Use of Preventive Care by Elderly Male Veterans Receiving Care Through the Veterans Health Administration, Medicare Fee-for-Service, and Medicare HMO Plans

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Objectives. We compared use of preventive care among veterans receiving care through the Veterans Health Administration (VHA), Medicare fee-for-service (FFS) plans, and Medicare health maintenance organizations (HMOs).

Methods. Using both the Costs and Use, and Access to Care files of the Medicare Current Beneficiary Survey (2000–2003), we performed a cross-sectional analysis examining self-reported use of influenza vaccination, pneumococcal vaccination, serum cholesterol screening, and serum prostate-specific antigen measurement among male veterans 65 years or older. Veterans' care was categorized as received through VHA, Medicare FFS, Medicare HMOs, VHA and Medicare FFS, or VHA and Medicare HMOs.

Results. Veterans receiving care through VHA reported 10% greater use of influenza vaccination ($P<.05$), 14% greater use of pneumococcal vaccination ($P<.01$), a nonsignificant 6% greater use of serum cholesterol screening ($P=.1$), and 15% greater use of prostate cancer screening ($P<.01$) than did veterans receiving care through Medicare HMOs. Veterans receiving care through Medicare FFS reported less use of all 4 preventive measures ($P<.01$) than did veterans receiving care through Medicare HMOs.

Conclusions. Receiving care through VHA was associated with greater use of preventive care. (*Am J Public Health.* 2007;97:2179–2185. doi:10.2105/AJPH.2007.114934)

The Veterans Health Administration (VHA) is the largest integrated public-sector health care system in the United States.[1] Under a set of reforms in 1995 that emphasized increased use of information technology, performance measurement, and service integration, VHA has become a leader in delivering high-quality care to veterans.[2–6] One comprehensive cross-sectional study of 596 VHA patients and 992 community patients (older than 35 years) between 1997 and 2000 found that veterans treated at VHA scored significantly higher for overall quality of care, chronic disease care, and preventive care.[7]

Previous research has also demonstrated that Medicare health maintenance organizations (HMOs) are superior to Medicare fee-for-service (FFS) plans in delivering preventive care to patients.[8] Medicare HMOs can use health care management techniques such as performance measurement, data analysis, and care coordination to improve the efficiency and quality of care delivered to patients.[9,10] There are few studies, however, that have compared Medicare HMOs and VHA.[11,12] Only 1 study to date has compared the quality of care delivered by VHA to the care delivered by high-performing commercial managed-care programs.[11] That study, which focused on diabetes, found that diabetes-related processes of care (e.g., eye examination and hemoglobin A_{1C} measurement) and 2 intermediate outcomes (targets for hemoglobin A_{1C} and low-density lipoprotein cholesterol) were more likely to be achieved for patients cared for in the VHA system than for patients cared for in commercial managed-care plans.

In contrast to VHA, in which the strides in quality improvement have been relatively uniform across the 21 different Veterans Integrated Service Networks, there is large variation in the quality of care delivered by Medicare HMOs plans.[13] This variation may be because of different organizational characteristics among plans. A plan can be structured as a staff-model organization, in which the plan owns the hospital and physicians are salaried, or as a loose financial arrangement between multiple providers in unrelated practice settings.[10,13] Previous research has identified 4 factors in high-performing managed-care programs that lead to the delivery of high-quality care: (1) a strong working relationship with the plan's physicians; (2) quality-focused leadership, culture, and values; (3) a high-quality physician practice base in the delivery system; and (4) an emphasis on the use of data and analysis in clinical improvement.[10,14]

VHA has all 4 of these characteristics. It has strong local practice leadership, with emphasis on performance measurement and quality improvement; strong relationships with academic medical centers, which creates a high-quality physician practice base; and an electronic health record that facilitates use of data for clinical improvement. VHA is in effect a large managed-care organization caring for over 5 million veterans across the country.[1,15]

Our primary objective was to use pooled data on veterans from the Medicare Current Beneficiary Survey (MCBS) to compare the preventive care delivered to veterans in VHA with care delivered to veterans by Medicare HMO and FFS plans. Many elderly veterans, however, are eligible to receive care from both Medicare and VHA and can also use both programs simultaneously (dual users). Therefore, we also compared the preventive care received by veterans through dual use of these sources with care received through

