Surveillance of Heart Diseases and Stroke Using Centers for Medicare and Medicaid (CMS) Data: A Researcher’s Perspective

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Associate Professor
Need for strong population-based data to achieve surveillance goals.
Current Gaps

• No comprehensive national surveillance system
  – Track patterns of disease, care, and outcomes over time

• Cohort Studies
  – Provide valuable information, but have limitations

• CVD and stroke have a large impact in the elderly population
Population growth

Total population

65+ years

75+ years

SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2006*, Figure 1.
Data from the U.S. Census Bureau.
Previous Strategies Using CMS Data

- Cross-sectional design
- Subset of national cohort
- Focus on short-term outcomes
- Limited patient-level information
- No individual follow-up over time
Prospective Surveillance

Stroke Index Event ➔ Outcomes
- Mortality
- Rehospitalization
  - Recurrent Event
  - Other Events
- Utilization of Outpatient Resources
- Cost
Risk-Adjustment

Cohort

Index Event: Comorbid or Complication?

Outcomes

Prior history

1 Year
Track Cohort over Time

Cohort

Continuous FFS

Outcomes
Linked Hospitalizations: “Episode of Care”

Stroke Index Event
Hospital A

Stroke Index Event
Hospital B

Transfer

Day 0

Day X

Outcomes
How to Access CMS Data: ResDAC

www.resdac.umn.edu/
CMS Data:
Innovations have simplified the process
Readmission Rates by Sex

122,063 hospital discharges for TIA (ICD-9 435)

<table>
<thead>
<tr>
<th>Condition</th>
<th>30-Day Rate</th>
<th>1-Year Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIA</td>
<td>1.1</td>
<td>5.3</td>
</tr>
<tr>
<td>Stroke*</td>
<td>1.3</td>
<td>5.9</td>
</tr>
<tr>
<td>CAD**</td>
<td>0.5</td>
<td>6.9</td>
</tr>
<tr>
<td>TIA*</td>
<td>4.9</td>
<td>4.5</td>
</tr>
<tr>
<td>CAD*</td>
<td>5.8</td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.0001
** p = 0.001

Stroke 2009;40:2116-2122
Risk-Adjusted Outcomes
(Women / Men)

Analyses are risk-adjusted for age (continuous), race (white vs. other), admission source (ED, skilled nursing facility, vs. other), Deyo comorbidity score (≥ 3 vs. < 3), number of hospitalizations in prior year (≥2 vs. <2), and medical history (yes vs. no; cancer, dementia, chronic obstructive pulmonary disease, ischemic stroke, diabetes, hypertension, acute myocardial infarction, congestive heart failure, and atrial fibrillation).

Stroke 2009;40:2116-2122
CAD and Mortality

All analyses are adjusted for age (continuous), race (white vs. other), admission source (ED, skilled nursing facility, vs. other), Deyo comorbidity score (≥ 3 vs. < 3), number of hospitalizations in prior year (≥2 vs. <2), and medical history (yes vs. no; cancer, dementia, chronic obstructive pulmonary disorder, ischemic stroke, diabetes, hypertension, acute myocardial infarction, congestive heart failure, and atrial fibrillation). P<0.01

Stroke 2009;40:2116-2122
1-Year Recurrent Stroke Rates
1994-1996

A. Risk Standardized Recurrent Stroke Rates

B. Counties with Standardized Rates Above the National Mean

Legend
Risk Standardized Rates (per 100 person years)
- <10.78
- 10.78 - 12.06
- 12.07 - 13.29
- 13.30 - 14.88
- >14.89
- No Data Available

Cerebrovascular Diseases, in press
1-Year Recurrent Stroke Rates 2000-2002

A. Risk Standardized Recurrent Stroke Rates

B. Counties with Standardized Rates Above the National Mean

- Recurrent stroke hospitalization rates decreased by 5%
- Marked geographic variation

Legend
- >20% Decline
- 10% - 20% Decline
- No Change
- 10% - 20% Increase
- >20% Increase
- No Data Available

*23 Counties Were Excluded Due to Percentage Errors greater than 20% for Risk-Standardized Rates at any of the time periods

