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Post-myocardial infarction quality of care among disabled Medicaid beneficiaries with and without serious mental illness

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Abstract

Objective—To examine the association between serious mental illness and quality of care for myocardial infarction among disabled Maryland Medicaid beneficiaries.

Methods—We conducted a retrospective cohort study disabled Maryland Medicaid beneficiaries with myocardial infarction from 1994 to 2004. Cardiac procedures and guideline-based medication use were compared for persons with and without serious mental illness.

Results—Of the 633 cohort members with myocardial infarction, 137 had serious mental illness. Serious mental illness was not associated with differences in receipt of cardiac procedures or guideline-based medications. Overall use of guideline-based medications was low; 30 days after the index hospitalization for myocardial infarction, 19%, 35%, and 11% of cohort members with serious mental illness and 22%, 37%, and 13% of cohort members without serious mental illness had any use of angiotensin converting enzyme inhibitors or angiotensin receptor blockers, beta-blockers and statins, respectively. Study participants with and without serious mental illness had

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similar rates of mortality. Overall, use of beta-blockers (hazard ratio 0.93, 95% CI 0.90-0.97) and statins (hazard ratio 0.93, 95% CI 0.89-0.98) were associated with reduced risk of mortality.

Conclusions—Quality improvement programs should consider how to increase adherence to medications of known benefit among disabled Medicaid beneficiaries with and without serious mental illness.

Keywords

quality of care; myocardial infarction; mental illness

BACKGROUND

Cardiovascular disease mortality rates among persons with serious mental illness are approximately double rates among the overall population.[1,2] Reasons for increased cardiovascular disease mortality among this group include high prevalence of cardiovascular risk factors, such as obesity,[3,4] hypertension,[5] diabetes,[6] and dyslipidemia[7] and behavioral risk factors such as smoking,[8] poor diet,[9] and physical inactivity.[10] It is unclear whether poor quality of care, such as failure to receive guideline-based cardiac procedures and medications after myocardial infarction, also contributes to premature mortality among persons with serious mental illness.

Research on quality of care for myocardial infarction among persons with SMI is limited and shows mixed results.[11,12,13,14] A study by Druss and colleagues of patients treated in the Veteran's Health Administration (VA) system during 1994-1995 examined receipt of guideline-based procedures among a national cohort of Medicare beneficiaries ages 65 years and older.[15] The authors found that patients with SMI were significantly less likely to undergo percutaneous transluminal coronary angioplasty (PTCA) and cardiac catheterization compared to patients without SMI.[15] The same study showed no difference in 30-day mortality between myocardial infarction patients with and without SMI.[15] Another study by Druss and colleagues using the same cohort of Medicare beneficiaries found no difference in receipt of guideline-based medications among persons with and without SMI whose clinical characteristics made them 'eligible and ideal' for receipt of the medications, but that persons with SMI categorized as 'eligible but not ideal' for receipt of guideline-based medications following myocardial infarction were less likely than their counterparts without SMI to receive beta-blockers and angiotensin converting enzyme (ACE) inhibitors.[12] Petersen and colleagues studied persons treated for myocardial infarction in the VA system and found that patients with SMI were less likely than those without SMI to undergo an in-hospital angiography but found no difference in the receipt of guideline-based medications at discharge or receipt of coronary artery bypass graft (CABG) procedures 90 days after discharge.[13] The authors found no difference in mortality 30 days and one year following myocardial infarction between persons with and without SMI.[13] Another study of persons treated for myocardial infarction in the VA examined use of aspirin and beta-blockers at the most recent outpatient visit following myocardial infarction among persons with and without SMI.[14] The authors found that persons with substance use disorders were less likely to use beta-blockers at their most recent outpatient visit compared to persons without substance use disorders, but no other differences in outcomes between persons with and without SMI.[14]

To our knowledge, no study to date has examined the rate of post-myocardial infarction cardiac procedures, adherence to guideline-based medications, and mortality in the same cohort of persons with SMI. Our study addresses this gap by assessing these three outcomes among a cohort of racially diverse, disabled adult Maryland Medicaid beneficiaries with myocardial infarction. The primary objective of this study was to compare rates of cardiac

procedures and use of medications recommended by national guidelines for post-myocardial infarction care among persons with and without SMI. The secondary objective was to assess whether receipt of procedures or use of guideline-based medications were associated with mortality.

