ORIGINAL ARTICLES

# Race, Resource Use, and Survival in Seriously Ill Hospitalized Adults

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**OBJECTIVE:** To examine the association between patient race and hospital resource use.

**DESIGN:** Prospective cohort study.

**SETTING:** Five geographically diverse teaching hospitals.

**PATIENTS:** Patients were 9,105 hospitalized adults with one of nine illnesses associated with an average 6-month mortality of 50%.

**MEASUREMENTS AND MAIN RESULTS:** Measures of resource use included: a modified version of the Therapeutic Intervention Scoring System (TISS); performance of any of five procedures (operation, dialysis, pulmonary artery catheterization, endoscopy, and bronchoscopy); and hospital charges, adjusted by the Medicare cost-to-charge ratio per cost center at each participating hospital. The median patient age was 65; 79% were white, 16% African-American, 3% Hispanic, and 2% other races; 47% died within 6 months. After adjusting for other sociodemographic factors, severity of illness, functional status, and study site, African-Americans were less likely to receive any of five procedures on study day 1 and 3 (adjusted odds ratio [OR] 0.70; 95% confidence interval [CI] 0.60, 0.81). In addition, African-Americans had lower TISS scores on study day 1 and 3 (OR −1.8; 95% CI −1.3, −2.4) and lower estimated costs of hospitalization (OR −$2,805; 95% CI −$1,672, −$3,883). Results were similar after adjustment for patients' preferences and physicians' prognostic estimates. Differences in resource use were less marked after adjusting for the specialty of the attending physician but remained significant. In a subset analysis, cardiologists were less likely to care for African-Americans with congestive heart failure ($p < .001$), and cardiologists used more resources ($p < .001$). After adjustment for other sociodemographic factors, severity of illness, functional status, and study site, survival was slightly better for African-American patients (hazard ratio 0.91; 95% CI 0.84, 0.98) than for white or other race patients.

**CONCLUSIONS:** Seriously ill African-Americans received less resource-intensive care than other patients after adjustment for other sociodemographic factors and for severity of illness. Some of these differences may be due to differential use of subspecialists. The observed differences in resource use were not associated with a survival advantage for white or other race patients.

**KEY WORDS:** resource use; race; African-Americans; survival; specialty care.
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Racial differences have been demonstrated in access to medical care,[1,2] utilization of specific procedures,[3–5] the presentation and management of patients with acute conditions,[6] and treatments for life-threatening conditions.[7] African-Americans in particular report less access to health care than whites, and these differences are reported at all income levels. African-Americans report more dissatisfaction with care when hospitalized and are more likely than whites to believe that their hospitalizations are too short.[2] However, few data are available for hospitalized patients on racial differences in severity of illness, resource utilization, length of stay, or patient outcomes. In one report that addressed these issues, Buckle and colleagues studied 1,184 elderly patients.[8] African-Americans were more severely ill than whites at admission and, for each level of severity, had shorter hospitalizations and lower charges. These differences were not explained by the patient's disease, operative procedures,

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age, gender, hospital, or payer. Whether these differences resulted from patients' preferences for care or from hospital admission and discharge practices was not addressed. Furthermore, data on patient outcomes were not available.

Although substantial racial differences have been observed in several areas, important questions remain. In general, most studies of racial differences have been unable to adjust in detail for illness severity or for patient preferences, or to relate differences in care to patient outcomes. Similarly, most studies have been unable to determine whether differences in rates of utilization of procedures are associated with differences in patient outcomes, such as survival. Using a database collected from more than 9,000 seriously ill hospitalized adults, we investigated whether race was associated with differences in resource utilization, use of specific procedures, and hospital charges. We adjusted for the effect of patients' preferences for life-extending treatment and cardiopulmonary resuscitation (CPR). Among patients whose qualifying diagnosis was congestive heart failure, we examined whether racial differences in treatment by subspecialists contributed to any observed difference in resource use. In addition, in an attempt to understand whether any observed difference in resource use affected survival, we examined whether race had an impact on patient survival.

## METHODS

### Study Design

This analysis was performed using data collected as part of the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT). A full description of the objectives of this project was published previously.[9] In brief, SUPPORT was a prospective study of the preferences, decision making, and outcomes of seriously ill hospitalized adults. This study had two phases: an observational phase in which patients were enrolled between June 1989 and June 1991 (phase 1) and a subsequent interventional phase in which patients were enrolled between January 1992 and January 1994 (phase 2). During phase 2, clinicians randomized to the intervention were given information about their patient's prognosis and preferences for care and were assigned a clinical nurse specialist to facilitate symptom control and effective communication with patients. Because no differences were observed in outcomes or care processes between phase 1 and phase 2 control patients, or between phase 2 control patients and intervention patients, phase 1 and phase 2 patients were combined into a single database.[10]

