Steady improvements have been made in the management of cardiovascular disease over the last decade.1,2 Yet, certain racial and ethnic minority groups have not experienced equivalent improvements in outcomes. For example, although the overall rate of hospitalization for heart failure has declined in recent years, decreases have been lower in blacks compared with whites.2 In addition, mortality related to stroke continues to be higher in blacks.3 There are multiple potential explanations for this heightened cardiovascular risk among minorities, including their higher prevalence of cardiovascular risk factors such as hypertension, diabetes mellitus, and obesity;4 the presence of genetic differences predisposing to disease;5 differences in socioeconomic factors relating to education, income, language proficiency, and living environments;6 and concerning physician attitudes, biases, or frank racism.3,7

The Institute of Medicine defines “disparities” as “differences in health outcomes that persist when access and patient clinical factors are controlled.”8 In acknowledging the presence of these disparities experienced by racial and ethnic minorities, the American College of Cardiology (ACC) launched the Coalition to Reduce Racial and Ethnic Disparities in Cardiovascular Disease Outcomes (CREDO) alliance and the American Heart Association (AHA) issued a statement highlighting racial differences in stroke care, among other initiatives.9,10 Through these efforts, the ACC and AHA aim to improve physician awareness of racial disparities in cardiovascular disease care, conduct patient education, and provide tools to health systems to help combat inequalities.

There is an urgent need for additional information regarding the pathways mediating racial disparities in cardiovascular care, especially those pathways that are amenable to interventions. We have therefore chosen to review a broad range of articles pertinent to racial and ethnic disparities in cardiovascular disease. These include papers examining racial differences in the quality of care provided for patients with myocardial infarction,11 trends in procedure use for patients with heart failure,12 survival after heart transplantation,13 the relative importance of traditional and novel biomarkers of cardiovascular risk,14 and the influence of socioeconomic factors such as living environment on outcomes.6

We hope you find these reviews informative. Our goal should be the delivery of high-quality health care regardless of a patient’s age, sex, or race.
Randomized, Controlled Trial of an Intervention to Enable Stroke Survivors Throughout Los Angeles County Safety Net to “Stay With the Guidelines”

Summary: Inpatient programs initiate secondary stroke prevention care before hospital discharge, but such care may not be continued after hospitalization. To improve the delivery of secondary stroke preventive services after discharge among the high-risk, indigent, minority population of Los Angeles County, the authors have designed a chronic care model–based program called Systemic Use of STroke Averting INterventions (SUSTAIN). This intervention includes group clinics, self-management support, report cards, decision support through care guides and protocols, and coordination of ongoing care. The first specific aim is to test, in a randomized, controlled trial (RCT), whether SUSTAIN improves blood pressure control among an analytic sample of 268 patients with a recent stroke or transient ischemic attack discharged from 4 Los Angeles County public hospitals. Secondary outcomes include control of other stroke risk factors, lifestyle habits, medication adherence, patient perceptions of care quality, functional status, and quality of life. A second specific aim is to conduct a cost analysis of SUSTAIN from the perspective of the Los Angeles County Department of Health Services by using direct costs of the intervention, cost equivalents of associated utilization of county system resources, and cost equivalents of the observed and predicted averted vascular events.

Conclusion: In this methods paper, the authors have proposed a novel, community-based care system to improve the use of secondary stroke prevention services in a diverse, low-income, vulnerable population recently admitted for stroke or transient ischemic attack. Previous studies have shown that minorities have a greater burden of disease and are less likely to receive appropriate secondary prevention services. In its first phase, SUSTAIN will use an RCT design to study the impact of peer-education sessions and self-management tools on blood pressure control. If successful, this model may be applicable to other healthcare settings serving minority populations as well.

Ethnic Differences in Out-of-Hospital Fatal Pulmonary Embolism

Summary: Little is known about demographic and clinical factors associated with out-of-hospital pulmonary embolism (PE). In a study of out-of-hospital fatal PEs, the authors examined the prevalence of such factors among 578 cases investigated by the Office of Chief Medical Examiner in New York city. Blacks represented the greatest proportion of cases (58.2%), followed by whites (25.1%), Hispanics (15.6%), and Asians (1.2%). Race-adjusted incidence rate of fatal PE per 100,000 persons per year was over 3 times higher among blacks than for whites (odds ratio, 3.37; 95% confidence interval [CI], 3.31–4.11 versus odds ratio, 1.15; 95% CI, 0.96–1.33, P<0.001). Inquiry from the decedents’ families and physicians revealed a history of immobility in nearly half of the patients. Over 50% of patients in each subgroup had obesity (body mass index [BMI] ≥30.0 kg/m²), whereas pregnancy, advanced cardiopulmonary disease, and substance abuse were infrequent. Compared with whites, blacks and Hispanics died at a younger age (P<0.001 for the Kolmogorov-Smirnov test). The differences persisted after multivariable adjustment for BMI, sex, and genetic test results.

Conclusion: Blacks are known to have a higher incidence of deep vein thrombosis (DVT), recurrent DVT, and worse in-hospital and 90-day outcomes from venous thromboembolism (VTE), compared with whites and Hispanics. This study provided a rare opportunity to investigate the factors associated with out-of-hospital fatal PE. The racial differences were not fully explained by the investigated clinical factors and genetic tests. Until the cause or cause-cluster for such differences are elucidated, it would be prudent to promote policies that raise the public awareness for VTE prevention, particularly among ethnic subgroups that are at higher risk. This would be in line with the recent Surgeon General’s call to action for prevention of VTE.

