPSHCS. These unit costs for inpatient hospitalizations and outpatient visits were applied uniformly across all age and racial categories.

Indirect costs of mortality, morbidity, and sick days for veterans with diabetes were not attempted because estimates of lost productivity due to short-term morbidity, long-term morbidity, and mortality are not available in VA databases.

## RESULTS

### Utilization of VA inpatient services by veterans with diabetes

Table 1 summarizes 1994–1998 hospital inpatient utilization and 1997–1998 outpatient clinic utilization for veterans with diabetes. The median length of hospital stay in persons with diabetes decreased from 7.0 in 1994 and 1995 to 6.0 in years 1996–1998. The total number of hospital discharges declined, from 152,223 in

1994 to 126,373 in 1998. The 1996–1997 decrease of 12% was the largest single-year decrease during this period. While the median length of stay and total number of hospital discharges decreased over time, the total number of outpatient clinic visits increased 12.8% between 1997 and 1998.

Figure 1 shows trends in total number of hospital discharges between 1994 and 1998 for veterans with diabetes in different race and age groups. There is a consistent decline over time in the number of discharges for all age groups, except the  $\geq 75$  years group, whose hospitalizations increased over time. The most common inpatient surgical procedures for veterans with diabetes in 1998 were coronary artery bypass surgery (CABG), excisional debridement, toe amputation, below-the-knee amputation, and vascular bypass with peripheral shunts (data not shown). These five surgical inpatient procedures represented 29.4% of all surgical inpatient procedures. The top five non-surgical procedures, electrocardiogram (ECG) monitoring, packed cell transfusions, diagnostic cardiac ultrasound, computer-assisted tomography (CAT) scan, and antibiotic injection, accounted for 23.3% of all nonsurgical procedures (data not shown).

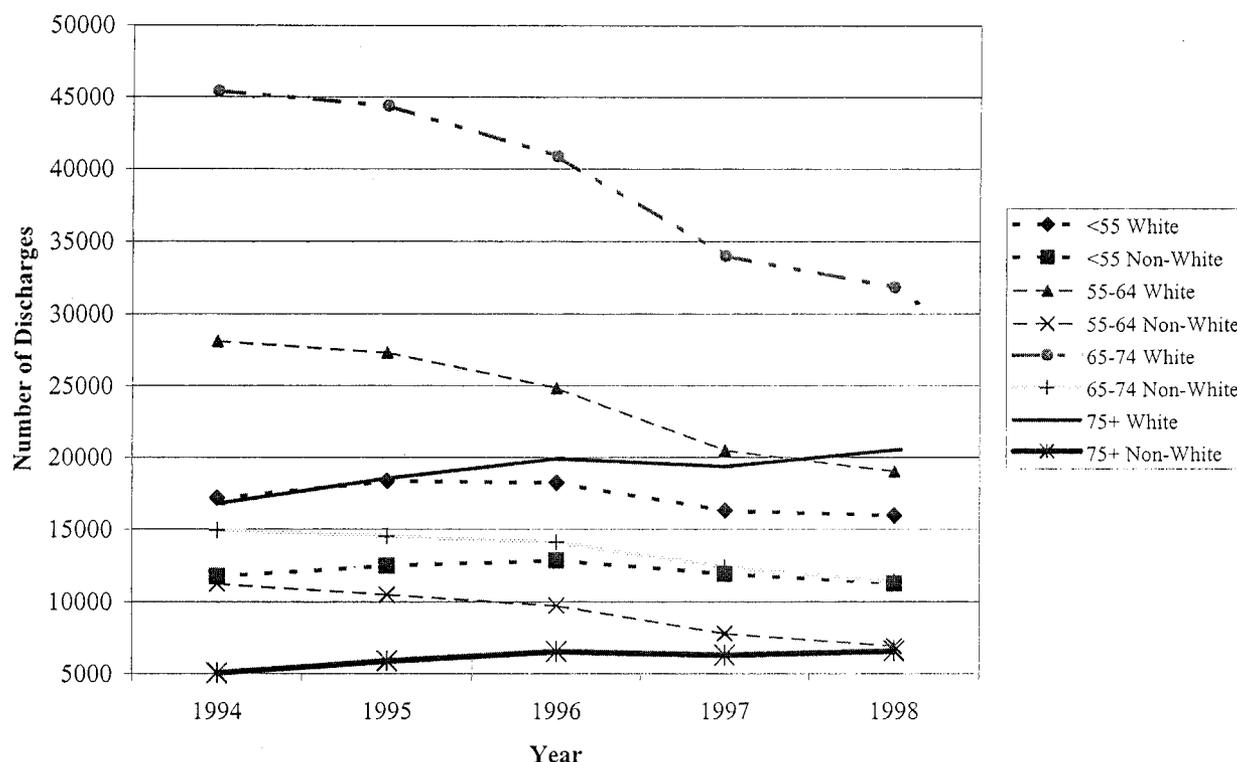
### Utilization of VA outpatient services by veterans with diabetes

