Published in final edited form as:

J Am Med Dir Assoc. 2020 April ; 21(4): 513–518. doi:10.1016/j.jamda.2019.10.008.

Predictors of Rehospitalization in Post-Acute Rehabilitation among Different Ethnic Groups

Verena R. Cimarolli, PhD^{a,*}, Francesca Falzarano, PhD^b, Stephanie Hicks, PhD^c

^aLeadingAge LTSS Center @UMass Boston, Washington, DC

^bDepartment of Geriatrics and Palliative Medicine, Weill Cornell Medicine, New York, NY

^cSchool of Professional Studies, Columbia University, New York, NY

Abstract

Objectives: Previous research has shown that ethnicity may play a role in increased risk for hospital readmission during a post-acute rehabilitation care (PARC) stay. However, little is known about risk factors influencing discharge status from PARC settings among different ethnic groups. Hence, the aim of our study was to investigate the relationship of individual characteristics (eg, sex, neighborhood quality) and health behavior (use of rehabilitation services) with rehospitalization across ethnic groups of older adult patients who received post-acute rehabilitation for a cardiovascular disease at a skilled nursing facility (SNF).

Design: Retrospective study with data extraction from electronic medical records (EMRs) at admission and discharge.

Setting: SNF.

Participants: The sample consisted of 520 post-acute rehabilitation patients (96 Hispanics, 172 African Americans, and 252 Whites) 60 years or older with an admitting condition of a circulatory-related disease.

Measurements: Sociodemographic and health-related variables, and discharge status (rehospitalized or home).

Results: For the Hispanic sample, lower community quality was associated with a greater likelihood of being rehospitalized. For African Americans, having no social support, higher levels of admission functional dependency, and shorter length of stay were significantly associated with a higher likelihood of being rehospitalized. For the group of White participants, the following variables emerged as risk factors for rehospitalization: being male, lower admission cognitive functioning, higher levels of admission depressive symptomatology, and shorter length of stay.

Conclusions/Implications: Individual characteristics and health behaviors that are risk factors for rehospitalization during a post-acute stay vary across ethnic groups. Hence, the study provides

*Address correspondence to Verena R. Cimarolli, PhD, LeadingAge LTSS Center @UMass Boston, 2519 Connecticut Ave NW, Washington, DC 20008. vcimarolli@leadingage.org (V.R. Cimarolli).

The authors declare no conflicts of interest.

insights for PARC clinicians into specific patient characteristics to be aware of as risk factors for less optimal patient outcomes.

Keywords

Post-acute rehabilitation; post-acute care; discharge status; hospitalization; ethnicity; skilled nursing facility

Many medically complex patients—commonly older adults—are discharged from an acute care hospital to post-acute care settings within skilled nursing facilities (SNFs) to receive rehabilitation to recover from an injury or illness. SNFs serve older adults who are frail with multiple comorbidities and with complex medical care needs, often requiring complicated and resource-intensive post-hospital care.¹ The most optimal outcome for older adults who are frail after discharge from post-acute rehabilitation care (PARC) of a SNF would be to transition to independent living at home (with the support of home care if needed). The least optimal outcome would be to be rehospitalized and, therefore, return to acute care instead of returning home. Overall, about 12% of older adults who are admitted to SNFs for post-acute rehabilitation are re-admitted to acute care within 30 days.² These 30-day rehospitalization rates, however, are higher in African Americans and Hispanics compared with white PARC patients.³ This is also a finding that has emerged in other care settings. For example, in acute care facilities, African American and Hispanic patients have consistently higher hospital re-admission rates when compared with whites.^{4–6}