Myocardial Infarction

Differences by race have been demonstrated both in the incidence of acute coronary syndromes and the acute treatment of these conditions. Data from the Atherosclerosis Risk in Communities study has shown that black men and women in the United States are more likely to have incident myocardial infarction than their white counterparts. In addition, death rates from coronary heart disease (CHD) remain higher for blacks compared with whites. These differences by race in CHD outcomes may be due in part to the fact that people of color have been less likely to receive effective treatments in the acute setting such as cardiac catheterization, percutaneous coronary intervention, and surgical revascularization. Even when receiving these procedures, minorities have been shown to be less likely to receive newer technologies such as drug eluting stents. In addition, time to reperfusion has often been higher among minority groups, in part due to the special hospital protocols for these patients. The following articles add to our understanding of care differences for myocardial infarction experienced by racial and ethnic minorities. The studies investigate trends by race in rates of hospitalization for acute myocardial infarction over time, the efficacy of quality improvement initiatives in increasing adherence to important care processes, differences by race in important outcomes associated with percutaneous coronary intervention such as bleeding and stent thrombosis, and the influence of home zip code on admission to high-quality and revascularization hospitals.

Differences in Admitting Hospital Characteristics for Black and White Medicare Beneficiaries With Acute Myocardial Infarction

Summary: Racial disparities in acute myocardial infarction (AMI) treatment may be due to differences in admitting hospitals. Little is known about factors associated with hospital selection for black and white patients with AMI. The authors identified 65,633 Medicare beneficiaries with AMI in 63 hospital referral regions with at least 50 black admissions during 2005. Distance from the patients’ homes to hospital referral region hospitals was calculated using zip codes. Hospital quality was assessed using a composite score made up of hospital risk-adjusted 30-day mortality and AMI performance measures. On average, blacks lived closer to revascularization hospitals (mean, 3.8 versus 6.8 miles; P<0.001) and to high-quality hospitals (mean, 5.6 versus 9.7 miles; P<0.001). After distance was accounted for, blacks were relatively less likely (P<0.001) to be admitted to revascularization hospitals (risk ratio [RR], 0.87; 95% confidence interval [CI], 0.80–0.95) and to high-quality hospitals (RR, 0.88; 95% CI, 0.801–0.95), but more likely (P<0.001) to be admitted to low-quality hospitals (RR, 1.17; 95% CI, 1.05–1.29). To further control for the impact of unmeasured differences in environmental characteristics experienced by different racial groups, analyses were repeated on a subset of blacks and whites that were pair-matched by home zip code (n=10,422). In these analyses, differences in admissions to revascularization (RR, 0.92; 95% CI, 0.80–1.05), high-quality (RR, 0.94; 95% CI, 0.81–1.07), and low-quality (RR, 1.15; 95% CI, 0.94–1.35) hospitals were not significant.

Conclusion: As with previous literature, the authors demonstrate the presence of racial disparities in access to AMI care. Black patients were less likely to be admitted to hospitals with revascularization capabilities and high-quality AMI outcomes than would be expected based on their closer proximity to these facilities. However, the authors attribute this disparity not to race, but to differences in the living environments of blacks compared with whites. The local
Care and Outcomes of Asian-American Acute Myocardial Infarction Patients: Findings From the American Heart Association Get With The Guidelines–Coronary Artery Disease Program

Summary: Asian-Americans represent an important and fast-growing minority population in the United States. Yet data are limited regarding the clinical care and outcomes of Asian-Americans after acute myocardial infarction (AMI). The authors analyzed 107,403 AMI patients from the United States’ Get With The Guidelines–Coronary Artery Disease (GWTG-CAD) program between 2003 and 2008. They studied use of 6 AMI process-based performance measures, composite defect-free care (proportion receiving all eligible process measures), door-to-balloon time, and in-hospital mortality by race. Compared with white AMI patients, Asian-American AMI patients were older with more traditional cardiovascular risk factors such as diabetes mellitus, hypertension, and smoking. Blacks were less likely to get smoking cessation counseling (65.6% versus 81.5%), but otherwise received comparable quality of care for process measures as well as door-to-balloon times. Improvements over time in process measures, defect-free care, and door-to-balloon times were similar for white and Asian-American patients.

Conclusion: The study suggests that a specific hospital quality improvement program can increase quality of care for a minority population and not just white Americans. However, specific quality areas may require more targeted strategies. For example, the study found that despite being more likely to smoke, Asian-Americans less often received smoking cessation counseling. It is not known whether this discrepancy was because of differences in the site of care for Asian-Americans relative to white patients or particular limitations with the GWTG-CAD program.

Translational Research Investigating Underlying Disparities in Acute Myocardial Infarction Patients’ Health Status (TRIUMPH): Design and Rationale of a Prospective Multicenter Registry

Summary: Black patients with acute myocardial infarction (AMI) have worse outcomes than white patients with regard to mortality and quality of life. The Translational Research Investigating Underlying Disparities in Acute Myocardial Infarction Patients’ Health Status (TRIUMPH) study was designed to explore whether racial differences in outcomes after AMI are mediated by differences in clinical, genetic, metabolic, socioeconomic, or treatment characteristics between white and black patients. TRIUMPH enrolled 4340 persons with AMI admitted to 443 hospitals between 2002 and 2007. They examined individual and overall composite rates of defect-free care, defined as the proportion of patients receiving all eligible process-based performance measures, as well average door-to-needle and door-to-balloon times for patients undergoing attempted revascularization. Summary results and temporal trends were presented by race. The authors found that overall, individual performance measure use was high at study initiation, though all improved significantly over the study period. Defect-free care was slightly less common for blacks, though this gap was present only during the first half of the study period. Progressive improvement in defect-free care was noted for all races/ethnicities with time. Trends were consistent across sites regardless of the proportion of treated black and Hispanic patients. However, a significant percentage of patients of all races had door-to-needle times and door-to-balloon times in excess of the recommended 30 minutes and 90 minutes, respectively. Times among blacks were higher than that among whites for both revascularization strategies.

