

Racial Disparities in African Americans With Diabetes: Process and Outcome Mismatch

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Over the past 2 decades, numerous studies have clearly demonstrated that both racial and ethnic disparities exist in healthcare delivery and outcomes in the United States.¹⁻³ In 2002, the Institute of Medicine defined disparities as “racial or ethnic differences in the quality of healthcare that are not caused by access-related factors or clinical needs, preferences, and appropriateness of intervention.”¹ The report also highlighted the uncertainty in understanding the root causes of this disparity. As part of “Healthy People 2010,” the Department of Health and Human Services called for an elimination of disparities in healthcare.² In order to meet this demand we must better understand the basis of the problem.

Previous data show that African Americans with diabetes are less likely to have recommended process of care measures such as glycated hemoglobin (A1C) and lipid measurements performed.^{3,4} There is also evidence to suggest that African Americans with diabetes in particular have disparate results on outcome measures such as blood glucose control, blood pressure control, A1C values, cholesterol values, and incidences of retinopathy, chronic kidney disease, and lower-extremity amputations.⁵⁻⁷ While it is clear that disparities in both process and outcomes exist, there continues to be a lack of understanding as to how these disparities are related and if they are consistently related to these opportunity gaps described above.⁸ This connection is critical to help guide parity in healthcare outcomes for all patients.

Physicians’ understanding of the significance and magnitude of the effects of racial disparities on healthcare appear to be lower than one might expect given the previously cited publications. In a study of cardiologists, for example, only one-third felt that racial health disparities existed.⁹ In the same study, only 1 in 8 felt that disparities existed within their own practice. In a review of cardiothoracic surgeons, while some surgeons acknowledged that disparities existed, most attributed these disparities to patient characteristics.¹⁰ These examples are not unique to 1 specialty or even to the care of chronic diseases in general. Rather, they are endemic to the US healthcare system.

Change in healthcare requires a multidisciplinary effort that includes significant physician, patient, and system changes. Physician-led, multidisciplinary teams need accurate, timely data to drive change.¹¹ The evidence is variable that quality improvement practices can lessen disparities in diabetes care.¹² One

Background: Over the past 2 decades, numerous studies have demonstrated the existence of racial disparities in patient care in the United States. Specifically, African Americans with diabetes are less likely to have recommended process of care measures performed and outcome benchmarks for quality of care.

Objectives: To evaluate the delivery of diabetes care (processes and outcomes) associated with racial categories using a national web-based registry—the American Osteopathic Association Clinical Assessment Program (AOA-CAP).

Study Design: A retrospective analysis of data retrieved from the AOA-CAP database on outcomes and process measures for diabetes.

Methods: A total of 10,699 Caucasian and African American patients who received diabetes care had data entered into the AOA-CAP registry between July 1, 2005, and October 30, 2010. African Americans represented 3123 patients (29%), Caucasians 7576 (71%). Demographic, process of care, and outcomes comparisons between ethnicities were carried out using χ^2 and *t* tests. Composite measures of process and outcomes of diabetes care were created to investigate the effect of race on care.

Results: The process of care composite measure was significantly different among African American patients (*P* = .02) who were more likely to receive all indicated care than Caucasian patients (33.9% vs 31.6%). Evaluation of the composite outcome measure, which quantifies the percentage of patients achieving control of all 3 intermediate outcomes, was (*P* < .001) lower in African Americans than in Caucasians (8.1% vs 12.3%).

Conclusions: African American patients with diabetes were as likely or more likely to have recommended process of care measures performed. In spite of this, intermediate diabetes outcomes were still poorer in the same African American population.

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Take-Away Points

- Racial disparities are widespread in healthcare.
- Racial disparities can affect diabetes outcomes and, therefore, performance measurement.
- The source of such disparities is often unknown.
- This manuscript shows how patient outcomes and processes of care can be affected differently by racial disparities.

method is a systematic data collection and review with patient registries. Patient registries can provide a useful tool to aid in data collection and analysis.¹³ In order to understand the effect of disparities on processes and outcomes of care and maximize the benefit of these registries, it is imperative that race be included as a variable.¹⁴ We are using registries to understand quality opportunities and to judge performance at the healthcare provider level. Risk adjustment is important to isolate the effect of interventions or the contribution by the provider.

