

RACIAL/ETHNIC DIFFERENCES IN UTILIZATION OF POST-STROKE REHABILITATION SERVICES: A SYSTEMATIC REVIEW

Objective: To examine racial/ethnic differences in utilization of stroke-related rehabilitation.

Methods: We searched Medline (from 1966–2007), CINAHL (from 1982–2007), PsycINFO (1966–2007), REHABDATA (1966–2007), the Cochrane Library, and reference lists of published articles. We identified 82 studies in our initial search, including randomized and quasi-randomized controlled trials, working papers, technical reports, and conference presentations of stroke patients that reported utilization of rehabilitation services including physical therapy (PT), occupational therapy (OT), speech-language pathology (SLP), and at least two groups that differed by race/ethnicity. Because of limited information on outcomes and heterogeneity of the studies, a formal meta-analysis was not conducted. A qualitative aggregation of study findings was performed instead.

Results: Ten studies involving 214,229 patients met the final criteria for review. Racial/ethnic minorities were more likely to receive rehabilitation and have longer lengths of stays in studies that reported use of rehabilitation services. In contrast, when studies reported discipline-specific (PT, OT, SLP) utilization of services, the results were mixed.

Conclusions: Racial/ethnic differences in the utilization of rehabilitation services primarily reflected the manner in which service utilization was reported. Future studies should be designed to ensure an accurate comparison of service utilization by race/ethnicity. (*Ethn Dis.* 2008;18:365–372)

Key Words: Stroke, Rehabilitation, Race/Ethnicity

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INTRODUCTION

Stroke is a leading cause of long-term disability in the United States, with $\approx 700,000$ Americans experiencing a new or recurrent stroke each year at a cost of ≈ 63 billion dollars.¹ An examination of the demographics of stroke reveals that racial/ethnic minorities experience more negative consequences of stroke.^{2–11} Stroke-related death rates are significantly higher for racial/ethnic minorities,^{1,6–8} and greater initial stroke severity has been reported.^{3–5,11} Higher incidences of stroke recurrence also exist, thereby contributing to greater mortality⁹ and higher per capita costs for stroke-related care.¹²

In 2000, the Minority Health and Disparities Research and Education Act¹³ was enacted, mandating the Institute of Medicine's (IOM) study of health disparities. The landmark report *Unequal Treatment* documented longstanding disparities in health care across a variety of settings and health conditions, including cardiovascular disease, cancer, diabetes, and renal disease.¹⁴ The report included a review of studies of racial differences in utilization of rehabilitation services: physical therapy (PT) and occupational therapy (OT). Three studies were identified, and two reported disparities in the use of PT or OT after a hip fracture.^{15,16} The final study concluded that although a larger proportion of elderly Blacks used inpatient PT or OT after stroke, the observed differences in use were associated with motor deficits that were proportionally greater among Black patients.¹⁷ Unfortunately, limited consideration has been given to possible

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disparities in the utilization of rehabilitation services after stroke since the IOM report, despite the financial burden stroke poses on the US population.^{1,12} This lack of inclusion of stroke rehabilitation in national discussions of disparities is surprising, particularly given the focus on racial/ethnic disparities in incidence, prevalence, and equity of stroke-related care.^{1,18,19}

The current literature is unclear regarding the equality of rehabilitation service utilization after stroke.¹⁸ Comparisons of use, timing, and amount of rehabilitation services among Black and White Medicare patients provide conflicting evidence regarding use of PT and OT.^{17,20,21} Further compounding the literature are studies of the veteran population, who have equal access to rehabilitation services after stroke.^{17,22,23} In summary, little is known about racial/ethnic variations in the utilization of rehabilitation after stroke. The objective of this study was to conduct a systematic review of the literature to examine racial/ethnic differences in the utilization of stroke-related rehabilitation services.

RESEARCH DESIGN AND METHODS

Criteria for Considering Studies for this Review

We included all randomized and quasirandomized controlled trials, working papers, technical reports, and conference presentations of stroke patients that reported utilization of rehabilitation services, including: rehabilitation, PT, OT, speech-language pathology (SLP) or speech therapy (ST), and the race-ethnicity of the participants.

