Introduction

Stroke in the young is reportedly increasing [1-6]

Proposed causes include

- Increasing CV risk factors
- Changes in definition of TIA and stroke
- Increased use of advanced imaging

Question: Do trends in...

(1) Neurologically focused ED visits
(2) Differential classification of stroke & TIA over time
(3) Changes in the use of advanced imaging
...contribute to the reported increase in stroke?

If stroke truly is rising, it should be a high priority for research and public health moving forward

Methods: Finding Trends

1. Evaluating Neuro RFVs
   - Proportion of Neuro RFVs out of all ED visits
   - Change in Neuro RFV incidence

2. Classifying stroke/TIAs
   - Proportion of stroke/TIAs out of Neuro RFVs
   - Proportion of strokes within stroke/TIAs

3. Evaluating imaging use
   - Change in MRI use within Neuro RFVs

Results 1: Neuro RFV incidence is rising faster in the young (p = 0.022)

Results 2 & 3: Trends of Stroke/TIAs & MRI use

Study Population

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Neuro RFV, n = 1.88M (1.24M-2.04M)</th>
<th>Stroke/TIA, n = 0.86M (0.78M-1.04M)</th>
<th>All Subjects, n = 2.70B (1.99B-2.28B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean yr (SD)</td>
<td>46 (23)</td>
<td>70 (15)</td>
<td>36 (24)</td>
</tr>
<tr>
<td>Female</td>
<td>59%</td>
<td>56%</td>
<td>54%</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>White 62%</td>
<td>73%</td>
<td>59%</td>
</tr>
<tr>
<td>Black 20%</td>
<td>13%</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>11%</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>Other</td>
<td>7%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Insurancex</td>
<td>Private</td>
<td>30%</td>
<td>21%</td>
</tr>
<tr>
<td>Medicare</td>
<td>26%</td>
<td>60%</td>
<td>12%</td>
</tr>
<tr>
<td>Medicaid</td>
<td>19%</td>
<td>7%</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>24%</td>
<td>11%</td>
<td>27%</td>
</tr>
<tr>
<td>MRI</td>
<td>2%</td>
<td>10%</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Age Distribution</td>
<td>18 - 44</td>
<td>40%</td>
<td>6%</td>
</tr>
<tr>
<td>45 - 64</td>
<td>25%</td>
<td>48%</td>
<td>15%</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Hypertension</td>
<td>32%</td>
<td>66%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td>CEDVD</td>
<td>7%</td>
<td>60%</td>
<td>3%</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>11%</td>
<td>37%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Conclusions

- With the assumptions for the young vs. old,
  - Neuro RFVs increasing faster
  - Similar specificity of stroke diagnosis
  - Lower prior probability of stroke diagnosis

We can hypothetically calculate false positives, which presents a potential explanation for reported trends

Summary

- Do trends in neuro-focused ED visits, classification of stroke and TIA, and changes in imaging use contribute to reported increasing stroke incidence?
- In this cross-sectional study (1995-2015), neuro-focused ED visit incidence rose faster in young vs. old
- Meaning: Increasing false positive diagnoses in the young may be a contributing factor to the observed increases in stroke incidence in the young and merits further scrutiny

References

1. [Chang et al. 2016. Neurology.]
5. [Yang et al. Stroke. 2016.]

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### Definitions

- Neuro RFV: ED visit with primary reason for visit being a neurologically-focused symptom/concern
- Stroke/TIA: ED visit given primary diagnosis of stroke or TIA (based on ICD-9 coding)

### Methods

- Retrospective, serial, cross-sectional study on a nationally representative sample of ED visits in the US using NHAMCS data from 1995-2015
- Examines time trends in age-stratified reasons for visit, stroke/TIA diagnoses, and MRI utilization
- Dataset & Patients:
  - NHAMCS: Survey data on utilization and provision of ambulatory services in hospital EDs
  - Complete a retrospective, serial, cross-sectional study
  - Stratafy by age: young (18 - 44 years) and older adults (65+ years)
  - Define primary study population (Neurologically focused RFV)
  - Define secondary study population (Stroke/TIA population)

### Results

- Young: OR 1.00, 95% CI: 0.93 – 1.08
- Old: OR 1.00, 95% CI: 0.98 – 1.03

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