



A 3-State Analysis of Black–White Disparities in Diabetes Hospitalizations Among Medicaid Beneficiaries

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Abstract

Introduction: Although diabetes is one of the leading chronic disease in the country, efforts in primary care and patient self-care management could prevent most of the diabetes-related hospitalizations and produce cost savings and improvements in quality of life. We used information from Medicaid beneficiaries in 3 states to predict racial differences in diabetes hospitalizations and demonstrate how they vary across states.

Methods: We conducted a cross-sectional study to examine differences between black and white patients with diabetes hospitalizations. Information was obtained from the Medicaid Analytic eXtract files. We used multiple logistic regression models to assess the significance of the differences.

Results: Analysis included 10 073 adult Medicaid recipients from the states of Mississippi (51%), Georgia (35%), and Michigan (14%). Blacks were more likely to experience longer hospital stays in Georgia (odds ratio [OR] = 1.040; 95% confidence interval [CI]: 1.03-1.06) and Mississippi (OR = 1.048; 95% CI: 1.03-1.07). A majority of patients in both groups were likely to be discharged to their homes for self-care. Black patients had lower odds of repeated stays in Georgia (OR = 0.670; 95% CI: 0.54-0.84), but higher odds in Michigan (OR = 1.580; 95% CI: 1.12-2.24). Similar differences occurred when patients were matched by age and sex. Blacks had lower odds of qualifying for dual Medicare–Medicaid enrollment benefit in Georgia and Mississippi.

Conclusion: Racial differences in diabetes-related hospitalizations reflect possible inefficiencies in the process of care. Identification of race-specific factors for hospitalizations and implementation of primary care strategies that support effective self-management skills would aid in reducing diabetes hospitalizations and related disparities.

Keywords

diabetes, diabetes hospitalization, racial disparities, Medicaid, health disparities

Introduction

Nearly 12% of US adult population has been reported to have diabetes.¹ In 2012 alone, the US spending on diabetes was \$245 billion, of which inpatient care expenditure accounted for \$76 billion, or about 30% of the total diabetes-related expenditure. In addition, diabetes was a listed diagnosis in 7.2 million hospital discharges among US adults in 2014, with a reported average hospitalization cost of \$28 083 per person.²

Racial disparities in access to health care and differences in quality of care have been persistent in the United States, and epidemiological studies have suggested existence of racial disparities in the prevalence, treatment, and outcomes related to diabetes.^{3,4} Previous investigations have shown that compared

to whites, blacks have higher prevalence rates of diabetes, worse glycemic control, and greater frequency of hospital admissions due to diabetic complications.^{5,6} Meanwhile, reports show African Americans continue to experience more

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barriers to access to health care and low quality of care compared to white Americans.⁷

Medicaid is the largest public health insurance for low-income and minority populations, with 60% of its beneficiaries being racial minorities.⁸ Racial disparities have been reported in different aspects of care among Medicaid enrollees. For instance, the risk of poor adherence to antidiabetic medications was 12% higher among African Americans compared to whites,⁹ and African Americans experience lower rates of health insurance coverage than whites in all insurance categories, thus creating barriers to timely diagnosis and potential increases to untreated diabetes-related conditions.¹⁰ Generally, disparities in the frequency of receiving preventive care contribute to the overall differences in the quality of care between African Americans and whites.¹¹

Since most of the racial minorities are disproportionately vulnerable to a majority of diabetes-related conditions, including end-stage renal disease, extremity amputation, and diabetic retinopathy that lead to increased need for hospitalizations,¹²⁻¹⁴ hospitalizations become a critical measure of service utilization in relation to the disease. This measure is associated with both quality and cost of care and thus has a great potential for producing useful information on effectiveness of care. In the current study, we used the experience of Medicaid enrollees in the states of Georgia, Michigan, and Mississippi to make a cross-sectional examination of racial differences in diabetes hospitalizations. Despite having the chronically ill account for 80% of total Medicaid expenditure,¹⁵⁻¹⁸ and a widely available body of knowledge on racial and ethnic disparities in health care,⁸ literature is still limited on information regarding disparities in diabetes care within the Medicaid population. Disparities among Medicaid recipients would contribute toward increasing the magnitude of racial inequities in the country. Although states might have different eligibility rules, Medicaid population is generally considered to be at higher risk in almost all categories of health and health care, including excessive diabetes hospitalizations. Racial disparities that may be masked by geographical variations in this population could have severe implications than those occurring in the general population.

