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Association of Medicare Advantage vs Traditional Medicare With 30-Day Mortality Among Patients With Acute Myocardial Infarction

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IMPORTANCE Medicare Advantage health plans covered 37% of beneficiaries in 2018, and coverage increased to 48% in 2022. Whether Medicare Advantage plans provide similar care for patients presenting with specific clinical conditions is unknown.

OBJECTIVE To compare 30-day mortality and treatment for Medicare Advantage and traditional Medicare patients presenting with acute myocardial infarction (MI) from 2009 to 2018.

DESIGN, SETTING, AND PARTICIPANTS Retrospective cohort study that included 557 309 participants with ST-segment elevation [acute] MI (STEMI) and 1 670 193 with non–ST-segment elevation [acute] MI (NSTEMI) presenting to US hospitals from 2009-2018 (date of final follow up, December 31, 2019).

EXPOSURES Enrollment in Medicare Advantage vs traditional Medicare.

MAIN OUTCOMES AND MEASURES The primary outcome was adjusted 30-day mortality. Secondary outcomes included age- and sex-adjusted rates of procedure use (catheterization, revascularization), postdischarge medication prescriptions and adherence, and measures of health system performance (intensive care unit [ICU] admission and 30-day readmissions).

RESULTS The study included a total of 2 227 502 participants, and the mean age in 2018 ranged from 76.9 years (Medicare Advantage STEMI) to 79.3 years (traditional Medicare NSTEMI), with similar proportions of female patients in Medicare Advantage and traditional Medicare (41.4% vs 41.9% for STEMI in 2018). Enrollment in Medicare Advantage vs traditional Medicare was associated with significantly lower adjusted 30-day mortality rates in 2009 (19.1% vs 20.6% for STEMI; difference, −1.5 percentage points [95% CI, −2.2 to −0.7] and 12.0% vs 12.5% for NSTEMI; difference, −0.5 percentage points [95% CI, −0.9% to −0.1%]). By 2018, mortality had declined in all groups, and there were no longer statically significant differences between Medicare Advantage (17.7%) and traditional Medicare (17.8%) for STEMI (difference, 0.0 percentage points [95% CI, −0.7 to 0.6]) or between Medicare Advantage (10.9%) and traditional Medicare (11.1%) for NSTEMI (difference, −0.2 percentage points [95% CI, −0.4 to 0.1]). By 2018, there was no statistically significant difference in standardized 90-day revascularization rates between Medicare Advantage and traditional Medicare. Rates of guideline-recommended medication prescriptions were significantly higher in Medicare Advantage (91.7%) vs traditional Medicare patients (89.0%) who received a statin prescription (difference, 2.7 percentage points [95% CI, 1.2 to 4.2] for 2018 STEMI). Medicare Advantage patients were significantly less likely to be admitted to an ICU than traditional Medicare patients (for 2018 STEMI, 50.3% vs 51.2%; difference, −0.9 percentage points [95% CI, −1.8 to 0.0]) and significantly more likely to be discharged to home rather than to a postacute facility (for 2018 STEMI, 71.5% vs 70.2%; difference, 1.3 percentage points [95% CI, 0.5 to 2.1]). Adjusted 30-day readmission rates were consistently lower in Medicare Advantage than in traditional Medicare (for 2009 STEMI, 13.8% vs 15.2%; difference, −1.3 percentage points [95% CI, −2.0 to −0.6]; and for 2018 STEMI, 11.2% vs 11.9%; difference, 0.6 percentage points [95% CI, −1.5 to 0.0]).

CONCLUSIONS AND RELEVANCE Among Medicare beneficiaries with acute MI, enrollment in Medicare Advantage, compared with traditional Medicare, was significantly associated with modestly lower rates of 30-day mortality in 2009, and the difference was no longer statistically significant by 2018. These findings, considered with other outcomes, may provide insight into differences in treatment and outcomes by Medicare insurance type.

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Supplemental content

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Enrollment in private Medicare Advantage plans has increased from 24% of Medicare beneficiaries in 2009 to 41% in 2021.[1] Prior research has shown that patients enrolled in Medicare Advantage use fewer services than those enrolled in traditional Medicare,[2,3] but it is unclear to what extent these differences in use are the result of unmeasured selection,[4] seeking care from different clinicians or hospitals,[5] or care management tasks used by Medicare Advantage plans to influence care.[6] One way to understand these differences better is to study the care patterns of patients who present with an acute condition that can be identified in a uniform way across the 2 programs.

Acute myocardial infarction (MI) is a leading cause of death in older adults and an exemplar condition for such a comparison because it is common, has agreed upon diagnostic criteria, and acute MI patients are uniformly admitted to the hospital.[7-9] In addition, although clinical guidelines recommend early revascularization for patients presenting with ST-segment elevation MI (STEMI), use of cardiac interventions for non–ST-segment elevation MI (NSTEMI) is more discretionary. Prior studies have compared treatment patterns for Medicare Advantage and traditional Medicare patients presenting with acute MI in specific areas of the country or within a small group of hospitals and have largely found similar treatment patterns.[10-14] This analysis builds on these prior studies by examining a more recent comprehensive national sample of patients presenting with acute MI over a time period when enrollment in Medicare Advantage has steadily increased. Moreover, the 2012 introduction of penalties for high rates of acute MI readmissions under the Hospital Readmissions Reduction Program applied only to traditional Medicare patients, and this may have contributed to the emergence of treatment pattern differences.

In this study, Medicare Advantage and traditional Medicare patients hospitalized with acute MI between 2009 and 2018 were compared with respect to 30-day mortality, treatment processes, and other outcomes.

