

Managed Care and Cancer Outcomes for Medicare Beneficiaries With Disabilities

Richard G. Roetzheim, MD, MSPH; Thomas N. Chirikos, PhD; Kristen J. Wells, PhD, MPH;
Ellen P. McCarthy, PhD, MPH; Long H. Ngo, PhD; Donglin Li, MD, MPH;
Reed E. Drews, MD; and Lisa I. Iezzoni, MD, MSc

In 2005, 1 in 6 Medicare beneficiaries (6.5 million persons) was entitled to receive Medicare benefits because of disability.¹ Medicare beneficiaries with disabilities seem to be at risk for increased cancer mortality,² even when diagnosed at the same stage or at an earlier stage, compared with persons without disabilities.³ In addition, persons with disabilities may receive different cancer treatment than persons without disabilities.^{2,4}

Medicare beneficiaries may receive care within a health maintenance organization (HMO) or within the fee-for-service (FFS) sector. It is uncertain whether the type of health insurance arrangement (HMO vs FFS) affects the quality of care for Medicare beneficiaries with disabilities.⁵ In some studies,^{6,7} beneficiaries with disabilities were less satisfied with managed care plan performance and were more likely to disenroll. However, other evidence indicates that beneficiaries with disabilities receiving care in HMO plans perceive better access to primary care services and greater affordability of health services than those with traditional Medicare coverage.⁸ Medicare beneficiaries who are enrolled in HMO plans are more likely to undergo cancer screening,⁹⁻¹² generally have cancers diagnosed at an earlier stage,¹³⁻¹⁶ and may have improved survival.¹⁴

The Surveillance, Epidemiology, and End Results (SEER) cancer registries merged with Medicare data have been used to study health disparities among persons with disabilities.^{2,3} We used merged SEER-Medicare data to evaluate whether the type of Medicare insurance arrangement (HMO or FFS) affects cancer outcomes for Medicare beneficiaries with disabilities. We studied 2 high-volume cancers, breast cancer and lung cancer. We chose breast cancer because it is amenable to screening and because experiences of these patients would capture potential disparities in early detection and treatment. In contrast, screening is not recommended to detect lung cancer, although surgery and radiation treatment may improve survival.^{17,18}

METHODS

Data Sources

We used the SEER-Medicare dataset, which links SEER registry information to Medicare claims data.^{19,20} SEER consists of 11 population-based tumor registries representing approximately 14% of the US population.²⁰ SEER collects patient information on demographic characteristics, primary

Objective: To determine if the type of insurance arrangement, specifically health maintenance organization (HMO) vs fee-for-service (FFS), affects cancer outcomes for Medicare beneficiaries with disabilities.

Study Design: Retrospective cohort.

Methods: We used the Surveillance, Epidemiology, and End Results–Medicare linked dataset to identify beneficiaries older and younger than 65 years entitled to Medicare benefits because of disability (Social Security Disability Insurance) who subsequently were diagnosed as having breast cancer (n = 6839) or non–small cell lung cancer (n = 10,229) from 1988 through 1999. We categorized persons according to Medicare insurance arrangement (continuous FFS, continuous HMO, or mixed FFS/HMO) during the periods 12 months before diagnosis and 6 months after diagnosis. Using a retrospective cohort design, we examined stage at diagnosis, cancer-directed treatments, and survival.

Results: Women with continuous HMO insurance had earlier-stage breast cancer diagnosis (adjusted relative risk, 0.77; 95% confidence interval, 0.65-0.91) and were more likely to receive radiation therapy following breast-conserving surgery (adjusted relative risk, 1.11; 95% confidence interval, 1.03-1.19). Women having continuous HMO insurance had better breast cancer survival, primarily resulting from earlier-stage diagnosis. Among persons with non–small cell lung cancer, those having mixed FFS/HMO insurance were more likely to receive definitive surgery for early-stage disease (adjusted odds ratio, 1.23; 95% confidence interval, 1.02-1.49) and to have better overall survival but not significantly better lung cancer survival.

Conclusion: When diagnosed as having breast cancer or non–small cell lung cancer, some Medicare beneficiaries with disabilities fare better with managed care compared with FFS insurance plans.

(*Am J Manag Care.* 2008;14(5):287-296)

For author information and disclosures, see end of text.

In this issue

Take-away Points / p295

www.ajmc.com

Full text and PDF

Web exclusive

e-Figures 1 through 4

tumor site, stage at diagnosis, tumor size, histologic findings, tumor grade, hormone receptor status, initial course of treatment, and vital status. SEER tracks vital status annually, and death certificates are used to capture underlying cause of death.

Study Sample

We identified all persons 21 years and older within the SEER-Medicare dataset having a pathologically confirmed first diagnosis of breast cancer ($n = 62,315$) or non-small cell lung cancer ($n = 55,770$) from January 1, 1988, through December 31, 1999. We then restricted our sample to those persons who originally qualified for Medicare coverage because of Social Security Disability Insurance (6839 with breast cancer and 10,229 with lung cancer). Therefore, our sample includes persons younger than 65 years who have Social Security Disability Insurance and persons 65 years and older whose Social Security Disability Insurance has been automatically converted to Old Age Survivors Insurance. As described elsewhere, we focused exclusively on individuals with Medicare when newly diagnosed with cancer, eliminating persons disabled by cancer.³

Medicare data indicate for each month whether persons were eligible for Part A and Part B and whether they were enrolled in an HMO insurance arrangement. To examine possible effects of insurance structure on early detection of cancer, we constructed a variable that defined insurance arrangement before diagnosis. We determined the type of insurance arrangement during the month of diagnosis and the previous 12 months. For this period, we assigned cases to 1 of the following 3 insurance categories: FFS for persons continuously enrolled in traditional FFS Medicare, HMO for persons continuously enrolled in HMO plans, and mixed FFS/HMO for persons enrolled in both FFS and HMO plans during the period. To examine treatments following diagnosis, we designated similar postdiagnosis insurance variables for persons continuously eligible for Medicare Part A and Part B during the month of diagnosis and the 6 months after diagnosis (or until death if survival was <6 months). For analyses of survival, we assigned cases to similar insurance categories covering the prediagnosis and postdiagnosis periods combined.

