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Unmet Nursing Care Linked to Rehospitalizations Among Older Black AMI Patients: A Cross-Sectional Study of U.S. Hospitals

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Abstract

Background—Recent studies suggest that nurses may be unable to complete all aspects of necessary care due to a lack of time. Research is needed to determine whether unmet nursing care contributes to disparities in readmissions for vulnerable populations.

Objectives—To examine differences in the relationship between nursing care left undone and acute myocardial infarction (AMI) readmissions among older Black patients compared to older White patients.

Research Design—Cross-sectional analysis of multiple datasets, including: 2006–2007 administrative discharge data, a survey of registered nurses, and the American Hospital Association Annual Survey. Risk-adjusted logistic regression models were used to estimate the association between care left undone and 30-day readmission. Interactions were used to examine the moderating effect of care left undone on readmission by race.

Results—The sample included 69,065 patients in 253 hospitals in California, New Jersey, and Pennsylvania. Older Black patients were 18% more likely to experience a readmission after adjusting for patient and hospital characteristics and more likely to be in hospitals where nursing care was often left undone. Black patients were more likely to be readmitted when nurses were unable to talk/comfort patients (OR 1.09; 95% CI 1.01–1.19), complete documentation (OR 1.16; 95% CI 1.01–1.32), or administer medications in a timely manner (OR 1.26; 95% CI 1.09–1.46).

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Conclusions—Unmet nursing care is associated with readmissions for older Black patients following AMI. Investment in nursing resources to improve the delivery of nursing care may decrease disparities in readmission.

Keywords

Readmission; disparities; acute myocardial infarction; tasks left undone

INTRODUCTION

Hospital readmissions following acute myocardial infarction (AMI) represent a significant burden to older patients and a substantial cost to healthcare systems. Nearly one-fifth of all Medicare beneficiaries are rehospitalized within 30 days of discharge, while another third are readmitted within 90 days.¹ Strategies to reduce AMI readmissions for older adults have included a range of interventions, such as transitional care, chronic disease management, or the use of health coaches for select populations.^{2–5} While these interventions have proven effective in some instances, they require the hiring of additional healthcare personnel, are costly to implement, and have shown mixed results.^{4–6} Surprisingly, few studies have described if these interventions are generalizable to diverse communities at increased risk for readmissions or if healthcare systems are making full use of healthcare providers already on hand—in particular their direct care nursing staff.

This study examined the incidence of AMI readmissions and sought to determine if differences in 30-day rehospitalizations among older Black and White patients were a result of individual-level factors (e.g., medical comorbidities, SES) or hospital-level influences, such as the quality of nursing care. Older Black AMI patients are 13% more likely than older Whites to be readmitted to a hospital within 30 days of discharge,⁷ which places them at higher risk for later physical deconditioning, functional decline, and increased need for skilled nursing once returning to community settings.^{8,9} While readmission disparities are in part related to limitations in post-discharge access to specialists or gaps in care continuity,^{10,11} a growing body of research suggests that there may be opportunities to prevent readmissions through improvements in nursing care services during the acute hospitalization.¹²

For example, McHugh and colleagues found that care in hospitals characterized by good work environments was associated with odds of readmission that were 7% lower for heart failure patients.¹³ Similarly, Weiss and colleagues found that the odds of readmissions decreased significantly in the presence of higher nurse staffing.¹⁴ While the link between readmissions and traditional *structural* characteristics of health care organizations (i.e., staffing) is clear, few studies have focused on nursing care *processes*, raising questions about how the delivery of nursing care influences outcomes among older minorities.. Hospital nursing care after AMI is complex, requiring patient education, timely medication administration, vigilant monitoring, and emotional support to prevent future complications. If essential nursing care following AMI is omitted or delayed more frequently in hospitals where older minorities receive care, it is plausible that this may contribute to readmission disparities.