Methods

Patients and Inclusion Criteria

Patients in this study were Medicaid recipients in the states of Georgia, Michigan, and Mississippi who had diabetes hospitalizations in 2009. We selected the states included in this study to be able to examine racial differences without the potential confounding effect of location. All 3 states taken together provide a meaningful opportunity for making South–Midwest comparisons that may present distinct features related to racial distribution of the residents with possible manifestation of racial differences attributable to geographical location.¹⁹ In the study, we included patients aged 18 years or older with known racial identities. We defined diabetes hospitalization as any

hospital inpatient stay in which diabetes was first-, second-, or third-listed recorded diagnoses at discharge to capture the magnitude of the disease among Medicaid recipients. Diagnostic codes in the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM; ICD-9, all 250 codes)* were used to determine patients with diabetes hospitalizations. Only black and white patients who had diabetes hospitalizations during the year of study were included. Patients of other races were excluded from this study to create black–white-only differences in diabetes hospitalizations since African Americans are the predominant minority group in the states included in the study and have exhibited a higher burden of the disease among other racial minority groups.^{9,20} We obtained patient information from the Medicaid Analytic eXtract data system, owned and managed by the Centers for Medicare and Medicaid Services (CMS).²¹ The system collects personal-level information that includes demographic and clinical profile associated with inpatient care.

Variable Definitions

Demographic variables for the patients included race, age in years, gender, and state of residence. Dual Medicare–Medicaid enrollment eligibility was included as a system variable to examine resource differential between the 2 racial groups. Clinical variables included length of stay (in days), repeated stays in the year of study, having a procedure, including diabetes-related procedures during admission, and discharge status. We assessed discharge status as a dichotomous variable; the first category was that of patients discharged to their homes for self-care, while the second category included patients transferred into other facilities or their homes for follow-up care. Postdischarge follow-up care included both home-based care and facility-based outpatient services. Lastly, we computed cost of care as the product of total charges billed to the patient and CMS' cost to charge ratio for the year of study. This cost measure produces estimates of hospital cost from reported charges and serves as a proxy for hospital payments.²²

Analysis

We computed descriptive statistics to examine demographic and clinical profiles of the patients based on their racial backgrounds. Chi-square tests of associations and *t* tests for comparisons of means were performed to investigate racial differences among the patients in the study. Multiple logistic regression was used to predict black–white differences in diabetes hospitalizations; two different models were used at this level of analysis for each state. In the first model, all patients from each state were included in the analysis. In the second model, black patients were age- and sex-matched to white patients in an attempt to eliminate any biases that might be introduced by any unequal distribution of age or gender in diabetes hospitalizations between the 2 racial groups. Both models were adjusted for all covariates in the study.

Table 1. Patient Profiles in Diabetes Hospitalizations Among Medicaid Recipients in a 3-State Study.

