

Association Between Ambulatory Care Utilization and Coronary Artery Disease Outcomes by Race/Ethnicity

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Background—Coronary artery disease is common, and there exist disparities in management and outcomes. The purpose of this study is to examine the association between ambulatory care utilizations and inpatient acute myocardial infarction (AMI) mortality.

Methods and Results—This is a retrospective analysis of a stratified national sample of Medicare fee-for-service enrollees aged 66 years and older from January 1, 2010 to December 31, 2011. We measured both number of ambulatory visits and presence of ambulatory cardiac tests. The primary outcome was inpatient AMI mortality. Using multivariate logistic regression models, we estimated the association between ambulatory care utilization and the main patient outcomes, adjusting for patient- and area-level demographic, geographical, and clinical characteristics. We found that a significantly lower percentage of Hispanics and Asians, relative to whites, had frequent ambulatory care visits. Among the largest 4 race/ethnic groups, Asians had the highest observed inpatient mortality rate (15.9%). Overall, low ambulatory utilization was associated with higher odds (odds ratio=1.85 [95% confidence interval: 1.11-3.08]), and ambulatory cardiac testing was associated with lower odds (odds ratio=0.73 [0.55-0.95]) of inpatient AMI mortality, after adjustment for covariates. Asians had higher odds of inpatient AMI mortality even after adjustment for covariates.

Conclusions—Among Medicare fee-for-service enrollees, Hispanics and Asians had lower rates of ambulatory care visits, and all minority groups had higher odds of hospitalization for AMI. Ambulatory care utilization, including both ambulatory clinic visits and outpatient cardiac tests, were associated with AMI mortality. Further research is needed to understand the causal relationship between ambulatory care utilization and cardiovascular outcomes. (*J Am Heart Assoc.* 2019;8:e013372. DOI: 10.1161/JAHA.119.013372.)

Key Words: ambulatory care • coronary artery disease • disparities • myocardial infarction • race and ethnicity

Coronary artery disease affects 15 million adults, and 5% of these individuals have acute myocardial infarction (AMI) annually.¹ Despite improvements in AMI diagnosis and management, there exist significant disparities in the treatment and outcome of AMI among different racial/ethnic

groups.^{2–18} Among blacks and Hispanics, lower rates of invasive cardiac interventions have been associated with worse AMI mortality. According to a recent study, Asian Americans (Asians), the fastest growing minority in the United States, had high inpatient AMI mortality.^{19,20} Because racial/ethnic minorities are low ambulatory care utilizers,^{21–25} low ambulatory utilization among minorities may be associated with poor coronary artery disease outcomes.

Frequent ambulatory care utilization has been associated with improved health outcomes,^{26–30,30,31} but presence of an association between ambulatory care utilization and coronary artery disease outcomes is unclear. Specifically, lower healthcare utilization has been associated with underdiagnosis of common medical conditions, which can potentially lead to worse health outcomes. Racial/ethnic disparities in access to care have been associated with lower healthcare utilization and the underdiagnosis of chronic conditions; the prevalence of undiagnosed cardiac comorbidities among minorities is higher than that of whites.²³ Blacks and Hispanics also have high rates of ambulatory care-sensitive conditions.^{31–33} Therefore, it is important to examine the relationship between

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Clinical Perspective

What Is New?

- Low ambulatory utilization is associated with higher odds (odds ratio=1.85 [95% confidence interval: 1.11-3.08]), and ambulatory cardiac testing is associated with lower odds (odds ratio=0.73 [0.55-0.95]) of inpatient acute myocardial infarction mortality.
- Asian Americans have the highest observed inpatient mortality rate (15.9%), and they have increased odds of inpatient acute myocardial infarction mortality even after adjusting for patient and area-level demographic, geographical, and clinical characteristics.

What Are the Clinical Implications?

- Future studies are needed to examine the potential benefits of ambulatory cardiac testing in the prevention of acute myocardial infarction mortality and lowering the risk of hospitalization for acute myocardial infarction.

ambulatory care utilization and coronary artery disease outcomes and how this varies among racial/ethnic minorities.

