

**ORIGINAL RESEARCH**

# Geographic and Facility Variation in Inpatient Stroke Rehabilitation: Multilevel Analysis of Functional Status



Timothy A. Reistetter, PhD, OTR,<sup>a</sup> Yong-Fang Kuo, PhD,<sup>b</sup>  
Amol M. Karmarkar, PhD, MPH, OTR,<sup>c</sup> Karl Eschbach, PhD,<sup>d</sup> Srinivas Teppala, MBBS, MPH,<sup>c</sup>  
Jean L. Freeman, PhD,<sup>d</sup> Kenneth J. Ottenbacher, PhD, OTR<sup>c</sup>

From the <sup>a</sup>Department of Occupational Therapy, <sup>b</sup>Department of Preventive Medicine and Community Health, <sup>c</sup>Division of Rehabilitation Sciences, and <sup>d</sup>Internal Medicine—Division of Geriatrics, University of Texas Medical Branch, Galveston, TX.

## Abstract

**Objective:** To examine geographic and facility variation in cognitive and motor functional outcomes after postacute inpatient rehabilitation in patients with stroke.

**Design:** Retrospective cohort design using Centers for Medicare and Medicaid Services (CMS) claims files. Records from 1209 rehabilitation facilities in 298 hospital referral regions (HRRs) were examined. Patient records were analyzed using linear mixed models. Multilevel models were used to calculate the variation in outcomes attributable to facilities and geographic regions.

**Setting:** Inpatient rehabilitation units and facilities.

**Participants:** Patients (N=145,460) with stroke discharged from inpatient rehabilitation from 2006 through 2009.

**Intervention:** Not applicable.

**Main Outcome Measures:** Cognitive and motor functional status at discharge measured by items in the CMS Inpatient Rehabilitation Facility—Patient Assessment Instrument.

**Results:** Variation profiles indicated that 19.1% of rehabilitation facilities were significantly below the mean functional status rating (mean  $\pm$  SD, 81.58 $\pm$ 22.30), with 221 facilities (18.3%) above the mean. Total discharge functional status ratings varied by 3.57 points across regions. Across facilities, functional status values varied by 29.2 points, with a 9.1-point difference between the top and bottom deciles. Variation in discharge motor function attributable to HRR was reduced by 82% after controlling for cluster effects at the facility level.

**Conclusions:** Our findings suggest that variation in motor and cognitive function at discharge after postacute rehabilitation in patients with stroke is accounted for more by facility than geographic location.

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Most studies examining geographic variation in health care outcomes have been conducted in acute care facilities<sup>1-10</sup> and explore factors that contribute to the use of diagnostic and surgical procedures.<sup>11,12</sup> Researchers have reported that differences in

procedures and surgical rates are related to a lack of clinical practice guidelines or agreement among physicians.

Few studies have focused on geographic variation associated with postacute care settings. Kane et al<sup>13</sup> assessed geographic variation in postacute care use from 1996 to 1998. They found a 12% difference in the use of postacute care attributed to practice style variation, the type of rehabilitation services across regions, and diversity in administrative policy at the local level. Geographic variation has been reported in stroke and orthopedic procedures (eg, joint replacement) commonly associated with physical rehabilitation.<sup>14-17</sup> Little information is available at a

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national level regarding variation in functional status outcomes after postacute stroke rehabilitation.

Following the Affordable Care Act,<sup>18</sup> the Institute of Medicine (IOM) investigated geographic variation including payment structures, access to care, efficiency, and quality of care. The IOM report indicates that 73% of variation in Medicare spending is due to postacute care use, including rehabilitation.<sup>19</sup> The IOM findings suggest that some regions are more efficient than others at delivering quality care. The report indicates that Medicare reimbursement policies are a driver of variation and excessive health care use, because the payment system rewards intensity as opposed to the value and quality of care.<sup>19</sup>

Reducing variation is often reported as a method to slow health care spending and improve care.<sup>20-24</sup> The IOM report argues that reducing variation is only meaningful if it focuses on inefficient or low-quality health care delivery.<sup>19</sup> Variation in quality of care and the measures that reflect quality of care are important components related to health care policy development and implementation.