Although there is a paucity of research on the relationship of ethnicity and successful rehabilitation outcomes in PARC settings of SNFs, evidence that ethnicity functions as a predictor of clinical outcomes in post-acute rehabilitation is emerging. For instance, Cary et al⁷ examined the effects of patient characteristics on rehabilitation outcomes of hip fracture patients admitted to Medicare-certified inpatient rehabilitation facilities following an acute stay. They found that scores on a physical functioning measure at discharge were lower in minority subgroups and in older, male participants. In terms of discharge status, younger and female participants were more likely to be discharged home from post-acute care. Further, African American, Asian, and Hispanic patients were significantly more likely to be discharged home compared with non-Hispanic whites. The authors note that although minority older adults had poorer functioning at discharge, the higher likelihood of minorities being discharged home may be associated with stronger social networks. Although these findings provide important insights on the role of ethnicity in post-acute patient outcomes and hint to the potentially complex relationship between ethnicity and clinical outcomes of post-acute patients, they do not shed light on the role of specific risk factors for poor PARC outcomes (eg, being rehospitalized) within ethnic groups. Hence, studies are needed that examine individual characteristics that influence rehabilitation outcomes by ethnic groups to isolate targets for interventions for specific ethnic groups. Specifically, we know little about specific socioeconomic status (SES) indicators, and particularly those related to the quality of communities where older adults reside that may contribute to poor PARC outcomes (eg, not being discharged home). SES factors are important to examine because, even if the highest quality of care is provided, they may exacerbate disparities in successful PARC outcomes in patients.

In SNFs, scientific inquiry into the relationship of sociodemographic factors and clinical outcomes is largely missing and the question of which SES-indicators may be related to undesirable PARC outcomes (eg, rehospitalization during PARC stay as opposed to being discharged home) remains unanswered. However, knowledge regarding these factors is essential to achieving the most optimal PARC rehabilitation outcomes for the medically complex patients that these settings serve.

Hence, the aim of our study was to investigate the relationship between individual characteristics (eg, sex, neighborhood characteristics) and health behaviors (use of rehabilitation services) with the occurrence of being rehospitalized as opposed to being discharged home in different older adult ethnic groups. We focused our study on older adult patients who were discharged from a SNF after receiving post-acute rehabilitation for cardiovascular disease. The focus on patients with cardiovascular diseases was because these diseases are prevalent among minorities, they are a frequent precipitant for post-acute rehabilitation stays, and are a leading cause of death in the United States.^{8,9}

Methods

Study participants were older adult patients discharged from post-acute rehabilitation at a large SNF in New York City over a 2-year period. Inclusion criteria included (1) 60 years of age or older, (2) an admitting condition of cardiovascular disease, (3) first time admitted from acute care, and (4) discharged to acute care (rehospitalized) or discharged home. Data were extracted from patients' electronic medical records (EMRs), and publicly available data were used to determine the quality of the community/neighborhood where each patient resided. The admission and discharge EMR data extracted came from the Minimum Data Set (MDS) 3.0,¹⁰ which is a standardized tool to provide information for conducting a comprehensive assessment of patients admitted to SNFs including physical (eg, diagnoses), functional (activities of daily living), and psychosocial (depression, preferences, interests) domains. MDS 3.0 assessments are completed on a regular basis, including upon admission and upon discharge from the facility. Its use is federally mandated for all certified institutions that receive Medicaid and Medicare funding. MDS 3.0 data are gathered by interdisciplinary team members, with data collection and management supervised by the Resident Assessment Utilization Management department. The study was approved by the Internal Review Board of the institution (The New Jewish Home) where the research was conducted (Internal Review Board Approval # 2015-02).

Conceptual Model

Andersen's Behavioral Model of Health Services Use¹¹ was employed as a conceptual model (Figure 1). This model postulates that health outcomes depend on individual characteristics and health behaviors (eg, rehabilitation service use). Individual characteristics include predisposing (eg, sex), enabling (eg, social support), and need-related (eg, level of physical functioning) factors. This framework has been used in other studies investigating predictors of rehabilitation outcomes.⁷ Specifically, the current study focused on examining predictors of being rehospitalized in 3 different ethnic groups: Hispanics, African Americans, and whites. Based on Andersen's model, we wanted to determine which

predisposing factors (ie, age, sex), enabling factors (ie, community characteristics, cognition, depression, social support), and need-related factors (ie, physical/activities of daily living [ADL] functioning, comorbidities), as well as health behaviors (ie, length of stay in post-acute) predict likelihood of rehospitalization (health outcome).

