Florida-Georgia Vascular Study Group: Fall 2014

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Division of Vascular Surgery
University of Florida
College of Medicine
Vascular Quality Initiative

- SVS VQI collects:
  - Pre-operative risk factors
  - Intra-procedural variables
  - Post-procedural outcomes
  - **One-year follow-up data**

- SVS PSO
  - Oversight of data sharing arrangements
  - Oversight of dissemination of information to participating providers
  - Protects data from discovery in federal and state courts
  - Eliminates need for IRB approval and patient consent

- M2S:
  - Secure, web-based data collection and analysis system
VQI Regional Groups

- Anonymous pooling of information.
- Increasing power and ability to detect root causes of outcomes.
- Facilitating & initiating quality improvement projects
SVS VQI

Reliable Data Collection

Risk adjusted comparative reports

Quality Improvement Projects

Outcome Assessment
FGVSG

Formed 2010
(FL Vasc Study Group)

2012 Became Florida-Georgia VSG
Regional Meetings

- Spring 2012/Fall 2012: University of Florida
  5/9 Centers

- Spring 2013: Emory University
  13 Centers

- Fall 2013: Hosted by Florida Hospital
  19 Centers

- Spring 2014: Emory University
  20 Centers

- Fall 2014: University of Florida
  23 Centers
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotid Endarterectomy</td>
<td>2378</td>
</tr>
<tr>
<td>Infra-inguinal Bypass</td>
<td>1043</td>
</tr>
<tr>
<td>Endo AAA Repair</td>
<td>896</td>
</tr>
<tr>
<td>Open AAA Repair</td>
<td>307</td>
</tr>
<tr>
<td>Carotid Artery Stent</td>
<td>371</td>
</tr>
<tr>
<td>Peripheral Vascular Intervention</td>
<td>1348</td>
</tr>
<tr>
<td>Supra-inguinal Bypass</td>
<td>448</td>
</tr>
<tr>
<td>Thoracic and Complex EVAR [old]</td>
<td>403</td>
</tr>
<tr>
<td>Hemodialysis Access</td>
<td>2500</td>
</tr>
<tr>
<td>Lower Extremity Amputation</td>
<td>50</td>
</tr>
<tr>
<td>IVC Filter</td>
<td>130</td>
</tr>
<tr>
<td>Thoracic and Complex EVAR</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9894</strong></td>
</tr>
</tbody>
</table>
National VQI Update
Vascular Quality Initiative®

Growth of Participating Centers

291 Centers, 45 States + Ontario
Vascular Quality Initiative

16 Regional Quality Groups

- Rocky Mountain Vascular Quality Initiative
- Mid-America Vascular Study Group
- Northern California Vascular Study Group
- Southern California Vascular Outcomes Improvement Collaborative
- Mid-West Vascular Network
- Michigan Vascular Study Group
- Upper Mid-West Vascular Network
- Great Lakes Vascular Study Group
- Vascular Study Group of New England
- Vascular Study Group of Greater New York
- Mid-Atlantic Vascular Study Group
- Chesapeake Regional Vascular Study Group
- Virginias Vascular Study Group
- Carolinas Vascular Quality Group
- FI / GA / MS Vascular Study Group
## Vascular Quality Initiative®

<table>
<thead>
<tr>
<th>Total Procedures Captured (as of 9/1/2014)</th>
<th>169,667</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carotid Endarterectomy</td>
<td>41,755</td>
</tr>
<tr>
<td>Carotid Artery Stent</td>
<td>6,079</td>
</tr>
<tr>
<td>Endovascular AAA Repair</td>
<td>16,424</td>
</tr>
<tr>
<td>Open AAA Repair</td>
<td>5,849</td>
</tr>
<tr>
<td>Peripheral Vascular Intervention</td>
<td>53,245</td>
</tr>
<tr>
<td>Infra-Inguinal Bypass</td>
<td>20,313</td>
</tr>
<tr>
<td>Supra-Inguinal Bypass</td>
<td>6,621</td>
</tr>
<tr>
<td>Thoracic and Complex EVAR</td>
<td>2,775</td>
</tr>
<tr>
<td>Hemodialysis Access</td>
<td>13,719</td>
</tr>
<tr>
<td>Lower Extremity Amputations</td>
<td>1,570</td>
</tr>
<tr>
<td>IVC Filter</td>
<td>1,317</td>
</tr>
</tbody>
</table>

### VQI Monthly Procedure Volume

![Graph showing VQI monthly procedure volume from Sep 2012 to Jul 2014.](chart.png)
## Regional Growth:

- **23 Centers**

<table>
<thead>
<tr>
<th>Registry</th>
<th>Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany Vascular Specialist Center</td>
<td>Albany Vascular Specialist Center</td>
</tr>
<tr>
<td>Baptist Hospital of Miami</td>
<td>Baptist Hospital of Miami</td>
</tr>
<tr>
<td>BayCare Health System</td>
<td>St. Anthony's Hospital</td>
</tr>
<tr>
<td>Coastal Vascular &amp; Interventional, PLLC</td>
<td>Coastal Vascular &amp; Interventional, PLLC</td>
</tr>
<tr>
<td>Florida Hospital</td>
<td>Florida Hospital</td>
</tr>
<tr>
<td>Floyd Medical Center</td>
<td>Floyd Medical Center</td>
</tr>
<tr>
<td>John F Lucas III</td>
<td>John F Lucas III, MD</td>
</tr>
<tr>
<td>Memorial Health University Medical Center</td>
<td>Memorial Health University Medical Center</td>
</tr>
<tr>
<td>Memorial Healthcare System</td>
<td>Memorial Regional Hospital</td>
</tr>
<tr>
<td>Munroe Regional Medical Center</td>
<td>Munroe Regional Medical Center</td>
</tr>
<tr>
<td>Northside</td>
<td>Northside Hospital Atlanta</td>
</tr>
<tr>
<td>Northside</td>
<td>Northside Hospital Cherokee</td>
</tr>
<tr>
<td>Northside</td>
<td>Northside Hospital Forsyth</td>
</tr>
<tr>
<td>Orlando Health</td>
<td>Orlando Health - Dr. P. Phillips Hospital</td>
</tr>
<tr>
<td>Orlando Health</td>
<td>Orlando Health - Orlando Regional Medical Center</td>
</tr>
<tr>
<td>Orlando Health</td>
<td>Orlando Health - South Seminole Hospital</td>
</tr>
<tr>
<td>Piedmont Hospital</td>
<td>Piedmont Hospital</td>
</tr>
<tr>
<td>Redmond Regional Medical Center</td>
<td>Redmond Regional Medical Center</td>
</tr>
<tr>
<td>Sarasota Memorial Health Care System</td>
<td>Sarasota Memorial Hospital</td>
</tr>
<tr>
<td>Tampa General Hospital</td>
<td>Tampa General Hospital</td>
</tr>
<tr>
<td>The Emory Clinic</td>
<td>The Emory Clinic</td>
</tr>
<tr>
<td>The Vein and Vascular Institute of Tampa Bay</td>
<td>The Vein and Vascular Institute of Tampa Bay</td>
</tr>
<tr>
<td>University of Florida, Gainesville</td>
<td>University of Florida, Gainesville</td>
</tr>
</tbody>
</table>
Registry improvements
Ongoing Registry Improvements

TEVAR/Complex EVAR
- Complete
- Actively being used for FDA sanctioned Post-Approval Surveillance Study

EVAR
- In Progress

CEA/CAS
- In progress
- To be used for CREST II along with NCDR (National Cardiovascular Data Registry)

Venous Modules
- Saphenous (End of 2014)
- IVC Filter
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Readmissions?
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30 day Follow Up Infra-inguinal Bypass

• Offered to all VQI members August 2014
• Data Collected:
  – 30 day Post Op SSI
  – 30 day Readmission data (used to assess feasibility of broader readmission collection in future)
  – Report available to identify procedures requiring 30 day follow up
  – 1 year follow up still required
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Other upcoming VQI Projects:

• Prospective, Non-Randomized, Multi-Center Evaluation of the long-term safety and effectiveness of the Lombard Medical Aorfix™ AAA Flexible Stent Graft System

• Society of Vascular Medicine joined VQI: PAD module 2015

• PVI Module enhancements: Increasing Devices in PVI module
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TEVAR Aortic Dissection Device Surveillance Project

• Gore and Medtronic (likely Cook in future)
• Acute or Chronic Descending Aortic Dissections
• Non-identifiable data shared with FDA and Industry
• 5 year and 1 year projects
• Steering Committee: Richard Cambria, Chair
  – Ali Azizzadeh, Adam Beck, Jack Cronenwett, Mark Fillinger, John Kern, Joe Lombardi, Grace Wang, Rod White
Reimbursements

- Reimbursement for additional reporting requirements:
  - $1300 Initial Treatment
  - $400 Each annual follow up – 30 day, 1 – 4 year
  - $700 Final 5 year follow up
  - $700 Additional intervention (if applicable)

- Reimbursement will be released only when all associated data inquiries have been resolved.

- All payments are disbursed quarterly by the SVS PSO to the designated entity in the contract addendum
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TEVAR Aortic Dissection Device Surveillance Project
Interested? Contact:

- Carrie Bosela, Administrative Director SVS PSO
- Nadine McLeod, Clinical Trials Project Manager, M2S

Send all TEVAR Aortic Dissection project related communication to TEVARProject@m2s.com or call Nadine at (857) 999 2066

Send all Non-project related communications/questions to PathwaysSupport@m2s.com or call 603.298.5509 x392
# M2S Pathways Recent Updates

## Q1 Accomplishments

<table>
<thead>
<tr>
<th>Project</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATHWAYS: Released Acute Ischemic Stroke procedure and follow-up forms</td>
<td>3/24/2014</td>
</tr>
<tr>
<td>PATHWAYS: Launched redesigned PATHWAYS home page with configurable notification</td>
<td>3/24/2014</td>
</tr>
<tr>
<td>PATHWAYS: Released features to support multiple societies and PSOs</td>
<td>3/24/2014</td>
</tr>
<tr>
<td>PATHWAYS: Released PQRS 2013</td>
<td>1/21/2014</td>
</tr>
<tr>
<td>PATHWAYS: Released Full Patient List report</td>
<td>3/24/2014</td>
</tr>
<tr>
<td>Analytics: Released Advanced Filtering feature</td>
<td>3/31/2014</td>
</tr>
<tr>
<td>Analytics: Released new filter operators ‘in between’ and ‘is one of’</td>
<td>3/31/2014</td>
</tr>
<tr>
<td>Standardized Data Import: Released support of 2014 ICD-9 and CPT codes</td>
<td>2/12/2014</td>
</tr>
</tbody>
</table>

## Q2 Accomplishments

<table>
<thead>
<tr>
<th>Project</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized Data Import: Released utilities for user account management</td>
<td>6/30/2014</td>
</tr>
<tr>
<td>Analytics: Released enhancements to the Advanced Filter Feature (Phase II)</td>
<td>5/7/2014</td>
</tr>
<tr>
<td>Analytics: Released Analytics permissions for individual reports</td>
<td>5/7/2014</td>
</tr>
<tr>
<td>PATHWAYS: Standardized pre-op, discharge, and follow-up medications across all 11 arterial registries</td>
<td>5/7/2014</td>
</tr>
<tr>
<td>PATHWAYS: Released Amputation Follow-up Form</td>
<td>5/7/2014</td>
</tr>
</tbody>
</table>

## Q3 Accomplishments

<table>
<thead>
<tr>
<th>Project</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATHWAYS: Released new TEVAR form to support Type B Dissection Post Approval Surveillance</td>
<td>8/11/2014</td>
</tr>
<tr>
<td>Analytics: Release User-defined Calculated Variables (Phase I)</td>
<td>Coming soon in Sep.</td>
</tr>
</tbody>
</table>
Arterial Quality Committee Update
Vascular Quality Initiative®

AQC Activities:

– Beta blocker analysis: not recommended prophylactically
– Heart rate analysis: not predictive of post-op cardiac events
– Quality recommendation for antiplatelet and statin medications prescribed at discharge to prolong survival
– Revised TEVAR and EVAR data forms
– RAC approved 22 national clinical research projects
– PQRS/QCDR
Center Opportunity Profile for Improvement (COPI) Reports
Center Opportunity Profile for Improvement (COPI) Reports:

- CEA length of Stay
- Surgical Site Infection after Lower Extremity Bypass
- EVAR length of Stay:
  - For elective endovascular aneurysm repair (EVAR), 21% of patients are staying longer than 2 days
  - SVS PSO recently released a COPI report to improve EVAR LOS based on risk adjusted model
Patient population

- Procedures done from 2011 to May 28, 2014
- Elective EVAR
- Excluding patients with
  - prior aortic surgery
  - those admitted from a nursing home
  - procedures performed during the weekend
  - death prior to 3 days
Percent of Patients with Length of Stay > 2 days
after Elective Endovascular Aneurysm Repair from 2011 to May 2014
(adjusted for risk factors listed in COPI report)
Observed and Expected

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LOS greater than 2 days after EVAR varies across VQI centers from 0% to 100%.
Regional Variation
Percent of Patients LOS > 2 days

* p-value < 0.01

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Elective EVAR

- Factors associated with LOS > 2 days post procedure
  - Patient characteristics
  - Procedure details
  - Post-op complications
  - Day of week

Possible target for better pre-op and/or discharge planning

Modifiable factors – possible areas to change to improve an outcome

LOS
## Vascular Quality Initiative®

<table>
<thead>
<tr>
<th></th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of procedures from 2011 to 5/28/2014</td>
<td>82</td>
<td>1319</td>
<td>11670</td>
</tr>
<tr>
<td>Number of procedures excluded*</td>
<td>31</td>
<td>453</td>
<td>3386</td>
</tr>
<tr>
<td><em><em>Number of elective procedures (exclusions</em>)</em>*</td>
<td>51</td>
<td>866</td>
<td>8284</td>
</tr>
</tbody>
</table>

### Length of stay (days)

<table>
<thead>
<tr>
<th></th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>2.2</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.8</td>
<td>3.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Median</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### % LOS > 2 days

<table>
<thead>
<tr>
<th></th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observed</strong> (procedures entered into model)</td>
<td>25%</td>
<td>17%</td>
<td>21%</td>
</tr>
<tr>
<td><strong>Expected</strong></td>
<td>14%</td>
<td>18%</td>
<td>21%</td>
</tr>
</tbody>
</table>

*Observed statistically significant from Expected*  

\[ p < 0.05 \]  

*Observed rate was higher than expected*
Your Center Opportunity Profile for Improvement (COPI)

Legend:
- Lowest 25th percentile
- Highest 75th percentile

Reference is for risk factors having more than 2 categories and is the comparison category for the risk factor.

Excludes patients with procedures not on same day of admission or on weekend, patients admitted from a nursing home, death within 2 days after procedure, patients with prior aortic surgery, and nonelective procedures.

**EVAR: Risk factors for LOS > 2 days**

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Odds Ratio</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1.7</td>
<td>19%</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Person of color</td>
<td>1.9</td>
<td>12%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 70 years</td>
<td>Reference</td>
<td>53%</td>
<td>43%</td>
<td>42%</td>
</tr>
<tr>
<td>70 to 79 years</td>
<td>1.2</td>
<td>53%</td>
<td>43%</td>
<td>42%</td>
</tr>
<tr>
<td>80 years or above</td>
<td>1.8</td>
<td>20%</td>
<td>23%</td>
<td>23%</td>
</tr>
<tr>
<td>COPD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-COPD</td>
<td>Reference</td>
<td>53%</td>
<td>43%</td>
<td>42%</td>
</tr>
<tr>
<td>On Medication</td>
<td>1.3</td>
<td>17%</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>On Home Oxygen</td>
<td>1.4</td>
<td>5%</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

**Procedure details**

<table>
<thead>
<tr>
<th>Estimated Blood Loss</th>
<th>Odds Ratio</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 150 ml</td>
<td>Reference</td>
<td>17%</td>
<td>19%</td>
<td>25%</td>
</tr>
<tr>
<td>151 - 300 ml</td>
<td>1.3</td>
<td>17%</td>
<td>19%</td>
<td>25%</td>
</tr>
<tr>
<td>&gt; 300 ml</td>
<td>2.1</td>
<td>13%</td>
<td>10%</td>
<td>14%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure Time</th>
<th>Odds Ratio</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 120 minutes</td>
<td>Reference</td>
<td>23%</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>121 - 180 minutes</td>
<td>1.4</td>
<td>23%</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>&gt; 180 minutes</td>
<td>2.5</td>
<td>19%</td>
<td>11%</td>
<td>19%</td>
</tr>
<tr>
<td>Complex procedure*</td>
<td>1.6</td>
<td>25%</td>
<td>26%</td>
<td>29%</td>
</tr>
</tbody>
</table>
### Vascular Quality Initiative®

<table>
<thead>
<tr>
<th>Post-op complications</th>
<th>Odds Ratio</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vasopressors Required Posp-op</td>
<td>3.4</td>
<td>0.0%</td>
<td>3.8%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>14.2</td>
<td>0.0%</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Dysrhythmia</td>
<td>6.8</td>
<td>2.0%</td>
<td>2.1%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Post-op CHF</td>
<td>5.7</td>
<td>2.0%</td>
<td>0.7%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>1.9</td>
<td>0.0%</td>
<td>0.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Change of Renal Function</td>
<td>12.1</td>
<td>2.0%</td>
<td>1.7%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Leg Ischemia/Emboli</td>
<td>1.9</td>
<td>2.0%</td>
<td>1.1%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Wound Complication</td>
<td>6.7</td>
<td>2.0%</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Return to OR</td>
<td>4.5</td>
<td>0.0%</td>
<td>1.9%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day of week</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>1.2</td>
<td>43%</td>
<td>19%</td>
<td>21%</td>
</tr>
<tr>
<td>Tuesday/Wednesday/Thursday</td>
<td>Reference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday</td>
<td>1.4</td>
<td>2%</td>
<td>16%</td>
<td>16%</td>
</tr>
</tbody>
</table>

* Complex procedure if hypogastric coil, unplanned graft extension, femoral endarterectomy, fem-fem bypass, ilio-femoral bypass, thromboembolectomy, iliac angioplasty, iliac stent, renal PTA/stent, other arterial reconstruction or open conversion.
Vascular Quality Initiative®

The Vascular Quality Initiative® (VQI) is a national, multi-center quality improvement program sponsored by the Society for Vascular Surgery® (SVS) and the Society for Vascular Surgery and Endovascular Therapy (SVS/STVR) and funded by Merck, Inc. in collaboration with the SVS Foundation.

The VQI is a collaborative effort to improve the quality of care delivered to patients undergoing vascular procedures. The VQI provides a platform for participating centers to share data, compare outcomes, and implement evidence-based practices to improve patient care.

The VQI focuses on several key areas, including:
1. **Quality of Care**: Enhancing the quality of care provided to patients undergoing vascular procedures.
2. **Performance Improvement**: Identifying and implementing practices that improve patient outcomes.
3. **Patient Safety**: Ensuring patient safety throughout the care process.
4. **Continuous Improvement**: Encouraging a culture of continuous improvement and learning.

The VQI utilizes a robust data collection system to capture outcomes and process measures. This data is used to identify areas for improvement and to measure the impact of changes implemented by participating centers.

Through the VQI, participating centers can:
- Share data with each other and with the broader vascular surgery community.
- Compare their outcomes to those of other centers.
- Identify best practices and implement them to improve patient outcomes.
- Monitor trends and outcomes over time.

The VQI is an important tool for advancing the field of vascular surgery and improving the care delivered to patients with vascular diseases.
• EVAR LOS COPI report was sent July 2014
  • Instructions to download report
  • VQI application
    – https://pathways.m2s.com

• Once you receive the report and you have questions about it contact Carrie Bosela
  – C.Bosela@svspso.org
Research Advisory Committee Update
National Projects Approved:

- Complete List of projects available on VQI website
- FGVSG:
  - BB project
  - HR Project
  - EVAR Explant Project
  - TEVAR morbidity/mortality prediction project
  - PQRS Project
Research Proposals

• Instructions located on the website:
  www.vascularqualityinitiative.org

• Regional Data Request
  • All requests (Regional and National) should be directed to the Regional RAC before national submission
  • Adam Beck, Sal Scali, Yazan Dawayri (if you’re interested, please let me know)

• National Data Request
Measuring late outcomes in VQI by linking Medicare claims data

- In cooperation with the Dartmouth Institute for Health Policy and Clinical Practice

- SVS PSO has linked Medicare claims data with VQI clinical data for individual patients and procedures

- Allow the PSO and regional quality groups to measure the outcome of vascular procedures beyond the one year follow-up time point
Measuring late outcomes in VQI by linking Medicare claims data

- Work performed by Philip Goodney, MD, for the SVS PSO
- Funded by the Society for Vascular Surgery, the National Institutes of Health, and the Agency for Health Care Research and Quality
- Medicare data are generally available for claims submitted 2 years ago
- Procedures performed 7 years ago in VQI, the PSO can now evaluate 5 year follow-up for events that are captured by claims data
Venous Quality Committee – Jose Almeida, MD, Chair
- IVC filter module: 1163 procedures
- Varicose vein module in development
  - Focus on vein centers, integrate with vein-specific EMR vendors
  - Include Quality of Life variables
  - Projected release: end 2014
  - Academic version to follow
The IAC was selected by multiple specialty societies to evaluate and offer accreditation of vein centers.

Criteria for superficial venous evaluation and management have now been established (www.intersocietal.org/vein).

Lowell Kabnick, M.D., President of the IAC Vein Center Board of Directors emphasized the importance of quality assessment by vein centers. “Certification of quality outcomes is increasingly demanded by patients, payers, specialty boards and regulatory agencies.”

VQI will be used to assess quality.
Regional Data Review
**Percentage of 2012 procedures with 9 month or greater Follow-up**

by office visit or phone contact (as of 2/1/2014)

Excludes patients who died before 9 months and CAS/PVI patients with technical failure.

<table>
<thead>
<tr>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># procedures</td>
<td>% follow-up</td>
</tr>
<tr>
<td>CAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEMO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OAAA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEVAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2012 Overall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2011 Overall</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Procedures done in 2012 that have 9 month or greater follow-up as of 2/1/2014

The SVS PSO Governing Council recommends a long term follow-up of 80% or more. This information is essential to evaluate the long term outcomes of patients and can help identify centers with best practice.
Vascular Quality Initiative®

Center Variation Within Your Region

- 14%
- 21%
- 22%
- 46%
- 50%
- 59%
- 66%
- 81%
- 82%
- 83%
- 86%
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Regional Variation across VQI and VQI Mean Rate

Others’ region indicates centers that do not belong to a region.

Note: This report is a patient safety work product generated within the SVS PSO, LLC, is considered privileged and confidential.
# Vascular Quality Initiative®

## Discharge Medications

2012 and 2013 Procedures (as of 6/1/2014)

Excludes missing, not treated for medical reason, and non-compliant

<table>
<thead>
<tr>
<th></th>
<th>% Antiplatelet &amp; Statin</th>
<th>% Antiplatelet only</th>
<th>% Statin only</th>
<th>% Neither</th>
<th>Number of procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFRA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OAAA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPRA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEVAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Your Region</strong></td>
<td>70%</td>
<td>19%</td>
<td>5%</td>
<td>6%</td>
<td>7104</td>
</tr>
<tr>
<td><strong>VQI</strong></td>
<td>72%</td>
<td>19%</td>
<td>4%</td>
<td>4%</td>
<td>128772</td>
</tr>
</tbody>
</table>
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Center Variation within Your Region

0%  20%  40%  60%  80%  100%

46%  59%  64%  64%  67%  70%  70%  70%  71%  71%  72%  72%  72%  75%  80%  84%  85%  92%  96%  100%
Vascular Quality Initiative

Regional Variation within VQI and Mean Rate

- Greater NY: 61%
- SOVONet: 67%
- Rocky...: 67%
- NorCal: 68%
- Virginia’s: 69%
- Others: 69%
- Florida-Georgia: 70%
- SoCal VOICE: 71%
- Upper Midwest: 71%
- Mid-Atlantic: 72%
- Mid-America: 73%
- Carolina’s: 74%
- Midwest: 75%
- Great Lakes: 75%
- Chesapeake: 76%
- New England: 77%
- Michigan: 82%
- VQI: 72%
Factors associated with surgical site infection after lower extremity bypass in the Society for Vascular Surgery (SVS) Vascular Quality Initiative (VQI)

