Primary Data Collection of Cognitive Impairment

James C. Iannuzzi, MD, MPH
Assistant Professor of Surgery
Co-Director, CSHORE
Division of Vascular & Endovascular Surgery
Department of Surgery
UCSF
San Francisco VA Healthcare System
June 7th, 2022
Disclosures

- **Funding**
  - NIA OAIC REC Scholars program
  - Michael Zinner Surgical Outcomes Research Fellowship
- **No Financial disclosures**
Primary Data Collection of Cognitive Function: In the context of my research

- Pros
- Cons
- Outcomes
- Challenges
- Lessons Learned
- Future Directions
How I Fit

- Vascular Surgeon
- Health Services Researcher
  - Co-Director, Collaborative for Surgical Health Outcomes & Research in Equity (C-SHORE)
- Age Friendly Health System
  - Vascular Surgery Outpatient Clinic Participant
- Geriatric Surgical Verification
  - Standards and Verification Committee Member
# Vascular Patients are Complex

## Overall Ranking

1. **Cardiac**
2. **Vascular**
3. **Thoracic**
4. **Neurologic**
5. **General**
6. **Urology**
7. **Orthopedic**
8. **ENT**
9. **Plastics**

## Table

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>Intraoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Ranking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cardiac</td>
<td>Vascular</td>
<td>General</td>
<td>Cardiac</td>
</tr>
<tr>
<td>2. Vascular</td>
<td>Cardiac</td>
<td>Cardiac</td>
<td>Vascular</td>
</tr>
<tr>
<td>3. Thoracic</td>
<td>Thoracic</td>
<td>Vascular</td>
<td>Neurologic</td>
</tr>
<tr>
<td>4. Neurologic</td>
<td>Urology</td>
<td>Thoracic</td>
<td>Neurologic</td>
</tr>
<tr>
<td>5. General</td>
<td>Neurologic</td>
<td>Neurologic</td>
<td>General</td>
</tr>
<tr>
<td>6. Urology</td>
<td>General</td>
<td>Thoracic</td>
<td>General</td>
</tr>
<tr>
<td>7. Orthopedic</td>
<td>Orthopedic</td>
<td>Urology</td>
<td>Orthopedic</td>
</tr>
<tr>
<td>8. ENT</td>
<td>ENT</td>
<td>Plastics</td>
<td>ENT</td>
</tr>
<tr>
<td>9. Plastics</td>
<td>Plastics</td>
<td>Plastics</td>
<td>Plastics</td>
</tr>
</tbody>
</table>

ASA class ≥ 4
Major Comorbidities
Emergent Operation
Concurrent Procedure
Additional Procedure
Length of Hospital Stay
Non-Home Discharge
Readmission
Major Complication
Mortality

Ramirez et al. Surgery 2020
NSQIP 2017
PAD is a Risk Factor for Vascular Dementia

Common Risk Factors of Vascular Dementia:
- Diabetes mellitus
- High blood pressure
- High cholesterol
- Coronary heart disease
- Peripheral artery disease
Research Objective

- Estimate prevalence of **Cognitive Impairment (CI)**
- Identify **CI** risk factors in patients with PAD
- Is **CI** associated with **worsening clinical status**?
Need Primary Data Collection!

- No CI data in surgical registries
  - NSQIP, VQI
- Large administrative datasets
  - ADRD – often not coded
  - Mild cognitive impairment often unrecognized
- Few prior studies
Choosing a Test

- Sensitivity
- Domains
- Time Required
- Acceptability
  - Subjects
  - Staff
  - Reviewers
- Generalizability

<table>
<thead>
<tr>
<th>Cognitive Tests</th>
<th>Age Friendly Health System</th>
<th>Geriatric Surgical Verification System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-COG</td>
<td>Mini-COG</td>
<td>Mini-COG</td>
</tr>
<tr>
<td>MoCA</td>
<td>MoCA</td>
<td></td>
</tr>
<tr>
<td>SLUMS</td>
<td>SLUMS</td>
<td></td>
</tr>
<tr>
<td>MMSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIH Toolbox – Cognition Battery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAGE at Home</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CI in Veterans with PAD
Study Design

Single Level 1a VA Outpatient Clinic

Inclusion Criteria

- PAD surveillance
- 7/2020 - 1/19/2022
Mini COG in PAD

- N = 32
- 3 (9%) screened positive
- 23 (72%) < 5 points
- Duration 1:46 minutes