Stage at Diagnosis

SEER determines stage at diagnosis based on a combination of pathologic surgical and clinical assessments available within 2 months of diagnosis.²¹ Stage at diagnosis is recorded using the American Joint Committee on Cancer (AJCC) staging system (stage 0, I, II, III, or IV). In our analysis of stage at diagnosis, we excluded persons whose cancers

were unstaged (346 with breast cancer and 1182 with lung cancer).

Cancer-directed Treatments

SEER collects information on the initial course of treatment, which was defined as all cancer-directed treatments within 4 months of diagnosis from 1973 through 1998 and within 12 months of diagnosis after 1998. Ascertainment of surgery and radiation therapy by SEER is generally complete.^{22,23} However, ascertainment of chemotherapy is incomplete and is not included in the SEER-Medicare-linked dataset. SEER does not collect information on prediagnosis screening tests such as mammography. We relied solely on SEER information to define cancer-directed treatments because Medicare claims are unavailable for persons having HMO insurance.

We defined breast-conserving surgery as segmental mastectomy, lumpectomy, quadrantectomy, tylectomy, wedge resection, nipple resection, excisional biopsy, or partial mastectomy that was not otherwise specified. We defined mastectomy as subcutaneous, total (simple), modified radical, radical, extended radical mastectomy, or mastectomy that was not otherwise specified. We examined frequency of breast-conserving surgery among women having AJCC stage I, II, or IIIA cancers. We further examined the following 2 secondary outcomes related to quality of care: (1) receipt of axillary lymph node dissection and (2) receipt of radiation therapy among women who undergo breast-conserving surgery. Sentinel lymph node biopsies, a recent innovation, are not reported in our database.

Depending on tumor size, histologic findings, and location, surgery can provide definitive treatment for non-small cell lung cancer.^{17,18} Radiation therapy may be curative for persons with resectable tumors who do not undergo surgery.^{24,25} We examined the frequencies of surgical resection and radiation therapy among persons having early-stage lesions (AJCC stage I) for whom treatment can be curative. Similar to the classification by Bach and colleagues,²⁶ we categorized surgical resection with curative intent as follows: radical or partial pneumonectomy, lobectomy, bilobectomy, sleeve resection, segmentectomy, wedge resection, and local resection. For persons who did not undergo surgery, we used SEER data to determine if surgery was contraindicated or was not recommended.

Survival

We examined survival (all-cause and cancer-specific mortality) following diagnosis. We measured survival time as the number of days from diagnosis until death or December 31, 2001, whichever came first. For all-cause mortality analyses,

we censored observations of persons alive at the end of follow-up. We studied breast cancer–specific and lung cancer–specific deaths, censoring observations of subjects alive at the end of follow-up or who died from causes other than breast cancer or lung cancer.

Statistical Analysis

We conducted bivariate analyses to compare demographic and tumor characteristics of our study sample by HMO status vs FFS status at diagnosis. Because this was an observational study that did not randomize subjects to HMO insurance vs FFS insurance, patient characteristics were expected to differ between the 2 groups. We used the method of propensity scoring to control for these differences.^{27,28}

Propensity scores reflect the likelihood that a patient had HMO insurance at diagnosis based on his or her observed characteristics. We used multivariate logistic regression analysis with stepwise variable selection to calculate propensity scores (performed separately for patients with breast cancer and for patients with lung cancer). Having HMO insurance at diagnosis was the outcome, with the following variables as potential predictors: age at diagnosis, race/ethnicity, marital status at diagnosis, census-derived measures of median household income and percentage of households without high school education, SEER tumor registry, year of diagnosis, and tumor characteristics (grade, histologic findings, and hormone receptor status). We then used propensity scores to group patients into quintiles according to their probability of having HMO insurance at diagnosis derived from observed characteristics. We then added propensity scores (quintiles) as a covariate in all multivariate analyses. This process has been estimated to eliminate more than 90% of the bias resulting from differences in observed covariates.²⁹

We conducted multivariate polychotomous logistic regression analysis to examine associations between HMO insurance vs FFS insurance arrangement and AJCC stage at diagnosis (stage 0, I, II, III, or IV). Odds ratios less than 1 indicate earlier stage at diagnosis. Logistic models adjusted for age at diagnosis (continuous), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian American/Pacific Islander, or other), marital status at diagnosis (married, widowed, never married, or other), census-derived measures of median household income and percentage of households without high school education, SEER tumor registry, year of diagnosis, grade (well differentiated, moderately differentiated, or poorly/undifferentiated), and propensity scores. For persons with lung cancer, logistic models also adjusted for sex. For women with breast cancer, logistic models also adjusted for estrogen receptor status (pos-

itive, negative, or unknown), progesterone receptor status (positive, negative, or unknown), and histologic findings (unfavorable subtypes [inflammatory or Paget disease] or ductal or lobular/mixed favorable subtypes [medullary carcinoma or papillary, villous, or mucinous adenocarcinomas]). We converted odds ratios to relative risks with 95% confidence intervals for each treatment outcome.³⁰

We plotted survival curves for all-cause mortality and for cancer-specific mortality separately. Survival differences between subjects having HMO insurance vs FFS insurance were tested using the log-rank test. We excluded persons with *in situ* cancers from survival analyses.