Medicare HMO plans. We focused on measures of preventive care because these measures have an important role in reducing morbidity and mortality in the elderly.[16–19]

METHODS

Study Design

We conducted a cross-sectional analysis of pooled data from the 2000–2003 MCBS. Medicare beneficiaries were surveyed on their service in the armed forces, insurance coverage, and use of VHA as a source of care, which allowed comparisons of receipt of preventive care across different settings. The MCBS is conducted by the Center for Medicare and Medicaid Services. The data are collected for a nationally representative sample of aged, disabled, and institutionalized Medicare beneficiaries from 107 geographic sampling units. The MCBS uses a 4-year "rotating panel,"[20] whereby each year one third of the sample is retired and a new group is added. For this analysis, we used data from both the 2000–2003 Cost and Use and Access to Care files. Both files track data on enrollment status, insurance, self-rated physical and mental health, and sociodemographic characteristics. The Cost and Use files also provide data on health care use and expenditures, and the Access to Care file provides additional data on access to care variables such as having a usual place of care.[20]

Sample

We included community-dwelling (i.e., noninstitutionalized) male elderly veterans (65 years and older) and examined data on receipt of preventive care for each adult from the last year for which data was available in the survey, so that each veteran was represented once in the data. We determined veteran status from the question, "Have you ever served in the armed forces?" and eliminated a small number of female veterans. Because questions on cholesterol screening were not included in the 2000 survey, the sample size for this analysis was smaller. We chose the last year of participation in the survey, as questions on cholesterol screening were not administered every year and using the last year of participation provided a larger sample for analysis of this outcome.

Outcome Variables

Our dependent variables were 4 self-reported preventive measures: (1) influenza vaccination, (2) pneumococcal vaccination, (3) serum cholesterol screening, and (4) measurement of serum prostate-specific antigen. Respondents were asked whether they had received a flu shot in the prior winter, whether they had ever received a shot for pneumonia, had blood cholesterol measured, and had received a blood test for prostate cancer. All dependent variables were categorized dichotomously as use or nonuse of the particular preventive service. All outcome variables, with the exception of cholesterol screening, which was not asked in the 2000 survey, were queried every year.

Independent Variables

We divided sources of care into 5 categories: (1) VHA only, (2) VHA and Medicare, (3) VHA and Medicare HMOs, (4) Medicare FFS only, and (5) Medicare HMOs only. Veterans who received less than $100 of care from any source other than VHA were considered VHA-only users. Veterans who accessed care through either Medicare FFS or HMOs, in addition to VHA, were considered dual users. Veterans who did not use any health care services in VHA were assigned to either Medicare FFS only or Medicare HMO only categories. We categorized the sample by the following sociodemographic characteristics: age, race/ethnicity, annual household income, education, marital status, household size, and census region. We also categorized data on self-reported health status, presence of comorbid conditions, and smoking status.

We computed an MCBS-adapted Charlson Comorbidity Index for each veteran on the basis of self-reported comorbidities.[21,22] The Charlson Index contains 19 categories of comorbidity, which are primarily defined through diagnosis codes from the *International Classification of Diseases, Ninth Revision* (*ICD-9*).[23] Each category had an associated weight, taken from the original Charlson report, which was based on the adjusted risk of 1-year mortality.[22,24,25] The overall comorbidity score reflects the cumulative increased likelihood of 1-year mortality; the higher the score, the more severe the comorbidity.

For each veteran, we also included information on access to care, such as whether he had a usual place to obtain care or had supplemental health insurance. The relationship between receiving age-appropriate preventive care and source of care may be related to limited contact with the health care system. We therefore also collected data on "total payments to all sources" as a measure of use from the Cost and Use files.

Statistical Analysis

We described respondent characteristics using standard means and frequency analyses. We used the χ^2 test to examine the bivariate relationships between use of recommended services and receiving care through 1 of 5 different sources. We used multivariable logistic regression to assess the independent effect of the source of care on use of each preventive care service, creating independent models for each outcome and allowing us to control for the sociodemographic characteristics, self-reported health status, smoking, having supplemental private insurance, and having a usual place of care. We also included the year the survey was administered as an independent variable in the analyses to adjust for any secular trends such as availability of the flu vaccine during the flu season. We also adjusted our analyses for the census region in which a veteran resided.