In both phase 1 and phase 2, inpatients were enrolled prospectively at five geographically diverse academic medical centers. The study design was reviewed and approved by the institutional review board at each clinical site, and verbal informed consent was obtained in a standard manner prior to interviews with patients, their families, and their physicians. Patients were eligible if they were at least 18 years of age and met defined diagnostic and illness severity criteria for at least one of nine diagnostic categories: acute respiratory failure, chronic obstructive lung disease, congestive heart failure, cirrhosis, nontraumatic coma, metastatic colon cancer, advanced non-small-cell lung cancer, multiple organ system failure with sepsis, or multiple organ system failure with malignancy. Specific diagnostic criteria were designed to identify patients at late or advanced stages of their illness with 6-month survival estimated to be approximately 50% based on pilot studies performed by the SUPPORT investigators. Patients were screened for eligibility on hospital admission, and those in the intensive care unit were screened daily. Patients were excluded if, at the time of hospital admission, they were pregnant, non-English speaking, nonresident foreign nationals, transferred from another hospital to a setting other than intensive care, diagnosed as having AIDS, hospitalized with an expected length of stay of less than 72 hours, or admitted following head trauma. Eligible patients who were discharged or who died within 48 hours of study entry were excluded.

### Data Collection

Data for this analysis were collected by chart abstraction and interviews with patients and their surrogates (defined as those who made decisions for the patients in the event the patients were unable to do so). Patients were excluded from interviews if they were unable to communicate because of intubation, cognitive impairment, coma, or for other reasons. Data gathered by chart review included diagnosis, comorbid conditions, acute physiology score (APS) on days 1 and 3 following study entry, the use of any of five specific procedures, and resource utilization. The APS is a physiology-based component of APACHE III and includes physiologic measurements as well as the Glasgow coma score, a measure of neurologic function.[11] The APS has been shown previously to predict in-hospital mortality, with higher scores indicating increased risk. Comorbid conditions were obtained by chart review using a list of more than 30 diagnoses, including cancer and dementia, developed as part of the APACHE II scoring system; a comorbidity score was calculated by simple count of comorbid conditions.[12] We also collected information on the specialty of the attending physician who was caring for the patient at the time of study enrollment (classified as surgery, pulmonary disease, cardiology, oncology, and general medicine or other medical subspecialties).

Data gathered at the initial patient or surrogate interview between hospital days 3 and 6 following enrollment provided information on patients' demographics, preferences to undergo CPR in the event of cardiac arrest, preferences for comfort care in the event of terminal illness, and functional status and activity status 2 weeks prior to study entry. Functional status was measured using a revised version of the Katz Activity of Daily Living Scale,[13,14] and activity status was measured using a revised version of the Duke Activity Status Index.[15,16] Activity status measured the patient's ability to perform personal, household, or recreational tasks associated with known metabolic requirements. Demographics including race were collected directly from the patient or, if the patient could not be interviewed, from the patient's surrogate. If information on race was not available from either of these sources, we used information available from the medical record or the participating hospital's patient registration database ($n$ = 1,150). Information on race was not available from any source for only 29 patients. Information on family income in the calendar year before the hospitalization was also obtained from the patient or surrogate. For preferences, when patient interview data were not available, we substituted the surrogate's report of the patient's preferences, as would be done in clinical practice. The exact wording of the questions on patient's desire for CPR in the event of cardiopulmonary arrest and preferences for life-extending treatment are shown in Appendix A. After classifying patients who responded "don't know" as wanting life-extending treatment, the test-retest reliability of these two questions was 97% and 74%, respectively. Responses were classified in this way because, in practice, CPR is withheld only when patients indicate a clear preference to forgo this treatment. Data were not available on patient's preferences for the use of the specific procedures listed below.

Physicians were interviewed between 2 and 6 days after study entry. Physicians were asked to estimate the probability of their patient's survival to 2 and 6 months (see Appendix A). The specialty of the primary attending physician was obtained by physician questionnaire or from the admitting office at each clinical site.

Resource utilization was measured using the average Therapeutic Intervention Scoring System (TISS) score during study day 1 and study day 3, as well as average scores on days 1, 3, 7, 14, and 25 while patients remained hospitalized. Previous studies have found this index to be valid and reliable for measuring resource use.[17] TISS is an additive measure of resource intensity. It assigns 1 point for minor interventions such as pulse oximetry, chest physical therapy, and peripheral intravenous therapy; and 2 to 4 points for more substantial interventions such as intubation, thrombolytic therapy, insertion of an arterial line, endoscopy, and surgery. We also collected information on the use of specific procedures including major surgery, dialysis, pulmonary artery catheter placement, endoscopy, and bronchoscopy. Major surgery was defined as any surgical procedure that occurred in the operating room and required anesthesia. Dialysis included acute hemodialysis or peritoneal dialysis, and we excluded patients on chronic dialysis before study entry. Endoscopy included any upper gastrointestinal tract endoscopic procedures. Bronchoscopy included both diagnostic and therapeutic procedures. Finally, we collected total hospital charges from the participating hospital's billing systems. As a proxy for hospital costs, we adjusted charges using the Medicare cost-to-charge ratio for each uniform bill, 1982 version cost center at each participating hospital each year.