Jeffrey A. Kalish, MD,* Alik Farber, MD,* Karen Homa, PhD,† Magdiel Trinidad, MD,‡ Adam Beck, MD,# Mark G. Davies, MD, PhD,§ Larry W. Kraiss, MD,‖ and Jack L. Cronenwett, MD,* on behalf of the Society for Vascular Surgery Patient Safety Organization Arterial Quality Committee, Boston, Mass; Chicago, Ill; Tucson, Ariz; Gainesville, Fla; Houston, Tex; Salt Lake City, Utah; and Lebanon, NH

Percentage of Infrainguinal Bypass Procedures with Chlorhexidine or Chlorhexidine + Alcohol Skin Prep during 2011-2014 (as opposed to iodine–based skin prep, through June, 2014)

<table>
<thead>
<tr>
<th>Chlorhexidine</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Chlorhexidine # procedures</td>
<td>% Chlorhexidine # procedures</td>
<td>% Chlorhexidine (N)</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>64%</td>
<td>943</td>
<td>73% (14712)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

Center Variation within Your Region

18%  20%  43%  46%  60%  65%  77%  89%  91%  94%  95%  100%  100%  100%
Chlorhexidine skin prep has been shown to reduce surgical site infection rate by 50% in these patients in VQI when compared to iodine-based skin prep.
Percentage of Major Complications after Infrainguinal Bypass during 2011-2014
(In-hospital Death, Major Ipsilateral Amputation or Graft Occlusion, through June 2014)

<table>
<thead>
<tr>
<th>Major Complications</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Composite Outcome</td>
<td>4%</td>
<td>574</td>
<td>4% (10169)</td>
</tr>
<tr>
<td># Procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vascular Quality Initiative

Center Variation within Your Region

0%  0%  0%  0%  0%  0%  0%  3%  4%  5%  6%  6%  6%  9%
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Regional Variation within VQI and Mean Rate

0% 3% 3% 3% 4% 4% 4% 4% 4% 4% 5% 5% 8% 8% 4%

SVS
m2S
Society for Vascular Surgery
Mean Preoperative Ipsilateral Duplex Peak Systolic Velocity in Asymptomatic Patients undergoing CEA
(Patients without any history of neurologic or retinal symptoms on either side, 2011-June, 2014)

<table>
<thead>
<tr>
<th>PSV</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean PSV</td>
<td># procedures</td>
<td>Mean PSV</td>
</tr>
<tr>
<td></td>
<td>325</td>
<td>506</td>
<td>346 (9610)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

Center Variation within Your Region

57  222  248  257  257  261  286  323  325  333  336  339  399  421  459
Regional Variation within VQI and Mean Rate
Percentage of Percutaneous Femoral PVI Procedures Using Ultrasound Guidance (vs. No guidance or fluoroscopy guidance, 2011-May, 2104. Excludes cut-down)

<table>
<thead>
<tr>
<th>Ultrasound Guidance</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Ultrasound Guidance</td>
<td># Procedures</td>
<td>% Ultrasound Guidance</td>
<td># Procedures</td>
</tr>
<tr>
<td>18%</td>
<td>1945</td>
<td>38% (41832)</td>
<td></td>
</tr>
</tbody>
</table>
Regional Variation within VQI and Mean Rate

Year (YR) vs. Percentage Variation:
- YR 1: 5%
- YR 2: 13%
- YR 3: 18%
- YR 4: 19%
- YR 5: 22%
- YR 6: 25%
- YR 7: 31%
- YR 8: 32%
- YR 9: 35%
- YR 10: 40%
- YR 11: 41%
- YR 12: 44%
- YR 13: 56%
- YR 14: 57%
- YR 15: 59%
- YR 16: 38%
Carotid Endarterectomy Stroke or Death in Hospital
(Primary, isolated, elective procedures, all years through June, 2014)

<table>
<thead>
<tr>
<th>CEA Stroke or Death</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed (N)</td>
<td>Expected (p-value)</td>
<td>Observed (N)</td>
</tr>
<tr>
<td></td>
<td>1.3% (N=1501)</td>
<td>1.1% (p=0.46)</td>
<td>1% (N=29619)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

CEA Stroke or Death in Hospital
Center Variation within Your Region
Observed (Red) vs Expected (Blue) based on Risk-Adjustment

- % Observed
- % Expected
Carotid Artery Stent Stroke or Death in Hospital
(elective, primary, atherosclerotic procedures, all years through June 2014)

<table>
<thead>
<tr>
<th>CAS Stroke or Death</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed (N)</td>
<td>Expected (p-value)</td>
<td>Observed (N)</td>
</tr>
<tr>
<td>Observed (N=219)</td>
<td>1.4%</td>
<td>2.1% (p=0.434)</td>
<td>2.5% (N=3292)</td>
</tr>
</tbody>
</table>
Open Non-ruptured AAA In hospital Mortality
(Excludes ruptured procedures, all dates through June, 2014)

<table>
<thead>
<tr>
<th>Open Mortality</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed (N)</td>
<td>Expected (p-value)</td>
<td>Observed (N)</td>
</tr>
<tr>
<td></td>
<td>5.5% (N=219)</td>
<td>3.6% (p=0.146)</td>
<td>3.2% (N=4246)</td>
</tr>
</tbody>
</table>
Open Non-ruptured AAA in Hospital Mortality
Center Variation within Your Region
Observed (Red) vs Expected (Blue) based on Risk-Adjustment

% Observed
% Expected
Open Non-ruptured AAA in Hospital Mortality
Regional Variation

Observed (Red) vs Expected (Blue) based on Risk-Adjustment
## Carotid Endarterectomy: Percentage of Patients with Length of Stay > 1 Day
(excludes urgent, emergent cases during all years through June, 2014)

<table>
<thead>
<tr>
<th>CEA LOS &gt; 1 day</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed (N)</td>
<td>Expected (p-value)</td>
<td>Observed (N)</td>
</tr>
<tr>
<td></td>
<td>36% (N=1248)</td>
<td>27% (p=&lt;0.001)</td>
<td>25% (N=27713)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

Percent CEA LOS > 1 day
Center Variation Within Your Region
Observed (Red) vs Expected (Blue) based on Risk-Adjustment

- % Observed
- % Expected
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Percent CEA LOS > 1 day
Regional Variation

Observed (Red) vs Expected (Blue) based on Risk-Adjustment

- % Observed
- % Expected

Society for Vascular Surgery
m2S
Endovascular AAA Repair: Percentage of Patients with Length of Stay > 2 Days  
(Non-ruptured, infra-renal repairs during all years through June, 2014)

<table>
<thead>
<tr>
<th>EVAR LOS &gt; 2 days</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed (N)</td>
<td>Expected (p-value)</td>
<td>Observed (N)</td>
</tr>
<tr>
<td></td>
<td>18% (N=581)</td>
<td>20% (p=0.236)</td>
<td>22% (N=10676)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

Percent EVAR LOS > 2 days
Center Variation Within Your Region
Observed (Red) vs Expected (Blue) based on Risk-Adjustment
Vascular Quality Initiative®

Percent EVAR LOS > 2 days
Regional Variation
Observed (Red) vs Expected (Blue) based on Risk-Adjustment

% Observed
% Expected
Open AAA Repair: Percentage of Patients with Length of Stay $\geq$ 8 Days
(Non-ruptured, infra-renal repairs during all years through June, 2014)

<table>
<thead>
<tr>
<th>Open AAA LOS $\geq$ 8 days</th>
<th>Your center</th>
<th>Your region</th>
<th>VQI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>Expected (p-value)</td>
<td>Observed</td>
</tr>
<tr>
<td></td>
<td>34% (N=146)</td>
<td>28% (p=0.097)</td>
<td>27% (N=3522)</td>
</tr>
</tbody>
</table>
Vascular Quality Initiative®

Percent oAAA LOS >= 8 days
Center Variation Within Your Region
Observed (Red) vs Expected (Blue) based on Risk-Adjustment

- % Observed
- % Expected
Percent oAAA LOS >= 8 days
Regional Variation
Observed (Red) vs Expected (Blue) based on Risk-Adjustment
Follow up > 9 Months: 2012 Procedures

Regional Variation across VQI and VQI Mean Rate

Others' region indicates centers that do not belong to a region.
UF Smoking Cessation QI Project Update

Adam W. Beck, M.D.
Workflow

• Identify patients
  • Each new and returning patient is asked if they are a current smoker and they are identified as such when scheduled for clinic

• Patients will be identified on clinic lists from the DB providers receive

• Providers will follow their protocol in clinic and document in their note (templated information) what intervention offered and whether the patient accepted that intervention

• Data regarding initial intervention and follow-up are collected in an Access database

• Tentative quarterly review of information to assess results
Provider’s Protocol

• Discussion regarding the importance of smoking cessation
  “I understand that is very difficult to quit, but…”

• First line therapy: Wellbutrin and low-dose Nicotine Patch

• Instruct patient to choose a (minimally-stressful) quit date and initiate both medications one week prior to that date
Interventions aid in patients’ smoking cessation efforts

<table>
<thead>
<tr>
<th>As of 10/21/2014</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRT only</td>
<td>8</td>
<td>14.8%</td>
</tr>
<tr>
<td>Wellbutrin + NRT</td>
<td>25</td>
<td>46.3%</td>
</tr>
<tr>
<td>Wellbutrin</td>
<td>7</td>
<td>13.0%</td>
</tr>
<tr>
<td>Chantix</td>
<td>10</td>
<td>18.5%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>7.4%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
## UF Smoking Cessation Results as of 10/21/2014

### Smoking QI results:

<table>
<thead>
<tr>
<th>Category</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered but not quit</td>
<td>81</td>
<td>36.8%</td>
</tr>
<tr>
<td>Quit</td>
<td>36</td>
<td>16.4%</td>
</tr>
<tr>
<td>Dead</td>
<td>10</td>
<td>4.5%</td>
</tr>
<tr>
<td>Not Documented</td>
<td>22</td>
<td>10.0%</td>
</tr>
<tr>
<td>Refused</td>
<td>71</td>
<td>32.3%</td>
</tr>
<tr>
<td>Total</td>
<td>220</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
What we’ve learned

• Patients WILL quit!

• Frequent reinforcement works, especially by more than one practitioner

• Healthcare providers need just as much encouragement as the patients
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**VAPOR (VAascular Physician Offer and Report) Trial**

- **Primary Investigators:**
  - Phil Goodney-Dartmouth
  - Alik Farber-Boston University

- **Standard of Care vs. Intensive intervention/discussion**

- **Funded by an SVS Foundation Multicenter Clinical Studies Planning Grant**

- **Site initiation 8/2014**
Integrating VQI into M&M

• “These data are great, but how do we use them?”
  – Internal QI
    • COPI reports
  – Research
    • Not applicable to most practicing surgeons
    • Prolonged period before data are distributed/assimilated into practice
  – Integration into Morbidity and Mortality conferences
  – M2S Analytics and Reporting
Tracking your own unique data
#hashtags to Track New Variables:

- Requests: for the addition of new variables to the VQI registry for specific new quality improvement or quality research projects
- Temporary Solution: #hashtags in comment field
- Each Tag must follow the #[Tag:value] format, where ‘Tag’ is the unique variable name and the ‘value’ is a numeric or textual value
A regional group wishes to monitor whether nicotine replacement was prescribed at time of discharge.

New variable = nictrx (Nicotine replacement), with options = 0, 1 or 2 where 0=none, 1= patch, 2=gum

Hashtag would be entered as : [#nictrx:0] or [#nictrx:1] or [#nictrx:2]

This illustrates use of numbers for categorical choices as response, which may be more applicable if many choices, or long words with many keystrokes.
A regional group wishes to monitor whether smoking cessation counseling was offered at time of discharge.

New variable = smokcs (smoking counseling), with options = yes or no

Hashtag would be entered as: #[smokcs:yes] or #[smokcs:no]

This illustrates use of full word in response, i.e., yes or no, which requires more keystrokes but maybe less prone to error than entering numbers to stand for choices.
Long-term follow-up: The Achilles’ heel of the VQI
VQI and One Year Follow-up

- VQI is different from other registries (NSQIP) because of longer follow-up
- Without this, we are missing the most important part of our care, especially in patients undergo elective procedures
- At the inception of the VSGNE (VSGNNE), the prescribed rate of 1-year follow-up was 80%
- <50% of Centers in the VQI (including the VSGNE) are able to meet that goal
Follow-Up Rates Today

- Regional long-term follow-up rate for 2012 procedures is 64%
  - 2011: 53%

- National long-term follow-up rate for 2012 procedures is 57%
  - 2011: 60% (was 29% in January 2011)
The Society for Vascular Surgery
Vascular Quality Initiative®

One Year Follow Up
One-year follow-up

There are several outcomes variables in the registry that required one year follow-up.

