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Post-Acute Care Services Received by Older Adults Following a Cardiac Event: A Population-Based Analysis

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Abstract

Background—Post-acute care (PAC) is available for older adults who need additional services after hospitalization for acute cardiac events. With the aging population and an increase in the prevalence of cardiac disease, it is important to determine current PAC use for cardiac patients to assist health care workers to meet the needs of older cardiac patients. The purpose of this study was to determine the current PAC use and factors associated with PAC use for older adults following hospitalization for a cardiac event that includes coronary artery bypass graft (CABG) and valve surgeries, myocardial infarction (MI), percutaneous coronary intervention (PCI), and heart failure (HF).

Methods and Results—A cross-sectional design and the 2003 Medicare Part A database were used for this study. The sample (n=1,493,521) consisted of patients aged 65 years and older discharged after their first cardiac event. Multinomial logistic regression was used to examine factors

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associated with PAC use. Overall, PAC use was 55% for cardiac valve surgery, 50% for MI, 45% for HF, 44% for CABG, and 5% for PCI. Medical patients use more skilled nursing facility care and surgical patients use more home health care. Only 0.1–3.4% of the cardiac patients use intermediate rehabilitation facilities. Compared to those who do not use PAC, those who use home health care and skilled nursing facility care are older, female, have a longer hospital length of stay, and more comorbidity. Asians, Hispanics and Native Americans were less likely to use PAC after hospitalization for an MI or HF.

Conclusions—The current rate of PAC use indicates that almost half of non-disabled Medicare patients discharged from the hospital following a cardiac event use one of these services. Healthcare professionals can increase PAC use for Asians, Hispanics and Native Americans by including culturally targeted communication. Optimizing recovery for cardiac patients who use PAC may require focused cardiac rehabilitation strategies.

The Agency for Healthcare Research and Quality recently reported that post-acute care (PAC) use after hospitalization in the United States has risen 30% for skilled nursing facilities (SNF) and intermediate rehabilitation facilities (IRF), and 53% for home health care (HHC).¹ Currently, one-third of adults age 65 and older use PAC after a hospitalization,^{2, 3} yet the current rate of PAC use for cardiac patients 65 years of age and older has not been reported. Patients who use PAC receive traditional rehabilitation services that focus on improvement of activities of daily living through physical and occupational therapy and education. For cardiac patients, additional rehabilitation services are needed for optimal recovery that are specific to their cardiac event, such as monitoring the cardiac response to therapy, learning self-management of cardiac symptoms and lifestyle changes, survival management, and cardiac education.⁴ Unfortunately traditional PAC services do not include these cardiac-specific services for older adults following a cardiac event that includes hospitalization for coronary artery bypass graft (CABG) and cardiac valve surgeries, myocardial infarction (MI), percutaneous coronary interventions (PCI) and heart failure (HF).⁵

The rate of PAC use and the factors associated with PAC use are important. Specifically, factors associated with PAC use can be used to assist in the early identification of patients likely to use PAC to ensure adequate planning for discharge and efficient transitions. The rate of PAC use can be used to justify standardization of interventions to address common cardiac recovery issues across the transitions of care and during PAC. The current study was designed to determine the rate of PAC service use by cardiac patients and to identify the characteristics of cardiac patients who use PAC services. This study is the first step in the understanding of the need to integrate a full range of cardiac-specific services to enhance recovery during PAC.