We included studies that recruited patients with a diagnosis of stroke and reported the race-ethnicity of at least two racial/ethnic groups. Patients received services in the following settings: inpatient, outpatient, nursing home, or other rehabilitation settings.

We recorded outcomes that reflected comparisons of utilization of rehabilitation, PT, OT, or SLP (ST) interventions between the identified racial/ethnic groups. Utilization outcomes were defined as: 1) number of sessions or visits per week; 2) total number of sessions or visits; 3) total minutes per day; 4) total minutes per week; 5) length of stay (LOS) in days or weeks; 6) odds of receiving rehabilitation, PT, OT, or SLP (ST).

Search Methods for Identification of Studies

We used the Cochrane Collaboration Group search strategy as outlined in the Cochrane Handbook for Systematic Reviews of Interventions.²⁴ We searched Medline (from 1966–2007), CINAHL (from 1982–2007), PsycINFO (1966–2007), REHABDATA (1966–2007), and the Cochrane Library. The following (MESH) terms were used in our search: stroke, cerebrovascular accident, rehabilitation, rehab, physical therapy, occupational therapy, speech therapy, speech-language pathology, disparities, length of stay, utilization, race, ethnicity, racial

groups, ethnic groups, and racial/ethnic groups. We identified studies that reported rehabilitation use even if the study's primary purpose was not related to rehabilitation service utilization. Similarly, studies that reported comparisons of rehabilitation service utilization by race or ethnicity were identified. Hand searches of reference lists and a search of Google Scholar identified conference presentations, working papers, and technical reports. Hand searches consists of a page-by-page review of journal issues related to rehabilitation to identify reports of trials reported in full-length articles, abstracts, news columns, editorials, letters, or other text.²⁴ We also searched for reviews of health disparities in rehabilitation and the national organization websites for each of the rehabilitation services included in this study. We limited this review to studies conducted in the United States and published in English.

Methods of the Review

Full text of all potentially relevant studies was obtained after a review of the abstracts. For each part of the review, two reviewers (CE, HB) assessed studies for inclusion independently. Differences regarding study eligibility and data extraction were resolved by consensus.

Reviewers (CE, HB) independently extracted data with an adapted version of the EPOC Data Collection Checklist.³⁵ The data collection checklist is a guide designed to assist reviewers with the identification of relevant information or data to be used in the analysis.

Given the heterogeneity of studies, patient populations, and rehabilitation settings, we decided *a priori* not to use meta-analyses to pool the results of studies. Instead, the results are presented in tabular format to provide a qualitative assessment of the studies of interest on the basis of population demographics, outcome variables and statistical significance of rehabilitation utilization.

Data presented (where available) are: 1) primary data sources, 2) baseline sample information and comparisons by racial/ethnic group (ie, age, stroke severity, functional level), and 3) rehabilitation service (PT, OT, ST) utilization. We report significance data (eg, percentages, odds ratios [ORs], confidence intervals [CIs], and *P* values) between racial/ethnic groups. The studies are presented in three groups: 1) rehabilitation utilization, 2) PT/OT utilization, and 3) SLP (ST) utilization.

RESULTS

A total of 82 studies were identified and screened. Sixty six failed to meet study criteria and were excluded from the analysis. Six of the 16 remaining studies reported racial/ethnic differences in utilization of stroke services; however, they included more than one disease condition. These six studies did not report stroke-related data separately; therefore, they were not included in the analysis. Ten studies that involved 214,229 patients met the inclusion criteria and were reviewed.

We used the same format for reporting the results of race or ethnicity and quantifying service utilization that was used in the original studies. Studies including patients seen in Veterans Administration (VA) facilities are summarized in Tables 1–3 and then separately in Table 4. Table 4 highlights rehabilitation service provision in VA facilities, which differ from non-VA facilities because equal access to care is guaranteed to all veterans regardless of race or ethnicity.