Our interest in examining variations in clinical processes that might result in disparities led us to examine the impact of unmet nursing care on readmissions among older Black patients. The concept of unmet nursing care, or “tasks left undone” is defined as nursing tasks left incomplete due to a lack of time.¹⁵ Unmet nursing care has been linked to settings with high nurse workloads, inadequate resources, ineffective communication between clinicians, and limited clinical autonomy.^{15–19} Over the past decade, researchers in both national and international contexts have demonstrated that unmet care may result in adverse outcomes, including medication errors, falls, infections, readmissions, and decreased patient satisfaction.^{15,20,21} Older minority patients may be more vulnerable to the effects of unmet nursing care due to higher rates of medical comorbidities, lower health literacy, and (in some instances) limited English proficiency.^{22–24}

We examined the association between unmet nursing care and readmissions among older Black AMI patients through the use of survey responses of over 14,000 nurses collected across three states (California, New Jersey, and Pennsylvania). Our study’s conceptual framework builds on the Process of Care and Outcomes Model (PCOM), which incorporates elements of Donabedian’s structure-process-outcomes model, and proposes a direct relationship between the care environment, patient factors, unmet nursing care, and outcomes.^{20,25} The PCOM also suggests that outcomes and unmet nursing care may be influenced by both structural (e.g., staffing, work environment) and patient factors (e.g., SES, comorbidity; see Figure 1, Supplemental Digital Content).

Our framework allows us to:

1. determine the prevalence of unmet nursing care in hospitals where older Black AMI patients receive care, and
2. examine differences in the association between unmet nursing care and readmissions for older Black patients compared to older White patients.

Beginning in fiscal year 2013, the Centers for Medicare & Medicaid Services (CMS) enacted the Hospital Readmissions Reduction Program to improve care quality by decreasing payments to acute care hospitals with excess preventable readmissions for specific conditions, including AMI.²⁶ Hospitals with large concentrations of older Black patients face a disproportionate risk of penalties.²⁷ Results of our study provide actionable steps for healthcare systems seeking clinical solutions to reduce readmissions in this population.

METHODS

Design and Sample

This cross-sectional analysis used 2006–2007 data sources: administrative discharge records, the Multi-State Nursing Care and Patient Safety Study of Registered Nurses (RNs), and the American Hospital Association (AHA) Annual Survey. The sample included 69,065 older adult patients admitted for AMI in 253 acute care nonfederal hospitals in three states (California, New Jersey, and Pennsylvania). The sample included 14,879 RNs working as staff nurses in the study hospitals.

Patients—Patients included in this study were 65–90 years old and had a principal diagnosis of AMI. Patient data including demographics and hospitalizations were obtained from state administrative databases: California’s Office of Statewide Health Planning and Development, the New Jersey Department of Health and Senior Services, and the Pennsylvania Health Care Cost Containment Council. Only patients identified as either White or Black were included in the analysis. A measure of patient socioeconomic status was obtained by merging the zip codes of patients’ residences with U.S. Census data to calculate a neighborhood socioeconomic index measure.^{28,29} Patients were excluded from the study if they: (1) left the hospital against medical advice, (2) died during the hospitalization, (3) were discharged to another hospital, or (4) were discharged the same or next day following the admission.³⁰

Nurses—The Multi-State Nursing Care and Patient Safety Study provided information about nurse demographics, staffing, work environment, and the care provided to patients on the nurse respondent’s last shift. Nurses provided the name of their hospital employer, which enabled us to link the nurse responses with patient outcomes and hospital characteristics. The nurse database was created from a random sampling of 40% of all RNs in California and Pennsylvania and 50% of all RNs in New Jersey. Details about the survey methodology are elaborated elsewhere.³¹ Among the 253 study hospitals, the average number of nurse survey respondents was 59, ranging from 10–282.

Hospitals—Hospitals were included in this study if they were: (1) adult nonfederal acute care hospitals; (2) had 50 or more AMI discharges during the study period; (3) had 10 or more nurse survey respondents; and (4) participated in the 2006 AHA survey. The AHA survey provided data on hospital characteristics such as the number of beds, teaching status, and technology capacity.