Conclusion: Although minorities experience a disproportionate share of death and disability from ischemic heart disease, it is often difficult to understand the source of this disparity, as black and white patients may differ with regard to clinical status, treatments received, site of care, socioeconomic status, and other variables. The TRIUMPH study makes a unique contribution by attempting to disentangle the effects of these factors as well as novel genetic and metabolic biomarkers in minority populations.

Recent Declines in Hospitalizations for Acute Myocardial Infarction for Medicare Fee-for-Service Beneficiaries: Progress and Continuing Challenges

Summary: The authors examine trends in rates of hospitalization for acute myocardial infarction (AMI) in the United States among elderly patients with Medicare fee-for-service health insurance between 2002 and 2007. AMI hospitalization rates were calculated annually per 100,000 beneficiary-years with Poisson regression analysis and stratified by age, sex, and race. Over the study period, the annual AMI hospitalization rate fell from 1131 per 100,000 beneficiary-years in 2002 to 866 per 100,000 beneficiary years in 2007, a relative decline of 23.4%. After adjustment for age, sex, and race, the AMI hospitalization rate declined by 5.8% per year. Importantly, while white men experienced a 24.4% decrease in AMI hospitalizations over the study period, black men experienced a smaller decline of 18.0% (P<0.001 for interaction). Similarly, black women had a smaller decline in AMI hospitalizations compared with white women (18.4% versus 23.3%, respectively; P<0.001 for interaction).

Conclusion: Although AMI hospitalization rates among Medicare fee-for-service patients decreased across age, sex, and race categories from 2002 to 2007, rates of decline were less impressive for black men and women relative to their white counterparts. The source of this disparity is unknown, though as the authors state may be related to worse risk factor control in older blacks versus whites. The impact of improved risk factor control on the frequency of AMI-related hospitalization among minorities should be testable within the context of ongoing or previously completed clinical trials.

Racial and Ethnic Differences in the Treatment of Acute Myocardial Infarction: Findings from the Get With The Guidelines–Coronary Artery Disease Program

Summary: The authors sought to determine whether racial/ethnic differences in evidence-based care for acute myocardial infarction (AMI) persisted among hospitals participating in the Get With The Guidelines–Coronary Artery Disease (GWTG-CAD) registry. The authors analyzed 142,953 patients with AMI admitted to 443 hospitals between 2002 and 2007. They examined individual and overall composite rates of defect-free care, defined as the proportion of patients receiving all eligible process-based performance measures, as well average door-to-needle and door-to-balloon times for patients undergoing attempted revascularization. Summary results and temporal trends were presented by race. The authors found that overall, individual performance measure use was high at study initiation, though all improved significantly over the study period. Defect-free care was slightly less common for blacks, though this gap was present only during the first half of the study period. Progressive improvement in defect-free care was noted for all races/ethnicities with time. Trends were consistent across sites regardless of the proportion of treated black and Hispanic patients. However, a significant percentage of patients of all races had door-to-needle times and door-to-balloon times in excess of the recommended 30 minutes and 90 minutes, respectively. Times among blacks were higher than that among whites for both revascularization strategies.

Conclusion: With increasing time in the GWTG-CAD program, defect-free care increased for patients of all races/ethnicities, and many quality disparities for process measures were eliminated. By improving care for all patients, quality initiatives have the power to reduce disparities. However, GWTG-CAD does not appear to improve all associated care processes and outcomes, as timely reperfusion did not occur in a significant minority of patients; blacks experienced the greatest delays.
Association of Bleeding and In-Hospital Mortality in Black and White Patients With ST-Segment-Elevation Myocardial Infarction Receiving Reperfusion

Summary: The authors sought to determine whether black race is associated with higher bleeding risk after thrombolysis or primary percutaneous coronary intervention (PCI) for patients presenting with ST elevation myocardial infarction. They evaluated data from the National Registry for Myocardial Infarction (NRMI) 4 and 5 from participating centers between 2000 and 2006. The authors compared differences between white and black patients in in-hospital major bleeding (bleeding requiring intervention, including transfusion) and death. Adjustment was made for patient demographic and clinical characteristics using logistic regression with inclusion of a hospital random effect to account for patient clustering by institution. The authors found that the adjusted odds ratio for bleeding was higher for blacks than whites for patients undergoing thrombolysis or primary percutaneous coronary intervention (adjusted odds ratio 1.21 and 1.33, respectively). Bleeding was associated with a similar increase in hospital mortality in both race groups.

Conclusion: Despite having younger age and increased body mass index, both of which are protective against bleeding complications, blacks with ST elevation myocardial infarction treated with fibrinolysis or primary percutaneous intervention are more likely to have bleeding requiring intervention relative to whites. It will be important to understand if these findings are present in contemporary practice among patients undergoing primary percutaneous coronary intervention, as avoiding bleeding strategies like radial access, bivalirudin, and closure devices are more commonly used. It will also be important to track outcomes beyond hospitalization to know whether peri-procedural bleeding impacts long-term outcomes differently for minorities.