METHODS

Sample

We conducted a retrospective cohort study of disabled Maryland Medicaid participants with myocardial infarction between fiscal years 1994 and 2004. For our analysis, we included Medicaid beneficiaries who were discharged from an acute care hospital or emergency department with a principal diagnosis of acute myocardial infarction (ICD-9 code 410) between July 1, 1994 and June 30, 2004 (N=633). Among this subset with myocardial infarction, persons with a diagnosis of SMI at baseline (N=137) were compared to persons without SMI (N=496). Criteria for identifying persons with SMI included having any schizophrenia diagnosis or being disabled (defined as eligibility for Supplemental Security Income) in addition to having a diagnosis of bipolar disorder, major depression, or other mental disorder diagnoses and specialty mental health care use. Other diagnoses included psychoses other than schizophrenia and affective psychoses, organic psychoses, obsessive compulsive disorder and other anxiety disorders. Persons who died during the index hospitalization were excluded (N=40). The cohort was a subgroup of disabled Maryland Medicaid beneficiaries who have been followed since 1993 (N=26,575). The initial cohort had the following inclusion criteria: age 21-62 between July 1, 1992 and June 30, 1993 and two-year continuous enrollment in Medicaid and residence in either metropolitan Baltimore or the rural eastern shore area of Maryland. Additionally, cohort participants were designated as having a medical disability for entry into the Medicaid cohort. The study was approved by the Johns Hopkins Medical Institutions and the Maryland Department of Health and Mental Hygiene Institutional Review Boards.

Data & Measures

Information on age, sex, race and area of residence (urban, suburban, or rural) and SMI diagnoses were obtained from Maryland Medicaid administrative claims files. Medicaid hospitalization data for the years 1994-2004 was used to identify medical co-morbidities. Baseline medical co-morbidities were identified using hospitalization data from the time period between each participant's entry into the cohort and their index hospitalization for myocardial infarction. Time-varying medical co-morbidities were identified using data from the time period following the index hospitalization for myocardial infarction. Once participants were diagnosed with a co-morbid condition, they were assumed to have the condition throughout the remainder of follow-up, which began the day of the index hospitalization and continued until the patient died, was no longer eligible for Medicaid, or June 30, 2004, whichever came first.

Cardiac procedures—Cardiac procedures included CABG, PTCA, and cardiac catheterization during and 30 days after the index hospitalization. Information on performance of cardiac procedures was obtained from hospital discharge data (ICD-9 codes 36.10 to 36.19 for CABG, 36.01, 36.02, and 36.05 for PTCA, and 37.21, 37.23, 88.57, 88.58, and 88.59 for cardiac catheterization). As we used Medicaid administrative claims data without detailed clinical chart information, eligibility for procedures was not determined. We therefore measured overall rates of each procedure of interest as proxies for receipt of guideline-based post-MI cardiac procedures. The cardiac procedure measures were defined as dichotomous variables indicating whether or not the study participant had the cardiac procedure during the index hospitalization or within 30 days of the index

hospitalization, respectively. A composite measure of receipt of any procedure during the index hospitalization was also created.

Medications—Guideline-based medications included ACE inhibitors or angiotensin receptor blockers (ARBs), beta-blockers, and statins. Information on use of guideline-based medication use was obtained from Maryland Medicaid pharmacy claims data. Medication receipt was measured as two dichotomous variables indicating whether or not the study participant was prescribed the drug of interest within 30 days and one year of the index hospitalization for myocardial infarction, respectively. Composite measures for use of any medication at 30 days and one year following myocardial infarction were also created. The medication possession ratio, used to measure medication adherence, was calculated as the sum of days with supplied prescriptions for ACE/ARB inhibitors, beta-blockers, or statins for a given participant divided by the total number of days the participant was eligible for pharmacy services within 30 days and one year after the index hospitalization. Eligibility for pharmacy services began the day a participant was discharged from the index hospitalization. Unlike the uninsured, who may receive a limited supply of free medication at discharge from a Maryland hospital, Medicaid beneficiaries receive a prescription at discharge. The medication use measures therefore capture any prescription filled on or after the day of discharge from the index hospitalization.

