Why Do Some Alleged Vascular Surgeons Perform 1 or 2 AAA Repairs Per Year?
What is the Result and How can the Problem be Fixed?

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Elective AAA Repair Outcome Based on Volume

- **Open AAA repair**: (oAAA)
  - Higher surgeon and hospital annual volume reduced mortality
  - Only high volume surgeons, centers had < 5% mortality standard of SVS
- **EVAR**:
  - Only higher hospital annual volume slightly reduced mortality
  - All centers, surgeons < 3% mortality
- **Recommendation**:
  - Open AAA repair should only be performed by high volume surgeons and hospitals

- Zettervall, Schermerhorn et al, J Vasc Surg 2017

What About Very Low Volume Surgeons?

- 0-1 Cases/year on average
- New York State Database 2000-2014
- Open AAA Repair (oAAA):
  - Performed by 614 unique surgeons
  - 52% were very low volume
- Carotid Endarterectomy (CEA):
  - Performed by 1071 unique surgeons
  - 48% were very low volume
- Half of all surgeons performing oAAA or CEA did 0-1 cases per year from 2000 to 2014 in NY

- Mao et al, JAMA Surg, 2017

Based on US Medicare data, 2001-2008

Very Low Volume Surgeons Decreased Over Time

But, Remained 20% in 2014

Very Low Volume Surgeons by Year

Number of Surgeons who were Very Low Volume

Percent of Surgeons who were Very Low Volume

Disclosures

- None relevant to this presentation
Outcomes of Very Low Volume Surgeons

Un-Adjusted In-Hospital Results + 30-Day Re-Admission

<table>
<thead>
<tr>
<th>Mean Annual Surgeon Volume</th>
<th>oAAA</th>
<th>CEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1 Others</td>
<td>0-1 Very Low</td>
<td>P&lt;</td>
</tr>
<tr>
<td>Death</td>
<td>3.5%</td>
<td>6.7%</td>
</tr>
<tr>
<td>MI</td>
<td>1.6%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Stroke</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LOS &gt; 75th %</td>
<td>30%</td>
<td>39%</td>
</tr>
<tr>
<td>Median Charge</td>
<td>$49K</td>
<td>$55K</td>
</tr>
<tr>
<td>30 Day Re-admission</td>
<td>13.6%</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

Odds-Ratio Compared with Non-Very Low Volume Surgeons

Multivariable Analysis Adjusted for Patient, Surgeon, Hospital Characteristics

<table>
<thead>
<tr>
<th>oAAA</th>
<th>CEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>2X</td>
</tr>
<tr>
<td>MI</td>
<td>1.8X</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.8X</td>
</tr>
<tr>
<td>LOS &gt; 75th %</td>
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<td>30 Day Re-admission</td>
<td>1.8X</td>
</tr>
</tbody>
</table>

*NR=Not reportable due to small n

Very Low Volume Surgeons in NY

- Decreasing with time, but still 20% in 2014
  - Most are cardiac or general, not vascular surgeons
- One-third located in NY City
  - Where travel distance to higher volume provider not issue
- Treat patients who are younger, healthier, more often non-white and on Medicaid
  - Socially disadvantaged, in low volume hospitals
- Had substantially worse outcomes, higher cost, longer LOS, and higher readmission rates
  - These results were also true when very low volume threshold was set at 3 cases per year

Why Do Some Surgeons Perform only 1-2 oAAA / CEA Per Year?

- Increased volume of EVAR and CAS is reducing volume of oAAA and CEA being performed overall
  - More competition for fewer cases
  - Non-vascular surgeons "dabbling" in vascular surgery
- Concern that sending these patients to a larger center will reduce other referrals and income
- Not tracking their results in a registry like VQI that allows them to know they have bad results
- Lack of rigorous surgeon level volume guidelines set by the SVS

How Can the Problem be Fixed?

- Add requirements for Medicare reimbursement
  - Surgeon could choose either:
    - Track outcomes in a QI registry and achieve standard
    - Meet a minimum annual volume for reimbursement
      - Perverse incentive to treat inappropriate patients to increase volume
- Educate patients → importance of reviewing outcomes or volume when choosing a surgeon
- Society of Vascular Surgery should take the lead