Predisposing Factors

Self-reported demographic characteristics for patients including age, sex, and race or ethnicity were obtained from patients' EMRs.

Enabling Factors

Community-level characteristics—To calculate an indicator of the quality of community that the patients resided in, we obtained information on crime rates, unemployment rates, median educational attainment, median household income, and neighborhood resources from 2 publicly available data sources (New York City Government precinct data and American Community Survey [ACS]). Number of crimes per 1000 residents (crime rate) within each designated precinct was obtained using publicly available data from the New York City Government precinct data (<http://maps.nyc.gov/crime/>). Each patient's address was used to identify neighborhood crime rate. Crime rates for the month before each patient was enrolled in post-acute rehabilitation were recorded.

To gather information on other community-level characteristics, the ACS census data were used. Each patient's address and zip code were used to determine which community district he or she resided in. Then, community district data were examined to ascertain information related to neighborhood quality, including unemployment rates, median household income, and median educational attainment for both high school and college. Two variables were included to measure educational attainment based on prior research using ACS data.^{12,13} In addition, neighborhood resources were also examined by recording the proportion of vacant housing units in each community district. According to the United States Census Bureau,¹⁴ units are considered vacant if used for seasonal purposes, if they are for sale or for rent, if an occupier owns the unit but has residence elsewhere, etc. The availability of such housing units, such as housing units for seasonal purposes, is less likely in lower socioeconomic neighborhoods. Thus, vacant housing units are indicative of higher socioeconomic status.

Principal component analysis, a common approach used when analyzing census data,^{15,16} was used to create a composite variable for the 6 community indicators, with higher scores reflecting greater or more optimal community quality. This method was chosen to combine the predictors to form an overall index that captures multiple dimensions of community quality and to reduce the number of variables used in the current analyses. In addition, principal component analysis was used to standardize each of the community-level variables to be transformed to the same scale.

Cognitive functioning—Cognitive functioning at admission was assessed via the Brief Interview for Mental Status.¹⁷ This 5-item instrument is part of the MDS and measures cognitive function by assessing word repetition, recall, and temporal orientation. A summary

score across the 5 items was created, with possible scores ranging between 0 and 15. Higher Brief Interview for Mental Status scores indicate better cognitive functioning.

Depressive symptoms—For an indicator of depressive symptomatology, we extracted Patient Health Questionnaire-9¹⁸ scores from the residents' MDS 3.0 admission assessments. The Patient Health Questionnaire-9 items assess the extent to which the resident has been bothered by symptoms of depression such as feeling down, depressed, or hopeless over the past 2 weeks, using a 4-point Likert type scale (0 = never or 1 day; 3 = 12–14 days; possible range = 0–27).

Social support—Whether the patient had social support from family members or friends (Yes/No) was ascertained by examining clinical notes in the EMR. Having received social support (Yes) was determined if clinical notes indicated that a family member and or friend either visited during post-acute stay or attended the patient's care plan meeting(s).

Need-Related Factors

We used 2 need-related indicators: functional dependence in ADLs and number of comorbidities at admission. Functional dependence was measured at admission to post-acute rehabilitation via the functional dependence measure of the ADL scale adapted for the MDS (MDS-ADL).¹⁹ The scale allows clinicians to rate a resident's degree of difficulty in performing 11 ADL tasks, including bathing and dressing. Ratings for each task can range from 0 (independent) to 4 (total dependence), with lower scores denoting less functional dependence. A weighted score was calculated for each patient by adding the scores of the items that were answered for each patient and dividing the sum by the number of items answered for each patient. This calculation yielded functional dependence scores, with values possibly ranging from 0 to 4.

Number of diagnoses in addition to the admitting condition was also extracted from the MDS.