Heart disease is the leading cause of hospitalization in the U.S.⁶ and the majority of patients with a cardiac event or procedure are over the age of 65.^{7, 8} Post-acute care is available to patients over 65 through the Medicare program and services include therapy (physical, occupational, and speech) and skilled nursing care.⁹ Services are provided in skilled nursing facilities (SNF), intermediate rehabilitation facilities (IRF), and through home health care agencies (HHC). The type of PAC that is selected (e.g. HHC versus SNF) is usually determined by the functional status of the patient, the availability of informal caregivers, and the availability of PAC services.^{2, 3} For example, patients who have minimal functional impairments and have a caregiver may use HHC; however, older adults who have physical limitations and do not have a caregiver generally use a SNF. In contrast, use of an IRF requires meeting specific admission criteria such as need for physical, occupational, and speech therapies, and the ability to tolerate three hours of therapy a day.¹⁰ In addition, IRFs must admit 60% of their patients from specific diagnoses such as stroke, spinal cord injury, amputation, or major trauma.¹¹ Thus, IRF care is reserved for diagnoses traditionally considered to be “rehabilitative conditions” and require more than 2 rehabilitative therapies.¹¹

Published reports of PAC use are from the 1990's. Using U.S. data, 37% of MI patients used PAC and¹² and the rate in Canada was 20%.^{13, 14} For CABG patients, PAC use increased from 17% in 1993 to 39% in 1996.¹⁵ Heart Failure patients had the highest use of PAC reaching almost 50%.¹⁶ There were no reports on the rate of PAC use by cardiac valve replacement or PCI patients. As hospitalizations for heart disease and the incidence¹⁷ and survival¹⁸ of cardiac events increases, it is estimated that the percentage of older adults who use PAC after a cardiac event will increase.¹⁹

Factors associated with PAC use have been examined for MI patients only. Factors included are the availability of PAC services and severity of illness.¹² No studies were found that examined factors related to PAC for CABG, cardiac valve, HF, or PCI patients. Therefore the purposes of the current study were to (1) describe the rates of PAC service use (home health care, skilled nursing facility care, and intermediate rehabilitation facility care), and (2) explain the patient characteristics (age, gender, race, comorbidity, length of stay, and hospital costs) associated with PAC use in older patients following hospitalization for a cardiac event.

Methods

This cross-sectional study used a population-based sample from the 2003 Medicare Part A database (Medicare Provider Analysis and Review, MEDPAR) and the Center for Medicare and Medicaid Denominator file. At the time the study was conducted, the 2003 file was the most recent complete data available. The MEDPAR is an administrative database that contains all Medicare-reimbursed inpatient hospital stays, and includes data on primary diagnosis, comorbidity, surgical procedures, and age, sex, race, and discharge destination from which PAC use can be determined (e.g. HHC). This study received exempt status from the institutional review board committee as no identifiable data were included.

Study Population

The study population consisted of traditional Medicare beneficiaries 65 years of age and older who survived a hospitalization for a single medical or surgical cardiac event (n=1,493,521). The study population does not include patients enrolled in Medicare Managed Care. In 2003, 13% of the adult population over 65 years of age in the U.S. used a Medicare Managed Care plan for their health insurance.²⁰

Cardiac events examined were MI, HF, CABG, cardiac valve surgery, and PCI. Older adults typically have multiple hospitalizations, thus to control for potential confounding from the increased likelihood of PAC use that may be observed with aging and cumulative cardiac events, only the first hospitalization for a cardiac event during 2003 was used.

The entire 2003 MEDPAR database was used to initially screen for the primary diagnosis using the International Classification of Diseases, 9th Clinical Modification (ICD-9-CM) codes for the index cardiac events. Each MEDPAR record carries up to 10 diagnosis codes and 6 procedure codes. Individuals were excluded if they were (1) classified as disabled, (2) classified as end-stage renal disease, (3) were hospitalized for more than 1 cardiac event, or (4) were more than 90 years of age and were not receiving Medicare Part B (because these individuals are considered to be deceased). This last technique was used to delete invalid cases for age as recommended by Research Data Assistance Center (ResDAC). Disabled beneficiaries and those with end-stage renal disease were excluded as use of PAC may be related to these chronic conditions and not necessarily due to the cardiac event.

Variables

The dependent variable, PAC, was captured from the MEDPAR discharge destination variable. PAC categories were: (1) home with no PAC, (2) home health care, (3) skilled nursing facility, and (4) intermediate rehabilitation facility.

