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Neuroimaging for Pediatric Head Trauma: Do Patient and Hospital Characteristics Influence Who Gets Imaged?

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Abstract

Objectives: To identify patient, provider, and hospital characteristics associated with the use of neuroimaging in the evaluation of head trauma in children.

Methods: This was a cross-sectional study of children (≤ 19 years of age) with head injuries from the National Hospital Ambulatory Medical Care Survey (NHAMCS) collected by the National Center for Health Statistics. NHAMCS collects data on approximately 25,000 visits annually to 600 randomly selected hospital emergency and outpatient departments. This study examined visits to U.S. emergency departments between 2002 and 2006. Multivariable logistic regression was used to analyze characteristics associated with neuroimaging in children with head injuries.

Results: There were 50,835 pediatric visits in the 5 year sample, of which 1,256 (2.5%, 95% CI = 2.2% to 2.7%) were for head injury. Among these, 39% (95% CI = 34% to 43%) underwent evaluation with neuroimaging. In multivariable analyses, factors associated with neuroimaging included white race (odds ratio [OR] 1.5, 95% CI = 1.02 to 2.1), older age (OR 1.3, 95% CI = 1.1 to 1.5), presentation to a general hospital (vs. a pediatric hospital, OR 2.4, 95% CI = 1.1 to 5.3), more emergent triage status (OR 1.4, 95% CI = 1.1 to 1.8), admission or transfer (OR 2.7, 95% CI = 1.4 to 5.3), and treatment by an attending physician (OR 2.0, 95% CI = 1.1 to 3.7). The effect of race was mitigated at the pediatric hospitals compared to at the general hospitals ($p < 0.001$).

Conclusions: In this study, patient race, age, and hospital-specific characteristics were associated with the frequency of neuroimaging in the evaluation of children with closed head injuries. Based on these results, focusing quality improvement initiatives on physicians at general hospitals may be an effective approach to decreasing rates of neuroimaging after pediatric head trauma.

Keywords

Cranio-cerebral trauma; Diagnostic imaging; Emergency service; hospital

INTRODUCTION

Pediatric head trauma results in greater than 650,000 emergency department (ED) visits in the United States every year.¹ The challenge in the diagnostic evaluation of these patients is to identify intracranial injury (readily accomplished by neuroimaging with computed tomography [CT]), while limiting unnecessary imaging procedures and their attendant risks.

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Although neuroimaging is frequently employed, fewer than 10% of scans are diagnostic of traumatic brain injury (TBI), and fewer than 1% of children with minor head trauma who undergo CT imaging require neurosurgical intervention.^{2,3} Studies have attempted to identify clinical predictors for TBI to guide clinicians in the optimal use of neuroimaging, but there remains significant practice variation, with rates of imaging ranging from 5% to 70%.^{1,4-6} It is uncertain how the most recent large cohort study by Kuppermann et al. will change practice patterns.⁷

The short-term benefits of judicious use of imaging for pediatric head trauma include the avoidance of imaging costs, fewer procedural sedations for imaging, and shorter ED lengths of stay.⁸ The long-term benefits include the avoidance of unnecessary exposure to radiation, which is associated with an increased risk of cancer mortality.⁹ Despite these incentives for limiting unnecessary head imaging, CT rates for head trauma continue to increase.^{2,3,10-12}

There may be patient, provider, hospital, and geographic characteristics associated with the decision to perform imaging in pediatric closed head injury patients. Associations between head imaging and age, as well as hospital type have been demonstrated on univariate analysis in prior studies, without controlling for confounding variables.⁴ The creation of a multivariate model to identify factors associated with neuroimaging in pediatric head injury, particularly nonclinical factors, may be useful in the development of targeted quality improvement interventions. Our hypothesis is that nonclinical factors, including hospital type (pediatric vs. general), patient race and age, and provider type may significantly influence the utilization of neuroimaging in the setting of pediatric head trauma. The goal of this study was to investigate nonclinical factors associated with neuroimaging in pediatric head trauma patients using a multi-year national database of ED visits.

METHODS

Study Design

This was retrospective review of data from the National Hospital Ambulatory Medical Care Survey (NHAMCS). This study was deemed exempt from full review by the institutional review board, because the data are publicly available and de-identified.