Health Behavior

We used PA length of stay in days obtained from the EMR as an indicator of health behavior.

Outcome

Discharge status was measured as a dichotomous variable. A patient was given a value of "1" if he or she was rehospitalized during post-acute care. Alternatively, a patient received a "0" if the patient was discharged home.

Data Analysis Plan

Descriptive analyses and analyses comparing the 3 ethnic groups (1-way ANOVAs and χ^2 analyses) were run on all study variables. Then, a factor analysis was conducted to compute an indicator of community quality based on the 6 community characteristics variables. The components of the 6 community-level items (crime rate, median household income, percent unemployed, median educational attainment for high-school and college, and proportion of vacant housing units) were examined. Percent unemployed was reverse coded and all scores

were standardized to be scale equivalent. The Kaiser-Meyer-Olkin measure of sampling adequacy was .872, which exceeded the recommended value of .6, and Bartlett's test of sphericity was significant ($\chi^2(15) = 4551.564, P < .001$), leading us to reject the null hypothesis. Results indicated that the communalities were all above .6 indicating that each item shared common variance.

Principal component analysis was used to create a composite community-level variable for the 6 community indicators. The initial eigenvalues showed that the first factor explained 72% of the variance, the second factor 17% of the variance, and a third factor explained 7% of the variance. The fourth, fifth, and sixth factors had eigenvalues of 2.3%, 1.01%, and .61%, respectively. Although the results suggested that 2 components be extracted, the community-level items adequately loaded onto 1 component. The loading for crime rate was $-.83$, $.89$ for proportion of vacant housing units, $.97$ for employment, median household income, and median educational attainment for high school, and $.98$ for median educational attainment for college. A composite variable was then created (with values ranging from -1.97 to 1.29), in which higher scores reflected greater community quality.

We also computed a correlation matrix to examine the interrelationships between the predictor variables to check for collinearity as well as correlations with the outcome variable rehospitalized (Yes/No). After that, we ran 3 logistic regression analyses (1 for each ethnic group) to determine the effects of the independent variables on not being discharged home (rehospitalized). Therefore, to identify correlates of not returning home, relying on Andersen's model of healthcare utilization, we conducted 3 stepwise logistic regression analyses—1 for each of the 3 ethnic groups—with predisposing variables (ie, age and sex) in the first block, enabling variables (ie, admission cognitive functioning, admission depressive symptomatology, and social support) in the second block, need-related variables (ie, admission functional dependence, comorbidities) in the third block, and our health behavior variable (ie, length of stay) in the fourth block.

Results

Sample Characteristics

Sociodemographic and health-related characteristics by ethnic group are displayed in Table 1. Comparison analyses showed that white participants were significantly older, lived in communities with significantly higher quality, had significantly lower functional dependence scores, a lower presence of social support, and a significantly lower representation of women when compared with both Hispanics and African Americans. Further, whites had significantly higher scores of cognitive functioning when compared with Hispanics. Of note is also that, although statistically not significant, whites had the lowest rehospitalization rates when compared with Hispanics and African Americans.

Correlational Analyses

Table 2 shows bivariate relationships between predictor variables and the outcome variable by ethnic or racial group. All significant correlations ranged between about $.19$ and $.44$ indicating weak to moderate relationships between the predictor variables and the outcome

across the 3 ethnic groups. For example, in Hispanics, being rehospitalized was significantly moderately correlated with lower admission cognitive functioning and a higher number of comorbidities. In African Americans, being rehospitalized was significantly associated with lower cognitive functioning at admission, more depressive symptoms, no social support, higher admission functional dependence, and shorter length of stay. A similar pattern of correlations emerged for whites: being rehospitalized was significantly associated with lower admission cognitive functioning, more depressive symptoms, no social support, a higher number of comorbidities, and a shorter length of stay.

