Racial/Ethnic Differences in Post-Stroke Outcomes and Rehabilitation Utilization

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MUSC College of Health Professions

Aging Research Day - 2010
Focus on Stroke in South Carolina
Folly Beach, South Carolina
February 19, 2010
Burden of Stroke in America

• 795,000 stroke each year
  – 610,000 initial; 185,000 recurrent

• $73.7 billion for 2010
  – Direct and Indirect

• $140,000 annually
  – IP
  – Rehab
  – F/U for persisting deficits
Burden of Stroke in America

- **Stroke Factors**
  - **Age**
    - ~90% >65
  - **Race/Ethnicity**
    - 2-3X risk of stroke
    - ↑ risk of death
    - ↑ risk at younger age
    - Greater activity limitations
  - **Residence**
    - Stroke belt

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MUSC Health
MEDICAL UNIVERSITY of SOUTH CAROLINA
Burden to Stroke in South Carolina

• Stroke in SC - 2007
  – 3<sup>rd</sup> leading cause of death; 2,460
  – 14,047 hospitalizations for stroke-related complications
  – Hospitalization costs = $442 million

• Blacks are more than 60% more likely to die than Whites
Stroke, Race/Ethnicity, and Rurality – South Carolina

• 34% of SC population are racial/ethnic minorities
• SC is predominately rural and poor state
  – 40-50% of population living in rural areas
  – 24% below poverty line

• Lack of human capital and resources
  – Health cannot be separated from education and economic issues

• Health insurance
  – Rural minorities less likely to be insured

• Access to care
  – Shortages of providers in rural communities
Stroke-Related Outcomes
Race/Ethnicity and Outcomes - Mortality

• On average stroke-related death occurs every 4 minutes or ~1 of every 18 deaths in the US (2006)
  – 2006 overall 43.6/100,000
    • 41.7 White males
    • 41.1 White females
    • 67.1 Black males
    • 57.0 Black females
    • 35.9 Hispanic/Latino males
    • 32.3 Hispanic/Latino females
Residence and Outcomes - Mortality

- Higher incidence of stroke and 20-50% more likely to die of stroke-related deaths in the stroke belt (Howard, et al. 1995, 1999, 2009; Casper et al., 1995; Lackland et al. 1999)

- Adult residence results in increase risk of mortality even among adults born in stroke belt but no longer living there (Glymour et al., 2009)
  - (1980) OR 1.55 Blacks, 1.45 Whites
  - (1990) OR 1.47 Blacks, 1.29 Whites
  - (2000) OR 1.34 Blacks, 1.34 Whites

- Individuals with short-term exposure to the stroke belt were at increased risk of stroke death (Shirra et al., 2008)
Race/Ethnicity and Outcomes - Severity

- **Horner 1991**
  - Blacks with lower Fugl-Meyer and Barthel Index on admission

- **Jones 2000**
  - Blacks with lower Canadian Neurological Scale on admission

**Figure 1.** Evolution of (top) physical and (bottom) functional impairment from ischemic stroke by patient’s race.
Race/Ethnicity and Outcomes - Rehabilitation

• Horner (2003)
  – Secondary data analysis of VA Acute Stroke (VAST) study
    • Patients followed 1 year after stroke onset
  – Low income Blacks who experienced delays in initiation of IP rehab had worse recovery trajectory in first year
  – Poverty and lack of supportive social resources in home environment attributed to differences
Race/Ethnicity and Outcomes - Rehabilitation

- Bhandari (2005)
  - Retrospective cohort study of 1591 patients seen in IP rehab facility
  - No significant differences in OT or PT session or LOS
  - Blacks with 1.9 point (7%) less improvement in FIM change score and lower mean FIM d/c score (88.3 vs 91.2) for those d/c home
Race/Ethnicity and Outcomes - Rehabilitation

- Chiou-Tan (2006)
  - Retrospective analysis of Uniform Data System for Medical Rehabilitation database
  - 68 Hispanic, 83 Black, 20 White patients

