The Impact of a Change in Medicare Reimbursement Policy and HEDIS Measures on Stage at Diagnosis Among Medicare HMO and Fee-For-Service Female Breast Cancer Patients

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Objective: To examine the effects of health plan enrollment [health maintenance organizations (HMO) or fee-for-service (FFS)], a change in Medicare reimbursement policy which allowed for annual rather than biennial mammograms, and Health Plan Employer Data Information Set (HEDIS) measures on stage at diagnosis among older women with breast cancer.

Methods: We used the population-based Surveillance Epidemiology and End Results (SEER)-Medicare database to identify all elderly women age 65–74 who were diagnosed with breast cancer from 1994 to 2002. We compared stage at diagnosis, demographic characteristics, and tumor characteristics for FFS or HMO enrollment in the periods before and after the 1998 policy change. We compared the effect of women age 65–69 whose mammography use in the HMO system is measured by HEDIS and those who are older (age 70–74).

Results: We identified 20,106 women enrolled in FFS Medicare, and 10,751 women enrolled in an HMO. Women ages 65–74 who were enrolled in a Medicare HMO were more likely to be diagnosed at an early stage both before and after the policy change, but the disparity decreased from 4.7% to 2.3%, a relative change of 51.1%. The disparity was not specific to the ages included in the HEDIS measure.

Conclusions: A decrease of 51.1% in the HMO-FFS disparity in breast cancer stage at diagnosis coincided with the 1998 change in Medicare mammography reimbursement policy. The existence of HEDIS measures for HMOs does not create a disparity in stage at diagnosis between those whose mammograms are measured by HEDIS (younger women) and those whose are not (older women).

Key Words: breast cancer, cancer stage, Medicare, HMO, mammography

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One in 7 women born in the United States will be diagnosed with breast cancer at some time in her life. In 2006, an estimated 212,920 women were diagnosed, and 40,970 women will die of it.[1] However, with adequate screening and treatment, breast cancer morbidity and mortality can be minimized.

Screening and Stage at Diagnosis

Cancer screening is advocated because it results in tumors being found at earlier stages and improved survival. Medicare managed care (health maintenance organizations [HMO]) enrollees are diagnosed at an earlier stage than those in the standard fee-for-service (FFS) program for melanoma and cancers of the female breast, cervix, and colon.[2] It is hypothesized that this pattern may be due to increased coverage and possibly promotion of screening tests by HMOs. Other factors associated with use of breast cancer screening include age,[3,4] race,[3,4] education,[4,5] and risk of death.[3]

Changes in Breast Cancer Screening Reimbursement Policy

Medicare mammography reimbursement has changed dramatically since 1990.[6] Beginning January 1, 1991, Medicare covered the cost of biennial screening mammograms for women age 65 and older, and mammography use subsequently increased by 15.6%.[7] Beginning in January 1, 1998, Medicare expanded mammography coverage to annual screening mammograms. Although Medicare policy regarding screening mammography has explicitly changed, HMOs have consistently been required to provide at least what FFS Medicare provides, but are allowed to provide additional benefits. Many studies of the differences in quality and cost

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of cancer care between the FFS and HMO options have been conducted.[2,8–12] Studies of differences in breast cancer diagnosis and treatment of Medicare enrollees between HMO and FFS settings have found that the HMO enrollees were diagnosed at an earlier stage.[8,9]

Since 1997, the Health Plan Employer Data Information Set (HEDIS)[13] has measured breast cancer screening levels in Medicare HMO plans as rate of mammography within the past 2 years for women age 65–69 years.[14] There are no similar published measures for patients treated in FFS Medicare or for women in HMOs over age 70.

We hypothesized that the HMO-FFS breast cancer stage at diagnosis disparity identified by Riley et al[8] would narrow or disappear after the 1998 Medicare policy change to reimbursing annual mammograms, because the frequency of screening in FFS beneficiaries would increase relative to the higher levels of screening seen in HMO enrollees. We also sought to examine whether the disparity varies by age group, because the HMO HEDIS measure only includes women up to age 69, but the expanded mammogram benefit does not have an upper age limit.

