

# **SUPPLEMENTAL MATERIAL**

**Table S1. Baseline characteristics of patients and hospitals included and excluded from the analytic sample.**

Variable	Overall N=125,134	Included N=48,993	Excluded N=76,141	P-value	Standardized Difference, %
<b>Demographics</b>					
Age, years*	77 (71 - 83)	77 (71 - 83)	78 (71 - 84)	<.0001	10.9
Sex				0.04	1.2
Female	59,606 (47.6)	23,163 (47.3)	36,443 (47.9)		
Male	65,528 (52.4)	25,830 (52.7)	39,698 (52.1)		
Race				<.0001	
White	95,846 (81.9)	40,573 (82.8)	55,273 (81.2)		4.1
Black	6,699 (5.7)	2,775 (5.7)	3,924 (5.8)		0.4
Hispanic	5,658 (4.8)	2,476 (5.1)	3,182 (4.7)		1.8
Asian	3,806 (3.3)	1,191 (2.4)	2,615 (3.8)		8.1
Other	5,019 (4.3)	1,978 (4.0)	3,041 (4.5)		2.1
Missing, %	8,106 (6.5)	0 (0.0)	8,106 (10.6)		
<b>Cardiac Diagnosis</b>					
Heart failure with CAD	3,909 (3.1)	0 (0.0)	3,909 (5.1)	<.0001	-
Confirmed AMI - non-STEMI	39,010 (31.2)	13,919 (28.4)	25,091 (33.0)		9.9
Confirmed AMI - STEMI	11,584 (9.3)	4,590 (9.4)	6,994 (9.2)		0.6
Confirmed AMI - unspecified	50,251 (40.2)	22,524 (46.0)	27,727 (36.4)		19.5
Other	7,240 (5.8)	0 (0.0)	7,240 (9.5)		-
Peripheral vascular disease	47 (0.0)	0 (0.0)	47 (0.1)		-
Cerebral vascular disease	41 (0.0)	0 (0.0)	41 (0.1)		-
Unstable angina	4,498 (3.6)	2,756 (5.6)	1,742 (2.3)		17.2
Coronary artery disease	8,554 (6.8)	5,204 (10.6)	3,350 (4.4)		23.8
<b>Year</b>					
2009	9,798 (7.8)	3,084 (6.3)	6,714 (8.8)	<.0001	18.5
2008	20,031 (16.0)	6,680 (13.6)	13,351 (17.5)		
2007	19,512 (15.6)	7,270 (14.8)	12,242 (16.1)		
2006	19,131 (15.3)	7,105 (14.5)	12,026 (15.8)		
2005	21,566 (17.2)	9,500 (19.4)	12,066 (15.8)		
2004	18,855 (15.1)	8,076 (16.5)	10,779 (14.2)		
2003	16,241 (13.0)	7,278 (14.9)	8,963 (11.8)		
<b>Medical History</b>					
Atrial fib/atrial flutter	12,096 (13.0)	5,482 (11.7)	6,614 (14.3)	<.0001	7.8