Measures

Outcome Variable—The outcome of interest was all-cause readmission within 30 days of discharge following an index admission for a principal diagnosis of AMI. The index admission was defined using the CMS Risk-Standardized Readmission Measure.³⁰ Even when the discharging hospital differed from the readmitting hospital, we were able to identify readmissions if patients were readmitted to a hospital included in our sample.

Explanatory Variables—Explanatory variables included a patient-level indicator of race and a hospital-level measure of nursing tasks left undone. The nurse survey asked respondents to report which (if any) of 10 common nursing care tasks were necessary but left incomplete on their last shift due to a lack of time. The nursing care tasks were developed and overlapped with items from two validated instruments which assessed provider perceptions of care quality: Schwirian’s Six-Dimension Scale of Nursing Performance and the Slater Nursing Competencies Rating Scale.^{15,32,33} The nursing care tasks included: pain management, providing treatments and procedures, coordinating care, administering medication on time, preparing patients/families for discharge, patient surveillance, documenting care, teaching/counseling, developing/updating care plans, and talking to and comforting patients. Nurse reports of tasks left undone were aggregated to

create a hospital-level mean for each nursing care activity. Hospitals were classified as “rarely” leaving tasks undone if in the bottom 25th percentile, “sometimes” if in the middle 50th percentile or “frequently” if in the top 25th percentile.

Potentially Confounding Variables—Potentially confounding variables were adjusted for in the analyses and included both patient- and hospital-level variables. Patient-level variables included age, sex, comorbidities, SES, race, and discharge destination. Discharge destination included: home with or without home care, skilled nursing facility, short-term hospital, intermediate care, and other facility.

Hospital-level variables included structural characteristics and were derived from the AHA and nurse surveys. Hospital size was defined by the number of beds and categorized as small (< 100), medium (101–250), and large (>250). Teaching status was defined by the ratio of medical trainees to beds and categorized as major (> 1:4), minor (< 1:4), and non-teaching (no medical trainees). Technology status was categorized as high if the hospital was able to perform open heart surgery and/or major organ transplantation. Hospital ownership type was categorized as government non-federal, not-for-profit, or for-profit. A U.S. Census measure of population density was used to categorize hospital location as either urban (> 50,000) or rural (< 50,000). Models also controlled for state indicator variables, the volume of AMI patients per hospital, and the minority-serving status of the hospital, defined by hospitals in the highest decile of the proportion of Black patients.^{7,13}

The nurse work environment was measured using the Practice Environment Scale of the Nursing Work Index (PES-NWI), a National Quality Forum-endorsed measure included in the nurse survey.³⁴ The PES-NWI is a 31-item instrument composed of 5 subscales: staffing and resource adequacy; nurse participation in hospital affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; and collegial nurse-physician relations.³⁴ Nurse reports of each subscale were aggregated to the hospital-level to create a median hospital-level value of each subscale. The nurse work environment was then categorized as poor (0–1 subscales), mixed (2–3 subscales), or good (4–5 subscales), depending on how many of the 5 subscales exceeded the median.

Nurse staffing ratios were derived from the nurse survey. The number of patients on the unit was divided by the number of RNs on the unit during the last shift and then aggregated to create a hospital-level measure of nurse staffing.

Analysis

Characteristics of the study patient population were described using analysis of variance and *t* tests. Hospital characteristics were described at the hospital and patient level by race. The distribution of older Black and White patients was evaluated by the hospital-level frequency of each nursing task left undone. Analysis of variance was used to test for differences in the distribution of patients across hospitals with varying levels of nursing tasks left undone.