We conducted multivariate Cox proportional hazards regression analyses to estimate adjusted relative hazard rates for each mortality outcome (all cause and cancer specific). Hazard rates less than 1 indicate lower mortality and more favorable survival relative to the referent group. We fit 2 sets of Cox proportional hazards models for each mortality outcome. In the initial models, hazard rates were adjusted for age, sex (for lung cancer only), marital status (married, single, separated/divorced, widowed, or unknown), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, or other), census-derived measures of median household income and percentage of households without high school education, tumor grade (well differentiated, moderately differentiated, poorly differentiated, undifferentiated, or unknown), and propensity scores. For women with breast cancer, initial models also adjusted hazard rates for estrogen receptor status (negative, positive, or unknown), progesterone status (negative, positive, or unknown), and histologic findings (ductal, lobular/mixed, favorable subtypes, unfavorable subtypes, or other). Subsequent models also adjusted hazard rates for AJCC stage at diagnosis (stage I, II, III, IV, or unstaged).

As a sensitivity analysis, we repeated multivariate models excluding patients with missing data on tumor characteristics (tumor grade, estrogen receptor status, or progesterone receptor status). To gauge the public health effect of our findings, we calculated attributable fractions using the following formula: Attributable Fraction = $pd(RR - 1)/RR$, where *pd* indicates the proportion of cases exposed to the risk factor; and *RR*, the adjusted hazard rate.³¹ The institutional review boards at our institutions approved this study. All statistical analyses used SAS version 9.1 (SAS Institute, Cary, North Carolina).

RESULTS

Table 1 lists the characteristics of our sample. Persons having HMO insurance at diagnosis tended to be older and more likely to reside in census tracts having higher median household

■ CLINICAL ■

■ **Table 1.** Demographic and Clinical Characteristics by Insurance Status^a

Characteristic	Insurance Type at Breast Cancer Diagnosis			Insurance Type at Lung Cancer Diagnosis		
	HMO (n = 878)	FFS (n = 5316)	P	HMO (n = 1491)	FFS (n = 7896)	P
Age, mean, y	63.9	61.4	<.001	66.9	64.4	<.001
Age, y, %						
<60	24.0	35.9	<.001	10.4	21.9	<.001
60-64	21.1	19.2		18.3	22.7	
65-69	29.4	22.6		35.5	29.0	
≥70	25.5	22.3		35.7	26.4	
Sex, %						
Female	—	—	—	29.2	28.0	.35
Male	—	—		70.8	72.0	
Race/ethnicity, %						
Non-Hispanic white	68.8	69.2	<.001	72.8	74.8	<.001
Non-Hispanic black	14.9	20.0		15.8	19.3	
Hispanic	10.1	6.9		7.7	3.5	
Asian	5.1	2.9		3.3	2.0	
Other	1.0	1.0		0.4	0.5	
Marital status, %						
Married	42.1	29.2	<.001	55.3	49.3	<.001
Single	11.9	24.2		10.8	14.6	
Separated/divorced	18.5	18.2		15.0	17.0	
Widowed	24.5	24.8		16.3	15.6	
Unknown	3.1	3.7		2.6	3.6	
Census-derived median household income, \$	36,573	32,488	<.001	34,210	31,361	<.001
Percentage of ZIP code/census tract without high school education	22.9	25.3	<.001	26.1	26.2	.84
Registry site, %						
San Francisco/Oakland, California	22.4	11.1	<.001	20.4	10.4	<.001
Connecticut	4.1	12.9		4.8	12.6	
Detroit, Michigan	4.6	19.8		10.4	22.3	
Hawaii	3.5	2.7		3.6	2.0	
Iowa	2.6	10.3		4.1	13.7	
New Mexico	4.4	4.4		5.2	4.0	
Seattle, Washington	14.4	10.5		12.3	11.8	
Utah	1.7	3.4		1.5	2.3	
Atlanta, Georgia	2.9	7.6		1.5	8.8	
San Jose/Monterey, California	5.5	3.4		3.3	2.2	
Los Angeles, California	33.9	14.0		33.1	9.9	

(Continued)

Medicare Beneficiaries With Disabilities

Table 1. Demographic and Clinical Characteristics by Insurance Status (Continued)^a

Characteristic	Insurance Type at Breast Cancer Diagnosis			Insurance Type at Lung Cancer Diagnosis		
	HMO (n = 878)	FFS (n = 5316)	P	HMO (n = 1491)	FFS (n = 7896)	P
American Joint Committee on Cancer stage, %						
In situ	13.8	12.3	<.001	—	—	—
I	46.1	37.6		23.8	23.9	.30
II	29.3	32.9		4.7	4.4	
III	4.9	7.0		28.3	28.6	
IV	3.0	4.7		30.0	31.8	
Unstaged/unknown	3.0	5.6		13.2	11.4	
Tumor grade, %						
Well differentiated	16.6	11.4	<.001	3.9	3.8	.34
Moderately differentiated	30.0	27.7		16.3	17.2	
Poorly differentiated	27.2	24.7		38.2	35.4	
Undifferentiated	3.1	2.5		6.4	6.9	
Unknown	23.1	33.7		35.2	36.6	
Histologic findings, %						
Ductal	73.1	76.4	.25	—	—	—
Lobular/mixed	13.4	11.8		—	—	
Favorable subtypes ^b	7.4	6.2		—	—	
Unfavorable subtypes ^c	2.5	2.1		—	—	
Other	3.5	3.6		—	—	
Estrogen receptor status, %						
Positive	61.6	52.4	<.001	—	—	—
Negative	17.2	16.6		—	—	
Unknown	21.2	31.0		—	—	
Progesterone receptor status, %						
Positive	48.6	44.5	<.001	—	—	—
Negative	26.0	22.7		—	—	
Unknown	25.4	32.8		—	—	

^aFFS indicates fee-for-service; HMO, health maintenance organization. Percentages may not sum to 100% due to rounding.