Variable	Overall	Included	Excluded	P-value	Standardized Difference, %
	N=125,134	N=48,993	N=76,141		
COPD or asthma	16,576 (17.8)	7,967 (17.0)	8,609 (18.6)	<.0001	4.3
Diabetes	32,261 (34.7)	15,743 (33.6)	16,518 (35.8)	<.0001	4.6
Hyperlipidemia	44,080 (47.4)	23,065 (49.2)	21,015 (45.5)	<.0001	7.4
Hypertension	68,507 (73.6)	34,850 (74.4)	33,657 (72.9)	<.0001	3.4
Peripheral vascular disease (PVD)	11,297 (12.1)	5,460 (11.6)	5,837 (12.6)	<.0001	3.0
CAD	16,453 (17.7)	8,459 (18.0)	7,994 (17.3)	0.003	1.9
Prior MI	21,517 (23.1)	9,891 (21.1)	11,626 (25.2)	<.0001	9.7
Cerebrovascular accident/transient ischemic attack	11,005 (11.8)	5,255 (11.2)	5,750 (12.4)	<.0001	3.8
Implantable cardioverter defibrillator	538 (0.6)	261 (0.6)	277 (0.6)	0.38	0.6
Heart failure	20,071 (21.6)	8,443 (18.0)	11,628 (25.2)	<.0001	17.5
Anemia	2,875 (3.1)	1,394 (3.0)	1,481 (3.2)	0.04	1.3
Pacemaker - Biventricular/Resync/ cardiac resynchronization therapy	1,476 (1.6)	739 (1.6)	737 (1.6)	0.81	0.2
Dialysis (Chronic)	2,178 (2.3)	911 (1.9)	1,267 (2.7)	<.0001	5.3
Renal insufficiency	12,234 (13.1)	5,411 (11.5)	6,823 (14.8)	<.0001	9.6
Depression	2,258 (2.4)	1,241 (2.6)	1,017 (2.2)	<.0001	2.9
Prior PCI or CABG	3,805 (4.1)	2,186 (4.7)	1,619 (3.5)	<.0001	5.9
Valvular heart disease	518 (0.6)	277 (0.6)	241 (0.5)	0.15	0.9
Med history panel missing, %	32,077 (25.6)	2,121 (4.3)	29,956 (39.3)	<.0001	93.6
Smoking	17,037 (14.0)	7,007 (14.6)	10,030 (13.6)	<.0001	2.7
Missing, %	3,592 (2.9)	957 (2.0)	2,635 (3.5)		
<b>Measures</b>					
Systolic blood pressure, mmHg*	124 (110 - 139)	123 (110 - 138)	124 (110 - 140)	0.0005	3.5
Missing, %	45,025 (36.0)	4,959 (10.1)	40,066 (52.6)		
BMI*	26.6 (23.4 - 30.3)	26.6 (23.5 - 30.4)	26.5 (23.2 - 30.2)	<.0001	3.5
Missing, %	38,423 (30.7)	4,898 (10.0)	33,525 (44.0)		
Ejection fraction*	50 (35 - 59)	50 (38 - 60)	47 (35 - 58)	<.0001	11.2
Missing, %	36,108 (28.9)	12,250 (25.0)	23,858 (31.3)		
Ejection fraction <40% or moderate or severe dysfunction	29,585 (29.2)	10,973 (25.9)	18,612 (31.5)	<.0001	12.2
Missing, %	23,683 (18.9)	6,689 (13.7)	16,994 (22.3)		
<b>In-Hospital Procedures</b>					
No procedure	18,190 (21.9)	6,402 (15.1)	11,788 (29.0)	<.0001	34.2
Cardiac cath/coronary angiography	49,363 (59.4)	28,025 (66.0)	21,338 (52.6)	<.0001	27.6
Cardioversion	317 (0.4)	156 (0.4)	161 (0.4)	0.49	0.5
CABG or cardiac valve surgery	9,291 (11.9)	5,467 (12.9)	3,824 (10.7)	<.0001	9.3
PCI or PCI with stent	37,589 (45.3)	22,056 (52.0)	15,533 (38.3)	<.0001	27.8
Cardiac resynchronization therapy -P	160 (0.2)	88 (0.2)	72 (0.2)	0.84	0.5

Variable	Overall N=125,134	Included N=48,993	Excluded N=76,141	P-value	Standardized Difference, %
or CRT-D					
Implantable cardioverter defibrillator only	275 (0.3)	162 (0.4)	113 (0.3)	0.009	1.8
Dialysis or ultrafiltration, or unspecified	326 (0.4)	135 (0.3)	191 (0.5)	<.0001	3.1
Mechanical ventilation	2,388 (2.9)	1,093 (2.6)	1,295 (3.2)	<.0001	3.7
Right cardiac catheterization	1,022 (1.2)	671 (1.6)	351 (0.9)	<.0001	6.5
Procedure panel missing, %	42,098 (33.6)	6,545 (13.4)	35,553 (46.7)	<.0001	78.1
<b>Hospital Characteristics</b>					
Number of beds*	331 (209 - 504)	342 (226 - 527)	327 (202 - 472)	<.0001	19.2
Missing, %	95 (0.1)	0 (0.0)	95 (0.1)		
Region				<.0001	
West	29,090 (23.2)	8,547 (17.4)	20,543 (27.0)		23.1
South	40,506 (32.4)	17,433 (35.6)	23,073 (30.3)		11.3
Midwest	30,813 (24.6)	13,781 (28.1)	17,032 (22.4)		13.3
Northeast	24,725 (19.8)	9,232 (18.8)	15,493 (20.3)		3.8
Academic hospital	67,783 (54.2)	28,873 (59.0)	38,910 (51.2)	<.0001	15.8
Missing, %	160 (0.1)	47 (0.1)	113 (0.1)		
Rural location	15,259 (12.4)	6,020 (12.5)	9,239 (12.3)	0.35	0.5
Missing, %	1,780 (1.4)	753 (1.5)	1,027 (1.3)		
Primary PTCA performed for AMI	107,293 (87.4)	44,180 (91.3)	63,113 (84.9)	<.0001	20.1
Missing, %	2,412 (1.9)	629 (1.3)	1,783 (2.3)		
Cardiac surgery performed on-site	94,128 (76.9)	39,751 (82.7)	54,377 (73.2)	<.0001	23.1
Missing, %	2,724 (2.2)	914 (1.9)	1,810 (2.4)		
Heart transplants performed at site	13,906 (11.5)	5,541 (11.6)	8,365 (11.4)	0.31	0.6
Missing, %	3,715 (3.0)	1,084 (2.2)	2,631 (3.5)		

\*Continuous variables presented as median (IQR).