Key Points

Question Among Medicare beneficiaries with acute myocardial infarction (MI) from 2009-2018, did outcomes and treatment processes differ for patients enrolled in Medicare Advantage as compared with traditional Medicare?

Findings In this retrospective cohort study that included 557 309 participants hospitalized with ST-segment elevation [acute] MI (STEMI) and 1 670 193 with non–ST-segment elevation [acute] MI (NSTEMI), enrollment in Medicare Advantage, compared with traditional Medicare, was associated with significantly lower adjusted 30-day mortality rates in 2009 (with STEMI: Medicare Advantage [19.1%] vs traditional Medicare [20.6%]; with NSTEMI: Medicare Advantage [12.0%] vs traditional Medicare [12.5%]). By 2018, mortality had declined in all groups, and there were no longer statistically significant differences between Medicare Advantage (17.7%) and traditional Medicare (17.8%) for STEMI or for NSTEMI (Medicare Advantage [10.9%] vs traditional Medicare [11.1%]).

Meaning Enrollment in Medicare Advantage, compared with traditional Medicare, was associated with modestly lower rates of 30-day mortality following acute MI in 2009, and the difference was no longer statistically significant by 2018.

Methods

Data and Patients

This project was approved by the Centers for Medicare & Medicaid Services privacy board and the Harvard Medical School institutional review committee, which also waived the requirement for obtaining informed consent because the claims data were deidentified and not collected for this study. The objective of the study was to compare 30-day mortality rates, revascularization rates, and measures of health system performance (intensive care unit [ICU] admission, hospital length of stay, and 30-day readmissions) cross-sectionally and then examine if differences have changed over time as Medicare Advantage enrollment has increased.

We used administrative data from the Medicare program to identify all adults aged 66 years or older continuously enrolled in both Medicare Part A and Part B for at least 1 year prior to and following a hospitalization (or until death within 1 year following hospitalization) with a principal diagnosis of acute MI between January 1, 2009, and December 31, 2018. Although the Centers for Medicare & Medicaid Services does not pay directly for hospitalizations of Medicare Advantage patients, hospitals that seek disproportionate share or graduate medical education payments are required to submit claims that include all of their Medicare patients, and these hospitals account for more than 90% of Medicare Advantage hospitalizations nationally.[5,14-18] Patients were classified as having Medicare Advantage if they were enrolled in Medicare Advantage during the month of their acute MI hospitalization, and we did not require that patients remain enrolled in Medicare Advantage for the entire study period. Thus, our main sources of data were the MedPAR files,[19] which include data on hospitalizations, and the Medicare Master Beneficiary Summary File, which contains enrollment and sociodemographic information. We also examined Medicare Part D event files to assess posthospital medication use for a 20% random sample of enrollees with Part D coverage.

We distinguished ST-segment elevation and non-ST-elevation MI (STEMI or NSTEMI, defined using relevant *International Classification of Diseases, Ninth Revision* [*ICD-9*] and *International Statistical Classification of Diseases, Tenth Revision* [*ICD-10*] codes [see eTable 1 in the Supplement]) because of differences in the patient characteristics and treatment approaches for these conditions. For instance, patients with STEMI are typically treated with prompt revascularization whereas for patients with NSTEMI, revascularization is considered more discretionary.[20,21]

We excluded patients with an acute MI admission during the 1-year period prior to the index hospitalization to avoid counting readmissions as de novo admissions. For patients who were transferred between hospitals as part of their admission, we evaluated the complete episode of care. We used data from 2008 for our 1-year look back (for those

hospitalized in 2009) and data from 2019 to assess posthospital outcomes for those hospitalized in 2018.

Outcomes

We examined outcomes of care and of treatment processes. The primary outcome we examined was age-, sex-, and comorbidity-adjusted 30-day mortality. Secondary outcomes included treatment processes (rates of cardiac catheterization and rates of cardiac revascularization including percutaneous coronary intervention and coronary artery bypass grafting) during the index hospitalization and within 90 days of hospitalization. Procedures were identified using *ICD-9* and *ICD-10* codes available in the submitted claims data (eTable 1 in the Supplement). We also examined measures of resource use including ICU admission, hospital length of stay, discharge destination (home or inpatient postacute care), transfer rate, and readmission within 30 days of discharge.

In addition, for the portion of the sample with available Part D pharmacy data, we examined prescriptions for and adherence to recommended medications based on the percentage of days covered from filled prescriptions in the 180-day period postdischarge. Recommended medications included statins, β-blockers, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers, and antiplatelet medications other than aspirin (for patients who had undergone coronary stent placement). For these measures, we looked for at least 1 filled prescription within 90 days of discharge because some patients were treated using these medications prior to discharge and therefore had available supply to last beyond 30 days. To measure adherence, we calculated the percent of patients who had sufficient medication for 80% or more of the days through 180 days, which was calculated as the ratio of the number of days the patient is covered by the medication to the total number of days in the period beginning with the date of the first fill after acute MI discharge.[22]

Additional Measures

For each acute MI hospitalization, we collected basic demographic information including age, sex, race, and ethnicity. We measured race and ethnicity (categorized as Black, Hispanic, White, and other for this study) using the Research Triangle Institute race variable in the Medicare Master Beneficiary Summary File, which imputes undercounted categories such as Hispanic based on surname and neighborhood. We included race and ethnicity in our full adjusted models because these have been associated with spending and outcomes in Medicare beneficiaries. Additional measures included comorbid conditions present on the index admission and previous admissions during the prior year using the Agency for Healthcare Research and Quality adaptation of the Elixhauser comorbidity index, which was available for both populations.[23] The Agency for Healthcare Research and Quality algorithm excludes cardiovascular conditions (eg, heart failure) identified in the index admission that could plausibly be related to the index acute MI but also includes other noncardiovascular conditions to improve ascertainment of comorbidities. We were not able to include diagnoses recorded for care delivered outside of the hospital because we lacked these data for Medicare Advantage enrollees.