## Statistical Analysis

We used descriptive statistics to characterize the patients in the study. For bivariable comparisons between African-American patients and those of other races, we used Student's $t$ tests, Wilcoxon tests, and $\chi^2$ tests, when appropriate. Measures of resource use (dependent variables) included the following: (1) average TISS score on days 1 and 3; (2) average TISS scores on hospital days 1, 3, 7, 14, and 25 following study entry (for days on which the patient remained hospitalized); (3) performance of one or more of five selected invasive procedures (major surgery, dialysis, pulmonary artery catheter placement, endoscopy, and bronchoscopy) on day 1 or 3 following study entry; and (4) hospital costs, estimated from hospital charges and cost-to-charge ratios by cost center, as described above. Because study inclusion required survival for 48 hours, two of the resource measures focused on study days 1 and 3 to allow for a cohort with uniform opportunity to utilize resources.

The primary independent variable was patient race, dichotomized into two groups: African-Americans and those of other race or ethnic background (white, Hispanic, Asian, and other groups combined). Other independent variables included in the analysis as potential confounders of the relation between race and resource use were: other sociodemographic factors (age, gender, years of education, family income, and type of health insurance); severity of illness (four diagnostic groupings based on SUPPORT qualifying diagnoses, APS on days 1 and 3 following study entry, the number of comorbid illnesses, cancer or dementia as a comorbid illness, and whether the patient's index hospitalization had begun before study eligibility); functional status (measured by activities of daily living and activity status); and hospital site. As a further measure of illness severity, we adjusted for the SUPPORT prognostic estimate for survival to 2 months, which was based on 11 physiologic measures recorded on day 3 after study entry, diagnosis, age, number of days in the hospital before study entry, presence of cancer, and neurologic function.[18]

When information on income and level of education was not available, we imputed values using methods described previously.[19] When income information was not available from the patient or surrogate ($n$ = 2,065), it was imputed by constructing a classification tree that included the median household income for those residing in the geographic area corresponding to the patient's ZIP code, insurance status, hospital enrollment, site, and years of education. When the patient's level of education was not available from the patient or surrogate ($n$ = 1,634), we imputed a value for years of education by constructing a classification tree using income, site of enrollment, age, race and the median value of a home in the geographic area corresponding to the patient's ZIP code. When insurance information was not available ($n = 59$), we used a similar approach to impute values for these patients.

When information about functional status and activity status was not available from patients, we substituted surrogates' reports of patients' functional and activity status, calibrated to patients' responses. For patients without information about functional status and activity status from interviews with patients or surrogates, we imputed values using methods described previously.[20] For the 2,065 patients without functional status information from either the patient or the surrogate, dependencies in activities of daily living were imputed based on an ordinal logistic regression model that included the patient's age, diagnosis, comorbid illnesses, Glasgow coma score, APS, and site of enrollment. For activity status, our second measure of patient function, we imputed a value using a similar approach when neither patient nor surrogate information was available ($n = 2{,}099$).

To examine the effect of imputed values on our analysis, we repeated the analysis for patients with primary data available for income, insurance, and education ($n = 5{,}790$), and our results were unchanged. To examine the effect of using patient race information obtained by chart review or from the participating hospital's registration database, we repeated the analysis for patients with interview data available for race ($n = 5{,}786$), and the results were unchanged. Similarly, we repeated the analysis for patients with interview data available for functional status and activity status ($n = 6{,}985$), and again, the results were unchanged. Therefore, we present only the analysis using the larger database.

To analyze the independent effect of race on procedure use, we used logistic regression and adjusted for demographic factors, severity of illness, functional status, and study site.[21] To measure the independent effect of race on TISS and hospital charges and costs, we used linear regression, again adjusting for demographics, severity of illness, functional status, and study site. We log transformed hospital costs to allow for analysis of a normally distributed outcome, and in analyses of hospital costs, we also adjusted for the year of the patient's enrollment in the study.

