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Ambulatory Care Sensitive Hospitalizations among Medicaid Beneficiaries with Chronic Conditions

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Abstract

Objectives—This study examined the relationship between ambulatory care sensitive hospitalizations (ACSH) and patient-level and county-level variables.

Methods—Utilizing a retrospective cohort approach, multi-state Medicaid claims data from 2007–2008 was used to examine ACSH at baseline and follow-up periods. The study cohort consisted of adult, non-elderly Medicaid beneficiaries with chronic physical conditions, who were continuously enrolled in fee-for-service programs, not enrolled in Medicare, and did not die during the study period (N=7,021). The dependent variable, ACSH, was calculated in the follow-up year using an algorithm from the Agency for Healthcare Research and Quality algorithm. Patient-level (demographic, health status, continuity of care) and county-level (density of healthcare providers and facilities, socio-economic characteristics, local economic conditions) factors were included as independent variables. Multivariable logistic regression models were used to examine the relationship between ACSH and independent variables.

Results—In this study population, 8.2% had an ACSH. African-Americans were more likely to have an ACSH [AOR=1.55, 95% CI 1.16, 2.07] than Caucasians. Adults with schizophrenia were more likely to have an ACSH, compared to those without schizophrenia [AOR=1.54, 95% CI 1.16, 2.04]. Residents in counties with a higher number of community mental health centers [AOR=0.88, 95% CI 0.80, 0.97] and rural health centers [AOR=0.98, 95% CI 0.95, 0.99] were less likely to have an ACSH.

Conclusions—Programs and interventions designed to reduce the risk of ACSH may be needed to target specific population subgroups and improve healthcare infrastructure.

Keywords

Ambulatory care sensitive hospitalization; County-level factors; Medicaid; Quality of care

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Introduction

Ambulatory care sensitive hospitalizations (ACSHs), also referred to as potentially preventable hospitalizations, are inpatient stays that may be preventable with timely and effective outpatient treatment.[1,2] As care for chronic conditions provided in hospitals is more costly than in outpatient or primary care settings, and can negatively affect patients' quality of life, ACSHs are considered important measures of health-care quality and are targeted by quality improvement efforts.[2] Although the rates of ACSH declined by 14.0% between 2005 and 2011,[3] ACSHs still accounted for 10% of all hospitalizations in 2011, and 5.8% of all Medicaid inpatient stays.[4]

ACSHs are associated with high financial burden to payers, patients, and society.[5] According to the 2010 National Healthcare Quality Report, ACSH-related costs were \$27.1 billion in 2007.[6] Furthermore, a study utilizing Medical Expenditure Panel Survey data (2005–2010) reported that charges for ambulatory care sensitive conditions (ACSCs) were four times higher when treated in an inpatient versus outpatient settings.[7] As the health-care systems move toward achieving better health, better value, and lower costs, ACSHs have become an accountability measure to improve quality and lower health-care costs.

Given that ACSHs can be avoided with the delivery of high-quality outpatient treatment and disease management, it is important to monitor ACSH rates among patient subpopulations and how various patient and community factors are associated with these hospitalizations. Such information can help inform policymakers and providers how to target populations most in need of improvement in outpatient care.[4,8] Existing research suggests that ACSHs are influenced by patient-level and county-level factors.[9–24] However, a majority of studies investigating the association between these factors and ACSH were conducted in elderly or Medicare populations,[16,17,21,22] and these findings may not be applicable to the nonelderly Medicaid population. Furthermore, Medicaid programs incur an estimated \$438 billion in health-care expenditures and provide health-care services to the vulnerable, indigent, and disabled population.[25,26] In addition, preventable hospitalization rates have been reported to be higher for the Medicaid beneficiaries compared to those with private health insurance.[27] Few studies have focused on those enrolled in Medicaid.[13,14,28–31] One of these studies examined the association between federally qualified health centers (FQHCs) as a source of primary care and ACSHs, and concluded that the rates of ACSHs were the lowest among those relying on FQHCs as their source of primary care.[14] The other study examined predictors of ACSH in Medicaid-enrolled assisted living residents in Florida and concluded that factors including increasing age, being Hispanic or other race/ethnicity, and comorbid physical health conditions were associated with higher rates of ACSHs in younger enrollees.[13] Yet, none of these studies examined ACSHs in Medicaid enrollees with chronic conditions. Presence of chronic physical and mental health conditions has been reported to be associated with poor quality of medical care. One study reported that chronic conditions, including congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), diabetes, hypertension, and dementia were key predictors of preventable hospitalizations.[27] Further, studies have also reported increased ACSHs in those with chronic kidney disease (CKD), type 2 diabetes, and mental illness.[20] These findings suggest a need for examining ACSHs in adults with chronic physical conditions.

Therefore, the primary objective of this study is to examine the relationship between ACSHs and patient-level factors and county-level health-care characteristics among fee-for-service (FFS) Medicaid beneficiaries with selected chronic physical conditions.

Methods

Study design

The study was conducted using a retrospective cohort approach to analyze observational data in real-world settings. Patients with selected chronic conditions from 1 January 2007 to 31 December 2007 (baseline period) were followed from 1 January 2008 to 31 December 2008 (follow-up period). ACSHs were identified only among inpatient users during the follow-up period.