Because Medicare Advantage plans may seek to direct their patients to a smaller number of preferred hospitals, we also examined whether patients enrolled in Medicare Advantage were treated at a more concentrated group of hospitals in each geographic region. For each set of patients (Medicare Advantage and traditional Medicare), we constructed a county-level measure of the Herfindahl-Hirschman Index (HHI) by summing the squared market shares of STEMI or NSTEMI hospital admissions for hospitals serving patients from each county with patients enrolled in Medicare Advantage or traditional Medicare. We then reported the mean of the county-level HHI weighted by the Medicare Advantage enrollment in the county.[24] The index can range from 0 to 10 000, with 10 000 representing a monopoly market with only 1 hospital. A market is considered concentrated if its HHI is greater than 2500 and super concentrated if its HHI is greater than 5000.[25-27]

Statistical Analyses

First, we compared the demographic characteristics and comorbidities of patients hospitalized with STEMI and NSTEMI for each program in each calendar year; we present data for our first year (2009) and last year (2018) for simplicity with full results for all study years available by request.

Second, we calculated age- and sex-adjusted STEMI and NSTEMI rates (hospitalizations per 1000 enrolled population age ≥66 years per year), treatment approaches, outcomes, and measures of resource use for each program and calendar year, standardized to match the age and sex distribution of Medicare Advantage enrollees in 2018.[28] To test for differences in rates, we used χ^2 tests or *t* tests as appropriate. Less than 0.1% of patients were missing data on either age or sex, and these observations were excluded from the analyses.

Third, to adjust rates of 30-day mortality and 30-day readmissions for a larger set of patient characteristics, we estimated the Medicare Advantage/traditional Medicare difference in rates using a nested sequence of linear regression models introducing, in turn, control variables for age and sex, sociodemographic characteristics (race and ethnicity and Medicaid dual eligibility), and Elixhauser comorbidities. To simplify the presentation of these results, we estimated this sequence of models for the first and last years of the study period separately.

Fourth, we added hospital fixed effects to distinguish residual Medicare Advantage/traditional Medicare differences due to systematically different assignment to high-performing hospitals vs those driven by treatment differences within each hospital. Results in models that included hospital fixed effects were similar, so we present results from models that did not include hospital fixed effects. Because coefficients for readmission were largely similar when controlling for this broader set of covariates, we present the age and sex standardized results for readmissions. Statistical tests were considered significant at a threshold of *P* value of less than .05, and all testing was 2-sided. Because of the

Table. Study Population by Condition and Coverage Type in 2009 and 2018

	Enrolled patients, %[a]			
	STEMI		NSTEMI	
	Medicare Advantage	Traditional Medicare	Medicare Advantage	Traditional Medicare
2009				
No.	13 045	50 905	34 034	125 138
Sociodemographic characteristics				
Age, mean, y	77.9	79.1	79.1	80.3
Female sex	45.9	49.0	48.2	51.3
Male sex	54.1	51.0	51.8	48.7
Race and ethnicity[b]				
Black	7.8	5.6	10.5	7.8
Hispanic	7.5	4.3	8.4	4.4
White	81.8	87.5	78.3	85.3
Other[c]	2.8	2.5	2.7	2.4
Urban	51.1	44.2	51.2	44.8
Comorbidities				
Hypertension	62.3	63.2	69.2	69.2
Diabetes	26.8	25.6	34.3	33.2
Fluid and electrolyte disorders	20.3	24.1	25.4	29.7
Chronic pulmonary disease	16.3	18.4	22.1	24.8
Kidney failure	12.9	13.1	21.7	21.3
Peripheral vascular disease	9.1	10.0	12.2	13.4
Other neurological disorders	5.6	7.6	6.8	9.0
Obesity	5.0	4.6	5.5	5.4
Depression	3.6	5.0	4.7	6.1
Congestive heart failure	4.2	6.1	8.1	10.7
2018				
No.	18 707	31 636	66 525	110 659
Sociodemographic characteristics				
Age, mean, y	76.9	77.4	78.4	79.3
Female sex	41.4	41.9	46.2	46.9
Male sex	58.6	58.1	53.8	53.1
Race and ethnicity[b]				
Black	8.3	5.3	11.9	7.5
Hispanic	10.1	4.8	10.8	5.0
White	76.9	85.2	73.1	83.4
Other[c]	4.7	4.8	4.2	4.1
Urban	48.7	43.4	48.6	43.1
Comorbidities				
Hypertension	58.8	58.9	57.7	59.6
Diabetes	36.4	32.8	47.9	43.8
Fluid and electrolyte disorders	31.3	32.4	38.7	40.6
Chronic pulmonary disease	20.8	19.9	30.4	30.0
Kidney failure	21.1	20.2	35.1	33.9
Peripheral vascular disease	12.5	11.4	18.0	16.5
Other neurological disorders	9.0	10.0	11.2	13.0
Obesity	14.5	14.5	20.2	18.9
Depression	8.7	8.8	12.6	13.6
Congestive heart failure	3.8	4.3	9.6	10.9

Abbreviations: NSTEMI, non–ST-segment elevation myocardial infarction; STEMI, ST elevation myocardial infarction.