MEDPAR is an administrative database used for billing, and because the discharge destination field in the MEDPAR is not a billing-based field, the PAC variable was validated. For example, validation was performed by determining the number of matches that included the discharge destination code for SNF and a hospital discharge date that matched an admission date to a SNF. Matches were found for 96.4% of the records (proportion of error was 3.6%). Records that could not be validated were excluded from further analyses (n=58,011). Sub-analysis on the non-validated subjects demonstrated that the cases deleted were not different on age, gender and number of comorbidities.

Type of cardiac event was the main exposure variable and was identified using ICD-9-CM codes as a “medical or surgical” cardiac event. Medical cardiac events were MI, PCI, or HF. Surgical cardiac events were CABG or cardiac valve surgery. Cardiac events were defined independent of multiple, concurrent cardiac events (i.e., MI independent of HF vs. MI with HF) as it was hypothesized a priori that the proportion of older adults using PAC and the factors associated with PAC would differ among patients with multiple cardiac events. The specific cardiac event codes abstracted were CABG (36.10–36.19), MI (410, excluding the fifth digit of 2, indicating an MI in the prior 8 weeks), PCI (36.0–36.09), HF (428), and cardiac valve surgery (35.0).

Other predictor variables examined in the model included age, gender, race, comorbidity, hospital length of stay and hospital reimbursement. Hospital lengths of stay and hospital reimbursement are proxy measures for disease severity. Comorbidity, collected from the 10 ICD-9 diagnosis codes in the MEDPAR, was defined by a computed score using the Elixhauser Comorbidity Index, which measures a total count of 30 comorbid diseases.^{21–23} For this research, a diagnosis of dementia was included and cardiac diagnoses were excluded, as these were defined as the main exposure variable and not comorbid conditions. Length of stay in the hospital was identified in the MEDPAR by the number of hospital days. The expenses associated with hospitalization were captured by the MEDPAR total hospital-reimbursed amount.

Statistical Analyses

After ResDAC, Centers for Medicare and Medicaid Services, and Institutional Review Board approval, the MEDPAR was merged with the denominator file through use of patient identifiers. Analyses included descriptive statistics for PAC use. Assumptions for logistic regression were tested and no violations were noted.²⁴ Multinomial logistic regression models were tested using a $p \leq 0.001$ significance level and the reference as “home with no PAC.” Multinomial logistic regression, a form of logistic regression, was used as the outcome variable (PAC use) has more than two categories (i.e. home with no PAC, SNF, and HHC).²⁴ In addition, multinomial logistic regression controls for potential confounders in the model and therefore each of the results can be interpreted in the context of controlling for all other factors. The reference category of ‘Home with no PAC’ was chosen as a comparison between this group and the HHC and SNF group was desired. Interaction terms included the type of cardiac event and age, gender, race, comorbidity, hospital length of stay, and hospital reimbursement. Analyses were conducted in SAS 9.1 for UNIX.

Results

Post-acute Care Use

The rate of PAC following hospitalization for non-disabled Medicare Beneficiaries is displayed in Figure 1. The PAC use for CABG was 44 % (N=80,044), for MI 50% (N=185,044), for HF 45% (N=1,188,711), and for cardiac valve surgery 55% (N=39,722). PAC use was less prevalent in patients following hospitalization for a PCI (5%) compared to other cardiac events. For medical cardiac events, SNF care was used more frequently by HF (25%) and MI (30%) patients than HHC (16% and 17%, respectively), whereas surgical cardiac patients (CABG and valve) used more HHC (32% and 34%, respectively) than SNF (11% and 20%, respectively). The least utilized PAC type was IRF care (.02% to 3%).

Factors Related to PAC Use

The multinomial logistic regression results for the factors related to PAC use are found in Tables 1 and 2. Due to the large sample size, variables were considered significant at the $p < 0.001$ level. For all cardiac event types, as age increased, so did the likelihood of using HHC and SNF care. For example, being over age 80 was associated with a 5 to 7 times increased likelihood of using a SNF. For all cardiac diagnoses, men were 20–60% more likely to go home and not use PAC when compared to women.