In further analyses, we incorporated other potential confounding factors into the multivariable model to examine the relation between patients' race and resource use. To explore whether differences in patients' preferences for life-extending care contributed to any observed differences in resource use, we adjusted for patients' preferences for life-extending care and CPR in the event of cardiac arrest. To examine whether physicians' prognostic estimates confounded the analysis, we adjusted for the estimates physicians made for patients' prognoses at 2 months. To examine whether the specialty of the primary physician caring for the patient at the time of study entry was a confounder, we adjusted for physician specialty as categorized above and included terms for site-specialty interactions. Because adjusting for physician specialty reduced the observed effect of race on resource use, we hypothesized that African-Americans may be less likely to have a subspecialist as their primary attending physician and that specialists may use more resources. Therefore we examined the relation between race and the specialty of the primary attending physician, and between physician specialty and resource use. In the subset of patients with congestive heart failure as the qualifying diagnosis, we examined the relation between race and having a cardiologist as the primary attending physician, using a bivariable approach and then adjusting for demographics, severity of illness, functional status, and study site. Similarly, among patients with heart failure, we examined the relation between specialty care and resource use, first using a bivariable approach and then adjusting for demographics, severity of illness, functional status, and study site. We restricted this secondary analysis to the group of patients with heart failure, because of the variability in the specialty of physicians caring for these patients and the frequency of this diagnosis among SUPPORT patients.

Finally, to determine whether any observed difference in resource use could lead to a survival advantage, we examined the relation between patient race and survival using a Cox proportional hazards model to calculate hazard rates, adjusting for socioeconomic factors, severity of illness, functional status, and site.[22]

## RESULTS

### Patient Characteristics

Of 9,105 patients enrolled, the median age was 65 and 43% were female (Table 1). Nearly 16% were African-American, 79% were white, 3% Hispanic, 1% Asian, and 1% other race. Eighteen percent had Medicaid Insurance Coverage, either alone or in combination with Medicare; 53% had private insurance (alone or in combination with Medicare); 24% had Medicare only; and only 4% were uninsured. The median level of education was completion of high school. Nearly 56% reported an income less than $11,000 annually. The median number of activities of daily living dependencies 2 weeks prior to hospitalization was 1. By 6 months of follow-up, 47% of the patients had died.

A comparison of patient characteristics according to patient race is shown in Table 1. Compared with white and other race patients, African-Americans were younger, more likely to be female, had fewer years of education, were less likely to have private health insurance, and had lower family income. In addition, for African-American patients the APS was higher (indicating more severe illness). The median day 1 APS was 50 for African-American patients and 46 for other race patients ($p < .001$). African-American patients were more likely to want life-extending care (45% vs 35%, $p < .001$) and to choose CPR in the event of cardiac arrest (67% vs 55%, $p < .001$).

**Table 1. Patient Characteristics by Race[*]**

| Factors[†] | African-American ($n$ = 1,423) | Other Race ($n$ = 7,653) | $p$ Value |
|---|---|---|---|
| Sociodemographics | | | |
| Median age | 60 (46, 70) | 66 (54, 75) | < .001 |
| Female gender (%) | 50 | 43 | < .001 |
| Median years of education | 11 (8, 12) | 12 (10, 14) | < .001 |
| Insurance (%) | | | < .001 |
| Private only | 22 | 31 | |
| Medicare only | 29 | 24 | |
| Medicaid only | 21 | 10 | |
| Private/Medicare | 8 | 27 | |
| Medicare/Medicaid | 13 | 6 | |
| No insurance | 8 | 4 | |
| Income (%) | | | < .001 |
| < $11,000 | 75 | 52 | |
| $11,000–24,999 | 15 | 22 | |
| $25,000–50,000 | 8 | 17 | |
| > $50,000 | 2 | 10 | |
| Severity of illness | | | |
| Diagnosis (%) | | | < .001 |
| Acute respiratory failure | 40 | 38 | |
| Congestive heart failure | 19 | 15 | |
| Coma | 9 | 6 | |
| Colon cancer | 3 | 6 | |
| Cirrhosis | 5 | 6 | |
| Multiple-organ system failure | 8 | 8 | |
| Lung cancer | 8 | 11 | |
| Chronic obstructive pulmonary disease | 8 | 11 | |
| Median days in hospital prior to study admission | 1 (1, 3) | 1 (1, 4) | .88 |
| Median number of comorbid illnesses | 2 (1, 3) | 2 (1, 3) | .37 |
| Median APS[‡] | | | |
| Day 1 | 50 (31, 71) | 46 (28, 66) | < .001 |
| Day 3 | 33 (20, 54) | 32 (19, 51) | .002 |
| Functional status | | | |
| Median number of ADL[‡] dependencies | 1 (0.5, 2) | 1 (0.5, 2) | .22 |
| Median activity status | 19 (15, 23) | 19 (16, 23) | .02 |
| Resource use | | | |
| Median TISS[‡] | | | |
| Days 1–25 | 24 (15, 35) | 23 (14, 35) | .96 |
| Days 1 and 3 | 30 (17, 42) | 28 (16, 42) | .26 |
| Patients receiving any of 5 invasive procedures (%) | 34 | 36 | .10 |
| Median length of stay for index admission | 12 (6, 23) | 12 (6, 24) | .29 |
| Median hospital costs | $15,316 ($6,092, $33,653) | $14,353 ($5,955, $36,673) | .58 |
| Patient outcomes (%) | | | |
| Six-month survival | 54 | 53 | .64 |