- Efficient
- Acceptable
- missing mild cognitive impairment
Montreal Cognitive Assessment

Validated Cognitive Impairment Screen

• Domains
  ▪ Visuospatial/Executive, Abstraction
  ▪ Naming, Repetition, Fluency
  ▪ Memory
  ▪ Attention

• Mild Cognitive Impairment
  ▪ MOCA Score 18-25

• Certified Tester

• Telephone Version
MoCA
9/1/2020-8/31/2021

- 135 met eligibility criteria
  - 82 screened
  - 37 Incomplete/left prior to screen
  - 16 refused
Majority with “New” Cognitive Impairment

- **CI**: 39%
- **No CI**: 61%
  
- **n=125**

- **New Diagnosis**: 8%
- **History**: 92%
  
- **n=77**

**Duration**: 12:09 (7:28-20:35) minutes
What to do with Positive Results

- MoCA is a screening test **only**
- Counselling by Clinician
- Notification to Primary Care Physician
- Referral to Geriatrician
- Further Neuropsychiatric testing may be indicated
<table>
<thead>
<tr>
<th>Covariate</th>
<th>Total n=125</th>
<th>CI n=77</th>
<th>No CI n=48</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>73.4 ± 6.7</td>
<td>74.4 ± 6.3</td>
<td>71.8 ± 7.1</td>
<td>0.03</td>
</tr>
<tr>
<td>Hypertension</td>
<td>109 (87)</td>
<td>72 (66)</td>
<td>37 (34)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>50 (40)</td>
<td>28 (56)</td>
<td>49 (44)</td>
<td>0.29</td>
</tr>
<tr>
<td>Prior PCI/CABG</td>
<td>33 (26)</td>
<td>21 (64)</td>
<td>12 (36)</td>
<td>0.78</td>
</tr>
<tr>
<td>Insulin-Dependent Diabetes Mellitus</td>
<td>25 (20)</td>
<td>19 (76)</td>
<td>6 (24)</td>
<td>0.10</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>34 (27)</td>
<td>25 (74)</td>
<td>9 (26)</td>
<td>0.10</td>
</tr>
<tr>
<td>Prior Stroke/TIA</td>
<td>19 (15)</td>
<td>15 (79)</td>
<td>4 (21)</td>
<td>0.10</td>
</tr>
<tr>
<td>Post-Traumatic Stress Disorder</td>
<td>25 (20)</td>
<td>20 (80)</td>
<td>5 (20)</td>
<td>0.03</td>
</tr>
<tr>
<td>Depression</td>
<td>36 (29)</td>
<td>25 (69)</td>
<td>11 (31)</td>
<td>0.25</td>
</tr>
</tbody>
</table>
## Baseline Characteristics

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Total n=125</th>
<th>CI n=77</th>
<th>No CI n=48</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>73.4 ± 6.7</td>
<td>74.4 ± 6.3</td>
<td>71.8 ± 7.1</td>
<td>0.03</td>
</tr>
<tr>
<td>Hypertension</td>
<td>109 (87)</td>
<td>72 (66)</td>
<td>37 (34)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>50 (40)</td>
<td>28 (56)</td>
<td>49 (44)</td>
<td>0.29</td>
</tr>
<tr>
<td>Prior PCI/CABG</td>
<td>33 (26)</td>
<td>21 (64)</td>
<td>12 (36)</td>
<td>0.78</td>
</tr>
<tr>
<td>Insulin-Dependent Diabetes Mellitus</td>
<td>25 (20)</td>
<td>19 (76)</td>
<td>6 (24)</td>
<td>0.10</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>34 (27)</td>
<td>25 (74)</td>
<td>9 (26)</td>
<td>0.10</td>
</tr>
<tr>
<td>Prior Stroke/TIA</td>
<td>19 (15)</td>
<td>15 (79)</td>
<td>4 (21)</td>
<td>0.10</td>
</tr>
<tr>
<td>Post-Traumatic Stress Disorder</td>
<td>25 (20)</td>
<td>20 (80)</td>
<td>5 (20)</td>
<td>0.03</td>
</tr>
<tr>
<td>Depression</td>
<td>36 (29)</td>
<td>25 (69)</td>
<td>11 (31)</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Race & Ethnicity by Cognitive Impairment *