METHODS

Data

To evaluate the effects of the 1998 change in Medicare mammography reimbursement policy on the breast cancer stage at diagnosis disparity between HMO and FFS Medicare beneficiaries, we used the population-based linked tumor registry/Medicare claims (Surveillance Epidemiology and End Results [SEER]-Medicare) database to identify breast cancer cases diagnosed from 1994 to 2002. The SEER-Medicare database is widely used to study patterns of cancer care in the elderly.[2,5,8–11,15,16] SEER, a set of 16 population-based cancer registries sponsored by the National Cancer Institute, includes approximately 26% of the US population.[1] SEER collects information including patient demographic characteristics, tumor site, histology, stage, grade, first course of treatment (surgery and irradiation), follow-up for vital status, and cause of death as recorded on the death certificate. The SEER-Medicare database links the information from the SEER cancer registries with Medicare beneficiary claims for 93% of all people age 65 and older in the SEER registries.[17] Medicare data includes indicators of HMO enrollment at the time of diagnosis.

Stage was defined as in situ, I, II, III, IV, or unknown, using SEER modified American Joint Committee on Cancer (*AJCC*), 3rd ed. staging codes.[18] We categorized race as black, nonblack, or unknown due to the high sensitivity and specificity of the race variable for black enrollees.[19] Grade was categorized into I/II (well-differentiated/moderately differentiated), III/IV (poorly differentiated/undifferentiated), or unknown.

Sample Selection

The sample was limited to female Medicare beneficiaries age 65–74, diagnosed with breast cancer from 1994 to 2002. We limited our sample to women younger than age 75 to include women up to 5 years older than the HEDIS cut point of 69 years. We restricted our cohort to women enrolled in both Medicare part A and Medicare part B at time of diagnosis for 2 reasons: mammograms are a part B benefit, and women must be enrolled in Medicare part B to enroll in a Medicare HMO. We sequentially excluded women with a previous cancer diagnosis (3997, 6.6%), those diagnosed at a nursing home, autopsy, or death certificate (175, 0.3%), and those in the 4 SEER registries that only collected data from 2000 to 2002 (13,702, 24.4%). We also removed the 4 registries with managed care penetration of 8.6% or less (11,482 cases). The remaining 8 registries include: San Francisco-Oakland, Connecticut, Hawaii, New Mexico, Seattle, Atlanta, San Jose-Monterey, and Los Angeles. These registries had a minimum of 13.2% penetration (range, 13.20–52.83%).

Analysis

We compared groups on demographic characteristics using the χ^2 test for categorical variables and the 2-sided t test for continuous variables. We compared tumor characteristics for staged invasive cases only. We tested for stage at diagnosis differences for women age 65 and with those age 66 at time of diagnosis to ensure we were not biasing our results by including women who may not have had the opportunity to be screened before enrolling in Medicare.

We constructed an ordered logistic regression model, predicting earlier stage at diagnosis, adjusting for the following categorical variables: health plan type, time period, age at diagnosis, race (black, nonblack, or unknown), marital status (married, unmarried, or unknown), and geographic location by registry. We also tested for an interaction between health plan type and time period (before or after change in FFS reimbursement policy). We examined whether there were increasing rates of FFS early stage at diagnosis over time and for time periods 1994–1997 and 1998–2002, using a 1-sided Cochran-Armitage test for trend. Women with unknown stage were excluded.

All statistical analyses were completed using SAS software, version 9.1. The Institutional Review Board of the University of Minnesota determined that under federal guidelines, this study is exempt from review.

RESULTS

We identified 30,857 women age 65–74 diagnosed with breast cancer from 1994 to 2002. Of these, 20,106 (65.2%) were enrolled in FFS Medicare and 10,751 (34.8%) were enrolled in a Medicare HMO at the time of diagnosis. The percentage of women enrolled in an HMO increased from 31.0% in 1994–1997 to 37.8% in 1998–2002 (Table 1).

There were no differences in age distribution by HMO enrollment, but women enrolled in the HMO were more likely to be black in the period 1998–2002 and were less likely to have unknown marital status in both time periods.