Data source

Medicaid administrative data and claims files from four states, California, Illinois, New York, and Texas, were used. These states were specifically selected because of their low managed care penetration relative to other states as well as their diverse patient populations. Further, based on the Kaiser Family Foundation report (2012), these four states have the highest Medicaid spending – New York (\$53.3 billion), California (\$50.2 billion), Texas (\$28.3 billion), and Illinois (\$13.4 billion) – as well as the highest Medicaid enrollment rates. [25,32,33] The Personal Summary file provided information on beneficiary demographics (age, sex, race/ethnicity, and county of residence), Medicaid enrollment, and eligibility status. The Outpatient and Inpatient files included information on claims for services provided in ambulatory and inpatient settings and contained International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes. The 2009 Area Health Resource File provided county-level information on socioeconomic status, health-care resources, facilities, providers, and utilization and was linked to Medicaid administrative claims file using state code and county code.

Study population

The study population was based on Medicaid beneficiaries with one or more of 16 selected chronic physical conditions (asthma, arthritis, cardiac arrhythmias, coronary artery disease, cancer, CHF, CKD, COPD, dementia, diabetes, hypertension, hyperlipidemia, hepatitis, human immune deficiency virus, osteoporosis, and stroke). These conditions were selected based on the conceptual framework developed and adopted by the Department of Health and Human Resources for research, policy, program, and practice.[34] The study population was restricted to those with chronic physical conditions because it has been previously suggested that physical chronic conditions contribute to a higher risk of ACSHs. For example, chronic physical conditions such as diabetes and hypertension are considered predisposing to increased risk of ACSCs (e.g. diabetes complication).[20,27] Clinical Classifications Software (CCS) for ICD-9-CM was used for identification of all these conditions. CCS is a part of the Healthcare Cost and Utilization Project, sponsored by the Agency of Healthcare Research and Quality (AHRQ) and is based on the ICD-9-CM, in which ICD-9-CM's multitude of codes are collapsed into smaller number of clinically meaningful categories. [35]

The study population was further restricted to adults (21–64 years), enrolled in FFS Medicaid, not dually enrolled in Medicare, and did not die during the study period. The final cohort consisted of 7021 Medicaid beneficiaries with selected chronic physical conditions. The selection criteria are shown in Figure 1.

Dependent variable

The ACSHs were identified from the FFS Medicaid inpatient claims file during the follow-up period, using the Prevention Quality Indicators (PQIs) software, developed by investigators from Stanford University and the University of California as a part of their contract with AHRQ. The PQIs are a set of measures that can be used with the hospital inpatient data to identify ACSCs, using ICD-9-CM codes. The AHRQ's definition for overall, acute, and chronic composite PQI measure was used.[36,37]

Using PQI software, individuals with hospitalizations for 'any ACSC' were identified for any of the following conditions during the follow-up calendar year: (1) diabetes short-term complications; (2) diabetes long-term complications; (3) perforated appendicitis; (4) COPD; (5) hypertension; (6) CHF; (7) dehydration; (8) bacterial pneumonia; (9) urinary infections; (10) angina without a procedure; (11) uncontrolled diabetes; (12) adult asthma; and (13) lower extremity amputations among patients with diabetes. Acute condition-related ACSHs were those due to dehydration, bacterial pneumonia, and urinary infections. Chronic condition-related ACSHs were those due to diabetes short-term complications, diabetes long-term complications, COPD, hypertension, CHF, angina without a procedure, uncontrolled diabetes, adult asthma, and lower extremity amputations. [36,37] Individuals were categorized into two groups: those with hospitalization for any ACSC and those without hospitalization for any ACSC. Similarly, we classified those with and without hospitalizations for chronic ACSC.

Independent variables

Patient-level characteristics

Demographic and Medicaid eligibility characteristics: Variables included age, sex, race/ethnicity (African-American, Caucasian, Hispanic, and Asian, American Indian, or Pacific Islander), and Medicaid eligibility status (cash, medical need).

Mental health conditions: These are not predisposing to ACSC; however, mental conditions such as depression or schizophrenia have been shown to have negative effect on overall health and may also exacerbate existing physical chronic conditions resulting in increased risk of ACSHs.[20,38] Mental health conditions included depression, schizophrenia, and substance use disorders.

Primary care access: Primary care access was assessed using an index measure of continuity of care. Claims made for primary care visits 180 days before an index hospitalization in 2008 were identified from physician specialty codes and current procedural terminology (CPT-4) codes for services rendered. Continuity of primary care was measured using previously published continuity index called the Modified, Modified

Continuity Index (MMCI), with a possible range of 0–1. The MMCI index accounts for the total number of providers seen 6 months prior to an index hospitalization.[15,22]

Health-care utilization: Emergency room (ER) visits were included in the study and were identified from the setting the service was provided and CPT-4 codes for services rendered. ER visits were categorized as presence or absence of any ER visits. Inpatient visits were defined as any inpatient stays at baseline (including day stays) and were categorized as presence or absence of any inpatient visit.