Logistic Regression Analyses

Table 3 depicts results of logistic regression analyses predicting discharge status of being rehospitalized by ethnic group (Hispanic, African American, and white). For the Hispanic sample, higher community quality was associated with a reduction in the likelihood of being rehospitalized, specifically—based on the odds ratio—there was a 57% reduction with every unit of increased community quality. In African Americans, higher levels of admission functional dependency and shorter length of stay were significantly associated with a higher likelihood of being rehospitalized. Furthermore, in African Americans, those with social support were 85% less likely to be rehospitalized than those without social support. For the group of white participants, the following variables emerged as significant predictors and, therefore, are considered risk factors of being rehospitalized: being male (women were 61% less likely to be rehospitalized when compared with men), lower admission cognitive functioning, higher levels of admission depressive symptomatology, having no social support (those with social support were 70% less likely to be rehospitalized when compared with those without social support), and shorter length of stay.

Discussion

Previous research has identified race or ethnicity and other sociodemographic variables (eg, income) as predictors of poor rehabilitation care outcomes in older adults. Our study focused on identifying additional risk factors (eg, quality of older adults' communities) for rehospitalizations during post-acute care in a SNF drawing on Andersen's model of healthcare utilization. Furthermore, our study entailed examining these factors separately for 3 different ethnic groups. These subgroup analyses revealed that in the subgroup of Hispanics, lower neighborhood quality was the only risk factor for being rehospitalized. For the group of African American and white participants, a somewhat similar pattern of risk factors emerged: having no social support and shorter length of stay were associated with being rehospitalized. For African Americans, higher levels of admission ADL functional dependence represented a risk factor for rehospitalization. For white participants, 2 additional risk factors were being male and having more depressive symptoms at admission. Although Cary et al⁷ did not investigate factors within ethnic groups, our study confirmed the influence of certain predictors on being discharged home after PARC vs being rehospitalized; the variables that we identified that were in line with this previous research were functional status at admission and length of stay. However, we did only find these factors to play a role in successful rehabilitation outcomes for whites (only length of stay) and African Americans (both admission functional status and length of stay), but not for

Hispanic participants. In addition, consistent with Cary et al,⁷ sex served as a significant predictor of discharge status, however, this finding only occurred in the white subgroup. Furthermore, consistent with other research on rehospitalization rates from acute care facilities,^{4–6} we found that whites had the lowest rate when compared with Hispanics and African Americans. The current study extends previous research by individually examining predictors of rehospitalizations across ethnic groups. To our knowledge, this study is the first to examine differences across ethnic groups specifically in the context of post-acute rehabilitation care, with most prior research focusing on only ethnicity as a predictor and not how each set of predictors differs based on ethnicity.

Our findings also underscore the importance of social support—that is, family members and friends that are present while patients undergo rehabilitation. Previous research has emphasized the importance of the relationship between social support and health, particularly in individuals with cardiovascular disease.²⁰ In our study, social support emerged as a predictor for African Americans and whites, but not for Hispanics. This finding is surprising, as previous research has highlighted the benefits of familism and social support in Hispanic populations. For instance, the concept of the “epidemiologic paradox” has gained increasing attention in the literature. Hinojosa, Zsembik, and Rittman²¹ explained that Hispanics have shown health outcomes similar to white older adults due to the positive effects of familism and extended social networks in the Hispanic community. Hispanics, who typically emphasize respect for the older people, tend to have larger family networks and are more likely to have a greater number of informal caregivers compared with whites and African Americans.²¹ However, it is possible that when taking other factors into account, such as community quality and access to adequate healthcare and resources, the accrued effects of social, economic, and health disparities are not buffered by high levels of social support in this population.