Patient Factors	Georgia		Michigan		Mississippi	
	Black	White	Black	White	Black	White
Patients in racial group, n (%)	2157 (60)	1413 (40)	534 (39)	840 (61)	3518 (69)	1611 (31)
Age, years (SD)	55.4 (18.87)	59.3 (17.7) ^a	43.3 (16.7)	47.4 (16.5) ^a	55.5 (16.9)	56.5 (15.9)
Gender (female, %)	1745 (77)	1073 (82) ^b	319 (59)	500 (59)	2754 (79)	1140 (72) ^a
Cost of care, mean (SD), US\$	3712 (5102)	3086 (3893) ^a	4256 (8928)	3909 (6499) ^a	3535 (4717)	3436 (4284)
Procedure on admission, yes (%)	1368 (36)	873 (38)	289 (52)	408 (47) ^a	2519 (28)	1143 (28)
Discharge status						
Home (self-care; %)	1571 (74)	992 (71) ^a	381 (70)	583 (69)	2378 (68)	1031 (65)
Institutionalized care (%)	555 (26)	405 (29)	160 (30)	261 (31)	1112 (32)	561 (35)
Length of stay, days (SD)	2.8 (4.3)	2.1 (3.6) ^a	4.6 (8.0)	3.5 (4.5) ^a	2.7 (3.5)	2.5 (3.4)
Repeated stays, yes (%)	480 (27)	286 (24) ^a	169 (40)	188 (28) ^b	967 (34)	395 (29) ^b
Dual eligibility, yes (%)	875 (41)	764 (55) ^b	66 (12)	144 (17) ^a	1275 (37)	661 (42) ^b

Abbreviation: SD, standard deviation.

^a*P* < .05.^b*P* < .01.**Table 2.** Logistic Regression Results of 3-State Comparisons in the Prediction of Black–White Differences in Diabetes Hospitalizations Among Medicaid Recipients.

Patient Factors	Georgia (n = 3570)	Michigan (n = 1374)	Mississippi (n = 5129)	All Patients
	Odds Ratios and Corresponding 95% Confidence Intervals			
Age, years (SD)	0.996 (0.99-1.00)	0.990 (0.98-0.99) ^a	1.001 (0.99-1.01)	1.001 (0.99-1.01)
Gender (female, %)	1.422 (1.19-1.71) ^b	1.1058 (0.82-1.36)	1.458 (1.26-1.69) ^b	1.504 (1.36-1.67) ^b
Cost of care, mean (SD)	1.000 (0.99-1.00)	1.000 (0.99-1.00)	1.000 (0.99-1.00)	1.000 (0.99-1.00)
Had procedure on admission	0.888 (0.75-1.06)	0.821 (0.63-1.07)	0.986 (0.83-1.17)	0.795 (0.72-0.88) ^b
Discharge to home for self-care	0.900 (0.76-1.07)	0.936 (0.70-1.25)	0.901 (0.78-1.05)	0.907 (0.82-1.01)
Length of stay, days (SD)	1.040 (1.03-1.06) ^b	1.001 (0.98-1.02)	1.048 (1.03-1.07) ^b	1.034 (1.02-1.04) ^b
Had repeated stays	0.670 (0.54-0.84) ^b	1.580 (1.12-2.24) ^a	0.883 (0.74-1.06)	0.944 (0.833-1.069)
Qualify for dual eligibility	0.770 (0.64-0.93) ^b	1.195 (0.87-1.64)	0.806 (0.68-0.95) ^a	0.863 (0.77-0.97) ^a

Abbreviation: SD, standard deviation.

^a*P* < .05.^b*P* < .01.

Results

Table 1 presents the profiles of the 10 073 adult Medicaid recipients who had diabetes-related hospitalizations in the 3 states in the study in 2009. Of these, 5129 (51%) were from the state of Mississippi, 3570 (35%) from Georgia, and 1374 (14%) from Michigan. Within states, we found out Georgia (60%) and Mississippi (69%) had higher proportions of black patients than did Michigan (39%). White patients were slightly older than blacks patients in all the 3 states. Women made at least 72% of the diabetes hospitalizations in both racial groups in the states of Georgia and Mississippi, while there were equal proportions (59%) of females with such hospitalizations in the state of Michigan. Black patients had more procedures on admission (52% vs 47%) in the state of Michigan and had higher cost of care than did white patients in all 3 states. Most patients in both racial groups in all 3 states were discharged home for self-care. Black patients had longer hospital stays in Georgia (2.8 vs 2.1 days) and Michigan (4.6 vs 3.5 days) as

well as larger proportion of repeated hospital stays in all 3 states. Also, the data showed larger percentages of white than black patients to have dual Medicare–Medicaid enrollment benefit in all 3 states: Georgia (55% vs 41%), Mississippi (42% vs 37%), and Michigan (17% vs 12%)