The number of visits to VA outpatient clinics for the years 1997 and 1998, partitioned by race and age group, are presented in Fig. 2. The total number of visits increased in all age/race groups between 1997 and 1998. Those in age groups <55, 55–64, and 65–74 years accounted for 82% of all diabetes-related outpatient visits in 1997 and 77% of all visits in 1998. The 1998 per-person visit rates for minority veterans are higher in all age

**Table 1**—Summary of VA inpatient and outpatient utilization, 1994–1998

Year	Median length of stay*	Hospital discharges		Outpatient visits†	
		n	Rate	n	Rate
1994	7.0 (3, 15)	152,223	1.68	—	—
1995	7.0 (3, 14)	153,829	1.69	—	—
1996	6.0 (3, 13)	149,003	1.68	—	—
1997	6.0 (3, 12)	130,946	1.64	1,664,072	4.5
1998	6.0 (3, 11)	126,373	1.61	1,908,505	4.6

\*Rates are number of discharges or visits per person. Hospital inpatient lengths of stay for the 25th and 75th percentiles are in parentheses. †Total number of daily visits with a maximum of one visit per patient per day.



**Figure 1**—Number of hospital discharges by race and age-group, 1994–1998.

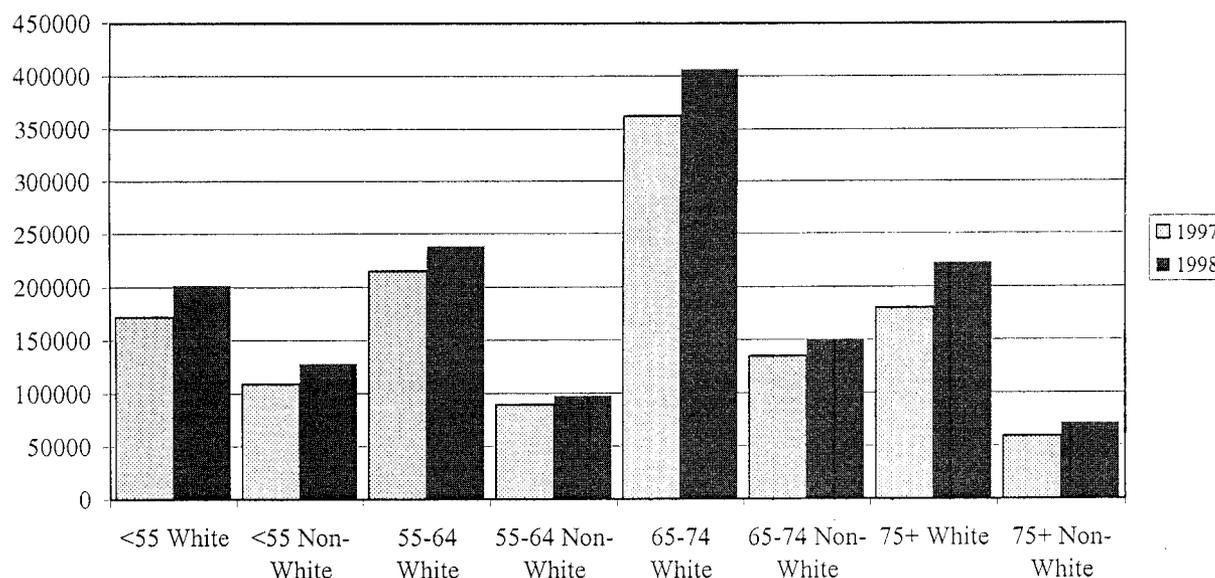
groups (4.9 vs. 4.7 for ages 55–64, 5.1 vs. 4.6 for 65–74, 5.2 vs. 4.6 for ≥75 years), except the under 55 group (4.5 vs. 4.4). Visit rates tended to increase with age for both racial groups. Primary care clinics are the locus of outpatient care for users of VA services, followed by podiatry and special diabetes clinics.

