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Race and Documentation of Cognitive Impairment Among Hospitalized Elders

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Running Head: Race and Documentation of Cognitive Impairment

ABSTRACT

Objectives: To evaluate whether race influences the agreement between screening results and documentation of cognitive impairment (CI) and delirium.

Design: Secondary data analysis.

Setting: An urban, public hospital/healthcare system.

Participants: 851 hospitalized older adults aged 65 years and older admitted to general inpatient medical services evaluated for CI and 424 evaluated for delirium.

Measurements: CI and delirium were measured on each participant using the Short Portable Mental Status Questionnaire (SPMSQ) and the Confusion Assessment Method (CAM), respectively, as the reference identification method. Clinical documentation of CI and delirium was defined by the presence of ICD-9 codes within one year prior to hospitalization through discharge for CI or hospital admission through discharge for delirium, respectively.

Results: 294 patients (34%) had CI based on SPMSQ performance and 163 patients (38%) had delirium based on CAM results. Among those in the CI cohort, 171 (20%) had an ICD-9 code for CI, whereas 92 (22%) in the delirium cohort had an ICD-9 code for delirium. After considering age, gender, education, socioeconomic status, chronic comorbidity, and severity of acute illness and in comparison to non-African Americans, African Americans had a higher adjusted odds ratio (AOR) for clinical documentation of CI {AOR: 1.66 (95% confidence interval, 0.95-2.89)} among participants screening positive on the SPMSQ, and also had higher odds of clinical documentation of CI {AOR: 2.10 (95% confidence interval, 1.17-3.78)} among participants screening negative on the SPMSQ. There were no differences in clinical documentation rates of delirium between African Americans and non-African Americans.

Conclusion: Racial differences in coding for CI may exist, resulting in higher documentation of CI in African Americans among those screening positive and screening negative for CI.

Key Words: delirium, cognitive impairment, race

INTRODUCTION

In 2002, the Institute of Medicine found racial and ethnic disparities in health care outcomes even after considering insurance status, income, age and severity of illness.[1,2] Much work has been conducted identifying reasons and sources of disparities affecting a significant proportion of the US population.[3-5] For example, prior work has identified similar rates of

cardiovascular screening and prevention techniques within racial subsets, however notable differences in race were found in those seeking acute care services or intervention techniques for cardiovascular disease.[6] In addition to a rapidly growing elderly population and a rise in ethnic minorities[7] the prevalence of cognitive impairment (CI) is dramatically growing. Previous studies have suggested that CI is significantly mis-diagnosed in elderly hospitalized African Americans, and that this population experiences worse in-hospital morbidity than non-African Americans.[7-19] Racial disparities may stem from biological differences, access to care, burden of comorbid disease, or cultural factors,[18] however more information regarding the clinical documentation of disease may offer a unique perspective on the existence of such disparities.

We have previously shown that a significant number of older adults admitted to a general medical inpatient ward have evidence of CI at the time of admission.[20,21] However, to our knowledge no study has investigated race as a potential risk factor for recognizing CI. Our objective was to evaluate the impact of race on the agreement between clinical documentation and screening results of CI and delirium among hospitalized older adults. We hypothesize that there is no difference in the documentation of CI or delirium between African Americans and non-African Americans.

METHODS

Standard Protocol Approvals, Registrations, and Participant Consents

The study was approved by the Indiana University–Purdue University–Indianapolis Institutional Review Board. All participants enrolled provided informed consent.

Study Setting and Population

The study setting, population and methods have been published previously.[20,21] Briefly, the study was conducted at Wishard Memorial Hospital (WMH) between July 1, 2006 and March 30, 2008. WMH is one of the largest safety-net hospital systems in the country, caring for the indigent and underserved population of Marion County, Indiana. We report a secondary data analysis from a randomized trial that employed a computerized decision support system among older adults over the age of 65 years, admitted to a general medical ward of WMH, and able to speak English.[20,21] Baseline assessments were available for 981 participants screened for

enrollment in the trial, and baseline and daily assessments were available for 424 who met inclusion criteria of having some form of cognitive impairment. Patients were excluded if they had previously been enrolled in the study or were aphasic or unresponsive at the time of cognitive assessment.