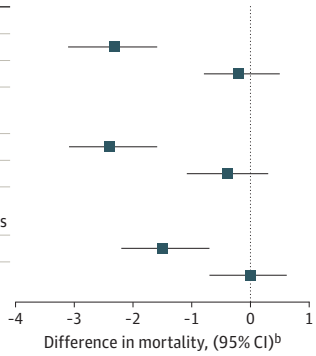
[a] Data are reported as percent values unless otherwise indicated.

[b] Race and ethnicity (categorized as Black, Hispanic, White, and other for this study) were measured using the Research Triangle Institute race variable in the Medicare Master Beneficiary Summary File, which imputes undercounted categories such as Hispanic based on surname and neighborhood.

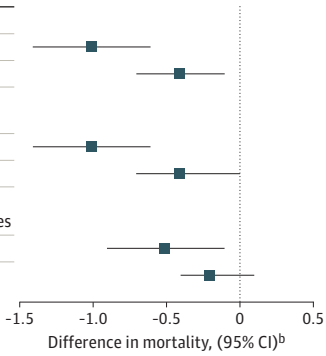
[c] The race and ethnicity category of *Other* includes Asian/Pacific Islander and American Indian/Alaska Native.

Figure 1. Thirty-Day Mortality Rate: 2009 and 2018[a]

Adjustments/ year	STEMI, % patient death: Medicare Advantage	Traditional Medicare
Age, sex		
2009	18.4	20.7
2018	17.7	17.8
Age, sex, race, ethnicity, and original reason for Medicare eligibility		
2009	18.4	20.7
2018	17.5	17.9
Age, sex, race, ethnicity, original reason for Medicare eligibility, and comorbidities		
2009	19.1	20.6
2018	17.7	17.8



Adjustments/ year	NSTEMI, % patient death: Medicare Advantage	Traditional Medicare
Age, sex		
2009	11.5	12.6
2018	10.8	11.2
Age, sex, race, ethnicity, and original reason for Medicare eligibility		
2009	11.5	12.6
2018	10.8	11.1
Age, sex, race, ethnicity, original reason for Medicare eligibility, and comorbidities		
2009	12.0	12.5
2018	10.9	11.1



[a] Sample sizes are reported in the Table.

[b] Indicates % difference of Medicare Advantage minus traditional Medicare.

STEMI indicates ST-segment elevation myocardial infarction; NSTEMI, non–ST-segment elevation myocardial infarction.

potential for type I error due to multiple comparisons, findings for analyses of secondary end points should be interpreted as exploratory. Our analyses were performed using SAS version 9.4.[29]

Results

During 2009 through 2018, we identified a total of 160 992 patients with STEMI within Medicare Advantage and 396 317 with STEMI within traditional Medicare. During this same time span, we identified 490 345 patients with NSTEMI within Medicare Advantage and 1 179 848 patients with NSTEMI within traditional Medicare. In 2009, the Medicare Advantage study cohort comprised 13 045 patients and traditional Medicare had 50 905 for STEMI, and for NSTEMI, the study cohort had 34 034 enrolled in Medicare Advantage and 125 138 in traditional Medicare. In 2018,the Medicare Advantage study cohort comprised 18 707 patients and traditional Medicare had 31 636 for STEMI, and for NSTEMI, the study cohort had 66 525 enrolled in Medicare Advantage and 110 659 in traditional Medicare. Incidence rates of both STEMI and NSTEMI decreased over time in traditional Medicare (eg, for NSTEMI, from 4.9/1000 in 2009 to 4.0/1000 in 2018), but were initially lower in Medicare Advantage, with the difference narrowing over time (eFigure 1 in the Supplement).

The mean age for patients in 2018 ranged from 76.9 years (STEMI, Medicare Advantage) to 79.3 years (NSTEMI, traditional Medicare) (**Table**). There were similar proportions of female patients in Medicare Advantage and traditional Medicare (41.4% vs 41.9% for STEMI in 2018). Medicare Advantage patients were more frequently Black (11.9% vs 7.5%) or Hispanic (10.8% vs 5.0%) for NSTEMI in 2018 ($P < .001$) than traditional Medicare patients, and they were less commonly White (73.1% vs 83.4% for NSTEMI in 2018, $P < .001$) than traditional Medicare patients. Rates of comorbidities increased over time, but were similar across Medicare Advantage and traditional Medicare; the 1 exception was diabetes, which was increasingly more prevalent in Medicare Advantage (eg, 26.8% vs 25.6% in Medicare Advantage and traditional Medicare for STEMI in 2009 and 36.4% vs 32.8% in 2018). Comorbidities for all years are available in eTable 2 and eTable 3 in the Supplement.