Using diabetes as a sample population, the authors explored a national database from osteopathic residency programs—the American Osteopathic Association Clinical Assessment Program (AOA-CAP). The authors evaluated the delivery of diabetes care to determine if there were differences in the process and outcomes of care associated with 2 racial categories.

METHODS

This study entailed retrospective analysis of national registry data collected from osteopathic family medicine and internal medicine residency programs. The AOA-CAP is a web-based registry providing a standard method of sampling patients and collecting information from medical records on key processes and outcomes of diabetes care. The diabetes module has been operational since 2003. Data are collected for the purposes of quality improvement and satisfaction of core competencies of systems-based practice and practice-based learning within osteopathic graduate medical education. The process and outcomes measures for the diabetes care database were developed from guidelines for diabetes care promulgated by the American Diabetes Association and the American Association of Clinical Endocrinologists.^{15,16} Measure development is overseen by the AOA-CAP Steering Committee with representation from internal medicine and family medicine program directors and leadership from the AOA. Clinical indicator definitions and constructs are “harmonized” with national organizations, including the National Committee on Quality Assurance, the American Medical Association Physician Consortium for Performance Improvement, and the National Quality Forum.¹⁷⁻¹⁹ **Table 1** lists the numerator and denominator of

each of the process of care measures and the intermediate outcome measures used in this analysis. Materials for AOA-CAP include documents standardizing patient selection, sampling, and data collection.

Residents imported the data on their own patients as part of a separate educational activity. There were no resident incentives or penalties based on how they performed on the data set for their patients. Information was abstracted from patient medical records using the most recent visit as a starting point and review of care prior to the most recent visit during a specified time period for each measure. Case selection for diabetes mellitus was based on any *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnosis of diabetes. Patients included in the database had to be older than 18 years and have had diabetes for at least 1 year, as well as have had at least 2 visits to the clinic. Patients treated by diet and lifestyle alone were excluded, as they were often monitored less closely. A sample size of 40 patients per residency program was recommended in order to provide a meaningful sample. However, cases from all programs were used regardless of the number of cases contributed by the program. Analysis excluded data from non-Caucasian and non-African American patients. Information regarding patient demographics and treatment were collected from each medical record. Data elements were entered in a Health Insurance Portability and Accountability Act–compliant manner into a web-based data collection form along with program identification.

The population included for this study included all diabetic cases entered into the AOA-CAP registry between July 1, 2005, and October 30, 2010, with race designations of Caucasian or African American (as other race designations are minimally represented in the database). Composite process and outcome measures were based on the percentage of patients receiving all indicated care or achieving goals on all intermediate outcomes. The composites were developed to evaluate the summary performance across the 2 categories of race. Demographic, process of care, and outcome comparisons between races were carried out using χ^2 and *t* tests, as appropriate. To investigate the potential bias introduced by differing demographic factors between the 2 races, multivariable analysis was used to evaluate the association between process and outcome composite and race. A hierarchical model using the type of residency program (family practice or internal medicine) as a class variable evaluated the effect of provider type on the findings. All analysis was completed using SAS Version 9.1 software (SAS Institute, Cary, North Carolina). This study was approved by the Geisinger Health System Institutional Review Board.

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Table 1. Comparisons Were Computed Using Standard Process and Intermediate Outcome Variables