VQI staff interviewed registry point-person at 10 hospitals to understand their processes of obtaining one year follow-up.
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Keys to success:

#1. Make a plan day one
   – Communicate the plan to the team
   – Involve physicians and office staff
   – Clear roles/responsibilities
   – Tie to performance evaluation
Keys to success:

#2. Paper Chart:

– Sticker or special color of chart for VQI patients
– Monthly print follow up form and put on chart
– Office staff make sure patient has an appointment that month or call the patient and complete the form
Vascular Quality Initiative

Keys to success:

#3. Electronic Medical Record:
- Work with Vendor to create flag system
- Data Coordinator access to office EMR’s
- Office staff need to own making follow up appointments and/or calling patients
Keys to Success:

#4. Physician Champion:
   – Lead physician at each practice
   – Partner with data coordinator
Barriers to Success:

- Lack of resources/time
- Lack of cooperation from physicians/office
- Lack of understanding of importance for participation
- No published penalty vs. other registries
UF Follow-Up Efforts

• On the day before clinic, check schedule for FGVSG patients and print follow-up forms
  – Vascular and TCV clinics

• Paperclip forms to patient’s FACE sheets so providers know to fill out form during visit

• Database manager receives forms after clinic and enters into M2S

• Other methods?
Barriers to Long-Term Follow-Ups

• Geography
  – VSGNE v. FGVSG
  – Transportation

• Hospital’s standard of care differs from M2S requirements
  – Open AAA
  – HD Access

• Patients refuse medical care

• Cancellations and No-Shows
Barriers to Long-Term Follow-Ups

- Patients lose insurance
- Chronically ill patients already have “enough medical appointments”
- Patients are difficult to contact and can be poor historians
- Outside medical records aren’t always comprehensive
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Ask for Help

• Run your long-term follow-up report

• Who can help?
  – Schedulers, database managers, other clinical staff, medical students, interns, etc.
How UF Increased Long-Term Follow-Up Compliance

- Look at patient’s chart for clinic visits that aren’t entered

- Complete easy follow-up modules first
  - Open AAA: you only need medications and related surgeries
  - HD Access: if you can’t get in touch with them, call dialysis center
Phone Follow-Ups

- They only work for certain modules

- Chronically ill patients often unable to remember timelines of all their procedures

- Use phone visits to get information on PCP, local specialists, imaging locations, ER visits and hospital location if not in chart
Outside Medical Records

• Be specific when asking for information

• Ask medical records department to pre-screen information, and ask if they have any other hospitalizations, ER visits, PCP/specialist appointments, or imaging reports on file
What We Learned

• Each month, run the long-term follow-up for that month last year and check SSDI
  – This avoids playing “catch up”

• Make a plan to get support staff on-board

• When patients are in pre-op, make your clinical standard of care follow-up clear
National VQI Efforts

• Discussed at first annual yearly planning meeting in September
• Working group formed:
  – Jens Jorgensen
  – Jeb Hallett
• Reward vs. Punishment for performance?
• Additional resources from VQI?
Final Discussion

• Next Meeting
  – Time/Date
  – Location
  – Organization

• Expanding region...name change?
  – Mississippi
  – Tennessee/Alabama?
Contact Us with Questions

- Adam Beck
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- Yuming Lin
  yuming.lin@surgery.ufl.edu
VQI Hemodialysis - Update

Thomas S. Huber, MD, PhD
Professor of Surgery
University of Florida College of Medicine
Gainesville, Florida

Florida-Georgia Vascular Study Group
Fall Meeting
October 30, 2014
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>My Physician Results (N=158)</th>
<th>All Other Center Participants (N=168)</th>
<th>All Other Regional Participants (N=1,883)</th>
<th>All Other National Participants (N=13,269)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>39.9%</td>
<td>49.40%</td>
<td>42.00%</td>
<td>39.80%</td>
</tr>
<tr>
<td>On Dialysis</td>
<td>76.6%</td>
<td>69.60%</td>
<td>66.90%</td>
<td>66.30%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>50.0%</td>
<td>50.60%</td>
<td>67.00%</td>
<td>35.10%</td>
</tr>
<tr>
<td>Pre-Op Venous Ultrasound mapping</td>
<td>92.4%</td>
<td>88.10%</td>
<td>61.30%</td>
<td>77.50%</td>
</tr>
<tr>
<td>AVF</td>
<td>64.6%</td>
<td>64.30%</td>
<td>86.70%</td>
<td>75.50%</td>
</tr>
<tr>
<td>Variable Name</td>
<td>My Physician Results (N=158)</td>
<td>All Other Center Participants (N=168)</td>
<td>All Other Regional Participants (N=1,883)</td>
<td>All Other National Participants (N=13,269)</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------</td>
<td>----------------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Radial, wrist</td>
<td>1.3%</td>
<td>1.20%</td>
<td>25.20%</td>
<td>15.10%</td>
</tr>
<tr>
<td>Death</td>
<td>1.9%</td>
<td>0.00%</td>
<td>0.10%</td>
<td>0.20%</td>
</tr>
<tr>
<td>Not Discharged Home</td>
<td>8.9%</td>
<td>7.70%</td>
<td>2.00%</td>
<td>3.30%</td>
</tr>
<tr>
<td>Post-op Length of Stay *</td>
<td>2.3 ± 4.5;</td>
<td>2.2 ± 5.2;</td>
<td>0.6 ± 3.5;</td>
<td>1.1 ± 8.5;</td>
</tr>
<tr>
<td>Early follow up (0-6 months)</td>
<td>Number</td>
<td>Percentage (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access Thrombosis</td>
<td>12</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wound infection</td>
<td>12</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steal of &quot;Yes&quot;</td>
<td>6</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swelling of &quot;Yes&quot;</td>
<td>7</td>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of procedures</td>
<td>305</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late follow up (12 months)</td>
<td>Number</td>
<td>Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>27</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access Thrombosis</td>
<td>12</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revision – Peripheral Intervention</td>
<td>49</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revision - Surgical</td>
<td>44</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VQI Hemodialysis Workgroup

- Chairman – Karen Woo.
- Revision of data collections forms.
- Anticipated form updates – 6 to 12 mos.
Recommended Changes
• None
Recommended Changes

- Remove creatinine level
- Remove CKD Stage 4 or 5
Recommended Changes
- Remove IV Drug Use
- Add Previous Permanent Access (type)
- Add Previous Peritoneal Dialysis
- Clarify Tunnel Catheter Neck
- Clarify Arterial Non-invasive Studies
Recommended Changes

- Clarify Procedure Location (i.e. site)
- Expand Anesthesia Options - local
- Add HeRO as Access Type
- Clarify branch ligation
- Add ulnar artery as anastomotic option
- Clarify Outflow Vein
- Clarify Target Vein Diameter
Recommended Changes

- Add new anti-platelets and anticoagulants
- Clarify antibiotic timing/choice
Recommended Changes
- Clarify 2nd stage/remedial procedures
- Clarify dialysis status and access use
- Quantify – swelling/steal/infection
- Clarify procedures to facilitate maturation
- Clarify procedures to facilitate patency

* Early follow-up required at 3 – 4 months
Currently on dialysis

0=no

Reason not on dialysis

1= pre dialysis

2=functioning kidney transplant

Access used prior to transplant

1=yes

Date used started prior to transplant

0=no

Date use started prior to transplant

Reason for never used

Access never used for dialysis

0=no

Date use started prior to abandonment

1= yes

Date use ended prior to abandonment

Reason access no longer being used

1= thrombosed

2= ligated/removed

Date maturation abandoned

0=no

Date maturation

1=yes

On peritoneal

Alternate access site preferred

not yet mature

continuing to wait for maturation

1=yes

Date maturation abandoned
Recommended Changes

• Clarify 2\textsuperscript{nd} stage/remedial procedures
• Clarify dialysis status and access use
• Quantify – swelling/steal/infection
• Clarify procedures to facilitate maturation
• Clarify procedures to facilitate patency

* Early follow-up required at 12 – 15 months
Discussion

• Utility of module
  – Lack of analytic tools
  – Access maturation vs patency

• Follow-up
  – Variability in practice patterns
  – Annual assessment
  – Patient compliance
Discussion

• Quality improvement opportunities
  – Prevalence of AVF
  – Incidence of AVF
  – Preoperative vein mapping

• Academic opportunities - multiple
United States Prevalent Vascular Access Rates

AVFs placed
AVFs in use
AV Grafts
All CVCs
CVCs >90 days

2003 2004 2005 2006 2007 2008 2009 2010 2011
Effect of Clopidogrel on Early Failure of Arteriovenous Fistulas for Hemodialysis
A Randomized Controlled Trial

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Michael Alton, MD
James A. Delmez, MD
Bradley S. Dixon, MD
Arthur Greenberg, MD
Jonathan Himmelfarb, MD
Miguel A. Vazquez, MD
Jennifer J. Gassman, PhD
Tom Greene, PhD
Milena K. Radeva, MS
Gregory L. Braden, MD
T. Alp Ikizler, MD
Michael V. Rocce, MD, MSCE
Ingemar J. Davidson, MD
James S. Kaufman, MD
Catherine M. Meyers, MD
John W. Kusek, PhD
Harold I. Feldman, MD, MSCE
for the Dialysis Access Consortium Study Group

Context The arteriovenous fistula is the preferred type of vascular access for hemodialysis because of lower thrombosis and infection rates and lower health care expenditures compared with synthetic grafts or central venous catheters. Early failure of fistulas due to thrombosis or inadequate maturation is a barrier to increasing the prevalence of fistulas among patients treated with hemodialysis. Small, inconclusive trials have suggested that antiplatelet agents may reduce thrombosis of new fistulas.

Objective To determine whether clopidogrel reduces early failure of hemodialysis fistulas.

Design, Setting, and Participants Randomized, double-blind, placebo-controlled trial conducted at 9 US centers composed of academic and community nephrology practices in 2003–2007. Eight hundred seventy-seven participants with end-stage renal disease or advanced chronic kidney disease were followed up until 150 to 180 days after fistula creation or 30 days after initiation of dialysis, whichever occurred later.

Intervention Participants were randomly assigned to receive clopidogrel (300-mg loading dose followed by daily dose of 75 mg; n=441) or placebo (n=436) for 6 weeks starting within 1 day after fistula creation.

Main Outcome Measures The primary outcome was fistula thrombosis, determined by physical examination at 6 weeks. The secondary outcome was failure of the fistula to become suitable for dialysis. Suitability was defined as use of the fistula at a dialysis machine blood pump rate of 300 ml/min or more during 8 of 12 dialysis sessions.

Results Enrollment was stopped after 877 participants were randomized based on a stopping rule for intervention efficacy. Fistula thrombosis occurred in 53 (12.2%) participants assigned to clopidogrel compared with 84 (19.5%) participants assigned to placebo (relative risk, 0.63; 95% confidence interval, 0.46–0.97; P=.018). Failure to attain suitability for dialysis did not differ between the clopidogrel and placebo groups (61.8% vs 59.5%, respectively; relative risk, 1.09; 95% confidence interval, 0.94–1.17; P=.40).

Conclusion Clopidogrel reduces the frequency of early thrombosis of new arteriovenous fistulas but does not increase the proportion of fistulas that become suitable for dialysis.

Trial Registration clinicaltrials.gov Identifier: NCT00057119 www.jama.com

1 Approximately 470,000 Americans have end-stage renal disease, and most are treated with hemodialysis.
A major challenge in caring for patients undergoing hemodialysis is maintaining a functioning vascular access, which is essential for performing the dialysis procedure. The effect of vascular access dysfunction is substantial—it is a leading reason for hospitalization among patients with end-stage renal disease and has associated annual costs in the United States that exceed $1 billion.2,3

For editorial comment see p 2205.
*Clopidogrel improved early thrombosis, but did not facilitate access maturation – 62% failure rate.