[*] *Information on patient race is missing for 29 patients.*

[†] *For all continuous factors, the median value is given as well as the 25th and 75th percentile.*

[‡] *APS, acute physiology score; ADL indicates activities of daily living; TISS, Therapeutic Intervention Scoring System.*

## Resource Utilization

For all patients, the median TISS score was 29 on study days 1 and 3 while the median TISS during hospitalization was 23. Approximately 36% of the patients had undergone one or more of the five invasive procedures on day 1 or day 3 following study entry. The most frequent procedure was pulmonary artery catheterization, which was performed in 29% of patients on either or both of these days. The median hospital charges adjusted by cost-to-charge ratios for each cost center were $14,489 (25th percentile $5,971; 75th percentile $36,143).

## Race and Resource Utilization

### Bivariable Analysis

In the unadjusted analysis, resource use was similar for African-Americans and patients of other races (see Table 1). The median average TISS on days 1 and 3 was 30

**Table 2. The Effect of Adjustment for Patients' Preferences on Resource Use for African-American versus Other Patients**

| | Without Preference Adjustment* | With Preference Adjustment* |
|---|---|---|
| Any procedure adjusted OR (95% CI) ($n$ = 6,010) | 0.70 (0.58, 0.84) | 0.69 (0.57, 0.83) |
| Day 1 & 3 TISS difference (95% CI) ($n$ = 6,010) | −2.2 (−1.5, −2.9) | −2.3 (−1.6, −3.0) |
| Day 1–25 TISS difference (95% CI) ($n$ = 6,010) | −2.3 (−1.7, −2.9) | −2.2 (−1.6, −2.8) |
| Hospital cost difference (95% CI) ($n$ = 5,404) | −$2,999 (−$1,671, −$4,409) | −$3,996 (−$2,515, −$5,390) |

**Adjusted for other patient sociodemographic factors, severity of illness, functional status, and hospital site (see text).*

for African-Americans and 28 for other patients ($p$ = .26). The median TISS during the entire hospitalization was 24 for African-Americans and 23 for other patients ($p$ = .96). Among African-American patients, 34% received any of five procedures on days 1 or 3, while for white and other race patients, 36% had one of these procedures ($p$ = .10). The median hospital costs for African-Americans and for white or other race patients were $15,316 and $14,353, respectively ($p$ = .58).

### Multivariable Analysis

After adjusting for sociodemographic characteristics, severity of illness, functional status, and study site, African-American patients utilized significantly fewer resources than patients of other races. For the 9,076 patients with complete data on race, comparing African-American to other race patients, African-American patients' adjusted day 1 and day 3 TISS score was 1.8 points lower (95% confidence interval [CI] 1.3, 2.4 points less) or 5% lower than other patients' scores. The adjusted TISS score for days 1 through 25 was 2.0 points lower (95% CI 1.5, 2.5 points less) or 7% lower for African-Americans. The adjusted odds ratio (OR) for receiving one or more of the five procedures was 0.70 (95% CI 0.60, 0.81), suggesting that African-American patients were significantly less likely to undergo these procedures. The median adjusted difference in hospital cost was $2,805 lower (95% CI $1,672, $3,883 less) or 11% lower for African-Americans than for white or other race patients.

For the subset of patients for whom data on preferences for life-extending care were available ($n$ = 6,010), we examined the effect of an additional adjustment for care preferences. Differences in resource use between African-Americans and other race patients persisted and were of similar magnitude after adjustment for preferences for life-extending care, in addition to demographics, severity of illness, functional status, and study site (see Table 2).

When the multivariable analyses of resource use included adjustment for physicians' estimates of the probabilities of their patients surviving 2 months as well as sociodemographics, severity of illness, functional status, and study site, the differences in resource use between African-Americans and other race patients persisted. For 7,433 patients with complete data, the adjusted OR for receiving any procedure was 0.73, the adjusted difference in average days 1 and 3 TISS was −1.9, the adjusted difference in days 1 through 25 TISS was −2.0, and the adjusted hospital cost difference was −$2,869. All these differences were similar in magnitude to those for the model without physicians' prognostic estimates, and remained significant ($p < .001$), suggesting that racial differences in resource use are not explained by differences in physicians' perceptions of patients' prognoses.