We repeated each analysis, including an MCBS-adapted Charlson Comorbidity Index, to determine whether the presence of comorbid conditions affected the results.[21] Because the likelihood of receiving preventive care may be influenced by the frequency of contacts with the health care system, we performed a sensitivity analysis by including a measure of use (total payments to all sources) as an independent variable in the analysis.

Individuals missing outcome data were excluded from the relevant adjusted analyses. Among eligible respondents, fewer than 0.6% were missing data for influenza vaccination, 0.3% for pneumococcal vaccination, 0.3% for cholesterol screening, and 5% for serum prostate-specific antigen testing. Individuals with missing sociodemographic data were also excluded from adjusted analyses (<1% of respondents for each characteristic, except household size, which was missing for 3% of

respondents, and usual place of care, which was missing for 8% of respondents). Given the large number of veterans who were missing data on usual place of care, we coded this variable as a categorical variable (1=usual place of care, 2=no usual place of care, and 3=missing or refused to answer) to diminish loss of information from the analysis.

TABLE 1—Sociodemographic Characteristics, Access to Health Care, and Health Status of Male Veterans 65 Years and Older, by Source of Care: Medicare Current Beneficiary Survey, 2000–2003

	VHA Only	VHA and FFS Medicare	VHA and Medicare HMOs	Medicare FFS Only	Medicare HMOs Only
Total respondents, No.	171	1009	145	3552	576
Age, y, median	74	77	76	76	75
Race, %					
White	76.9	89.9	86.2	92.2	89.7
Black	18.9	6.5	9.6	5.1	6.4
Other	4.1	3.6	4.2	2.7	3.8
Hispanic origin, %	11.9	4.1	8.3	2.6	4.9
Annual household income, $					
Mean	19 947	30 758	37 513	40 526	34 603
Median	16 800	25 000	24 000	30 000	28 000
Education, %					
Less than high school	48.5	27.6	27.8	23.3	23.6
High school graduate	22.8	28.2	32.6	26.1	27.1
More than high school	28.6	44.1	39.6	50.6	49.2
Married, %	59.6	74.8	69.6	74.5	71.5
Lives alone, %	28.2	20.1	19.3	19.6	21.5
Self-reported health status, %					
Excellent or very good	36.5	36.9	40.7	45.8	56.0
Good	28.2	34.8	33.1	32.5	28.6
Fair	27.1	18.6	17.2	15.1	11.7
Poor	8.2	9.6	8.9	6.6	3.7
Had a combat-related disability, %	27.6	23.2	24.3	6.7	4.8
Current smoker, %	25.7	11.3	13.8	12.5	10.8
Health care access, %					
Private insurance[b]	15.8	75.7	17.9	83.1	29.3
Had a usual place of care	90.6	89.1	97.9	84.2	97.2
Comorbid conditions, %					
Diabetes mellitus	17.5	28.9	29.6	18.9	18.6
History of myocardial infarction	25.7	29.7	28.3	20.9	15.8
History of stroke	22.8	17.9	13.7	12.8	10.7
COPD/asthma	24.5	21.9	17.24	15.9	11.98
Cancer	18.1	22.6	23.4	21.6	21
Charlson Comorbidity Index, mean	1.59	1.72	1.73	1.33	1.17
Total payments from all sources,[c] mean, $	3166	12 936	5692	11 312	5544

Note. VHA = Veterans Health Administration; FFS = fee-for-service; HMO = health management organization; COPD = chronic obstructive pulmonary disease. Percentages may not sum to 100 because of rounding. $P<.001$ for difference between 5 sources of care for all variables except "lives alone" ($P=.09$); we used the Pearson χ^2 or nonparametric tests where appropriate.

[a]Additional source of insurance coverage through employer or self-purchased.

[b]Total payments from all sources includes patient's out-of-pocket payments. Payments made by VHA and by Medicare HMOs may be underestimated.

Because we were analyzing nonrare events, odds ratios from adjusted analyses were converted to risk ratios for easier interpretation of results.[26–29] All analyses took into account the complex survey design and weighted sampling probabilities of the data source and were performed with Stata version 9.0 (StataCorp LP, College Station, Tex). All statistical tests were 2-tailed.