County-level characteristics

Population characteristics at the county level, including availability of primary care providers and health-care facilities, socioeconomic status (household income), and local economic conditions,[1,10,14,39] explain a substantial portion of the variations in preventable hospitalization or ACSHs. Based on *a priori* knowledge, variables accounting for socioeconomic status and local economic conditions included per-capita income, poverty level (percentage of individuals below poverty level), and metropolitan status. The variables related to availability of providers and health-care facilities included primary care shortage area, mental health-care shortage area, presence of FQHCs, community mental health center, and rural health center. Hospital density was defined as total number of hospitals per 100,000 individuals.

Statistical analysis

Chi-square tests of independence were used for categorical variables and *t*-tests for continuous variables to assess the statistical significance of unadjusted associations between patient-level and county-level characteristics and ACSH. Multivariable logistic regression models examined the association between patient-level and county-level characteristics and hospitalization for any, acute, or chronic ACSC. The reference group for the dependent variable was 'no ACSH' for any, acute, or chronic condition. Two regression models were conducted for each dependent variable: Model 1 included patient-level characteristics and Model 2 additionally included county-level characteristics. Multicollinearity tests were conducted prior to selection of variables for the logistic regression models. All analyses were conducted using Statistical Analysis Software version 9.3 (SAS Inc., Cary, NC, USA).

Results

Description of study population

After our exclusion criteria, we included 7021 Medicaid beneficiaries, accounting for 6.2% of all nonelderly Medicaid beneficiaries with at least one hospitalization in 2008. Overall, 8.2% experienced ACSH for any condition, and 5.3% experienced ACSH for chronic conditions. Description of the study population by ACSH for any and chronic conditions is presented in Table 1. A majority of the study population comprised of females (79.5%) and those aged 25–34 years (38.5%). Caucasians, African-Americans, and Hispanics represented 23.3%, 11.4%, and 56.1% of the study population, respectively.

Unadjusted associations between independent variables and ACSHs

ACSHs for any condition

Patient-level characteristics: As shown in Table 1, race/ethnicity was significantly associated with ACSHs for any condition ($p = 0.002$); African-Americans (11.4%) and the 'other' group (10.8%) had the highest rate. Those with schizophrenia had significantly higher rates of ACSHs, as compared to those without schizophrenia (11.9% vs 7.9%, $p = 0.002$). However, other patient-level characteristics including age, sex, Medicaid eligibility status (cash, medical need), mental health conditions (depression and substance abuse), primary care access (continuity of care), and health-care utilization (ER visits, inpatient visits) were not significantly associated with ACSHs for any condition.

County-level characteristics: As shown in Table 1, higher rates of ACSHs for any condition were observed in counties with a significantly lower than average number of community mental health ($p = 0.019$) and rural health centers ($p = 0.009$). Further, higher rates of ACSHs for any condition were observed in counties with a significantly lower per-capita income ($p = 0.002$). However, no significant associations were observed for metropolitan status, primary care and mental health-care shortage area, FQHC, poverty, and hospital density.

ACSHs for chronic conditions

Patient-level characteristics: As shown in Table 2, among demographics, race/ethnicity was significantly associated with ACSH for chronic conditions ($p = 0.003$), where the highest rates of ACSHs for chronic conditions were observed for African-Americans (8.1%). However, other patient-level characteristics, including age, sex, Medicaid eligibility status (cash, medical need), mental health conditions (depression, schizophrenia, and substance abuse), primary care access (continuity of care), and health-care utilization (ER visits, inpatient visits), were not significantly associated with ACSHs for chronic conditions.

County-level characteristics: As shown in Table 2, rates of ACSH were higher for residents living in counties with significantly lower than average number of mental health centers ($p = 0.003$). Further, rates of ACSHs were significantly higher among residents in counties with higher than average per-capita income ($p = 0.014$). No significant associations were observed for metropolitan status, primary care and mental health-care shortage area, rural health centers, FQHC, poverty, and hospital density.

Multivariable models of dependent variables

Adjusted odds ratios (AOR) and 95% confidence intervals (CI) from separate multivariable logistic regressions for ACSHs are summarized in Table 2. Model 1, adjusted only for patient-level characteristics – demographics and Medicaid eligibility status, mental health conditions, primary care access, and health-care utilization. In Model 2, both patient-level and county-level characteristics were included.

ACSHs for any condition

Model 1: Adjusting for patient-level characteristics: As shown in Table 3, among demographics, African-Americans were more likely to have any ACSH (AOR = 1.55; 95% CI: 1.16, 2.07) as compared with Caucasians. Those with schizophrenia were more likely to have any ACSH compared to those without schizophrenia (AOR = 1.54; 95% CI: 1.16, 2.04).

Model 2: Adjusting for patient and county-level characteristics: As shown in Table 3, in the multivariable model including patient-level and county-level variables, patient-level variables remained consistent with Model 1. Regarding county-level characteristics, residents living in counties with higher number of community mental health centers (AOR = 0.88; 95% CI: 0.80, 0.97) and rural health centers (AOR = 0.98; 95% CI: 0.95, 0.99) were less likely to have any ACSH as compared to residents living in counties with lower number of community mental health centers or rural health centers. None of the other county-level factors were significantly associated with any ACSH.

ACSHs for chronic conditions

Model 1: Adjusting for patient-level characteristics: Among demographics, African-Americans were 1.6 times as likely as Caucasians to have any ACSH ($p = 0.003$) (Table 4).