Cognitive Assessment

Because data was collected as a screening process for the randomized trial, standard diagnostic methods recommended for CI and delirium were not available. Therefore, we employed previously validated assessment tools, routinely used in clinical practice, to identify CI and delirium as described below. The assessments were conducted by a trained research assistant who was blinded to the clinical documentation of cognitive impairment and delirium. The outcomes of each assessment were used as a standardized reference for each study participant. The screening tools for this study are not intended to evaluate accuracy of clinical judgment, but as an objective reference against which to determine agreement with clinical documentation of CI and delirium in different races. Among those screened for the randomized trial, 851 had complete screening and clinical data at baseline, and the 424 enrolled in the trial had additional daily delirium assessments conducted throughout the hospital stay.

CI was identified using the Short Portable Mental Status Questionnaire (SPMSQ) at the time of hospital admission. The SPMSQ is composed of 10 brief items and has a sensitivity of 86% and specificity of 99% for a diagnosis of dementia.[22] The SPMSQ adjusts for race and education level by adding one point each for being African American and having an education level of sixth grade or lower. CI was defined using an SPMSQ score of 8 or less.[22]

Delirium was identified using the Confusion Assessment Method (CAM), which incorporated results of the cognitive assessment, reviewing the medical record, and interviewing the nursing staff of each participant.[23] The CAM has a sensitivity of 97% and a specificity of 92% in identifying delirium among hospitalized older adults.[23] Delirium was defined by the presence of an acute change or fluctuation in mental status, inattention, and either disorganized thinking or altered level of consciousness.[23, 24] Delirium was assessed at baseline and daily throughout the hospital stay among the 424 participants enrolled in the trial.

Agreement between screening results and clinical documentation of CI and Delirium

We used two cohorts to evaluate the documentation of CI and delirium. The first cohort evaluated the presence of CI using the SPMSQ performed at admission and excluded 130 participants with delirium at baseline (final cohort n=851). Those with delirium at baseline were excluded to avoid the influence of delirium on CI screening results, since our objective with this cohort was to compare screening results for CI with clinical documentation of CI. Clinical documentation of CI was considered positive if ICD-9 codes related to CI could be identified in each participant's electronic medical records within one year prior to hospitalization through discharge of the study-related hospitalization.

The second sample included those screening positive for CI at baseline who were enrolled in the randomized trial (n=424). This sample was screened for delirium daily throughout the hospital stay using the CAM. Clinical documentation of delirium was considered positive if ICD-9 codes for delirium were detected in the electronic medical record only between the time from hospital admission through discharge.

Other Data Collection

Demographics such as race, gender, age, and education level were collected during the patient's initial assessment and using the Regenstrief Medical Record System (RMRS), the main instrument used for data processing, patient monitoring and physician activity in the Wishard Health System.[25] Race was documented within RMRS as reported by the patient. For the purposes of this analysis, race will be reported as a dichotomous variable stratified into African Americans and non-African Americans, which primarily includes Caucasians, but also includes a smaller percentage of other nationalities. The Charlson Comorbidity index total scores were measured electronically by reviewing ICD-9 codes in the RMRS from one year prior to admission, including the duration of the study hospitalization.[26] The Acute Physiology Score (APS) from the APACHE III[27] was used to measure the acute severity of illness with data available in the RMRS. While the APACHE III was developed in the ICU using data from the first 24 hours after admission, we used the worst laboratory test value during the entire hospital stay to calculate the APS. Lastly, insurance status was grouped into low-income benefits, which included Medicaid beneficiaries and those qualifying for a local indigent care program, and all other benefit types.

