VSGNE 2010
22 Participating Hospitals
VSGNE 2010
22 Participating Hospitals

12 Community - 10 Academic
25 – 950 Hospital Beds

“Real World Practice”
Maine
Central Maine Medical Center, Lewiston
Pietro Guadalupi, MD
Allan M. Ingraham, MD
Mark Lanzeri, MD
Steven Levin, MD
Pamela R. Rietschel, MD
Sarat Vaddineni, MD
Eastern Maine Medical Center, Bangor
Robert A. Cambria, MD
Robert A. Clough, MD
Charles E. Dixon, MD
Larry D. Flanagan, MD
Lisa Floyd, MD
Terrance K. Fournier, MD
John W. Hallett, MD
Felix Hernandez, Jr., MD
Dennis Ng, MD
Andrew Sherwood, MD
Peter Ver Lee, MD
Maine General Medical Center, Augusta, ME
Christobal G. Alvarado, MD
Maine Medical Center, Portland
Georges S. Abourjaily, MD
Christopher Baker, MD
Paul H.S. Bloch, MD
David Burkey, MD
David Butzel, MD
Rajiv Desai, MD
Jeffrey E. Florman, MD
Neal C. Hadro, MD
Robert Hawkins, MD
Christopher Healey, MD
William E. Herbert, MD
Peter Higgins, MD
Douglas L. Jicha, MD
Jens Eldrup-Jorgensen, MD
Usman Nasir-Khan, MD
Eddie Kwan, MD
Walter Keller, DO
John Wahlig, MD
Mercy Hospital, Portland
Paul H.S. Bloch, MD
Robert Hawkins, MD
Christopher Healey, MD
William E. Herbert, MD
Jens Eldrup-Jorgensen, MD

New Hampshire
Catholic Medical Center, Manchester
Yvon Baribeau, MD
David Coelho, MD
William Clutterbuck, MD
Patricia Furey, MD
Richard Murphy, MD
William Tanski, MD
Concord Hospital, Woodsville
Christopher S. Danielson, DO
Kenneth S. Danielson, MD
Dartmouth-Hitchcock Med Ctr, Lebanon
Christopher Alessi, MD
Jack L. Cronenwett, MD
Mark F. Fillinger, MD
Philip P. Goodney, MD
Richard J. Powell, MD
Eva M. Rzucidlo, MD
Marc C. Schermerhorn, MD
David Stone, MD
Daniel B. Walsh, MD
Mark C. Wyers, MD
Robert M. Zwolak, MD
Elliot Hospital, Manchester
Larry Hoeppe, MD
William Wilson, MD
Lakes Region General Hospital, Laconia
Samuel C. Aldridge, MD
Robert Anderson, MD
Glenn Fusonie, MD
John H. Vignati, MD
Vermont
Fletcher Allen Health Care, Burlington
Julie E. Adams, MD
Daniel J. Bertges, MD
Christopher Morris, MD
Kenneth Najarian, MD

Vermont Continued:
Fletcher Allen Health Care, Burlington Continued
David Belcher, MD
Todd Peebles, MD
Michael Ricci, MD
Andrew C. Stanley, MD
Georg Steinthorsson, MD
Steven R. Shackleford, MD
Rutland Regional Medical Center, Rutland
Matthew Conway, MD
J. Christian Higgins, MD
Baxter Holland, MD
Brad Jimmo, MD
John Louras, MD
Victor Pisanieli, MD

Massachusetts
Baystate Medical Center, Springfield
Mark Hirko, MD
Berkshire Medical Center, Pittsfield
Eli L. Carletti, MD
Michael S. Cohn, MD
José M. Heisecke, MD
Christian R. Galvez-Padilla, MD
Parvis J. Sadighi, MD
Boston Medical Center, Boston
Allik Farber, MD
Jeffrey Kalish, MD
Palma Shaw, MD
Jonathan Woodson, MD
Massachusetts General Hospital, Boston
Richard Cambria, MD
Mark F. Conrad, MD
Virendra I Patel, MD
Tufts Medical Center, Boston
Keven Daly, MD
James Estes, MD
James Halin, MD
Mark D. Iafrati, MD
William C. Mackey, MD
Stephen Maloney, MD
Thomas O’Donnell, MD
Noah Rosen, MD
Calin Vasiliiu, MD
Andrew Weintrub, MD
St Anne’s Hospital, Fall River
David Bigatell, MD
Ibrahim G. Eid, MD
Martin Fogle, MD

Massachusetts Continued:
University of Massachusetts Medical Center, Worcester
Elias Arous, MD
Rocco Ciocca, MD
Mohammad Eslam, MD
Subhaah Gulati, MD
Louis Mesina, MD
William P. Robinson III, MD
Andres Schanzer, MD
Stephens Taylor, MD
Richard Whitten, MD

Connecticut
St. Francis Hospital, Hartford
Scott Facteau, MD
Steven Ruby, MD
Eugene D. Sullivan MD
Yale New Haven Hospital, New Haven
Melin Arici, MD
John Aruny, MD
John A. Curtis, MD
Alan Dakid, MD
Ralph DeNatale, MD
John Forrest, MD
Richard Gusberg, MD
Faisal Hasan, MD
Jeffrey Hnath, MD
Jeffrey Indes, MD
Carlos Men, MD
Hamid Mojibian, MD
Bart Muhs, MD
Jeffrey Pollak, MD
Eric Reiner, MD
Michael Remetz, MD
Bauer Sumpio, MD
Tom Sweeney, MD
Craig Thomson, MD

> 100 VSGNE Members 2010
>14,000 Operations Reported

CEA, CAS, AAA, LEB (2003-2010)
Guests from Other Regions

- Adam Beck, MD
  - University of Florida, Gainesville, FL

- Jeb Hallett, MD
  - Roper St Francis, Charleston, SC

- Ellen Farrokhi, MD
  - Virginia Mason Medical Center, Seattle, WA

- Mark Davies, MD, PhD, MBA
  - Methodist Hospital, Houston, TX

- Todd Vogel, MD
  - University of Medicine & Dentistry of NJ, Brunswick, NJ

- Larry Kraiss, MD & Bjoern Suckow, MD
  - University of Utah Medical Center, Salt Lake City, UT

- Wayne Johnston, MD, Kori Kingsbury, CEO
  - Toronto General, Ontario, Canada
Sample of Quality Reports
Elective Endo AAA Repair

- Use of Beta Blockers
- Use of Aspirin or Plavix
- Use of Statins
- Volume

- Unfit OAAA
- Endoleak at Completion
- Type I or III Endoleak
- Estimated Median Blood Loss

- Not Extubated
- Post-op Complications
- Not Discharged Home
- Mortality

Notes:
- Use of Aspirin or Plavix: 95% benchmark (dashed line) established Nov. 2008.
- Volume: Figures for the last year are annualized.
- Post-op Complications: Transfusion > 3 units, MI, dysrhythmia, CHF, respiratory, renal dysfunction, leg ischemia, embol, bowel, esophageal, wound complication or return to OR.
Infra-Inguinal Bypass Mortality or Major Amputation by Surgeon

Set Parameters
- Start Date: 01/01/2003
- End Date: 05/30/2010
- Diabetes: All
- Dialysis: All
- Pre-Adm Living: All
- Prosthetic: All
- Indication: All
- Pathology: Occlusive
- Ambulation Pre-Op: All

Infra-inguinal Bypass Mortality or Major Amputation by Surgeon
Arranged by Increasing Annualized Rate
n=3027
Infra-Inguinal Bypass Mortality or Major Amputation by Center

Infra-inguinal Bypass Mortality or Major Amputation by Center
Arranged by Increasing Annualized Rate

n = 3284
Variation in Beta-Blocker Use Across Surgeons

Beta-Blocker Use by Medical Center
Agenda - Administrative Topics

- Version 1.7 upgrades, supra vs. infrainguinal procedures
- PVI form
- One year follow-up, multiple follow-ups
- EVAR, ? 2 or 3 year follow-up point
- Review final TEVAR, Dialysis form
- Potential primary amputation module
- Validation by hospital audits
- Printing reports for semi-annual meetings
Version 1.7 Software Update

- **New fields** for all procedures:
  - Skin prep type
  - Stroke (as post-op complication)
- CEA - drain
- PVI – bivalirudin
- CAS
  - Medicare health insurance claim number
  - Rankin score for stroke
  - Arterographic stenosis
Version 1.7 Software Update

- Save button on all web input pages
- Follow-up form editing/deletion allowed
- Multiple follow-up visits allowed
- Audit log for all user actions (eg, delete)
- 18 existing fields updated (eg, extubation)
- Unit conversions for Canadian centers
- Separated supra- from infra-inguinal LEB
  - Paper forms in folders
Supra vs. Infra-inguinal Bypass