To examine the association between race and readmission, multiple logistic regression was used, accounting for clustering of patients in hospitals using robust standard errors. To examine the association between care left undone and readmission, each nursing care task

was scaled by a factor of 10. This allowed us to interpret coefficient effects on the odds of readmission as a 10-percentage-point increase in the number of nurses who reported leaving the task undone. Our sample of Blacks aged 65 and older (6.1%) is slightly lower than national estimates (8.1%).³⁵ This did not however, affect our ability to estimate the effect of care left undone on the odds of being readmitted as odds ratios are unaffected by the relative sample distribution of Blacks and Whites.³⁶

RESULTS

Characteristics of 69,065 AMI patients are described in Table 1. Nearly 94% of the sample racially identified as White, the other 6% identified as Black. On average, Black patients were younger, had lower SES, and had more comorbidities. Black patients in the sample were readmitted significantly more than White patients (23.5% vs. 18.8%). Black and White patients were readmitted for similar reasons, including heart failure, AMI, and coronary atherosclerosis (see Table 1, Supplemental Digital Content).

The distributions of the study sample by hospital characteristics are described in Table 2. Among the 253 study hospitals, 230 (90.6%) were located in urban regions. Older Black patients were more likely to be admitted to large, urban, high-technology, major teaching hospitals. Black patients were more often cared for in for-profit hospitals (8.8% vs. 5.9%) and less often cared for in not-for-profit hospitals (87.9% vs. 89.6%).

Nearly half (47.8%) of the hospitals in the sample were characterized as having a poor nurse work environment. Compared with older White patients, older Black patients were more often admitted to hospitals with a poor work environment (51.4% vs. 44.4%) and less often to hospitals with a good work environment (21.4% vs. 28.1%). Older Black patients were more often admitted to better-staffed hospitals (19.7%) compared with their older White counterparts (16.9%). In general, older Black patients were more often in hospitals that often left care undone and less often in the hospitals that rarely left care undone (Table 3). Older Black patients were significantly more likely than older White patients to be admitted to hospitals where teaching (33.18% vs 24.72%), documenting (23.74% vs 32.97%), surveillance (30.26% vs 25.13%), discharge preparation (30.36% vs 24.49%), treatments/procedures (36.18% vs 24.71%), and pain management (37.14% vs 25.41%) were more often left undone (the top quartile). Hospital-level distributions of nursing care tasks left undone available in Figure 2, Supplemental Digital Content.

Models in Table 4 demonstrate the effects of race on the odds of readmission, accounting for patient (age, sex, comorbidities, patient SES, and discharge destination) and hospital characteristics (bed size, teaching status, technology status, ownership type, geographic location, state indicator variables, minority-serving status, volume of AMI patients, practice environment, and nurse staffing). After adjusting for patient and hospital characteristics, Black patients had a 16% higher likelihood of readmission 30 days after an index admission for AMI, compared with their White counterparts (OR 1.16, 95% CI 1.06–1.27; Table 4).

The effect of each care task left undone on readmission is described in Table 5. Model 1 describes the unadjusted effect of each 10-percentage-point increase in the number of nurses

who reported leaving a task undone on the odds of readmission for all patients. After controlling for hospital and patient characteristics (Model 2), only omitted care planning (OR 1.02, 95% CI 1.00–1.05) was associated with higher odds of readmission. Model 3 includes the addition of an interaction term and describes the differential effect of unmet nursing care on patients by race. The odds of readmission increased when older Black patients experienced unmet nursing care: specifically, when nurses omitted comforting and talking with patients (OR 1.09, 95% CI 1.00–1.19), documenting care (OR 1.16, 95% CI 1.01–1.32), or administering medications in a timely manner (OR 1.26, 95% CI 1.09–1.46). Nursing care that was left undone had no significant effect on the likelihood of readmission for older White patients.