Variable	Numerator	Denominator
Intermediate Outcomes		
A1C <7%	Number of diabetic patients with A1C <7% on the most recent visit	All diabetic patients
LDL <100 mg/dl	Number of diabetic patients with LDL <100 mg/dL on the most recent visit	All diabetic patients
BP <130 mm Hg systolic and <80 mm Hg diastolic	Number of diabetic patients with a systolic BP <130 mm Hg and a diastolic BP <80 mm Hg on the most recent visit	All diabetic patients
Outcome composite	Number of diabetic patients with A1C <7% and LDL <100 mg/dL and systolic BP <130 mm Hg and diastolic BP <80 mm Hg	
Processes of Care		
Foot exam	Number of diabetic patients with a complete foot exam during the previous year (structural, neurologic, and vascular exam)	All diabetic patients
Albuminuria screen	Number of diabetic patients with neuropathy or screening for microalbuminuria during the previous year	All diabetic patients
Ophthalmologic exam recommended	Number of diabetic patients with documentation of an ophthalmologic exam recommended during the past year	All diabetic patients
ACE/ARB in patients with albuminuria	Number of diabetic patients given an ACE inhibitor or an ARB	Diabetic patients with albuminuria and without contraindication to the medications
ACE/ARB in hypertensive patients	Number of diabetic patients given an ACE inhibitor or an ARB	Hypertensive diabetic patients without contraindication to the medications
A1C done within past year	Number of diabetic patients with A1C documented within the past year	All diabetic patients
LDL done within past year	Number of diabetic patients with LDL documented during the past year	All diabetic patients
Process composite	Number of diabetic patients with all indicated processes of care	All diabetic patients
ACE/ARB indicates angiotensin-converting enzyme/angiotensin receptor blocker; A1C, glycated hemoglobin; BP, blood pressure; LDL, low-density lipoprotein.		

RESULTS

A total of 10,699 patients with diabetes fit the criteria for this study. Data were abstracted across 195 osteopathic family medicine and internal medicine programs. African Americans represented 3123 patients (29%) and Caucasians 7576 (71%). The demographics of the patients are displayed in **Table 2**. There were significant baseline differences between the 2 ethnicities with regard to age: African American patients were on average 1.3 years younger ($P < .001$). The percentage of men was greater in the Caucasian population (45.2% vs 41.9%). In addition, African American patients were significantly more likely to be on insulin ($P = .003$). African American patients were significantly more likely to have Medicaid as the primary insurance (25.3% vs 19.4%; $P < .001$) and significantly less likely to have commercial insurance (21.8% vs 25.2% $P < .001$)

or Medicare (32.1% vs 26.1%; $P = .05$) compared with Caucasians.

Achievement of specific process or outcomes goals across ethnicity is displayed in **Table 3**. Higher rates of foot exam ($P = .02$), recommendation of ophthalmologic exam ($P < .001$), and screening for microalbuminuria ($P > .001$) were seen among the African American patients. The process composite measure, representing the percentage of patients with all indicated processes of care, was also significantly higher among African American patients ($P = .02$). However, intermediate diabetes outcomes were significantly lower in African Americans, including meeting the glucose ($P < .001$), blood pressure ($P < .001$), and LDL-C goals ($P < .001$). The composite outcome measure was also ($P < .001$) lower among African American patients.

A multivariable model was used to evaluate the effect of demographic differences on the process and outcome compos-

■ **Table 2.** Demographic Information

	African American (n = 3123)	Caucasian (n = 7576)	P
Male	41.88%	45.23	.002
Age (mean)	55.5	56.8	<.001
Insulin-requiring	42.14%	34.52%	<.001
Insurance type			<.001
Medicare	26.13%	32.14%	<.001
Medicaid	25.33%	19.42%	<.001
Commercial	21.17%	25.19%	<.001
Self-pay	7.40%	8.60%	.43
Other	19.89%	13.95%	<.001

■ **Table 3.** Process and Outcome Differences

	African American (n = 3123)	Caucasian (n = 7576)	P
Process Measures			
Foot exam	65.07%	59.89%	<.001
A1C done	93.28%	92.81%	.039
LDL evaluation done	85.08%	86.76%	.02
Ophthalmologic exam recommended	69.71%	63.11%	<.001
Screen for albuminuria	74.16%	69.92%	<.001
ACE/ARB in hypertension	80.64%	82.25%	.84
ACE/ARB with albuminuria	82.37%	83.65%	.42
Process composite	33.97%	31.59%	.02
Outcome Measures			
A1C <7%	36.70%	43.98%	<.001
LDL <100 mg/dL	39.48%	46.81%	<.001
BP <130/80 mm Hg	28.98%	35.40%	<.001
Outcome composite	8.13%	12.34%	<.001

ACE/ARB indicates angiotensin-converting enzyme/angiotensin receptor blocker; A1C, glycated hemoglobin; BP, blood pressure; LDL, low-density lipoprotein.

higher than the percentage found on bivariate analysis. The difference between outcome composite scores was an OR of 0.67 (CI 0.51-0.89), similar to the magnitude found in bivariate analysis. Results of hierarchical modeling using provider type did not affect the associations found in logistic regression between race and other covariates.