- Originally added “supra” to LEB to capture more procedures requiring antibiotics in PQRI
  - Problems with bilateral cases
- Separated supra- from infra- LEB procedures
  - Separated old data in registry
  - New data forms in v1.7
- Infra-inguinal bypass form → original format
  - Unilateral with inflow at external iliac or distal
Supra-Inguinal Bypass

- Ax-fem, aorto-fem, ilio-fem and fem-fem
- Allows bilateral recipient arteries
- Allows occlusive or aneurysmal pathology
  - Only use for isolated iliac aneurysm
  - Use open AAA for aorto-iliac aneurysm
Any issues with PVI forms or data entry?
One Year Follow-up

- For operations performed in 2008
  - Region average: 83%
  - Center range: 25 – 100%

![Percent of Longterm Follow-Ups Returned](chart.png)

- Reported 2003-2006
- Reported 2007
- Reported 2008
- Reported 1st 1/2 2009
One Year Follow-up

- For operations performed in 2008
  - Region average: 83%
  - Center range: 25 – 100%
  - Surgeon range: 20 – 100% (see table in folder)

### Elective Open AAA Repairs

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>N</th>
<th>Transfused &gt;3 units</th>
<th>% Return To OR</th>
<th>% Post-op MI</th>
<th>Statin Use All Procedures July 2009 - June 2010</th>
<th>For Procedures done in 2008 % followed-up</th>
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<td>6</td>
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</table>
One Year Follow-up

- For operations performed in 2008
  - Region average: 83%
  - Center range: 25 – 100% (see graph in folder)
  - Surgeon range: 20 – 100% (see graph in folder)

- 4 Surgeons with 100% follow-up

- How can we improve follow-up?
Follow-up at one year yields limited data about endoleak rate or sac expansion.

Should we add an EVAR follow-up time point at 2 or 3 years?
New Forms for Review

- Dialysis access
- TEVAR

- In folder, being prepared for web by M2S
Primary Amputation Module?

- We currently track amputations done after index LEB procedure.

- **Should we track primary amputations?**

- This would provide the overall outcome for patients with critical limb ischemia.

- Draft amputation data form in folder.
Case Validation

• Validation ensures the accuracy and completeness of our data
• Improves the value of the registry
• 07-09 is the third series of VSGNE validations
• Conducted internally by VSG-PSO staff
• Processing of validation files is now codified and documented for replication in other VSG-PSO regions
• Incorporating SSN in 07-09 series to tie into social security death index
Venn Diagram

Validation

VSGNE data at M2S 383 records

Matched operation records 273 records

110 records presently in vsg that will need to be checked

 hosp data 461 records

188 records in vsg billing data that will need to be checked

7/27/2011

JH Higgins MS
110 individual operation records present in VSGNE database

But NOT MATCHED to operations in DHMC Hospital Administrative data (the blue crescent in the venn diagram)

DHMC staff will have to confirm they indeed belong in the VSG database

<table>
<thead>
<tr>
<th>Procedure Id</th>
<th>Center ID</th>
<th>Hospital</th>
<th>FIRST NAME</th>
<th>LAST NAME</th>
<th>M</th>
<th>MRN</th>
<th>SSN</th>
<th>DOB</th>
<th>Admit dt</th>
<th>Surgery dt</th>
<th>Discharge dt</th>
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<td>Richardson</td>
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<td>3/25/2009 12:00:00 AM</td>
<td>3/25/2009 12:00:00 AM</td>
<td>3/30/2009 12:00:00 AM</td>
<td>LEB</td>
<td>Home</td>
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<td>Nursing care</td>
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<td>Richardson</td>
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<td>LEB</td>
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</tr>
</tbody>
</table>
188 individual operation records identified by ICD-9 at DHMC

But NOT MATCHED to operations in current VSGNE database (the red crescent in the venn diagram)

DHMC staff will have to confirm they indeed belong in the VSG database

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Admit Billing #</th>
<th>First Name</th>
<th>Last Name</th>
<th>MI</th>
<th>Patient Med Record #</th>
<th>Social Security #</th>
<th>DOB</th>
<th>Gender</th>
<th>Admit Date</th>
<th>Surgery Date</th>
<th>Discharge Date</th>
<th>Procedure</th>
<th>Discharge status</th>
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<td>18960402</td>
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<td>RICHARD</td>
<td>FORD</td>
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<td>00013910</td>
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<td>11/02/1924</td>
<td>Male</td>
<td>03/27/2009</td>
<td>03/27/2009</td>
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<td>OpenAAA = ICD-9 38.44 or 38.25</td>
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<td>GREENE</td>
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<td>Leb = ICD-9 39.29 or 39.38</td>
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Individual operation records with disagreement between Hospital data and data entered into VSGNE database

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<tr>
<th>Disagreement Field</th>
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</table>
Validation – Next Steps

- Hospital receives report of potential data entry errors
  - Review patient identifiers, dates
  - Edit patient data online if appropriate

- Hospital receives reports of potentially missing procedures
  - Review procedures
  - Enter procedure online if appropriate
Printing Reports for Meetings

- As we add centers, the size of existing reports makes it difficult to print on 1 page.

- Substantial work to create for each center.

- Do we need to distribute reports for meetings? Can we view these on web?

- Would other report formats be helpful?
For 2009 data, successful MDs should receive payment in November, 2010

Issues:

- Some MDs submitted wrong TIN or NPI
- CMS counts all procedures relevant to peri-op antibiotics in denominator
  - Not all these operations are recorded in VSGNE
  - Must submit on 80% of all cases, not just VSGNE
  - If high number of general surgery or cases not recorded in VSGNE, may not achieve 80%
PQRI Reporting

- **Improvements for 2010**
  - General web form being developed to enter basic information for procedures that require antibiotic reporting that are not recorded in VSGNE, for retrospective entry this year.
  - Method to audit CPT claims data for surgeons to ensure that they have submitted 80% of relevant procedures for PQRI reporting.
### PQRI General Form

**Patient Information**
- Name: Fake Patient
- DOB: 01/01/1980

**Vascular Study Group of New England**

**PQRI General Form**

Dartmouth Hitchcock Medical Center

**Search | Procedure | Reports | Admin**

#### PQRI 1

- **Surgery Date**: / / 
- **Surgeon**: Select
- **Does the patient have Medicare Part B?**: Yes
- **CPT Code**: [Enter/Search]
- **Type of Surgery**: Select

**Peri-Op Antibiotic Ordered:**
- **Start <1hr Pre-op**: Select
- **Stop <24hr Post-op**: Select
- **1st-2nd Gen Cephalosporin**: Select

---

For Vascular Procedures in PQRI Antibiotic Measures Not Recorded in VSGNE
Only Vascular Procedures (Not general, cardiac or thoracic procedures)
PQRI Reporting

- Need more vascular specific PQRI measures
  - Working with SVS to submit measures this year
Possible New Measures for PQRI

- **Outcome measures** (in hospital)
  - Stroke of death after CEA/CAS in asympt pt
  - Death after elective AAA repair for <5.5 cm

- **Process measures**
  - Discharged on statin after CEA, LEB
  - Anti-platelet Rx pre- and post- CEA, CAS
  - Surveillance CT in year after EVAR
  - Surveillance duplex in year after vein LEB
Statin Working Group
for the Vascular Study Group of New England (VSGNE)

Andres Schanzer MD, Brian Nolan MD, David Stone MD, Robert Hawkins MD, Joseph Meyer MD, Richard Powell MD
October 28th, 2010
Goal

1. To evaluate the role and use of statins in VSGNE patients

2. To increase statin-use in VSGNE patients
Is statin-use an important quality metric in the VSGNE?
MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20,536 high-risk individuals: a randomised placebo-controlled trial

Heart Protection Study Collaborative Group*  
LANCET, 2002.

Fluvastatin and Perioperative Events in Patients Undergoing Vascular Surgery

Olaf Schouten, M.D., Ph.D., Eric Boersma, Ph.D., Sanne E. Hoeks, M.Sc., Robbert Benner, Ph.D., Hero van Urk, M.D., Ph.D., Marc R.H.M. van Sambeek, M.D., Ph.D., Hence J.M. Verhagen, M.D., Ph.D., Nisar A. Khan, Ph.D., Martin Dinkelgrun, M.D., Ph.D., Jeroen J. Bax, M.D., Ph.D., and Don Poldermans, M.D., Ph.D., for the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography Study Group  
NEJM, 2009.