Using a nationally representative sample of Medicare (fee-for-service) enrollees aged 66 and older, we examined (1) ambulatory care utilization rates and (2) the association between ambulatory care utilization and coronary artery disease events by race/ethnicity. The main coronary artery disease outcomes we examined were (1) inpatient mortality among those who are hospitalized with a primary diagnosis of AMI and (2) hospitalization for angina, an ambulatory care-sensitive condition. We hypothesized that lower ambulatory care utilization among racial/ethnic minorities would be associated with higher AMI inpatient mortality and/or hospitalization for angina.

Methods

The data used in this analysis cannot be shared directly with other investigators because of the terms of the data use agreement. However, investigators can obtain access to these data by application to the Centers for Medicare and Medicaid Services.³⁴

Study Population

We included those who were at least 66 years old on January 1, 2010 and had continuous Medicare fee-for-service coverage from January 1, 2009 to December 31, 2011 (or until death). We excluded those with a missing/invalid birth date, sex, race/ethnicity, or zip code. This resulted in a national

eligible cohort of 21.6 million Medicare enrollees. Out of this eligible cohort we obtained a (stratified) random sample of 1 million enrollees with oversampling for minorities. The sample was also stratified by geographic regions, using Dartmouth's partition of the country into 306 hospital referral regions; equal numbers of enrollees were sampled from each region. We also obtained sampling weights to obtain estimates representing the national population of eligible fee-for-service Medicare enrollees. Informed consent was not required because we used anonymized data from the Centers for Medicare and Medicaid Services.

Race/Ethnicity

The data categorized patients into the following 5 race/ethnicity groups: Hispanics, non-Hispanic whites, non-Hispanic blacks, Asians, and others. The data did not identify the national origin of Hispanics or Asian Americans.

Primary Outcomes

The primary outcome measures were (1) inpatient AMI mortality among those who were admitted with a primary diagnosis of AMI (*International Classification of Diseases, Ninth Revision [ICD-9]: 410*)³⁵; and (2) admission for angina without a procedure, an ambulatory care-sensitive condition, from January 1, 2010 to December 31, 2011. Inpatient AMI mortality is one of the Inpatient Quality Indicators from the Agency for Healthcare Research (AHRQ), and hospitalization for angina without procedure is one of the conditions associated with AHRQ's potentially preventable hospitalization measures.^{36,37} Hospitalization for angina was identified using ICD diagnosis codes (*ICD-9* codes 411.1, 411.8, 413 without surgical procedures [*Current Procedural Terminology* codes 01-86.99]).³⁸ For Medicare enrollees with more than 1 hospitalization for AMI, 1 hospitalization was randomly selected from the study period, and that visit was used to measure the AMI mortality.

Ambulatory Care Utilization

The primary covariate of interest was ambulatory care utilization. We obtained 2 utilization measures: the number of all ambulatory care visits and the presence of ambulatory cardiac tests. For ambulatory care visits, we examined different types of ambulatory visits, including primary care visits and cardiology visits. To address geographical variations in provider availability,³⁹ we examined the distribution of specialists to determine whether there were variations in ambulatory cardiac tests based on provider availability. We also examined outpatient cardiac tests, including ECG, stress testing, myocardial perfusion imaging, and angiography using *Current Procedural Terminology* codes.

Covariates

Based on previous literature, we identified key demographic attributes, comorbidities, use of invasive cardiac procedures, and area-based characteristics that were associated with admissions and mortality for coronary artery disease.^{14,40-42} Patient characteristics included race, sex, age, and cardiac comorbidities. Age was categorized into 3 groups: 65-74, 75-84, and 85+. Geographical factors included region, urban type, provider availability, and distance to the nearest hospital.⁴³ Region was defined broadly as Northeast, South, West, or Midwest. We used zip code-level geocoded data capturing urban type, provider availability, and median distance to the nearest hospital from the Census Bureau's American Community Survey and the Area Healthcare Resource File.^{44,45} For primary care provider (PCP) availability, we assigned individuals into 4 groups, the top quartile (>82.3 PCP/100k) residents, second quartile (69.1-82.3 PCP/100k) residents, third quartile (59.2-68.9 PCP/100k) residents, lowest quartile (<59.2 PCP/100k) residents. For distance to nearest hospital, the groups were defined as living less than a mile, less than 5 miles, or 5 or more miles away from their nearest hospital. We also captured cardiac conditions, which included atrial fibrillation, chronic kidney disease, congestive heart failure, diabetes mellitus, ischemic heart disease, depression, stroke/transient ischemic attack, cancer, anemia, hyperlipidemia, and hypertension.