Mortality

STEMI

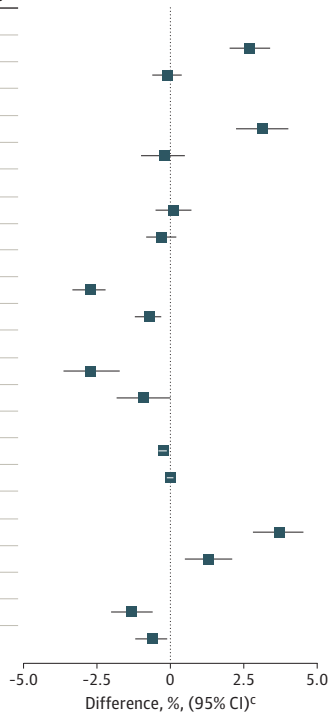
Enrollment in Medicare Advantage, compared with traditional Medicare, was associated with lower age- and sex-standardized 30-day mortality rates for STEMI in both 2009 and 2018, but this difference narrowed over time (eFigure 2 in the Supplement). In models adjusting for age and sex, 2009 mortality was 18.4% for Medicare Advantage vs 20.7% for traditional Medicare (difference, −2.3 percentage points [95% CI, −3.1 to −1.6]). After adjusting for age, sex, race, ethnicity, original reason for Medicare eligibility, and comorbidities, this difference narrowed to 19.1% for Medicare Advantage vs 20.6% for traditional Medicare (difference, −1.5 percentage points [95% CI, −2.2 to −0.7]; **Figure 1** and eFigure 3 in the Supplement). By 2018, mortality had declined in both groups and adjusted models, and there were no longer statistically significant differences between Medicare Advantage (17.7%) and traditional Medicare (17.8%) (difference, 0.0 percentage points [95% CI, −0.7 to 0.6]). Results in models that included hospital fixed effects were similar.

NSTEMI

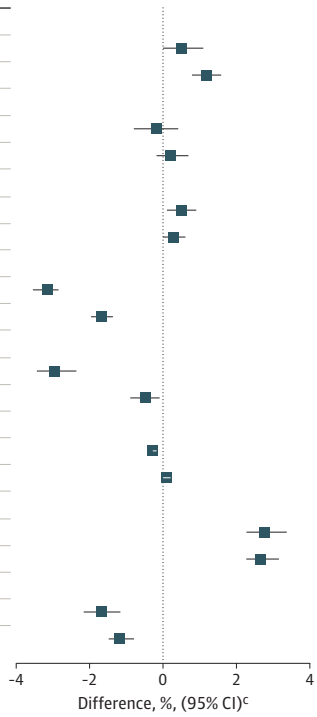
Results for NSTEMI followed a similar pattern. In models that were adjusted for age, sex, race, ethnicity, original reason for Medicare eligibility, and comorbidities, enrollment in Medicare Advantage was associated with a significantly lower adjusted 30-day mortality rate in 2009 (12.0%) than for traditional Medicare (12.5%) (difference, −0.5 percentage points [95% CI, −0.9 to -0.1]) but was no longer significantly different in 2018 (10.9% for Medicare Advantage vs 11.1% for traditional Medicare; difference, −0.2 percentage points [95% CI, −0.4 to 0.1]) (Figure 1 and eFigure 3 in the Supplement).

Figure 2. Procedure Rates and Hospital Utilization: 2009 and 2018[a]

Metric[b]/year	STEMI, % of patients: Medicare Advantage	STEMI, % of patients: Traditional Medicare
90-d Cardiac catheterization rate		
2009	80.0	77.3
2018	90.5	90.7
90-d PCI rate		
2009	62.7	59.6
2018	77.2	77.4
90-d CABG rate		
2009	11.2	11.1
2018	7.5	7.8
Interhospital transfer rate		
2009	7.7	10.4
2018	6.0	6.8
ICU bed utilization rate		
2009	40.6	43.2
2018	50.3	51.2
Mean length of stay, d		
2009	5.9	6.1
2018	5.1	5.1
Discharge to home rate		
2009	71.0	67.3
2018	71.5	70.2
Readmission rate		
2009	13.8	15.2
2018	11.2	11.9



Metric[b]/year	NSTEMI, % of patients: Medicare Advantage	NSTEMI, % of patients: Traditional Medicare
90-d Cardiac catheterization rate		
2009	61.4	60.9
2018	69.1	67.8
90-d PCI rate		
2009	30.3	30.5
2018	35.5	35.2
90-d CABG rate		
2009	12.6	12.1
2018	13.2	12.9
Interhospital transfer rate		
2009	10.6	13.8
2018	9.9	11.6
ICU bed utilization rate		
2009	27.8	30.8
2018	23.4	23.9
Mean length of stay, d		
2009	6.6	6.9
2018	6.2	6.1
Discharge to home rate		
2009	70.7	67.9
2018	72.1	69.4
Readmission rate		
2009	17.1	18.7
2018	14.7	15.9



[a] Sample sizes are reported in the Table.

[b] Data are standardized by sex and age. Numeric values indicate % of patient utilization for all metrics except length of stay, which is reported as mean length of stay, number of days.

[c] Indicates % difference of Medicare Advantage minus traditional Medicare for all metrics except length of stay, which is reported as difference in mean length of stay, number of days. For exact difference (95% CI) values, see the section Inpatient and 90-Day Procedures and Resource Use.

STEMI indicates ST-segment elevation myocardial infarction; NSTEMI, non–ST-segment elevation myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; ICU, intensive care unit.

Inpatient and 90-Day Procedures and Resource Use

STEMI

In 2009, age/sex standardized 90-day cardiac catheterization rates were significantly higher for Medicare Advantage (80%) than for traditional Medicare (77.3%) (difference, 2.7 percentage points [95% CI, 2.0 to 3.4]), and percutaneous coronary intervention rates were also higher for Medicare Advantage (62.7%) than for traditional Medicare (59.6%) (difference, 3.1 percentage points [95% CI, 2.2 to 4.0]) but showed no differences by 2018 (**Figure 2** and eFigure 3 in the Supplement). Coronary artery bypass grafting rates, which decreased among Medicare Advantage beneficiaries from 11.2% in 2009 to 7.5% in 2018, were not significantly different in the 2 programs (7.5% for Medicare Advantage vs 7.8% for traditional Medicare in 2018, difference, −0.3 percentage points [95% CI, −0.8 to 0.2]).