Rehabilitation

Four studies reported utilization of rehabilitation services by race or ethnicity (Table 1).^{22,26–28} Both Stineman et al²² and Gregory et al²⁷ reported a significantly longer rehabilitation length of stay (LOS) for Blacks than for Whites. Gregory et al²⁷ noted a longer

Table 1. Racial/ethnic differences in rehabilitation utilization after stroke

Study	Data Source	Sample	Group Comparisons	Service Utilization	Significance
Stineman et al (2001)	1994–1995 VA and non-VA data from UDSmr	VA: 2009 Whites 700 Black 216 Hispanic 41 other Non-VA: 42,074 White 7195 Black 1458 Hispanic 1655 other	Age: VA=66.4; Non-VA=70.8 Motor FIM: VA=50.6; Non-VA=41.1	Black 6.2% longer LOS in VA rehab Black 2.0% longer LOS in non-VA rehab	$P=.01$ $P=.0009$
Chiou-Tan et al (2006)	UDSmr 2000–2003	20 White 68 Hispanic 83 Black	Admission FIM significant: White=66.5 Hispanic=58.9 Black=68.9	LOS (days) White=18.15 Hispanic=17.75 Black=17.10	$P=.26$
Gregory et al (2006)	Maryland Health Services and Cost Review Commission Database	9064 White 3144 Black	Stroke Severity: Greater hemorrhagic strokes among Blacks	Mean LOS-IP rehab Whites=5.0 Blacks=7.0	$P=.0001$
Xie et al (2007)	2005 Behavioral Risk Factor Surveillance System—21 states and District of Columbia	3374 White 552 Black 41 Hispanic/other	None reported	Report of OP stroke rehab Black OR 1.49 [1.10–2.00] Hispanic OR 1.06 [0.70–1.67]	$P<0.05$ NS

VA = Veterans Administration, UDSmr = Uniform Data System for Medical Rehabilitation, FIM = Functional Independence Measure, LOS = length of stay, IP = inpatient, OP = outpatient, OR = odds ratio, NS = nonsignificant.

LOS for Blacks in a retrospective study of facilities in the state of Maryland ($P=.0001$). Stineman et al²² studied >55,000 stroke patients included in the Uniform Data System for Medical Rehabilitation (UDSmr) and noted longer LOSs for Blacks seen at both VA ($P=.01$) and non-VA facilities ($P=.0009$). In contrast, Chiou-Tan's²⁶ examination of the 2000–2003 UDSmr data revealed that Blacks had slightly shorter (17.1 days) LOSs than did Whites (18.2 days), but the difference did not reach significance ($P=.26$). Finally, in a review of self-reported rehabilitation use obtained from the 2005 Behavioral Risk Factor Surveillance System,²⁹ Xie et al²⁸ found greater odds of Blacks receiving outpatient rehabilitation after stroke when Whites served as the reference group (OR 1.49 [95% CI 1.10–2.00], $P<.05$). Approximately 38% of Blacks reported receiving outpatient stroke rehabilitation compared to ≈29% of Whites and 30% of Hispanics. In summary, Blacks were more likely to receive rehabilita-

tion services and to have longer rehabilitation stays.

Physical Therapy and Occupational Therapy

Five studies reported utilization of PT and OT services by race or ethnicity (Table 2).^{17,30–33} Horner et al¹⁷ found no racial differences in the likelihood of receiving PT or OT after stroke in a national sample of Black and White Medicare patients after adjusting for characteristics associated with the use of PT/OT (relative risk [RR] 1.06 [95% CI .89–1.27], $P=.42$). Blacks received approximately the same number of days of PT/OT as Whites during hospital stays ($P=.90$). Goldstein et al³⁰ reported similar findings for utilization of PT and OT in a study of Veteran stroke patients from 1995 through 1997. Physical therapy was utilized by 74.9% of non-Whites and 70.5% of Whites while occupational therapy was used by 19.6% of non-Whites and 16.0% of Whites. Neither of the observed differences reached significance.

Cook et al³² examined responses from the 1998 Health and Retirement Study (HRS). Ten percent of the respondents who reported a diagnosis of stroke in the past two years received PT/OT services. The stroke sample ($n=1363$) represented 12% of the total sample ($N=11,126$) of the 1998 HRS. Blacks (OR 1.84 [95% CI .41–3.47], $P=.16$) and Hispanics (OR 1.53 [95% CI .73–3.42], $P=.32$) had a greater likelihood of receiving PT/OT services than did Whites. However, neither of these differences reached significance.