Cerebrovascular Diseases, in press
An Administrative Claims Model Suitable for Profiling Hospital Performance Based on 30-Day Mortality Rates Among Patients With an Acute Myocardial Infarction

Harlan M. Krumholz, MD, SM; Yun Wang, PhD; Jennifer A. Mattera, MPH; Yongfei Wang, MS; Lein Fang Han, PhD; Melvin J. Ingber, PhD; Sheila Roman, MD, MPH; Sharon-Lise T. Normand, PhD

An Administrative Claims Measure Suitable for Profiling Hospital Performance on the Basis of 30-Day All-Cause Readmission Rates Among Patients With Heart Failure

Patricia S. Keenan, PhD, MHS; Sharon-Lise T. Normand, PhD; Zhenqiu Lin, PhD; Elizabeth E. Drye, MD, SM; Kanchana R. Bhat, MPH; Joseph S. Ross, MD, MHS; Jeremiah D. Schuur, MD, MHS; Brett D. Stauffer, MD; Susannah M. Bernheim, MD, MHS; Andrew J. Epstein, PhD, MPP; Yongfei Wang, MSc; Jeph Herrin, PhD; Jersey Chen, MD, MPH; Jessica J. Federer, MPH; Jennifer A. Mattera, MPH; Yun Wang, PhD; Harlan M. Krumholz, MD, SM

Public Reporting of 30-Day Mortality for Patients Hospitalized With Acute Myocardial Infarction and Heart Failure

Harlan M. Krumholz, MD, SM; Sharon-Lise T. Normand, PhD
Change in AMI All-Cause Risk-Standardized Mortality Rates (RSMR) From 1995 to 2006

AMI All-Cause Risk-Standardized Mortality Rates (RSMR) From 1995 to 2006

30-Day Stroke Risk Standardized Mortality Rate by HRR

1999

(National Average RSMR = 10.5 [SD 2.6] %)

Presented at ISC 2010
30-Day Stroke Risk Standardized Mortality Rate by HRR

2005
(National Average RSMR = 11.2 [SD 1.7] %)

Presented at ISC 2010
Organization of Stroke Care: Joint Commission Certified Primary Stroke Centers

Unadjusted Outcomes

<table>
<thead>
<tr>
<th>JCAHO Certified:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day Mortality</td>
<td>9.8</td>
<td>11.3</td>
</tr>
<tr>
<td>30-Day Readmission</td>
<td>13.8</td>
<td>14.6</td>
</tr>
</tbody>
</table>

* *p < .0001

Stroke 2009;40:3574-3579
Risk Adjusted Analyses: Stroke Outcomes

<table>
<thead>
<tr>
<th>Outcomes*</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day Mortality</td>
<td>0.94 (0.92-0.97)</td>
</tr>
<tr>
<td>30-Day Readmission</td>
<td>0.97 (0.95-0.99)</td>
</tr>
</tbody>
</table>

Referent Group=Non-JCAHO Certified Hospitals

*Adjusted for age, gender, race, Deyo score 3+, 2+ hospitalizations in prior year, prior stroke, diabetes, history of AMI, cancer, heart failure, COPD, dementia, hypertension, CABG and PTCA

Risk Adjusted Outcomes For Patients Treated at JCAHO Certified Stroke Centers vs Non-Accredited Hospitals

Stroke 2009;40:3574-3579
Advantages of Using CMS Data

• National perspective
  – Patient level and hospital level analyses

• “Aerial” view of disease in the elderly
  – Subgroups
  – Time trends
  – Utilization of resources

• Complements the perspective of cohort studies and registries
Limitations

• Accuracy of diagnostic codes
• Unmeasured factors in administrative data
  – Symptoms, test results, medical decisions
  – Disease severity
  – Medications
• Restriction to hospitalized events
  – Underestimate true burden in community
  – *but* .. reflects hospital resource utilization, can expand surveillance with outpatient files
Future.....

- Develop expertise in using administrative data for disease surveillance (seminars, workshops)
- Use additional CMS data files (Outpatient, SNF)
- Combine data resources
  - Social economic status
  - Behavioral / lifestyle factors
  - Access and availability of care
  - Medications
  - Cost data
  - Registries with additional clinical detail
Thank you