Study Limitations

One notable limitation is the use of the MDS assessments, which are completed by clinicians and may lack standardization of assessment and have compromised scoring procedures. Another study limitation is the lack of availability of socioeconomic-related variables from patients’ EMRs. Because care facilities do not collect individual socioeconomic status and income data, we retrieved socioeconomic-related census data from the ACS. This limitation highlights the importance of collecting socially determinant information in patient medical records, which can play an important role when studying the relationship of SES and community with health outcomes in older adults, and can also aid in more adequate care planning for patients. Related to the limitation of utilizing MDS data, which can be limiting for research purposes, is the lack of available data on the quality of post-acute care received. Quality of care is an important predictor of rehabilitation outcomes, which was not included in our study and, therefore, represents an additional study limitation. In fact, prior research has shown that certain ethnic groups receive lower quality of care. For instance, in 1 study African Americans with stroke received fewer evidence-based interventions when compared with whites and Hispanics. Hence, quality of care could also be related to outcomes in ethnically diverse patient population in post-acute care settings of SNFs.²²

Conclusions and Implications

Our study shows that individual characteristics and health behaviors that represent risk factors for reshospitalization for PARC patients in SNFs somewhat differ across ethnic groups. Hence, the study provides insights for PARC practitioners into what specific patient characteristics to be aware of that could potentially result in less optimal patient outcomes. The most important practical implication of our study is that knowledge of variables contributing to disparities in PARC rehabilitation outcomes within a SNF will facilitate addressing risk factors as part of initial care planning, family and patient education, and discharge planning to ensure the most optimal patient outcomes. For example, our finding that lack of social support—that is the lack of presence of a family member or friend during PARC stay—is a risk factor for rehospitalization among African American and white patients represents an intervention point for PARC practitioners who could encourage patients to have family members and friends present during PARC stay, and particularly during care plan meetings. This knowledge can also aid policymakers advocating for increased awareness of the influence of sociodemographic factors on performance measures in PARC settings, ensuring access to care and quality of care for disadvantaged populations in need of post-acute rehabilitation in SNFs.

Acknowledgments

We thank the staff and administration of The New Jewish Home for their support of this work.

This research did not receive funding from agencies in the public, commercial, or not-for-profit sectors.

References

1. The Medical Direction and Medical Care Group. The role of the attending physician in the nursing home, Report. 2011 Available at: https://www.health.ny.gov/professionals/nursing_home_administrator/docs/11-13_att_phys_role.pdf. Accessed May 5, 2018.
2. Ottenbacher KJ, Karmarkar A, Graham JE, et al. Thirty-day hospital readmission following discharge from postacute rehabilitation in fee-for-service Medicare patients. *JAMA* 2014;311:604–615. [PubMed: 24519300]
3. Li Y, Cai X, Glance LG. Disparities in 30-day Rehospitalization rates among Medicare skilled Nursing facility residents by race and site of care. *Med Care* 2015;53:1058–1065. [PubMed: 26492217]
4. Qian F, Fonarow GC, Smith EE, et al. Racial and ethnic differences in outcomes in older patients with acute ischemic stroke. *Circulation* 2013;6:284–292.
5. Joynt KE, Orav EJ, Jha AK. Thirty-day readmission rates for Medicare beneficiaries by race and site of care. *JAMA* 2011;305:675–681. [PubMed: 21325183]
6. Mochari-Greenberger H, Liao M, Mosca L. Race/ethnic differences in statin prescription and clinical outcomes among hospitalized patients with coronary heart disease. *Am J Cardiol* 2014;113:413–417. [PubMed: 24295550]
7. Cary MP Jr, Merwin EI, Oliver MN, Williams IC. Inpatient rehabilitation outcomes in a national sample of Medicare beneficiaries with hip fracture. *J App Geron* 2016;35:62–83.
8. Kochanek KD, Xu JQ, Murphy SL, et al. Deaths: Final data for 2009 [PDF-2M]. *Natl Vital Stat Rep* 2011;60:1–116.
9. Ford ES. Trends in predicted 10-year risk of coronary heart disease and cardiovascular disease among US adults from 1999 to 2010. *J Am College of Cardiol* 2013;61:2249–2252.
10. Centers for Medicare and Medicaid Services. Long Term Care Resident Assessment Instrument User's Manual Version 3.0. Rockville, MD: Health Care Financing; 2018.