Asian Americans were more likely to receive more OT sessions per day (1.72 sessions/day, $P<.05$) than were Whites (reference group) in a retrospective cohort study by Bhandari et al,³¹ patients who classified themselves as “other” were more likely to receive more total therapy (PT/OT) sessions per day (5.20 sessions/day, $P<.05$). However, Bhandari et al did not find racial/ethnic differences in the total number of PT sessions provided or in

Table 2. Racial/ethnic differences in physical therapy and occupational therapy utilization after stroke

Study	Data Source	Sample	Group Comparisons	Service Utilization	Significance
Horner et al (1997)	Medicare patients aged ≥ 65 years in 297 hospitals in 5 states: 1981–1982 1985–1986	2497 Black and White patients	Age: Blacks younger Hospital type: larger proportion of Black patients admitted to government/large/urban	66.3% of Black patients vs 55.8% White patients received IP PT/OT Average days of PT/OT Blacks 7.6 Whites 8.2	Receipt of IP PT/OT RR 1.11 [95% CI 0.93–1.33] $P=.22^*$ Receipt of IP PT/OT RR 1.06 [.89–1.27] $P=.42^\dagger$
Goldstein et al (2003)	1995–1997 Veterans Administration Acute Stroke Study	520 White 226 Black 28 Hispanic	Canadian Neurological Scale: Whites=8.8 Non-Whites=8.4 ($P=.06$)	Utilization of therapy (%) White 70.5 Nonwhites 74.9 PT 16.0 OT 19.6	$P=.27$ $P=.20$
Bhandari et al (2005)	Retrospective cohort 1995–2001	421 White 419 Black 96 Asian 33 Hispanic 33 Other	Age >65 years: Hispanic and other significant Mean FIM admission: Asian and other significant	Mean LOS – no differences Mean total therapy sessions Other – greater no. of sessions Mean OT sessions Asian – greater no. of sessions Mean PT sessions	Reference = White $P<.05$ $P<.05$
Cook et al (2005)	Health and Retirement Study database subsample	9391 White 1401 Black 728 Hispanic 1363 Stroke	None Reported	No differences Likelihood of attending OT/PT White OR .65 [95% CI .25–1.97] Black OR 1.84 [95% CI .41–3.46] Hispanic OR 1.53 [95% CI .73–3.42] No. of minutes of treatment to resident in seven-day observation period	$P=.46$ $P=.16$ $P=.32$
Weech-Maldonado (2007)	2002 Nursing Home Minimum Data Set	50,238 residents	None Reported		
Odds Ratio					
Black					PT .75 OT .88 $P<.001$; <.01
Hispanic					.67 .71 $P<.0001$; <.0001
Asian					.70 .81 $P<.01$; NS
Am. Indian					.93 .61 $P=NS$; NS

IP = inpatient, PT = physical therapy, OT = occupational therapy, RR = relative risk, FIM = functional independence measure, LOS = length of stay, OR = odds ratio, CI = confidence interval, NS = nonsignificant.
 * Unadjusted RR.
 † Adjusted RR.

Table 3. Racial/ethnic differences in speech-language pathology utilization after stroke

Study	Data Source	Sample	Group Comparisons	Service Utilization	Significance
Goldstein et al (2003)	1995–1997 Veterans Administration Acute Stroke Study	520 White 226 Black 28 Hispanic	CNS: White=8.8 Non-White=8.4 ($P=.06$)	Utilization of Therapy (%) White - non-White 9.6–12.6	$P=.21$
Fridriksson et al. (2005)	SC Department of Statistics Hospital admissions, procedures, discharge data for patients with diagnosis of stroke (1996–2000)	76,777 patients 28.0% African American 71.1% White 9.0% other	None Reported	Odds of Using Speech and Audiology Services Whites OR 1.28	With African Americans and other as reference: $P<.0001$
Weech-Maldonado (2007)	2002 Nursing Home Minimum Data Set	50,238 patients	Cognitive Performance Scale ADL Function Group comparisons not reported	No. of minutes of treatment to resident in seven-day observation period Odds Ratio: Black .83 Hispanic .64 Asian .75 American Indian .78	$P<.001$ $P<.001$ $P<.01$ $P = NS$

CNS = Canadian Neurological Scale, ADL = activities of daily living, NS = nonsignificant.

the mean LOS in comparisons of racial/ethnic minorities (Blacks, Asians, Hispanics, others) and Whites.