In contrast, measures of resource use differed consistently over time across the 2 programs. Interhospital transfer was less common in Medicare Advantage (7.7%) than in traditional Medicare (10.4%) (difference, −2.7 percentage points; [95% CI, −3.3 to −2.2]) in 2009 and also in 2018 (Medicare Advantage, 6.0% vs traditional Medicare, 6.8%; difference, −0.7 percentage points [95% CI, −1.2 to −0.3]). Medicare Advantage patients were also significantly less likely to be admitted to an ICU (40.6% vs 43.2% for traditional Medicare; difference, −2.7 percentage points [95% CI, −3.6 to −1.7] in 2009 and also in 2018 (Medicare Advantage, 50.3% vs traditional Medicare, 51.2%; difference, −0.9 percentage points [95% CI, −1.8 to 0.0]). Medicare Advantage patients were significantly more likely to be discharged to home rather than to inpatient post-acute care (71.0%) vs patients with traditional Medicare (67.3%) (difference, 3.7 percentage points [95% CI, 2.8 to 4.5]) in 2009 and also in 2018 (Medicare Advantage, 71.5% vs traditional Medicare, 70.2%; difference, 1.3 percentage points [95% CI, 0.5 to 2.1]). Hospital length of stay, however, was not significantly different across the 2 programs.

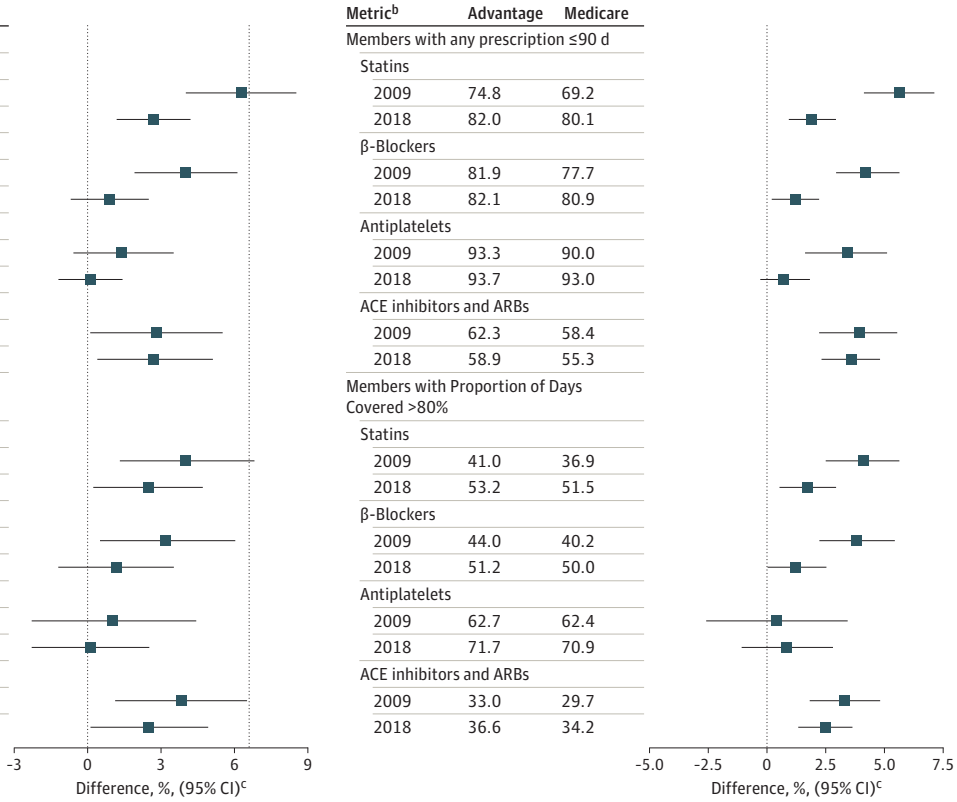
Enrollment in Medicare Advantage, as compared with traditional Medicare, also was significantly associated with lower adjusted readmission rates within 30 days of discharge across the entire period in 2009 (13.8% vs 15.2%; difference, −1.3 percentage points [95% CI, −2.0 to −0.6]) and in 2018 (Medicare Advantage, 11.2% vs traditional Medicare, 11.9%; difference, −0.6 percentage points [95% CI, −1.2 to 0.0]).

NSTEMI

In contrast to STEMI, catheterization and revascularization rates for patients admitted with NSTEMI were not significantly

Figure 3. Postdischarge Prescription Drug Utilization and Adherence: 2009 and 2018[a]

Metric[b]	STEMI, % of patients: Medicare Advantage	STEMI, % of patients: Traditional Medicare	NSTEMI, % of patients: Medicare Advantage	NSTEMI, % of patients: Traditional Medicare
Members with any prescription ≤90 d				
Statins				
2009	82.6	76.3	74.8	69.2
2018	91.7	89.0	82.0	80.1
β-Blockers				
2009	85.4	81.4	81.9	77.7
2018	89.3	88.4	82.1	80.9
Antiplatelets				
2009	91.2	89.8	93.3	90.0
2018	94.3	94.2	93.7	93.0
ACE inhibitors and ARBs				
2009	69.5	66.7	62.3	58.4
2018	69.6	66.8	58.9	55.3
Members with Proportion of Days Covered >80%				
Statins				
2009	51.1	47.1	41.0	36.9
2018	67.4	64.9	53.2	51.5
β-Blockers				
2009	52.0	48.7	44.0	40.2
2018	63.7	62.5	51.2	50.0
Antiplatelets				
2009	63.6	62.5	62.7	62.4
2018	73.2	73.1	71.7	70.9
ACE inhibitors and ARBs				
2009	41.0	37.2	33.0	29.7
2018	47.5	45.0	36.6	34.2



[a] Sample sizes are reported in the Table.