Does Black Ethnicity Influence the Development of Stent Thrombosis in the Drug-Eluting Stent Era?

Summary: Black race has been suggested to predict stent thrombosis (ST) after drug-eluting stent implantation. The authors examined whether socioeconomic status or comorbid conditions confound the contribution of black race to the development of ST. They compared 1594 black patients with 5642 nonblack patients who received drug-eluting stents between April 2003 and December 2008 from a single center registry. Overall, 108 definite ST were reported. On univariate analysis, black patients were younger (mean age 63.43 versus 65.15 years; \( P < 0.001 \)) and were more likely than nonblack patients to have hypertension (89.8% versus 81.7%; \( P < 0.001 \)), diabetes mellitus (45.5% versus 30.8%; \( P < 0.001 \)), chronic renal insufficiency (19.2% versus 10.7%; \( P < 0.001 \)), and congestive heart failure (18.7% versus 13.1%; \( P < 0.001 \)). Clopidogrel compliance at the time of the ST event was higher in blacks than in the nonblack population (87.5% versus 77.8%; \( P < 0.001 \)). After multivariable Cox regression analysis was performed to adjust for comorbidities, median income (a marker of socioeconomic status), and Clopidogrel compliance, black race emerged as a strong predictor of definite late ST (hazard ratio=2.60).

Conclusion: This study adds to the growing body of evidence indicating that race may be an independent predictor of long-term outcomes after stenting, even when accounting for socioeconomic status, comorbidities, and clopidogrel compliance. Potential hypotheses that can explain these findings include elevated levels of clopidogrel resistance among black patients and higher rates of suboptimal stent implantation in blacks, the latter of which has yet to be systematically studied.

Heart Failure

Heart failure (HF) among racial and ethnic minorities has unique features relating to its age at onset, incidence rates, clinical presentation, treatment, and other factors. Hispanics and blacks have a younger average age at HF onset. Blacks are more than 20 times more likely than whites to have HF before the age of 40. In addition, HF hospitalizations are more frequent among blacks compared with whites. Language barriers and differences in disease concepts can increase the time to presentation and worsen symptomatology at the time of first contact with the health system. Once diagnosed with HF, minorities may be less likely to benefit from the available HF therapies. Socioeconomic considerations may also reduce adherence to these treatments. Some, but not all studies have reported disparities in HF care or outcomes among blacks and other minority subgroups.

Race-based disparities in HF care and outcomes extend to patients with end-stage HF, including those requiring heart transplants. Despite constituting an increasing percentage of heart transplant candidates, racial minorities continue to be listed for transplant at a later stage in their disease process and are at higher risk for adverse outcomes in both the pre- and posttransplant phases. Relative to whites, black transplant recipients have been shown to have less generous health insurance policies and lower adherence to immunosuppression, both of which are felt to contribute to poorer outcomes in this population.

Articles in this section examine multiple topics in HF including racial differences in the efficacy of β blocker therapy, trends by race in the use of implantable cardioverter defibrillators, the impact of acculturation on HF outcomes, and differences by race in the care and outcomes of heart transplantation patients.

Racial Differences in Incident Heart Failure During Antihypertensive Therapy

Summary: Hypertension and heart failure (HF) are both more frequently seen among blacks. In addition, hypertensive black patients are more likely to have incident HF. However, it is unclear whether incident HF is more common among hypertensive black versus white patients who are being similarly treated. In a post hoc study of Losartan Intervention for End Point Reduction in Hypertension (LIFE) trial participants, the authors compared the incidence rate of HF among black versus nonblack participants. Baseline blood pressures and the magnitude of on-treatment change in blood pressure were similar in blacks and nonblacks. Over a mean follow-up of 4.7±1.1 years, 5.8% of blacks (29 of 497) and 2.9% of nonblacks (236 of 8199) had incident HF (\( P < 0.0001 \)). The results persisted after adjustment for a variety of demographic and clinical factors, and electrocardiographic characteristics such as QRS duration and indices of left ventricular hypertrophy (hazard ratio 2.30, 95% confidence interval 1.24–4.28).

Conclusion: Much of the racial differences in incident HF among hypertensive patients has been attributed to the greater burden of risk factors and lower medication adherence among blacks. In contrast, this study showed that among similarly treated blacks and whites, the rate of incident HF is not similar. The study had several methodological limitations, however, such as the relatively small number of black participants, geographical discrepancy for location of enrolled black versus white participants, and marked background differences in clinical risk factors between whites and blacks. Although racial interaction has been previously shown for efficacy of drug therapy in heart failure, significant background differences in patient populations within this study suggests that other nonmeasured confounding factors such as financial stress, area of residence, and others may be mediating the apparent racial difference in outcomes.

Acculturation and Outcomes Among Patients With Heart Failure

Summary: Language barriers and cultural factors such as different disease perception might impact the interactions of care seekers with the healthcare system. The authors sought to determine if acculturation, reflected by a person’s place of birth and primary
language spoken, was associated with outcomes among inpatients admitted with heart failure (HF) at Denver Health Medical Center. A patient with high acculturation needed to speak English as his or her primary language. For those with missing or unknown data regarding their primary spoken language, high acculturation was defined as being born in the United States. Of the 1268 studied patients, 18% had low acculturation. They were older, more likely to be uninsured or under the Colorado Indigent Care Plan, more frequently had diabetes mellitus, and were mostly (70%) born in Mexico. Unadjusted analyses showed higher 30-day readmission rates but similar 1-year mortality rates in those with low acculturation versus those with high acculturation. After multivariable adjustment for demographics, comorbidities, and laboratory tests, low acculturation remained an independent predictor of 30-day readmission (odds ratio, 1.70; 95% confidence interval [CI]: 1.07–2.68), but not 1-year all-cause mortality (hazard ratio, 0.69; 95% CI, 0.42–1.14).