After adjusting for the specialty of the primary attending physician (pulmonary disease, cardiology, oncology, surgery, and general medicine or other medical subspecialties), the effect of race on resource use was reduced 25% to 50% (about 25% for procedures and days 1 through 25 TISS, 33% for days 1 and 3 TISS, and 50% for hospital costs), implying that specialty confounds the relation between race and resource use (see Table 3). We

**Table 3. The Effect of Adjustment for the Specialty of the Primary Attending Physician on Resource Use for African-American versus Other Patients**

| | Without Adjustment for Physician Specialty* | With Adjustment for Physician Specialty*† |
|---|---|---|
| Any procedure adjusted OR (95% CI) ($n$ = 9,072) | 0.70 (0.60, 0.81) | 0.77 (0.66, 0.91) |
| Day 1 & 3 TISS difference (95% CI) ($n$ = 9,071) | −1.8 (−1.3, −2.4) | −1.2 (−.67, −1.7) |
| Day 1–25 TISS difference (95% CI) ($n$ = 9,072) | −2.0 (−1.5, −2.5) | −1.5 (−1.0, −2.0) |
| Hospital cost difference (95% CI) ($n$ = 8,173) | −$2,805 (−$1,672, −$3,883) | −$1,438 (−$664, −$2,174) |

**Adjusted for other patient sociodemographic factors, severity of illness, functional status, and hospital site.*
*†Physician specialty was adjusted for across all diagnostic categories.*

hypothesized that African-Americans may be less likely to have a specialist as their primary attending physician and that specialists may be more likely to utilize resources. To investigate these hypotheses, we determined whether African-American patients admitted with the diagnosis of congestive heart failure were less likely to have a cardiologist as their primary attending physician and whether being cared for by a cardiologist was associated with increased resource use. Within this subset of patients with congestive heart failure ($n$ = 1,385), African-Americans were less likely to have a cardiologist as their primary attending physician (41% vs 56%, $p < .001$). Patients with congestive heart failure who had a cardiologist as their attending physician received more resource-intensive treatment than patients with congestive heart failure who were cared for by noncardiologists (e.g., median average of TISS days 1 through 25 was 18 vs 14, $p < .001$). Patients with cardiologists as their attending physicians were more likely to have a pulmonary artery catheter line inserted (46% vs 25%, $p < .001$). For patients with heart failure, these relations persisted after adjustment for patient demographics, severity of illness, functional status, and site, suggesting that differential use of specialists accounts, in part, for the observed relation between race and resource use among patients with heart failure.

### Effect of Race on Survival

The observed survival at 2 months for African-American patients compared with white and other race patients was 0.66 and 0.65, respectively. At 6 months, the observed survival for African-Americans compared with white and other race patients was 0.54 and 0.53, respectively. After adjustment for factors included in the analysis of resource use (sociodemographics, severity of illness, functional status, and study site) using a Cox proportional hazards model, adjusted survival time was slightly better for African-American patients than for white and other race patients (hazard ratio 0.91, 95% CI 0.84, 0.98).

## DISCUSSION

Our findings demonstrate that race is associated independently with resource utilization in seriously ill hospitalized adults, after adjustments for other sociodemographic factors, severity of illness, functional status, site, the specialty of the patients' primary attending physician, physicians' prognostic estimates, and patients' preferences for life-extending treatments. For African-Americans resource use was consistently lower for all measures: TISS, a composite measure of resource intensity, the use of any of five diagnostic or therapeutic procedures, and hospitalization costs. Although these findings were not apparent on bivariable analyses, they were noted consistently after careful adjustment for important confounding factors. The absence of an association between race and resource use on bivariable analysis is not surprising given the younger age and the worse severity of illness for African-Americans in SUPPORT, since both younger age and worse illness severity are associated with resource use. Additional resources provided to white and other race patients did not translate into a survival benefit for them.

Our findings that African-American patients had more severe illness as measured by the APS than other patients is similar to that reported by other investigators. For example, Buckle and colleagues used a computerized severity index [8] to show that African-Americans had more severe illness when hospitalized. Our findings that African-Americans had similar mortality to white and other race patients are in disagreement with the results of some other studies, possibly owing to differences in the patient population we studied or to the inability of previous studies to adjust for severity of illness. For example, other data demonstrate that African-Americans may be more likely to suffer from heart disease, stroke, and premature death.[23–25] Mortality for African-Americans less than 65 years of age exceeds that for whites by 58%.[26] In a study of intensive care, in-hospital mortality for African-Americans was nearly three times higher than that for whites after adjusting for illness severity, case mix, and type of health insurance (risk ratio 2.9; 95% CI 1.5, 5.6).[27] However, other studies, like ours, did show similar survival for African-Americans and white or other race patients.[28,29]

Our findings are consistent with previous research demonstrating that African-Americans receive less resource-intensive care, yet do not have higher mortality than white or other race patients. In an analysis of patients receiving care in 42 different intensive care units performed by Williams et al., African-Americans had more severe illness than patients of other race. After careful adjustment for illness severity, African-Americans had slightly but significantly less resource use in the intensive care unit, but similar mortality to other patients.[28] In a study of race and variation in cardiac procedure use, Peterson et al. found that African-Americans with an acute myocardial infarction were less likely to undergo cardiac procedures but had better 30-day survival and similar 1-year survival when compared with white patients.[29] Our results are similar to those of Peterson et al., in that we report less resource use but slightly better short-term survival for African-American patients than for white and other race patients.