Study Setting and Population

We examined ED visits for the years 2002–2006. The NHAMCS is an annual survey of hospital ED and outpatient department visits, designed by the National Center for Health Statistics, a division of the Centers for Disease Control and Prevention, and is administered by the U.S. Census Bureau. The survey measures ambulatory care service utilization in hospital EDs and outpatient clinics in the United States. Data are obtained from samples of geographically defined areas, hospitals within these areas, clinics and EDs within hospitals, and patient visits within these clinics and EDs as components of the four-stage probability design. A nationally representative sample of non-institutional general (medical, surgical, and children's) and short-stay hospitals, excluding federal, military, and Veterans Administration hospitals, is randomly selected within geographically defined areas (primary sampling units), after adjustment for size. ED visits and outpatient clinics are sampled separately. Data are collected on approximately 25,000 visits annually to some 600 hospital EDs and outpatient departments and are utilized to derive national estimates.

Visit information is collected during a randomly assigned 4-week reporting period each year by trained staff members at the sampled hospitals with monitoring by NHAMCS field representatives. Data consistency is ensured by data processing at a central facility followed by manual checking by a computerized algorithm.¹³ All NHAMCS datasets are publicly available (http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm).

In the NHAMCS database, up to three diagnoses are recorded as free text for each visit and then centrally coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. We identified patient visits for head trauma in children ≤ 19 years using the ICD-9-CM codes for skull fracture (800.xx to 804.xx), concussion (850.xx), intracranial hemorrhage (851.xx to 853.xx), other brain injury (854.xx), and head injury not otherwise specified (959.01). We separately analyzed patient visits exclusively for soft tissue injuries of the head using the ICD-9-CM codes for superficial injury of face, neck, and scalp, except eye (910.xx), and contusion of face, scalp, and neck, except eye(s) (920.xx).

Study Protocol

Facilities are indicated only by a pseudo-identifier in NHAMCS; therefore, we used characteristics of the visits to categorize the types of hospitals as described in prior published studies using NHAMCS data.^{4,14} EDs in which 90% or more of all visits (i.e., not only those for head injury) were for patients 19 years or younger were classified as pediatric facilities. Academic hospitals were defined as facilities in which at least 25% of the patients were evaluated by a resident physician. We examined data on other hospital characteristics, including region (Northeast, South, Midwest, and West), hospital ownership (private, nonprofit, and government), and setting (urban vs. rural).

In addition to type of hospital, we examined the following variables: injury intent (unintentional, intentional, and unknown), discharge diagnoses, patient demographics (age, sex, race, and ethnicity), patient insurance type (private and not private), day of visit (weekday vs. weekend), ED visit within 72 hours, provider types (attending physician, resident, nurse practitioner, physician assistant), and patient disposition (discharge vs. hospital admission or transfer). Patient race (white or non-white) and ethnicity (Hispanic or non-Hispanic) were determined based on the observations of hospital personnel, unless it is hospital policy to ask patients directly for this information. This is in accordance with the NHAMCS instructions to record race and ethnicity according to the “hospital’s usual practice or based on your knowledge of the patient or from information in the medical record.”¹³ The NHAMCS data do not include any direct measure of socioeconomic status, thus “type of insurance” served as a surrogate measure, comparing private insurance to not-private insurance (combining the category ‘Medicaid’ with ‘self-pay,’ ‘no charge,’ ‘other,’ and the very low frequency categories ‘Medicare,’ ‘Workman’s Compensation’). In addition, this database also does not contain information about injury severity (e.g. Injury Severity Score) so we used “immediacy with which the patient should be seen,” “associated injuries,” “admit to hospital,” and “transfer” as proxies for injury severity. The “associated injuries” variable was defined as the presence of any non-TBI ICD-9-CM injury code in the diagnoses. Finally, we also included variables to describe the proportion of white patients and patients with private insurance seen at a hospital, in order to distinguish disparities in care within hospitals versus those across hospitals.¹⁵ Binary variables were created using the median proportion of white or private insurance patients in all the hospitals in the dataset, and classifying hospitals as serving high or low proportions of white or private insurance patients.

Outcomes Measures

Rates of neuroimaging and of intracranial injury were determined from the data set. The NHAMCS case report form indicates only whether a computed tomography (CT) or magnetic resonance imaging (MRI) was performed, not specifically whether the imaging was neuroimaging, or CT/MRI for other body systems. We made the assumption that imaging was neuroimaging in these cases since our study sample consisted of patients with

head injuries. Intracranial hemorrhage (ICH) was determined using the ICD-9 codes described above.