RESULTS

Characteristics Related to Source of Care

There were 5646 elderly veterans surveyed between 2000 and 2003, including 193 women, who were eliminated from the sample. The final sample included 5453 male veterans with self-reported data on flu and pneumonia vaccination, 5165 with data on serum prostate-specific antigen testing, and 4201 with data on cholesterol screening. We compared the sociodemographic characteristics, access to care, and health status of veterans who accessed care through 1 of 5 sources (Table 1). Male veterans receiving care only from VHA were on average younger than veterans seeking care from other sources, and they were significantly more likely to be Black, poor, not married, and to report fair or poor health ($P<.001$). Compared with veterans who accessed care in Medicare HMOs or through Medicare FFS, veterans cared for only by VHA had a higher mean Charlson Comorbidity Index; however, dual users of VHA and Medicare (FFS or HMOs) had a higher Charlson Comorbidity Index than VHA-only users ($P<.001$).

Use of Preventive Services

Overall, use of preventive services across all 5 sources of care was high, ranging from 70% to 95% across all outcomes measured (Table 2). The most variation across all 5 sources of care was observed for pneumococcal vaccination; 71% of veterans who received care through Medicare FFS and over 90% of dual users of VHA and Medicare HMOs reported receiving the vaccine. Overall, veterans exposed to any VHA care (VHA only or dual use) were more likely to report receipt of the preventive measures examined ($P<.001$).

TABLE 2—Weighted Percentage of Veterans Receiving Preventive Health Care Services, by Source of Care: Medicare Current Beneficiary Survey, 2000–2003

	Total Sample, %	VHA Only, %	VHA and Medicare FFS, %	VHA and Medicare HMOs, %	Medicare FFS Only, %	Medicare HMOs Only, %
Total respondents, No.		171	1009	145	3552	576
Preventive health services						
Influenza vaccination	75.6	78.3	85.4	82.6	72.3	76.6
Pneumococcal vaccination	76.0	86.9	86.3	90.2	71.7	78.3
Serum cholesterol measurement	86.9	92.1	95.1	92.5	84.1	86.2
Prostate cancer screening[a]	73.3	78.2	82.9	85.7	70.2	72.2

Note. VHA = Veterans Health Administration; FFS = fee-for-service; HMO = health management organization. $P < .001$ for difference between 5 sources of care for all variables (Pearson χ^2).
[a]Prostate serum-antigen testing.

Relationship Between Source of Care and Use of Preventive Services

Use of only VHA for care was associated with an increased use of preventive services (Table 3). After multivariable adjustment, compared with veterans cared for through Medicare HMO plans, veterans cared for through VHA reported a 10% higher use of influenza vaccination (risk ratio=1.10; 95% confidence interval [CI]=1.07, 1.17), a 14% higher use of pneumococcal vaccination (risk ratio=1.14; 95% CI=1.05, 1.20), a 6% nonsignificant higher use of serum cholesterol screening (risk ratio=1.06; 95% CI=0.99, 1.11), and a 15% higher use of prostate cancer screening (risk ratio=1.15; 95% CI=1.05, 1.23).

Overall, dual users had a higher use of preventive measures than did veterans cared for through Medicare HMO plans. Veterans who received care through both VHA and Medicare FFS had a 7% to 10% higher use of all 4 preventive measures studied than did veterans cared for through Medicare HMO plans ($P<.01$); veterans who sought care through both VHA and Medicare HMO plans had 16% higher use of pneumococcal vaccination ($P<.01$) and a 19% higher use of prostate cancer screening ($P<.01$) than did users of Medicare HMO plans only, with no difference in receipt of influenza vaccination and cholesterol screening. Compared with care through Medicare HMO plans, care through Medicare FFS was associated with a 9% to 30% lower use of the 4 preventive measures examined ($P<.001$). The Hosmer–Lemeshow test gave no evidence of an improper functional form ($P>.3$ for each model).

Given the disagreement in the literature as to whether inclusion of comorbid conditions is appropriate in examining receipt of age-appropriate care, we also examined how inclusion of the Charlson Comorbidity Index affected the relationships examined (Table 4). Cholesterol screening in particular is recommended every year for some populations and every 5 years for others and is particularly sensitive to the presence of certain comorbid conditions.[30] Overall, inclusion of the Charlson Comorbidity Index had a negligible impact on the relationships observed (Table 4).