Mortality—Mortality data was obtained by linking the cohort to National Death Index (NDI) data from 1994-2004. The NDI matched user records to death records using 12 criteria, including social security number, first name, last name, and year of birth. We used the death records determined most likely to be correct matches based on the probabilistic scoring technique used by the NDI.

Statistical Analysis

Logistic regression was used to estimate the likelihood of receipt of cardiac procedures and guideline-based medications in persons with and without SMI. General linear models using the gamma distribution for count data were used to estimate average differences in the percentage of days participants used ACE/ARB inhibitors, beta-blockers, and statins at 30 days and one year following the index hospitalization. Cardiac procedure and medication outcome models controlled for the demographic characteristics age, sex, race, and area of residence (urban/suburban/rural) and baseline co-morbidities including diabetes, cerebrovascular disease, hypertension, renal disease, chronic pulmonary disease, congestive heart failure, cancer, and drug and alcohol abuse. Cox proportional hazards modeling was used to estimate the hazard ratios for total mortality associated with quality of care among persons with and without SMI. To examine the association between guideline-based medication use and mortality, the medication possession ratio in the year prior to death for each medication of interest was regressed on mortality. The medication possession ratio was multiplied by 10 so that hazard ratios could be interpreted as risk of mortality associated with a 10% increase in medication adherence. To examine the association between cardiac procedures and mortality, presence of any cardiac procedure in the year prior to death was regressed on mortality. The mortality model controlled for time-varying co-morbidities, age, sex, race, and area of residence.

RESULTS

Of the 633 cohort members with myocardial infarction, 137 had serious mental illness. Sixty-four percent of persons with SMI were female, compared to 62% of persons without SMI. Fifty-three percent and 58% of cohort members with and without SMI were black. Compared to participants without SMI, participants with SMI were younger, less likely to

have a history of diabetes, and more likely to use alcohol (Table 1). Three hundred and seven study participants died during the study period. The one-year mortality rate following index hospitalization for myocardial infarction was 13.4%, similar to one-year mortality rates observed in a study persons hospitalized for myocardial infarction in Massachusetts. [16]

Cardiac procedures

During the index hospitalization, the adjusted percent of participants with serious mental illness who received any cardiac procedure (CABG, cardiac catheterization, or PTCA) was 18.5% (95% CI 12.8-26.0), compared to 17.0% (95% CI 13.8-20.7) among persons without SMI. Thirty days following the index hospitalization, 33.3% (95% CI 25.8-41.9) of persons with SMI and 26.3 (95% CI 22.6-30.5) of persons without SMI had received a cardiac procedure. The overall increase in procedures from the index hospitalization to 30 days after the index hospitalization was driven by increases the proportion of participants receiving CABG (2.0% among persons with SMI during the index hospitalization compared to 7.6% at 30 days following the index hospitalization) and PTCA (11.7% among persons with SMI during the index hospitalization and 18.0% at 30 days following index hospitalization) There were no differences between the adjusted percent of CABG, PTCA, or catheterization procedures between persons with and without SMI at the index hospitalization or 30 days after the index hospitalization (Table 2).

Medication use

There were no differences in medication use or days of medication adherence between persons with and without SMI (Figure 1). Beta-blockers were the most commonly used medications in persons with and without SMI, followed by ACE/ARB inhibitors and statins. The adjusted percent of persons using beta-blockers at 30 days following acute MI was 35.0% (95% CI 27.1-43.7) for persons with SMI and 36.6% (95% CI 32.3-41.1) for persons without SMI. One year after the index hospitalization, these adjusted percents increased to 58.3% (95% CI 50.0-66.5) and 52.4% (95% CI 48.8-57.0), respectively. In contrast, 19.3% and 40.0% of persons with SMI used ACE/ARB inhibitors at 30 days and one year following hospital discharge, and 10.8% and 22.8% of persons with SMI used statins during the same time periods.

Among participants who took any medication, at 30 days following the index hospitalization the adjusted percent days of use was highest for statins among participants with SMI (79.8%) and beta-blockers among participants without SMI (88.2%). No differences in percent days of medication adherence between persons with and without SMI were statistically significant at the $P < .05$ level.