The benefit of statins in non-cardiac vascular surgery patients

Anton F. H. Stalenhoef, MD, PhD, Nijmegen, The Netherlands  
JVS, 2009.
MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20,536 high-risk individuals: a randomised placebo-controlled trial

Heart Protection Study Collaborative Group*
In patients with PAD, 22% risk reduction for MACE in simvastatin group

Fluvastatin and Perioperative Events in Patients Undergoing Vascular Surgery

Olaf Schouten, M.D., Ph.D., Eric Boersma, Ph.D., Sanne E. Hoeks, M.Sc., Robbert Benner, Ph.D., Hero van Urk, M.D., Ph.D., Marc R.H.M. van Sambeek, M.D., Ph.D., Hence J.M. Verhagen, M.D., Ph.D., Nisar A. Khan, Ph.D., Martin Dunkelgrun, M.D., Ph.D., Jeroen J. Bax, M.D., Ph.D., and Don Poldermans, M.D., Ph.D., for the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography Study Group

NEJM, 2009.
RELATIVE RISK 0.55 (95% CI 0.34-0.88)

RELATIVE RISK 0.47 (95% CI 0.24-0.94)

The benefit of statins in non-cardiac vascular surgery patients

Anton F. H. Stalenhoef, MD, PhD, Nijmegen, The Netherlands

JVS, 2009.
### Table I. Clinical trials in patients with carotid artery stenosis undergoing carotid endarterectomy (CEA)

2 studies: significant ↓ perioperative stroke and mortality

### Table II. Clinical trials in patients with AAA

1 study: significant ↓ mortality post surgery

3 studies: significant ↓ aneurysm growth

### Table III. Clinical trials in patients with PAD

4 studies: ↓ mortality

### Table IV. Clinical trials in patients with peripheral vascular disease (combined carotid, aorta and lower extremity)

3 studies: ↓ mortality

1 study: ↓ MACE

How is our statin-use in the VSGNE?
All Procedures - Statin
Use VSG Region N=14,027
Statin Use by Center
All Procedures N=14,207

Percent Use

Center ID

Region
## Statin Administration--Safety

<table>
<thead>
<tr>
<th>Blood enzymes</th>
<th>STATIN (10,269)</th>
<th>PLACEBO (10,267)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x upper limit of normal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver: ALT &gt; 3xULN</td>
<td>77 (0.8%)</td>
<td>65 (0.6%)</td>
</tr>
<tr>
<td>Muscle: CK &gt; 10xULN</td>
<td>9 (0.09%)</td>
<td>5 (0.05%)</td>
</tr>
</tbody>
</table>

TARGET: 90%
Statin Administration

• **Who:** Any patient with vascular disease

• **Drug:** Simvastatin

• **Dose:** 40 mg po daily

• **Timing:** Ideally 4 week prior to surgery
  – Data to suggest any time before is better than none

• **Necessary testing:** ALT, AST, CPK baseline and at 6 weeks

• **Duration:** Lifelong
UMass Memorial

Medical Center, University Campus
55 Lake Avenue North, Worcester, MA 01655
Tel: 508-856-5599 Fax: 508-856-8329

Name ________________________________ Date ______________________

Address ________________________________

Simvastatin 40 mg tablet
Sig: One tablet PO daily
Disp: 30

Refill 0 1 2 3 4 5
NPI # __________________________

Interchange is mandated unless the practitioner writes the words “no substitutions” in space above.

DEA# __________________________

Practitioner’s Signature (MD, NP, PA)

Supervising Physician (if applicable)
October 15, 2009

Dear [Name],

As we discussed in the office, we have started you on a new medication called simvastatin. This medication is one of a class of medications called a “statin”. It has been shown to be very effective in reducing the chances of stroke, heart attack, and death in patients with peripheral arterial disease (PAD), carotid artery disease, and aneurysmal disease.

This medicine works by lowering your LDL cholesterol. However, statins also help to make atherosclerotic plaques (cholesterol build-up in blood vessels) more stable, so that they are less likely to break apart and cause heart attacks or strokes. This effect occurs regardless of the cholesterol level. As a result, even people with PAD who have a “normal” cholesterol level will benefit from taking a statin.

As you were advised, we are also sending a letter to your primary care physician to ask him or her to check an important laboratory test in four to six weeks. This test will measure how your liver is working. In a small number of patients, simvastatin can affect liver function. Additionally, it is important to notify your surgeon or primary care physician if you develop severe muscle aches after starting simvastatin.

As always, if you have further questions please feel free to contact our office at [Contact Information] and we would be happy to speak with you.

Sincerely,

[Signature]
October 15, 2009

Dear Dr. __________________,

We had the pleasure of seeing ________________ in our office today in consultation. In our medication review, we noticed that he/she is not on statin therapy. A growing body of literature, as summarized in a recently published meta-analysis,1 has demonstrated that statin therapy is extremely beneficial in reducing morbidity and mortality in patients with peripheral arterial disease (PAD). This benefit has been shown to extend to patients undergoing revascular surgery, lower extremity bypass surgery, and abdominal aortic aneurysm surgery, regardless of their cholesterol levels.

Given these data, all 60 participating physicians in the Vascular Study Group of New England (VSGNE) have set forth an initiative to increase statin use in all patients undergoing vascular surgical procedures. Accordingly, in the office today, we initiated statin therapy in our shared patient by providing a prescription for simvastatin 40 mg daily. We have sent off a baseline liver function panel today and asked him/her to arrange follow-up with your office for repeat liver function studies in 4 – 6 weeks.

As always, if you have further questions please contact our office at __________________ and we would be happy to discuss this with you further.

Sincerely,

October 23, 2009

Dear Dr. ___________________,

We had the pleasure of seeing ______________ in our office today in consultation. In our medication review, we noticed that he/she has a documented statin allergy and is therefore not on statin therapy. A growing body of literature, as summarized in a recently published meta-analysis,1 has demonstrated that statin therapy is extremely beneficial in reducing morbidity and mortality in patients with peripheral arterial disease (PAD). This benefit has been shown to extend to patients undergoing carotid surgery, lower extremity bypass surgery, and abdominal aortic aneurysm surgery, regardless of cholesterol level.

Given these data, all 69 participating physicians in the Vascular Study Group of New England (VSGNE) have set forth an initiative to increase statin prevalence in all patients undergoing vascular surgical procedures. As a result, we would like to ask you to consider the significance of the patient’s reported allergy and whether it might be appropriate to try initiating statin therapy again.

As always, if you have further questions please contact our office at __________________ and we would be happy to speak with you.

Sincerely,

Successful Examples: What Can We Learn

- Highest rate 2009
  - Georg Steinthorsson, FAHC
  - Glenn Fusonie, LRGH
  - Bob Hawkins, MMC
  - William Wilson, Elliot
  - Yvon Baribeau, CMC

- Highest rate 2010
  - Julie Adams, FAHC
  - Paul Block, MMC
  - Pam Rietshcel, CMMC
  - Scott Fecteau, St. Francis

- Most improved 2008 to 2010
  - Andy Stanley, FAHC
  - Dan Walsh, DHMC
  - Mike Ricci, FAHC
Yale-New Haven Hospital/M2S Data Integration

Jeffrey Indes M.D.
Medical Director VSGNE (YNHH)

October 28, 2010
Data Integration
Multidisciplinary Team

• David Naccarato – Sr System Analyst (YNHH Lab IT)
• Marcelo Adaos - Periop System Administrator (YNHH OR IT)
• Pamela Hunt - Periop Project Manager (YNHH OR IT)
• Ke Zhang – R&D Project Manager (M2S)
• Deborah MacAulay- Account Executive (M2S)
• Diane Collins RN- Performance Manager (YNHH)
• Jennifer Young RN- Clinical Data Abstractor (YNHH)
• Jeffrey Indes MD- Medical Director (YNHH)
• Bauer Sumpio MD-Director YNHH-HVC Vascular Service
Data Integration Importance

- Yale New Haven Hospital (YNHH) began data entry into M2S Vascular Registry through VSGNE on September 1, 2010
- Physician compliance with data entry (Vasc, IR, Int. Cards)
- Improved user friendliness
- Accuracy of data entry
- Patient demographics sent to M2S to allow for a “pick list” of patient name or medical record number
- Abstractors can easily search for cases
OR/Interventional Lab Data Extract Workflow

• Sequel server (SQL) query extracts the data from the OR Centricity Perioperative system database and the interventional labs scheduling databases
• The data is saved in a Comma Separated Values (CSV) format
• Secure File Transfer Protocol (SFTP) function transmits the information in a secure channel to M2S (Required Hospital approval/ IT security approval)
• M2S integrates this data into their database
• A task schedule program runs both programs at 08:00 am with a 10 minute difference.
OR Schedule and Lab Schedule Upload