Model 2: Adjusting for patient and county-level characteristics: As shown in Table 4, in the multivariable model including patient- and county-level variables, African-Americans were more likely to have any ACSH for chronic conditions ($p = 0.005$), consistent with Model 1. Regarding county-level characteristics, those residing in counties with higher number of community mental health centers (AOR = 0.80; 95% CI: 0.70, 0.92) were more likely to have ACSHs, whereas counties with higher number of FQHCs (AOR = 1.01; 95% CI: 1.00, 1.02) had lower odds of ACSHs.

Discussion

To the best of our knowledge, this is the first study to examine patient-level and county-level characteristics associated with ACSHs in Medicaid beneficiaries with chronic conditions. The rate of hospitalization for any ACSC was 8.2% among inpatient users from four diverse states. In addition, the rate of ACSHs chronic conditions was 5.3%. These findings are similar to those indicated in the previous reports, in which ACSH accounted for 10% of all hospitalizations in 2008 and potentially preventable chronic conditions accounted for 6.2% of all hospitalizations.[4] These findings suggest that ACSHs persist among FFS Medicaid beneficiaries with selected chronic conditions.

Racial disparities in ACSHs have been previously reported [9,12,40] and were observed in our study, even after controlling for county-level socioeconomic and health factors. Further, higher rates of racial disparities have been reported for preventable hospitalizations for chronic conditions; similar to the findings in our study, where African-Americans had a higher probability of ACSHs for chronic conditions.[9] Our study findings underscore the need for programs and system-level interventions to increase health-care access and reduce

preventable hospitalizations. In addition to interventions, reducing racial disparities will require management of patients within a coordinated health-care system.

Consistent with the previous study findings, we found schizophrenia to be associated with higher rates of ACSHs. The increased risk of ACSHs in individuals with serious mental illnesses can be attributed to the higher rates of concomitant chronic conditions such as diabetes, cardiovascular disease, and chronic lung disease in this population. Our study specifically focused on individuals with chronic physical conditions.[41,42] Further, it has been suggested that patients with schizophrenia have difficulties accessing primary care, receive poorer quality of care for chronic mental and physical health conditions, and have a lower adherence to treatments for chronic conditions, which may further increase the risk of ACSHs in these patients.[41,42]

Regarding county-level characteristics, our study findings indicate that ACSHs are less likely among residents in counties with a higher number of community mental health and rural health centers compared to those without these facilities, consistent with the findings of a previous study.[30] This suggests that access to health care can increase the quality of primary care and reduce hospitalization rates for ACSHs.[10] In addition, our study findings also show that non-metro counties have higher rates of ACSHs, consistent with a previous study,[3] and emphasize the need for improved access to health care. However, with regard to FQHCs, our results indicated an increase in ACSHs in counties with a higher number of FQHCs, contrary to the results from Probst et al.'s study,[10] which found lower ACSH among both working age adults (18–64) and older adults (≥ 65 years) in counties with a higher number of FQHCs.

Practice and policy implications

Our study findings have some practice and policy implications. We found that residents of counties with community mental health-care centers and rural health centers were less likely to have ACSHs. These findings highlight the importance of increasing health-care access through community-based health-care centers. Under the Affordable Care Act, funding for community-based health centers throughout the nation is increased,[43] and it is plausible that these centers may continue to play an essential role in reducing the risk of ACSH among Medicaid beneficiaries.

Our study sheds light on the need for improving delivery of care in individuals with serious mental illnesses such as schizophrenia. This is consistent with prior research, which has documented increased nation-wide rates of preventable hospitalizations among individuals with schizophrenia.[42] Individuals with serious mental illnesses generally present with increased severity of illness to primary care than the general population, thus requiring hospitalization for the appropriate treatment.[41] A review of studies comparing the quality of care between individuals with and without mental illness documented poor quality of medical care among those with mental illness.[20] Furthermore, adult Medicaid beneficiaries with serious mental illness often receive care from different physicians, and these visits are frequently not coordinated. [22] Therefore, a better integration of primary care services into mental health care, also known as reverse integration may reduce the risk of ACSH for these individuals. The emerging models of delivery, such as accountable care

organizations or patient-centered medical homes, which offer coordinated and comprehensive primary care services may be especially important for those with serious mental illnesses. In this context, the role of community-based health-care centers cannot be emphasized enough. According to the Bureau of Primary Health Care, health centers use a team-based approach with a multidisciplinary team of providers that includes behavioral health-care providers, primary care physicians, health educationists, and many others.[43] Further, a study by Laditka et al. indicated that a higher number of primary care physicians is associated with reduced rate of ACSHs, further emphasizing the importance of primary care on overall performance of health-care system.[44]

The study findings also underscored the persistence of racial disparities in preventable hospitalizations. There is also evidence that African-American nonelderly adults may be at high risk for preventable hospitalization even after controlling for individual and county-level characteristics associated with hospitalizations.[40] Therefore, African-American Medicaid beneficiaries may be particularly at increased risk for preventable hospitalizations. Prior research has shown that African-Americans receiving care from community-based health-care centers are less likely to have an ACSH compared to those receiving care elsewhere.[30]

However, studies have shown that not a single intervention but multifactorial interventions that target providers, payers, and community-level infrastructure may be needed to effectively reduce racial disparities.[45] In this context, the Kaiser Family foundation suggestions on increasing the knowledge base, improving the number and capacity of providers in underserved areas, and raising public and provider awareness [46] may be critical in reducing the risk of ACSH among African-Americans.