Mortality

Risk of mortality among the disabled Maryland Medicaid cohort with myocardial infarction did not differ for participants with and without SMI (Table 3). The adjusted hazard ratios showing the association between a 10% change in medication possession in the year prior to death showed that 10% higher adherence to beta-blockers (hazard ratio 0.93, 95% CI 0.90-0.97) and statins (hazard ratio 0.93, 95% CI 0.89-0.98) was associated with decreased mortality, suggesting that use of these medications decreases mortality following MI.

Subgroup Analysis

We conducted a subgroup analysis of post-myocardial infarction care among persons with schizophrenia only. Results in the subgroup with schizophrenia were identical to results in the overall cohort; we found no differences in the proportion of persons with versus without

schizophrenia who received cardiac procedures or guideline-based medications following myocardial infarction, nor were there differences in medication adherence between disabled Medicaid beneficiaries with versus without schizophrenia (results not shown).

DISCUSSION

We conducted a retrospective cohort study of a sample of disabled adult Maryland Medicaid beneficiaries with myocardial infarction, one of the first studies to evaluate rates of cardiac procedures, guideline-based medication use, and mortality in a single cohort. In our study, SMI was not associated with quality of cardiac care. Overall, disabled participants with and without SMI had low rates of use of medications of known benefit, an important finding given that this is one of the first studies using Medicaid claims data to show that beta-blocker and statin use is associated with reduced mortality.

Prior studies assessed quality of post-myocardial infarction care among Medicare[11,12] and VA[13,14] patients with and without SMI. In contrast to the results of our study, Druss and colleagues found that Medicare beneficiaries ages 65 years and older with SMI were less likely to undergo cardiac catheterization and receive beta-blockers and ACE inhibitors than their counterparts without SMI.[11,12] Druss studied a national cohort of older (mean age 76 years), predominantly white Medicare beneficiaries with myocardial infarction.[11,12] In contrast, we examined quality of care for myocardial infarction in a cohort of racially diverse, working-age disabled adult Medicaid beneficiaries. As a result, participants with and without SMI in our cohort may share risk factors, such as low socioeconomic status; high prevalence of cardiac risk factors such as smoking, poor diet, and lack of physical activity; and high burden of co-morbid medical conditions which mediate differences in quality of care for myocardial infarction between persons with and without SMI in other populations. [12,17] The fact that the non-SMI comparison group in our study is disabled may account for the fact that we found no differences in post-myocardial infarction quality of care between persons with and without SMI. The disabled non-SMI population had a range of chronic medical conditions shown in Table 1, including congestive heart failure and renal failure. In addition, 6% of study participants without SMI had respiratory failure, and 1% had HIV/AIDS at baseline (results not shown). In addition, Druss and colleagues study Medicare beneficiaries in 1994-1995. As our study examined quality of care for post-myocardial infarction through 2004, it is possible that improvements in quality of care for persons with SMI over this time period account for the lack of difference in quality of care for disabled Maryland Medicaid beneficiaries with and without SMI.

Similar to our study, studies of quality of post-myocardial infarction care in the VA suggest few differences in care between persons with and without SMI. Two characteristics shared by VA and Medicaid beneficiaries may contribute to the lack of difference in post-myocardial infarction care in persons with and without SMI in our study. First, both VA and Medicaid beneficiaries face relatively low cost-related barriers to care, with free or low-cost care provided based upon income criterion. Second, both the VA and Medicaid serve large numbers of patients with mental illness.[18,19] VA providers and providers serving Medicaid beneficiaries may have more experience caring for the complicated medical needs of persons with SMI than providers serving other groups of patients, reducing disparities in care.[20]

While the results of our study, like similar studies of VA beneficiaries, show no disparities in quality of care between persons with and without SMI, rates of cardiac procedures and guideline-based medication use appear to be lower among our cohort of disabled Medicaid beneficiaries with myocardial infarction compared to rates among the VA, Medicare, and privately insured populations.[13,14,21,22] Studies showing high post-myocardial infarction