Table 2. Fistula Thrombosis

<table>
<thead>
<tr>
<th>No. (%) of Patients</th>
<th>Clopidogrel (n = 435)\textsuperscript{a}</th>
<th>Placebo (n = 431)\textsuperscript{a}</th>
<th>Relative Risk Confidence Interval\textsuperscript{b}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrombosis at 6 wk (all patients)</td>
<td>53 (12.2)</td>
<td>84 (19.5)</td>
<td>0.63 (0.46-0.97)\textsuperscript{c}</td>
</tr>
<tr>
<td>By location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm fistula</td>
<td>31 (12.9)</td>
<td>60 (24.7)</td>
<td>0.53 (0.36-0.77)</td>
</tr>
<tr>
<td>Upper arm fistula</td>
<td>22 (11.3)</td>
<td>24 (12.8)</td>
<td>0.89 (0.52-1.53)</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Six of the 441 patients randomized to clopidogrel and 5 of the 436 patients randomized to placebo were not included because patency was not evaluated.

\textsuperscript{b}Relative risks were stratified for fistula location and center.

\textsuperscript{c}The 95% confidence interval reported is the repeated confidence interval adjusted for interim monitoring. The repeated \( P \) value adjusted for interim monitoring is .018.
Hemodialysis Fistula Maturation (HFM) Study Objectives

- To identify *predictors* of AVF maturation.
- To evaluate *mechanisms* of AVF maturation.

Domains - anatomy, biology, patient-specific attributes, process of care
Access use at first outpatient hemodialysis, by pre-ESRD nephrology care, 2010

Figure 1.19 (Volume 2)

Incident ESRD patients, 2010.
Decades After, Incident Fistulae Fall Short of Recommendations; A Current Policy Concern

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Dorry Segev, MD PhD9; Julie A. Frerichs, MD10

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Revised: August 11, 2014
Word count: 3648
Conflicts of interest: None

1
GUIDELINE 1. PATIENT PREPARATION FOR PERMANENT HEMODIALYSIS ACCESS

Appropriate planning allows for the initiation of dialysis therapy at the appropriate time with a permanent access in place at the start of dialysis therapy.

1.4 Patients with a glomerular filtration rate (GFR) less than 30 mL/min/1.73 m² (CKD stage 4) should be educated on all modalities of kidney replacement therapy (KRT) options, including transplantation, so that timely referral can be made for the appropriate modality and placement of a permanent dialysis access, if necessary. (A)

1.2 In patients with CKD stage 4 or 5, forearm and upper-arm veins suitable for placement of vascular access should not be used for venipuncture or for the placement of intravenous (IV) catheters, subclavian catheters, or peripherally inserted central catheter lines (PICCs). (B)

1.3 Patients should have a functional permanent access at the initiation of dialysis therapy.

1.3.1 A fistula should be placed at least 6 months before the anticipated start of HD treatments. This timing allows for access evaluation and additional time for revision to ensure a working fistula is available at initiation of dialysis therapy. (B)

1.3.2 A graft should, in most cases, be placed at least 3 to 6 weeks before the anticipated start of HD therapy. Some newer graft materials may be cannulated immediately after placement. (B)

1.3.3 A peritoneal dialysis (PD) catheter ideally should be placed at least 2 weeks before the anticipated start of dialysis treatments. A backup HD access does not need to be placed in most patients. A PD catheter may be used as a bridge for a fistula in “appropriate” patients. (B)

1.4 Evaluations that should be performed before placement of a permanent HD access include (Table 1):

1.4.1 History and physical examination, (B)

1.4.2 Duplex ultrasound of the upper-extremity arteries and veins, (B)

1.4.3 Central vein evaluation in the appropriate patient known to have a previous catheter or pacemaker, (A)

BACKGROUND

Since implementation of the KDOQI Vascular Access Guidelines in 1997, which encouraged increased placement of fistulae, CMS has embraced this recommendation with the implementation of the Fistula First Breakthrough Initiative (FFBI). This initiative endorses the goals recommended by the KDOQI fistula rates of 50% or greater for incident—and at least 40% for prevalent—patients undergoing HD. The FFBI promotes the placement of fistula in all suitable HD patients. Working through the ESRD Networks, the FFBI promotes the placement of fistula using 11 “Change Concepts” that encourage the development of specific strategies; these 11 Change Concepts have been identified to help the kidney community improve the rate of fistula placement. Five of these strategies emphasize the same goals as CPG 1 and Clinical Practice Recommendation (CPR) 1: education of patients regarding fistulae, protection of vessels, vessel mapping, and sufficient lead-time for fistula maturation (NVAD; www.fistulafirst.org). The breakthrough initiative has reset the goal for fistula creation to 65% by 2009.

RATIONALE

Characteristics of a patient’s arterial, venous, and cardiopulmonary systems will influence which access type and location are most desirable for each patient. The patient’s life expectancy and planned duration of CKD stage 5 therapy also can influence the type and location of the access. All patients should be evaluated as in Table 1.

Venipuncture complications may render veins potentially available for vascular access unsuitable for construction of a primary fistula. Patients and health care professionals should be educated about the need to preserve veins to avoid loss of potential access sites in the arms and maximize chances for successful fistula placement.
Routine Preoperative Vascular Ultrasound Improves Patency and Use of Arteriovenous Fistulas for Hemodialysis: A Randomized Trial

Martin Ferring,* Martin Claridge,* Steven A. Smith,† and Teun Wilmink

*Department of Renal Medicine, Worcestershire Royal Hospital, Worcester, United Kingdom; and Departments of Vascular Surgery and Renal Medicine, Heart of England Hospital, Birmingham, United Kingdom

Background and objectives Arteriovenous fistulas (AVF) are the preferred vascular access for hemodialysis but have a considerable failure rate. This study investigated whether routine preoperative vascular ultrasound results in better AVF outcome than physical examination.

Design, setting, participants, & measurements: Patients with end-stage kidney disease referred for permanent access formation were assessed by independent examiners using physical examination and ultrasound. After random allocation, the ultrasound report was disclosed to the surgeon for patients in the ultrasound group but not for the clinical group. End points were AVF failure and survival rates, analyzed by intention to treat and by use for hemodialysis.

Results: AVFs were made in 208 of 218 randomized patients. Clinical and ultrasound groups were similar in terms of patient characteristics, allocation to individual surgeons, and proportion of forearm AVFs. The ultrasound group had a significantly lower rate of immediate failure (4% versus 11%, P = 0.026) and, among failed AVFs, less thrombosis (33% versus 67%, P = 0.028). Primary AVF survival at 1 year was not statistically different (ultrasound = 66%, clinical = 56%, P = 0.081). Assisted primary AVF survival at 1 year was significantly better for the ultrasound group (98% versus 45%, P = 0.002). The number of patients requiring preoperative ultrasound to prevent one AVF failure was 12.

Conclusions: Routine preoperative vascular ultrasound in addition to clinical assessment improves AVF outcomes in terms of patency and use for dialysis. National Research Register, United Kingdom, trial number N0046131432.


The arteriovenous fistulas (AVF) are the preferred vascular access for hemodialysis (1,2). However, AVF failure is a common problem, particularly for radiocubital AVF, with a modest two-thirds survival by 1 year (3). AVF failure is often attributed to vascular complications because an increasing number of elderly patients with diabetes and end-stage renal disease are accepted for hemodialysis treatment (4–9).

Physical examination has traditionally been used to identify a suitable artery and vein for AVF formation (10). Preoperative vascular mapping with ultrasound has been shown to predict AVF outcomes (11–13). The Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines recommend the use of routine ultrasound mapping for all patients but noted the lack of level one evidence to support this recommendation (1).

We conducted a randomized trial to evaluate the outcome of routine preoperative assessment with ultrasound in terms of patency and use of AVFs for hemodialysis.

Materials and Methods

Participants

This study was approved by the Local Ethics Committee of East Birmingham, United Kingdom, and was registered with the U.S. National Research Register, trial number N0046131432, and adhered to the Declaration of Helsinki.

All patients with end-stage kidney disease in Heart of England Hospital (Birmingham, United Kingdom) who were referred for formation of AVF were invited to take part in the study. Included were all with either none or one previous AVF. Patients who had already participated in the study, who had more than one previous AVF, or had a previous upper arm arteriovenous graft were excluded. Patients who gave informed written consent were recruited between August 31, 2004 and September 30, 2006. An independent data management company collected clinical data from electronic patient and hemodialysis session records.

Preoperative assessment

All patients were evaluated with physical and ultrasound examination by independent assessors blinded to each other. Physical examination was carried out by one of four vascular surgeons (one consultant, three trainees) with experience in AVF formation. Following a standard protocol, the pulses at elbows and wrists and the superficial veins in the forearm and upper arm (with tourniquet) were assessed. Vessels were considered suitable if the artery had a good pulse and the vein was patent and of good caliber. The most dilated possible site was chosen for AVF formation.

The ultrasound examination was carried out by a nephrology trainee.
PERIOPERATIVE MANAGEMENT OF HYPERGLYCEMIA-
AN OPPORTUNITY FOR IMPROVEMENT

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Department of Anesthesiology
Emory University School of Medicine
Introduction

- Causes of perioperative hyperglycemia.
- Relationship between hyperglycemia and postoperative outcomes.
- Association between hyperglycemia and long term outcomes.
- Impact of glycemic control modalities on outcomes.
- Proposal to measure the effect of glycemic control in FGVSG patients.
Causes of Perioperative Hyperglycemia

- Very common: >40% ICU
  >30% non-ICU
  (Cook et al 2009)

- Inpatient hyperglycemia can be due:
  1. Known Diabetes
  2. Undiagnosed DM
  3. Acute hyperglycemia secondary to
     a. stress (normal hormonal response to even uncomplicated surgery involves glycogenolysis, gluconeogenesis, and relative insulin resistance),
     b. nutritional changes (TPN/enteral)
     c. medications
- Known benefit of close glycemic control on the incidence of long-term complications of diabetes

- Increasingly clear that acute hyperglycemia can have short-term detrimental effects on surgical and critically ill patients.
Long Term Effect of Impaired Glucose Tolerance and DM

Association Between Hyperglycemia and Increased Hospital Mortality in a Heterogeneous Population of Critically Ill Patients

**James Stephen Krinsley, MD**

---

**Table 7. Hospital Mortality Rate and Mean Glucose Value**

<table>
<thead>
<tr>
<th>Mean* (mg/dL)</th>
<th>Mortality rate (%)</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-99</td>
<td>9.6</td>
<td>264</td>
</tr>
<tr>
<td>100-119</td>
<td>12.2</td>
<td>491</td>
</tr>
<tr>
<td>120-139</td>
<td>15.1</td>
<td>338</td>
</tr>
<tr>
<td>140-159</td>
<td>18.8</td>
<td>202</td>
</tr>
<tr>
<td>160-179</td>
<td>28.4</td>
<td>141</td>
</tr>
<tr>
<td>180-199</td>
<td>29.4</td>
<td>102</td>
</tr>
<tr>
<td>200-249</td>
<td>37.5</td>
<td>144</td>
</tr>
<tr>
<td>250-299</td>
<td>32.9</td>
<td>70</td>
</tr>
<tr>
<td>&gt;300</td>
<td>42.5</td>
<td>40</td>
</tr>
</tbody>
</table>

*Glucose values expressed as a range of mean values. The \( \chi^2 \) test was used for trend (\( P < .001 \)).
The Clinical Significance of an Elevated Postoperative Glucose Value in Nondiabetic Patients after Colorectal Surgery

Evidence for the Need for Tight Glucose Control?