- Daily schedules uploaded to M2S automatically
- Lab schedule refreshes every 6 hours
- OR schedule refreshes every 24 hours
- M2S purges the patient database every 30 days removing non-vascular registry cases
Data Validation and Processing by M2S

• Set up SFTP folder on M2S server for data transfer to ensure the security of patient data
• Validate every record to prevent creating duplication
• Automated notification to customer whenever mismatches or errors occur
• Automated notification to customer if a scheduled data transfer didn’t occur
Snapshot of YNHH/M2S Data Integration

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<th>First Name</th>
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Potential matches without procedures (Click last name to select)

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<th>First Name</th>
<th>MI</th>
<th>DOB</th>
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Thank You
Update on perioperative Beta-Blocker Protocol

Jens Eldrup-Jorgensen, MD
Chief, Division of Vascular Surgery, MMC
Professor of Surgery, Tufts Univ Sch Med
Director, Vascular Center, MMC
2003 Regimen

Metoprolol 25 mg po BID
Metoprolol 25 mg po BID

Advantages –
selective agent
low dose- minimal chance of side effects
liver metabolism - not renal
available in IV formulation
Metoprolol 25 mg po BID

Disadvantages –
  low dose – minimal clinical effect
  some reports favor bisoprolol
Increases Across All Surgeons

Beta Blocker Use, by Surgeon

90% Beta Blocker Use Target

= 2003-2005

= 2006-2008
Beta Blocker Use, By Center

Center | Proportion
--- | ---
1 | 63%
2 | 72%
3 | 76%
4 | 81%
5 | 85%
6 | 88%
7 | 91%
8 | 94%

90% Beta Blocker Use Target

2003-2005
2006-2008
No Change in Mortality Over Time

Beta Blocker Use in VSGNE 2003-2008

January - March 2003
12.8%

Mortality

October - December 2008
12.1%
p = 0.782

Mortality

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Non-Significant Decline in POMI, in Patients On Peri-Operative Beta Blockers

Beta blocker use, by Type of Beta Blocker

- **Peri-op**: 4.4% (2003-2005), 2.6% (2006-2008)
- **Chronic**: 6.9% (2003-2005), 6.9% (2006-2008)

*P-values:* 
- Peri-op: 0.43
- Chronic: 0.897

*Time periods:* 
- 2003-2005
- 2006-2008
Increase in Chronic and Perioperative Beta Blockers

<table>
<thead>
<tr>
<th>Year</th>
<th>Proportion (%)</th>
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<td>2004</td>
<td>54%</td>
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<td>2005</td>
<td>57%</td>
</tr>
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<td>2006</td>
<td>31%</td>
</tr>
<tr>
<td>2007</td>
<td>33%</td>
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<tr>
<td>2008</td>
<td>61%</td>
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</table>

CHRONIC BETA BLOCKERS

PERI-OP BETA BLOCKERS

\( p < 0.01 \)
Was Our Dose High Enough?

No Change in Heart Rate on Arrival

Beta Blocker Use In VSGNE 2003-2008

January-March 2003 = 71

Arrival Heart Rate

October-December 2008 = 71

Proportion (%) [Heart Rate]

\( p = 0.25 \)
VSGNE Questions

• This was a successful process improvement initiative
• There was no impact on clinical outcomes
Why was there no effect on cardiovascular outcomes?

- Beta blockers are most effective in high risk patients undergoing high risk operations
- We had a high incidence of high risk patients on chronic beta blockers
- Much of our improvement was in low risk patients
- There was minimal impact on HR
Guidelines for pre-op management:
European Soc Card/Euro Soc Anesthesiology

Conclusions

Significant reduction in perioperative ischemia, MI, and cardiac mortality
Risk reduction more marked in high risk patients
Does not decrease risk in low risk patients and may be harmful
Debatable in intermediate risk patients
Treatment onset and choice of doses are limited
Ischemia and troponin are reduced and long term outcome improved in patients with lower heart rate
Guidelines for pre-op management: European Soc Cardiology/Eur Anesthesiology

Recommendations

Beta blocker should be titrated
Start 30 day and at least 7 day preoperatively
Bisoprolol 2.5 mg or Metoprolol 50 mg daily
  titrated to HR 60-70
Duration of therapy unknown
ACC/AHA Guidelines

Beta blocker

I. Continue BB in pts currently taking
IIa. Start titrated BB in pts with CAD or high risk (RCRI>1)
IIb. Usefulness uncertain in intermediate (RCRI-1) to low risk (RCRI-0)
**VSGNE Questions**

**Perioperative BB therapy**

- Should we risk stratify patients before starting beta blocker??
- Or should we not give to low risk patients?
VSGNE Questions
Perioperative BB therapy

• Should we use a different beta blocker??
• Bisoprolol vs metoprolol.
VSGNE Questions

Perioperative BB therapy

• Should we use a different dose??
• 25 mg BID is a low dose.
• Does not affect HR (?MI)
Beta Blockade and Heart Rates

8568 Elective VSGNE Operations Jan 2003 to June 2010
(Carotid stents excluded)

Arrival Heart Rate

Max Intra Op Heart Rate

BPM
VSGNE Questions
Perioperative BB therapy

• Should we titrate the dose to heart rate??
• Decreased heart rate tend to correlate with decreased postop MI.
VSGNE Questions
Titrate to HR

• Surgeon – home titration
  office follow-up with RN or MD
• PCP – office visit
• PAU – dose adjustment (many are phone)
• ASU – prior to OR
HOME TITRATION OF $\beta$-BLOCKER DOSE

TITRATION BY HEART RATE:
   Accepted (DECREASE IV and others).

TECHNOLOGY:
   Widely used, home devices available.
      FDA approved
      Accuracy, +/- 3% or 3 digits
      Artifact indicators
         low flow
         motion
   Easy to use
   Cost, retail $150-200/unit (we can do better).
   Manufacturers; SPOMedical PulseOx 6000, NONIN GO$_2$. 
HOME TITRATION OF β-BLOCKER DOSE

BABY STEPS

Pilot:
- Identify device(s) Obtain 20 (10 each).
- Instruct and send home with typical patients not on β-blocker to use daily for one week. Verify appropriate use in office.

Protocol:
- Target Population
- Dose, Drug and HR parameters
- Start time pre-op
- IRB
HOME TITRATION OF β-BLOCKER DOSE

Possible PROTOCOL

Population;

>3 Lee risk factors (>70yr, current or prior angina pectoris, prior MI, CHF or CVA)
Elective major vascular surgery
Ability to measure HR by pulse oximeter in home
Not currently on β-blocker

Treatment;

Two weeks before surgery instruct in use of pulse oximeter and verify in office in day 1 and 7.
Begin β-blocker (bisoprolol, metoprolol). Starting dose and frequency to be determined.
Pt measures HR in AM resting. Adjust dose >60, <70. Schedule to be determined.
Continue HR monitoring peri-operatively.

End Points;
Heart rate, initial and maximum in OR
Cardiac death, non-fatal MI in hospital, stroke
Community-based Registries for QI and Comparative Effectiveness

A Challenging Partnership

Ellen Farrokhi, M.D.

Virginia Mason Medical Center
• Adverse outcomes and errors are a part of clinical care

• Quality monitoring and improvement
  – Good for
    • Patients
    • Payers
    • Surgeons

• OR is a profit and a loss center

• Most surgeons have no meaningful benchmarking

• Registries for QI can also be used to address comparative effectiveness
What is SCOAP?

• A surgeon-led collaborative using a data driven quality surveillance and response system to deliver more appropriate, safer and higher quality surgical care across the Pacific Northwest

• How does it work?
  – Surveillance of surgical process and outcome metrics that are relevant to patients and surgeons-fed back to clinicians
  – Active change using:
    • Checklists
    • Standard orders
    • Education programs
    • Benchmarks
The Scope of SCOAP
Before SCOAP Variability
Colon Resection Reoperation Rate
By Hospital, 1987-2004
Colon Resection Reoperation

SCOAP data 2009

1500 fewer emergency reoperations
Colostomy
Doubled risk of death
Increased costs of care

ICU stays

SCOAP Hospitals

Pre-SCOAP
Testing for Leak in OR
Prevents Reoperation After OR

Q1 06 | Q2 | Q3 | Q4 | Q1 07 | Q2 | Q3 | Q4 | Q1 08 | Q2 | Q3 | Q4
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
0% | 20% | 40% | 60% | 80% | 100% | (Denominator)
SCOAP Community Speaks Up
Abdominoperineal Resection (APR)

We were recently asked by colleagues at Northwest Hospital, "What is SCOAP implying when it measures rates of abdominoperineal resection (APR) by hospital for patients with rectal cancer?" Read more...