We report differences according to patient race with a cardiologist as the primary attending physician, and in resource use according to the specialty of the primary attending physician. For patients with congestive heart failure, African-American patients were less likely to have cardiologists as their primary attending physicians, and patients cared for by cardiologists as their primary attending physician utilized more resources. This finding is consistent with the results of several other studies.[30–34] For example, Greenfield et al., in the Medical Outcomes

Study, found that specialty care was associated with increased resource use as measured by hospitalizations, the use of diagnosis tests, frequency of visits, and prescription costs.[30] Although this is a matter of controversy, several reports suggest that better outcomes may be associated with specialized care.[35-37] For example, a substudy of the Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries (GUSTO Trial) suggested that Americans had more specialty care than Canadians, and had better outcomes.[38] Results of a physician survey suggest that general internists may be less knowledgeable than cardiologists about guidelines for management of patients with coronary artery disease, which could lead to better outcomes for subsets of patients managed by cardiologists.[39] In our analysis of patients with heart failure, however, treatment by cardiologists as primary attending physicians was not associated with better survival (data not shown).

We report differences in preferences for life-extending care between African-Americans and other patients although these differences did not contribute substantially to the observed differences in resource use. There are several possible explanations for these differences. On the one hand, differences in care preferences according to race may represent true differences in preferences. Alternatively, the questions we asked may have been interpreted differently by persons of different race, leading to differences in measured preferences. Minority patients may perceive themselves to be at risk for not receiving treatment and act to reduce these risks by requesting aggressive treatment. In a more detailed analysis of preferences for CPR among SUPPORT patients, we found that race was an important bivariable correlate of patients' preferences, but in the multivariable analysis, the effect of race was no longer statistically significant after adjusting for disease severity, prognosis, patients' functional status, and patients' perceptions of their likely survival.[38]

Why the increased use of resources for white and other race (not African-American) patients is not associated with a survival advantage is unclear. Possibly, the differences we observed relate to discretionary procedures or care that may not be strongly related to patient outcomes. For the procedures we studied, such as the use of the pulmonary artery catheter, there is no clear consensus on indications for their use or whether their use leads to better patient outcomes. Nevertheless, differences in resource use by race that are not explained by illness severity, case mix, or other factors are an important indication that differences exist in the care of seriously ill hospitalized adults.

This analysis is limited in several important ways. First, although we controlled for severity and used severity measures developed in patients of different races, our severity measures may have introduced error, perhaps by having an unmeasured interaction with race. For the subset of patients with heart failure, more refined adjustment for disease-specific severity measures might change our results. For these patients, differences by race in severity of illness could have affected resource use, the likelihood of having a cardiologist as primary attending physician, and patient outcomes. For example, cardiologists may have been caring for patients with more severe illness, which could explain increased resource use and the absence of a survival benefit for patients treated by cardiologists. In addition, as we did not collect data on specialty consultations, we do not know the extent to which specialists were consulted by the primary attending physician. Frequent involvement by cardiologists as consultants in the care of patients whose primary attending physician was a generalist could explain the similar outcomes we observed for patients cared for by cardiologists or noncardiologists as their primary attending physicians.

Second, although we accounted for patients' preferences to undergo aggressive care or CPR in the event of cardiac arrest, we did not have information on patients' preferences to undergo the specific procedures studied in this analysis. Third, differences in resource use by race were apparent only after careful adjustment for confounding factors. Possibly, use of a different adjustment strategy could have changed our results. However, we believe the multivariable adjustments we used were appropriate and demonstrate a true effect, which is consistent with other similar studies.[28] Fourth, patients we studied were highly selected, and our results may not be generalizable to African-Americans with other diagnoses or with less severe illness. Fifth, we were unable to adjust for differences in access to care. A relative lack of access to primary care by African-American patients could result in less intensive use of resources as well as a survival advantage following hospitalization. For example, in the subset of patients with heart failure, African-American patients who lacked primary care might be hospitalized with more easily reversible disease associated with better survival. Finally, information on family income was not available for all patients, nor were patients' occupations available. If we had more detailed measures of socioeconomic status, the impact of race alone may have been measured more effectively.

In summary, our findings demonstrate that seriously ill African-Americans received less resources and fewer procedures than patients of other races, after adjusting for other sociodemographics, severity of illness, functional status, patients' preferences, physicians' prognostic estimates, and the specialty of the attending physician. Closer examination of patients with congestive heart failure suggests that physician specialty is associated with resource use and that African-American patients have cardiologists as their attending physicians less often than white and other race patients. For all patients, despite the observed differences in resource use, white and other race patients did not have a survival advantage at 2 or 6 months of follow-up. Further work is required to determine if the procedures we studied were systematically underused in African-American patients or overused in white and other race patients. In addition, more attention should be focused on whether differential use of subspecialty care is a marker for access to care, and whether seriously ill patients' needs are best served by specialists or generalists.