DISCUSSION

A number of studies have highlighted the presence of racial/ethnic differences in AMI readmissions; none to our knowledge have examined the relationship between these differences and unmet nursing care. Nurses play a critical role in the care of post AMI patients and are responsible for the facilitation of a range of interventions, including health education, administration of new drug therapies, and ensuring a clear management plan is sent to the general practitioner.³⁷ Despite their role, nurses increasingly report an inability to complete all necessary care due to time scarcity, with some studies suggesting that nurses spend only 20–30% of their time in direct patient care, attending instead to non-clinical administrative demands.³⁸ Our findings suggest that older Black AMI patients endure greater consequences when nursing tasks are left undone. Specifically, we noted several types of unmet care activities, including interpersonal (talking/comforting) and clinical nursing care (documentation and timely medication administration) that may lead to disproportionate rates of readmissions.

Recent studies suggest that increasing the number of staff nurses may reduce avoidable rehospitalizations.^{13, 14} This recommendation may not be immediately feasible, however, for all institutions due to financial constraints. Our findings of a relationship between unmet nursing care and readmissions, even after accounting for staffing and the work environment, suggest that an additional opportunity to reduce readmission disparities may lie in improving the care delivery process and confirms the theoretical link between unmet care and outcomes outlined in the PCOM.²⁰

Our results are timely in light of efforts to improve care transitions from hospitals to outpatient settings. Hospital readmissions often represent a symptom of poorly executed care transitions, characterized by conflicting information regarding disease management, confusing medication regimens, and a lack of follow-up care.^{2,3} During an inpatient admission, the average AMI patient receives up to four new medications, in addition to smoking cessation counseling, weight management, nutritional advisement, and the initiation of cardiac rehabilitation.³⁷ Vulnerable populations may have lower health literacy and experience higher levels of frustration when attempting to understand complex medical regimens.³⁹ Adequate communication and psychosocial support from nurses during the acute care admission is a prerequisite for effectively introducing new therapies to vulnerable populations. Our findings suggest that insufficient nurse communication may result in a

higher likelihood of readmissions for older Blacks and are consistent with the work of Mitchell, who found an association between the quality of nurse communication and readmissions.⁴⁰ Our study extends these findings and notes that insufficient nurse communication coupled with an inability to provide emotional support may be particularly concerning for Black patients who in prior studies have noted considerable mistrust of hospitals and fewer reports of quality interactions with healthcare providers.^{41, 42}

Our sample of older Black patients was on average younger, yet had more comorbidities and were more likely to be of lower socioeconomic status. Lower socioeconomic position may present barriers for accessing primary care providers and specialists or procuring necessary medications.⁴³ These patient determinants represent risk factors for readmissions that should be accounted for when developing patient-centered approaches for care management and must be documented in the health record.⁴⁴ It has long been recognized that thorough documentation promotes effective communication between staff. Despite this, studies suggest more than a quarter of nurses report inadequate time to document care.^{12,19} A recent systematic review found nursing documentation often excluded important elements such as psychosocial issues, patient preferences, and previous health behaviors.⁴⁵ Documentation which omits the full range of determinants affecting older Black patients may lead to errors in decision making resulting in care planning that fails to reflect the health beliefs and needs of this population.

Many of the nursing care activities in this study were not found to be significant predictors of readmission disparities. Intuitively, we expected that unmet care activities such as discharge planning and patient education would predict readmissions among Black patients. Yet, we failed to detect such an association, and findings from other studies have been mixed.⁴⁶ Surprisingly, timely medication administration, often regarded as a medication error, represented the unmet care need that had the strongest association with readmission disparities. Medication administration and management is a core activity of post-AMI care and includes rapid reperfusion through percutaneous coronary intervention [PCI], or fibrinolysis, and medical therapies (e.g., beta blockers, aspirin, nitrates, anticoagulants, analgesics).³⁷ Failure to administer medications in a timely manner has been linked to adverse outcomes such as mortality.⁴⁷ Recent work by Lambert and colleagues⁴⁸ found higher odds of readmissions for AMI among patients with delays in fibrinolytic therapy. For older Black patients (who are more often clinically complex) delays in time-critical medications may lead to post-discharge complications requiring readmissions. While there are well-documented disparities in time to cardiac reperfusion for older minorities,⁴⁹ to our knowledge no studies have examined the association between medication delays and readmissions disparities, hence, further studies examining such associations are warranted.