SCOAP Making a Difference: A Look at the Data
Abdominoperineal Resection (APR)

SCOAP data indicates serious variability between SCOAP hospitals in the rates of APR and only slight improvement in the use of sphincter-saving approaches over the time we have been measuring the use of APR. Click here to see the data.
**Step 1: Prior to Induction of Anesthesia (Nursing and Anesthesia)**

- Patient identification
- Consent
- Allergies
- Catheter and I.V. status
- Medication review
- Presence of alcoholic beverages
- Awareness of extremes of age
- Allergy history
- Patient position
- Anesthesia equipment available

**Step 2: Briefing—Prior to Skin Incision (All Team Members)**

- Team members introduce themselves by name and role
- Confirm patient (at least 2 identifiers), site, procedure
- Personnel exchanges discussed (timing of and plan for announcing exchanges)
- Anesthesia
  - Concerns (airway, special meds [beta blockers], relevant allergies, conditions affecting recovery, etc.)
- Surgeon
  - Brief description of procedure and anticipated difficulties
  - Expected duration of procedure
  - Expected blood loss
  - Need for instruments/supplies/IV access beyond those normally used for the procedure
- Nursing/Surgical Tech Team
  - Equipment issues (e.g., instruments ready and trained on, requested implants available, gas tanks full)
  - Sharps management plan reviewed
  - Other patient concerns

**Step 3: Process Control—Prior to Skin Incision (Surgeon Leads)**

- Essential imaging displayed, right and left confirmed
- Antibiotic prophylaxis given in last 60 minutes

**Step 4: Debriefing—At Completion of Case (All Team Members)**

- (Surgeon and Nursing) Before closure: Are instrument, sponge, and needle counts correct?
- (Surgeon and Nursing) If specimen, confirm label & instructions (e.g., orientation, lymph nodes for colon CA)
- (Surgeon and Anesthesia) Key concerns for recovery (e.g., plan for pain management, nausea/vomiting)

---

**Adapted from the WHO “Safe Surgery Saves Lives” campaign**

**SCOAP is a program of the Foundation for Health Care Quality**

[www.scoapchecklist.org](http://www.scoapchecklist.org)
Macro-economic Evaluation
Colectomy

Average Cost/case (2008 dollars)

- Non-SCOAP
Macro-economic Evaluation
Colectomy

Average Cost/case (2008 dollars)

- Non-SCOAP
- SCOAP

$15.4 million
Macro-economic Evaluation
Gastric Bypass

$20.8 million

2006
2007
2008

NonSCOAP
SCOAP

$24,000
$22,000
$20,000
$18,000
$16,000
$14,000
$12,000
$10,000
Calculated Savings-$60 million/4 yrs

Reduced LOS
Reduced intensity of care
30 Day Death After Elective Open AAA

CHARS Data 1995-2005

% Death w/i 30 days vs. Hospital ID

Symbol:
- Black Square: 0-99 cases
- Red Circle: >100 cases

>100 cases
Vascular Interventions SCOAP

A Community Working Together to Improve the Quality of Vascular Care
• Development began in 2007
• Just finished first year of data collection
• 12 of 15 hospitals (that perform vascular procedures) abstracting
  – All cases by all practitioners
• Active participation from 3 communities
  – IR community
  – Cardiology community
  – Vascular Surgery
SCOAP and CER

- SCOAP drives QI through surveillance, performance benchmarking and integration of best practices
- Research questions
  - How interventions compare
  - How emerging technology impacts
  - Which strategies are best
- Comparative Effectiveness Research (CER)
  - Science of how well healthcare interventions/strategies work and how they impact patients/system
  - Include multiple stakeholder perspectives
- Key to getting more value for healthcare dollars
$11.7 million AHRQ grant to SCOAP

Develop CER infrastructure superimposed on QI platform

- Automated data capture from EMRs
  - Increases data capture into registry

- Patient survey center
  - Adds post-discharge clinical and patient reported outcomes

- Adds data from healthcare payers + outpatient environments
  - More complete record of care

- Research board for policies and best practices
CERTN Benefits to QI Aspects

• Automated data capture - reduces manual burden at hospitals
  – Sites can participate in more SCOAP components for fewer human resources

• Longitudinal record of care + patient reported outcomes
  – Improves depth of QI benchmarking

• CER outcomes become benchmarks for QI

• CERTN personnel at centers/offices work with hospitals to maximize QI activities
• First use is VI-SCOAP registry
• CER project comparing all treatment strategies for PAD
  – non-intervention v. endovascular interventions v. surgical bypass.
• QI around peri-operative safety
  – Beta-blocker continuation example by linking “failure to continue” to 30 day CV outcomes
• Endpoint
  – Effectiveness and cost-effectiveness of interventions and non-interventions at 1 yr
Future

• Higher risk SCOAP
  – Esophagus, Pancreas, Liver

• Lower risk SCOAP
  – Sampling of ambulatory procedures
    • Focus on PONV, readmission, corrective procedures (ERCP or reintervention after Lap Chole)
  – Ambulatory bariatric survey module

• Gynecology
• Spine
• Urology
To Find Out More

www.scoap.org
Quality Improvement

Reducing Complication Rates

Open AAA Repair
Variation in Complication Rates Among 17 VSGNE Centers

6284 VSGNE Elective Carotid Endarterectomy Operations
(Jan 2003 to June 2019)

2676 VSGNE Elective Lower Extremity Bypass Operations
(Jan 2003 to June 2010)

1201 VSGNE Elective Open AAA Repair Operations
(Jan 2003 to June 2019)

1380 VSGNE Elective Endovascular AAA Repair Operations
(Jan 2003 to June 2010)

* Elective cases only with no concurrent CABG
Data Source: VSGNE database

* Elective cases only with no concurrent CABG
Data Source: VSGNE database

* Elective cases only with no concurrent CABG
Data Source: VSGNE database

* Elective cases only with no concurrent CABG
Data Source: VSGNE database
Variation in Open AAA Complications

Range Among 17 Medical Centers
Variation in Open AAA Complications

1201 VSGNE Elective Open AAA Repair Operations
Jan 2003 to June 2010

Complication Rate

Dysrhythmia
Respiratory
Change in Renal FX
Return to OR
Any MI
CHF
Transfusion >= 3 Units
Mortality
Bowel Ischemia
Leg Isch-Emboli

This document is protected by New Hampshire's Quality Assurance Statute RSA 151:13a & RSA 329:29-Q, and is not to be shared or distributed outside the Vascular Study Group of New England.
Elective Open AAA Repair

- Return to the operating room
- Multivariate predictors:
  - Wound complication OR 18
  - Leg ischemia/embolus OR 16
  - Bowel ischemia OR 11
  - Blood loss > 1700 ml OR 2.8

(All P<.01)
QI Panel: Open AAA Repair

- **Transfusion ≥ 3 units PRBs** – 4%
  - Range 0 – 40%

- **Return to operating room** – 6%
  - Range 0 – 20%

- **Myocardial infarction** – 6%
  - Range 0 – 17%

  (among surgeons with ≥ 10 cases)
Quality Improvement Topics

- Post-op glucose management – Brian Nolan
- Pre-op imaging for CEA – Brian Nolan
- Predicting outcome after AAA rupture – Will Robinson
- Wound infection after LEB – Jeff Kalish
- Smoking cessation – Andy Hoel
- LOS and complications – David Kuwayama
- Functional outcome after amputation – Bjorn Suckow
Post-Operative Blood Glucose Management Update

Brian W. Nolan, MD, MS
Post-op Glucose Management

• Initial analysis
  – Prevalence of diabetes in vascular patients
  – Outcomes of diabetics

• QI effort over last several years surrounding management of post-operative blood glucose in diabetic patients.
  – Fletcher-Allen
Question

• Can protocol based care improve post-operative glucose control and outcomes?
Prevalence of Diabetes

- CEA (n=4125): 8% NIDDM, 22% IDDM
- LEB (n=2145): 25% NIDDM, 26% IDDM
- Any AAA (n=1849): 1% NIDDM, 15% IDDM
Post-Operative Complication Rates

* p<0.05
Summary

• Multicenter study of glucose control and outcomes following LEB
  – Protocol based care
  – Diabetes care service

• Short survey
Preoperative Imaging for CEA

Brian W. Nolan, MD, MS and David Kuwayama, MD
Introduction

• Variation in use of carotid imaging prior to CEA
  – Increase use CTA, MRA over recent years
  – Likely variable across centers

• Increased imaging=increased cost
  – CTA: $1200-$2700
  – MRA: $600-$1000

• Questionable impact on outcomes
Question

• Is more better? Does additional pre-operative imaging improve outcomes of CEA?