Tumor grade, estrogen receptor status, lymph node positivity, and tumor size varied across Medicare option. Women enrolled in a Medicare HMO were more likely to have lower-grade tumors during both time periods. HMO enrollees were more likely to have their nodal status assessed and were also less likely to have positive nodes. Tumor size was missing for a greater percentage of FFS enrollees than

TABLE 1. Demographic and Tumor Characteristics

	Medicare Biennial Mammogram Policy 1994–1997		Medicare Annual Mammogram Policy 1998–2002	
	FFS	**HMO**	**FFS**	**HMO**
N (row %)	9366 (69.0)	4214 (31.0)	10,740 (62.2)	6537 (37.8)
Mean age (SD)	69.6 (2.9)	69.6 (2.9)	69.5 (2.9)	69.5 (2.8)
Age category				
65–69	4521 (48.3)	2068 (49.1)	5282 (49.2)	3256 (49.8)
70–74	4845 (51.7)	2146 (50.9)	5458 (50.8)	3281 (50.2)
Race*				
Nonblack	8779 (93.7)	3918 (93.0)	10,054§ (93.6)	6059 (92.7)
Black	572 (6.1)	291 (6.9)	677 (6.3)	473 (7.2)
Marital status†				
Married	4935 (52.7)	2300 (54.6)	5860 (54.6)	3653 (55.9)
Unmarried	4159 (44.4)	1818 (43.1)	4538 (42.2)	2717 (41.6)
Stage				
In situ	1360‖ (14.5)	653 (15.5)	1881‖ (17.5)	1062 (16.2)
I	4176 (44.6)	2050 (48.7)	4713 (43.9)	3154 (48.3)
II	2452 (26.2)	1089 (25.8)	3008 (28.0)	1779 (27.2)
III	474 (5.0)	161 (3.8)	428 (4.0)	206 (3.1)
IV	372 (4.0)	111 (2.6)	409 (3.8)	208 (3.2)
Unstaged	532 (5.7)	150 (3.6)	301 (2.8)	128 (2.0)
Registry				
San Francisco-Oakland	1002‖ (10.7)	1030 (24.4)	1138‖ (10.6)	1367 (20.9)
Connecticut	2105 (22.5)	145 (3.4)	2161 (20.1)	599 (9.2)
Hawaii	457 (4.9)	215 (5.1)	599 (5.6)	303 (4.6)
New Mexico	591 (6.3)	194 (4.6)	845 (7.8)	226 (3.5)
Seattle	1575 (16.8)	546 (13.0)	1888 (17.6)	973 (14.9)
Atlanta	921 (9.8)	46 (1.1)	1072 (10.0)	257 (3.9)
San Jose-Monterey	667 (7.1)	331 (7.9)	730 (6.8)	514 (7.9)
Los Angeles	2048 (21.9)	1707 (40.5)	2307 (21.5)	2298 (35.1)
Grade‡				
I/II	4005‖ (53.6)	1984 (58.2)	5415§ (63.3)	3481 (65.1)
III/IV	2170 (29.0)	850 (24.9)	2376 (27.7)	1379 (25.8)
Unknown	1299 (17.4)	577 (16.9)	767 (9.0)	487 (9.1)
Estrogen receptor status‡				
Positive	4972‖ (66.5)	2424 (71.1)	6114‖ (71.4)	3958 (74.0)
Negative	1141 (15.3)	416 (12.2)	1111 (13.0)	706 (13.2)
Unknown/not done	1361 (18.2)	571 (16.7)	1333 (15.6)	683 (12.8)
Mean size‡** (SD)	2.0 (1.7)	1.9 (1.9)	2.0¶ (1.7)	1.8 (1.5)
Median size‡	1.5	1.5	1.5¶	1.5
Node positive (%)‡††	27.9¶	25.1	29.5¶	27.1

P values are for differences between the HMO and FFS cohorts within each time period.

*Race was unknown for 0.2% of FFS and 0.1% of HMO enrollees in years 1994–1997 and 0.1% of FFS and HMO enrollees in years 1998–2002.

†Marital status was unknown for 2.9% of FFS and 2.3% of HMO enrollees in years 1994–1997 and 3.2% of FFS and 2.5% of HMO enrollees in years 1998–2002.

‡Staged invasive cases only.

**Tumor size was unknown for 5.1% of FFS and 3.2% of HMO enrollees in years 1994–1997 and 4.3% of FFS and 3.8% of HMO enrollees in years 1998–2002.

††Node positivity was unknown for 8.4% of FFS and 7.0% of HMO enrollees in years 1994–1997 and 4.5% of FFS and 3.3% of HMO enrollees in years 1998–2002.

§$P < 0.05$.

¶$P < 0.01$.

‖$P < 0.001$.

HMO enrollees (4.7% vs. 3.6%). Women enrolled in a Medicare HMO were more likely to have positive estrogen receptor status in both time periods. Over time, fewer women had unknown tumor grade or estrogen receptor status.