Black non-Hispanic (NH) and white NH surgical patients (cardiac valve and CABG) used PAC at similar rates; race differences were noted in PAC use after MI and HF. Black NH were 13% less likely to use SNF when compared to white NH after MI and 3% more likely to use HHC after hospitalization for HF. Also for MI and HF, Hispanic, Asian, and Native Americans were 28% less likely to use HHC and 40–45 % less likely to use SNF when compared to white NH.

Older medical cardiac event patients (MI and HF) with more than one comorbid condition were more likely than patients with no comorbid conditions to use both HHC and SNF. For cardiac surgical patients (cardiac valve and CABG) only patients with two or more comorbid conditions were more likely to use PAC than those with no comorbid conditions. For both medical and surgical cardiac conditions, patients with hospital length of stay, and hospital charges that were greater than the median, had a greater likelihood of using HHC and SNF care when compared to those below the medians in these groups. For example after cardiac valve surgery or CABG, people with longer lengths of hospital stay were 3 times more likely to use SNF. In general, these factors were all significant predictors of distinguishing between patients going home with no PAC and those using HHC and SNF. Odds ratios (OR) were greater for SNF care when compared to home with no PAC, than for HHC when compared to home with no PAC. Interaction terms were not significant.

Discussion

This study revealed that in 2003, from 44 to 55% of non-disabled Medicare Beneficiaries age 65 and older used PAC after being hospitalized for a cardiac event. The rate of PAC use for non-disabled Medicare Beneficiaries with a cardiac event was greater than for similarly aged patients in the general hospitalized population (33%)^{2,3} and greater than for cardiac patients in the 1990s (38%).^{12, 13, 15} The rate of PAC use is comparable to that used by vascular surgery patients, which includes amputees.²⁵ Amputees require additional PAC that includes intensive physical and occupational services and similarly cardiac patients require additional support during early recovery as indicated by their PAC use.

There are many reasons for the current rate of PAC use for non-disabled Medicare cardiac patients. First, it may reflect a level of difficulty that older adults experience after hospitalization due to increased comorbidity and complications. Second, it may be due to an

increase in survival rate of cardiac patients as a result of evidenced-based medication protocols (e.g. aspirin and beta blockers) and advanced intervention protocols (thrombolytics and PCI).²⁶ Additionally, increased PAC use by older cardiac patients may be due to a limited availability of family members to provide care in the home. From a health services perspective, the shortened hospital length of stay and the substitution of hospital care with PAC may contribute to the current rate of PAC services.²⁷ The increase in PAC may be due to the change in rehabilitation services from traditional rehabilitation patients (stroke, amputation, knee and hip fractures and surgery) to general medical-surgical patients.²⁸ These last mentioned patients are unique rehabilitation candidates because their physical decline is less acute, yet they have more premorbid physical disability and need to adopt skills in chronic disease self-management.

In this study, PAC use followed a logical sequence in which cardiac events with greater complexity were associated with greater PAC use: cardiac valve patients had the highest use, and PCI patients had the lowest use. This is reasonable because PCI patients usually have single-vessel disease, shorter hospital stay, and fewer complications. In contrast, cardiac valve patients have frequent complications that include arrhythmias and heart failure,^{29–30} and therefore may require PAC for monitoring and treatment. The complexity of the cardiac event was also related to the types of PAC used. Surgical patients (CABG and cardiac valve) used more HHC, while medical patients (HF and MI) used more SNF care. This is logical because medical patients, compared with surgical patients, usually have more comorbidity and subsequent recovery needs.

The infrequent use of IRF care (0.42–3.4%) was not surprising. Although IRF may be of benefit to cardiac patients, such care is not usually offered to cardiac patients because admission criteria require a need for more than two types of therapy (physical, occupational, speech).^{10,11} Perhaps the addition of admission requirements for IRF can include education and self-management training as a type of therapy. Self-management therapy will provide cardiac patients the opportunity to learn skills required for optimal recovery.