Among patients who were hospitalized with AMI, we examined the receipt of invasive cardiac procedures, specifically coronary artery bypass surgery and percutaneous coronary intervention. We also differentiated AMI cases into non-ST-segment-elevation and ST-segment-elevation MI.

Statistical Analyses

We conducted descriptive statistics of the patient characteristics and geographical factors as well as the presence of cardiac comorbidities both for the overall study population and by different racial/ethnic subgroups. We also examined racial/ethnic differences in healthcare utilization, including ambulatory clinic visits and cardiovascular tests (electrocardiography, stress test, myocardial perfusion imaging, and angiography). Next, we calculated the frequency of hospitalizations for angina and AMI among the study population and by racial/ethnic groups. For AMI hospitalization, we described racial/ethnic differences by type of AMI, the occurrence of invasive cardiac procedures, and length of inpatient stay. We ran multivariable logistic regressions to examine factors associated with AMI hospitalization and then conducted multivariate logistic regression to examine the relationship between ambulatory care utilization and AMI inpatient

mortality, adjusting for patient characteristics, geographical factors, and AMI-related covariates. Last, we examined effect modifications by sex and age groups in the multivariable logistic regression.

All statistical analyses were conducted using SAS software, version 9.3 (SAS Institute Inc, Cary, NC) and Stata 14.1 (StataCorp Stata Statistical Software: Release 14, College Station, TX). The Boston University Institutional Review Board approved this study.

Results

Our stratified study sample consisted of equal numbers of whites, blacks, and Hispanics (N=300 000 each) and 100 000 Asians. There were significant differences (all $P<0.01$) in sociodemographic characteristics among different racial groups (Table 1). Interestingly, more than half of Asians resided in the West, compared with only 17% of the total study population. The highest proportion of Asians resided in metropolitan areas (96.1%), areas with high physician availability and in close proximity to a hospital. There were also significant racial/ethnic differences (all $P<0.01$) in the prevalence of cardiac comorbidities; whites had the highest rate of atrial fibrillation (9.7%), and blacks had the highest rate for chronic kidney disease (19.6%), congestive heart failure (20.7%), diabetes mellitus (40.4%), stroke/transient ischemic attack (6.0%), cancer (10.0%), anemia (31.7%), and hypertension (73.0%).

There were significant differences (all $P<0.01$) in ambulatory healthcare utilization among different racial/ethnic groups (Table 2). Overall, 31.9% of the study population had no ambulatory care visits, 10.6% had 1-3 ambulatory care visits, 36.0% had 4-12 ambulatory care visits, 16.7% had 13-24 visits, and 4.9% had more than 24 ambulatory care visits. About half (48.1%) of the Asians had no ambulatory care visits. There were also significant differences (all $P<0.01$) in the prevalence of obtaining ambulatory cardiac tests among racial/ethnic groups. ECG was the most common test, with 44.7% of the study population getting at least 1 ECG performed in 2009. Other commonly conducted cardiac tests included stress tests (11.4%) and myocardial perfusion imaging (9.4%).

Next, we examined hospitalization for angina and AMI (Table 3). The prevalence of hospitalization for angina was small (prevalence was less than 0.1%). The prevalence of AMI hospitalization was 1.5% for the total population, and Asians had the lowest rate of hospitalization during the study period (1.0%, $P<0.01$). Among different racial/ethnic groups, there were variations in types of AMI, prevalence of invasive cardiac procedures, and length of hospital stay. Asians had the highest rate of ST-segment-elevation MI (32.3%, $P<0.01$).

Table 1. Descriptive Statistics of Medicare Fee-for-Service Enrollees (2009) by Race and Ethnicity*