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Race/Ethnicity</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>F</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Admission total FIM™ rating</td>
<td>Entire sample</td>
<td>64.51</td>
<td>19.91</td>
<td>18-111</td>
<td>5.38</td>
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<td>21.15</td>
<td>18-111</td>
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<td>66.59</td>
<td>18.56</td>
<td>21-99</td>
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<tr>
<td>Discharge total FIM™ rating</td>
<td>Entire sample</td>
<td>88.15</td>
<td>20.25</td>
<td>21-119</td>
<td>1.17</td>
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<td>88.20</td>
<td>21.95</td>
<td>21-116</td>
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<tr>
<td>FIM™ gain</td>
<td>Entire sample</td>
<td>23.64</td>
<td>11.54</td>
<td>0-60</td>
<td>4.35</td>
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<td>26.73</td>
<td>11.60</td>
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<td>21.53</td>
<td>10.98</td>
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<tr>
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<td>21.70</td>
<td>11.76</td>
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<tr>
<td>FIM™ efficiency</td>
<td>Entire sample</td>
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<td>0.851</td>
<td>0-4.71</td>
<td>3.42</td>
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<td>1.70</td>
<td>0.940</td>
<td>0.13-4.71</td>
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<td>Black</td>
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<td>0.803</td>
<td>0-3.5</td>
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<td>White</td>
<td>1.20</td>
<td>0.568</td>
<td>0-2.29</td>
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<tr>
<td>Length of stay, days</td>
<td>Entire sample</td>
<td>17.48</td>
<td>7.068</td>
<td>1-36</td>
<td>0.26</td>
<td>0.772</td>
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<td>17.10</td>
<td>7.129</td>
<td>1-36</td>
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<td></td>
<td>Black</td>
<td>17.10</td>
<td>7.129</td>
<td>1-36</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>18.15</td>
<td>6.938</td>
<td>2-27</td>
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<td></td>
</tr>
</tbody>
</table>

* Post hoc pairwise comparisons: Hispanics had significantly \( P < 0.05 \) lower admission FIM™ scores and greater FIM™ gains than blacks.
Race/Ethnicity and Outcomes - Rehabilitation

- Ottenbacher (2008)
  - Retrospective analysis of Uniform Data System for Medical Rehabilitation database
  - 123,537 White, 25,334 Black, 7994 Hispanic, 4827 Other

Table 1. Patient Characteristics and Outcomes by Race/Ethnicity for the Full Sample

<table>
<thead>
<tr>
<th>Variables*</th>
<th>Non-Hispanic White</th>
<th>Black</th>
<th>Hispanic</th>
<th>Other</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>N (%)</td>
<td>123,537 (75)</td>
<td>25,334 (16)</td>
<td>7994 (5)</td>
<td>4827 (3)</td>
<td>161,922 (100)</td>
</tr>
<tr>
<td>Female</td>
<td>53%</td>
<td>56%†</td>
<td>58%†</td>
<td>59%†</td>
<td>53%</td>
</tr>
<tr>
<td>Married</td>
<td>53%</td>
<td>37%‡</td>
<td>52%‡</td>
<td>59%‡</td>
<td>59%</td>
</tr>
<tr>
<td>Medicare</td>
<td>75%</td>
<td>61%†</td>
<td>54%†</td>
<td>50%†</td>
<td>72%</td>
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<tr>
<td>Medicaid</td>
<td>3%</td>
<td>10%†</td>
<td>15%†</td>
<td>15%†</td>
<td>5%</td>
</tr>
<tr>
<td>Hemoragic stroke‡</td>
<td>13%</td>
<td>17%†</td>
<td>16%†</td>
<td>19%†</td>
<td>14%</td>
</tr>
<tr>
<td>Discharged to home</td>
<td>66%</td>
<td>74%</td>
<td>74%‡</td>
<td>76%‡</td>
<td>68%</td>
</tr>
</tbody>
</table>

Contingency variables

- Age, mean (SD)
- Admission FIM total
- Discharge FIM total
- Length of stay, days
- Efficiency
- Onset to admission
- No. of consultations

*Categorical variables reported as percentage; continuous variables reported as mean (SD). Bivariate differences in categorical variables examined with χ² tests; bivariate difference in continuous variables examined with one-way analysis of variance and Dunnett’s post hoc tests. Non-Hispanic white served as the reference group for all bivariate comparisons. P<0.01 on 2-tailed test (reference group is non-Hispanic white). Hemoragic stroke—International Classification of Diseases, 9th Revision of 430.0 to 432.9.
Race/Ethnicity and Outcomes - Rehabilitation

- Ottenbacher (2008)
  - Retrospective analysis of Uniform Data System for Medical Rehabilitation database
  - 123,537 White, 25,334 Black, 7994 Hispanic, 4827 Other
Stroke-Related Rehabilitation Utilization
Race/Ethnicity and Service Utilization

• Ellis & Egede (2009)
  – Review of studies conducted in the US between 1998 and 2008
  – Identified race/ethnicity of rehabilitation utilization
  – 11 studies; 363,540 patients
# Race/Ethnicity and Service Utilization