11. Andersen RM. National health surveys and the behavioral model of health services use. *Med Care* 2008;46:647–653. [PubMed: 18580382]
12. Yang J, Schupp CW, Harrati A, et al. Developing an area-based socioeconomic measure from American Community Survey data. Fremont, California: Cancer Prevention Institute of California; 2014.
13. Clemens J, Strain MR. The short-run employment effects of recent minimum wage changes: Evidence from the American Community Survey. *Contemp Econ Policy* 2017;36:711–722.
14. United States Census Bureau. Housing vacancies and homeownership. (CPS/HVS) annual statistics 2013 Available at: <https://www.census.gov/housing/hvs/data/ann13def.html>. Accessed May 3, 2018.
15. Vyas S, Kumaranayake L. Constructing socio-economic status indices: How to use principal components analysis. *Health Policy Plan* 2006;21:459–468. [PubMed: 17030551]
16. Friesen CE, Seliske P, Papadopoulos A. Using principal component analysis to identify priority neighbourhoods for health services delivery by ranking socioeconomic status. *Online J Public Health Inform* 2006;8:e192.
17. Chodosh J, Edelen MO, Buchanan JL, et al. Nursing home assessment of cognitive impairment: Development and testing of a brief instrument of mental status. *J Am Geriatr Soc* 2008;56:2069–2075. [PubMed: 19016941]
18. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606–613. [PubMed: 11556941]
19. Morris JN, Fries BE, Morris SA. Scaling ADLs within the MDS. *J Gerontol A-Med* 1999;54A:M546–M553.
20. Lett HS, Blumenthal JA, Babyak MA, et al. Social support and prognosis in patients at increased psychosocial risk recovering from myocardial infarction. *Health Psych* 2007;26:418–427.
21. Hinojosa MS, Zsembik B, Rittman M. Patterns of informal care among Puerto Rican, African American, and White stroke survivors. *Ethnicity Health* 2009;14: 591–606. [PubMed: 19670066]
22. Schwamm LH, Reeves MJ, Pan W, et al. Race/ethnicity, quality of care, and outcomes in ischemic stroke. *Circulation* 2010;121:1492. [PubMed: 20308617]

Fig. 1.

Study conceptual model based on Andersen's (2008) Model of Health Services Use.

Table 1

Participant Characteristics by Ethnicity/Race

Variables	Hispanics (n = 96)		African Americans (n = 172)		Whites (n = 252)		Sign P
	N (%)	M (SD, Range)	N (%)	M (SD, Range)	N (%)	M (SD, Range)	
Predisposing							
Age		79.2 (8.9, 61–94)		78.2 (8.4, 60–96)		82.4 (8.2, 60–99)	.00
Sex (female)	58 (60.4)		117 (68.0)		127 (50.4)		.00*
Enabling							
Community quality		−0.22 (0.89, −1.97–1.12)		−0.50 (0.80, −1.83–1.16)		0.52 (0.77, −1.40–1.29)	.00*
Admission cognitive functioning (BIMS)		10.6 (4.8, 0–15)		11.6 (4.4, 0–15)		12.23 (4.5, 0–15)	.03 [†]
Admission depressive symptomatology (PHQ-9)		1.4 (3.1, 0–15)		1.7 (3.6, 0–18)		1.2 (2.6, 0–20)	.31
Social support (yes)	85 (88.5)		136(79.1)		177 (70.2)		.00*
Need-related							
Admission functional dependence (MDS-ADL)		2.9 (0.29, 2.18–4)		2.9 (0.30, 1.82–3.56)		2.8 (0.34, 1.18–3.44)	.01 [†]
Comorbidities count		9.0 (6.6, 0–34)		9.0 (6.3, 0–35)		9.1 (6.3, 0–33)	.97
Health behavior							
Average length of stay		23.9(11.4,4–60)		21.8 (11.1, 1–68)		20.7 (10.6, 1–65)	.05
Outcome							
Rehospitalized (yes)	26 (27.1)		44 (25.6)		54 (21.4)		.44

BIMS, Brief Interview for Mental Status; M, mean; MDS-ADL, ADL scale adapted for the MDS; PHQ-9, Patient Health Questionnaire-9; SD, standard deviation.