Conclusion: The study provides valuable insight about the association between primary language or country of birth and outcomes among inpatients admitted for HF to a US hospital. As the ultimate goal is to address the modifiable parts of acculturation, such as language competency and system knowledge, future studies looking at the influence of these and other modifiable variables could better inform strategies designed to improve outcomes among immigrant populations. Future studies should also include additional variables that potentially mediate the impact of language status and country of birth such as ability to communicate symptoms and disease perception, as well as potential confounders such as level of income.36

Care and Outcomes of Hispanic Patients Admitted With Heart Failure With Preserved or Reduced Ejection Fraction: Findings From Get With The Guidelines–Heart Failure

Summary: Hispanics are known to be at relatively high risk of developing heart failure (HF). Using the data from the Get With The Guidelines Registry, the authors determined whether there are distinct differences in hospital outcomes and receipt of evidence-based care for Hispanics compared with non-Hispanic whites with preserved versus reduced ejection fraction. Overall, the authors studied 6117 Hispanics and 71859 non-Hispanic whites included in the registry from 2005 to 2010. Compared with non-Hispanic whites, a slightly greater proportion of Hispanics had HF with reduced ejection fraction. Hispanic patients were more likely to be younger and to have diabetes mellitus, hypertension, and elevated body weight. Although no ethnic differences existed in in-hospital mortality for patients with reduced ejection fraction, Hispanics with preserved systolic function had a lower in-hospital mortality rate relative to whites after multivariable adjustment (odds ratio, 0.50; 95% confidence interval: 0.31–0.81, \( P = 0.005 \)). The process measures of quality care improved in all 4 subgroups over time. Results were consistent across a variety of subgroup analyses.

Conclusion: This is the first study to compare the care and outcomes of Hispanics and non-Hispanic HF patients with preserved versus reduced ejection fraction. Lack of availability of certain variables such as New York Heart Association functional class and socioeconomic status, as well as voluntary participation of hospitals in the registry were among the limitations of the study. Nevertheless, consistent improvement in quality of care for all patient subgroups including the Hispanic minorities is encouraging and hints at reduction of the existing disparities.46 The specific rationale and implications of results stratified by ejection fraction were not made explicitly clear by the authors.46

Predictors of Self-Report of Heart Failure in a Population-Based Survey of Older Adults

Summary: The extent of patients’ awareness about having a diagnosis of heart failure (HF) is variable—the difference in awareness by race is unknown. Guru and colleagues compared patient self-report of HF from the Health and Retirement Study (HRS) with Medicare claims data as the reference standard. The authors also sought to determine the independent predictors of correctly self-reporting HF in the HRS. Among 5753 studied patients, 83.8% correctly reported that they did not have HF, 3.9% correctly reported that they had received a diagnosis of HF (positive self-report of HF and ≥1 HF identified claim), and 11.6% were unaware that they had a Medicare HF-associated claim. A negligible proportion of patients (0.7%) reported having HF without the existence of a confirmatory Medicare HF claim. Sensitivity and specificity of self-report for the presence of an HF diagnosis were therefore 25.2% and 99.2%, respectively. In all multivariable models, blacks were least likely to self-report HF. Similarly, Hispanics were in general less likely than whites to correctly self-report HF. The presence of ≥1 HF inpatient claim and specifically, presence of ≥4 inpatient claims were among other important independent predictors of accurate HF self-report.

Conclusion: This study showed that a majority of elderly patients in the Health and Retirement study with a claims-related diagnosis of HF were unaware of their diagnosis. Self-reported HF was more infrequent among blacks. However, use of Medicare claims data as the gold standard for diagnosing HF is suboptimal, as overcoding may occur due to financial incentives. Yet regardless of the true numbers, it is clear that a large proportion of HF patients are unaware of their diagnosis. Communication between health providers and older HF patients and their caregivers will require improvement, especially in cases where patients come from racial and ethnic minority groups. Interestingly, study results also question the validity of HF self-report when used for research purposes.47

Association of β-Blocker Exposure With Outcomes in Heart Failure Differs between Black and White Patients

Summary: β-Blockers (BB) are a mainstay of heart failure (HF) treatment; yet data regarding their efficacy in black individuals are inconclusive. The authors performed a retrospective study of 1094 patients (476 whites and 618 blacks) who received care from a large health system and were hospitalized for HF between January 2000 and June 2008 and had a documented ejection fraction <50%. BB exposure was estimated over 6-month time blocks using pharmacy claims data. Proportional hazards regression with adjustment for baseline patient covariates and exposure to other HF medications was used to test the association between BB exposure and all-cause hospitalization or death. Interaction between race and BB exposure was formally tested. Black patients were younger, had lower rates of coronary disease and atrial fibrillation, and had lower ejection fraction when compared with white patients (all \( P \leq 0.05 \)). In adjusted models, BB exposure was associated with lower risk of death or hospitalization in both groups, but more so in white individuals (hazard ratio, 0.40; \( P = 0.001 \)) compared with black individuals (hazard ratio, 0.67; \( P = 0.024 \)). A formal test for interaction indicated that the protection associated with BB exposure differed by race (\( P = 0.098, \beta = 0.40 \)).