## Table 1. Racial/ethnic differences in poststroke rehabilitation length of stay.

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Ethnicity</th>
<th>Patients (n)</th>
<th>Length of stay (days)</th>
<th>p-value</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Black</td>
<td>419</td>
<td>20.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asian–American</td>
<td>96</td>
<td>20.47</td>
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<tr>
<td></td>
<td></td>
<td>Hispanic</td>
<td>33</td>
<td>22.94</td>
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<tr>
<td></td>
<td></td>
<td>Other</td>
<td>33</td>
<td>20.82</td>
<td></td>
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<tr>
<td>Stineman <em>et al.</em> (2001)</td>
<td>1994–1995 Uniform Data System for Medical Rehabilitation from patients seen in non-Veterans Administration facilities</td>
<td>White</td>
<td>42,074</td>
<td>2.0% longer</td>
<td>0.0009</td>
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<tr>
<td></td>
<td></td>
<td>Black</td>
<td>7195</td>
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<tr>
<td></td>
<td></td>
<td>Hispanic</td>
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<tr>
<td></td>
<td></td>
<td>Other</td>
<td>1655</td>
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<td></td>
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</tr>
<tr>
<td>Gregory <em>et al.</em> (2006)</td>
<td>Maryland Health Services and Cost Review Commission Database</td>
<td>White</td>
<td>9064</td>
<td>5.0</td>
<td>0.0001</td>
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<td></td>
<td></td>
<td>Black</td>
<td>3144</td>
<td>7.0</td>
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<tr>
<td></td>
<td></td>
<td>Black</td>
<td>68</td>
<td>17.75</td>
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<tr>
<td></td>
<td></td>
<td>Hispanic</td>
<td>83</td>
<td>17.10</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Black</td>
<td>25,334</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Hispanic</td>
<td>7994</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td>4827</td>
<td></td>
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</tr>
</tbody>
</table>
## Race/Ethnicity and Service Utilization

### Table 2. Racial/ethnic differences in the odds of receiving poststroke rehabilitation services.

<table>
<thead>
<tr>
<th>Study</th>
<th>Data Source</th>
<th>Sample and ethnicity</th>
<th>Odds of receiving therapy (odds ratio)</th>
<th>p-value</th>
<th>Ref.</th>
</tr>
</thead>
</table>
| Cook et al. (2005)        | Health and Retirement Study database subsample        | 1,363 patients with diagnosis of stroke  
                              | White: 53.2%  
                              | Black: 23.9%  
                              | Hispanic: 23.9%  
                              | Occupational/physical therapy | 0.65  
                              |                                        | 1.84  
                              |                                        | 1.53  | Not significant | [31] |
                              | Asian American: 28.0%  
                              | White: 71.1%  
                              | Other: 9.0%  
                              | Speech therapy/audiology  
                              | NA  | 1.28  | <0.0001 | [32] |
| Weech-Maldonado (2007)    | 2002 Nursing Home Minimum Data Set                    | 50,238 residents  
                              | Black  
                              | Hispanic  
                              | Asian  
                              | American Indian  
                              | Physical therapy  
                              | 0.75  | 0.67  | 0.70  | 0.93 | 0.001  
                              |                                        | 0.0001 | 0.01  | Not significant |
|                          |                                        | Occupational therapy  
                              | Black  
                              | Hispanic  
                              | Asian  
                              | American Indian  
                              | 0.88  | 0.71  | 0.81  | 0.61  | <0.01  
                              |                                        | <0.0001 | Not significant | Not significant |
|                          |                                        | Speech therapy  
                              | Black  
                              | Hispanic  
                              | Asian  
                              | American Indian  
                              | 0.83  | 0.64  | 0.75  | 0.78  | <0.001  
                              |                                        | <0.001  | <0.01  | Not significant |
                              | Black: 552  
                              | Hispanic/Other: 41  
                              | Rehab  
                              | 1.49  | 1.06  | <0.05 | [34] |
# Race/Ethnicity and Service Utilization

## Table 3. Racial/ethnic differences in utilization of poststroke rehabilitation in the Veterans Administration facilities.

<table>
<thead>
<tr>
<th>Study</th>
<th>Data source</th>
<th>Ethnicity</th>
<th>Patients (n)</th>
<th>Rehabilitation utilization</th>
<th>p-value</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stineman et al. (2001)</td>
<td>1994–1995 Uniform Data System for Medical Rehabilitation from patients seen in Veterans Administration facilities</td>
<td>White, Black, Hispanic, Other</td>
<td>2009, 700, 216, 41</td>
<td>6.2% longer length of stay</td>
<td>0.01</td>
<td>[34]</td>
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<tr>
<td>Goldstein et al. (2003)</td>
<td>1995–1997 Veterans Administration Acute Stroke Study (VAST)</td>
<td>White, Black, Hispanic</td>
<td>520, 226, 28</td>
<td>White and Other Physical therapy: 70.5 and 74.9 Occupational therapy: 16.0 and 19.6 Speech therapy: 9.6 and 12.6</td>
<td>Not significant</td>
<td>[38]</td>
</tr>
</tbody>
</table>
• Conclusions
  – Racial/ethnic differences may exist in post-stroke utilization however patterns of utilization were mixed
  – Longer LOS reported among Blacks, Odds of receiving rehabilitation were lower among racial/ethnic minorities
General Summary

• Race/ethnicity is a critical variable in study of stroke and stroke-related outcomes
• Initial stroke severity may be greater among racial/ethnic minorities
• Racial/ethnic differences may exist in rehabilitation outcomes
• Studies of post-stroke rehabilitation are generally mixed
Questions/Comments