quality of care for persons with and without SMI in the VA system are consistent with other studies showing high rates of other quality of care indicators in the VA,[23] likely due to the VA's ability, as a national system, to coordinate and monitor quality of care using electronic patient data.[23] In the VA during 1998-1999, over 90% of patients with SMI for whom the therapy was not medically contraindicated or discontinued were taking beta-blockers and aspirin at their most recent outpatient visit following hospitalization for MI;[14] in comparison, the adjusted proportions of Maryland Medicaid beneficiaries with SMI during 1994-2004 using ACE/ARB inhibitors, beta-blockers, and statins at 30 days (19%, 35%, and 11%, respectively) and one year (40%, 58%, and 23%, respectively) after discharge were considerably lower. The percent of persons with SMI who received PTCA during the index hospitalization for myocardial infarction were similar in our study and the 2000 study of older Medicare beneficiaries by Druss and colleagues (12% and 11.8%),[11] however Druss found that 8.2% of Medicare beneficiaries with SMI received CABG during the index hospitalization,[11] compared to only 1% of Maryland Medicaid beneficiaries with SMI. In a recent study of Aetna beneficiaries during 2008-2009 with myocardial infarction, about 66% received PCTA and 18% received a CABG procedure during the index hospitalization, [21]. Data from a registry of acute myocardial infarction records from 383 US hospitals shows that rate of receipt of cardiac procedures and guideline-based medications were even higher when calculated only among patients eligible for procedures according to national guidelines and with patients who had no contraindications for post-MI medications.[22]

While use of guideline-based post-myocardial infarction medication in our study was lower than in the VA and privately insured populations, adherence to medications among those disabled Medicaid beneficiaries taking any medication appears similar to adherence in the privately insured population. Our longitudinal study design and use of pharmacy claims data allowed us to measure the medication possession ratio, or percent days of use among participants taking guideline-based medications. The percent days of use of ACE/ARB inhibitors, beta-blockers, and statins did not differ among persons with versus without SMI, a result consistent with several studies showing no differences in adherence to non-psychotropic medications between persons with and without SMI.[24,25,26] Two studies investigating adherence to medications for diabetes found that among persons with diabetes, persons with SMI had better adherence to diabetes medications than persons without SMI, a finding perhaps attributable to experience adhering to complex psychotropic medication regimens among persons with SMI).[25,26] In our study, one year after the index hospitalization the percent days of use ranged from 52% (beta-blockers) to 60% (ACE/ARB inhibitors and statins) among persons without SMI and from 53% (beta-blockers) to 63% (statins) among persons with SMI. A 2011 study of Aetna beneficiaries found similar rates of adherence among beneficiaries with usual prescription coverage; the medication possession ratios, calculated among persons with three months to one year of follow-up time post MI, were 61% for ACE/ARB inhibitors and beta-blockers, respectively, and 65% for statins. [27]

In addition, we were able to evaluate the effects of cardiac procedures and adherence to ACE/ARB inhibitors, beta-blockers, and statins on mortality. Importantly, our study showed that use of beta-blockers and statins is associated with reduced mortality. To our knowledge, this is one of the first studies using administrative claims data to show a protective effect of these medications on mortality.

LIMITATIONS AND STRENGTHS

Our study had several limitations. Due to the constraints of administrative claims data, we were unable to determine patients' eligibility for cardiac procedures. Therefore, our cardiac procedure outcome measures served as proxies for post-myocardial infarction quality of

care. Furthermore, our inability to assess potential contra-indications for the post-myocardial infarction medications of interest may have explained why some individuals did not receive a procedure or prescription. Our study used Medicaid administrative claims data, which may not have perfect precision in assessment of quality indicators; however, studies have used similar administrative data to evaluate the use of recommended therapies for heart failure. [17] Nonetheless, our study also has important strengths. Our longitudinal study design allowed us to evaluate receipt of cardiac procedures and medications of known benefit at multiple time points, as well as to evaluate adherence to guideline-based medications and to assess the effects of cardiac procedures and medication use on mortality among the disabled adult Medicaid population with myocardial infarction.

CONCLUSIONS

In conclusion, we found that quality of post-myocardial infarction care did not differ between disabled Medicaid beneficiaries with and without SMI. Rates of cardiac procedures and guideline-based medication use were lower than those found in previous studies of non-Medicaid populations, but adherence to medications among participants using guideline-based medications was high. Given that our study showed that beta-blocker and statin use were associated with decreased mortality, strategies for increasing receipt of guideline-based medications among the disabled Maryland Medicaid population is needed. Future research is needed to identify effective strategies to improve medication use following myocardial infarction among this vulnerable population and to determine if different strategies are needed for persons with and without SMI. In addition, clinicians and health systems administrators serving the Medicaid population should consider adopting coordinated care techniques, such as use of integrated electronic health records or pharmacy records, to monitor and improve quality of care for patients with myocardial infarction.