Factors associated with PAC use for all cardiac events have similar trends for gender, age comorbidity, length of hospital stay and hospital reimbursement. Women were more likely to use PAC (women are the reference category; men 20–40% less likely to use PAC). Age trends also were consistent, as age increased, so did the likelihood of using PAC. For example after CABG, the likelihood of using SNF for an age over 80 was 7.4 times that of an age of 65–69. These trends reflect an age-gender effect consistent with mortality data showing that men die at a younger age. Similar trends were noted for comorbidity and hospital factors. As the intensity of type of PAC use increased (i.e. SNF a greater intensity than HHC) so did the likelihood of having a longer length of hospital stay, higher reimbursement, and more comorbidity indicating greater disease severity. These trends are consistent with patients after hospitalization for stroke, hip fracture and joint replacement.^{31,32,33} The increase in PAC for these groups is significant as older women with increased comorbidity and complications are less likely to receive care from a cardiologist after hospitalization³⁴ and less likely to attend an outpatient cardiac rehabilitation program.³⁵ The lack of follow-up with a cardiologist and outpatient cardiac rehabilitation is a problem as these services include vigilant monitoring and education on chronic disease self-management skills.

The findings related to race indicate that compared to white NH, Asian, Hispanic, and Native American are 18–45% less likely to use PAC, for MI and HF. Potential reasons for lower use of PAC by Asians, Hispanics, and Native Americans include factors such as cultural issues, and language barriers. For black NH, compared to white NH, there were no differences in PAC after CABG and valve surgery; black NH use HHC and SNF care as often as white NH. Results

for the medical diagnoses of MI and HF are somewhat contradictory. Black NH are less likely to use SNF care as white NH, yet, 3% more likely to use HHC after a hospitalization for HF.

Clinical Implications

A potential disparity in the use of PAC for Asians, Hispanics and Native Americans exists and may be approached by attending to cultural and communication issues. Culturally tailored interventions to address PAC use by these groups may assist in ensuring that Hispanics, Asians, and Native Americans receive appropriate PAC services.

The study highlights important opportunities for the improvement in the quality of care delivered to older adults who use PAC. Current practices in the care delivered and transitions in PAC do not take into consideration that almost half of the hospitalized cardiac patients will receive some PAC. Patients who use PAC may not be ready for discharge education and skill training during their hospital stay. Development of a transitional education model to teach and assess skills in chronic disease management will enhance recovery for these patients.

An additional area for improvement in clinical care is the development of communication strategies to facilitate safe and effective handoffs during the transitions between types of PAC. Patients transitioning from hospital to SNF to HHC are at risk for medication errors and rehospitalizations which have been recently reported to be as high as 20% during the 30 days after hospital admission.³⁶ Medication errors and rehospitalization can be reduced by the implementation of standardized communication and effective handoffs to ensure that transitions between care providers are coordinated.³⁷

Lastly, an opportunity exists to include transitional cardiac rehabilitation services across PAC settings. Traditional rehabilitation services use physical and occupational therapy that are directed at improving independence in activities of daily living and do not address the components of cardiac rehabilitation. The standardization of transitional cardiac rehabilitation services can include monitoring the cardiac response to therapy, learning self-management of cardiac symptoms and life-style changes, survival management, and chronic disease management skills. The guidelines from the American Association of Cardiovascular and Pulmonary Rehabilitation can be used to develop protocols and checklists to guide the standardization of transitional cardiac rehabilitation services.³⁶ The expansion of traditional PAC services to include components of cardiac rehabilitation is important because only 19% of older cardiac patients receive outpatient cardiac rehabilitation.³⁵ Transitional cardiac rehabilitation will ensure that these individuals receive this critical first step in recovery. In addition, the inclusion of transitional cardiac rehabilitation services will reduce barriers to participation in early outpatient cardiac rehabilitation, which is often delayed due to clinical, social, and logistical reasons.³⁸