Analytic Methods for Planned Comparisons

We used Chi-square tests to evaluate the differences in categorical variables and two-sample T-tests for continuous variables across race groups. For each outcome of CI and delirium, we calculated the odds of documentation of the condition in African Americans relative to non-African Americans, separately for the patients who screened positive or screened negative for the condition according to the screening test. A three-way table (race-by-CI-by-CI documentation) for all participants was used to test whether any differential CI documentation by CI screening status differed across race, as reflected by the three-way interaction. Logistic regression models were used to assess the relationship between race and documentation of each of the outcomes by screening result while adjusting for other demographic and socioeconomic factors, disease severity, and comorbidity.

RESULTS:

Study Population

Population characteristics stratified by race are described in table e-1. A total of 981 participants had screening assessments available for analysis. After excluding 130 participants with delirium at baseline, 851 participants were available for the CI cohort. From the original 981 participants, 424 participants screened positive for CI according to the SPMSQ and had daily delirium assessments, comprising the delirium cohort. There were no differences between African Americans and non-African Americans in regards to gender, education, severity of acute illness and chronic comorbidity, but African Americans were significantly older than non-African Americans. The proportion of CI, as assessed by SPMSQ at the time of hospital admission, was identical at 34% across African Americans and non-African Americans, but the proportion of CI documented by ICD-9 codes was significantly higher among African Americans. In contrast to CI, the proportion with delirium is higher among African Americans with a marginally significant difference (p=0.07), but the delirium documentation rate by ICD-9 codes is identical for both racial groups.

- Insert table e-1 -

Documentation of CI across Races

Among 851 participants in the CI cohort, 294 (34%) had CI according to SPMSQ and 171 (20%) had an ICD-9 diagnosis code for CI ($p<0.001$ by McNemar's test). Among those with CI according to the SPMSQ, 105 (36%) had documented ICD-9 codes for CI. Among 557 participants without CI, 66 (12%) also had documented CI from ICD-9 codes. Table e-2 presents the relationship between race and documentation of CI separately for participants who are either positive or negative for CI based on SPMSQ. Among those screening positive on the SPMSQ, African Americans have a significantly higher chance of clinical documentation than non-AAs (42.3% vs. 27.0%); the difference estimated by the odds ratio 1.98 ($p=0.007$). Among participants who screened negative for CI according to SPMSQ, the documentation of CI was also significantly higher among African Americans than non-African Americans (odds ratio of 2.13, $p=0.009$). The higher rate of documentation of CI in African Americans relative to non-African Americans did not differ significantly between patients who did or did not screen positive for CI ($p=0.851$ for testing the race-by-documentation-by-screening interaction). After adjusting for age, gender, education, insurance status, chronic comorbidity, and severity of acute illness, the increased documentation of CI in African Americans relative to non-African Americans remained similar to the unadjusted relations.

- Insert table e-2 -

Documentation of Delirium Across Races

The prevalence of delirium among hospitalized older adults was 38% among the 424 with CI who had delirium screenings throughout the hospital stay. Among 163 participants with delirium according to the CAM, 52 (32%) were recognized with an ICD-9 code for delirium within the RMRS. Among 261 participants without delirium, 40 (15%) were recognized with an ICD-9 code for delirium within the RMRS. Table e-3 presents the relationship between race and documentation of delirium stratified by delirium screening results using the CAM assessment result. The documentation of delirium (by ICD-9) among those with delirium by CAM was not higher in African Americans compared to non-African Americans (odds ratio of 0.98, 95% confidence interval 0.49-1.94). Similarly no difference in delirium documentation was identified among those without delirium according to CAM (odds ratio 0.90, 95% confidence interval 0.46-1.76). Controlling for patient characteristics did not change the essential findings.