Limitations

Although this study adds to the nascent literature on ACSH among Medicaid beneficiaries, the study findings need to be interpreted in light of its limitations. As the study focused only on beneficiaries from four states, it is not generalizable to the entire Medicaid population. A majority of population from these states were residing in urban areas, which provide beneficiaries with adequate health-care access, thereby resulting in quality and timely care. The ACSH rates are expected to be higher for states with a majority of population residing in rural areas. Further, our findings might overestimate the racial/ethnic disparities for states that are not racially/ethnically diverse. In addition, the beneficiaries who are not enrolled in Medicaid health maintenance organizations (HMO) were excluded. Given that less than one-third of the population receives FFS care in Medicaid, this study suffers selection bias. It is expected that managed care beneficiaries might have lower rates of ACSHs; however, a previous study [42] showed that there were no differences in preventable hospitalization rates between Medicaid HMO enrollees and Medicaid FFS patients. In addition, our study focused on Medicaid beneficiaries with a subset of the most common physical chronic conditions, which may further limit its generalizability to Medicaid beneficiaries without chronic conditions, which may be at lower risk of ACSHs. Furthermore, our study utilized retrospective cohort approach and cannot be used to establish causal relationships.

Conclusions

Overall, our analyses revealed that Medicaid beneficiaries with chronic conditions experienced 8.2% of preventable hospitalizations, thus warranting the need for comprehensive care for those with chronic conditions. Patient-and county-level factors were associated with the risk of preventable hospitalizations. Programs designed to reduce the risk of ACSH may need to focus on appropriate delivery of high-quality outpatient treatment and disease management.

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Figure 1.
Schematic presentation of selection criteria

Table 1

Description of study population by hospitalization for any ambulatory care sensitive conditions among Medicaid fee-for-service (FFS) beneficiaries with selected physical chronic conditions, multistate Medicaid 2007–2008.

	Total		Any ACSH				
			ACSH		No ACSH		
ALL	N 7021	% 100.0	N 576	% 8.2	N 6445	% 91.8	p-Value
Patient-level characteristics							
Sex							0.140
Female	5579	79.5	444	8.0	5135	92.0	
Male	1442	20.5	132	9.2	1310	90.8	
Age group (years)							0.615
21–24	1471	21.0	109	7.4	1362	92.6	
25–34	2705	38.5	225	8.3	2480	91.7	
35–44	1459	20.8	117	8.0	1342	92.0	
45–54	838	11.9	74	8.8	764	91.2	
55–64	548	7.8	51	9.3	497	90.7	
Race/ethnicity **							0.002
Caucasian	1638	23.3	123	7.5	1515	92.5	
African-American	801	11.4	91	11.4	710	88.6	
Hispanic	3942	56.1	301	7.6	3641	92.4	
Asian/AI/PI	288	4.1	23	8.0	265	92.0	
Other	352	5.0	38	10.8	314	89.2	
Cash eligibility							0.081
Yes	1552	22.1	144	9.3	1408	90.7	
No	5469	77.9	432	7.9	5037	92.1	
Medical eligibility							0.186
Yes	4168	59.4	327	7.8	3841	92.2	
No	2853	40.6	249	8.7	2604	91.3	
Depression							0.585
Yes	971	13.8	84	8.7	887	91.3	
No	6050	86.2	492	8.1	5558	91.9	
Schizophrenia **							0.001
Yes	520	7.4	62	11.9	458	88.1	
No	6501	92.6	514	7.9	5987	92.1	
Substance abuse							0.103
Yes	570	8.1	57	10.0	513	90.0	
No	6451	91.9	519	8.0	5932	92.0	
Continuity of primary care							0.148
Complete	1804	25.7	135	7.5	1669	92.5	
Some	1868	26.6	144	7.7	1724	92.3	

	Total		Any ACSH				
			ACSH		No ACSH		
ALL	N 7021	% 100.0	N 576	% 8.2	N 6445	% 91.8	p-Value
None	3349	47.7	297	8.9	3052	91.1	
Emergency room (ER) visits							0.454
Any ER visit	1415	20.2	123	8.7	1292	91.3	
No ER visits	5606	79.8	453	8.1	5153	91.9	
Inpatient (IP) visits							0.336
Any IP visit	1238	17.6	110	8.9	1128	91.1	
No IP visits	5783	82.4	466	8.1	5317	91.9	
County-level characteristics							
Metropolitan status							0.323
Non-metro	513	7.3	48	9.4	465	90.6	
Metro	6508	92.7	528	8.1	5980	91.9	
Primary care shortage area							0.728
Whole county	5354	76.3	433	8.1	4921	91.9	
Part county	1376	19.6	116	8.4	1260	91.6	
No shortage	291	4.1	27	9.3	264	90.7	
Mental health care shortage area							0.982
Whole county	4574	65.1	377	8.2	264	91.8	
Part county	2035	29.0	166	8.2	4921	91.8	
No shortage	412	5.9	33	8.0	1260	91.6	
	Mean	SD	Mean	SD	Mean	SD	
CMHC *	1.17	1.72	1.01	1.36	1.19	1.75	0.019
Rural health center **	2.20	6.56	1.51	4.75	2.25	6.70	0.009
FQHC	26.30	27.16	26.65	28.88	26.27	27.00	0.745
% Below poverty level	14.90	4.24	14.81	4.09	14.91	4.26	0.602
Per-capita income (USD) **	46,072.14	25,153.46	49,168.53	27,992.76	45,795.42	24,867.58	0.002
Hospital density	1.48	1.30	1.48	1.02	1.48	1.32	0.963