[b] Data are standardized by sex and age.

[c] Indicates % difference of Medicare Advantage minus traditional Medicare.

STEMI indicates ST-segment elevation myocardial infarction; NSTEMI, non–ST-segment elevation myocardial infarction; ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker.

different across the 2 programs, although the rate of cardiac catheterization was higher in Medicare Advantage by 2018 (69.1% for Medicare Advantage vs 67.8% for traditional Medicare; difference, 1.2 percentage points [95% CI, 0.8 to 1.6]). Differences in measures of resource use and readmissions, however, paralleled those seen for patients with STEMI.

Postdischarge Medication Use

Rates of filled prescriptions were higher for Medicare Advantage enrollees for STEMI and NSTEMI in both time periods but narrowed between 2009 and 2018 (**Figure 3** and eFigure 3 in the Supplement). For instance, rates of statin prescription fills after STEMI were 82.6% for Medicare Advantage vs 76.3% for traditional Medicare (difference, 6.3 percentage points [95% CI, 4.0 to 8.8]) in 2009, and 91.7% for Medicare Advantage vs 89.0% for traditional Medicare (difference, 2.7 percentage points [95% CI, 1.2 to 4.2]) in 2018. Similarly, for those who filled any prescription, rates of adherence were generally higher in Medicare Advantage but narrowed over the study period. Among those filling a statin prescription after STEMI, the percentage of members with a Proportion of Days Covered (PDC) greater than 80% was 51.1% for Medicare Advantage vs 47.1% for traditional Medicare (difference, 4.0 percentage points [95% CI, 1.3 to 6.8]) in 2009, and 67.4% for Medicare Advantage vs 64.9% for traditional Medicare (difference, 2.5 percentage points [95% CI, 0.2 to 4.7]) in 2018.

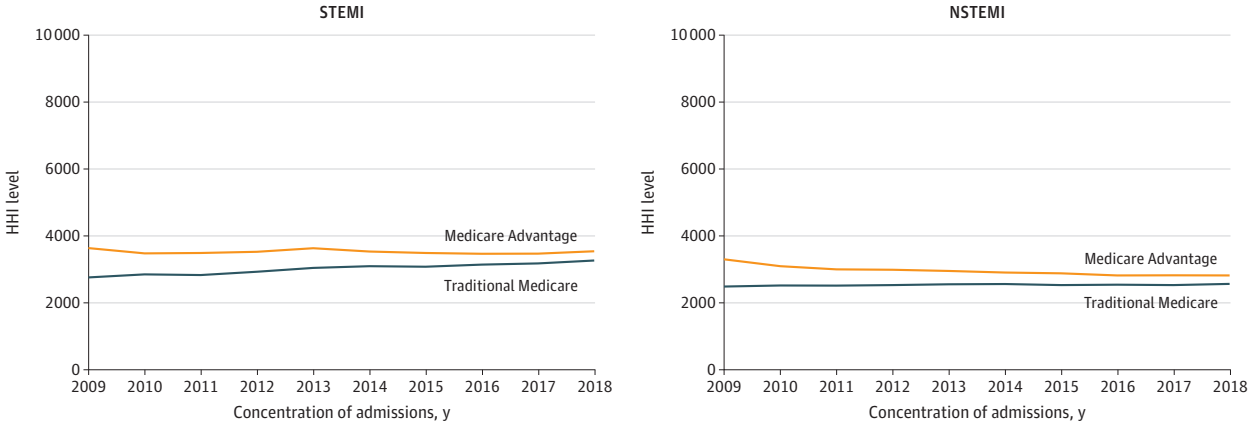
Hospital Concentration

In 2009, the care of Medicare Advantage patients was more concentrated in a smaller number of hospitals. For instance, for STEMI, the HHI, which was calculated for each program based on the market share of hospitals for treated patients with acute MI within counties, was 3600 in Medicare Advantage as compared with 2700 in traditional Medicare (**Figure 4**). As Medicare Advantage enrollment grew over time, this difference lessened, but the HHI remained higher in Medicare Advantage in 2018 by 279 points for STEMI and 254 points for NSTEMI as compared with traditional Medicare.

Discussion

In this retrospective analysis of acute MI outcomes and treatment patterns among Medicare beneficiaries enrolled in traditional Medicare or Medicare Advantage in 2009 and 2018, enrollment in Medicare Advantage, compared with traditional

Figure 4. Hospital-Level Concentration of Acute MI Admissions by MI and Medicare Type (Herfindahl-Hirschman Index): 2009-2018



County-level measures of the Herfindahl-Hirschman Index (HHI) were constructed by summing the squared market share of ST-segment elevation myocardial infarction (STEMI) or non–ST-segment elevation myocardial infarction (NSTEMI) hospital admissions for hospitals serving patients from each county with patients enrolled in Medicare Advantage or traditional Medicare.

The mean of the county-level HHI was weighted by the Medicare Advantage enrollment in the county. Index range, 0 to 10 000, with 10 000 representing a market with only 1 hospital. A market is considered concentrated if its HHI is greater than 2500 and super concentrated if greater than 5000.