Weech-Maldonado³³ examined the number of minutes of PT and OT in nursing home residents with stroke during a seven-day observation period in 2002. In contrast to previously reported studies of PT and OT utilization after stroke, the 2002 Nursing Home Minimum Data Set (MDS)

revealed that Blacks (OR .75, $P<.001$; OR .88, $P<.01$) and Hispanics (OR .67, $P<.0001$; OR .71, $P<.0001$) were less likely to receive PT and OT services than were Whites. Similarly, Asians were less likely to receive PT services (OR .70, $P<.01$) than were Whites. In summary, studies of racial/ethnic differences in PT and OT utilization after stroke reported mixed results.

Speech Language Pathology (Speech Therapy)

Three studies reported utilization of ST services by race or ethnicity (Table 3).^{30,33,34} Goldstein et al³⁰ reported a greater percentage of non-White veterans (12.6%) used SLP (ST) services compared with White veterans (9.6%), although the difference did not reach significance ($P=.21$). Fridriksson et al³⁴ examined the South Carolina Depart-

Table 4. Racial/ethnic differences in poststroke rehabilitation in VA facilities

Study	Data Source	Sample	Group Comparisons	Service Utilization	Significance
Stineman et al (2001)	1994–1995 VA and non-VA data from Uniform Data System for Medical Rehabilitation	VA: 2009 White 700 Black 216 Hispanic 41 other Non-VA: 42,074 White 7195 Black 1458 Hispanic 1655 other	Age (years): VA=66.4 Non-VA=70.8 Motor FIM: VA=50.6 Non-VA=41.1	Blacks – 6.2% longer LOS in VA rehab Blacks - 2.0% longer LOS in non-VA rehab	VA $P=.01$ Non-VA $P=.0009$
Goldstein et al (2003)	1995–1997 Veterans Administration Acute Stroke Study	520 White 226 Black 28 Hispanic	Canadian Neurological Scale: White=8.8 Non-White=8.4 ($P=.06$)	Utilization of therapy (%) White – Non-White PT – 70.5 - 74.9 OT – 16.0 - 19.6 ST – 9.6 - 12.6	$P=.27$ $P=.20$ $P=.21$

VA = Veterans Administration, FIM = Functional Independence Measure, LOS = length of stay, PT = physical therapy, OT = occupational therapy, ST = speech therapy.

Studies reporting utilization patterns of rehabilitation suggest that Blacks are more likely to receive rehabilitation services and have longer length of stay.

ment of Statistics hospital admission and discharge data from 1996 through 2000 and observed that Whites had greater odds of using SLP (ST) services (OR 1.28 [95% CI 1.174–1.242], $P < .0001$) after stroke than did African Americans/others.³⁴ Finally, Weech-Maldonado's³³ analysis of the 2002 Nursing Home MDS noted that the odds of Black (OR .83, $P < .001$), Hispanic (OR .64, $P < .001$), and Asian (OR .75, $P \leq .01$) nursing home residents with stroke receiving SLP (ST) during a seven-day observation period in 2002 was less than that for Whites. American Indian nursing home residents with stroke were also less likely to receive SLP (ST) than Whites (OR 0.78, $P > .05$); however these differences were not significant. To conclude, comparisons of SLP (ST) use after stroke were mixed; two of three studies suggested that racial/ethnic minorities were less likely than Whites to receive SLP (ST) after stroke while greater use was reported in the third study.