	All	White	Black	Hispanic	Asian	Other	P Value
Sociodemographic characteristics							
Gender							
Male	41.7	41.9	38.3	42.8	41.0	43.8	<0.01
Female	58.3	58.1	61.7	57.2	59.0	56.2	
Age group							
65 to 74 y	44.4	43.5	48.8	49.9	45.9	57.9	<0.01
75 to 84 y	37.4	37.6	35.4	36.6	38.0	33.4	
85+ y	18.3	18.9	15.8	13.5	16.0	8.7	
Region							
Northeast	19.1	19.8	15.1	15.2	16.3	15.6	<0.01
Midwest	24.2	25.8	19.7	8.9	9.1	15.8	
South	39.8	38.9	58.5	41.2	19.0	29.7	
West	16.9	15.6	6.7	34.8	55.6	38.8	
Geographical characteristics							
Urban type							
Metropolitan	77.5	75.9	84.9	89.7	96.1	70.3	<0.01
Urban area	12.4	13.3	7.8	6.7	3.1	15.3	
Rural	10.1	10.8	7.3	3.6	0.8	14.4	
Physician availability							
# of physicians/100k, average	208	207	216	198	224	217	<0.01
# of primary care physician/100k, average	74.5	74.3	76.3	70.9	81.0	81.2	<0.01
Proximity to a nearest hospital							
≤1 mile from a hospital	24.2	22.6	32.8	35.6	38.9	24.1	<0.01
≤5 mile from a hospital	35.4	35.2	38.8	33.3	41.2	30.6	
>5 mile from a hospital	40.4	42.3	28.4	31.1	19.8	45.4	
Cardiac comorbidities							
Atrial fibrillation	9.0	9.7	4.5	4.9	4.9	5.1	<0.01
Chronic kidney disease	12.7	12.1	19.6	14.0	11.9	12.5	<0.01
Congestive heart failure	16.2	15.9	20.7	17.4	12.6	13.6	<0.01
Diabetes mellitus	27.1	25.1	40.4	39.7	35.3	34.7	<0.01
Ischemic heart disease	33.4	33.7	31.6	34.8	29.3	29.3	<0.01
Depression	10.7	11.0	8.1	12.4	5.4	8.6	<0.01
Stroke/TIA	4.2	4.0	6.0	4.3	3.5	3.4	<0.01
Cancer	8.4	9.4	10.0	6.5	5.8	7.2	<0.01
Anemia	23.9	23.0	31.7	28.7	27.2	21.4	<0.01
Hyperlipidemia	48.8	49.1	45.1	48.1	51.9	43.9	<0.01
Hypertension	61.2	60.2	73.0	62.1	62.8	57.9	<0.01

Reprinted from Kim et al²⁵ with permission. Copyright ©2019, Springer Nature. TIA indicates transient ischemic attack.

*Weighted percentage

Among those who were hospitalized for AMI, whites had the highest rate of receiving percutaneous coronary intervention (34.2%, $P<0.01$).

To understand hospitalization for AMI, we examined clinical predictors of AMI admissions (Figure 1). After adjustment for all covariates, all minorities (blacks, odds

Table 2. Healthcare Utilization of Medicare Fee-for-Service Enrollees (2009) by Race and Ethnicity*

	All	White	Black	Hispanic	Asian	Other	P Value
Healthcare utilization							
Number of ambulatory clinic visits							
0	31.9	30.6	35.7	41.3	48.1	33.9	<0.01
1-3	10.6	10.8	10.5	8.5	8.0	10.8	
4-6	14.3	14.6	13.8	10.9	10.3	12.9	
7-12	21.7	22.1	20.6	18.0	16.0	19.8	
13-24	16.7	16.9	15.1	16.1	13.3	16.7	
25+	4.9	4.9	4.2	5.3	4.3	5.9	
Number of outpatient cardiology clinic visits							
0	61.5	60.9	63.2	64.8	67.3	69.1	<0.01
1-3	14.3	14.4	14.8	12.8	12.2	11.9	
4-10	12.7	13	11.5	11.1	11.4	10.4	
11-30	9.3	9.4	8.5	9.2	7.6	7.1	
30+	2.3	2.3	1.8	2.1	1.5	1.5	
Outpatient cardiac testing							
ECG	44.7	44.8	45.1	43.3	41.9	37.4	<0.01
Stress test	11.4	11.5	10.4	11.7	11.6	10.7	<0.01
Myocardial perfusion imaging	9.4	9.4	9	9.8	8.2	8.6	<0.01

*Weighted percentage.

ratio [OR]=0.91 [0.84-0.97]; Hispanics, OR=0.92 [0.86-0.98]; Asians, OR=0.69 [0.57-0.84]; others, OR=0.82 [0.68–1.00]) were less likely than whites to be admitted

for AMI. Other characteristics associated with hospitalization for AMI included being female (OR=0.76 [0.71-0.82]) and being older (75-84 years old, OR=1.33 [1.22-1.45];