Data Analysis

Weights, strata, and primary sampling unit design variables provided by the NHAMCS were used for all analyses. We used descriptive statistics, with appropriate weighting, to account for the survey sampling methodology, using the *svy* commands available in Stata 10.1 (StataCorp, College Station, TX). Variables associated with head imaging ($p \leq 0.1$ on a chi-square test) served as independent variables in a multivariate logistic regression model that included race, ethnicity, and three confounders identified a priori: “associated injuries,” “geographic region,” and “socioeconomic status.” The variables previously described to control for disparities within hospitals were also included in the final model.¹⁶ In developing this model, close attention was given to the number of observations analyzed in order to assure that it was not over-fitted. Unless otherwise noted, percentages are expressed as survey-weighted proportions and all p-values are two-sided. Significance in the final model was defined as a p-value of less than 0.05.

RESULTS

Head Injury Visit Rates and Characteristics

Of the 183,520 ED visits in the pooled five-year sample, 27.7% (95% CI = 26.7% to 28.8%) were for children 19 years or younger, representing 158,000,000 pediatric ED visits nationally. Of these, 1256 visits (2.5%; 95% CI = 2.2% to 2.7%) were for head injury, representing 3,890,996 visits. An additional 1245 visits (2.5%; 95% CI = 2.4% to 2.8%) were for soft tissue injuries alone. Thirty-nine percent of pediatric patients diagnosed with head injury had imaging (95% CI = 34 to 43); 1.3% of those diagnosed with head injury (95% CI = 0.61% to 2.6%) were ultimately diagnosed with ICH. In contrast, only 18% of those diagnosed with soft tissue injuries alone (95% CI = 15% to 21%) underwent imaging. Demographics and other characteristics for the study population are shown in Tables 1a and 1b.

Head Imaging and Association with Patient, Provider, Geographic and Hospital Characteristics

Univariate analysis of patient characteristics identified race as significantly associated with head imaging (Table 1a). Injury severity variables, immediacy with which the patient should be seen, associated injuries, and admission or transfer status were also significantly associated with head imaging (Table 1a). The type of hospital (pediatric hospital vs. general hospital) was the only hospital characteristic associated with head imaging (Table 1b). Other variables that passed the univariate screen ($p \leq 0.1$) but were not statistically significant ($p < 0.05$) included intentionality of injury ($p = 0.06$) and seen by an attending physician ($p = 0.1$). Sex, ethnicity, and type of insurance were not predictive of imaging. The metropolitan statistical area (MSA), region of the United States, type of hospital funding, teaching hospital status, day of week, recent ED visit, and other provider type (resident, physician assistant, or nurse practitioner) were also not significantly associated with the use of head imaging. Intracranial hemorrhage was more common in patients undergoing head imaging at pediatric hospitals (7.8%, 95% CI = 1.8% to 29%) compared to general hospitals (1.1%, 95% CI = 0.33% to 3.3%) (OR 7.9, 95% CI = 1.1 to 57). There was no significant difference in the rates of ICH among imaged patients who were white versus non-white.

A multivariate logistic regression model was used to determine the odds of neuroimaging for pediatric head trauma based on patient and hospital factors. White race (OR 1.5, 95% CI = 1.02 to 2.1), increasing age (OR 1.3, 95% CI = 1.1 to 1.5), immediacy with which patient

should be seen (OR 1.4, 95% CI = 1.1 to 1.8), hospital admission or transfer (OR 2.7, 95% CI = 1.4 to 5.3), evaluation by an attending physician (OR 2.0, 95% CI = 1.1 to 3.7), and evaluation at a non-pediatric hospital (OR 2.4, 95% CI = 1.1 to 5.3) were significantly associated with neuroimaging (Table 2). Ethnicity, type of insurance, intentionality of injury, associated injuries, high proportion of white patients, high proportion of patients with private insurance, region, and MSA did not achieve significance in the multivariate model (Table 2).

Effect modification was found between race and hospital type: white patients were more likely to receive imaging at non-pediatric hospitals compared to non-whites, but not in pediatric hospitals ($p < 0.001$ for interaction term).