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## APPENDIX A

### *Interview Questions*

1. *Interview question regarding CPR preference:* "As you probably know, there are a number of things doctors can do to try to

revive someone whose heart has stopped beating, which usually includes a machine to help breathing. Thinking of your current condition, what would you want your doctors to do if your heart ever stops beating? Would you want your doctors to try to revive you, or would you want your doctors not to try to revive you?"

2. *Interview question regarding life-extending care:* "If you had to make a choice at this time, would you prefer a course of treatment that focuses on extending life as much as possible, even if it means having more pain and discomfort, or would you want a plan of care that focuses on relieving pain and discomfort as much as possible, even if that means not living as long?"

3. *Physician interview question regarding patient's prognosis:* "What is the probability this patient will live for 2 (6) months or more?"

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# REFLECTIONS

## Fall from Grace

As a new member of the junior faculty, I like to attend Grand Rounds when I can. I feel the continuity of medical history, finding my place between the kyphotic emeritus attendings in the front rows and the slouched young residents in the back. I watch what were once heroes in the academic halls—the self-appointed Giants of medicine—snoozing through thrombolytic therapy and clinical practice guidelines.

The other day, at a noontime lecture by a world-renowned cardiologist, my attention was riveted to a retired practitioner stuffing half-a-dozen plexiwrapped sandwiches into a Ralphs bag, hoarding at least 20 napkins in his fist. Who had he been? I wondered. Was he always a pilferer? Did he always slink out of the lecture when the lights went down, back to his room with his tunafish catch?

As the speaker wielded his remote control, I imagined the front row Rumpelstiltskin, twenty years earlier, upon the lectern, calling for his own next slide. Was he as dazzling in his day, captivating the attention of resident and student, alike? Did he rattle off his data with the assurance of authority, imagining himself at the pinnacle of medicine? Did he scoff at the cuppers and bleeders of yore, suffused with his sense of having arrived at truth, unencumbered by the ignorance of generations past?

When he finally descended from the mount of his podium, did the masses of his colleagues and the housestaff cluster about him, throwing verbal flowers at his feet and asking earnestly for more details of his research? Would he then stroll off to teach physical diagnosis on the wards, passing on the art of medicine he believed would never take a back-seat to technology?

I'm sure there were minor sacrifices in his glory years. He was probably late for dinner most nights. His wife, now-deceased, must have learned not to wait for him, tucking the children into bed without him. But she would understand that medicine came first. Patients needed him. Doctors-in-training needed him. The progress of medicine itself needed him.

And the professional gratification was worth it all. In the cloister of hospital and office, there was no better life. He wrote the orders, laid-on the hands. Even the "good evening, doctor" from maintenance personnel and garage attendants, compensated for night visits to the emergency room. Whenever he left the premises, changing out of his white cape into his drab Clark Kent attire, he felt, regretfully, the sting of anonymity. The BMW in the next lane did not see his stethoscope as it cut him off, wagging an impersonal finger in the air.

Did the professor ever foresee that one day he might be squirreling vending-machine sandwiches into a shopping bag at Grand Rounds? Did he ever glimpse his own mortality?

"I grow old, I grow old" . . . I am haunted by T.S. Eliot's image of an aging man with his trousers rolled. Even as a young academician (swept up in the publish-or-perish fast lane and in daily meetings with the movers and shakers), I cannot help notice, like Eliot's Prufrock, how people come and go in this profession. My mentors are graying, getting paunchy, acquiring tics and tremors. And the little old men I never knew—the inventors of invasive new technology, the lords of private practice—each morning shuffle into the doctor's lounge, grab their bagels and cream cheese, and nod off in front of Oprah.

Already, just two years out of my own residency, I look like a relic to the new housestaff. They are uncomfortable calling me by my first name. I am an "attending." In private, surely they find me a bit gauche and out of date. (The name of the latest seratonin-re-uptake inhibitor escapes me.)

The medical students, for God's sake, tremble in front of me as they interview for coveted residency slots. "Hey, you guys, it's just me," I want to tell them. "I've been there, done that. Don't tell me what you *think* I want to hear. Tell me why you really want to be an internist." They unfailingly insist they want to "help people." Nobody has yet had the temerity to say it's nice to be loved.

These days, I find myself going to bed earlier and earlier. I rarely have to take night call. The frenetic days are over. The phone is quiet. The beeper doesn't shatter the silence anymore. But still, sometimes I toss and turn at 3 AM. It's no longer the fear of having botched an admission, anymore, someone crashing because of my presumed negligence, that troubles me. It's an image of little old me, forty years from now, struggling on my osteoporotic limbs to cross the great hospital corridor to the auditorium, with fleet-footed housestaff hurrying in another direction, waiting impatiently for me to pass.

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