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ORIGINAL ARTICLE

Regional Variation in Stroke Rehabilitation Outcomes

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Abstract

Objective: To examine and describe regional variation in outcomes for persons with stroke receiving inpatient medical rehabilitation.

Design: Retrospective cohort design.

Setting: Inpatient rehabilitation units and facilities contributing to the Uniform Data System for Medical Rehabilitation from the United States.

Participants: Patients (N = 143,036) with stroke discharged from inpatient rehabilitation during 2006 and 2007.

Interventions: Not applicable.

Main Outcome Measures: Community discharge, length of stay (LOS), and discharge functional status ratings (motor, cognitive) across 10 geographic service regions defined by the Centers for Medicare and Medicaid Services (CMS).

Results: Approximately 71% of the sample was discharged to the community. After adjusting for covariates, the percentage discharged to the community varied from 79.1% in the Southwest (CMS region 9) to 59.4% in the Northeast (CMS region 2). Adjusted LOS varied by 2.1 days, with CMS region 1 having the longest LOS at 18.3 days and CMS regions 5 and 9 having the shortest at 16.2 days.

Conclusions: Rehabilitation outcomes for persons with stroke varied across CMS regions. Substantial variation in discharge destination and LOS remained after adjusting for demographic and clinical characteristics.

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Persons with stroke represent the largest impairment group of Medicare beneficiaries receiving inpatient medical rehabilitation services in the United States.[1] These services are provided in different settings governed by a variety of rules and regulations. The settings operate using diverse admission policies, staffing ratios, and service delivery patterns. For example, inpatient rehabilitation facilities (IRFs) have a Centers for Medicare and Medicaid Services (CMS) compliance requirement that identifies 13 conditions as eligible for services within an IRF.[1] Stroke has consistently been the most common Medicare rehabilitation impairment group receiving services in IRFs over the past 5 years and represents between 16% and 21% of all IRF Medicare cases.[1]

There is variation nationally in the availability of IRFs. The 4 states with the highest number of IRFs are Texas, California, Pennsylvania, and New York.[1] Each has between 70 and 90 facilities, while Wyoming, West Virginia, Vermont, and Delaware each has less than 5.[2] State-level differences in the number of IRF beds per Medicare beneficiary are different than the geographic distribution of IRF settings by state.[2] The impact of these geographic differences on rehabilitation outcomes is largely unknown.

Regional variation has been reported in health care for more than 20 years.[3-5] Most regional variation studies examine acute

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care services. Researchers have found variation across diagnostic groups from cardiac to cancer.[6-9] The presence and reasons for regional variation in the use of health services nationally have been debated in health care reform discussions.[10-13] Not only does regional variation exist in service use, but it has also been noted in health care spending.[14-17]

A common concern is that higher service use and costs do not translate into better quality or higher satisfaction with care.[11] There is currently a heightened emphasis on reducing regional variation as part of health care reform. This discussion is described as a "win-win," where focused strategies can lead to cost savings while improving quality of care. Regional variation is an important issue for providers, payers, and policy makers as they attempt to improve efficiency and maximize the quality of health care delivery systems.[18]

A few studies[19-26] have examined regional differences in postacute rehabilitation services and outcomes. Researchers studying the use of postacute care after stroke and other common diagnoses found significant regional variation, which they attributed, in part, to practice styles, facility availability, and regulations.[22] A study of disparities in postacute care in Arizona, Florida, New Jersey, and Wisconsin, by Freburger et al,[26] found significant regional differences in IRF and skilled nursing facility (SNF) use after adjusting for individual, facility, and state differences. Other studies[27-29] examining SNF rehabilitation after hip replacement found significant regional differences in the amount of treatment provided. Differences in physical and occupational therapy services in stroke rehabilitation have also been reported.[23,30]

Understanding how geographic variability is associated with outcomes will help rehabilitation professionals and administrators implement practice guidelines and quality improvement programs designed to improve care in areas with poor outcomes.[31] An important step in this process is to describe region-specific outcomes of rehabilitative care at the national level.

The purpose of this study was to examine, in a large national sample, regional differences in stroke rehabilitation outcomes, including (1) length of stay (LOS), (2) functional status (discharge motor and cognitive status, overall functional change), and (3) the percentage of patients discharged to the community. Conceptually, variation in health service use and rehabilitation is linked to geography as well as demographic, clinical, and other factors that influence care decisions and resource utilization.[26,32-34] Our study was guided by Kane and Radosevich's[35] conceptual model for health outcomes research. We categorized variables that influence rehabilitation outcomes into demographic, clinical, and regional factors (fig 1).

Our main focus was to provide basic descriptive information regarding regional variation in outcomes for persons receiving inpatient rehabilitation after a stroke. Based on the conceptual model, our previous research and clinical experience, and the existing literature, we hypothesized that differences in outcomes would be present across regions after adjusting for demographic and clinical factors.

List of abbreviations:

CI	confidence interval
CMS	Centers for Medicare and Medicaid Services
IRF	inpatient rehabilitation facility
IRF-PAI	Inpatient Rehabilitation Facility–Patient Assessment Instrument
LOS	length of stay
OR	odds ratio
SNF	skilled nursing facility
UDSMR	Uniform Data System for Medical Rehabilitation

Methods

Data source

We used a retrospective cohort design to examine inpatient rehabilitation records across 10 geographic regions. Data were obtained from the Uniform Data System for Medical Rehabilitation (UDSMR). The UDSMR database is the largest nongovernmental data repository for inpatient medical rehabilitation information in the United States.[36] The UDSMR database includes patient records starting in 1987 for 850 to 900 rehabilitation hospitals or facilities across the nation. For this study, we used patient demographics, clinical information, and rehabilitation outcomes from 2006 and 2007 contained in the UDSMR database.

Study sample

The sample included individuals with stroke based on *International Classification of Diseases–9th Revision* codes (430–433.9, 436, 439). The eligible sample included adults between the ages of 18 and 100 years who were living at home before their acute stroke and were discharged from an IRF in 2006 or 2007 (N = 167,450 patient records). A patient record was excluded if it was not an IRF admission for initial rehabilitation (n = 9700). Records were also excluded if they reflected an atypical course of rehabilitation—for example, >30 days from acute event to IRF admission (n = 11,577), an IRF stay <3 days (n = 2997), or >3 SDs of the logarithm for LOS (n = 1523). Records with missing data for key variables (eg, age, discharge setting) were excluded (n = 1859). We included patients with program interruptions (n = 1340). These records represented 1% of the sample and in our sensitivity analysis did not influence the results. Given that program interruptions represent patient stays that were distributed across regions, we chose to leave these records in our analysis. The final sample included 143,036 patients, which represents approximately 85% of the eligible patient records.

Study variables

Based on our experience with stroke outcomes studies using large national datasets,[37-40] we examined 3 common stroke rehabilitation outcomes. Consistent with our conceptual model, we entered demographic characteristics, clinical factors, and geographic region as covariates.

Community discharge

Discharge settings in the UDSMR database are grouped into categories. Community includes home, board-and-care settings, transitional living, and assisted living. Long-term care includes nursing home, SNFs, chronic hospitals, and other alternative care settings. Acute care includes discharges to units in the same facility as well as other acute facilities. Rehabilitation includes settings in other facilities or subacute settings within the same IRF. In this study, we dichotomized discharge settings into those returning to community and those needing institutional levels of care.