Table 3. Hospitalization for Angina and AMI (January 1, 2010 Through December 31, 2011)*

	All	White	Black	Hispanic	Asian	Other	P Value
Angina	0.12	0.11	0.14	0.14	0.05	0.11	<0.01
AMI	1.5	1.5	1.5	1.5	1.0	1.2	<0.01
Number of patients admitted for AMI	14 466	4622	4535	4334	492	483	
Type of AMI							
NSTEMI	69.4	68.6	76.2	73.6	67.7	73.5	<0.01
STEMI	30.6	31.4	23.8	26.4	32.3	26.5	
Prevalence of invasive cardiac procedures							
PCI	33.5	34.2	25.6	31.7	27.9	46.0	<0.01
CABG	5.5	5.5	4.9	6.5	5.1	3.6	0.30
Length of stay, d							
1	12.6	12.9	10.5	10.2	10.3	12.4	<0.01
2-3	32.3	32.9	26.7	29.9	29.8	31.1	
4-7	33.7	33.3	38.1	34.6	33.6	34.0	
8+	21.5	21.0	24.7	25.3	26.3	22.5	
Inpatient AMI mortality	8.7	8.7	7.4	9.3	15.9	6.2	<0.01

*Weighted percentages.

AMI indicates acute myocardial infarction; CABG, coronary artery bypass graft; NSTEMI, non-ST-segment-elevation myocardial infarction ; PCI, percutaneous coronary intervention; STEMI, ST-segment-elevation myocardial infarction.