Medicare, was associated with modestly lower adjusted 30-day mortality in 2009, but the difference was eliminated by the end of the study period. Medicare Advantage and traditional Medicare patients with acute MI experienced largely similar rates of cardiac catheterization, percutaneous coronary intervention, and coronary artery bypass grafting by 2018, but Medicare Advantage patients had higher rates of receiving and adhering to guideline-concordant medications after discharge. In addition, treatment of Medicare Advantage patients with acute MI was less resource intensive, involving significantly lower rates of ICU use and readmission and higher rates of discharge to home.

Prior comparisons of patients treated in Medicare Advantage vs traditional Medicare, mostly published between 1999 and 2003, suggested substantially lower utilization of resources in Medicare Advantage and, in some cases, higher quality of care.[13] In a study using data from 2007, total medical expenditures for members diagnosed with cardiovascular disease were 39% lower among Medicare Advantage enrollees compared with a matched sample of traditional Medicare enrollees, driven partly by 47% lower procedure expenditures.[14] With respect to quality, there was no significant difference in access to cardiologists or treatment delay (eg, time to electrocardiogram or door-to-needle times) within a sample of traditional Medicare and Medicare Advantage members admitted to Minnesota hospitals for acute MI in the 1990s.[12] Similarly, several studies have found higher[11,30,31] or similar[10] prescription rates for clinically recommended medications following an acute MI in Medicare Advantage compared with traditional Medicare. Conversely, a more recent study found that between 2011 and 2014, adjusted readmission rates following acute MI were slightly higher for Medicare Advantage enrollees.[32]

The findings of this study raise important questions about outcomes of care in the 2 programs, with Medicare Advantage enrollment being associated with better survival at 30 days for much of the study period, although these differences were eliminated by 2018. The results showed that mortality differences in the earlier years were diminished but not eliminated after controlling for patient comorbidities and did not change appreciably after including hospital fixed effects. This suggests that some of the differences in earlier outcomes likely were explained by unmeasured residual differences in health status but not by Medicare Advantage patients being treated at different sets of hospitals.[33] This also could partially explain why these differences narrowed over time as opportunities for selection have decreased with the growing enrollment in Medicare Advantage. Another potential factor could be the growth of accountable care organizations and value-based payment in traditional Medicare since 2012. A more robust experimental design would be needed to answer this question more definitively. Patients from the 2 programs were similar with respect to most comorbidities, although Medicare Advantage enrollees were more likely to be from underserved minority populations.

With few exceptions, hospitals that treat Medicare Advantage patients also treat traditional Medicare patients. Thus, the finding that care processes for patients presenting with STEMI, as well as those with NSTEMI (which follow relatively well-described clinical guidelines[21]), were almost identical between the programs was expected. In contrast, rates of prescriptions for and adherence to guideline-concordant medications were higher in Medicare Advantage. Medicare Advantage plans might have better systems for tracking such use and encouraging adherence or might make access to such drugs simpler or less expensive.[34] In addition, medication adherence contributes to Medicare Advantage plans' star ratings, particularly for integrated Medicare Advantage–Part D plans.

Medicare Advantage patients were treated in a less resource-intensive way when presenting with either type of MI. Medicare Advantage patients were less likely to be admitted to the ICU, less likely to be transferred among hospitals, and

more likely to be discharged to home rather than to a post-acute care facility. Although hospitals are not subject to penalties under the Hospital Readmissions Reduction Program for Medicare Advantage patients, Medicare Advantage patients were significantly less likely to be readmitted within 30 days, a difference that was robust to controlling for comorbidities and hospital fixed effects. These differences in readmission rates were larger than the interquartile range in risk-adjusted all-cause readmission rates across hospitals.[35] Taken together, these differences likely amount to substantial savings accruing to Medicare Advantage plans for care that is largely similar to that delivered in traditional Medicare. This study also showed that Medicare Advantage care was provided in a more concentrated set of hospitals, although this difference has lessened over time as enrollment in Medicare Advantage has increased. A higher concentration of care might allow Medicare Advantage plans to more easily affect length of stay and discharge destination through the use of care managers or clinical social workers placed within higher-volume hospitals.[36-38]

Limitations

This study has several limitations. First, we relied on diagnosis codes in administrative claims both to identify study patients and to measure care processes and comorbidities. Although such coding is not always sensitive or specific, coding approaches for acute MI are well established and expected to be used consistently by hospitals treating these patients.[8,9] Second, Centers for Medicare & Medicaid Services adopted the *ICD-10* in October 2015, and coding practices might have changed as a result. Third, over time, the intensity of coding of comorbidities has increased, particularly in the Medicare Advantage program.[39] In this study, however, measured comorbidities were obtained only from hospital claims, and though hospitals also might have coded more intensively over time, coding practices within hospitals would likely not vary by payer. Fourth, although hospitals are required to submit claims to Medicare to qualify for disproportionate share payments and graduate medical education, they are not directly paid for these claims, so they may be submitted less reliably for Medicare Advantage patients. Fifth, Medicare Advantage was analyzed as a single program, but there might be significant plan-level variation in treatment. Sixth, although the analyses of outcomes controlled for patient comorbidities and other characteristics, other unmeasured differences in health status might have influenced the mortality differences observed. Seventh, ascertainment of discharge destination for Medicare Advantage enrollees may be less accurate than for traditional Medicare enrollees.

Conclusions

Among Medicare beneficiaries with acute MI, enrollment in Medicare Advantage, compared with traditional Medicare, was significantly associated with modestly lower rates of 30-day mortality in 2009, and the difference was no longer statistically significant by 2018. These findings, considered with other outcomes, may provide insight into differences in treatment and outcomes by Medicare insurance type.

ARTICLE INFORMATION

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