Based on 7021 nonelderly (21–64 years) FFS Medicaid beneficiaries residing in California, Illinois, New York, and Texas with selected physical chronic conditions, who were alive and had continuous FFS enrollment through the observation period, and were not enrolled in Medicare. Significant group differences in hospitalization for any condition were tested with chi-square and *t*-tests. Asterisks represent significant group differences between the ‘ambulatory care sensitive hospitalization’ and ‘no ambulatory care sensitive hospitalization’ groups.

p < 0.001;

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0.001 *p* < 0.01;

*
0.01 *p* < 0.05.

ACSH: Ambulatory care sensitive hospitalizations; AI/PI: American Indian or Pacific Islander; CMHC: community mental health center; FQHC: federally qualified health center; SD: standard deviation; USD: United States dollar.

Table 2

Description of study population by hospitalization for chronic ambulatory care sensitive conditions among Medicaid fee-for-service (FFS) beneficiaries with selected physical chronic conditions, multistate Medicaid 2007–2008.

ALL	Total		Chronic ACSH				p-Value
	N 7021	% 100.0	ACSH		No ACSH		
			N 374	% 5.3	N 6445	% 94.7	
Patient-level characteristics							
Sex							0.227
Female	5579	79.5	345	5.2	6274	94.8	
Male	1442	20.5	97	5.9	1553	94.1	
Age group (years)							0.821
21–24	1471	21.0	75	5.1	1396	94.9	
25–34	2705	38.5	144	5.3	2561	94.7	
35–44	1459	20.8	73	5.0	1386	95.0	
45–54	838	11.9	51	6.1	787	93.9	
55–64	548	7.8	31	5.7	517	94.3	
Race/ethnicity **							0.003
Caucasian	1638	23.3	85	5.2	1553	94.8	
African-American	801	11.4	65	8.1	736	91.9	
Hispanic	3942	56.1	186	4.7	3756	95.3	
Asian/AI/PI	288	4.1	15	5.2	273	94.8	
Other	352	5.0	23	6.5	329	93.5	
Cash eligibility							0.088
Yes	1552	22.1	96	6.2	1456	93.7	
No	5469	77.9	278	5.1	5191	94.9	
Medical eligibility							0.447
Yes	4168	59.4	215	5.2	3953	94.8	
No	2853	40.6	159	5.6	2694	94.4	
Depression							0.791
Yes	971	13.8	50	5.1	921	94.9	
No	6050	86.2	324	5.4	5726	94.6	
Schizophrenia							0.059
Yes	520	7.4	37	7.1	483	92.9	
No	6501	92.6	337	5.2	6164	94.8	
Substance abuse							0.367
Yes	570	8.1	35	6.1	535	93.9	
No	6451	91.9	339	5.3	6112	94.7	
Continuity of primary care							0.106
Complete	1804	25.7	84	4.7	1720	95.3	
Some	1868	26.6	92	4.9	1776	95.1	

	Total		Chronic ACSH				
			ACSH		No ACSH		
ALL	<i>N</i> 7021	% 100.0	<i>N</i> 374	% 5.3	<i>N</i> 6445	% 94.7	<i>p</i> -Value
None	3349	47.7	198	5.9	3151	94.1	
Emergency room (ER) visits							0.456
Any ER visit	1415	20.2	81	5.7	1334	94.3	
No ER visits	5606	79.8	293	5.2	5313	94.8	
Inpatient (IP) visits							0.572
Any IP visit	1238	17.6	70	5.7	1168	94.3	
No IP visits	5783	82.4	304	5.3	5479	94.7	
County-level Characteristics							
Metropolitan status							0.891
Non-metro	513	7.3	28	5.5	485	94.5	
Metro	6508	92.7	346	5.3	6162	94.7	
Primary care shortage area							0.090
Whole county	5354	76.3	286	5.3	5068	94.7	
Part county	1376	19.6	65	4.7	1311	95.3	
No shortage	291	4.1	23	7.9	268	92.1	
Mental health-care shortage area							0.964
Whole county	4574	65.1	244	5.3	4330	94.7	
Part county	2035	29.0	107	5.3	1928	94.7	
No shortage	412	5.9	23	5.6	389	94.4	
	Mean	SD	Mean	SD	Mean	SD	
CMHC *	1.17	1.72	0.96	1.16	1.18	1.74	0.013
Rural health center	2.20	6.56	1.58	4.85	2.23	6.64	0.065
FQHC	26.30	27.16	27.39	30.21	26.24	27.00	0.426
% Below poverty level	14.90	4.24	14.52	3.67	14.92	4.27	0.074
Per-capita income (USD) *	46,072.14	25,153.46	49,173.00	27,909.02	45,897.67	24,980.27	0.014
Hospital density	1.48	1.30	1.44	0.93	1.48	1.31	0.595

Based on 7021 nonelderly (21–64 years) FFS Medicaid beneficiaries residing in California, Illinois, New York, and Texas with selected physical chronic conditions, who were alive and had continuous FFS enrollment through the observation period, and were not enrolled in Medicare. Significant group differences in hospitalization for chronic condition were tested with chi-square and *t*-tests. Asterisks represent significant group differences between the ‘ambulatory care sensitive hospitalization’ and ‘no ambulatory care sensitive hospitalization’ groups.