Ravi P. Kiran, MBBS, MS, FRCS, FACS, MSc, Matthias Turina, MD, PhD, Jeff Hammel, MS, and Victor Fazio, MB, MS, MD (Hon), FRACS, FRACS (Hon), FACS, FRCS
## Entire study cohort, N = 2628

### Nondiabetic
- **N = 2447 (93.1%)**
  - Normoglycemic (<125 mg/dL)
    - 816 patients (33.3%)
  - Hyperglycemic
    - Mild HG: 1289 patients (52.7%)
    - Severe HG: 342 patients (14%)

### Preexisting diabetes
- **N = 181 (6.9%)**
  - Normoglycemic (<125 mg/dL)
    - 63 patients (34.8%)
  - Hyperglycemic
    - Mild HG: 98 patients (54.1%)
    - Severe HG: 20 patients (11%)

### Outcome variables of interest
- Index hospitalization
- 30-day readmission, reoperation, mortality

---

**Operation + 48 hr**
<table>
<thead>
<tr>
<th>TABLE 2. Outcome Variables for Nondiabetic Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Glycemia (mg/dL)</td>
</tr>
<tr>
<td>Overall</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Intraoperative</td>
</tr>
<tr>
<td>No. patients 2447</td>
</tr>
<tr>
<td>EBL 166 ± 187</td>
</tr>
<tr>
<td>Transfusion (no. patients) 234 (9.6%)</td>
</tr>
<tr>
<td>Length of surgery (min) 158.2 ± 96.1</td>
</tr>
<tr>
<td>Diverting ostomy 21.9%</td>
</tr>
<tr>
<td>Postoperative</td>
</tr>
<tr>
<td>Acute renal failure 34 (1.4%)</td>
</tr>
<tr>
<td>Anastomotic leak 60 (2.5%)</td>
</tr>
<tr>
<td>Arrhythmia 46 (1.9%)</td>
</tr>
<tr>
<td>Myocardial infarction 5 (0.20%)</td>
</tr>
<tr>
<td>Pneumonia 22 (0.90%)</td>
</tr>
<tr>
<td>Reintubation 9 (0.37%)</td>
</tr>
<tr>
<td>Sepsis 45 (1.8%)</td>
</tr>
<tr>
<td>SSI deep 12 (0.49%)</td>
</tr>
<tr>
<td>SSI superficial 107 (4.4%)</td>
</tr>
<tr>
<td>SSI organ/space 96 (3.9%)</td>
</tr>
<tr>
<td>UTI 95 (3.9%)</td>
</tr>
<tr>
<td>DVT 65 (2.7%)</td>
</tr>
<tr>
<td>Length of stay (d) 8.2 ± 7.1</td>
</tr>
<tr>
<td>Readmission 295 (12.1%)</td>
</tr>
<tr>
<td>Reoperation 114 (4.7%)</td>
</tr>
<tr>
<td>Mortality 9 (0.37%)</td>
</tr>
</tbody>
</table>

Outcome variables stratified by level of glycemia. *P* values indicate probabilities of significant differences found by analysis of variance testing, and footnote symbols (*, †, or ‡) indicate the group(s) that differ from normoglycemia as reference.
Preoperative glucose as a screening tool in patients without diabetes

Rui Wang, BA, a,b Maria T. Panizales, MSN, RN, a,* Margo S. Hudson, MD, c
Selwyn O. Rogers, MD, MPH, a,d and Jeffrey L. Schnipper, MD, MPH b,e
- 6683 patients without diabetes
- nonemergent vascular and general surgery
- Last glucose measured within 30 d before surgery was the main predictor variable
- postoperative infection within 30 d as the primary outcome.
Fig. 3 — Preoperative glucose level as a marker for postoperative infection, over the range 70–179 mg/dL, adjusted for age, gender, BMI, ASA classification, and type of surgery using a multivariable logistic model.
Follow-up data demonstrated that 15% of patients with preoperative glucose $\geq 100$ mg/dL were diagnosed with diabetes within one year after surgery.
Pathophysiology

- impaired vasodilatory responses in the wound;
- changes in expression of adhesion molecules, cytokines, and chemokines;
- enhanced responses of complement;
- depressed neutrophil chemotaxis, phagocytosis, and release of reactive oxygen species.
Hyperglycemia in patients without Diabetes is more significant

DIABETES PARADOX
Perioperative Hyperglycemia and Risk of Adverse Events Among Patients With and Without Diabetes

Meera Kotagal, MD,* Rebecca G. Symons, MPH;‡ Irl B. Hirsch, MD,§ Guillermo E. Umpierrez, MD,§ E. Patchen Dellinger, MD,¶ Ellen T. Farrokh, MD,|| and David R. Flum, MD, MPH**; for the SCOAP-CERTAIN Collaborative††

Adverse events, by diabetes status and postoperative glucose level.
TABLE 2. Multivariate Model for Risk of Composite Adverse Events Among Patients With and Without Diabetes

<table>
<thead>
<tr>
<th>Patients with diabetes</th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.03</td>
<td>1.02–1.04</td>
</tr>
<tr>
<td>Male sex</td>
<td>1.23</td>
<td>1.06–1.43</td>
</tr>
<tr>
<td>Perioperative insulin use</td>
<td>1.33</td>
<td>1.03–1.71</td>
</tr>
<tr>
<td>Perioperative BG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG $\leq$ 125</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>125 $&lt;$ BG $&lt;$ 180</td>
<td>0.76</td>
<td>0.57–1.01</td>
</tr>
<tr>
<td>BG $\geq$ 180</td>
<td>0.94</td>
<td>0.72–1.23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients without diabetes</th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.04</td>
<td>1.03–1.05</td>
</tr>
<tr>
<td>Male sex</td>
<td>1.02</td>
<td>0.87–1.19</td>
</tr>
<tr>
<td>Perioperative insulin use</td>
<td>3.62</td>
<td>2.28–5.74</td>
</tr>
<tr>
<td>Perioperative BG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG $\leq$ 125</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>125 $&lt;$ BG $&lt;$ 180</td>
<td>2.39</td>
<td>1.89–3.03</td>
</tr>
<tr>
<td>BG $\geq$ 180</td>
<td>5.12</td>
<td>3.80–6.90</td>
</tr>
</tbody>
</table>
The Protective Effect of Insulin
Importance of Perioperative Glycemic Control in General Surgery:
A Report From the Surgical Care and Outcomes Assessment Program

Steve Kwon, MD, MPH*;†, Rachel Thompson, MD‡, Patchen Dellinger, MD*, David Yanez, PhD§, Ellen Farrohki, MDǁ, and David Flum, MD, MPH*;†
evaluated the relationship of perioperative hyperglycemia (>180 mg/dL) and insulin administration on mortality, reoperative interventions, and infections

colorectal and bariatric surgery at 47 participating hospitals
Adverse events among patients without diabetes

- Glucose ≤ 180 (n = 6,512)
- Glucose > 180 (n = 1,013)

Proportion of patients (%)

- Composite infections
- All reoperative interventions
- In-hospital deaths

* indicates statistical significance.
patients with hyperglycemia who received insulin were at no greater risk than those with normoglycemia

**FIGURE 2.**
Multivariate logistic regression of composite infections, reoperative interventions, and inpatient mortality rates for hyperglycemia (>180 mg/dL) on the day of surgery with and without adjustment for administration of insulin.
The Role of Intensive Glycemic Control in ICU Patients

- Leuven Surgical Trial in 2001 (single center)
- Leuven Medical Trial in 2006 (single center)
- NICE SUGAR trial (multi center)
INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS

GREET VAN DEN BERGHE, M.D., PH.D., PIETER WOUTERS, M.SC., FRANK WEEKERS, M.D., CHARLES VERWAEST, M.D., FRANS BRUYNINCKX, M.D., MIET SCHETZ, M.D., PH.D., DIRK VLASELERS, M.D., PATRICK FERDINANDE, M.D., PH.D., PETER LAUWERS, M.D., AND ROGER BOUILLON, M.D., PH.D.
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>CONVENTIONAL TREATMENT (N=783)</th>
<th>INTENSIVE TREATMENT (N=765)</th>
<th>P VALUE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death during intensive care — no./total no. (%)</td>
<td>63/783 (8.0)</td>
<td>35/765 (4.6)</td>
<td>&lt;0.04 (adjusted)</td>
</tr>
<tr>
<td>During first 5 days of intensive care</td>
<td>14/783 (1.8)</td>
<td>13/765 (1.7)</td>
<td>0.9</td>
</tr>
<tr>
<td>Among patients receiving intensive care for &gt;5 days</td>
<td>49/243 (20.2)</td>
<td>22/208 (10.6)</td>
<td>0.005</td>
</tr>
<tr>
<td>Reason for intensive care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac surgery</td>
<td>25/493 (5.1)</td>
<td>10/477 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Neurologic disease, cerebral trauma, or brain surgery</td>
<td>7/30 (23.3)</td>
<td>6/33 (18.2)</td>
<td></td>
</tr>
<tr>
<td>Thoracic surgery, respiratory insufficiency, or both</td>
<td>10/56 (17.9)</td>
<td>5/66 (7.6)</td>
<td></td>
</tr>
<tr>
<td>Abdominal surgery or peritonitis</td>
<td>9/58 (15.5)</td>
<td>6/45 (13.8)</td>
<td></td>
</tr>
<tr>
<td>Vascular surgery</td>
<td>2/32 (6.2)</td>
<td>2/30 (6.7)</td>
<td></td>
</tr>
<tr>
<td>Multiple trauma or severe burns</td>
<td>3/35 (8.6)</td>
<td>4/33 (12.1)</td>
<td></td>
</tr>
<tr>
<td>Transplantation</td>
<td>1/44 (2.3)</td>
<td>2/46 (4.4)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6/35 (17.1)</td>
<td>0/35</td>
<td></td>
</tr>
<tr>
<td>No history of diabetes</td>
<td>57/680 (8.4)</td>
<td>31/664 (4.7)</td>
<td></td>
</tr>
<tr>
<td>No history of diabetes and &gt;5 days of intensive care</td>
<td>45/218 (20.6)</td>
<td>20/187 (10.7)</td>
<td></td>
</tr>
<tr>
<td>History of diabetes</td>
<td>6/103 (5.8)</td>
<td>4/101 (4.0)</td>
<td></td>
</tr>
<tr>
<td>History of diabetes and &gt;5 days of intensive care</td>
<td>4/25 (16.0)</td>
<td>2/21 (9.5)</td>
<td>0.02</td>
</tr>
<tr>
<td>Cause of death — no.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple-organ failure with proven septic focus</td>
<td>33</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Multiple-organ failure without detectable septic focus</td>
<td>18</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Severe brain damage</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Acute cardiovascular collapse</td>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>In-hospital death — no./total no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>85/783 (10.9)</td>
<td>55/765 (7.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>Patients receiving intensive care for &gt;5 days</td>
<td>64/243 (26.3)</td>
<td>35/208 (16.8)</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Figure 1. Kaplan–Meier Curves Showing Cumulative Survival of Patients Who Received Intensive Insulin Treatment or Conventional Treatment in the Intensive Care Unit (ICU).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Conventional Treatment (N=783)</th>
<th>Intensive Treatment (N=765)</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration of intensive care — days</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>3</td>
<td>3</td>
<td>0.2</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>2–9</td>
<td>2–6</td>
<td></td>
</tr>
<tr>
<td>≤5 Days</td>
<td>Median</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>2–3</td>
<td>2–3</td>
<td>0.2</td>
</tr>
<tr>
<td>&gt;5 days</td>
<td>Median</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>9–27</td>
<td>8–20</td>
<td>0.003</td>
</tr>
<tr>
<td>Patients requiring &gt;14 days of intensive care — no. (%)</td>
<td>123 (15.7)</td>
<td>87 (11.4)</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Duration of ventilatory support — days</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>2</td>
<td>2</td>
<td>0.06</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>1–6</td>
<td>1–4</td>
<td></td>
</tr>
<tr>
<td>≤5 Days of intensive care</td>
<td>Median</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>1–2</td>
<td>1–2</td>
<td>0.9</td>
</tr>
<tr>
<td>&gt;5 Days of intensive care</td>
<td>Median</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>7–23</td>
<td>6–16</td>
<td>0.006</td>
</tr>
<tr>
<td>Patients requiring &gt;14 days of ventilatory support — no. (%)</td>
<td>93 (11.9)</td>
<td>57 (7.5)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Inotropic or vasopressor treatment — no. (%)</strong></td>
<td>586 (74.8)</td>
<td>574 (75.0)</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Renal impairment — no. (%)</strong></td>
<td>12</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Peak plasma creatinine &gt;2.5 mg/dl</td>
<td>96 (12.3)</td>
<td>69 (9.0)</td>
<td>0.04</td>
</tr>
<tr>
<td>Peak plasma urea nitrogen &gt;54 mg/dl</td>
<td>88 (11.2)</td>
<td>59 (7.7)</td>
<td>0.02</td>
</tr>
<tr>
<td>Dialysis or continuous venovenous hemofiltration</td>
<td>64 (8.2)</td>
<td>37 (4.8)</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Hyperbilirubinemia (peak bilirubin &gt;2 mg/dl) — no. (%)</strong></td>
<td>209 (26.7)</td>
<td>171 (22.4)</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Bloodstream infection — no. (%)</strong></td>
<td>61 (7.8)</td>
<td>32 (4.2)</td>
<td>0.003</td>
</tr>
<tr>
<td>Septicemia during intensive care</td>
<td>134 (17.1)</td>
<td>106 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Treatment with antibiotics for &gt;10 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromyographic evidence of critical-illness polynuropathy — no./total no. (%)</td>
<td>107/206 (51.9)</td>
<td>45/157 (28.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>At any time</td>
<td>39/206 (18.9)</td>
<td>11/157 (7.0)</td>
<td>0.001</td>
</tr>
<tr>
<td>On more than 2 occasions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red-cell transfusions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients requiring transfusion — no. (%)</td>
<td>243 (31.0)</td>
<td>219 (28.6)</td>
<td>0.3</td>
</tr>
<tr>
<td>No. of transfusions/patient‡</td>
<td>2</td>
<td>1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>1–3</td>
<td>1–2</td>
<td></td>
</tr>
<tr>
<td><strong>Cumulative TISS-28 score‡</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>108</td>
<td>105</td>
<td>0.2</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>76–293</td>
<td>76–215</td>
<td></td>
</tr>
<tr>
<td>≤5 Days of intensive care</td>
<td>Median</td>
<td>84</td>
<td>85</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>67–111</td>
<td>68–115</td>
<td>0.3</td>
</tr>
<tr>
<td>&gt;5 Days of intensive care</td>
<td>Median</td>
<td>563</td>
<td>431</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>329–956</td>
<td>271–670</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Hypoglycemia and Risk of Death in Critically Ill Patients

The NICE-SUGAR Study Investigators*
intensive glucose control leads to moderate and severe hypoglycemia, both of which are associated with an increased risk of death.