DISCUSSION

This review assessed racial/ethnic differences in the utilization of rehabilitation services after stroke. Utilization patterns of rehabilitation across studies of multiple racial/ethnic groups had mixed results. Studies reporting utilization patterns of rehabilitation suggest that Blacks are more likely to receive rehabilitation services and have longer LOS. However, when discipline-specific

(PT, OT, SLP) utilization patterns are reported, the results are quite variable.

Two of four studies reporting rehabilitation use indicated longer LOS among racial/ethnic minorities. A third study using a national data set indicated that racial/ethnic minorities had greater odds of receiving outpatient rehabilitation. When discipline-specific (PT, OT, SLP) utilization was reported, two of five studies examining use of PT and OT services after stroke demonstrated significant differences.^{31,33} One reported greater use of therapy use by Asians and those identified as other,³¹ while the second study concluded that racial/ethnic minority nursing home residents were less likely to receive PT and OT services.³³ Finally, two of three studies of ST use after stroke reported lower odds of receiving ST among racial/ethnic minorities.^{33,34}

We must consider the following key points when interpreting the findings of the studies included in this review. First, 4 of 10 studies^{22,28,32,34} reviewed in this study were not specifically designed to examine racial/ethnic differences in the utilization of rehabilitation services. Although the data were useful, attempting to interpret utilization patterns from studies taken out of the context of the original study warrants some caution. For example, the Centers for Disease Control report²⁸ included only yes/no responses to "Have a doctor or nurse ever told you that you had a stroke?" and if the respondent answered yes, the follow-up question "Did you go to any type of outpatient rehabilitation?" was then asked. The use of closed-end questions does not adequately assess frequency and duration of therapies for adequate racial/ethnic comparisons and may influence some responses compared to more open-ended questions.³⁵ Further, while the studies of PT³² and ST³⁴ utilization included data related to racial/ethnic minorities, the primary purposes of those studies were to examine PT and ST utilization patterns in general rather than racial/ethnic differences.

Second, we decided to include studies completed in both VA and non-VA facilities in this review. Combining studies completed in VA and non-VA facilities to examine differences in utilization patterns for any service can be complicated by the equal access to care that is provided to veterans of all racial/ethnic backgrounds in VA facilities.^{14,36–37} In addition, veterans tend to be younger, were more likely to be retired due to disability or unemployed, and had higher functional abilities on admission. Overall, VA facilities are more likely to provide services to individuals from racial/ethnic minority groups and low socioeconomic backgrounds,^{22,38} which may explain why we found no racial/ethnic differences in VA studies (Table 4).

We experienced a number of challenges in our attempts to consolidate and interpret the findings of the studies reported. First, study populations and rehabilitation settings were variable. Variability also existed in the intensity and frequency of rehabilitation interventions across rehabilitation settings. Second, the six studies designed specifically to examine racial/ethnic differences in rehabilitation utilization did not consistently compare or report baseline values of stroke severity and functional level of impairment. Only four studies^{22,26,30,31} reported baseline comparisons of stroke severity between racial/ethnic groups. This absence of baseline data was surprising since baseline group comparisons should be included to prevent sample bias, given evidence of greater stroke severity in racial/ethnic minorities.^{3–5,11}

Established measures such as the Functional Independence Measure³⁹ are appropriate for baseline group comparisons since they have predictive value for discharge disposition (nursing home, rehabilitation facility), level of functional impairment, and overall outcomes.⁴⁰ In the absence of baseline comparisons, reports of greater service utilization or longer LOS may reflect more severe or complicated strokes that require

greater levels of rehabilitation expertise rather than independent racial/ethnic differences.⁴¹ Further, additional attention should be given to variation in hospital-level practices, particularly when considering the differences in findings of studies completed in VA facilities and academic medical centers and studies that use administrative databases.⁴¹

In conclusion, the results reported here suggest no racial/ethnic differences in the utilization of rehabilitation services after stroke when comparing use of specific rehabilitation disciplines. A number of questions remain due to the variability in data collected, including study purposes and designs, baseline demographic comparisons, rehabilitation settings, and interpretation of findings. Well-designed and adequately powered studies that include good baseline data and outcomes measures by race/ethnicity will be required to definitively answer questions about racial/ethnic differences in rehabilitation utilization after stroke.

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