 $p < 0.001$;

**
0.001 $p < 0.01$;

*
0.01 $p < 0.05$.

ACSH: Ambulatory care sensitive hospitalizations; AI/PI: American Indian or Pacific Islander; CMHC: community mental health center; FQHC: federally qualified health center; SD: standard deviation; USD: United States dollar.

Table 3

Adjusted odds ratios (AOR) and 95% confidence intervals (CI) from multivariable logistic regressions of hospitalizations for any ambulatory care sensitive conditions among Medicaid fee-for-service (FFS) beneficiaries with selected chronic conditions, multistate Medicaid, 2007–2008.

	Model 1			Model 2		
	AOR	95% CI	p-Value	AOR	95% CI	p-Value
Patient-level characteristics						
Sex						
Female	Ref			Ref		
Male	1.05	[0.84,1.32]	0.641	1.02	[0.81,1.28]	0.844
Age group (years)						
21–24	Ref			Ref		
25–34	1.14	[0.90,1.45]	0.558	1.15	[0.90,1.46]	0.796
35–44	1.06	[0.81,1.40]	0.910	1.05	[0.80,1.39]	0.610
45–54	1.07	[0.78,1.48]	0.783	1.01	[0.73,1.40]	0.959
55–64	1.12	[0.77,1.63]	0.832	1.04	[0.72,1.53]	0.880
Race/ethnicity						
Caucasian	Ref			Ref		
African-American **	1.55	[1.16,2.07]	0.004	1.53	[1.12,2.09]	0.002
Hispanic	1.04	[0.82,1.32]	0.786	1.11	[0.86,1.43]	0.762
Asian/AI/PI	1.13	[0.71,1.82]	0.074	1.20	[0.74,1.95]	0.172
Other	1.47	[0.94,2.16]	0.362	1.42	[0.95,2.11]	0.524
Cash eligibility						
Yes	Ref			Ref		
No	1.02	[0.76,1.36]	0.905	1.09	[0.88,1.36]	0.502
Medical eligibility						
Yes	Ref			Ref		
No	1.05	[0.85,1.31]	0.632	1.06	[0.86,1.29]	0.463
Depression						
Yes	Ref			Ref		
No	1.03	[0.80,1.31]	0.825	1.05	[0.82,1.35]	0.726
Schizophrenia **						
Yes	Ref			Ref		
No	0.65	[0.49,0.86]	0.003	0.64	[0.48,0.85]	0.002
Substance abuse						
Yes	Ref			Ref		
No	0.88	[0.65,1.18]	0.382	0.90	[0.67,1.22]	0.477
Continuity of primary care						
None	Ref			Ref		
Some	0.86	[0.71,1.04]	0.217	0.89	[0.72,1.10]	0.326
Complete	0.90	[0.73,1.09]	0.992	0.90	[0.72,1.12]	0.942
Emergency room (ER) visits						

	Model 1			Model 2		
	AOR	95% CI	p-Value	AOR	95% CI	p-Value
No ER visits	Ref			Ref		
Any ER visit	1.02	[0.84,1.24]	0.722	1.02	[0.82,1.26]	0.821
Inpatient (IP) visits						
No IP visits	Ref			Ref		
Any IP visits	1.06	[0.86,1.30]	0.341	1.05	[0.85,1.29]	0.524
County-level characteristics						
Metropolitan status						
Metro				Ref		
Non-metro				1.40	[0.92,2.15]	0.126
Primary care shortage area						
No shortage				Ref		
Whole county				0.82	[0.49,1.37]	0.566
Part county				0.86	[0.51,1.45]	0.723
Mental health-care shortage area						
No shortage				Ref		
Whole county				1.06	[0.65,1.71]	0.321
Part county				1.08	[0.68,1.72]	0.889
CMHC *				0.88	[0.80,0.97]	0.011
Rural health center *				0.98	[0.95,0.99]	0.028
FQHC				1.00	[0.99,1.01]	0.111
% Below poverty level				1.01	[0.98,1.03]	0.630
Per-capita income				1.00	[1.00,1.00]	0.389
Hospital density				0.96	[0.88,1.06]	0.434

Based on 7021 nonelderly (21–64 years) FFS Medicaid beneficiaries residing in California, Illinois, New York, and Texas with selected physical chronic conditions, who were alive and had continuous FFS enrollment through the observation period, and were not enrolled in Medicare.

Model 1 consisted of only patient-level variables (demographic and Medicaid eligibility characteristics, mental health conditions, primary care access, and health-care utilization).

Model 2 consisted of both patient-level and county-level variables. County-level variables were metropolitan statistical area, primary care shortage areas, mental health-care shortage areas, community mental health centers, rural health centers, federally qualified health centers, poverty level, per-capita income, and hospital density.