^bInclude papillary, mucinous, tubular, and medullary.

^cInclude inflammatory and Paget's disease.

income. Consistent with market penetration of HMOs, patients having HMO insurance were more likely to originate from SEER registries in California and in Seattle, Washington. Among patients with breast cancer, those having FFS insurance were more likely to have missing information on tumor grade and on estrogen receptor status and progesterone receptor status.

Table 2 summarizes the likelihood of earlier stage at diagnosis according to insurance arrangement during 12 months before diagnosis. For women with breast cancer,

those having HMO insurance were diagnosed at earlier stages relative to those having FFS insurance. There was some evidence of earlier stage at diagnosis for women with mixed FFS/HMO insurance (ie, the odds ratio was statistically significant in the unadjusted model but not in the model that controlled for age, race/ethnicity, and other covariates). Health maintenance organization insurance vs FFS insurance was not associated with stage at diagnosis for persons with lung cancer.

■ **Table 2.** Likelihood of Earlier Stage at Diagnosis by Insurance Status^a

Insurance Type ^b	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Breast cancer (n = 5772)		
FFS (n = 4924)	1 [Reference]	1 [Reference]
HMO (n = 664)	0.73 (0.63-0.85)	0.77 (0.65-0.91)
Mixed FFS/HMO (n = 184)	0.73 (0.56-0.96)	0.78 (0.59-1.04)
Lung cancer (N = 7804)		
FFS (n = 6758)	1 [Reference]	1 [Reference]
HMO (n = 811)	0.97 (0.85-1.11)	0.96 (0.83-1.11)
Mixed FFS/HMO (n = 235)	1.02 (0.81-1.30)	1.01 (0.79-1.29)

CI indicates confidence interval; FFS, fee-for-service, HMO, health maintenance organization; OR, odds ratio.

^aResults of polychotomous logistic regression analysis examining American Joint Committee on Cancer stage (0, I, II, III, or IV). Outcomes in boldface are statistically significant at *P* < .05.

^bDuring 12 months before diagnosis.

insurance varied over time, we repeated our analyses separately for 2 periods, persons diagnosed from 1989 through 1994 and persons diagnosed from 1995 through 1999. Results were similar for both periods. We calculated an attributable fraction for the 831 breast cancer deaths observed in the cohort (769 with FFS insurance and 62 with HMO insurance). We estimated that 17% (144 deaths) would theoretically have been prevented if patients having FFS insurance had a mortality experience comparable to that of patients having HMO insurance.

Insurance type was sometimes statistically significantly associated with cancer-directed treatments for breast cancer and for lung cancer (Table 3). Women having HMO insurance were more likely to receive radiation therapy following breast-conserving surgery. There was a statistically nonsignificant trend for women having HMO insurance to receive breast-conserving surgery rather than mastectomy. Insurance status had no effect on the likelihood of axillary lymph node dissection. Among persons diagnosed as having non-small cell lung cancer, those having mixed FFS/HMO insurance were more likely to receive definitive surgery for early-stage tumors.

eFigure 1 through eFigure 4 (available at <http://www.ajmc.com>) show all-cause and cancer-specific survival curves. Among women with breast cancer, those having HMO insurance had better breast cancer survival compared with those having FFS insurance. Among persons with lung cancer, there was a statistically nonsignificant trend for improved survival among persons having mixed FFS/HMO insurance.

Breast cancer mortality rates were lower for women having HMO insurance (Table 4). Lower breast cancer mortality rates persisted after adjustment for patient characteristics and for tumor characteristics but were no longer present after further adjustment for stage at diagnosis. Among patients with non-small cell lung cancer, those with mixed FFS/HMO insurance had better overall survival (with trends toward better lung cancer survival) in unadjusted analysis and in analysis adjusted for covariates.

Results were similar when subjects having missing information on tumor characteristics were excluded from the sample and multivariate analysis was repeated (data not shown). To examine the possibility that the effects of HMO

DISCUSSION

Insurance type (FFS vs HMO) sometimes was statistically significantly associated with treatment outcomes for Medicare beneficiaries with disabilities diagnosed as having breast cancer or lung cancer. Patients with disabilities having HMO insurance coverage were more likely to be diagnosed as having earlier-stage breast cancer and were more likely to undergo radiation therapy after breast-conserving surgery. Health maintenance organization insurance coverage was associated with longer breast cancer survival primarily because of earlier-stage diagnosis. Insurance status had fewer statistically significant associations for patients with disabilities diagnosed as having lung cancer (eg, no association with stage).