The strength of this study is the representation of older adults by the use of the CMS administrative database. The use of an administrative database, however, has limitations. The database does not include Medicare Managed Care enrollees (13%); therefore the use of services for these older adults may be different. In addition, variables not included in the administrative database also may be important, such as physical performance indicators (balance and gait speed),³⁹ social factors (living arrangements and family support),³⁶ and psychological factors (cognitive status and mood).⁴⁰⁻⁴¹ Another limitation is that access was limited to 2003 data and therefore data from previous years could not be used to identify the patients who may have been admitted for a cardiac event the previous year.

Recommendations for future large database research include the examination of PAC use for patients with frequent rehospitalizations, comparison of rehospitalization rates of patients who go home without PAC and those who use SNF and HHC, and quantifying complicated

transitions for cardiac patients similar to the work of Kind and colleagues.⁴² Future research to unveil information on transitions of care will be enhanced by using the Chronic Condition Warehouse Data that includes administrative data (MedPAR) and SNF and HHC patient level data.⁴³ In addition, descriptive studies are needed to identify cardiac specific interventions during PAC and patient preferences for integrating cardiac rehabilitation into PAC. In summary, our findings indicate that for all cardiac events, except PCI, approximately 50% of non-disabled Medicare Beneficiaries use PAC services. The type of use of PAC differed for medical and surgical procedures, with medical patients using more SNF care and surgical patients using more HHC. Patients who used PAC were typically older, female, had longer hospital stays, and had a higher rate of comorbidity. Disparities exist in the use of PAC. Knowledge gained from this study contributes to the need to develop strategies that focus on the standardization of cardiac specific rehabilitation during post-acute care to optimize recovery outcomes for older adults.

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Figure 1. Percent Use of Post- Acute Care Services by Cardiac Event for Non-disabled Medicare Beneficiaries Age 65 Years and Older, 2003

PAC=post acute care; CABG=coronary artery bypass graph surgery; MI=myocardial infarction; PCI=percutaneous coronary intervention; HF=heart failure; HHA=home health agency; IRF=intermediate rehabilitation facility; SNF=skilled nursing facility.

Table 1

Multinomial Logistic Regression Predicting Home Health Care and Skilled Nursing Facility use for Myocardial Infarction and Heart Failure

	MI (n=185,044)		HF (n=1,188,711)	
	Type of PAC			
	HHC OR (95% CI)	SNF OR (95% CI)	HHC OR (95% CI)	SNF OR (95% CI)
Age:				
65–69	1.0	1.0	1.0	1.0
70–74	1.29 (1.22, 1.36)	1.48 (1.40, 1.57)	1.18 (1.16, 1.21)	1.42 (1.39, 1.45)
75–79	1.61 (1.53, 1.70)	2.33 (2.21, 2.46)	1.46 (1.43, 1.50)	2.16 (2.12, 2.21)
80+	2.60 (2.48, 2.73)	5.93 (5.65, 6.22)	2.20 (2.16, 2.24)	5.42 (5.31, 5.53)
Gender:				
Female	1.0	1.0	1.0	1.0
Male	0.75 (0.73, 0.77)	0.60 (0.59, 0.62)	0.77 (0.76, 0.79)	0.62 (0.62, 0.63)
Race:				
White NH	1.0	1.0	1.0	1.0
Black NH	1.01 ^a (0.97, 1.07)	0.87 (0.83, 0.91)	1.03 (1.01, 1.05)	0.82 ^c (0.80, 0.83)
Other	0.82 (0.72, 0.92)	0.55 (0.49, 0.62)	0.82 (0.78, 0.87)	0.60 (0.57, 0.64)
Comorbidity:				
0	1.0	1.0	1.0	1.0
1	1.16 (1.10, 1.23)	1.21 (1.15, 1.28)	1.19 (1.16, 1.23)	1.51 (1.45, 1.56)
>2	1.47 (1.39, 1.55)	1.70 (1.62, 1.79)	1.62 (1.57, 1.67)	3.19 (3.09, 3.30)
Length of stay:				
Below median	1.0	1.0	1.0	1.0
Above median	2.71 (2.63, 2.80)	3.71 (3.61, 3.81)	2.42 (2.39, 2.45)	3.26 (3.22, 3.29)
Reimbursement:				
Below median	1.0	1.0	1.0	1.0
Above median	1.26 (1.22, 1.30)	1.38 (1.34, 1.42)	1.34 (1.33, 1.36)	1.49 (1.47, 1.50)