Table 2 shows the results of multiple logistic regression model on the black–white differences in diabetes hospitalizations in the 3 states included in the study. Black patients were shown to be more likely to be hospitalized younger than their white counterparts in the state of Michigan (odds ratio [OR] = 0.990; 95% confidence interval [CI]: 0.98-0.99). Compared to white female patients, black female patients in Georgia were 1.4 times and those in Mississippi were 1.5 times more likely to be hospitalized with diabetes (OR = 1.422; 95% CI: 1.19-1.71 and OR = 1.458; 95% CI: 1.26-1.69, respectively). There were no racial differences in the cost of care, odds of having a procedure, and discharge destination across the 3 states in the study. However, when patients from all 3 states were grouped together, the data showed black patients were about 20% less

Table 3. Logistic Regression Model of Age- and Gender-Matched Analysis of Black–White Differences in Diabetes Hospitalizations Among Medicaid Recipients.

	Georgia (n = 1906)	Michigan (n = 738)	Mississippi (n = 3505)	All Patients
Patient Factors	Odds Ratios and Corresponding 95% Confidence Intervals			
Cost of care, mean (SD)	1.000 (0.99-1.00)	1.000 (0.99-1.00)	1.000 (0.99-1.00)	1.000 (0.99-1.00)
Had procedure on admission	0.857 (0.69-1.07)	0.933 (0.64-1.36)	0.909 (0.72-1.14)	0.772 (0.7-0.89) ^a
Discharge to home for self-care	1.056 (0.85-1.31)	1.082 (0.72-1.64)	1.147 (0.95-1.38)	1.070 (0.94-1.22)
Length of stay, days (SD)	1.059 (1.03-1.09) ^a	1.034 (0.99-1.09)	1.033 (1.01-1.06) ^b	1.054 (1.03-1.08) ^a
Had repeated stays	0.483 (0.34-0.69) ^a	0.750 (0.40-1.42)	0.855 (0.65-1.13)	0.711 (0.58-1.87)
Qualify for dual eligibility	0.597 (0.49-0.73) ^a	0.682 (0.44-1.07)	0.816 (0.67-0.99) ^b	0.798 (0.71-0.90) ^a

Abbreviation: SD, standard deviation.

^a*P* < .01.

^b*P* < .05.

likely than white patients to have a procedure on admission (OR = 0.795; 95% CI: 0.72-0.88). The results further showed black patients in Georgia had 4.0% (OR = 1.040; 95% CI: 1.03-1.06), while those in Mississippi had 4.8% (OR = 1.048; 95% CI: 1.03-1.07) higher odds than the white patients to experiencing longer hospital stays when admitted for diabetes-related reasons. Compared to white patients, black patients in Georgia were less likely, but those in Michigan were more likely, to have repeated hospitalizations for diabetes-related reasons (OR = 0.670; 95% CI: 0.54-0.84 and OR = 1.580; 95% CI: 1.12-2.24, respectively). In relation to dual Medicare–Medicaid enrollment, black patients were found to have 23% (OR = 0.770; 95% CI: 0.64-0.93) and about 19% (OR = 0.806; 95% CI: 0.68-0.95) lower odds of qualifying for the benefit in the states of Georgia and Mississippi, respectively.

Table 3 shows the results of the second logistic regression model in which black patients were matched by age and sex to white patients for a further examination of racial differences in diabetes hospitalizations. We found no racial differences in diabetes hospitalizations in the state of Michigan based on all factors included in the analyses. However, black patients who had diabetes hospitalizations in the states of Georgia and Mississippi were at higher risk of having longer hospital stays than white patients (OR = 1.059; 95% CI: 1.03-1.09 and OR = 1.033; 95% CI: 1.01-1.06). Furthermore, black patients in the state of Georgia were 52% less likely to experience repeated hospital stays (OR = 0.483; 95% CI: 0.34-0.69).