We did not present models that included the variable "total annual payments from all sources," because of potential underreporting of payments by Medicare HMOs and VHA and the lack of uniformity in measuring and reporting costs between VHA and Medicare. However, inclusion of this variable in the models presented did not alter the magnitude or significance of the relationships observed (data not shown).

DISCUSSION

The transformation of VHA is widely attributed to a set of reforms that took place in the 1990s under the leadership of Kenneth Kizer.[1,3,5] As part of these reforms, VHA instituted a comprehensive electronic medical record system that includes a reminder system with emphasis on preventive care (e.g., vaccination, screening), chronic care management (e.g., blood pressure, diabetes, and cholesterol control), and integration of care.[1] We found that veterans receiving care through VHA (either alone or through dual use) reported significantly higher use of preventive care services than did veterans who received care through Medicare HMO plans.

Managed-care plans differ widely in their organizational structure, and there is significant variation in the quality of care delivered by these plans.[8,13,31] They can be little more than loose networks of physicians tied together through various financial arrangements; group-model HMOs, in which the plan contracts with a single large group of physicians on an exclusive basis and the physicians are paid through capitation; or full staff-model HMOs, in which physicians are salaried employees.[31] In our study, we could not differentiate between the different types of managed-care organizations and may have combined HMOs that differ in culture, organization, and type of quality-care processes employed. Many HMOs are not staff-model organizations that have electronic health records and electronic reminder systems available to the same degree as VHA and therefore cannot as readily integrate and monitor care. Managed-care plans that primarily comprise a loose network of physicians may not have the same tools (e.g., accessibility of data for quality improvement, electronic reminder system) to improve quality of care that are available in staff- or group-model HMOs or VHA.

There are many reasons that could explain why VHA is better at delivering preventive care than are Medicare HMO plans. VHA may be more attuned to the needs of veterans than other sources of care. In addition, the political oversight provided through Congress and the strong political constituency of veterans provide a strong incentive for VHA to improve the quality of care.[1] Medicare HMOs also have an incentive to improve their publicly reported Healthcare Effectiveness Data and Information Set (HEDIS) measures but many also have to respond to the profit expectations of shareholders; these 2 incentives do not always converge.

TABLE 3—Relationship Between Source of Health Care and Use of Preventive Services in Model 1: Medicare Current Beneficiary Survey, 2000–2003