Among Medicare beneficiaries, patients belonging to HMOs are more likely to be screened for cancer⁹⁻¹² and are more likely to have cancers diagnosed at an earlier stage.¹³⁻¹⁶ This may in part explain our finding of earlier breast cancer diagnosis and improved survival. Higher rates of cancer screening within HMOs may result from greater emphasis on delivery of preventive care³² and from increased focus on primary care rather than on subspecialty care.³³ In some studies, beneficiaries with disabilities in HMOs perceived better access to primary care services⁸ and were more likely to undergo cancer screening tests.³⁴ Greater use of preventive services in HMOs may be the result in part of favorable selection in which healthier patients are differentially enrolled in HMOs.³⁵

There was some evidence that Medicare beneficiaries with disabilities enrolled in HMOs were more frequently treated with breast-conserving surgery as shown by a statistically significant odds ratio in the unadjusted model but not in the adjusted model. These HMO enrollees were more often treat-

Table 3. Cancer Treatments by Insurance Status^a

Insurance Type	%	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Breast cancer			
Receipt of breast-conserving surgery^b			
FFS	40.2	1 [Reference]	1 [Reference]
HMO	47.2	1.33 (1.13-1.58)	0.97 (0.87-1.07)
Mixed FFS/HMO	44.9	1.22 (0.75-1.96)	1.04 (0.80-1.34)
Receipt of radiation therapy after breast-conserving surgery^c			
FFS	70.7	1 [Reference]	1 [Reference]
HMO	79.4	1.60 (1.18-2.16)	1.11 (1.03-1.19)
Mixed FFS/HMO	83.3	2.07 (0.79-5.45)	1.21 (1.06-1.39)
Receipt of lymph node dissection^d			
FFS	86.2	1 [Reference]	1 [Reference]
HMO	85.0	0.91 (0.72-1.15)	1.01 (0.98-1.04)
Mixed FFS/HMO	87.0	1.07 (0.53-2.17)	1.01 (0.92-1.11)
Lung cancer			
Receipt of surgery^e			
FFS	63.1	1 [Reference]	1 [Reference]
HMO	69.3	1.10 (1.01-1.20)	1.06 (0.97-1.16)
Mixed FFS/HMO	80.0	1.27 (1.04-1.54)	1.23 (1.02-1.49)
Receipt of radiation therapy^f			
FFS	28.7	1 [Reference]	1 [Reference]
HMO	22.9	0.79 (0.63-1.00)	0.93 (0.77-1.12)
Mixed FFS/HMO	20.0	0.69 (0.31-1.53)	1.11 (0.66-1.84)
Receipt of surgery or radiation therapy^f			
FFS	88.6	1 [Reference]	1 [Reference]
HMO	88.8	1.00 (0.96-1.05)	1.00 (0.95-1.05)
Mixed FFS/HMO	96.0	1.09 (1.00-1.18)	1.09 (1.02-1.17)

CI indicates confidence interval; FFS, fee-for-service; HMO, health maintenance organization; OR, odds ratio.

^aDuring 12 months before diagnosis and during 6 months after diagnosis. Outcomes in boldface are statistically significant at *P* < .05.

^bAmong women having American Joint Committee on Cancer (AJCC) stage I, II, or IIIA lesions and undergoing breast-conserving surgery or mastectomy (n = 4480).

^cAmong women having AJCC stage I, II, or IIIA lesions and undergoing breast-conserving surgery (n = 1775).

^dAmong women having AJCC stage I, II, or IIIA lesions (n = 4480).

^eAmong persons having AJCC stage I cancers (n = 2240).

^fAmong persons having AJCC stage I cancers (n = 2240). Adjusted models also controlled for concomitant lung cancer surgery.

ed with radiation therapy following breast-conserving surgery (the treatment combination recommended by National Institutes of Health consensus panels) and had better breast cancer survival. Persons having HMO insurance were more likely to have tumor grade and hormone receptor status documented for their cancers. Findings from previous studies suggest that in general Medicare beneficiaries belonging to HMOs are more likely to undergo breast-conserving surgery,³⁶ to receive adjuvant radiation therapy following breast-con-

serving surgery,¹⁶ and to have improved breast cancer survival.^{36,37} Our study extends these findings to Medicare beneficiaries with disabilities.

The reasons for treatment differences among patients having HMO insurance vs FFS insurance could not be ascertained in this study but may result from variations in practice structure. Health maintenance organizations, especially staff-model and group-model forms, have resources and organizational structures that can disseminate standards of care and ensure that cur-

■ **Table 4.** Mortality Rates by Insurance Status^a

Insurance Type	Unadjusted HR (95% CI)	Adjusted HR (95% CI)	Stage-adjusted HR (95% CI) ^b
Breast cancer (n = 4877)			
All-cause mortality			
FFS	1 [Reference]	1 [Reference]	1 [Reference]
HMO	0.87 (0.75-1.01)	0.81 (0.69-0.95)	0.91 (0.78-1.07)
Mixed FFS/HMO	0.94 (0.76-1.17)	0.92 (0.74-1.15)	0.97 (0.78-1.21)
Breast cancer mortality			
FFS	1 [Reference]	1 [Reference]	1 [Reference]
HMO	0.67 (0.52-0.87)	0.75 (0.57-0.98)	0.97 (0.73-1.27)
Mixed FFS/HMO	0.77 (0.54-1.11)	0.88 (0.61-1.28)	0.97 (0.67-1.41)
Lung cancer (n = 8834)			
All-cause mortality			
FFS	1 [Reference]	1 [Reference]	1 [Reference]
HMO	0.99 (0.92-1.06)	0.95 (0.88-1.03)	0.97 (0.90-1.05)
Mixed FFS/HMO	0.88 (0.79-0.99)	0.89 (0.79-0.996)	0.87 (0.78-0.98)
Lung cancer mortality			
FFS	1 [Reference]	1 [Reference]	1 [Reference]
HMO	1.01 (0.93-1.09)	0.99 (0.91-1.09)	1.01 (0.93-1.11)
Mixed FFS/HMO	0.87 (0.77-0.99)	0.89 (0.78-1.02)	0.88 (0.77-1.01)