Aims

• Describe pre-operative imaging across time and center.
• Determine risk adjusted outcomes by imaging modality.
Sample

• 6,379 CEA at 12 centers, 2003-2009

• Exclusions...
  – 118; concomitant CABG
  – 3; missing outcomes data
  – 12; missing imaging data

• N=6,246; analytic sample
## Patient Demographics

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>70</td>
</tr>
<tr>
<td>Male Gender</td>
<td>60%</td>
</tr>
<tr>
<td>Ipsilateral Cortical Symptoms</td>
<td>25%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>87%</td>
</tr>
<tr>
<td>Tobacco</td>
<td>80%</td>
</tr>
<tr>
<td>CAD</td>
<td>33%</td>
</tr>
<tr>
<td>DM</td>
<td>31%</td>
</tr>
<tr>
<td>COPD</td>
<td>24%</td>
</tr>
<tr>
<td>Positive Stress Test</td>
<td>11%</td>
</tr>
<tr>
<td>CHF</td>
<td>7.4%</td>
</tr>
<tr>
<td>Renal Insufficiency</td>
<td>5.7%</td>
</tr>
<tr>
<td>Prior Ipsilateral CEA</td>
<td>2.3%</td>
</tr>
<tr>
<td>Prior Radiation</td>
<td>1.1%</td>
</tr>
<tr>
<td>NWR</td>
<td>1.0%</td>
</tr>
<tr>
<td>ASA or Plavix</td>
<td>89%</td>
</tr>
<tr>
<td>Pre-op BB (any)</td>
<td>83%</td>
</tr>
<tr>
<td>Pre-op Statin (any)</td>
<td>74%</td>
</tr>
</tbody>
</table>

n=6,246
Use of Imaging Modalities Over Time

P<0.01
Preop Duplex by Center

97% 94% 92% 97% 97% 99% 100% 96% 93% 95% 96% 98%
Preop CTA by Center

- Center 1: 26%
- Center 2: 11%
- Center 3: 12%
- Center 4: 33%
- Center 5: 23%
- Center 6: 16%
- Center 7: 0%
- Center 8: 22%
- Center 9: 32%
- Center 10: 52%
- Center 11: 22%
- Center 12: 14%

Average: 25%
Preop MRA by Center

![Bar chart showing percentages for different centers, with 23% highlighted.](image-url)
Multiple Preop Studies by Center

42%
## Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Duplex</th>
<th>CTA</th>
<th>MRA</th>
<th>Agram</th>
<th>&gt; 1 study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>0.76%</td>
<td>1.09%</td>
<td>1.12%</td>
<td>1.65%</td>
<td>0.92%</td>
</tr>
<tr>
<td>Death</td>
<td>0.19%</td>
<td>0.13%</td>
<td>0.28%</td>
<td>0.66%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Stroke or Death</td>
<td>0.81%</td>
<td>1.09%</td>
<td>1.19%</td>
<td>1.98%</td>
<td>0.96%</td>
</tr>
</tbody>
</table>

| p             | <0.001 | 0.27 | 0.23 | 0.13 | 0.68      |
Risk Adjusted Stroke or Death

N=308
N=5,937

*
Summary

• Significant variation in imaging prior to CEA
  – Practice patterns not patient driven
  – Increase use of CTA and multiple imaging modalities across time

• Patients who *do not* undergo duplex have significantly higher stroke rate

• Additional imaging has not lowered rates of stroke or death with CEA
Conclusions

Variation in preop imaging prior to CEA appears to be practice dependent. No demonstrable benefit of multiple imaging studies prior. Question the value particularly in era of cost containment.
Derivation and Internal Validation of a Practical Risk Score for Mortality after Open Repair of Ruptured Abdominal Aortic Aneurysms in a U.S. Regional Cohort and Comparison to Existing Models

William P. Robinson III MD\textsuperscript{1}, Andres Schanzer MD\textsuperscript{1}, Youfu Li MD\textsuperscript{1}, Brian Nolan MD\textsuperscript{2}, Philip Goodney MD\textsuperscript{2}, Mohammad Eslami, MD\textsuperscript{1}, Louis M. Messina MD\textsuperscript{1}, Jack L. Cronenwett, MD\textsuperscript{2}

\textsuperscript{1}Univ. of Massachusetts Medical School
Worcester, MA

\textsuperscript{2}Dartmouth-Hitchcock Medical Center
Lebanon, NH
Background and Objective

• Accurate prediction of in-hospital mortality after repair of ruptured AAA (RAAA) has important implications for clinical decisions, quality assurance, and resource utilization

• Existing prediction models lack practicality and robust validation and are not widely utilized

• Objective: Develop a practical risk score for prediction of In-hospital Mortality after open repair of ruptured AAAs (RAAA)

• Compare new risk score to the existing models
Methods

- Vascular Study Group of New England (VSGNE): Prospectively collected data from 11 academic and community centers
- 242 patients underwent open repair of RAAA from 2003-2009 and were randomly assigned to either a derivation (n=164) or to a validation set (n=78)
- Univariate and multivariate analysis via logistic regression
- Significant predictors were assigned integer weights to generate a integer risk score for mortality after repair RAAA
- Discrimination and calibration of VSGNE RAAA Risk Score were tested in the derivation and validation set via area under ROC curve (c-statistic) and Hosmer-Lemenshow test
- Glasgow Aneurysm Score, Hardman Index, Vancouver Score, and Edinburg Aneurysm Score tested in VSGNE cohort
## Mortality Open Repair RAAA

<table>
<thead>
<tr>
<th></th>
<th>Entire VSGNE Cohort</th>
<th>VSGNE Derivation Set</th>
<th>VSGNE Validation Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Deaths</td>
<td>91</td>
<td>60</td>
<td>31</td>
</tr>
<tr>
<td>Mortality Rate</td>
<td>38%</td>
<td>37%</td>
<td>40%</td>
</tr>
</tbody>
</table>

### Univariate Analysis: Predictors of In-hospital Mortality (p<.2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;76</td>
<td>4.6</td>
<td>2.6-8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cardiac Arrest</td>
<td>6.8</td>
<td>2.9-16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Loss of Consciousness</td>
<td>4.2</td>
<td>2.1-8.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Suprarenal Aortic Clamp</td>
<td>2.25</td>
<td>1.3-2.8</td>
<td>0.003</td>
</tr>
<tr>
<td>Women</td>
<td>2.109</td>
<td>1.032-4.311</td>
<td>0.041</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.794</td>
<td>0.853-3.775</td>
<td>0.124</td>
</tr>
<tr>
<td>Creatinine &gt;190 µmol/L (2.15 mg/dL)</td>
<td>2.406</td>
<td>0.949-6.100</td>
<td>0.064</td>
</tr>
<tr>
<td>Lowest preop SBP &lt;80</td>
<td>3.157</td>
<td>1.837-5.427</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CHF</td>
<td>1.767</td>
<td>0.774-4.036</td>
<td>0.177</td>
</tr>
</tbody>
</table>
# Multivariante Analysis: Predictors of In-hospital Mortality

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;76</td>
<td>5.3</td>
<td>2.8-10.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Cardiac Arrest</td>
<td>4.3</td>
<td>1.6-12</td>
<td>0.0048</td>
</tr>
<tr>
<td>Loss of Consciousness</td>
<td>2.6</td>
<td>1.2-6</td>
<td>0.018</td>
</tr>
<tr>
<td>Suprarenal Aortic Clamp</td>
<td>2.4</td>
<td>1.3-4.6</td>
<td>0.0057</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>Integer Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt;76</td>
<td>5.3</td>
<td>2</td>
</tr>
<tr>
<td>Cardiac Arrest</td>
<td>4.3</td>
<td>2</td>
</tr>
<tr>
<td>Loss of Consciousness</td>
<td>2.6</td>
<td>1</td>
</tr>
<tr>
<td>Suprarenal Clamp</td>
<td>2.4</td>
<td>1</td>
</tr>
</tbody>
</table>

VSGN E RAAA Risk Score: 0-6
### VSGNE RAAA Risk Score and Mortality

<table>
<thead>
<tr>
<th>VSGNE Risk Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>≥4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Patients</td>
<td>46</td>
<td>30</td>
<td>38</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Number Deaths</td>
<td>4</td>
<td>6</td>
<td>16</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Mortality Rate</td>
<td>9%</td>
<td>20%</td>
<td>42%</td>
<td>60%</td>
<td>79%</td>
</tr>
<tr>
<td>OR Death</td>
<td>1</td>
<td>2.6</td>
<td>7.6</td>
<td>15.8</td>
<td>39.4</td>
</tr>
</tbody>
</table>