Women in FFS Medicare were less likely to be diagnosed at an early stage than women in an HMO in both time periods (Table 2). Although 9.0% of FFS patients were diagnosed at stage III or IV during years 1994–1997, only

TABLE 2. Stage at Diagnosis by Year

	Biennial Mammogram Reimbursement Policy 1994–1997				Annual Mammogram Reimbursement Policy 1998–2002				
	1994	1995	1996	1997	1998	1999	2000	2001	2002
FFS									
III or IV (%)	8.9	9.2	9.7	8.2	7.4	8.6	7.9	8.2	7.0
Unstaged (%)	6.7	5.6	5.0	5.4	3.3	2.7	2.9	2.6	2.5
0, I, or II (%)	84.4	85.2	85.3	86.4	89.3	88.7	89.2	89.2	90.5
HMO									
III or IV (%)	6.4	5.5	6.2	7.5	7.0	5.9	6.0	6.2	6.6
Unstaged (%)	3.5	3.2	4.1	3.4	1.5	1.7	2.6	2.4	1.5
0, I, or II (%)	90.1	91.3	89.7	89.1	91.5	92.4	91.4	91.4	91.9

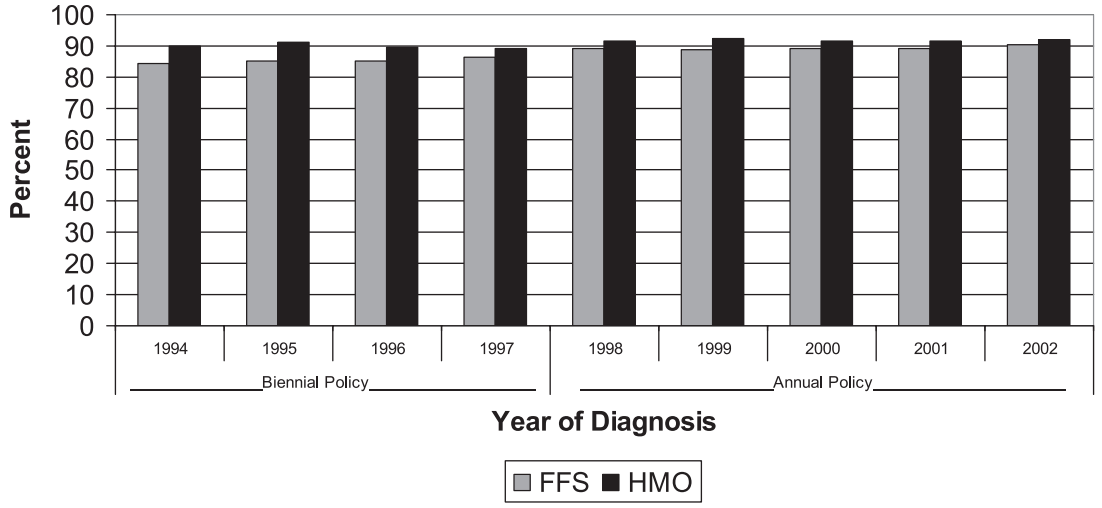

FIGURE 1. Percent of early stage diagnoses by health plan type and year.

6.4% of HMO patients were diagnosed at the same stages during 1994–1997 ($P < 0.001$). In years 1998–2002, these percentages fell to 7.8% for FFS patients and 6.3% for HMO patients ($P < 0.001$). As illustrated in Table 2 and Figure 1, the shift to early diagnosis is not a gradual change; rather we see an abrupt shift between 1997 and 1998. Rates of early-stage versus late-stage diagnosis for women in the FFS system did not significantly increase between 1994 and 1997, before the policy change ($P = 0.22$).

Notice, the difference in stage at diagnosis remained when stratifying by age group (Table 3). When diagnosed with breast cancer between age 65–69 in years 1994–1997, 4.7% more women were diagnosed at an early stage if enrolled in an HMO compared with FFS. After the FFS reimbursement change, this percentage dropped to 2.4% for years 1998–2002, a relative change of −48.9%. For women age 70–74 at time of diagnosis, the HMO-FFS percentage difference in early stage at diagnosis dropped from 4.7% in 1994–1997 to 2.2% in 1998–2002, a relative change of −53.2%. There was no difference in stage at diagnosis for women age 65 compared with those age 66 ($P = 0.46$).

The logistic regression model shows that the following women are more likely to be diagnosed at an early stage: those enrolled in an HMO, nonblacks, and married women (Table 4). The odds ratio point estimate for HMO versus FFS dropped from 1.15 in 1994–1997 to 1.08 in 1998–2002. The narrowing of the FFS-HMO disparity over time, measured as a health plan type—time period interaction, was statistically significant ($P = 0.03$).