Conclusion: The authors’ use of a large health system database to test the relationship between race and BB efficacy has minimized issues of underrepresentation and small sample size associated with previous subgroup analyses of randomized clinical trials. The improved outcomes associated with BB use regardless of race reinforce existing recommendations that BB be prescribed in the absence of contraindications to all HF patients with systolic dysfunction. However, as this study was observational, findings may be subject to residual unmeasured confounding, especially as groups appeared to be substantially different even in measured characteristics.44
Trends in Use of Implantable Cardioverter-Defibrillator Therapy Among Patients Hospitalized for Heart Failure Have the Previously Observed Sex and Racial Disparities Changed Over Time?

Summary: Previous studies have demonstrated low use of implantable cardioverter defibrillators (ICDs) as primary prevention, particularly among women and blacks. The authors investigated the degree to which the overall use of ICD therapy and disparities in use have changed in recent years. They examined 11,880 unique patients with a history of heart failure and left ventricular ejection fraction ≤35% who were ≥65 years old and enrolled in the Get With The Guidelines–Heart Failure (GWTG-HF) program from January 2005 through December 2009. The rate of ICD use was determined by year for the overall population and for groups on the basis of sex and race. From 2005 to 2007, overall ICD use increased from 30.2% to 42.4% and then remained unchanged in 2008 to 2009. After adjustment for potential confounders, ICD use increased significantly in the overall study population during 2005 to 2007 (odds ratio [OR], 1.28; P=0.0008) as well as in all race-sex subgroups including black women (OR, 1.82; P=0.0008), white women (OR, 1.30; P=0.010), black men (OR, 1.54; P=0.0009), and white men (OR, 1.25; P=0.0072). Although the rate of ICD use was lower in blacks as compared with whites in the beginning of the study period (OR, 0.79; 95% CI, 0.60–1.03), it was similar in 2009 (OR, 0.95; 95% CI, 0.73–1.23; P=0.67). However, ICS use remained lower in women as compared with men throughout the study period (OR, 0.63; 95% CI, 0.50–0.78; P=0.0001).

Conclusion: Despite its designation as a class 1 indication for eligible heart failure patients, ICD therapy has been shown in previous studies to be substantially underused, more so in blacks and women. The authors here demonstrate that among GWTG hospitals, racial disparities in ICD implantation rates were eliminated by the end of the study period. However, overall implantation rates among eligible patients remain quite low, and further understanding of the source of this potential undertreatment is needed.

Persistent Racial Disparities in Survival After Heart Transplantation

Summary: The authors sought to examine racial disparities in heart transplant survival by analyzing data from all adult patients (30,993 white and 8,082 nonwhite) registered on the United Network of Organ Sharing (UNOS) list that underwent primary heart transplant between 1987 and 2009. Nonwhites (blacks, Hispanics, other) exhibited a more severe clinical risk profile with increased comorbid conditions such as diabetes mellitus and renal failure compared with whites. Only black patients experienced a significantly higher risk of death posttransplantation (hazard ratio, 1.34; P<0.001) compared with whites even after multivariable adjustment for recipient, transplant, and socioeconomic factors. Conditions related to underimmunosuppression such as graft failure were common in blacks, whereas conditions related to overimmunosuppression such as infection were more common in whites. Despite a decrease in the overall mortality of transplant recipients over time, disparities in mortality between blacks and whites persisted.

Conclusion: Much progress has been made in the last few decades in the management of posttransplant patients as reflected in the decreasing overall mortality rate. However, success has not been uniform across racial groups. The authors highlight underimmunosuppression as one of the main reasons for this existing disparity, possibly relating to unmeasured characteristics among blacks such as further socioeconomic concerns, residential factors, and other variables. To improve long-term outcomes, additional effort may be required to ensure medication compliance and adequate follow-up testing of the allograft for rejection among minority patients.

Racial and Ethnic Differences in Wait-List Outcomes in Patients Listed for Heart Transplantation in the United States

Summary: The authors examined racial differences in outcomes for patients waiting for a primary heart transplant in the US by analyzing 10,377 patients (71% white, 21% black, and 8% Hispanic) listed in the Organ Procurement and Transplantation Network (OPTN) database between July 2006 and September 2010. Blacks and Hispanic patients were listed with higher urgency status (listing status 1A/1B) and were more likely to be supported with inotropes compared with whites. Hispanics were less likely to be supported on a left ventricular assist device compared with whites. After adjustment for baseline clinical characteristics, Hispanic patients experienced a higher risk of wait-list mortality (hazard ratio [HR], 1.51; 95% confidence interval [CI], 1.23–1.85) compared with whites. Blacks did not experience higher mortality relative to whites (HR, 1.13; 95% CI 0.97–1.31). Compared with white HT recipients, posttransplant in-hospital mortality was higher in black recipients (95% CI, 1.15–2.03), but was not different in Hispanic recipients (95% CI, 0.48–1.29).

Conclusion: This is the first study to evaluate racial/ethnic differences in wait-list characteristics and mortality among US patients waiting for a heart transplant. Interestingly, blacks and Hispanic patients were more likely to have higher urgency status and be on inotropes at the time of transplant listing, possibly because they were sicker or had less effective pretransplant care. That Hispanics were less likely to be on left ventricular assist devices at the time of listing may have to do with impaired care access for this population. The reason for higher adjusted wait-list mortality among Hispanics but not blacks has not been explained.