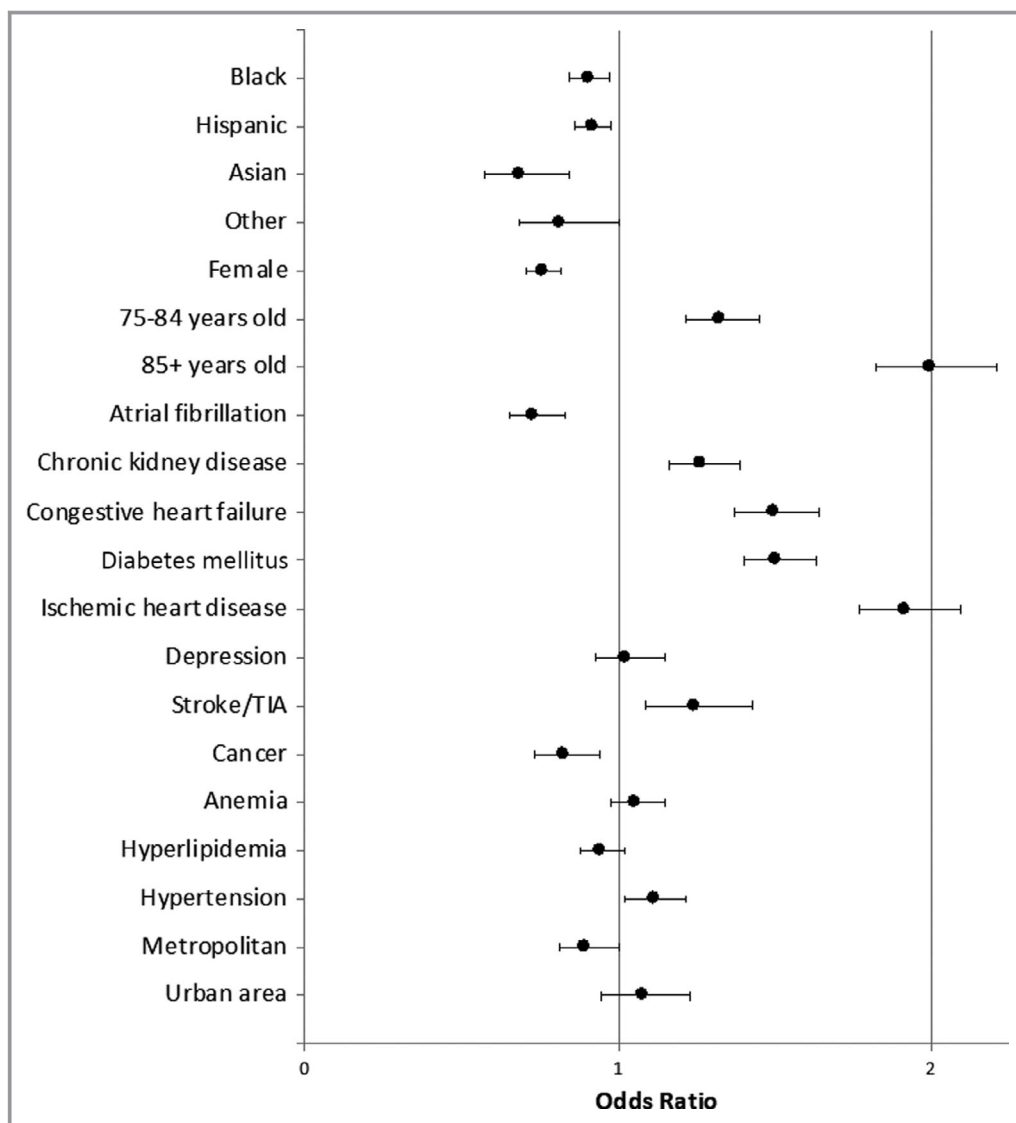


Figure 1. Association between patient characteristics and AMI hospitalization from January 1, 2010 through December 31, 2011. The logistic regression model also adjusted for region, PCP availability, and distance to the nearest hospital. AMI indicates acute myocardial infarction; PCP, primary care provider; TIA, transient ischemic attack. References: non-Hispanic White, 65-74 years old, and Rural.

85 years or older, OR=2.00 [1.82-2.21]) compared with 65-74 years old. The presence of chronic kidney disease, congestive heart failure, diabetes mellitus, ischemic heart disease, depression, stroke/transient ischemic attack, and hypertension was associated with increased odds of being admitted for AMI, but the presence of cancer and atrial fibrillation was associated with decreased odds of being admitted for AMI. There were no significant variations in region, urban type, PCP availability, or proximity to hospital in likelihood of AMI admission.

There were 14 466 Medicare enrollees with AMI hospitalization from January 1, 2010 to December 31, 2011, and AMI mortality was 8.7%. There was a significant difference in AMI

mortality ($P<0.01$): Asians had the highest observed inpatient mortality (15.9%). We performed multivariate logistic regression to examine an association between ambulatory care utilization and inpatient AMI mortality (Figure 2). Among different racial/ethnic groups, only Asians had increased odds of AMI mortality (OR=1.91 [1.05-3.48]) compared with whites. Compared with moderate ambulatory care utilization (4-12 ambulatory care clinic visits), low use of ambulatory clinic visits (0-3 visits) was associated with 87% increased odds (OR=1.87 [1.11-3.16]) of AMI mortality. The receipt of any of the cardiac tests was associated with decreased odds (OR=0.73 [0.55-0.95]) of inpatient AMI mortality. When we checked for effect modification, 65- to 74-year-old Asian patients had increased