These five clinics represent 69.6% of all outpatient visits by veterans with diabetes (data not shown).

**Total direct cost of diabetes-related VA services for veterans**

The direct cost of diabetes-related VA services for veterans totaled \$1.67 billion in

1998, which included \$214.8 million in outpatient care and \$1.45 billion in inpatient care. Table 2 presents the total diabetes-related costs for veterans by race and age groups in 1998. Inpatient and outpatient costs for white veterans represent the majority of total diabetes-related costs. Aggregate costs were more than



**Figure 2**—Number of VA outpatient visits by race and age-group, 1997–1998. \*Number of VA outpatient visits defined as the total number of daily visits with a maximum of one visit per patient per day.

Table 2—Estimated direct costs of diabetes by race and age, 1998

Variable	Inpatient costs	Outpatient costs	Aggregate costs
Race			
White			
Total	\$1,006,278,300	\$120,352,639	\$1,126,630,939
Per capita	\$4,166	\$498	\$4,664
Non-white			
Total	\$416,443,782	\$50,421,971	\$466,865,753
Per capita	\$4,323	\$523	\$4,847
Age			
<55 years			
Total	\$321,508,913	\$47,992,683	\$369,501,596
Per capita	\$3,242	\$484	\$3,726
55–64 years			
Total	\$307,633,891	\$48,393,325	\$356,027,216
Per capita	\$3,286	\$517	\$3,803
65–74 years			
Total	\$509,235,362	\$77,930,686	\$587,166,048
Per capita	\$3,297	\$505	\$3,801
≥75 years			
Total	\$318,305,233	\$40,466,458	\$358,771,691
Per capita	\$3,851	\$490	\$4,341

Totals by race do not sum to totals by age because costs for veterans of unknown race were excluded.

double those for nonwhite veterans. Per capita costs are comparable for white and nonwhite veterans. For these two racial groups, total costs and per capita costs were driven by utilization of inpatient services.

Total costs for inpatient and outpatient utilization increase steadily from age <55 years until ages 65–74 years and drop dramatically for the ≥75 age-group. This precipitous decline is due to the drop in utilization for this age-group, because unit costs are applied equally across all age and racial categories. Per capita costs increase more gradually by age-group, with a marked increase between ages 65–74 and ages ≥75 years. This increase is driven by higher inpatient costs for this group of veterans. The group with the highest utilization and cost were veterans aged 65–74 years.

**CONCLUSIONS**— The VA has experienced a decrease in inpatient utilization and an increase in outpatient utilization by veterans with diabetes. The \$1.67 billion spent on veterans with diabetes in FY1998 represented ~3.9% of total VA expenditures. The disproportionately large share of services consumed by this high-risk group is comparable to diabetic populations tracked in Medicare and private insurance programs (4).

The inpatient and outpatient services

received by these veterans are critical to their disease management. Outpatient clinic visits appear to be substituting for inpatient utilization over time for all age and racial groups. However, inpatient hospitalizations constitute the majority of total costs associated with diabetes. The dominance of hospital care in total costs is also consistent with national trends in other public and private health care systems.