Improved Survival in Heart Transplant Recipients in the United States: Racial Differences in Era Effect

Summary: Over the last 2 decades, posttransplant survival in heart transplant recipients has progressively improved. The authors sought to investigate whether the 3 major racial groups (white, black, and Hispanic) in the United States have benefited equally. They analyzed primary heart transplant recipients ≥18 years of age in the United States in the Organ Procurement and Transplantation Network (OPTN) database from 1987 to 2008. Of these, 29,986 (81.6%) were in whites, 4,745 (12.9%) were in blacks, and 2,017 (5.5%) were in Hispanics. The authors compared early (during the first 6 months) and late (after 6 months) posttransplant survival in recipients belonging to these groups in 5 successive eras (1987–1992, 1993–1996, 1997–2000, 2001–2004, 2005–2008). Early posttransplant survival rates improved (HR, 0.83; 95% CI, 0.80–0.87 for successive eras) equally in all 3 groups (black-era interaction, P=0.94; Hispanic-era interaction, P=0.40). Yet black patients remained at increased risk of early death or retransplantation (HR, 1.15). Risk factors for early posttransplant mortality across the 3 groups included the listing diagnosis, the level of cardiac support (and thus the severity of heart failure), pretransplant anti-HLA antibodies >10%, male recipients who received a heart from a female donor, and comorbidity at the time of transplant. Longer term survival improved in white (HR, 0.95; 95% CI, 0.92–0.97 for successive eras) but not in black (HR, 1.04; 95% CI, 0.99–1.09) or Hispanic (HR, 1.02; 95% CI, 0.95–1.09) recipients, resulting in increased disparities in longer term survival over time.

Conclusion: The authors demonstrated equal improvement in early survival among racial and ethnic groups but differential improvement in late posttransplant survival with whites doing the best. Predictors of early survival such as the level of required cardiac support, comorbidity, and reason for transplant have face validity. The reason for worse long-term outcomes among black transplant recipients
is unknown and may relate more to unmeasured variables related to socioeconomic status and living situation rather than specific processes of care as time from transplantation and peak intensity of healthcare utilization decreases.49

Racial Disparities in Cardiovascular Risk Factors
Racial and ethnic disparities in cardiovascular outcomes may be related in part to the disproportionate distribution of cardiovascular risk factors among minorities. For example, blacks have been shown to have a higher prevalence of traditional risk factors such as hypertension, diabetes mellitus, and hypercholesterolemia.50-52 Minority populations may also have a higher prevalence of nontraditional cardiovascular risk markers such as C-reactive protein, lipoprotein(a), fibrinogen, and specific intracellular adhesion molecules.53,54 Studies are required to understand the impact of this greater burden of risk in racial and ethnic minorities and their potential interaction with socioeconomic variables related to minority status such as poverty, unemployment, impaired access to health care, and discrimination.

The following section contains studies pertinent to cardiovascular risk among minorities such as the predictive accuracy of traditional Framingham risk factors in blacks and Hispanics relative to whites, the utility of lipoprotein(a) as a risk marker in blacks, the presence of racial disparities in control of hypertension, and the impact of socioeconomic variables on cardiovascular outcomes.

Understanding Contributors to Racial Disparities in Blood Pressure Control
Summary: Previous studies on racial disparities in blood pressure (BP) control have predominantly focused on studying clinical and selected sociodemographic factors as drivers of disparities. In examining BP control among 806 patients from an urban safety-net hospital, the authors broadened the list of potential putative factors to study patients’ subjective beliefs about the cause of their high BP, concerns about present and potential future adverse effects from BP medications, medication adherence, and previous experiences of discrimination to determine whether the association between race and BP control remained after accounting for such factors via random effects logistic regression. Blacks indicated worse medication adherence, more discrimination, and more concerns about adverse effects from their BP medications as compared with whites. After accounting for all factors, race was no longer a significant predictor of BP control.

Conclusion: The present study, though limited by its single center design, provides useful insight into the potential reasons for racial disparity in BP control beyond routine differences in clinical characteristics between black and white patients. Factors such as patients’ understanding of disease and treatment, medication adherence, and discrimination when receiving health care have contributed to the gap in BP control. Identification of such factors can be important as they may be amenable to ameliorative measures such as increased patient education and counseling as well as provider training to recognize and combat even subtle forms of discrimination.55

Depressive Symptoms and Cardiovascular Mortality in Older Black and White Adults: Evidence for a Differential Association by Race
Summary: Previous literature has demonstrated that depressive symptoms are associated with a higher risk of developing cardiovascular risk factors in blacks compared with whites. However, it is unknown whether depression has a differential impact on cardiovascular end points including mortality in blacks compared with whites. The authors therefore examined the association by race between depressive symptoms and overall cardiovascular disease (CVD) mortality, ischemic heart disease (IHD) mortality, and stroke mortality in a sample of 6158 community-dwelling older adults. Using Cox proportional hazards models, they modeled time-to-CVD, IHD, and stroke death over a 9- to 12-year follow-up period. In race-stratified models that were adjusted for age and sex only, elevated depressive symptoms were significantly associated with CVD mortality, IHD mortality, and stroke mortality in blacks only. After further adjustment for standard cardiovascular risk factors, findings for total CVD mortality (HR, 1.66; P<0.001) and IHD mortality (HR, 1.62; P=0.006) were attenuated but remained significant, whereas findings for stroke strongly trended toward significance (HR, 1.65; P=0.06).