- **Discrimination:** C-statistic: .794
- **Calibration:** Hosmer-Lemeshow $\chi^2 = .86$, $p=.83$
Validation of VSGNE RAAA Risk Score

Mortality Rate

VSGNE RAAA Risk Score

- Validation Set: C-statistic: .77 , H-L $\chi^2 = 4.1 , p=.25$

VSGNE Derivation Set
VSGNE Validation Set
Performance of Existing Models in VSGNE

- **GAS** = Age + 17 for shock + 7 for myocardial disease + 10 for cerebrovascular dz + 14 for renal dz
  - C-statistic: .74, H-L $\chi^2 = 7.2$, p=0.52

- **Hardman Index**: Number of 5 risk factors present (Age > 76, ECG ischemia, Cr > 0.19mmol/L, LOC, Hgb < 9)
  - C-statistic: .72, H-L $\chi^2 = .86$, p=0.35

- **Edinburg Ruptured Aneurysm Score (ERAS)**: Number of 3 risk factors present (Hgb < 9, GCS < 15, BP < 90)
  - C-statistic: .67, H-L $\chi^2 = 1.55$, p=.2

- **Vancouver Score**: Probability death = $E^x / (1 + E^x)$ where $x = (-3.44) + [\text{sum of coefficients of significant variables}]$
  - Variables: age, reduced consciousness, cardiac arrest
  - C-statistic: .76, H-L $\chi^2 = 14.5$, p=0.07
Performance of Existing Models in VSGNE

<table>
<thead>
<tr>
<th>Mortality Rate</th>
<th>GAS</th>
<th>Hardman</th>
<th>ERAS</th>
<th>Vancouver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;82.9</td>
<td>0</td>
<td>0</td>
<td>&lt;0.317</td>
</tr>
<tr>
<td></td>
<td>82.9-91.4</td>
<td>1</td>
<td>1</td>
<td>0.317-0.423</td>
</tr>
<tr>
<td></td>
<td>91.4-100.9</td>
<td>2</td>
<td></td>
<td>0.423-0.679</td>
</tr>
<tr>
<td></td>
<td>&gt;100.9</td>
<td></td>
<td></td>
<td>&gt;0.679</td>
</tr>
</tbody>
</table>
Conclusions

- **Existing prediction rules**
  - Not previously validated in U.S. cohort
  - Not practical or widely-used
  - Good general correlation with mortality in VSGNE
  - Limited in identification of highest risk patients

- **VSGNE RAAA Risk Score**
  - Parsimonious model based on four variables readily assessed in current practice
    - Age >76
    - Preoperative Cardiac Arrest
    - Preoperative LOC
    - Suprarenal Aortic Clamp
  - Easily calculated: VSGNE RAAA Score of 0-6
Conclusions

- VSGNE RAAA Risk Score
- First prediction rule generated from a U.S. cohort
- Allows accurate prediction of mortality after open repair of RAAA
- Identifies those at highest levels of risk

Future Directions

- Bootstrapping methodology for validation
- Refinement / Development of analogous prediction rule for EVAR RAAA
- External validation
Thank you
Predictors of Wound Infection after Lower Extremity Bypass

Jeffrey Kalish, Alik Farber, Naomi Hamburg, Rob Eberhardt, Denis Rybin, Gheorge Doros, Jack Cronenwett, Andres Schanzer

On behalf of the Vascular Study Group of New England
Incidence

• Surgical site infection (SSI) following bypass surgery = 5-44%

  – PREVENT III:
    • 39% wound complication
    • 20.2% wound infection
    • 7.6% infections causing “serious wound complications”

  – BASIL:
    • 22.8% wound infection (same hospital stay)
    • 15.6% following discharge
Impact of Infections

• Morbidity to patient
• ↑ hospital LOS
• ↑ utilization of post-discharge services
• ↓ quality of life
• May lead to graft infection
• May lead to higher amputation rate and mortality
Risk Factors

- Female gender
- Oral anticoagulants
- Advanced age
- Obesity
- Dialysis-dependence
- Diabetes
Study Goals

1. Identify risk factors (pre-operative and intra-operative) for wound infection

2. Determine if wound infection influences post-operative outcomes
Definition

• Wound Infection = “culture positive or requiring antibiotic treatment”
Endpoints

- **Primary:**
  - in-hospital wound infection

- **Secondary:**
  - ipsilateral amputation
  - length of stay
  - 1-year follow-up data (graft patency, ipsilateral amputation, mortality)
Statistical Analysis

- Two-sample t-test
- Fischer’s Exact test
- Multivariate logistic regression
Sample Selection

VSGNE Database

All cases of Lower Extremity Bypass from 2003-2009

Age 39 and Older

No Functioning Transplant

No External Iliac Graft Origin
No SFA or Profunda Graft Recipient

No Bilateral Asymptomatic Indication

3276

3262

3233

3129

2938
## Indication for Bypass

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wound Infection (n=158)</th>
<th>No Wound Infection (n=2,780)</th>
<th>Incidence of Wound Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claudication</td>
<td>20.9%</td>
<td>25.2%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Rest Pain</td>
<td>17.1%</td>
<td>23.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Tissue Loss</td>
<td>51.9%</td>
<td>44.1%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Acute Ischemia</td>
<td>10.1%</td>
<td>7.2%</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

\[ p=0.054 \]
## Demographics: Claudication

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wound Infection (n=33)</th>
<th>No Wound Infection (n=701)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>60.4±10.6</td>
<td>64.6±10.5</td>
<td>*0.024</td>
</tr>
<tr>
<td>Gender</td>
<td>33.3%</td>
<td>25.3%</td>
<td>0.310</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>93.9%</td>
<td>98.7%</td>
<td>0.084</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>45.5%</td>
<td>26.3%</td>
<td>*0.026</td>
</tr>
<tr>
<td>Diabetes</td>
<td>24.2%</td>
<td>32.1%</td>
<td>0.445</td>
</tr>
<tr>
<td>ASA or Plavix</td>
<td>72.7%</td>
<td>74.6%</td>
<td>0.838</td>
</tr>
</tbody>
</table>
## Procedure: Claudication

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wound Infection (n=33)</th>
<th>No Wound Infection (n=701)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinal/Epidural</td>
<td>27.3%</td>
<td>21%</td>
<td>0.386</td>
</tr>
<tr>
<td>General</td>
<td>72.7%</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>Graft Origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFA</td>
<td>78.8%</td>
<td>79%</td>
<td>0.510</td>
</tr>
<tr>
<td>Profunda/SFA</td>
<td>21.2%</td>
<td>16.5%</td>
<td></td>
</tr>
<tr>
<td>Graft Recipient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popliteal</td>
<td>75.8%</td>
<td>82.2%</td>
<td>0.389</td>
</tr>
<tr>
<td>Distal</td>
<td>24.2%</td>
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## Procedure: Claudication

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<th>P-value</th>
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<tr>
<td>Graft Vein Type</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>None</td>
<td>21.2%</td>
<td>33.8%</td>
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<tr>
<td>GSV</td>
<td>75.8%</td>
<td>62.9%</td>
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<tr>
<td>Arm Vein</td>
<td>3%</td>
<td>3.3%</td>
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</tr>
<tr>
<td>Completion Doppler</td>
<td>45.5%</td>
<td>73.7%</td>
<td>*0.001</td>
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<tr>
<td>Completion Duplex</td>
<td>27.3%</td>
<td>8%</td>
<td>*0.001</td>
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<tr>
<td>Completion Arteriogram</td>
<td>42.4%</td>
<td>54.2%</td>
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# Demographics: CLI

<table>
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<tr>
<th>Variable</th>
<th>Wound Infection (n=109)</th>
<th>No Wound Infection (n=1,878)</th>
<th>P-value</th>
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<tbody>
<tr>
<td>Age</td>
<td>68.8±12.1</td>
<td>70.2±11.2</td>
<td>0.177</td>
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<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Female</td>
<td>35.8%</td>
<td>32.3%</td>
<td>0.462</td>
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<tr>
<td>Race</td>
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<tr>
<td>White</td>
<td>98.2%</td>
<td>98.8%</td>
<td>0.645</td>
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<tr>
<td>Diabetes</td>
<td>58.7%</td>
<td>59.4%</td>
<td>0.920</td>
</tr>
<tr>
<td>Dialysis</td>
<td>11%</td>
<td>9.4%</td>
<td>0.612</td>
</tr>
<tr>
<td>ASA or Plavix</td>
<td>81.7%</td>
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## Procedure: CLI