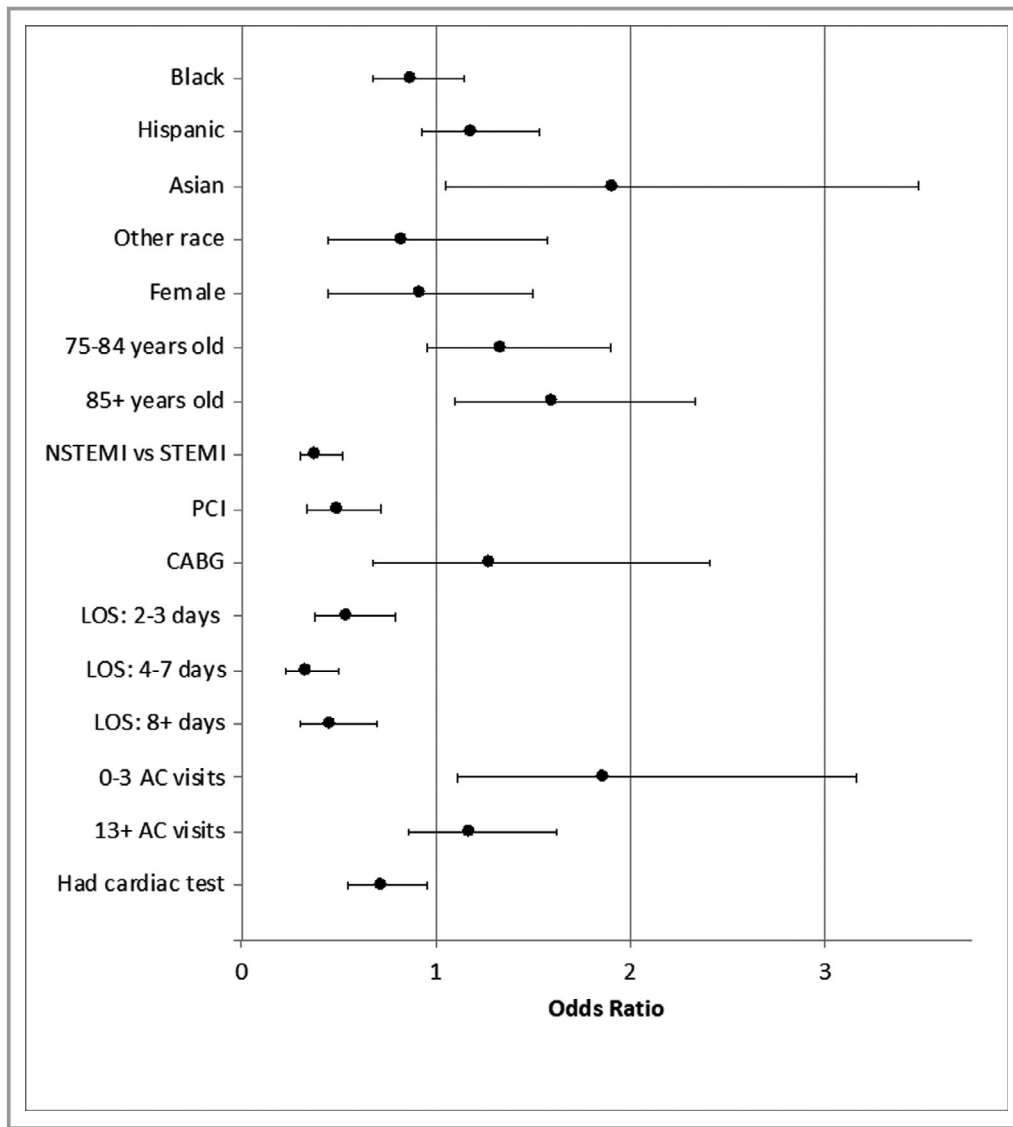


Figure 2. Odds ratio with 95% CI of inpatient AMI mortality (from December 1, 2010 through December 31, 2011) (N=14 466). The logistic regression model also adjusted for cardiac comorbidities, region, urban type, PCP availability, and distance to the nearest hospital. AC indicates ambulatory clinic; AMI, acute myocardial infarction; CABG, coronary artery bypass graft; LOS, length of stay; NSTEMI, non-ST-segment-elevation myocardial infarction; PCI, percutaneous coronary intervention; PCP, primary care provider; STEMI, ST-segment-elevation myocardial infarction. References: non-Hispanic White, 65-74 years old, LOS: 1 day, and 4-12 AC visits.

odds (OR=3.52 [1.25-9.90]) of AMI mortality, but this was not significant among those 75 to 84 years old (OR=2.26 [0.75-6.74]) and patients ≥ 85 years old (OR=2.39 [0.89-8.46]) (reference group was non-Hispanic whites 65-74 years old).

Discussion

Among fee-for-service Medicare enrollees, there existed racial/ethnic disparities in the number of ambulatory care visits but no consistent pattern in ambulatory cardiac imaging or tests. In general, Asians were low healthcare utilizers; they had the lowest rates of ambulatory care clinic

visits, admission for angina without procedures, and hospitalization for AMI. However, Asian Americans had the highest observed inpatient AMI mortality, which is consistent with previous studies.²⁰ There was an association between ambulatory care utilization and inpatient AMI mortality; fewer ambulatory clinic visits were associated with increased odds of AMI mortality, and the use of any ambulatory cardiac tests was associated with decreased odds of AMI mortality.