DISCUSSION

This study was designed to examine the effects of the considerably expanded Medicare reimbursement policy from biennial to annual mammograms, which went into effect on January 1, 1998. We hypothesized that the policy change would result in earlier stage at diagnosis for women enrolled in Medicare and a narrowing or disappearance of the HMO-FFS disparity, because women would have access to more frequent mammograms. After the policy change, women enrolled in FFS Medicare were more likely to be diagnosed with in situ disease or at stage I or II (85.3% for years 1994–1997 vs. 89.4% for years 1998–2002) and that the FFS-HMO gap narrowed but was not eliminated.

Early-stage diagnoses rose by 4.1%, 1.2% of which is due to a drop in stage III and IV diagnoses. The shift from

TABLE 3. Stage at Diagnosis by Age Group and Time Period

	Biennial Mammogram Reimbursement Policy 1994–1997			Annual Mammogram Reimbursement Policy 1998–2002		
	FFS	HMO	*P*	FFS	HMO	*P*
All ages			<0.0001			<0.0001
0, I, or II (%)	85.3	90.0		89.4	91.7	
III or IV (%)	9.0	6.4		7.8	6.3	
Unstaged (%)	5.7	3.6		2.8	2.0	
Ages 65–69			<0.0001			0.0005
0, I, or II (%)	85.4	90.1		89.6	92.0	
III or IV (%)	8.9	6.6		7.7	6.4	
Unstaged (%)	5.7	3.3		2.7	1.6	
Ages 70–74			<0.0001			0.0028
0, I, or II (%)	85.2	89.9		89.2	91.4	
III or IV (%)	9.1	6.3		7.9	6.3	
Unstaged (%)	5.7	3.8		2.9	2.3	

P values are for differences between the HMO and FFS cohorts within each time period.

TABLE 4. Ordered Logistic Regression Output for Earlier Stage at Diagnosis*

	Biennial Mammogram Policy for FFS Medicare 1994–997		Annual Mammogram Policy for FFS Medicare 1998–2002	
	OR (95% CI)	*P*	OR (95% CI)	*P*
Plan type		0.0002		0.0145
FFS	1.00 (Referent)		1.00 (Referent)	
HMO	1.15 (1.07–1.24)		1.08 (1.02–1.14)	
Race		0.0053		0.2060
Black	1.00 (Referent)		1.00 (Referent)	
Nonblack	1.25 (1.09–1.43)		1.10 (0.98–1.23)	
Unknown	1.51 (0.64–3.54)		0.72 (0.27–1.90)	
Age category, yr		0.2904		0.8373
65–69	1.00 (Referent)		1.00 (Referent)	
70–74	0.97 (0.91–1.03)		1.01 (0.95–1.06)	
Marital status		<0.0001		<0.0001
Not married	1.00 (Referent)		1.00 (Referent)	
Married	1.25 (1.17–1.33)		1.25 (1.18–1.32)	
Unknown	1.68 (1.36–2.07)		1.45 (1.21–1.73)	

*Controlling for registry; excludes unstaged cancers.
OR indicates odds ratio; CI, confidence interval.

invasive to in situ disease, seen by the 3.0% increase of in situ tumors in the FFS cohort, is particularly compelling and could directly reflect an increased rate of mammography in the FFS cohort after the policy change. The increase in early stage at diagnosis cannot be completely attributable to a decrease in unstaged tumors. In the FFS cohort, the percentage of unstaged tumors dropped 2.9% between the 2 time periods.

Results from our logistic regression analysis showed that women who were enrolled in an HMO and those who were married had a higher probability of early-stage diagnosis than other women. The effect of marital status on mammography rates has been shown in previous studies.[20] Relative to black women, nonblack women had a higher probability of early-stage diagnosis from 1994 to 1997 but not from 1998 to 2002.

The FFS-HMO gap in early-stage diagnosis significantly narrowed after the policy change, as shown by the interaction term in our logistic regression model. The interaction test provides evidence that the effect of HMO enrollment on early stage at diagnosis differed before and after the policy change of 1998. In 1994–1997, 4.7% more HMO patients were diagnosed at an early stage; this percentage fell to 2.3% in 1998–2002, a relative change of 51.1%. The HMO-FFS odds ratio dropped from 1.15 to 1.08.