Several limitations should be noted when considering our findings. This study was cross-sectional, limiting our ability to make causal inferences. Furthermore, there are potential interpretive difficulties with aggregate data and a possibility of ecological bias. It is possible that the readmitted patients in our sample are not the same patients for whom nursing care was missed. In a large multihospital design, using aggregate data from nurse survey respondents, it is not feasible to link individual nurses to the patients they cared for. Nurses may have also, over- or under-reported care tasks left undone, but research supports the

accuracy of nurse reports of hospital care quality.⁵⁰ Although our survey data include many nursing care activities, there may be additional aspects of nursing care not captured in the survey that influence readmissions for older Black patients following AMI. Our study data are limited to only three states and do not include hospitals from the Deep South, where there is a larger population of Black patients. We acknowledge that our results, drawn from 2006–2007 data, may raise questions about the relevance of our findings due to the introduction of policies to reduce readmissions in 2010. Current evidence, however, suggests that the financial penalties currently levied against hospital systems comprise only a small portion of the base CMS reimbursements and that penalties are, as yet, too small to incentivize immediate practice changes.⁵¹ Furthermore, despite the data limitations, there are no other sources that would allow us to link the process of nursing care across hundreds of hospitals, with minority health outcomes among tens of thousands of patients. Other studies at best can use AHA staffing data only; hence, our study offers an important and unique contribution. We note that our study is the first to draw conclusions regarding unmet nursing care and readmission disparities, and further research with more recent data is required to substantiate our findings.

Patients with AMI require complete and thorough nursing care to successfully transition from the hospital to home. Our findings suggest that unmet nursing care varies widely across U.S. hospitals and that older Blacks may be disproportionately in settings where care is missed more often. As the nation continues to intensify efforts to reduce health disparities, solutions may lie in ensuring adequate resources that to nurses working in direct care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Acute myocardial infarction patient characteristics by race, N = 69,065

Patient Characteristics	White n = 64,822		Black n = 4,243		p value
	N	%	N	%	
Readmission within 30 days	12,159	18.76	996	23.47	<0.001
Age (y), mean (SD)	79.22	7.87	77.06	7.93	<0.001
Female	32,441	50.05	2,493	58.76	<0.001
Socioeconomic status, mean (SD)					
Low	6,256	9.85	1,659	39.54	<0.001
Medium low	29,680	46.72	1,727	41.16	<0.001
Medium high	16,836	26.50	511	12.18	<0.001
High	10,752	16.93	299	7.13	<0.001
Discharge destination					
Home	28,168	43.45	1,735	40.89	0.001
Home with home health care	10,168	15.69	833	19.63	<0.001
Short-term hospital	10,356	15.98	603	14.21	0.002
Skilled nursing facility	8,336	12.86	603	14.21	0.011
Other facility	7,624	11.76	458	10.79	0.058
Intermediate care	170	0.26	11	0.26	0.970
Number of comorbidities, mean (SD)	1.99	1.33	2.44	1.40	<0.001
5 most common comorbidities					
Hypertension	40,081	61.83	3,117	73.46	<0.001
Diabetes, uncomplicated	15,208	23.46	1,327	31.28	<0.001
Chronic pulmonary disease	15,115	23.32	956	22.53	0.240
Renal failure	9,798	15.12	1,118	26.35	<0.001
Peripheral vascular disorders	6,962	10.74	522	12.30	0.002

Note. p values are generated from analysis of variance and t tests and represent the comparison of patients.