CI indicates confidence interval; HR, hazard rate; OR, odds ratio.
^aDuring 12 months before diagnosis and during 6 months after diagnosis for subjects with breast cancer (4118 for fee-for-service [FFS], 542 for health maintenance organization [HMO], and 217 for mixed FFS/HMO) and for subjects with non-small cell lung cancer (7568 for FFS, 916 for HMO, and 350 for mixed FFS/HMO). Outcomes in boldface are statistically significant at *P* < .05.
^bAlso adjusted for American Joint Committee on Cancer stage (I, II, III, IV, or unstaged). Persons with in situ cancers excluded.

rent practice patterns are consistent with these standards.^{38,39} Improved breast cancer survival among HMO recipients seemed to be primarily the result of earlier stage at diagnosis.

While HMO insurance vs FFS insurance arrangement was statistically significantly associated with breast cancer outcomes, lung cancer outcomes showed few effects. The subset of persons changing between HMO and FFS plans seemed to have better lung cancer outcomes. Among 137 patients with lung cancer who changed insurance type between diagnosis and 6-month follow-up, most (65%) changed from HMO insurance to FFS insurance. This group had a greater likelihood of undergoing surgery for early-stage disease and had better overall survival, with a statistically nonsignificant trend toward better lung cancer survival.

Changing between HMO and FFS Medicare plans might indicate problems in accessing care or dissatisfaction with care. Patients having disabilities are generally more likely to report dissatisfaction or problems with their healthcare plan^{6,7,40-42} and are more likely to disenroll from their HMO, often changing to an FFS plan.⁴³ Forced disenrollment from a

Medicare HMO plan has been associated with problems in accessing needed care.⁴⁴⁻⁴⁶

In our study, Medicare beneficiaries with disabilities had remarkably stable HMO and FFS insurance status during their follow-up, similar to other studies.^{47,48} Among persons continuously eligible for Medicare and followed up until their death, 95% of persons with lung cancer and 92% of persons with breast cancer had continuous coverage within FFS or HMO arrangements from the 12 months before diagnosis until their death. In addition, patients who changed between HMO and FFS plans generally had similar or better outcomes compared with persons continuously enrolled in FFS.

Our study had several important limitations. We did not have Medicare claims data for persons enrolled in HMOs and were unable to examine cancer screening or to supplement SEER information on treatment using Medicare claims. Our lack of Medicare claims for persons in HMOs prevented us from assessing comorbidity. SEER does not release data on chemotherapy, so we were unable to evaluate this aspect of cancer treatment, which is especially critical in

breast cancer. Medicare data did not include details about the specific HMO plan, so we were unable to assess the particular financial arrangements for the HMO plan, nor could we capture patient movement between HMO plans. Our sample was restricted to persons who originally qualified for Medicare coverage because of Social Security Disability Insurance, and our results may not generalize to the greater population of persons having disabilities. We studied persons who were diagnosed as having cancer through the end of 1999, and it is possible that trends may have changed since that time. Finally, this was an observational study that did not randomize subjects to insurance types. Statistical methods, such as propensity scores, can only adjust for measured characteristics within the cohort. As a result, it is possible that our results were in part due to unmeasured patient characteristics that differed between HMO patients and FFS patients and not because of the specific insurance arrangement.

In conclusion, Medicare beneficiaries with disabilities diagnosed as having breast cancer generally had more favorable outcomes within HMO arrangements. Health maintenance organization vs FFS insurance status had little effect on lung cancer outcomes. Changes between HMO and FFS insurance types were not associated with poor cancer outcomes.

Acknowledgments

This study used the linked SEER-Medicare database. The interpretation and reporting of these data are the sole responsibility of the authors. The authors acknowledge the efforts of several groups responsible for the creation and dissemination of the linked database, including the Applied Research Branch, Division of Cancer Control and Population Sciences, National Cancer Institute; the Office of Information Services and the Office of Strategic Planning, Centers for Medicare and Medicaid Services; Information Management Services, Inc; and the SEER Program Tumor Registries.

Author Affiliations: Department of Family Medicine, University of South Florida (RGR), and H. Lee Moffitt Cancer Center & Research Institute (RGR, TNC, KJW), Tampa; and Divisions of General Medicine and Primary Care (EPM, LHN, DL) and Hematology and Oncology (RED), Beth Israel Deaconess Medical Center, Department of Medicine, Harvard Medical School (EPM, LHN, RED, LII), and Institute for Health Policy, Division of General Medicine, Massachusetts General Hospital (LII), Boston.

Funding Source: This study was supported by grant R01 CA100029 from the National Cancer Institute.

Author Disclosures: The authors (RGR, TNC, KJW, EPM, LHN, DL, RED, LII) report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (RGR, TNC, EPM); acquisition of data (TNC, EPM, DL, LII); analysis and interpretation of data (RGR, TNC, KJW, EPM, DL, RED, LII); drafting of the manuscript (RGR, TNC, KJW, RED); critical revision of the manuscript for important intellectual content (RGR, TNC, EPM, RED, LII); statistical analysis (RGR, TNC, KJW, LHN, DL); and obtaining funding (TNC, LII).