Racial/ethnic minorities were less likely to be hospitalized for AMI compared with whites. This suggests a limitation of using inpatient AMI mortality to capture

outcomes associated with AMI. A lower likelihood of hospitalization among minorities can result in lower numbers of inpatient hospital stays, but these patients may have more advanced disease, worse symptoms, multiple comorbidities, and higher disease severity. This can result in a relatively smaller denominator when calculating their inpatient mortality; if there is similar population-level mortality, the measured inpatient AMI mortality among minorities may appear to be higher due to fewer hospitalizations for more severe cases. These potential differences in healthcare utilization behavior among different racial/ethnic groups may result in more minority-serving hospitals, usually safety-net hospitals, having worse inpatient AMI mortality. Differences in hospitalization for coronary artery disease and inpatient mortality may also arise from implicit bias; epidemiologic studies have shown Asians to have lower prevalence of cardiac comorbidities^{46,47} and thus higher thresholds of being admitted for treatment.

Our study established an association between ambulatory care utilization, both in the number of ambulatory clinic visits and ambulatory cardiac imaging tests, and inpatient AMI mortality. It is possible that low ambulatory care utilization may contribute to the high inpatient AMI mortality among Asian Americans. Previous studies have established an association between ambulatory utilization and health outcomes, and our study further supported the association between low healthcare utilization and worse health outcomes, specifically among Asian Americans and coronary artery disease.²³ One limitation of the population-level measure of low ambulatory care utilization is the question of whether low ambulatory care utilization reflects low healthcare utilization associated with good health versus low utilization due to barriers to accessing health care. This was addressed to some degree by examining geographical characteristics, such as region, urban type, provider availability, and distance to nearest hospital and adjusting for these factors in the model.

Low or lack of ambulatory care utilization could potentially result in worse cardiovascular outcomes through several mechanisms. One possibility is that there may exist higher unobserved disease burden and severity among patients from the lack of such diagnoses. Lower ambulatory care utilization is associated with a lower rate of awareness of having a medical diagnosis.²³ Our study showed some evidence of this by finding higher prevalence of some cardiac comorbidities contrary to epidemiologic studies.⁴⁸⁻⁵¹ Low ambulatory care utilization may indirectly reflect patients having difficulty navigating health care, which causes the lower number of healthcare visits.

In our study an increased number of ambulatory clinic visits was not associated with overall AMI mortality. Patients with frequent ambulatory clinic visits probably encompass 2

groups of patients with different healthcare utilization behaviors: 1 group is composed of those with multiple medical conditions, and the other group is composed of people who are healthy but high healthcare utilizers. Having these 2 potentially different groups of patients in the same category can negate the overall significant finding. For example, patients making ambulatory visits may have multiple medical problems and require frequent doctor's visits. On the other hand, patients may be making frequent doctor's visits because they can access and afford the care and want to ensure that they are and remain healthy. Last, ambulatory care utilization may depend on the supply of health services; more supply induces more demand, which can result in more healthcare utilization.^{52,53}

There are several limitations with this study. Given our observational data, a causal relationship cannot be established. The data lack clinical information regarding duration or severity of symptoms, admission vitals, ECG findings, and procedure complications. The data also did not include medications, which would have been helpful in understanding race/ethnicity-specific medical management of AMI and how clinical decisions were made in obtaining invasive cardiac procedures. We also do not have clinical information regarding decisions behind why patients received cardiac procedures; the high cardiac procedure rate among Asians might be due to more advanced or severe cases that require invasive interventions. The higher mortality among Asians admitted for AMI needs further examination, as identifying contributing factors can improve future outcomes. If the high mortality is due to a higher number of comorbidities, future studies should focus on restratifying risk for all AMI patients. However, if the high AMI mortality is a result of procedure-related complications common among Asians, such as high bleeding risk after antiplatelet therapy,⁵⁴⁻⁵⁶ then lower doses of antithrombotic medications should be used.

Conclusions

We found racial/ethnic disparities in ambulatory care utilization, and these disparities were associated with inpatient AMI mortality; more frequent ambulatory care visits and the presence of ambulatory cardiac tests were associated with decreased AMI mortality. Asians had the highest inpatient mortality even after adjustment for sociodemographic, geographical, and clinical characteristics. Our study shows that there is an association between ambulatory cardiac testing and coronary artery disease outcomes but a varying association between the number of ambulatory care utilizations and coronary artery disease outcomes. Future studies are needed to examine the potential benefits of ambulatory

cardiac testing in the prevention of AMI mortality and lowering the risk of hospitalization for AMI. It is also important to understand the causal relationship between ambulatory care utilization and cardiovascular outcomes to improve coronary artery disease outcomes.

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Disclosures

None.

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