DISCUSSION

Our study identifies several variables associated with head neuroimaging among pediatric patients seeking care in EDs for head injuries. Although pediatric head trauma is a frequent and potentially life-threatening injury, there is still controversy and variability in the use of neuroimaging for head injury.⁵ Blackwell et al. demonstrated the association between age and hospital type with the use of neuroimaging using univariate modeling of earlier NHMACS data.⁴ To our knowledge, this is the first study to use a multivariate model to analyze systemic and societal variables, including patient, provider, and hospital characteristics, not merely clinical factors that may play a role in the decision to use neuroimaging for the evaluation of pediatric head injury. We found that whites were 50% more likely to receive head-imaging than non-whites, after controlling for other socioeconomic, clinical, regional, and hospital characteristics.

Our study adds further evidence to the growing literature on racial and ethnic disparities in ED care, and new insight into the care of pediatric head injury patients. In a primarily adult study, Bazarian et al. found no difference in the use of CT for the evaluation of mild TBI based on race, but they did report increased placement of a nasogastric tube in Hispanics, and non-whites were found to have increased care by a resident physician and decreased referral to the primary care physician.¹⁷ While no study to date has evaluated socioeconomic disparities in the setting of pediatric head injury, a study of ED wait times revealed that minority children had longer wait times, even after controlling for triage status, hospital location (urban compared to non-urban), and insurance type.¹⁸ Chamberlain et al. found lower hospital admission rates for non-white children after adjusting for severity of illness, with white patients admitted 1.5 to 2 times the expected rate, even with lower levels of illness severity.¹⁹ African American and Hispanic children have also been found to have lower rates of opioid prescribing during pain-related ED visits in the United States.²⁰

One hypothesis for these disparities in care is that there are differences in patient-clinician communication, which may in part be due to differences in patient assertiveness (e.g. asking for a head CT), physician perception of the patient, or language barriers.²¹ Racial and ethnic differences may also be a reflection of disparities in socioeconomic status and access to medical care, which may influence physicians' treatment strategies.²² There may also be gaps in information conveyed to the patient about choices for treatment and exactly what those choices are.²³ Cultural differences in the expectation of the outcome of treatment (e.g. control of pain, management and resolution of pain after medication) and other cultural beliefs related to diseases, their treatment, and the medical system may be contributing factors to the disparities in care.^{20,24} Finally, although we attempted to control for injury severity in our model, it is possible that non-whites presented with a lesser degree of injury than whites, given the same rate of ICH in both imaged groups despite lower rates of imaging in non-whites.

Similar to the findings of Blackwell et al., we found significant increases in head CT utilization with increasing age.⁴ It is unclear why neuroimaging increases with the older age groups, even while attempting to control for injury severity with triage level, admission disposition, transfer status, and associated injuries. We hypothesize that ease of imaging (i.e., lack of need for sedation or restraint) or less concern about radiation risk may explain part of this phenomenon.²⁵ The mechanisms of injury in the older age groups, particularly in adolescents, may be more concerning, which may also influence the decision to obtain a head CT. As would be expected, patients deemed to require immediate evaluation and those admitted or transferred had increased odds of having head imaging, which would reflect severity of injury.

Hospital characteristics also appear to strongly influence the decision to obtain imaging after pediatric head injury. Children evaluated in general EDs were almost 2½ times more likely to undergo radiologic evaluation for head trauma compared to those seen in pediatric EDs, even after controlling for age and severity of injury. These findings are similar to those of Blackwell et al. who found that pediatric hospitals order significantly fewer neuroimaging studies after pediatric head injury compared to non-pediatric hospitals, although our study attempts to control for confounding variables.⁴ This type of variation in management at pediatric EDs compared to general EDs has also been described in the context of the management of pediatric splenic injuries, with lower rates of splenectomy at children's hospitals.²⁶⁻²⁷ The clinical decision to perform neuroimaging in the setting of pediatric head trauma may depend on the training and experience of the physician. Clinicians practicing at children's hospitals may possess skill sets and experience that favor management without imaging. In addition, our analysis suggests that physicians at pediatric hospitals were seven times more likely to find ICH when imaging was performed, compared to physicians at other hospitals. While this analysis does not include provider level information (e.g. general emergency medicine, pediatric emergency medicine, pediatrician), focusing quality improvement initiatives on physicians at general hospitals may be an effective approach to decrease rates of neuroimaging in pediatric patients with head trauma.