Conclusion: The authors demonstrate that racial differences in the impact of depression extended not only to cardiovascular risk factors, but also to multiple relevant cardiovascular outcomes. The failure of routine cardiovascular risk factors to explain away the higher adverse outcomes among blacks suggests that different pathways may mediate the effect of depression on cardiovascular outcomes in blacks compared with whites.56

Associations Between Lipoprotein(a) Levels and Cardiovascular Outcomes in Black and White Subjects: The Atherosclerosis Risk in Communities (ARIC) Study
Summary: Limited statistical power had prevented previous studies from clearly demonstrating the association of lipoprotein(a) (Lp(a)) and cardiovascular disease (CVD) in blacks. Subsequently, the authors examined the association between Lp(a) levels and incident CVD events, incident coronary heart disease (CHD) events, and incident ischemic strokes among blacks and whites in the Atherosclerosis Risk in Communities (ARIC) study. At baseline, Lp(a) levels were higher in blacks (median, 12.8 mg/dL) compared with whites (4.3 mg/dL). Increasing Lp(a) levels were associated with greater risk as the hazard ratios for incident CVD, incident CHD, and incident ischemic stroke per 1-SD-greater log-transformed Lp(a) were 1.13, 1.11, and 1.21 for blacks and 1.09, 1.10, and 1.07 for whites, respectively. All hazard ratios were significant (P<0.05) except that for ischemic stroke in whites. Similar associations with incident cardiovascular events were obtained after comparing the highest and lowest quintiles of race-specific Lp(a) levels as well as by comparing graded increases in Lp(a) using standard cutoffs of ≤10 mg/dL, >10 to ≤30 mg/dL, and >30 mg/dL.

Conclusion: Before this study, it was commonly believed that Lp(a) was less strongly associated with incident cardiovascular disease among blacks than in whites. However, the clear associations demonstrated using the ARIC database suggest that previous studies were likely to be underpowered to find this relationship. Finally, before Lp(a) becomes an integral part of routine screening in blacks, further studies are needed that demonstrate the impact of screening strategies on patient-important outcomes.57

Socioeconomic Position, Not Race, Is Linked to Death After Cardiac Surgery
Summary: The authors sought to determine whether the worse prognosis seen in blacks and whites postcardiac surgery is a function not of biological characteristic, but of socioeconomic variables. The authors used information from 23,330 patients from a quaternary referral center who underwent isolated coronary artery bypass grafting, isolated valve surgery, or combined coronary artery bypass grafting and valve procedures from 1995 to 2005. The median follow-up period was 5.8 years. The effect of race, sex, and socioeconomic position (SEP) on all-cause mortality was examined with 2-phase Cox model and generalized propensity score technique. SEP was...
defined by taking into account median household income; median value of housing unit; proportion of households receiving interest, dividend, or net rental income; the proportion of adults 25 years of age or older who had completed high school; proportion of adults 25 years of age or older who had completed college; and the proportion of employed persons 16 years of age or older in an executive, managerial, or professional specialty occupation. Blacks and women had lower SEP as compared with whites and men. Patients with lower SEP had more atherosclerotic disease burden, more comorbidity, and were more symptomatic. After risk-adjustment (including race), lower SEP was associated with a significant (P<0.05) reduction in survival after surgery for both men and women. In contrast, after risk adjustment including information on SEP, race was not significantly related to decreased long-term survival postcardiac surgery.

Conclusion: This study extends results of previous research by finding that racial and sex-based disparities in long-term outcomes after cardiac surgery may be mediated by socioeconomic variables. These findings complement other studies that have found that site of care is also a powerful mediator of racial disparities.12 Unlike biological differences based on race or sex, both socioeconomic status and site of care are potentially modifiable and therefore amenable to intervention.6

Prediction of Cardiovascular Death in Racial/Ethnic Minorities Using Framingham Risk Factors

Summary: The authors examined the ability of Framingham risk factors to predict cardiovascular disease (CVD) mortality in racial and ethnic minorities. Using linked data from the National Health and Nutrition Examination Survey III (NHANES III) and the National Death Index, the authors developed Cox proportional hazard models that predicted time to cardiovascular death separately for white, black, and Mexican American participants aged 40 to 80 years with no previous CVD. For each racial group, model calibration was assessed with the $\chi^2$ goodness-of-fit statistic, whereas discrimination was assessed with the c-statistic from the Cox regression. The 3 models were found to be similarly calibrated for whites ($\chi^2_{4}=3.44$, $P=0.49$), blacks ($\chi^2_{4}=3.56$, $P=0.47$), and Mexican-Americans ($\chi^2_{4}=3.04$, $P=0.55$). Similarly, the c-statistic for each model was similar at 0.8126 for whites, 0.7679 for blacks, and 0.7854 for Mexican Americans. Older age was more strongly associated with CVD mortality in whites compared with blacks and Mexican Americans. With all other risk factors held constant, blacks and Mexican Americans were at higher risk for cardiovascular death at younger ages compared with whites.

Conclusion: The present study demonstrates that traditional cardiovascular risk factors from the Framingham study are as effective in predicting CVD mortality in minorities as they are in whites. This finding is important, as traditional risk factors are routinely applied in practice to patients of all racial and ethnic backgrounds when estimating future risk. Further testing of the predictive utility of traditional risk factors in Asian Americans appears indicated.14

Disclosures

None

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Circ Cardiovasc Qual Outcomes. 2012;5:e33-e41
doi: 10.1161/CIRCOUTCOMES.112.967638
Circulation: Cardiovascular Quality and Outcomes is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-7705. Online ISSN: 1941-7713

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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