Address correspondence to: Richard G. Roetzheim, MD, MSPH, Department of Family Medicine, University of South Florida, 12901 Bruce B. Downs Blvd, MDC 13, Tampa, FL 33612. E-mail: rroetzhe@hsc.usf.edu.

Take-away Points

It is unknown whether the type of Medicare insurance arrangement, specifically health maintenance organization (HMO) vs fee-for-service (FFS), affects cancer outcomes for Medicare beneficiaries with disabilities, a vulnerable population. We found that Medicare beneficiaries with disabilities had better breast cancer outcomes if they were continuously enrolled in HMOs.

- Improved outcomes among HMO enrollees included earlier-stage breast cancer diagnosis, greater likelihood of receiving radiation therapy following breast-conserving surgery, and better breast cancer survival.
- The HMO vs FFS insurance arrangement had little effect on the care and outcomes of lung cancer among Medicare beneficiaries with disabilities.

REFERENCES

1. Centers for Medicare and Medicaid Services Web site. Medicare enrollment: disabled beneficiaries: as of July 2005. <http://www.cms.hhs.gov/MedicareEnRpts/Downloads/05Disabled.pdf>. Accessed January 21, 2008.
2. McCarthy EP, Ngo LH, Roetzheim RG, et al. Disparities in breast cancer treatment and survival for women with disabilities. *Ann Intern Med*. 2006;145(9):637-645.
3. McCarthy EP, Ngo LH, Chirikos TN, et al. Cancer stage at diagnosis and survival among persons with Social Security Disability Insurance on Medicare. *Health Serv Res*. 2007;42(2):611-628.
4. Caban ME, Nosek MA, Graves D, Esteva FJ, McNeese M. Breast carcinoma treatment received by women with disabilities compared with women without disabilities. *Cancer*. 2002;94(5):1391-1396.
5. Tanenbaum SJ, Hurley RE. Disability and managed care frenzy: a cautionary note. *Health Aff (Millwood)*. 1995;14(4):213-219.
6. Mobley L, McCormack L, Booske B, et al. Voluntary disenrollment from Medicare managed care: market factors and disabled beneficiaries. *Health Care Financ Rev*. 2005;26(3):45-62.
7. Robins CS, Heller A, Myers MA. Financial vulnerability among Medicare managed care enrollees. *Health Care Financ Rev*. 2005;26(3):81-92.
8. Beatty PW, Dhont KR. Medicare health maintenance organizations and traditional coverage: perceptions of health care among beneficiaries with disabilities. *Arch Phys Med Rehabil*. 2001;82(8):1009-1017.
9. Baker LC, Phillips KA, Haas JS, Liang SY, Sonneborn D. The effect of area HMO market share on cancer screening. *Health Serv Res*. 2004;39(6, pt 1):1751-1772.
10. Carrasquillo O, Lantigua RA, Shea S. Preventive services among Medicare beneficiaries with supplemental coverage versus HMO enrollees, Medicaid recipients, and elders with no additional coverage. *Med Care*. 2001;39(6):616-626.
11. Gordon NP, Rundall TG, Parker L. Type of health care coverage and the likelihood of being screened for cancer. *Med Care*. 1998;36(5):636-645.
12. Potosky AL, Breen N, Graubard BI, Parsons PE. The association between health care coverage and the use of cancer screening tests: results from the 1992 National Health Interview Survey [published correction appears in *Med Care*. 1998;36(10):1470]. *Med Care*. 1998;36(3):257-270.
13. Lee-Feldstein A, Feldstein PJ, Buchmueller T, Katterhagen G. Breast cancer outcomes among older women: HMO, fee-for-service, and delivery system comparisons. *J Gen Intern Med*. 2001;16(3):189-199.
14. Lee-Feldstein A, Feldstein PJ, Buchmueller T. Health care factors related to stage at diagnosis and survival among Medicare patients with colorectal cancer. *Med Care*. 2002;40(5):362-374.
15. Riley GF, Potosky AL, Lubitz JD, Brown ML. Stage of cancer at diagnosis for Medicare HMO and fee-for-service enrollees. *Am J Public Health*. 1994;84(10):1598-1604.
16. Riley GF, Potosky AL, Klabunde CN, Warren JL, Ballard-Barbash R. Stage at diagnosis and treatment patterns among older women with breast cancer: an HMO and fee-for-service comparison. *JAMA*. 1999;281(8):720-726.