Regulators use quality measures within policies and programs to facilitate performance at the facility level. For example, the readmission reduction program is specifically designed to facilitate continuity of care at discharge for acute care. The *Federal Register 2015 Final Rule for Medicare Inpatient Rehabilitation Facility Prospective Payment System* proposes functional status at discharge as a quality measure and indicator for rehabilitation.<sup>25</sup>

Few studies have evaluated geographic variation in quality measures for postacute care rehabilitation. The purpose of this study was to explore geographic variation in functional status, a Centers for Medicare and Medicaid Services (CMS)-proposed quality measure for inpatient stroke rehabilitation. Specifically, we examined regional and facility variation in cognitive and motor function using CMS records of beneficiaries who were discharged from inpatient rehabilitation facilities (IRFs) during 2006 to 2009. Based on previous research<sup>13</sup> and the recent IOM report,<sup>19</sup> we hypothesized that geographic regions would contribute to differences in cognitive and motor functional quality measures in patients receiving stroke rehabilitation.

## Methods

### Research design

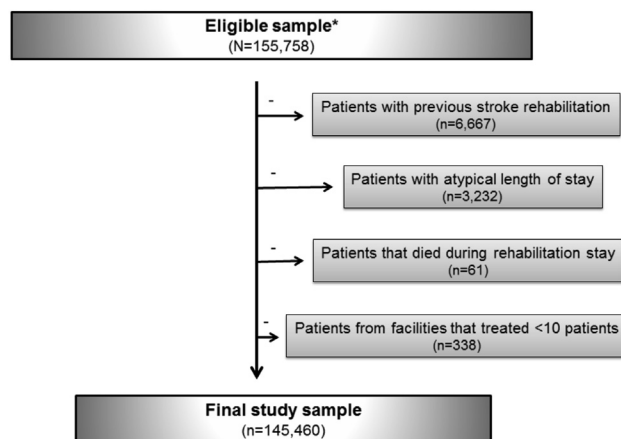
We conducted a retrospective cohort study including secondary analyses of Medicare fee-for-service beneficiaries with stroke who received postacute inpatient rehabilitation.

### Data sources

We used 4 CMS claims files: Beneficiary Summary, Medicare Provider Analysis and Review (MedPAR), Inpatient

#### List of abbreviations:

<b>CMS</b>	<b>Centers for Medicare and Medicaid Services</b>
<b>HRR</b>	<b>hospital referral region</b>
<b>ICC</b>	<b>intraclass correlation coefficient</b>
<b>IOM</b>	<b>Institute of Medicine</b>
<b>IRF</b>	<b>inpatient rehabilitation facility</b>
<b>IRF-PAI</b>	<b>Inpatient Rehabilitation Facility—Patient Assessment Instrument</b>
<b>MedPAR</b>	<b>Medicare Provider Analysis and Review</b>
<b>POS</b>	<b>Provider of Service</b>



\*Medicare fee for service beneficiaries discharged from acute hospitals between January 2006 - June 2009 with rehab impairments group codes for stroke, and who were living in the community prior to hospitalization

Fig 1 Study flow diagram.

Rehabilitation Facility—Patient Assessment Instrument (IRF-PAI), and the Provider of Service (POS). The Beneficiary Summary, MedPAR, and IRF-PAI were linked using the encrypted beneficiary identification.

### Sample

The sample included Medicare fee-for-service beneficiaries 66 years and older with rehabilitation impairment category codes for stroke defined by the CMS (01.1, 01.2, 01.3, 01.9). The eligible sample included patients who were discharged to IRFs from acute hospitals between January 2006 and June 2009. All patients included in the study were living in the community before their stroke (N = 155,758). We excluded persons who received previous stroke rehabilitation treatment (n = 6667), those with an atypical length of stay (ie,  $\leq 3$ d in rehabilitation: n = 3232), or who died during the rehabilitation stay (n = 61). Patients from rehabilitation facilities that treated <10 patients with stroke over the study period (n = 338) were also excluded. The final sample included 145,460 patient records from 1209 IRFs, which is 93% of the eligible sample (fig 1).

### Variables

Primary outcome variables were motor and cognitive function, and total functional status ratings at discharge from postacute inpatient rehabilitation. Motor and cognitive function were assessed using items from the IRF-PAI.<sup>26</sup> The IRF-PAI is administered within 3 days of admission and 3 days of discharge, and includes 18 items derived from the FIM instrument.<sup>26</sup> The motor subscale contains 13 items: eating, grooming, bathing, upper body dressing, lower body dressing, toileting, bladder management, bowel management, bed chair and wheelchair transfers, toilet transfers, tub and shower transfers, walking/wheelchair locomotion, and stairs. The cognitive subscale includes 5 items: comprehension, expression, social interaction, problem solving, and memory. Total functional status contained the sum of the 18 items. All items in the IRF-PAI are rated on a 7-point scale from 1 (total assistance) to 7 (complete independence). The reliability and validity of the items have been studied extensively in patients with stroke and other disabilities and found to be adequate.<sup>27,28</sup>

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