	Influenza Vaccination, RR (95% CI)	Pneumococcal Vaccination, RR (95% CI)	Serum Cholesterol Screening, RR (95% CI)	Prostate Cancer Screening, RR (95% CI)
Total respondents,[a] No.	5137	5136	4051	4902
Source of care				
VHA only	1.10 (1.07, 1.17)	1.14 (1.05, 1.20)	1.06 (0.99, 1.11)	1.15 (1.05, 1.23)
VHA and Medicare FFS	1.08 (1.01, 1.12)	1.09 (1.05, 1.13)	1.07 (1.02, 1.10)	1.10 (1.03, 1.17)
VHA and Medicare HMO	1.10 (0.99, 1.17)	1.16 (1.07, 1.21)	1.07 (0.99, 1.11)	1.19 (1.09, 1.26)
Medicare FFS	0.88 (0.80, 0.95)	0.70 (0.55, 0.89)	0.91 (0.84, 0.97)	0.89 (0.81, 0.97)
Medicare HMO (Ref)	1.00	1.00	1.00	1.00
Age, OR (95% CI)	1.04 (1.03, 1.06)	1.04 (1.03, 1.06)	1.00 (0.98, 1.02)	0.98 (0.96, 0.99)
Race				
Black	0.72 (0.54, 0.95)	0.83 (0.61, 1.13)	0.86 (0.55, 1.33)	1.02 (0.52, 1.26)
Other	1.2 (0.75, 1.07)	0.89 (0.58, 1.37)	0.86 (0.47, 1.55)	0.80 (0.51, 1.25)
White (Ref)	1.00	1.00	1.00	1.00
Hispanic origin	0.65 (0.40, 1.02)	0.66 (0.44, 1.01)	1.58 (0.94, 2.62)	0.96 (0.64, 1.44)
Natural logorithm of income, OR (95% CI)	1.12 (0.99, 1.26)	1.05 (0.94, 1.17)	1.26 (1.07, 1.48)	1.19 (1.08, 1.31)
Education				
More than high school	1.13 (1.03, 1.23)	1.07 (0.94, 1.20)	1.05 (0.89, 1.2)	1.11 (1.02, 1.19)
High school graduate	1.02 (0.87, 1.17)	0.95 (0.78, 1.13)	0.99 (0.79, 1.22)	1.1 (0.97, 1.26)
Less than high school (Ref)	1.00	1.00	1.00	1.00
Married	1.08 (1.02, 1.14)	1.09 (1.02, 1.14)	0.88 (0.76, 0.98)	1.03 (0.97, 1.08)
Lives alone	1.13 (0.88, 1.42)	1.10 (0.87, 1.36)	0.72 (0.51, 1.01)	0.93 (0.75, 1.16)
Self-reported health status				
Poor	1.71 (1.27, 2.27)	1.91 (1.36, 2.63)	2.16 (1.33, 3.38)	0.85 (0.64, 1.12)
Fair	1.39 (1.17, 1.64)	1.60 (1.36, 1.87)	2.04 (1.51, 2.65)	1.01 (0.86, 1.18)
Good	1.20 (1.07, 1.33)	1.10 (1.00, 1.22)	1.25 (1.07, 1.43)	1.09 (0.99, 1.19)
Excellent/very good (Ref)	1.00	1.00	1.00	1.00
Combat disability	0.79 (0.62, 1.02)	0.88 (0.68, 1.12)	1.21 (0.87, 1.66)	0.86 (0.70, 1.07)
Current smoker	0.65 (0.53, 0.79)	0.71 (0.62, 0.82)	0.65 (0.50, 0.85)	0.71 (0.59, 0.87)
Had private insurance	1.10 (1.06, 1.15)	1.03 (0.98, 1.07)	1.14 (1.09, 1.19)	1.09 (1.04, 1.14)
Had a usual place of care	1.07 (1.06, 1.08)	1.06 (1.05, 1.07)	1.08 (1.07, 1.09)	1.08 (1.07, 1.09)

Note. RR = risk ratio; CI = confidence interval; OR = odds ratio; VHA = Veterans Health Administration; FFS = fee-for-service; HMO = health maintenance organization. The reference groups for Hispanic origin, married, lives alone, combat disability, current smoker, private insurance, and usual place of care were non-Hispanic origin, not married, does not live alone, no combat-related disability, nonsmoker, no other source of insurance, and no usual place of care, respectively. The Hosmer–Lemeshow test gave no evidence of an improper functional form ($P > .3$ for each model). In addition to the covariates presented in the table, model 1 was also adjusted with logistic regression for census region and year the Medicare Current Beneficiary Survey was administered.

[a]Respondents with complete data for all variables.

In addition, VHA is organized into 21 Veterans Integrated Service Networks, each responsible for health care planning and resource allocation in a particular geographic region.[1] Veterans Integrated Service Networks are centered around the notion that health care delivery should be based on the specific population served. Because each network is composed of a number of hospitals and ambulatory-care facilities, resources are aligned around the population served, forcing the network to pool and coordinate its resources and services.[32] The implementation of the electronic health record across all VHA medical centers and the planning for care through global budgets have led to a degree of integration of care that may not be possible in Medicare FFS or Medicare HMO plans.[32] VHA is unique in the US health care system because it is both the payer and provider of care, which allows planning for the delivery of high-quality, cost-efficient care.

Our findings also highlight the phenomenon of veterans' dual use of Medicare and VHA services. Dual users had a higher mean Charlson Comorbidity Index, indicating that they were sicker than were VHA-only users. Dual users were also wealthier and more educated than were patients who sought care at VHA only. Veterans who received care through VHA and Medicare FFS had increased use of all 4 preventive care services, and among dual users of VHA and Medicare HMO plans, we found either increased use of preventive care services or no difference in receipt of preventive care. Previous work found that HMO-enrolled veterans access care through the VA.[33] Further research is needed to determine whether dual use represents duplication of care or an attempt by veterans to use resources from both sources to complement diverse health care needs.