- **White**: 54%, n=79
- **Black**: 94%, n=17
- **Asian**: 75%, n=4
- **Hispanic**: 67%, n=3

*p-value <0.01*
MOCA Domains by CI Status

- Memory (0-5)
  - CI: 2.0
  - No CI: 3.7
  - Δ 34%

- Visuospatial/Executive Function, Abstraction (0-7)
  - CI: 4.8
  - No CI: 6.3
  - Δ 21%

- Attention (0-6)
  - CI: 4.6
  - No CI: 5.8
  - Δ 20%

- Naming, Repitition, Fluency (0-6)
  - CI: 4.4
  - No CI: 5.2
  - Δ 13%

- Orientation (0-6)
  - CI: 5.4
  - No CI: 5.8
  - Δ 7%

* p-value <0.01 for each domain
Multivariable Logistic Regression: Unrecognized CI

IDDM: Insulin-Dependent Diabetes Mellitus
PTSD: Post-Traumatic Stress Disorder
TIA: Transient Ischemic Attack

Adjusted for: Education, Statin, and Chronic Kidney Disease
### CI Associated with Worsening Clinical Status

Revascularization within 3 months, new or non-healing wound

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Total n=125</th>
<th>CI n=77</th>
<th>No CI n=48</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>15 (12)</td>
<td>10 (12)</td>
<td>5 (10)</td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
<td>6 (5)</td>
<td>1 (1)</td>
<td>5 (10)</td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>39 (31)</td>
<td>19 (25)</td>
<td>20 (42)</td>
<td></td>
</tr>
<tr>
<td><strong>Worsening</strong></td>
<td><strong>65 (52)</strong></td>
<td><strong>47 (62)</strong></td>
<td><strong>18 (38)</strong></td>
<td><strong>0.01</strong></td>
</tr>
</tbody>
</table>
### Multivariable Logistic Regression: Worsening Clinical Status

<table>
<thead>
<tr>
<th>Covariate</th>
<th>AOR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Impairment</td>
<td>3.7</td>
<td>1.5-9.5</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

*Adjusted for Prior Major Amputation, Education, Statin, PTSD, Prior Stroke/TIA, IDDM, Hypertension, and Chronic Kidney Disease*
Pros

Why use Primary Data Collection?

- **Opportunity**
  - Poorly coded in major datasets
  - Paucity of Data

- Often unrecognized clinically

- Potential major impact on clinical outcomes

- Better understanding CRITICAL
Outcomes

- Cognitive function over time
- Maintaining independence
  - ADLs/IADLs
  - Living at home
- Specific clinical outcomes
  - Worsening clinical severity
  - In-Hospital Delirium
  - Medication compliance

- Surgical Outcomes
  - Major Cardiac Events
  - Urinary Tract Infections,
  - Inpatient Falls,
  - Readmission,
  - Nursing home discharge
  - LOS
Cons of Primary Data Collection

- Many different instruments
- Little consensus on which to use
- Often time intensive
- Shifting definitions of subtypes
- Generalizability/population dependent
- Lack of evidence on how to incorporate into decision making
- Perceived potential harm of routine screening
Challenges

- Getting Started
  - IRB bottleneck
  - In-person screening
- Time required to perform evaluation
  - Workflow
  - Balancing sensitivity and specificity
- Addressing positive screens
- Incorporating into care
- Caregiver Inclusion
- Repeated measures – practice effects
Lessons Learned

- Addresses a Major Gap
- Addressing workflow
  - Routine
  - Separate Room
  - Trained screener
- Continual Reassessment of Process
Future Directions

- Tablet based assessments
  - TabCAT
  - NIH examiner
- Short and long-term outcomes after Vascular Surgery
- PrehabPal
  - Self Assessment
  - Linked to directed approaches
The Team, The Team, The Team!
Fundamentally Multidisciplinary

- Louise Walter, MD
- Ken Covinsky, MD
- Emily Finlayson, MD
- Michael Conte, MD
- Katherine Possin, PhD
- Rebecca Sudore, MD
- Deborah Barnes, PhD
- Eric Smith, MS
- Ricky Gutierrez
- Anne Fabiny, MD

- Team Mentorship
- Research Team
- Clinical Collaboration
- Clinical and Research Team Coordination