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DISCUSSION

Our results suggest that, after considering potential confounders of age, gender, education, comorbidity, insurance status, and severity of acute illness, African Americans were more likely than non-African Americans to have clinical documentation for CI among those with positive and negative results on screening test. This finding supports the hypothesis that racial disparity exists in the clinical documentation of CI as described in prior literature.[8-19] Despite hypotheses that racial disparities may be due to education, the burden of comorbid disease, or encounter frequency,[6] our results suggest that differences in documentation rates are independent of these variables. The apparent racial disparity in the documentation of CI did not, however, translate to the documentation of delirium.

A previously published review cites the existence of racial disparity in the documentation of dementia,[28] as well as psychological ailments likely related to cognition.[28,29] Interestingly, screening tools for dementia have been criticized for their differential performance between African Americans and non-African Americans.[19,28] We selected a screening tool for CI based on its sensitivity to racial and educational differences;[22] however the purpose of screening tools used in this secondary data analysis was not to evaluate clinician judgment of the status of CI or delirium. Rather, we employed the screening tools as an objective reference against which to evaluate the clinical documentation of CI and delirium. Applying this methodology equally to each group found racial differences in the clinical documentation of CI.

Our results do not suggest a higher absolute rate of CI among African Americans, but rather the possibility that the healthcare system is more likely to document CI in African Americans regardless of screening results. The identification of CI by the healthcare system may therefore reflect either a racial bias or a difference in the accuracy of screening tests for CI. We conducted a sensitivity analysis removing the additional point in the SPMSQ attributed for race and found similar results indicating CI was more likely to be recognized among African Americans compared with non-African Americans. Our results may be explained, in part, by the performance of the screening method used and the improved education of all participants since the time the SPMSQ was developed. If screening using the SPMSQ resulted in higher false-

positive rates in African Americans compared with non-African Americans, a correlation with higher documentation by ICD-9 codes may be explained.

Strengths of this work include the multitude of variables included in the analysis, such as the level of education, insurance status, and reliable assessment tools for cognitive impairment and delirium. Additionally, our analysis was conducted within a safety net hospital in a population with similar sociodemographic and socioeconomic characteristics independent of race, minimizing the variability in the population to analyze the impact of race on the documentation of CI and delirium. Given our racially diverse population, we employed a screening tool for CI that accommodated differences in race[22] and found a difference in documentation rates that persisted despite adjusting for known confounders.

Our results are derived from a secondary analysis using data collected during a randomized controlled trial and therefore has limitations that should be noted. We did not capture the race of providers involved in each participant's care, thereby limiting our ability to test bias from the provider's perspectives. Additionally, we relied on screening tests to identify CI and delirium and must accept their known inaccuracies compared with diagnostic criteria. Although the SPMSQ and CAM are common tools used to identify CI and delirium, they are constructed as screening tools and not diagnostic tools. We were also unable to capture potential confounders associated with socioeconomic status, including income level, household income, or zip code of residence. All have been used in previous literature as proxy variables for socioeconomic status but were not readily available in this study.[6,9] However, we were able to extract insurance status, which indicated that the majority of our study population may be considered a low economic status by the fact that nearly 80% qualified either for Indiana Medicaid benefits or an indigent care program unique to the local environment. Lastly, pre-existing dementia was not included as a potential confounder for delirium identification or documentation. Documentation of dementia in electronic medical records is known to be unreliable, though the presence of a diagnosis of dementia may have heightened provider's suspicion of delirium or CI.[10,20]

In conclusion, results from this analysis suggest that the healthcare system is more likely to recognize CI in hospitalized older African Americans compared to non-African Americans regardless of the results of screening tests. Healthcare providers as well as researchers should be

aware of the potential for differences in the documentation of CI in electronic medical record systems as it relates to patient care and information technology research. Our results suggest providers need to improve awareness and influence of all confounders, including race, when considering a diagnosis of cognitive impairment.

