Racial Comparison of Outcomes and Costs for Inpatient Neutropenic Patients: A Multicenter Evaluation

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Abstract

Purpose: Racial disparities have been reported in the care and outcome of cancer patients. We evaluated whether race would influence the cost and outcomes of inpatient neutropenic cancer patients in a multicenter study from a large health care system in the southern United States.

Methods: Data was collected on all cancer inpatients with a diagnosis code for neutropenia in a 16-hospital system between October 1, 2002, and September 30, 2003. Demographics, treatment outcomes, and costs were compared between white and minority patients. A *P* value less than .05 was considered statistically significant.

Results: Two hundred seventy-nine cancer patients (0.29% of all admits) had a diagnosis of neutropenia. Demographics were similar between white and minority patients. However, minorities were more likely to be younger than whites (*P* = .002). With regards to outcomes, length of stay (LOS), LOS in the intensive care unit, and discharge status were not statistically different. Total hospital, medication, laboratory, radiation, surgery, and respiratory costs were also similar (*P* > .05), although minorities were less likely to receive myeloid colony-stimulating factors (*P* = .032) and more likely to have higher nursing care costs (*P* = .048).

Conclusion: In light of the escalating reports of racial disparities in cancer care, these minimal differences are encouraging.

Introduction

Many studies have demonstrated racial disparities in the cost and outcomes of cancer patients, with minorities generally having lower cost and poorer outcomes than whites.¹⁻³ For example, Godley et al¹ showed that elderly African Americans (AAs; *n* = 5,747) had shorter median overall survival times and shorter prostate cancer–specific survival times compared with elderly whites (*n* = 38,242) in the treatment of localized prostate cancer. However, research in controlled health care settings where there is equal access to care (e.g., Veteran's Administration, Department of Defense), have shown that treatment, cost, and outcome of patients is largely similar, regardless of race.⁴

Neutropenia is a common complication of many chemotherapy regimens, leading to dose reductions, infectious complications, and potential hospitalization. No published studies have compared the treatment outcomes and cost of inpatient neutropenic cancer patients based on race. We hypothesized that minority cancer patients in our 16-hospital system will have poorer outcomes and fewer treatment-related costs than white cancer patients for the treatment of neutropenia and neutropenic fever. This hypothesis is based on the published literature on health disparities in cancer care and the fact that there is no controlled mechanism in this health system to ensure equal access to care for all patients.

Methods

White and minority cancer inpatients with a diagnosis of neutropenia (International Classification of Disease [ICD] code: agranulocytosis) were selected from a database comprising 16 hospitals that are part of the same southern United States health care system between October 1, 2002, and September 30, 2003. Database fields that were compared between the two

groups included race, age, type of cancer, length of stay (LOS), case mix index (defined as the reflection of severity of illness on the basis of the principal diagnosis), discharge status, type of insurance, and cost (including total, medication, nursing, laboratory, surgery, radiology, occupational therapy/physical therapy, and respiratory costs). Medication use was also examined.

Diagnoses were obtained from an aggregated Diagnostic Related Group (DRG) coding system (Medicode-DRG Expert). Cost data were extracted from hospital financial data. The *t* test was used to evaluate normally distributed continuous variables, such as age, between white and minority patients. The Mann-Whitney U test was used to evaluate non–normally distributed continuous data, such as LOS and cost. The χ^2 test was used to evaluate categorical, nominal variables, such as type of medications. Two-way contingency analyses were used to evaluate the relationships between race and type of cancer, insurance status, and discharge status. A *P* value less than .05 was considered statistically significant. The Baptist Memorial Health Care institutional review board oversaw the study, but granted an exemption from the requirement to obtain consent from each patient because the study was completed as part of internal continuous quality improvement initiatives.

Results

Patient Demographics

Two hundred seventy-nine cancer inpatients had a diagnosis of neutropenia from 11 hospitals between October 1, 2002, and September 30, 2003; this accounted for 0.29% of all admits in the entire hospital system. Five hospitals had no neutropenic cancer inpatients. Sixty-nine percent of patients were white, 29% were AA, 1% were Hispanic, and less than 1% were black Hispanic. Only eight white patients (4%) had a concurrent

Table 1. Breakdown of Cancer Diagnoses Between White and Minority Patients ($P = .08$)

Type of Cancer	White (n=193)		Minority (n=86)	
	No.	%	No.	%
Respiratory	37	19	15	17
Genitourinary	28	15	8	9.3
Hematologic	26	13	27	31
Breast	24	12	13	15
Gastrointestinal	18	9	14	16
Metastatic	7	4	2	2
Oral	3	2	2	2
Other*	3	2	5	6

* Includes thyroid, unknown primary, and benign.

diagnosis of fever compared with two AA patients (2%), according to recorded ICD-9 classification for fever.

Demographic characteristics between white ($n = 193$) and minority patients ($n = 86$) were similar with respect to cancer diagnoses, insurance status, and case mix index (P for all was not statistically significant). Table 1 and Figure 1 detail cancer diagnosis and insurance status, respectively. Minority patients were statistically younger compared with white patients (average age for minorities, 55.9 years; standard deviation [SD], 16.4 years; average age for whites, 62.3 years; SD, 13.9 years; $P = .002$).

Outcomes

Outcomes were also similar between white and minority patients. Specifically, LOS and intensive care unit (ICU) LOS were comparable, with median overall stays of 7 days (range, 1 to 87 days) versus 7 days (range, 1 to 62 days; $P = .183$) and ICU LOS of 0 days (range, 0 to 16 days) versus 0 (range, 0 to 32 days; $P = .432$) for white and minority patients, respectively. Patients also had a similar discharge status, with the majority of all patients (85%) being discharged (Fig 2).