Dose response relationship
• meta-analysis of 21 trials in intensive care unit, perioperative care, myocardial infarction, and stroke or brain injury settings.

• IIT did not affect short-term mortality (relative risk, 1.00 [95% CI, 0.94 to 1.07] or infection rates

• IIT is associated with an increased risk for severe hypoglycemia
### Figure: Short-term mortality in studies of intensive insulin therapy, by inpatient setting.

<table>
<thead>
<tr>
<th>Study, Year (Reference)</th>
<th>Setting</th>
<th>Relative Risk (95% CI)</th>
<th>Events, n/n</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van den Berghe et al, 2006 (37)</td>
<td>MICU</td>
<td>0.99 (0.84–1.18)</td>
<td>178/595</td>
<td>182/605</td>
<td></td>
</tr>
<tr>
<td>Farah et al, 2007 (28)</td>
<td>MICU</td>
<td>1.17 (0.77–1.78)</td>
<td>22/41</td>
<td>22/48</td>
<td></td>
</tr>
<tr>
<td>Brunnhorst et al, 2008 (38)</td>
<td>MICU</td>
<td>0.95 (0.71–1.27)</td>
<td>61/247</td>
<td>75/289</td>
<td></td>
</tr>
<tr>
<td>Savioli et al, 2009 (39)</td>
<td>MICU</td>
<td>1.14 (0.45–2.89)</td>
<td>8/45</td>
<td>7/45</td>
<td></td>
</tr>
<tr>
<td>Van den Berghe et al, 2001 (16)</td>
<td>SICU</td>
<td>0.66 (0.48–0.92)</td>
<td>55/765</td>
<td>85/783</td>
<td></td>
</tr>
<tr>
<td>Grey and Perdrizel, 2004 (26)</td>
<td>SICU</td>
<td>0.53 (0.17–1.69)</td>
<td>4/34</td>
<td>6/27</td>
<td></td>
</tr>
<tr>
<td>Kirdemir et al, 2008 (27)</td>
<td>SICU</td>
<td>0.40 (0.08–2.01)</td>
<td>2/100</td>
<td>5/100</td>
<td></td>
</tr>
<tr>
<td>Arabi et al, 2008 (35)</td>
<td>Mixed MICU/SICU</td>
<td>0.84 (0.64–1.09)</td>
<td>72/266</td>
<td>83/257</td>
<td></td>
</tr>
<tr>
<td>De La Rosa et al, 2008 (42)</td>
<td>Mixed MICU/SICU</td>
<td>1.13 (0.89–1.44)</td>
<td>93/254</td>
<td>81/250</td>
<td></td>
</tr>
<tr>
<td>NICE-SUGAR, 2009 (17)</td>
<td>Mixed MICU/SICU</td>
<td>1.07 (0.97–1.18)</td>
<td>670/3010</td>
<td>627/3012</td>
<td></td>
</tr>
<tr>
<td>Preiser et al, 2009 (41)</td>
<td>Mixed MICU/SICU</td>
<td>1.22 (0.93–1.59)</td>
<td>100/536</td>
<td>83/542</td>
<td></td>
</tr>
<tr>
<td>Mackenzie et al, 2008 (40)</td>
<td>Mixed MICU/SICU</td>
<td>0.82 (0.58–1.15)</td>
<td>39/121</td>
<td>47/119</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (I² = 36.0%; P = 0.103)</strong></td>
<td></td>
<td></td>
<td>1304/6014</td>
<td>1303/6077</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study, Year (Reference)</th>
<th>Setting</th>
<th>Relative Risk (95% CI)</th>
<th>Events, n/n</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walters et al, 2006 (54)</td>
<td>Acute CVA</td>
<td>2.79 (0.12–62.48)</td>
<td>1/13</td>
<td>0/12</td>
<td></td>
</tr>
<tr>
<td>Malmberg et al, 1995 (13)</td>
<td>Acute MI</td>
<td>0.82 (0.51–1.32)</td>
<td>28/306</td>
<td>35/314</td>
<td></td>
</tr>
<tr>
<td>van der Horst et al, 2003 (50)</td>
<td>Acute MI</td>
<td>0.83 (0.48–1.43)</td>
<td>23/476</td>
<td>27/464</td>
<td></td>
</tr>
<tr>
<td>Cheung et al, 2006 (48)</td>
<td>Acute MI</td>
<td>1.36 (0.39–4.69)</td>
<td>6/126</td>
<td>4/114</td>
<td></td>
</tr>
<tr>
<td>Azevedo et al, 2007 (52)</td>
<td>Acute brain injury</td>
<td>0.73 (0.30–1.76)</td>
<td>8/31</td>
<td>6/17</td>
<td></td>
</tr>
<tr>
<td>Yang et al, 2009 (34)</td>
<td>Acute brain injury</td>
<td>1.01 (0.68–1.51)</td>
<td>35/121</td>
<td>34/119</td>
<td></td>
</tr>
<tr>
<td>Butterworth et al, 2005 (45)</td>
<td>CABG</td>
<td>1.23 (0.38–3.97)</td>
<td>6/188</td>
<td>5/193</td>
<td></td>
</tr>
<tr>
<td>Li et al, 2006 (30)</td>
<td>CABG</td>
<td>1.65 (0.15–17.54)</td>
<td>2/51</td>
<td>1/42</td>
<td></td>
</tr>
<tr>
<td>Okasan et al, 2007 (49)</td>
<td>Ventricular fibrillation</td>
<td>0.94 (0.53–1.68)</td>
<td>13/39</td>
<td>18/51</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal (I² = 0.0%; P = 0.975)</strong></td>
<td></td>
<td></td>
<td>122/1351</td>
<td>130/1326</td>
<td></td>
</tr>
<tr>
<td><strong>Total (I² = 0.0%; P = 0.463)</strong></td>
<td></td>
<td></td>
<td>1426/7365</td>
<td>1433/7403</td>
<td></td>
</tr>
</tbody>
</table>
Superiority of moderate control of hyperglycemia to tight control in patients undergoing coronary artery bypass grafting

Castigliano M. Bhamidipati, DO, a Damien J. LaPar, MD, a George J. Stukenborg, MA, PhD, b Christine C. Morrison, MSN, a John A. Kern, MD, a Irving L. Kron, MD, a and Gorav Ailawadi, MD a
FIGURE 2. Major complications and mortality by group. Data shown reflect percentage of major complications and mortality by serum glucose levels.
Glycemic Control in Non-ICU Patients

- Sliding Scale Insulin treats hyperglycemia AFTER it has occurred.
- Basal subq insulin administration with boluses throughout the day can prevent hyperglycemia
Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients With Type 2 Diabetes Undergoing General Surgery (RABBIT 2 Surgery)

Guillermo E. Umpierrez, MD¹,²
Dawn Smiley, MD¹,²
Sol Jacobs, MD¹,³
Limin Peng, PhD⁴
Angel Temponi, MD¹,²

Patrick Mulligan, BA¹,³
Denise Umpierrez, BA¹,²
Christopher Newton, MD¹,²
Darin Olson, MD, PhD¹,⁵
Monica Rizzo, MD⁶

The strongest evidence that hyperglycemia worsens outcomes is from cardiac surgery and critically ill patients admitted to surgical intensive care units (ICU) (7–9). In this setting, observational and prospective clinical trials have shown that hyper-
multicenter RCT

patients with type 2 diabetes undergoing general surgery

Target: postoperative glucose levels between 110 and 180 mg/dL

Result: improvement of glycemic control after the first day and decreased the risk of infections and all complications with the use of basal-bolus insulin compared with sliding scale insulin
A: Glucose levels during basal-bolus and SSI treatment.

Umpierrez G E et al. Dia Care 2011;34:256-261
Perioperative Blood Glucose Monitoring and Control in Major Vascular Surgery Patients

J.P. van Kuijk, O. Schouten, W.J. Flu, C.A. den Uil, J.J. Bax, D. Poldermans
<table>
<thead>
<tr>
<th>Author</th>
<th>Patients (N)</th>
<th>DM (%)</th>
<th>Mean age (years)</th>
<th>Type of surgery</th>
<th>Glucose target (mmol/l)</th>
<th>Mortality RR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surgical ICU patients</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>He(^3)</td>
<td>188</td>
<td>18</td>
<td>65.5</td>
<td>Abdominal/Neuro</td>
<td>4.4–6.1</td>
<td>Not reported</td>
</tr>
<tr>
<td>Stecher(^3)</td>
<td>117</td>
<td>13</td>
<td>52.6</td>
<td>Abdominal/trauma</td>
<td>4.4–6.1</td>
<td>1.05 (0.45–2.46)</td>
</tr>
<tr>
<td>Grey(^3)</td>
<td>61</td>
<td>12</td>
<td>55.6</td>
<td>General</td>
<td>4.4–6.6</td>
<td>0.53 (0.17–1.69)</td>
</tr>
<tr>
<td>Kia(^3)</td>
<td>265</td>
<td>26</td>
<td>68.2</td>
<td>Abdominal</td>
<td>4.1–6.3</td>
<td>1.74 (0.86–3.51)</td>
</tr>
<tr>
<td><strong>All surgical</strong></td>
<td>635</td>
<td>20</td>
<td>62.9</td>
<td></td>
<td>4.1–6.6</td>
<td>1.12 (0.60–2.10)</td>
</tr>
<tr>
<td><strong>Surgical—Medical ICU patients</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitchell(^3)</td>
<td>70</td>
<td>14</td>
<td>65.5</td>
<td>Surgical 62%</td>
<td>4.4–6.1</td>
<td>3.00 (0.89–10.16)</td>
</tr>
<tr>
<td>Wang(^3)</td>
<td>116</td>
<td>11</td>
<td>66.2</td>
<td>Surgical 15%</td>
<td>4.4–6.1</td>
<td>0.27 (0.13–0.57)</td>
</tr>
<tr>
<td>Brunkhorst(^3)</td>
<td>537</td>
<td>30</td>
<td>64.6</td>
<td>Surgical 53%</td>
<td>4.4–6.1</td>
<td>0.95 (0.71–1.27)</td>
</tr>
<tr>
<td>Iapichino(^3)</td>
<td>72</td>
<td>17</td>
<td>62.3</td>
<td>Surgical 32%</td>
<td>4.4–6.1</td>
<td>Not reported</td>
</tr>
<tr>
<td>Mackenzie(^3)</td>
<td>240</td>
<td>83</td>
<td>64.5</td>
<td>Surgical 46%</td>
<td>4.0–5.9</td>
<td>0.82 (0.58–1.15)</td>
</tr>
<tr>
<td>Arabi(^4)</td>
<td>523</td>
<td>40</td>
<td>52.4</td>
<td>Surgical 17%</td>
<td>4.4–6.1</td>
<td>0.84 (0.64–1.09)</td>
</tr>
<tr>
<td>Devos(^4)</td>
<td>1101</td>
<td>19</td>
<td>64.8</td>
<td>Surgical 58%</td>
<td>4.4–6.1</td>
<td>1.20 (0.93–1.55)</td>
</tr>
<tr>
<td>Azevedo(^e)</td>
<td>337</td>
<td>31</td>
<td>56.2</td>
<td>Surgical 40%</td>
<td>4.4–6.6</td>
<td>0.91 (0.62–1.34)</td>
</tr>
<tr>
<td>NICE-SUGAR(^4)</td>
<td>6104</td>
<td>20</td>
<td>60.4</td>
<td>Surgical 34%</td>
<td>4.5–6.0</td>
<td>1.14 (1.02–1.28)</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>3631</td>
<td>23</td>
<td>61.8</td>
<td></td>
<td>4.0–6.6</td>
<td>0.96 (0.80–1.15)</td>
</tr>
</tbody>
</table>

\(^e\) Denotes unpublished data.
Knowledge GAP

- Cardiac surgery SCIP performance measure:
  blood glucose <200 mg/dL POD#1 and POD#2

- No specific performance measures have been issued regarding vascular surgical patients.
However, the data shows that there is probably significant benefit to be gained for vascular surgery patients by careful attention to glycemic management.
The American Association of Clinical Endocrinologists (AACE) and the ADA- 2009 Consensus Statement

Updated recommendations:

reasonable, achievable, and safe glycemic goals:

ICU: range between 140 and 180 mg/dL.