* $P < .001$.[†] $P < .05$.

Table 2

Correlations Between Predictor Variables and Rehospitalization by Ethnicity

Predictor Variables	Rehospitalized (Y)		
	Hispanics (n = 96)	African Americans (n = 172)	Whites (n = 252)
Predisposing			
Age	.17	.05	-.01
Sex (female)	-.03	-.03	-.16 [*]
Enabling			
Community quality	-.12	-.09	-.04
Admission cognitive functioning (BIMS) [†]	-.27 [*]	-.26 [‡]	-.26 [‡]
Admission depressive Symptomatology (PHQ-9) [§]	.01	.29 [‡]	.19 [‡]
Social support (yes)	-.00	-.22 [‡]	-.19 [‡]
Need-related			
Number of comorbidities	.26 [‡]	.07	.13 [*]
Admission functional dependence (MDS-ADL) [§]	.22	.25 [‡]	.07
Health behavior			
Length of stay	-.15	-.44 [‡]	-.34 [‡]

BIMS, Brief Interview for Mental Status; MDS-ADL, ADL scale adapted for the MDS; PHQ-9, Patient Health Questionnaire-9.

^{*} $P < .05$.[†] Higher scores indicate more optimal functioning.[‡] $P < .001$.[§] Higher scores indicate less optimal functioning.

Table 3

Logistic Regression Examining Patient Characteristics on Rehospitalization

Predictor Variables	Hispanics (n = 96)				African Americans (n = 172)				Whites (n = 252)			
	B	SE	P	OR (95% CI)	B	SE	P	OR (95% CI)	B	SE	P	OR (95% CI)
Predisposing												
Age	.08	.04	.05	1.09(1.00–1.18)	-.01	.04	.82	.99 (.93–1.06)	-.03	.03	.27	.97 (.91–1.03)
Sex (female = 1)	.53	.72	.46	1.70 (.42–6.93)	-.58	.63	.36	.56 (.16–1.93)	-.95	.45	.04	.39 (.16–.94)*
Enabling												
Community quality	-.84	.42	.04	.43 (.19–.98)*	-.48	.42	.25	.62 (.27–1.40)	-.12	.27	.65	.89 (.52–1.51)
Admission BIMS [†]	-.09	.07	.21	.91 (.79–1.05)	-.11	.08	.15	.90 (.77–1.04)	-.11	.05	.04	.90 (.82–.99)*
Admission PHQ-9 [‡]	-.09	.11	.38	.91 (.74–1.12)	.16	.08	.06	1.17 (1.00–1.38)	.15	.07	.04	1.16(1.01–1.32)*
Social support (1 = yes)	.45	1.27	.72	1.58 (.13–18.81)	-1.90	.71	.01	.15 (.04–.60)*	-1.19	.45	.01	.30 (.13–.74)*
Need-related												
Admission MDS-ADL [‡]	.28	.43	.51	1.32 (.58–3.00)	1.42	.45	.00	4.15 (1.71–10.04) [§]	.36	.25	.16	1.43 (.87–2.34)
Comorbidities count	.19	.14	.17	1.21 (.92–1.60)	-.06	.10	.53	.94 (.77–1.15)	.07	.08	.36	1.08 (.92–1.26)
Health behavior												
Average length of stay	-.04	.03	.23	.97 (.91–1.02)	-.19	.05	.00	.83 (.76–.91) [§]	-.09	.03	.00	.91 (.86–.96) [§]
Nagelkerke R ²	.30				0.51				0.34			
χ^2	17.08*				53.84 [§]				43.54 [‡]			

CI, confidence interval; OR, odds ratios; PHQ-9, Patient Health Questionnaire-9; SE, standard error

* $P < .05$.[†] Higher scores indicate more optimal functioning.[‡] Higher scores indicate less optimal functioning.[§] $P < .01$.