Table 2

The distribution of the study sample by hospital and nursing characteristics

Characteristic	Hospitals <i>N</i> = 253		Patients				<i>p</i> value
			White <i>N</i> = 64,822		Black <i>N</i> = 4,243		
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Hospital characteristic							
State							
California	107	42.29	26,497	40.88	1,836	43.27	<0.001
New Jersey	45	17.79	11,294	17.42	927	21.85	
Pennsylvania	101	39.92	27,031	41.70	1,480	34.88	
Region							
Urban	230	90.55	60,368	92.65	4,046	94.53	<0.001
Rural	24	9.45	4,788	7.35	234	5.47	
Ownership							
For profit	22	8.70	3,851	5.94	374	8.81	<0.001
Not-for-profit	220	86.96	58,109	89.64	3,728	87.86	<0.001
Government, nonfederal	11	4.35	2,862	4.42	141	3.32	0.001
High technology	126	49.80	40,641	62.70	2,864	67.50	<0.001
Hospital size							
Small	11	4.35	1,925	2.97	36	0.85	<0.001
Medium	120	47.43	23,007	35.49	989	23.31	
Large	122	48.22	39,890	61.54	3,218	75.84	
Teaching status							
Non-teaching	117	46.25	29,421	45.39	1,146	27.01	<0.001
Minor teaching	110	43.48	26,934	41.55	1,992	46.95	
Major teaching	26	10.28	8,467	13.06	1,105	26.04	
Nursing characteristic							
Work environment							
Poor	121	47.83	28,763	44.37	2,179	51.36	<0.001
Mixed	66	26.09	17,858	27.55	1,157	27.27	

Characteristic	Hospitals <i>N</i> = 253				Patients				<i>p</i> value
					White <i>N</i> = 64,822		Black <i>N</i> = 4,243		
	<i>N</i>	%			<i>N</i>	%	<i>N</i>	%	
Good	66	26.09			18,201	28.08	907	21.38	
Nurse staffing (patients/nurse)									
<4	42	16.54			11,001	16.88	841	19.65	<0.001
4–<5	95	37.4			25,570	39.24	1,822	42.57	
5–<6	72	28.35			18,489	28.38	1,188	27.76	
6–<7	35	13.78			8,097	12.43	351	8.20	
7 or more	10	3.94			1,999	3.07	78	1.82	

Source: Author's analysis. *Note:* Percentages may not sum to 100% due to rounding. *p* values generated from analysis of variance and *t* tests and represent the comparison of patients.

Table 3

The distribution of patients by hospital quartiles of nursing care tasks left undone, by race

Nursing care tasks left undone	Patients				p value	
	White N = 64,822		Black N = 4,243			
	N	%	N	%		
Comforting and Talking	Rarely	16,503	25.46	871	20.53	<0.001
	Sometimes	31,855	49.14	2,310	54.44	
	Frequently	16,464	25.40	1,062	25.03	
Care Planning	Rarely	16,388	25.28	882	20.79	<0.001
	Sometimes	32,907	50.77	2,311	54.47	
	Frequently	15,527	23.95	1,050	24.75	
Teaching and Counseling	Rarely	14,538	22.43	694	16.36	<0.001
	Sometimes	34,263	52.86	2,141	50.46	
	Frequently	16,021	24.72	1,408	33.18	
Documenting	Rarely	17,266	26.64	675	15.91	<0.001
	Sometimes	32,167	49.62	2,169	51.12	
	Frequently	15,389	23.74	1,399	32.97	
Surveillance	Rarely	15,656	24.15	863	20.34	<0.001
	Sometimes	32,874	50.71	2,096	49.40	
	Frequently	16,292	25.13	1,284	30.26	
Discharge Preparation	Rarely	16,583	25.58	748	17.63	<0.001
	Sometimes	32,362	49.92	2,207	52.02	
	Frequently	15,877	24.49	1,288	30.36	
Timely Medications	Rarely	16,303	28.15	847	19.96	<0.001