LIMITATIONS

This was a cross-sectional analysis of previously collected data. Although the multistage sampling techniques of the NHAMCS database are designed to make the sample representative of the entire United States, the number of actual observations for pediatric head injury was limited. Several of the variables, including admission to the hospital and associated injuries, had small numbers of observations, though still above the threshold recommended by the NHAMCS statisticians for analysis. The low rates of ICH make any definitive comparisons between hospital types difficult.

The NHAMCS database also provides limited clinical information. We used ICD-9 codes, similar to prior published studies, but these codes do not reflect subtle clinical information that may influence the decision for imaging. Information as to the severity of injury is also limited. Although we attempted to adjust for injury severity with the variables “associated injuries,” “admission to the hospital,” “transferred from the hospital,” and “immediacy with which the patient should be seen,” we had no means of adjusting for severity of injury with validated instruments such as the Glasgow Coma Scale or Injury Severity Score. However, we assume that the combined admission/transfer variable would encompass all severe injuries and, if anything, bias our results towards the null as less severely injured children could be included.

The database also does not provide information on the specific type of imaging used for the patients; it only reports whether a CT or an MRI were performed. However, we based our

case definition on ICD-9-CM codes for head injury and with the multivariate analysis attempted to control for other associated injuries; therefore, imaging for head trauma was assumed to be head CT. Our findings are similar to those of Kuppermann et al. who found in a large prospective cohort that 35.3% of pediatric patients with mild TBI undergo head imaging.⁷ The NHAMCS database does not provide information regarding whether patients were transferred to the ED. Some of the patients seen in the pediatric EDs could have been referred from other hospitals where the initial head imaging was obtained, conferring a speciously low rate of imaging at the pediatric hospitals. Of the 144 head injury observations seen at the pediatric hospitals, six were admitted to the hospital without imaging, which perhaps represents referral patients. However, dropping these patients from the analyses does not significantly change univariate or multivariate estimations of the OR of imaging at pediatric hospitals compared to other hospitals.

Other potential limitations include the ascertainment of race, ethnicity, and socioeconomic status. The determination of race/ethnicity is not routinely made by patient self-identification, but by an unrelated observer, so this may lead to some misclassification. Because perception of a patient's race/ethnicity is likely related to disparities in care, misclassification compared to a patient's self report may be a less limiting factor.²⁰ The only measure of socioeconomic status in NHAMCS is type of insurance, which we controlled for in the multivariate analysis. However, we were not able to determine socioeconomic status by other descriptors. Misclassification bias is also possible in the ascertainment of whether hospitals were pediatric and/or academic hospitals. We used prior definitions from the literature for the classifications of hospital types but were not able to verify the accuracy of these classifications. The database also has very limited data on the types of clinicians providing care and we were only able to include provider type in our analysis. Last, and perhaps most importantly, the NHAMCS database does not offer data on outcomes so we are unable to demonstrate the effect of imaging on outcomes.

CONCLUSIONS

Our findings suggest disparities in the use of neuroimaging based on race, even after controlling for hospital admission, associated injuries, and type of insurance. The reasons for this are complex, but may include differences in the patient-physician relationship and ability to communicate, patient/family expectations about medical care and knowledge of treatment options, physician biases, as well as perhaps differences in acuity. This study also demonstrates with a multivariate analysis significant practice differences in the utilization of neuroimaging for pediatric head trauma in pediatric compared to general EDs. Interventions, including the application of neuroimaging decision rules, should be focused on both types of EDs, but a greater impact in reducing the use of unnecessary computed tomography scans may be seen in general EDs. Further investigation is needed to elucidate the reasons for these disparities and to determine appropriate interventions to ensure equal and appropriate care for all children.