BMI- body mass index; COPD- chronic obstructive pulmonary disease; PVD- peripheral vascular disease; CAD- coronary artery disease; MI- myocardial infarction; PCI- percutaneous coronary intervention; CABG- coronary artery bypass grafting; STEMI- ST-elevation myocardial infarction; NSTEMI- Non-ST-elevation myocardial infarction; AMI- acute myocardial infarction; PTCA- percutaneous transluminal coronary angioplasty

**Table S2. The associations between sex, race, and geographic region with 1-year and 3-year all-cause mortality.**

		Deaths	Unadjusted Analysis		Adjusted Analysis	
		N (%)	OR (95% CI)	P value	OR (95% CI)	P value
<b>At 1 Year</b>	Overall	8,432 (17.21)				
<b>Sex</b>						
	Female	4,344 (18.75)	1.14 (1.09, 1.20)	<.0001	0.97 (0.92, 1.03)	0.33
	Male	4,088 (15.83)	Reference		Reference	
<b>Race</b>				0.001		0.004
	Black	558 (20.11)	1.24 (1.12, 1.37)	<.0001	1.31 (1.16, 1.47)	<.0001
	Hispanic	378 (15.27)	0.85 (0.75, 0.96)	0.008	0.92 (0.81, 1.05)	0.21
	Asian	248 (20.82)	0.97 (0.80, 1.16)	0.72	0.91 (0.76, 1.09)	0.29
	Other	359 (18.15)	0.98 (0.83, 1.16)	0.80	0.99 (0.86, 1.14)	0.90
	White	6,889 (16.98)	Reference		Reference	
<b>Region</b>				0.004		0.46
	Midwest	2,246 (16.30)	0.65 (0.52, 0.82)	0.0003	0.93 (0.81, 1.06)	0.25
	South	2,917 (16.73)	0.69 (0.56, 0.84)	0.0002	0.91 (0.80, 1.03)	0.13
	West	1,422 (16.64)	0.67 (0.53, 0.86)	0.001	0.91 (0.79, 1.05)	0.17
	Northeast	1,847 (20.01)	Reference		Reference	
<b>At 3 Years</b>	Overall	15,857 (32.37)				
<b>Sex</b>						
	Female	8,150 (35.19)	1.19 (1.14, 1.23)	<.0001	0.98 (0.94, 1.03)	0.41
	Male	7,707 (29.84)	Reference		Reference	
<b>Race</b>				0.0001		0.0001
	Black	1,056 (38.05)	1.31 (1.19, 1.44)	<.0001	1.36 (1.23, 1.50)	<.0001
	Hispanic	730 (29.48)	0.91 (0.85, 0.99)	0.02	0.96 (0.89, 1.04)	0.30
	Asian	456 (38.29)	0.95 (0.84, 1.08)	0.45	0.91 (0.79, 1.06)	0.21
	Other	656 (33.16)	0.95 (0.80, 1.13)	0.55	0.97 (0.84, 1.13)	0.73
	White	12,959 (31.94)	Reference		Reference	
<b>Region</b>				0.008		0.20
	Midwest	4,333 (31.44)	0.70 (0.55, 0.88)	0.002	0.99 (0.87, 1.13)	0.88
	South	5,535 (31.75)	0.72 (0.58, 0.89)	0.002	0.94 (0.84, 1.06)	0.32

West	2,646 (30.96)	0.65 (0.51, 0.84)	0.0007	0.87 (0.75, 1.00)	0.05
Northeast	3,343 (36.21)	Reference		Reference	

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Adjusted for patients sociodemographic and lifestyles information (age, calendar year, BMI, smoking status), patients' medical history (atrial fibrillation/atrial flutter, COPD or asthma, diabetes, hyperlipidemia, hypertension, peripheral vascular disease (PVD), CAD, prior MI, cerebrovascular accident/transient ischemic attack, implantable cardioverter defibrillator, heart failure, anemia, pacemaker - biventricular/resync/ cardiac resynchronization therapy, dialysis (chronic), renal insufficiency, depression, prior PCI or CABG, valvular heart disease, systolic blood pressure at discharge, ejection fraction <40% or moderate or severe dysfunction), cardiac diagnosis (STEMI, NSTEMI, AMI unspecified, unstable angina, CAD), and hospital characteristics (geographic region, rural location, teaching status, number of beds, Primary PTCA, cardiac surgery, heart transplants site), patients' insurance status (Medicaid, Medicare, other, No insurance/Undetermined/Missing), medication use prior to hospital admission (ACE inhibitors, beta-blocker, aspirin, lipid-lowering agents), medication use at hospital discharge (ACE inhibitors, beta-blocker, aspirin, lipid-lowering agents), and the GWTG-CAD quality of care composite performance score.