Nursing care tasks left undone	Patients				<i>p</i> value
	White <i>N</i> = 64,822		Black <i>N</i> = 4,243		
	N	%	N	%	
Sometimes	31,931	49.26	2,254	53.12	
Frequently	16,588	25.59	1,142	26.91	
Care Coordination					
Rarely	16,963	26.17	724	17.06	
Sometimes	31,537	48.65	2,616	61.65	<0.001
Frequently	16,322	25.18	903	21.28	
Treatments and Procedures					
Rarely	16,420	25.33	574	13.53	
Sometimes	32,383	49.96	2,134	50.29	<0.001
Frequently	16,019	24.71	1,535	36.18	
Pain Management					
Rarely	16,279	25.11	915	21.56	
Sometimes	32,071	49.48	1,752	41.29	<0.001
Frequently	16,472	25.41	1,576	37.14	

Source: Author's analysis. *Note.* Hospitals were classified as "rarely," leaving tasks undone if in the bottom 25th percentile, "sometimes" if in the middle 50th percentile or "frequently" if in the top 25th percentile. Percentages may not sum to 100% due to rounding. *p* values generated from analysis of variance represent the comparison of patients. Hospital-level distributions of nursing care tasks left undone available in Figure 2, Supplemental Digital Content.

Table 4

The odds of readmission by race, before and after adjusting for patient and hospital characteristics

	Model 1 Unadjusted	Model 2 Patient Characteristics	Model 3 Hospital and Patient Characteristics
Black	1.33 ^{***} (1.22–1.45)	1.21 ^{***} (1.10–1.33)	1.16 ^{**} (1.06–1.27)

Note.

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

Model 1: unadjusted; Model 2: age, sex, comorbidities, patient socioeconomic status, and discharge destination; Model 3: (same as Model 2), state indicator variables, geographic location, ownership type, technology status, teaching status, bed size, minority-serving status, volume of AMI patients, practice environment, and nurse staffing.

Table 5

Effect of a 10% increase in nursing care left undone on odds of readmission, independently and by race

Odds of Readmission	Model 1 Unadjusted	Model 2 Hospital and Patient Characteristics	Model 3 Interaction of Race and Missed Nursing Care Task	
			White	Black
Comfort/Talking	1.04 * (1.00–1.07)	1.00 (0.97–1.04)	1.00 (0.96–1.03)	1.09 * (1.00–1.19)
Care Planning	1.05 *** (1.02–1.07)	1.02 * (1.00–1.05)	1.02 (1.00–1.04)	1.02 (0.95–1.10)
Teaching/Counseling	1.05 *** (1.02–1.09)	1.01 (0.98–1.04)	1.01 (0.98–1.04)	1.04 (0.96–1.13)
Documenting	1.05 * (1.00–1.09)	1.00 (0.97–1.27)	1.00 (0.96–1.03)	1.16 * (1.01–1.32)
Surveillance	1.05 ** (1.01–1.09)	1.02 (0.98–1.05)	1.01 (0.97–1.05)	1.09 (0.99–1.20)
Discharge Preparation	1.02 (0.97–1.07)	1.00 (0.96–1.04)	0.99 (0.95–1.04)	1.04 (0.88–1.24)
Timely Medications	1.04 (0.97–1.10)	1.00 (0.95–1.06)	0.99 (0.94–1.04)	1.26 ** (1.09–1.46)
Care Coordination	1.09 ** (1.02–1.17)	1.03 (0.97–1.10)	1.03 (0.96–1.10)	1.14 (0.91–1.42)
Treatments/Procedures	1.10 (1.00–1.22)	1.09 (0.99–1.19)	1.08 (0.99–1.19)	1.05 (0.78–1.40)
Pain Management	1.04 (0.94–1.14)	0.97 (0.89–1.07)	0.97 (0.89–1.06)	1.01 (0.77–1.33)

Note.

* $p < 0.05$;** $p < 0.01$;*** $p < 0.001$.

Model 1: unadjusted; Model 2: age, sex, comorbidities, patient socioeconomic status, race, discharge destination, state indicator variables, geographic location, ownership type, technology status, teaching status, bed size, minority-serving status, volume of AMI patients, practice environment, and nurse staffing; Model 3: (same as Model 2) interacts race and missed nursing care task.