Gross et al[16] found that after the expansion of Medicare reimbursement for colon cancer screening, both screening and the probability of early-stage cancer diagnosis increased. We hypothesized that a similar effect would be seen after the expansion of Medicare reimbursement for breast cancer screening. Although we cannot measure mammography rates in this study because we do not have access to claims for HMO enrollees, early-stage diagnoses became more common in both health plan types over the time period of our study and after the policy change in 1998.

These 2 findings suggest that routine preventive care is important. Routine care can result in earlier diagnoses of asymptomatic diseases, and with early diagnoses we see reductions in morbidity and mortality. Currently, Medicare enrollees are only allowed 1 routine physical examination—the "Welcome to Medicare physical." Policy makers could consider additional routine physicals for all Medicare enrollees. Routine preventive care is important not only to diagnose asymptomatic cancers but also chronic conditions such as depression, diabetes, and hypertension. Of course, as with any policy change, cost-effectiveness should be established. Previous studies have found that biennial screening mammograms are cost-effective for women age 65 and older[21]; a similar analysis should be conducted for annual screening mammograms or any other policy change considered by Medicare.

Our results parallel Riley's 1999 study[8] of breast cancer stage at diagnosis in Medicare enrollees. He found that women enrolled in Medicare HMOs were less likely than women enrolled in FFS Medicare to be diagnosed at a late stage. In fact, it is studies such as Riley's that were part of the impetus to change Medicare policy regarding coverage of mammograms. Although this disparity in stage at diagnosis continues to exist after the 1998 policy change, it has been significantly reduced.

Earlier stage at diagnosis in the Medicare HMO population may be due to increased contact with the health care system, including primary care practitioners. Keating et al[22] showed that women in FFS Medicare who had contact with a primary care physician in the 2 years preceding a breast cancer diagnosis were less likely to be diagnosed at an advanced stage than other women. HMO enrollees have more contact with physicians,[23] and their increased contact results in more use of preventive services, including mammogra-

phy,[23] and possibly clinical breast examinations, which result in earlier stage at diagnosis.

Although HEDIS reporting, which began in 1997, may provide additional motivation for managed care providers to encourage breast cancer screening in women age 65–69, the disparity persisted in women age 70–74. In fact, in women diagnosed from 1998 to 2002, the percentage difference in early-stage diagnosis was 2.4% for women age 65–69 and 2.2% for women age 70–74. Therefore, it is possible that the existence of HEDIS measures had an indirect effect on women age 70 and older enrolled in a Medicare HMO. This same spillover might extend to women enrolled in FFS Medicare. For example, outreach programs or other methods used to improve screening rates for HMO enrollees age 52–69 might benefit older women or those in FFS Medicare.

Over our study time period, mammography became more common. In 1994, 24.1% of American women age 40 and older had never had a mammogram. By 2002, this percentage had fallen to 15.9%.[24] Consumer acceptance of mammography and changing medical practice could have influenced women to seek mammograms, which would explain the trend toward earlier diagnoses for both FFS and HMO populations.

Our population-based study has limitations that must be acknowledged. We study cancer cases within the SEER registry areas. These areas have a lower percentage of white persons and persons living in poverty and a higher percentage of persons living in urban areas than the general US population.[17]

As expected, given the trend toward more urban areas, SEER registry areas have a higher percentage of HMO enrollment than the overall US population.[17] However, managed care penetration does not seem to affect breast cancer treatment in the FFS population of an area.[25] We do not have information regarding potentially important variables such as patient comorbidity status or use of mammograms for HMO enrollees in SEER-Medicare data. Likewise, we cannot distinguish among HMO subtypes such as Individual Practice Associations and group model HMOs to assess their impact relative to each other or Medicare FFS.

CONCLUSIONS

This population-based study of women age 65–74 and diagnosed with breast cancer found that those enrolled in traditional FFS Medicare were diagnosed at later stages than women enrolled in a Medicare HMO, even after Medicare expanded its coverage of mammography. Although the use of quality reporting may motivate some HMOs to provide more mammograms, the FFS/HMO disparity is not specific to the age groups included in the HEDIS measure. The narrowing of the FFS/HMO disparity coincided with a change in Medicare mammography reimbursement policy from biennial to annual on January 1, 1998 ($P = 0.03$). This finding points to the importance of Medicare coverage policy for facilitating earlier cancer diagnosis in the elderly.

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