General surgical patients:
- a premeal glucose target <140 mg/dL
- random blood glucose <180 mg/dL
- more or less aggressive goals depending upon the clinical status

Same management for patients with and without diabetes
Emory Project

- Basal-bolus regimen with insulin glargine and glulisine
  - Discontinue oral antidiabetic drugs on admission.
  - Start total daily insulin dose:
    - 0.4 units · kg body wt\(^{-1}\) · day\(^{-1}\) when the admission blood glucose concentration is 140-200 mg/dl
    - 0.5 units · kg body wt\(^{-1}\) · day\(^{-1}\) when the admission blood glucose concentration is between 201-400 mg/dl
  - Give one-half of total daily dose as insulin glargine and one-half as insulin glulisine.
  - Give insulin glargine once daily at the same time of the day.
  - Give insulin glulisine in three equally divided doses before each meal. Hold insulin glulisine if patient is not able to eat.

- Supplemental insulin (glulisine) following the “sliding-scale” protocol for blood glucose >140 mg/dl:
  A. If a patient is able and expected to eat all or most of his/her meals, give supplemental glulisine insulin before each meal and at bedtime following the “usual” column.
  b. If a patient is not able to eat, give supplemental glulisine insulin every 6 h (6–12–6–12), following the “insulin-sensitive” column.

- Insulin adjustment:
  a. If the fasting or mean blood glucose during the day is >140 mg/dl in the absence of hypoglycemia, increase insulin glargine dose by 20% every day.
  b. If patient develops hypoglycemia (<70 mg/dl), decrease glargine daily dose by 20%.
Conclusions

- Hyperglycemia is common in diabetic and non-diabetic hospitalized patients
- Hyperglycemia increases the risk of adverse postoperative outcomes
- Intensive IV insulin therapy in ICU patients did not improve mortality and may result in hypoglycemia
- Moderate hyperglycemia management is better achieved with the basal-bolus method in non-ICU patients
- Lack of data on hyperglycemia management in vascular surgery patients.
FGVSG proposal

- Currently, we collect data on DM diagnosis and treatment regimen (insulin, oral meds, diet)
- No data exists within VQI about glycemic control
- Proposal:
  Add Preoperative Glucose level (0-30 days)
  Add in hospital insulin use
UNDERSTAND THE CURRENT AND FUTURE CMS PQRS REQUIREMENTS
Physician Quality Reporting System
PQRS - Background

- Formerly known as the PQRI – Physician Quality Reporting Initiative
-Began in 2007
-Currently consists of 382 quality measures for Medicare beneficiaries
PQRS Quality Measures

- Quality measures are developed by provider associations, quality groups, and CMS
- Measures change from year to year
PQRS

- 6 National Quality Strategy (NQS) Domains
  1. Effective clinical care
  2. Patient safety
  3. Communication and care coordination
  4. Person and Caregiver-centered experience and outcomes
  5. Efficiency and Cost reduction
  6. Community/Population Health
PQRS

- First national program designed by CMS to link the reporting of quality data to physician payment

- Reporting on quality measures is voluntary
Incentives \rightarrow Adjustments
Penalties

- 2010 – 2% incentive payment
- 2011 – 1% incentive
- 2012 – 2014 – 0.5% incentive
- 2015 – 1.5% penalty (based on 2013 data)
- 2016 – 2.0% penalty (based on 2014 data)
Examples of Quality Measures

- PQRS #20 Timing of prophylactic parenteral antibiotic
- PQRS #23 Venous thromboembolism prophylaxis
- PQRS #357 Surgical Site Infection
- Readmission to the hospital
Vascular Surgery Quality Measures

1. #172 Hemodialysis vascular access decision-making by surgeon to maximize placement of autogenous arterial venous fistula
2. #257 Statin therapy at discharge after lower extremity bypass
3. #258 Rate of open repair of small or moderate non-ruptured AAA without major complications (discharged home by POD7)
4. #259 Rate of EVAR of small or moderate non-ruptured AAA without major complications (discharged home by POD2)
5. #260 Rate of CEA for asymptomatic patients without major complications (d/c home by POD2)
6. #344 Rate of CAS for asymptomatic patients without major complications (d/c home by POD2)
7. #345 Rate of postoperative stroke or death in asymptomatic patients undergoing CAS
8. #346 Rate of postoperative stroke or death in asymptomatic patients undergoing CEA
9. #347 Rate of EVAR of small or moderate non-ruptured AAA who die while in hospital
Proposed Measures for 2015

- Recurrence or amputation following endovascular infrainguinal lower extremity revascularization for non-limb threatening ischemia

- Recurrence or amputation following open infrainguinal lower extremity revascularization for non-limb threatening ischemia
Why participate

- Gives eligible providers the opportunity to assess the quality of care they are providing
- Quantify how often you are meeting a particular quality metric
- Feedback reports allow you to compare your performance with your peers
How to participate

- Reporting is voluntary
- Report data on quality measures for covered Physician Fee Schedule (PFS) services furnished to Medicare Part B beneficiaries
- Individual vs. Group reporting
Individual vs. Group

- Surgeons in a group practice must report individually

UNLESS

- The group practice submits a request to participate via the Group Practice Reporting Option (GPRO) and has received CMS approval
Individual reporting methods

- Medicare Part B claims
- Qualified PQRS registry
- Direct EHR using certified EHR technology
- CEHRT via Data Submission Vendor
- Qualified clinical data registry (QCDR)
Individual reporting methods

- Medicare Part B claims
Medicare Part B Claims

- At least 9 measures covering at least 3 NQS domains, or,
- 1 to 8 measures covering 1 to 3 NQS domains, and
- Report each measure for at least 50% of eligible Medicare part B FFS patients.
Individual reporting methods

- Qualified PQRS registry
Qualified PQRS Registry

- At least 9 measures covering at least 3 NQS domains, or,
- 1 to 8 measures covering 1 to 3 NQS domains, and
- Report each measure for at least 50% of Medicare part B FFS patients
Individual reporting methods

- Medicare Part B claims
- Qualified PQRS registry
- Direct EHR using certified EHR technology
- CEHRT via Data Submission Vendor
Direct EHR / Data Submission Vendor

- At least 9 measures covering at least 3 NQS domains, or,
- If the EHR does not contain 9 measures, the physician must report on at least 1 measure for which there is data.
Individual reporting methods

- Medicare Part B claims
- Qualified PQRS registry
- Direct EHR using certified EHR technology
- CEHRT via Data Submission Vendor
- Qualified clinical data registry (QCDR)
Qualified Clinical Data Registry

- CMS approved registries that collect and submit quality measure data to CMS on behalf of the individual physician

- The VQI is seeking to become a Qualified Clinical Data Registry for the PQRS
QCDR Measures Requirements

- QCDRs must support at least 9 measures across 3 of the 6 National Quality Strategy Domains

- 1 measure must be an outcome measure

- Measures must be able to be risk adjusted
Group reporting methods

- Qualified PQRS registry
- Direct EHR using CEHRT
- CEHRT via Data Submission Vendor
- Web interface (for groups of 25+ only)
- CMS-certified survey vendor (for groups of 25+ only)
Group reporting methods

- Qualified PQRS registry

- CMS-certified survey vendor (for groups of 25+ only)
Qualified PQRS Registry

- At least 9 measures covering at least 3 NQS domains, or,
- 1 to 8 measures covering 1 to 3 NQS domains, and
- Report each measure for at least 50% of Medicare part B FFS patients
- If the group practice does not report on 9 measures, CMS has a process to determine if they should have reported on additional quality measures.
Group reporting methods

- Direct EHR using CEHRT
- CEHRT via Data Submission Vendor

(25+ only)
Vendor

- At least 9 measures covering at least 3 NQS domains, or,
- If the EHR does not contain 9 measures, the group must report the measures for which Medicare data are available.
Group reporting methods

- Qualified PQRS registry
- Direct EHR using CEHRT
- CEHRT via Data Submission Vendor
- Web interface (for groups of 25+ only)
- CMS-certified survey vendor (for groups of 25+ only)
Web Interface

- Contains preselected quality measures that need to be reported
- 25-99 Physicians: Report on the first 218 patients
- 100+ Physicians: Report on the first 411 patients
Group reporting methods

- Qualified PQRS registry
- Direct EHR using CEHRT
- CEHRT via Data Submission Vendor
- Web interface (for groups of 25+ only)
- CMS-certified survey vendor (for groups of 25+ only)
Physicians supplement their PQRS reporting with the CAHPS survey (Consumer Assessment of Healthcare Providers and Systems)

A CMS-certified vendor will administer and collect the CAHPS for PQRS survey on behalf of the group practice’s patients
What to consider when selecting measures

- Clinical conditions commonly treated
- Types of care delivered frequently (e.g. preventive, chronic, acute)
- Settings where care is often delivered (e.g. office, ED, surgical suite)
- Quality improvement goals for 2014
- Other quality reporting programs in use or being considered
- What reporting method works best for you and/or your group practice
2017 and beyond

- More quality measures
- ? Higher penalties for not reporting
- ? Will private insurers adopt similar strategies
Cons

- Not mandatory that all physicians report their quality metrics
- 2% penalty may not be enough to encourage physicians to report
- Some of the quality measures are not validated
- Time and money to implement a reliable reporting system
Pros

- Attempts to improve the quality of care provided by physicians by using quality metrics developed by physicians in conjunction with CMS
Thank You
Feedback Reports

- Reporting rates of physicians
- Clinical performance
- Incentives earned
Maintenance of Certification Program

- Earn an additional incentive of 0.5% by working with a MOC entity

- Satisfactorily submit PQRS quality data for a 12-month period

AND

- Participate in a MOC program and successfully complete a MOC program practice assessment
Value-Based Payment Modifier program

- CMS is moving toward physician reimbursement that rewards value and a pay-for-performance structure rather than volume in a fee-for-service program.
Value-Based Payment Modifier

- Provides comparative performance information to physicians as part of Medicare’s efforts to improve the quality and efficiency of medical care.
- In 2015, groups of 100+ physicians will be subject to the value modifier
- In 2016, groups of 10+ physicians will be subject to the value modifier
- In 2017, all eligible physicians will be impacted
Collaboration and Integration of Data Resources to Improve Quality in an Academic Medical Center

Cris Crippen, RN
University of Florida
College of Medicine
Department of Surgery
• 2013 McKesson and eHealth Initiative survey
  – How are healthcare organizations using data to improve care?
    • Revenue Cycle Management
    • Resource Utilization
    • Prevention of Fraud and Abuse
    • Population Health Management
    • Quality Improvement

• Data Accessibility
Integrated Data Repository (IDR)

**Source Data**
- EMR
- Administrative Registries
- Labs
- Trials

**Quality**
- Provider Reports
- Public Reports
- Dashboards
- P4P
- Patient Satisfaction
- Disease Management

**Research**
- Clinical Trials
- Consents
- Public Health
- Epidemiology
- Best Practice

Purpose: Provide the same answer to like questions
110 quality databases identified at UF Health
EPIC Data

- Standardize report to import into database
  - Inclusion data
    - ICD 9 Primary Diagnosis
    - CPT Procedure Codes
    - Residents and fellows
    - Service
    - Attending

Currently manual entry
Goals for Consolidation

• Consolidate data and resources
  10 individual databases to one web-based interface
  Provide standard definitions (complications, case inclusion)
  Imported directly from EPIC (increased reliability)

• Standardize M & M conference materials

• Identify areas for improvement
• Similar projects in your institutions?

• Vision of VQI data to be shared by outside sources?