DISCUSSION

Using a large national patient registry of patients from osteopathic family medicine and internal medicine residencies, we found that African American patients with diabetes were more likely to have recommended process of care measures performed. This was driven primarily by higher levels of foot exams, rec-

ommendations of ophthalmologic exam, and screenings for microalbuminuria among African American patients. In spite of this, intermediate diabetes outcomes were still poorer in the same African American population. The disparity in outcomes was consistent across all 3 outcome components, with African American patients achieving lower levels of control of glucose, blood pressure, and lipids. Hence, these patients may be seeing action without benefit.

ite scores. The results, displayed in **Table 4**, suggest that after adjusting for the demographic differences, African Americans were still significantly more likely to have indicated processes of care. Other factors that predicted meeting the process of care composite measure included male gender and patients requiring insulin. Self-pay status predicted an odds ratio (OR) of 0.56 for meeting the process of care measure. African American patients were significantly less likely to achieve treatment goals as measured by the intermediate outcomes (OR 0.67). Other factors predicting failure to meet the outcome composite measure included patients who required insulin (OR 0.44). The magnitude of difference between process composite scores demonstrated an OR of 1.25 (CI 1.06-1.47)

Previous studies have shown that African Americans with diabetes are less likely to have process measures performed and to achieve favorable outcomes.³⁻⁷ Our findings differ, in that processes of care were performed more often for African American patients. Yet an outcome gap still exists. Nation-

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ally recognized process of care measures for diabetes^{15,16} are chosen based on their correlation with outcomes. Previous research has been mixed when directly comparing the processes and outcomes in ethnic populations. For example, some studies showed little or no difference in testing for A1C.²⁰ At the same time much evidence suggests that disparities in glycemic control outcomes exist.²¹ This relationship needs further study to elicit the unknown factors affecting this relationship. Further, this study did not have access to patient level end organ microvascular complications, such as legal blindness, neuropathy-associated neuropathic ulcers or amputations, and nephropathy leading to dialysis. These too need further study.

The primary focus of the AOA-CAP database program is quality improvement. Residency training programs are encouraged to use the comparison data to promote positive practice changes. It is possible that the resident group has become familiar with the database and has made changes to improve processes of care. One would expect that this would affect all ethnicities equally. However, if a deficit was present in a previous evaluation, it may have prompted the residents to pay special attention to an ethnicity when providing care. This was demonstrated in 1 study of quality improvement programs that targeted racial disparities in people with diabetes. In this study process of care measurement differences were not as predicted while disparities in intermediate outcomes persisted.¹² A large meta-analysis of performance improvement studies targeted on glycemic control as an outcome showed only small to modest improvements.²² This may point to a real disconnect between processes and outcomes among African Americans with diabetes. Further, it may take longer to achieve improvements in outcome measures, as outcomes require time of treatment to take effect, while process of care changes can be more immediate. This data set has no information on the overall health of the patients enrolled in the study, and it is possible that there was a difference in severity of illness among ethnic groups prior to treatment.