The data showed when matched by age and sex with white patients, black patients were less likely to qualify for dual Medicare–Medicaid enrollment benefit in the states of Georgia (OR = 0.597; 95% CI: 0.49-0.73) and Mississippi (OR = 0.816; 95% CI: 0.67-0.99). This finding held when patients from all 3 states were grouped together (OR = 0.798; 95% CI: 0.71-0.90).

Discussion

Diabetes is one of the ambulatory care–sensitive conditions, that is, a condition by which a great potential exists for

prevention of diabetes-related hospitalizations if ambulatory services include effective disease management strategies, especially in the area of primary care.²³ We conducted a study in 2 Southern and 1 Midwest states to examine and determine factors responsible for differences in diabetes hospitalizations between white and black patients among Medicaid beneficiaries. We found demographic, clinical, and system-related differences between the 2 racial groups. These differences varied among states and could have implications on disease management, cost, and resource allocation.

The occurrence of racial differences in health and health care often leads to considerations of applying cultural-specific interventions that could be effective in producing meaningful reductions in disparity gaps. In our study, both white and black patients exhibited unfavorable patterns in different aspects of diabetes hospitalizations. Based on these trends, and geographical locations, policy makers as well as providers and systems of care should be sensitive and intentional in promoting the implementation of practices leading to adequate utilization of cultural-specific and location-specific interventions in diabetes care. At the minimum, in order to decrease the likelihood of avoidable hospitalizations, any changes in the Medicaid program should consider improvements in the access to primary care to its beneficiaries.

We observed that most patients in both racial groups had home discharges for self-care. This is encouraging and suggestive of the development of more aggressive approaches in disease management strategies to reduce the risk of repeated hospitalizations for those who had to be hospitalized with diabetes. Patient navigators and disease management teams should be involved in the preparations of discharge protocols to effectively generate information for supporting patient's efforts in disease management. Any multidisciplinary or interdisciplinary support teams formed for this purpose would add value into the patient's power and ability to manage different aspects of the disease. For example, cultural-relevant disease management practices should integrate discharge plans and home-based services since a majority of patients in both racial groups are discharged home where they can utilize preplanned disease management interventions as part of their self-care. Cost

savings could be realized through this strategy by avoidance of readmission penalties and use of less costly outpatient services.

The reason for decreasing likelihood of procedures among black patients could not be determined by this study. Under ideal circumstance, this finding would imply cost savings, and in that sense, an understanding of how this population attains such a favorable disease course would be important for disease management purposes. However, previous investigations have reported that hospitals with high proportions of hospitalizations among African Americans have low rates of technology utilization on both black and white patients.²⁴ The study determined that black patients might be deprived in access to new procedures by receiving care at hospitals that have both lower procedure rates and higher racial disparities.²⁵ Another study reported that white patients tend to receive more intravenous recombinant tissue plasminogen activator therapy, a primary treatment after stroke, compared to their black counterparts.²⁶ Future studies that could establish the nature of the racial differences in the rates of procedures in diabetes hospitalizations would be necessary to make accurate assessments to determine what policy or care delivery approaches to adopt.

Since diabetes is a condition that could be successfully addressed at the primary care level, diabetes-related hospitalizations might reflect missed opportunities for possible cost savings caused by lapses in access and adherence to primary care services. Structural, personal, and cultural hindrances to effective primary care services, especially those with the greatest potential to cause racial disparities, should be identified and addressed by appropriate policy measures. For example, a study that compared primary care physicians who had less than 50% of patients from the minority groups with primary care physician who had more than 50% of minority group patients²⁷ showed that physicians who treated a greater number of minority patients were less educated and less experienced on preventive care practices and less likely to be board-certified practitioners. Furthermore, primary care physicians working with African Americans patients tend to provide a lower quality of care to all patients than do primary care providers working for plans in which fewer patients are African Americans.²⁸ Poor performance by such providers may increase the rates of preventable hospitalizations because they are likely to introduce inefficiencies such as disparities in preventive care and treatment.