BMI- body mass index; COPD- chronic obstructive pulmonary disease; PVD- peripheral vascular disease; CAD- coronary artery disease; MI- myocardial infarction; PCI- percutaneous coronary intervention; CABG- coronary artery bypass grafting; STEMI- ST-elevation myocardial infarction; NSTEMI- Non-ST-elevation myocardial infarction; AMI- acute myocardial infarction; PTCA- percutaneous transluminal coronary angioplasty

**Table S3. Mediation analysis by cardiac rehabilitation referral.**

Exposures	Cardiac Rehabilitation Referral	Natural Direct Effect		Natural Indirect Effect		Total Effect	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
<b>1 Year Mortality</b>							
<b>Sex</b>							
Female vs Male	Yes	0.93 (0.87, 0.99)	0.01	1.01 (1.01, 1.02)	<.0001	0.94 (0.89, 1.00)	0.05
	No	Reference		Reference		Reference	
<b>Race</b>							
Black vs White	Yes	1.20 (1.07, 1.34)	0.001	1.01 (1.00, 1.03)	0.0096	1.22 (1.09, 1.37)	0.0006
	No	Reference		Reference		Reference	
Hispanic vs White	Yes	0.81 (0.71, 0.93)	0.002	1.06 (1.04, 1.09)	<.0001	0.86 (0.75, 0.99)	0.03
	No	Reference		Reference		Reference	
Asian vs White	Yes	0.76 (0.62, 0.95)	0.01	1.10 (1.04, 1.17)	0.0019	0.84 (0.69, 1.02)	0.08
	No	Reference		Reference		Reference	
Other vs White	Yes	0.97 (0.83, 1.12)	0.63	1.01 (1.00, 1.03)	0.0749	0.98 (0.85, 1.13)	0.76
	No	Reference		Reference		Reference	
<b>3 Year Mortality</b>							
<b>Sex</b>							
Women vs Men	Yes	0.94 (0.89, 0.98)	0.003	1.01 (1.01, 1.02)	<.0001	0.95 (0.91, 0.99)	0.02
	No	Reference		Reference		Reference	
<b>Race</b>							
Black vs White	Yes	1.25 (1.13, 1.37)	<.0001	1.01 (1.00, 1.02)	0.0037	1.26 (1.14, 1.40)	<.0001
	No	Reference		Reference		Reference	
Hispanic vs White	Yes	0.84 (0.76, 0.93)	0.0006	1.04 (1.02, 1.07)	0.0002	0.88 (0.79, 0.98)	0.01
	No	Reference		Reference		Reference	
Asian vs White	Yes	0.83 (0.69, 1.00)	0.05	1.06 (1.02, 1.11)	0.0024	0.89 (0.75, 1.06)	0.18
	No	Reference		Reference		Reference	
Other vs White	Yes	0.94 (0.82, 1.09)	0.41	1.02 (1.00, 1.04)	0.0093	0.96 (0.83, 1.11)	0.58
	No	Reference		Reference		Reference	

Adjusted for patients sociodemographic and lifestyles information (age, calendar year, BMI, smoking status), patients' medical history (atrial fibrillation/atrial flutter, COPD or asthma, diabetes, hyperlipidemia, hypertension, peripheral vascular disease (PVD), CAD, prior MI, cerebrovascular accident/transient ischemic attack, implantable cardioverter defibrillator, heart failure, anemia, pacemaker - biventricular/resync/ cardiac resynchronization therapy, dialysis (chronic), renal insufficiency, depression, prior PCI or CABG, valvular heart disease, systolic blood pressure at discharge, ejection fraction <40% or moderate or severe dysfunction), cardiac diagnosis (STEMI, NSTEMI, AMI unspecified, unstable angina, CAD), and hospital characteristics (geographic region, rural location, teaching status, number of beds, Primary PTCA, cardiac surgery, heart transplants site), patients' insurance status (Medicaid, Medicare, other, No insurance/Undetermined/Missing), medication use prior to hospital admission (ACE inhibitors, beta-blocker, aspirin, lipid-lowering agents), medication use at hospital discharge (ACE inhibitors, beta-blocker, aspirin, lipid-lowering agents), and the GWTG-CAD quality of care composite performance score.