Asterisks represent significant group differences in ambulatory care sensitive hospitalization compared to the reference group. The logistic regressions also included intercept terms.

 $p < 0.0001$;

**
0.001 $p < 0.01$;

*
0.01 $p < 0.05$.

ACSH: Ambulatory care sensitive hospitalization; AI/PI: American Indian or Pacific Islander; CMHC: community mental health center; FQHC: federally qualified health center.

Table 4

Adjusted odds ratios (AOR) and 95% confidence intervals (CI) from multivariable logistic regressions of hospitalizations for chronic ambulatory care sensitive conditions among Medicaid fee-for-service (FFS) beneficiaries with selected chronic conditions, multistate Medicaid, 2007–2008.

	Model 1			Model 2		
	AOR	95% CI	p-Value	AOR	95% CI	p-Value
Patient-level characteristics						
Sex						
Female	Ref			Ref		
Male	1.03	[0.78,1.35]	0.856	1.00	[0.76,1.32]	0.996
Age group (years)						
21–24	Ref			Ref		
25–34	1.07	[0.80,1.43]	0.812	1.08	[0.81,1.45]	0.699
35–44	0.97	[0.69,1.35]	0.567	0.97	[0.69,1.36]	0.443
45–54	1.05	[0.71,1.54]	0.928	1.00	[0.67,1.48]	0.800
55–64	0.95	[0.60,1.50]	0.664	0.91	[0.57,1.45]	0.706
Race/ethnicity						
Caucasian	Ref			Ref		
African-American **	1.60	[1.14,2.25]	0.003	1.55	[1.07,2.24]	0.005
Hispanic	0.87	[0.70,1.24]	0.353	1.01	[0.74,1.37]	0.256
Asian/AI/PI	1.07	[0.59,1.86]	0.201	1.12	[0.62,2.02]	0.564
Other	1.22	[0.78,2.04]	0.587	1.16	[0.71,1.90]	0.930
Cash eligibility						
Yes	Ref			Ref		
No	0.96	[0.68,1.36]	0.817	1.02	[0.70,1.50]	0.906
Medical eligibility						
Yes	Ref			Ref		
No	1.00	[0.76,1.31]	0.989	1.04	[0.79,1.36]	0.799
Depression						
Yes	Ref			Ref		
No	1.12	[0.83,1.54]	0.451	1.15	[0.84,1.49]	0.371
Schizophrenia						
Yes	Ref			Ref		
No	0.71	[0.50,1.02]	0.063	0.71	[0.49,1.01]	0.060
Substance abuse						
Yes	Ref			Ref		
No	0.93	[0.64,1.35]	0.696	0.96	[0.66,1.41]	0.844
Continuity of primary care						
None	Ref			Ref		
Some	0.84	[0.65,1.08]	0.158	0.87	[0.67,1.12]	0.241
Complete	0.82	[0.63,1.08]	0.907	0.85	[0.65,1.12]	0.897
Emergency room (ER) visits						

	Model 1			Model 2		
	AOR	95% CI	p-Value	AOR	95% CI	p-Value
No ER visits	Ref			Ref		
Any ER visit	1.04	[0.81,1.35]	0.738	1.03	[0.79,1.33]	0.840
Inpatient (IP) visits						
No IP visits	Ref			Ref		
Any IP visits	1.02	[0.79,1.31]	0.452	1.01	[0.79,1.30]	0.371
County-level characteristics						
Metropolitan status						
Metro				Ref		
Non-metro				1.25	[0.72,2.15]	0.426
Primary care shortage area						
No shortage				Ref		
Whole county				0.67	[0.37,1.21]	0.060
Part county				0.56	[0.30,1.02]	0.278
Mental health-care shortage area						
No shortage				Ref		
Whole county				1.28	[0.71,2.31]	0.413
Part county				1.27	[0.72,2.23]	0.953
CMHC **				0.80	[0.70,0.92]	0.002
Rural health center				0.98	[0.96,1.01]	0.242
FQHC *				1.01	[1.00,1.02]	0.022
% Below poverty level				0.98	[0.94,1.01]	0.237
Per-capita income				1.00	[1.00,1.00]	0.893
Hospital density				0.95	[0.83,1.08]	0.402

Based on 7021 nonelderly (21–64 years) FFS Medicaid beneficiaries residing in California, Illinois, New York, and Texas with selected physical chronic conditions, who were alive and had continuous FFS enrollment through the observation period, and were not enrolled in Medicare.

Model 1 consisted of only patient-level variables (demographic and Medicaid eligibility characteristics, mental health conditions, primary care access, and health-care utilization).

Model 2 consisted of both patient-level and county-level variables. County-level variables were metropolitan statistical area, primary care shortage areas, mental health-care shortage areas, community mental health centers, rural health centers, federally qualified health centers, poverty level, per-capita income, and hospital density.

Asterisks represent significant group differences in ambulatory care sensitive hospitalization compared to the reference group. The logistic regressions also included intercept terms.

 $p < 0.0001$;

**
0.001 $p < 0.01$;

*
0.01 $p < 0.05$.

ACSH: Ambulatory care sensitive hospitalization; AI/PI: American Indian or Pacific Islander; CMHC: community mental health center; FQHC: federally qualified health center.