Cost

Table 2 shows the median total and itemized costs for white and minority patients. There was no significant difference in any area except for nursing, where minority patients had statistically higher nursing costs associated with their care (median cost of nursing, \$872 for minorities v \$581 for whites; $P = .048$).

Medication Use

Table 3 shows the percentage of patients who received at least one dose of myeloid colony-stimulating factors (CSFs) and/or anti-infectives. White patients were more likely to receive CSFs ($P = .032$), whereas anti-infective use between the two groups was similar. An analysis of chemotherapy regimens was not completed because the available data set contains inpatient medications only.

Figure 1. Insurance status of white and minority patients ($P = .493$).

Discussion

Several limitations need to be considered when analyzing these results. First, this retrospective review included evaluation of a health system claims database. These databases are likely to contain miscoding and/or be incomplete for demographic information. For example, a very small number of patients were coded as having a fever as defined by ICD-9 diagnoses. However, on the basis of the large number of patients who received

Figure 2. Discharge status of white and minority patients ($P = .68$).

at least one dose of an anti-infective, it can be assumed that more patients presented with febrile neutropenia than were noted in the database.

Table 2. Total Hospital and Departmental Costs for White and Minority Patients

	Cost (U.S. Dollars)		<i>P</i>
	White (n=193)	Minority (n=86)	
Total cost*	7,436	7,427	.84
Medication			.73
Median	1,229	1,280	
Range	45-51,026	10-15,360	
Nursing			.048†
Median	581	872	
Range	0-13,806	0-17,124	
Laboratory			.21
Median	602	689	
Range	6-15,495	0-12,173	
Surgery	0	0	.35
Median			
Range	0-5,741	0-634	
Radiology			.81
Median	111	101	
Range	0-2,484	0-4,290	
PT/OT			.93
Median	0	0	
Range	0-967	0-1,331	
Respiratory			.64
Median	0	0	
Range	0-968	0-1,314	

Abbreviation: PT/OT, physical therapy/occupational therapy.

* Range not available.

† Statistically significant.

Table 3. Percentage of Patients With One or More Doses of Colony-Stimulating Factors or Anti-Infectives

Prescription	White (n=193)	Minority (n=86)	<i>P</i>
Colony-stimulating factors	58	44	.03*
Third- and fourth-generation cephalosporin	50	50	.97
Carbapenem	19	16	.56
Aminoglycoside	22	13	.08
Fluoroquinolone	53	55	.78
Vancomycin	46	51	.44
β -lactamase penicillin	12	10	.73
Miscellaneous antibiotics	59	57	.29
Antifungals	45	38	.30

*Statistically significant.

A second limitation is that the majority of patients being compared did not have neutropenia as their primary reason for hospitalization. To be selected for this analysis, patients only had to have a diagnosis of neutropenia. Our database allows a maximum of 15 diagnoses per hospitalization. However, oftentimes the primary diagnosis listed is the most expensive diagnosis and not necessarily the most life threatening. Both of these factors make it difficult to match patient groups. It is worth reiterating that diagnosis coding is subject to misinformation and incompleteness.

Finally, the medication-use records provide information on therapies that patients received only as inpatients. It is not possible to evaluate chemotherapy records, but many patients are likely to have undergone chemotherapy treatment as outpatients.

With the exception of age and CSF use, the overall demographics, outcomes, and cost did not differ between white and minority neutropenic cancer patients in this large, multicenter hospital system. In light of escalating reports of racial disparities in cancer care, these results are encouraging. The difference in age between whites and minorities may be explained by the fact that minority patients are generally younger than white patients at the time of cancer diagnosis as documented by the Surveillance, Epidemiology, and End Results (SEER) database.⁵ The statistically significant difference in nursing costs was small and is likely not clinically significant.

The statistically significant difference in CSF use between whites and minorities may be explained in part by several factors. First, many minority patients present with more advanced stages of disease compared with white patients with the same cancers.⁶ If this is the case in our patient populations, treating physicians may have different treatment intents (ie, palliative *v* curative). This could have resulted in minority patients receiving single-agent chemotherapy rather than combination chemotherapy, thereby reducing the risk of neutropenia and the need

for CSF use. However, since white and minority patients had no difference in discharge status, this is unlikely to be the primary reason. Alternatively, minority patients may have received lower chemotherapy relative dose intensities (RDIs), as was documented by Griggs et al⁷ in a retrospective chart review of 489 breast cancer patients receiving chemotherapy. Here, multivariate analyses demonstrated that minority race/ethnicity and higher body mass index were independently associated with lower chemotherapy dose proportions and RDI, compared with white race and lower body mass index. A chart review is necessary to determine whether either the stage of cancer or RDI of chemotherapy regimens contributed to the difference in CSF use. Again, the difference in CSF use is unlikely to have clinical significance.

Although white patients had significantly higher CSF use and lower costs associated with nursing care, these results do not appear to be clinically relevant. Overall, our findings were favorable, considering that access to care was not controlled as it is in federal institutions. Future study plans include evaluating the cost and outcomes of cancer patients on the basis of insurance status as a result of the recent changes in Medicare reimbursement.

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Authors' Disclosures of Potential Conflicts of Interest

Although all authors completed the disclosure declaration, the following authors or their immediate family members indicated a financial interest. No conflict existed for drugs or devices used in a study if they are not being evaluated as part of the investigation.

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