Previous research comparing Medicare FFS with Medicare HMOs found that managed care was better at delivering preventive services, whereas traditional Medicare was better in other aspects of care related to access and satisfaction.[8,34] Similarly, we found that Medicare HMO plans were better than Medicare FFS plans at delivering preventive care to veterans.

Limitations

We note several important limitations to our study. This was a cross-sectional analysis, which limits the interpretation of the results. In addition, we did not have a measure of the number of visits in the prior year to include in our models. Patients with limited contact with the health system may not have had the opportunity to receive preventive care. We attempted to minimize this bias by including the variable "having a usual place of care" in our model. In addition, we included a variable that represented the "total annual payments from all sources" in a sensitivity analysis. Our main conclusions did not change; however, we did not present the results in a

TABLE 4—Relationship Between Source of Health Care and Use of Preventive Services in Model 2: Medicare Current Beneficiary Survey, 2000–2003

	Influenza Vaccination	Pneumococcal Vaccination	Serum Cholesterol Screening	Prostate Cancer Screening
Total respondents, No.	5137	5136	4051	4902
Sources of care, RR (95% CI)				
VHA only	1.09 (1.01, 1.17)	1.14 (1.04, 1.20)	1.06 (0.98, 1.11)	1.15 (1.04, 1.23)
VHA and Medicare FFS	1.07 (1.01, 1.12)	1.08 (1.03, 1.13)	1.06 (1.01, 1.09)	1.09 (1.02, 1.15)
VHA and Medicare HMO	1.09 (0.97, 1.17)	1.15 (1.05, 1.20)	1.07 (0.98, 1.11)	1.18 (1.08, 1.25)
Medicare FFS	0.87 (0.80, 0.94)	0.91 (0.84, 0.97)	0.91 (0.84, 0.97)	0.88 (0.81, 0.96)
Medicare HMO only (Ref)	1	1	1	1

Note. RR = risk ratio; CI = confidence interval; VHA = Veterans Health Administration; FFS = fee-for-service; HMO = health maintenance organization. The Hosmer–Lemeshow test showed no evidence of an improper functional form ($P > .3$ for each model). Model 2 had the same multivariable adjustments as model 1 plus the Charlson Comorbidity Index adapted for the Medicare Current Beneficiary Survey.

"total payments adjusted" format, because of the variability in collecting this information from various sources and the lack of similarity in assigning cost to care in VHA and Medicare.

Furthermore, the fact that most patients who had no payments made from any source of care were enrolled in Medicare FFS may suggest that VHA and Medicare HMO plans are making a concerted effort to identify and provide patients with age-appropriate preventive care. Therefore, it may not be appropriate to include a measure of use in the analysis, because it would bias the results in favor of Medicare FFS. Also, we studied the use of prostate cancer screening despite the current debate about its clinical benefit. In 2002, the US Preventive Services Task Force determined that the evidence is insufficient to recommend for or against routine screening for prostate cancer.[35] Even though the clinical utility of serum prostate-specific antigen testing is unclear, the pattern of this testing across different sources of care was similar to other preventive measures in our study.

Conclusions

Veterans receiving care at VHA reported receiving higher rates of 3 of 4 preventive measures than did veterans who received care from Medicare HMOs. Generally, receiving all or some care through VHA was associated with increased use of preventive care. Our results are particularly notable inasmuch as the population cared for by VHA is more likely to be Black, poor, and in fair or poor health, a group that often receives lower-quality care in the private sector.[36–42] ■

About the Authors

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This article was accepted June 22, 2007.

Contributors

S. Keyhani originated the study, supervised the programming, performed the analysis, and drafted the article. J.S. Ross and P. Hebert assisted with design, analysis, and drafting and revision of the article. C. Dellenbaugh was responsible for the development and refinement of analytic files and assisted in revising the article. J.D. Penrod and A.L. Siu supervised the study, provided input into the study's design, and assisted in drafting and revising the article.

Acknowledgments

This study was financially supported by the Department of Veterans Affairs' Health Services Research and Development Service (grant IIR 003-226-2).

Note. The Department of Veterans Affairs had no role in the design or conduct of the study; collection, management, analysis or interpretation of the data; or preparation, review, or approval of the article. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs.

Human Participant Protection

This study was approved by the institutional review board of the James J. Peters Veterans Administration Medical Center.

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