The starting point for any effort to improve quality of care in ethnic populations involves a systematic evaluation of gaps across racial categories. While physician factors are clearly one target for intervention, the lack of correlation between physician processes and patient outcomes across racial categories complicates this approach. This leads one to consider

■ **Table 4.** Logistic Regression Models With Process and Outcome Composites as Dependent Variables

	Adjusted OR (95% CI)
Process Composite Measures	
African American	1.25 (1.06-1.47)
Male	1.18 (1.02-1.37)
Age	1.01 (1.00-1.02)
Medicaid	1.10 (0.88-1.38)
Commercial	1.22 (0.99-1.50)
Self-pay	0.56 (0.39-0.80)
Other	0.98 (.077-1.25)
Insulin requiring	1.19 (1.02-1.39)
Outcome Composite Measures	
African American	0.67 (0.51-0.89)
Male	0.90 (0.71-1.14)
Age	1.01 (1.00-1.02)
Medicaid	0.95 (0.67-1.36)
Commercial	0.90 (0.65-1.24)
Self-pay	0.60 (0.34-1.09)
Other	0.75 (0.50-1.11)
Insulin-requiring	0.44 (0.33-.058)
CI indicates confidence interval; OR, odds ratio.	

other factors that may play a role in producing poor outcomes in ethnic populations.

While some point to socioeconomic and access differences as the root cause, access to care can mean many different things. While access to healthcare is likely to impact process of care measures, ability to pay for medications can also have a significant impact. Compared with non-Hispanic whites, African Americans are twice as likely to be uninsured.^{23,24} As noted in our population, African Americans were less likely to have Medicare or commercial insurance and more likely to have Medicaid. It is also true that most studies have found that disparities exist even with adjustments for socioeconomic^{1,25-29} and access issues. One theory is that lack of insurance or underinsurance may impact medication access to a higher degree than physician access. This could explain why outcomes are still more disparate than processes of care.

The lack of evidence of a causal relationship between socioeconomic status, access, adherence, and ethnic disparities suggests that other factors such as genetics and unmeasured environmental factors must be considered. One study suggested that rates of end-stage renal disease among ethnic minorities were disparate despite similar medical care coverage.³⁰ In this study, other complications were similar or lower relative to the Caucasian population. This suggests a possible genetic or environmental origin. This may be analogous to the different

responses of Caucasians and African Americans to angiotensin-converting enzyme inhibitors and hydralazine and nitrates in heart failure.³¹ Another recent study suggested that African Americans have higher A1C across the full spectrum of glucose values.³² This further questions the use of A1C levels to determine care disparities.

As the search for causal factors of racial disparities continues in medical treatment and outcomes, it is critical to increase awareness of the existence of these disparities. As noted previously, in a study of cardiologists published in 2005 it was found that one-third acknowledged that disparities occurred, while only 5% reported these differences in their own panel.⁹ A more recent survey of primary care physicians found that a large majority (88%) of respondents agreed that the problem existed while less than half felt that they were part of the problem.³³ Race is an important yet poorly subscribed variable in patient care registries.¹⁴ One of the explicit goals for the use of the AOA-CAP registry in residency programs is to teach the core competencies of system-based practice and practice-based learning. It is crucial that cultural competence be included in this equation.

There are several limitations with the use of registry data. The use of a retrospective, self-reported registry could introduce reporting bias into the data set. The data for the AOA-CAP registry is entered by family medicine and internal medicine residents throughout the United States and is based on past patient experience. Data entry is not independently verified. The authors feel there is no reason to believe bias is introduced because the accreditation requirement of using AOA-CAP is based on data contribution, not levels of performance. In addition, the findings are consistent with previously reported norms such as the National Committee on Quality Assurance.¹⁶ There was a greater proportion of African Americans who were being treated with insulin, which may signal a difference in care that may adversely affect outcomes.

The sample for this study was large and geographically diverse. The logistics of the AOA-CAP registry make the data blinded at the level of the patient to both the individual entering the data and the researchers who collect and analyze the data. The power of the use of registries in quality and population health improvement has been previously noted.¹³ The authors feel that this is a reliable model for other studies that evaluate performance in clinical care. Despite recent attention, the problem of racial disparities continues to be widespread and to affect all aspects of care.³⁴

CONCLUSIONS

Using a large national patient registry the authors found that African American patients with diabetes were more likely to have recommended process of care measures performed.

In spite of this, intermediate diabetes outcomes were poorer in the same African American population compared with the Caucasian population. This action without benefit still leaves this population at increased risk of complications, early morbidity and mortality, and excess healthcare costs. Further research is necessary to better understand this discrepancy and rectify its effects.

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