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Panel A: Adjusted percent of study cohort receiving guideline-based medications*

Panel B: Adjusted percent days of use among study cohort members receiving guideline-based medications*

Figure 1.

Receipt of and adherence to ACE/ARB inhibitors, beta-blockers, and statins for participants with and without serious mental illness within 30 days and one year of hospitalization for myocardial infarction, 1994-2004

*Bars indicate 95% confidence intervals. Adjusted for age, sex, race, area of residence, and baseline co-morbidities.

Table 1

Characteristics of 633 Maryland Medicaid cohort members with myocardial infarction, by diagnosis of serious mental illness, 1994-2004

	Non-SMI	SMI	P-Value
	N=496	N=137	
Age in years (mean)	54.1	51.7	0.003
Female (%)	61.5	63.5	0.67
Race (%)			
White	41.9	46.7	0.31
Black	58.1	53.3	
Area of Residence (%)			
Urban	87.5	89.1	0.87
Suburban	4.6	4.4	
Rural	7.9	6.6	
Co-morbidities (%)			
Diabetes	34.1	24.1	0.03
Cerebrovascular disease	7.7	8.0	0.88
Hypertension	44.0	37.2	0.16
Renal failure	10.7	8.0	0.36
Chronic obstructive pulmonary disease	22.4	21.2	0.76
Congestive heart failure	42.1	34.3	0.09
Cancer	8.1	8.8	0.79
Drug use	7.3	9.5	0.39
Alcohol use	9.1	15.3	0.03

Table 2

Receipt of cardiac procedures for participants with and without serious mental illness (SMI) during and within 30 days of hospitalization for myocardial infarction, 1994-2004 (N=633)

Procedure	Adjusted Percent Receiving Cardiac Procedures (95% CI)*			
	Index Hospitalization		30 days After Index Hospitalization	
	No SMI	SMI	No SMI	SMI
Any procedure	17.0 (13.8-20.7)	18.5 (12.8-26.0)	26.3 (22.6-30.5)	33.3 (25.8-41.9)
CABG	0.8 (0.2-2.3)	2.0 (0.6-6.2)	4.4 (2.9-6.6)	7.6 (4.1-13.8)
Catheterization	4.7 (3.1-7.1)	4.8 (2.2-10.1)	5.3 (3.5-7.8)	6.8 (3.6-12.4)
PTCA	11.5 (9.0-14.6)	11.7 (7.3-18.2)	16.8 (13.7-20.5)	18.0 (12.4-25.4)

* Adjusted for age, sex, race, area of residence, and baseline co-morbidities

Table 3

Adjusted hazard ratios of mortality in the Maryland Medicaid cohort by serious mental illness and selected characteristics (N=633), 1994-2004^{*}

	Hazard Ratio (95% CI)
Serious mental illness	1.01 (0.79-1.31)
Age	1.02 (1.00-1.03)
Race	
White	Ref
Black	0.76 (0.60-0.96)
Area of residence	
Rural	Ref
Suburban	1.07 (0.80-1.27)
Urban	0.96 (0.63-1.46)
Co-morbidities	
Diabetes	1.30 (1.03-1.63)
Cerebrovascular disease	1.59 (1.21-2.08)
Hypertension	0.85 (0.67-1.08)
Renal failure	2.14 (1.64-2.81)
Chronic obstructive pulmonary disease	1.15 (0.92-1.45)
Congestive heart failure	2.21 (1.70-2.86)
Cancer	1.66 (1.28-2.16)
Drug use	0.85 (0.56-1.28)
Alcohol use	1.34 (0.97-1.95)
Medication possession ratio in year prior to death	
ACE/ARB inhibitors	0.98 (0.94-1.02)
Beta-blockers	0.93 (0.90-0.97)
Statins	0.93 (0.89-0.98)
Any cardiac procedure in year prior to death	0.85 (0.58-1.25)

^{*} Adjusted for age, sex, race, area of residence, and time-varying co-morbidities