These chronically ill veterans will require a significant portion of VA services. The VA may be able to contain the growth of costs associated with diabetes by providing lower cost care in outpatient clinics and by providing cost-effective preventive care that has been shown to decrease the onset of diabetic complications. Since hospitalizations represent 87% of total costs, interventions designed to decrease the need for hospitalizations or more efficiently use services during a hospitalization will help lower the total costs of care associated with diabetes.

Many employed veterans receive care in the community paid for by employment-based insurance. In addition, all elderly veterans over 65 years of age have Medicare coverage and may receive additional services in the community. The estimates of VA utilization and cost presented here are a significant piece of the overall picture, although several limi-

tations of this study should be noted. First, the administrative data for utilization and diagnoses may be subject to coding errors. Kashner has demonstrated that diabetes is over-reported in administrative data compared with medical records (7). Second, the unknown race category generates underestimates of utilization and cost by race, particularly in the outpatient setting. Third, outpatient pharmacy costs are not included in these estimates.

The unit cost calculations require two qualifications. The cost estimates for an inpatient hospitalization or outpatient visit were based on the DSS cost-accounting system. The cost data in the DSS has not been validated through micro-costing, but does provide a useful approximation of costs at the patient level. Costs were based on workload in the VA Puget Sound Health Care System and adjusted to national costs using a medical price index. If veterans receive more resource intensive care in Seattle than in other VA facilities around the country, our system-wide costs would be overestimated. Again, these costs represent a useful approximation at the patient level of costs of care.

These estimates represent a lower bound on diabetes-related total utilization and costs of care for veterans because information on the utilization and cost of services paid for by Medicare, employment-based insurance, Medicaid, and other public and private programs is not available. However, it is clear that diabetes-related utilization is a significant driver of overall resource utilization in the VA (6). Effective clinical programs that can maintain veteran health will support efforts at containing costs. The VA is a source of high-quality inpatient and outpatient care for veterans with diabetes, but that high quality does come at a significant cost. For veterans with chronic conditions such as diabetes, the challenge is not how to eliminate or reduce services, but how to provide these services in a cost-effective manner. This challenge must be addressed as the VA seeks ways to improve patient care at the beginning of the 21st century.

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## References

1. Pogach LM, Hawley G, Weinstock R, Sawin C, Schiebe H, Cutler F, Zieve F, Bates M, Repke D: Diabetes prevalence and hospital and pharmacy use in the Veterans Health Administration: 1994. *Diabetes Care* 21:368–373, 1998
2. National Diabetes Advisory Board: *Annual Report*. Bethesda, MD, National Institutes of Health (NIH publ. no. 94-1587), 1994
3. Jiang HJ, Friedman B, Stryer D, Andrews R: Multiple hospitalizations for patients with diabetes. *Diabetes Care* 26:1421–1426, 2003
4. American Diabetes Association: Economic costs of diabetes in the U.S. in 2002. *Diabetes Care* 26:917–932, 2003
5. American Diabetes Association: Economic consequences of diabetes mellitus in the U.S. in 1997. *Diabetes Care* 21:296–309, 1998
6. Ashton CM, Septimus J, Petersen NJ, Soucek J, Menke TJ, Collins TC, Wray NP: Healthcare use by veterans treated for diabetes mellitus in the Veterans Affairs medical care system. *Am J Man Care* 9:145–150, 2003
7. Kashner TM: Agreement between administrative files and written medical records: a case of the Department of Veterans Affairs. *Medical Care* 36:1324–1336, 1998
8. Gorsky RD, Pamuk E, Williamson DF, Shaffer PA, Koplan JP: The 25-year health care costs of women who remain overweight after 40 years of age. *Am J Prev Med* 12:388–394, 1996
9. Wolf AM, Colditz GA: Current estimates of the economic cost of obesity in the United States. *Obes Res* 6:97–106, 1998
10. Barnett, PG, Rodgers JH: Use of the Decision Support System for VA cost-effectiveness research. *Medical Care* 37(Suppl. 4):AS63–AS70, 1999
11. Bureau of Labor Statistics [electronic source]. Available from <http://www.bls.gov>. Accessed 18 May 2000