Note: reference (ref) category is HOME

MI= myocardial Infarction, HF=heart failure, PAC=post acute care, HHC=home health agency, SNF=skilled nursing facility, NH=non-Hispanic.

no superscript: $p \leq 0.001$

^a $p > 0.05$

^b $0.01 < p \leq 0.05$

^c $0.001 < p \leq 0.01$

Table 2

Multinomial Logistic Regression Predicting Home Health Care and Skilled Nursing Facility use for Cardiac Valve Surgery and Coronary Artery Bypass Graft Surgery

	Cardiac Valve Surgery (n=39,722)		CABG (n=80,044)	
Type of PAC				
	HHC OR (95% CI)	SNF OR (95% CI)	HHC OR (95% CI)	SNF OR (95% CI)
Age:				
65–69	1.0	1.0	1.0	1.0
70–74	1.16 (1.08, 1.23)	1.73 (1.56, 1.92)	1.19 (1.15, 1.24)	1.70 (1.58, 1.84)
75–79	1.49 (1.40, 1.59)	3.24 (2.94, 3.58)	1.48 (1.42, 1.64)	3.39 (3.14, 3.65)
80+	1.73 (1.61, 1.85)	7.10 (6.43, 7.83)	1.90 (1.81, 2.00)	7.44 (6.88, 8.05)
Gender:				
Female	1.0	1.0	1.0	1.0
Male	0.80 (0.76, 0.83)	0.46 (0.44, 0.49)	0.80 (0.78, 0.83)	0.42 (0.40, 0.44)
Race:				
White NH	1.0	1.0	1.0	1.0
Black NH	1.15 ^b (1.02, 1.30)	1.01 ^a (0.86, 1.18)	1.01 ^a (0.93, 1.09)	1.10 ^a (0.98, 1.24)
Other	0.80 ^c (0.66, 0.98)	0.72 ^b (0.55, 0.95)	0.94 ^a (0.83, 1.06)	0.76 ^b (0.64, 0.94)
Comorbidities:				
0	1.0	1.0	1.0	1.0
1	1.03 ^a (0.96, 1.10)	0.98 ^a (0.90, 1.07)	1.06 ^a (0.99, 1.13)	0.99 ^a (0.89, 1.10)
2+	1.14 (1.07, 1.22)	1.18 (1.09, 1.29)	1.21 (1.16, 1.28)	1.34 (1.21, 1.48)
Length of stay				
Below median	1.0	1.0	1.0	1.0
Above median	1.53 (1.45, 1.61)	3.11 (2.91, 3.32)	1.36 (1.31, 1.41)	2.89 (2.72, 3.08)
Reimbursement				
Below median	1.0	1.0	1.0	1.0
Above median	1.41 (1.34, 1.49)	1.97 (1.85, 2.11)	1.31 (1.27, 1.36)	1.77 (1.68, 1.86)

Note: reference (ref) category is HOME

CABG coronary artery bypass Graft Surgery, PAC=post acute care, HHC=home health agency, SNF=skilled nursing facility, NH=non-Hispanic.

no superscript: $p \leq 0.001$

^a $p > 0.05$

^b $0.01 < p \leq 0.05$

^c $0.001 < p \leq 0.01$