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Table 1a

Characteristics of 1,256 patients ≤ 19 years of age with head injury diagnoses in the National Hospital Ambulatory Medical Care Survey from 2002-2006

		Head Imaging Performed n=508 Number of observations (%)	No Head Imaging Performed n=748 Number of observations (%)	P-value
Age, yrs	<1	61 (11)	132 (18)	<0.001
	1-4	70 (14)	176 (24)	
	5-11	104 (22)	178 (23)	
	12-19	273 (53)	262 (35)	
Sex	M	330 (65)	485 (64)	0.81
Race	White	408 (80)	534 (72)	0.006
	Non-White	100 (20)	214 (28)	
Ethnicity	Hispanic	68 (11)	118 (14)	0.13
	Not Hispanic	425 (87)	597 (82)	
	No Response	15 (2)	33 (4.4)	
Type of Insurance	Private	291 (57)	389 (54)	0.27
	Not Private	186 (35)	320 (40)	
	No Response/Unknown	31 (8)	39 (6)	
Clinical	Associated Injuries	48 (10)	31 (4)	0.001
	Unintentional Injury	427 (85)	667 (89)	0.06
	Not Unintentional	50 (9)	44 (6)	
	No Response/Unknown	31 (6)	37 (5)	
	Admitted or Transferred	75 (15)	33 (5)	<0.001
	Seen Past 72 hrs	12 (2)	11 (1)	0.33
	Not Seen Past 72 hrs	467 (92)	672 (90)	
	No response/Unknown	29 (6)	65 (9)	
	Immediacy with which patient should be seen			<0.001
	Immediate	65 (13)	89 (13)	
	Within 1 hr	323 (63)	348 (43)	
	>1hr	91 (17)	269 (37)	
	No triage or Unknown	29 (7)	42 (7)	

Table 1b

Other Characteristics Associated with Imaging in 1256 patients ≤ 19 years with Head Injury Diagnoses in the National Hospital Ambulatory Medical Care Survey from 2002-2006

		Head Imaging Performed n=508 Number of observations (%)	No Head Imaging Performed n=748 Number of observations (%)	P-value
Day of Week	Weekday	358 (71)	544 (73)	0.58
Type of Institution	Teaching Hospital	59 (9)	102 (9)	0.97
	Pediatric Hospital	42 (7)	102 (16)	0.009
	Non-Profit	388 (70)	586 (78)	0.17
	Government	70 (17)	98 (12)	
	Proprietary	50 (13)	64 (10)	
Geographic Characteristics	High Proportion White Patients	271 (59)	383 (55)	0.29
	High Percentage Patients with Private Insurance	283 (58)	379 (52)	0.13
	Northeast	134 (23)	193 (21)	0.43
	South	155 (33)	237 (39)	
	Midwest	110 (22)	162 (22)	
	West	109 (22)	156 (18)	
	MSA	443 (85)	671 (88)	0.14
Provider Characteristics	Attending	478 (94)	676 (90)	0.10
	Resident	68 (12)	97 (11)	0.48
	Nurse Practitioner	12 (3)	23 (2)	0.50
	Physician Assistant	32 (7)	60 (11)	0.11

Table 2Multivariable Model for Factors Associated with Imaging after Head Injury in Patients ≤ 19 years

	Variable	OR (95% CI)
Demographics	Sex	
	Male	---
	Female	1.1 (0.74-1.6)
	Race	-
	Non-white	--
	White	1.5 (1.02-2.1)
	Type of Insurance	
	Not Private	---
	Private	1.1 (0.74-1.6)
	Ethnicity	
	Not Hispanic	---
	Hispanic	0.77 (0.45-1.3)
Clinical Characteristics	Age, yrs (categorical)	1.3 (1.1-1.5)
	No Associated Injuries	--
	Associated Injuries	2.2 (0.99-5.0)
	Not Unintentional Injury	--
	Unintentional Injury	0.74 (0.37-1.5)
	Not Admitted or Transferred	---
	Admitted or Transferred	2.7 (1.4-5.3)
	Immediacy with which Patient Should Be Seen (categorical)	1.4 (1.1-1.8)
Hospital Characteristics	Pediatric Hospital	---
	Not Pediatric Hospital	2.4 (1.1-5.3)
	Low Proportion White Patients	--
	High Proportion White Patients	1.1 (0.76-1.6)
	Low Proportion Patients with Private Insurance	--
	High Proportion Patients with Private Insurance	1.3 (0.91-1.8)
Clinician Characteristics	Not Seen by Attending	--
	Seen by an Attending	2.0 (1.1-3.7)
Geographic Characteristics	Region	

	Variable	OR (95% CI)
	Northeast	---
	South	1.0 (0.63-1.6)
	Midwest	0.94 (0.55-1.6)
	West	1.3 (0.75-2.2)
	MSA	
	Non-MSA	---
	MSA	1.0 (0.60-1.8)