When we attempted to match patients by age and sex, we found the results did not change in the southern states of Mississippi and Georgia. These are among the states with the highest proportions of African Americans in the country. This finding exhibits the power of the study in demonstrating black–white differences that go beyond age and sex differences in the southern region of the nation. That is, longer hospital stays among black patients might be occurring due to negative behaviors in the communities, including poor preventive care experiences, cultural behaviors, and poor lifestyle choices. On the other hand, consistently low odds of eligibility for Medicaid–Medicare dual enrollment benefit among blacks might be a result of system failure at different levels in traditionally

black parts of the country. This failure could be partly responsible for escalating disease severity in black communities due to poor access to primary care services. Combined with the finding that no such Medicare–Medicaid enrollment differences existed between the 2 racial groups in the Midwest state, policy makers and provider communities should strongly consider state- and race-specific interventions targeting high-risk populations to promote adequate resource distribution. Furthermore, since Medicaid is a state-funded program using a combination of state and federal resources for its beneficiaries, differences in coverage or benefits such as dual eligibility that occur at either federal or state levels are important for both decision-making and resource allocation, and as such, they should be reflected in program management.

Despite the racial differences in diabetes hospitalizations, an important implication of our study is that overall benefits resulting from the reductions in diabetes hospitalizations such as potential cost savings and improvements in quality of life could be attainable with effective prevention of hospitalizations in both racial groups. According to our findings, prevention of the first hospitalization for a white Medicaid recipient is likely to eliminate possible repeated episodes of hospitalizations a patient is likely to experience. For a black Medicaid recipient, prevention of any diabetes hospitalization is important since the patient would potentially avoid an extended hospital stay once admitted. In addition, cost savings would be more significant when repeated hospitalizations, a possible area of cost concerns, are reduced among blacks. For example, a separate analysis of our data involving only black patients with repeated hospitalizations revealed this patient group as one of the largest consumer of inpatient care with cost of care higher than any other patient subgroup. Therefore, implementation of evidence-based diabetes prevention and home self-care strategies in communities across the country should be in the best interest of policy makers at all levels of the health-care system for reductions in preventable hospitalizations.

We acknowledge several limitations associated with our study. First, we used data for only 1 year of hospitalizations to generate results based on a cross-sectional, correlational design to predict black–white differences in diabetes hospitalizations. It is possible our results would have revealed different trends had we used longitudinal information with the power of establishing trends and causality. Second, although previous investigations have used a similar definition for diabetes hospitalizations,²⁹ we acknowledge that the use of discharge diagnosis alone without comparisons with admitting diagnosis, in addition to utilizing the first 3 diagnoses for identification of hospitalizations, could have introduced a degree of misclassification in diabetes hospitalizations. Lastly, although the information generated from this study might be useful in disease management, the findings made on the differences between blacks and whites are from 3 states only and involve Medicaid as the only source of insurance coverage. For these reasons, the findings may not be generalizable to the entire Medicaid or general populations. However, due to a large sample size and analytical methods employed, we expect our results to be

broadly appropriate for the aim of studying racial differences in diabetes hospitalizations.

In conclusion, we found out that racial differences do occur in diabetes hospitalizations. A careful examination of the sources and magnitude of these differences could lead to initiatives for cost savings and improvements in quality of life of the people living with diabetes. Since efforts are growing in the current health-care environment to improve primary care services and empower patients in taking active roles in their care information generated from our study could make a valuable contribution toward this goal and produce reductions in diabetes hospitalizations and health disparities in both Medicaid and general populations.

Declaration of Conflicting Interests

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