17. **National Comprehensive Cancer Network Web site.** NCCN Clinical Practice Guidelines in Oncology: non-small cell lung cancer, V.2.2008. http://www.nccn.org/professionals/physician_gls/PDF/nscl.pdf. Accessed February 29, 2008.
18. **Manser R, Wright G, Hart D, Byrnes G, Campbell DA.** Surgery for early stage non-small cell lung cancer. *Cochrane Database Syst Rev.* 2005;1:CD004699.
19. **Potosky AL, Riley GF, Lubitz JD, Mentnech RM, Kessler LG.** Potential for cancer related health services research using a linked Medicare-tumor registry database. *Med Care.* 1993;31(8):732-748.
20. **Warren JL, Klabunde CN, Schrag D, Bach PB, Riley GF.** Overview of the SEER-Medicare data: content, research applications, and generalizability to the United States elderly population. *Med Care.* 2002; 40(8)(suppl):IV-3-IV-18.
21. **Shambaugh E, Weiss M.** *Summary Staging Guide: Cancer Surveillance, Epidemiology, and End Results Reporting.* Bethesda, MD: Public Health Service, US Dept of Health and Human Services, National Institutes of Health; 1977. Publication 86-2313.
22. **Cooper GS, Virnig B, Klabunde CN, Schussler N, Freeman J, Warren JL.** Use of SEER-Medicare data for measuring cancer surgery. *Med Care.* 2002;40(8)(suppl):IV-43-IV-48.
23. **Virnig BA, Warren JL, Cooper GS, Klabunde CN, Schussler N, Freeman J.** Studying radiation therapy using SEER-Medicare-linked data. *Med Care.* 2002;40(8)(suppl):IV-49-IV-54.
24. **Rowell NP, Williams CJ.** Radical radiotherapy for stage I/II non-small cell lung cancer in patients not sufficiently fit or declining surgery (medically inoperable) [update of *Cochrane Database Syst Rev.* 2001;1:CD002935]. *Cochrane Database Syst Rev.* 2001;2: CD002935.
25. **Rowell NP, Williams CJ.** Radical radiotherapy for stage I/II non-small cell lung cancer in patients not sufficiently fit or declining surgery (medically inoperable): a systematic review. *Thorax.* 2001;56(8):628-638.
26. **Bach PB, Cramer LD, Warren JL, Begg CB.** Racial differences in the treatment of early-stage lung cancer. *N Engl J Med.* 1999;341(16): 1198-1205.
27. **Rosenbaum PR, Rubin DB.** Reducing bias in observational studies using subclassification on the propensity score. *J Am Stat Assoc.* 1984;79:516-524.
28. **Rubin DB.** Estimating causal effects from large data sets using propensity scores. *Ann Intern Med.* 1997;127(8, pt 2):757-763.
29. **Cochran WG.** The effectiveness of adjustment by subclassification in removing bias in observational studies. *Biometrics.* 1968;24(2):295-313.
30. **Flanders WD, Rhodes PH.** Large sample confidence intervals for regression standardized risks, risk ratios, and risk differences. *J Chronic Dis.* 1987;40(7):697-704.
31. **Rockhill B, Newman B, Weinberg C.** Use and misuse of population attributable fractions. *Am J Public Health.* 1998;88(1):15-19.
32. **Landon BE, Zaslavsky AM, Bernard SL, Cioffi MJ, Cleary PD.** Comparison of performance of traditional Medicare vs Medicare managed care. *JAMA.* 2004;291(14):1744-1752.
33. **Phillips KA, Haas JS, Liang SY, et al.** Are gatekeeper requirements associated with cancer screening utilization? *Health Serv Res.* 2004; 39(1):153-178.
34. **Chan L, Doctor JN, MacLehose RF, et al.** Do Medicare patients with disabilities receive preventive services? a population-based study. *Arch Phys Med Rehabil.* 1999;80(6):642-646.
35. **Morgan RO, Virnig BA, DeVito CA, Persily NA.** The Medicare-HMO revolving door: the healthy go in and the sick go out. *N Engl J Med.* 1997;337(3):169-175.
36. **Potosky AL, Merrill RM, Riley GF, et al.** Breast cancer survival and treatment in health maintenance organization and fee-for-service settings. *J Natl Cancer Inst.* 1997;89(22):1683-1691.
37. **Kirsner RS, Ma F, Fleming L, et al.** The effect of Medicare health care delivery systems on survival for patients with breast and colorectal cancer. *Cancer Epidemiol Biomarkers Prev.* 2006;15(4):769-773.
38. **Clancy CM, Brody H.** Managed care: Jekyll or Hyde? *JAMA.* 1995;273(4):338-339.
39. **Wagner EH, Austin BT, Von Korff M.** Organizing care for patients with chronic illness. *Milbank Q.* 1996;74(4):511-544.
40. **Jha A, Patrick DL, MacLehose RF, Doctor JN, Chan L.** Dissatisfaction with medical services among Medicare beneficiaries with disabilities. *Arch Phys Med Rehabil.* 2002;83(10):1335-1341.
41. **Iezzoni LI, Davis RB, Soukup J, O'Day B.** Satisfaction with quality and access to health care among people with disabling conditions. *Int J Qual Health Care.* 2002;14(5):369-381.
42. **Gold M, Nelson L, Brown R, Ciemnecki A, Aizer A, Docteur E.** Disabled Medicare beneficiaries in HMOs. *Health Aff (Millwood).* 1997;16(5):149-162.
43. **Laschober M.** Estimating Medicare Advantage lock-in provisions impact on vulnerable Medicare beneficiaries. *Health Care Financ Rev.* 2005;26(3):63-79.
44. **Schoenman JA, Parente ST, Feldman JJ, Shah MM, Evans WN, Finch MD.** Impact of HMO withdrawals on vulnerable Medicare beneficiaries. *Health Care Financ Rev.* 2005;26(3):5-30.
45. **Parente ST, Evans WN, Schoenman JA, Finch MD.** Health care use and expenditures of Medicare HMO disenrollees. *Health Care Financ Rev.* 2005;26(3):31-43.
46. **Booske BC, Lynch J, Riley G.** Impact of Medicare managed care market withdrawal on beneficiaries. *Health Care Financ Rev.* 2002; 24(1):95-115.
47. **Field TS, Cernieux J, Buist D, et al.** Retention of enrollees following a cancer diagnosis within health maintenance organizations in the Cancer Research Network. *J Natl Cancer Inst.* 2004;96(2):148-152.
48. **Riley GF, Feuer EJ, Lubitz JD.** Disenrollment of Medicare cancer patients from health maintenance organizations. *Med Care.* 1996; 34(8):826-836. ■