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Author Contributions: All authors were responsible for the study concept, design, acquisition of data, analysis and interpretation of data and preparation of the manuscript. Dr. Campbell and Dr. Boustani had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis

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TABLES:

Table e-1: Characteristics of Study Population

CI Cohort (n=851)			
	African American	Non-African American	P-value
N	489	362	
Mean Age, mean (SD)	74.8 (7.4)	73.3 (6.7)	0.002
% Female	69.9	67.7	0.494
Level of Education, mean, (SD)	10.2 (2.8)	10.4 (2.8)	0.310
Charlson Comorbidity score, mean (SD)	2.9 (2.5)	2.8 (2.4)	0.696
APS, mean (SD)	22.1 (13.3)	21.9 (12.9)	0.847
% Medicaid/Wishard Advantage	78.7	83.7	0.069
% CI, identified by SPMSQ score ≤ 8 points	34.4	34.8	0.891
% CI, identified by ICD-9 codes	24.3	14.4	<0.001
Delirium Cohort (n=424)			
N	247	177	
Mean Age, mean (SD)	78.6 (8.3)	75.3 (7.4)	<0.001
% Female	68.4	63.8	0.325
Level of Education, mean, (SD)	9.7 (2.9)	9.7 (2.8)	0.902
Charlson Comorbidity score, mean (SD)	2.5 (2.2)	2.6 (2.5)	0.422
APS, mean (SD)	25.9 (14.4)	25.1 (13.8)	0.560
% Medicaid/Wishard Advantage	77.7	79.1	0.737
% Delirium, identified by CAM positive	42.1	33.3	0.067
% Delirium, identified by ICD-9 codes	21.9	21.5	0.923

APS: Acute Physiology Score; CI: Cognitive Impairment; SD: Standard Deviation;

SPMSQ: Short Portable Mental Status Questionnaire; CAM: Confusion Assessment Method.

Table e-2: Association Between Race and Documentation of Cognitive Impairment (CI)

Clinical documentation (Presence of ICD9 code)	CI Status by SPMSQ Assessment			
	Positive (n=294)		Negative (n=557)	
	AA	Non-AA	AA	Non-AA
Positive (% of screened status)	71 (42.3%)	34 (27.0%)	48 (15.0%)	18 (7.6%)
Negative (% of screened status)	97 (57.7%)	92 (73.0%)	273 (85.0%)	218 (92.4%)
Unadjusted Odds Ratio (95% Confidence Interval)	1.98 (1.20-3.26)		2.13 (1.20-3.77)	
Adjusted Odds Ratio* (95% Confidence Interval)	1.66 (0.95, 2.89)		2.10 (1.17, 3.78)	

Odds ratios reflect the likelihood of clinical documentation of CI in African Americans compared with non-African Americans.

AA: African Americans; non-AA: non-African Americans; CI: Cognitive Impairment; CAM: Confusion Assessment Method; ICD-9: International Classification of Disease, 9th edition

*Multivariable model adjusting for age, gender, education, comorbidity, severity of illness, and insurance status; Reference group is non-African Americans

Table e-3: Association Between Race and Documentation of Delirium

Clinical documentation (presence of ICD9 code)	Delirium Status by CAM Assessment			
	Positive (n=163)		Negative (n=261)	
	AA	Non-AA	AA	Non-AA
Positive (% of screened status)	33 (32.2%)	19 (31.7%)	21 (14.7%)	19 (16.1%)
Negative (% of screened status)	71 (67.8%)	40 (68.3%)	122 (85.3%)	99 (83.9%)
Unadjusted Odds Ratio (95% Confidence Interval)	0.98 (0.49, 1.94)		0.90 (0.46, 1.76)	
Adjusted Odds Ratio* (95% Confidence Interval)	0.87 (0.42, 1.80)		0.81 (0.39, 1.66)	

Odds ratios reflect the likelihood of clinical documentation of delirium in African Americans compared with non-African Americans.

AA: African Americans; non-African Americans; CAM: Confusion Assessment Method; ICD-9: International Classification of Disease, 9th edition

*Multivariable model adjusting for age, gender, education, comorbidity, severity of illness, and insurance status; Reference group is non-African Americans