<table>
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<th>No Wound Infection (n=1,878)</th>
<th>P-value</th>
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<td>Anesthesia</td>
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<tr>
<td>Spinal/Epidural</td>
<td>30.3%</td>
<td>23.4%</td>
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<td>General</td>
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<td>76.6%</td>
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<tr>
<td>Graft Origin</td>
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<td>CFA</td>
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<td>10.2%</td>
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</tr>
<tr>
<td>Graft Recipient</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Popliteal</td>
<td>38.5%</td>
<td>52.7%</td>
<td>*0.011</td>
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<tr>
<td>Distal</td>
<td>61.5%</td>
<td>47.3%</td>
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</table>
## Procedure: CLI

<table>
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<th>No Wound Infection (n=1,878)</th>
<th>P-value</th>
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<tbody>
<tr>
<td>Graft Vein Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>13.8%</td>
<td>24.9%</td>
<td>*0.022</td>
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<tr>
<td>GSV</td>
<td>77.1%</td>
<td>66%</td>
<td></td>
</tr>
<tr>
<td>Arm Vein</td>
<td>9.2%</td>
<td>9.1%</td>
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<tr>
<td>Completion Doppler</td>
<td>56%</td>
<td>75.2%</td>
<td>*&lt;0.001</td>
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<tr>
<td>Completion Duplex</td>
<td>21.1%</td>
<td>8.1%</td>
<td>*&lt;0.001</td>
</tr>
<tr>
<td>Completion Arteriogram</td>
<td>57.8%</td>
<td>58.6%</td>
<td>0.920</td>
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</table>
## Multivariate Analysis

<table>
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<th>95% CI</th>
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<tbody>
<tr>
<td>Indication</td>
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<tr>
<td>Rest Pain vs. Claudication</td>
<td>0.82</td>
<td>0.48-1.41</td>
<td>0.476</td>
</tr>
<tr>
<td>Tissue Loss vs. Claudication</td>
<td>1.62</td>
<td>1.01-2.58</td>
<td>*0.045</td>
</tr>
<tr>
<td>Ischemia vs. Claudication</td>
<td>1.96</td>
<td>1.03-3.71</td>
<td>*0.04</td>
</tr>
</tbody>
</table>
## Multivariate: Claudication

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt;55 vs. ≥55</td>
<td>2.60</td>
<td>1.22-5.55</td>
<td>*0.013</td>
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<tr>
<td>Duplex</td>
<td>2.53</td>
<td>1.02-6.27</td>
<td>*0.046</td>
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<tr>
<td>COPD</td>
<td>2.24</td>
<td>1.09-4.62</td>
<td>*0.029</td>
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<tr>
<td>Doppler</td>
<td>0.40</td>
<td>0.18-0.88</td>
<td>*0.023</td>
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</table>

C-statistic of the final model 0.71 (full model 0.77)
<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplex</td>
<td>2.15</td>
<td>1.26-3.64</td>
<td>*0.005</td>
</tr>
<tr>
<td>Age &lt;55 vs. ≥55</td>
<td>1.75</td>
<td>1.00-3.05</td>
<td>*0.049</td>
</tr>
<tr>
<td>Graft Recipient: Distal vs. Popliteal</td>
<td>1.64</td>
<td>1.09-2.45</td>
<td>*0.017</td>
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<td>ASA or Plavix</td>
<td>1.58</td>
<td>0.95-2.61</td>
<td>0.075</td>
</tr>
<tr>
<td>Anesthesia: Spinal/Epidural vs. Gen’l</td>
<td>1.50</td>
<td>0.97-2.32</td>
<td>0.066</td>
</tr>
<tr>
<td>Doppler</td>
<td>0.51</td>
<td>0.34-0.77</td>
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</table>

C-statistic of the final model 0.67 (full model 0.68)
# Secondary Endpoints

<table>
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<tr>
<th>Variable</th>
<th>Wound Infection (n=158)</th>
<th>No Wound Infection (n=2,780)</th>
<th>P-value</th>
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<tr>
<td>Post-Op MI</td>
<td>4.4%</td>
<td>2.1%</td>
<td>0.084</td>
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<tr>
<td>CHF</td>
<td>12%</td>
<td>3.6%</td>
<td>*&lt;0.001</td>
</tr>
<tr>
<td>Respiratory</td>
<td>2.5%</td>
<td>0.8%</td>
<td>*0.042</td>
</tr>
<tr>
<td>Return to OR</td>
<td>24.7%</td>
<td>12.3%</td>
<td>*&lt;0.001</td>
</tr>
<tr>
<td>Graft Infection</td>
<td>3.2%</td>
<td>0.1%</td>
<td>*&lt;0.001</td>
</tr>
<tr>
<td>LOS (days)</td>
<td>13±12.7</td>
<td>7.7±7.4</td>
<td>*&lt;0.001</td>
</tr>
<tr>
<td>1-year major amputation</td>
<td>12.3%</td>
<td>8.9%</td>
<td>0.226</td>
</tr>
<tr>
<td>1-year primary patency</td>
<td>64.4%</td>
<td>70.8%</td>
<td>0.297</td>
</tr>
</tbody>
</table>
Completion Duplex / Doppler

• 74% of completion duplex studies done in 1 center (remainder spread over 11 centers)
  – This center is high-volume, and has high wound infection rate
    • more complicated cases?
    • center-specific?
    • sterility issue?

• Doppler story?
Summary

1. Higher risk of wound infection with CLI vs. claudication

2. Risks for Claudicants = COPD, younger age

3. Risks for CLI = distal target, younger age

4. Uncertain duplex / doppler relationship
Summary

• Wound infection
  – ↑ LOS
  – may have association with graft infection and other post-op morbidities
  – may have effect on 1-year amputation and 1-year graft patency
Limitations

- No details about wound infections
- Self-reporting and chart review
- Limited to in-hospital infections (not readmissions after discharge)
- Heavily influenced by centers with higher rates of infection
Smoking cessation in post-operative vascular surgery patients

A potential quality improvement initiative

Andrew Hoel, MD
10.28.2010
Smoking as a risk factor

• Smoking is a significant modifiable risk factor for vascular disease:
  • 2x risk of claudication sx
  • 3x risk of abdominal aortic aneurysm
• Continued smoking is associated with significant morbidity following vascular procedures:
  • 3x increased risk of graft failure with continued smoking
  • 10x increased risk major amputation with continued smoking

Kannel WB. Geriatrics 28:61-68. 1973
Willigendael EM. JVS 42:67-74. 2005..
Lederle FA. Arch int med. 160:1425-1430. 2000
Smoking cessation

- Estimated 2-6% annual quit rate in the general population.
- In patients undergoing cardiac procedures, 1-year quit rate:
  - 55% of CABG
  - 25% of PTCA
  - 14% of diagnostic angiography
- A retrospective review of post-operative patients demonstrated:
  - 20/100 person-year quit rate following major surgery
  - 10/100 person-year quit rate following outpatient surgery
  - Surgery as a “teachable moment” for smoking cessation.

Smoking cessation

• Type of intervention predicts outcome:
  • Smoking cessation interventions in hospitalized patients:
    • OR 1.65 (1.44-1.99) inpatient counseling + intensive outpatient follow-up
    • OR 1.09 (0.91-1.31) inpatient counseling alone

Smoking cessation in VSGNE

- Reviewed 12,864 patients in VSGNE of which 12,813 had smoking status documented.
Smoking cessation in VSGNE

- Of the 4361 patients who smoke (34%), 3540 had post-procedure smoking status documented.
- 1054 patients (45%), were non-smoking at follow-up.
Smoking Cessation in VSGNE

- Procedural variation in smoking cessation.
Smoking Cessation in VSGNE

- Center-specific variation in smoking cessation.
Smoking Cessation in VSGNE

Objectives:

• Delineate factors associated with smoking cessation.
• Query institutional practices for smoking cessation.
• Identify areas for improvement in smoking cessation.
Predictors of Length of Stay in the VSGNE Cohort

David Kuwayama, MD; Margaret Russell; Yuanyuan Zhao; Jack Cronenwett, MD
Dartmouth Hitchcock Medical Center
• Post-operative length of stay (LOS) is a major determinant of in-hospital costs

• Minimizing LOS without harming patient outcomes is an important goal in an era of cost containment
Categories of operation

- Carotid endarterectomy (primary, not concurrent with CABG)
- Lower extremity bypass (non-emergent, for CLI)
- Open AAA (elective including symptomatic)
- EVAR (elective including symptomatic)

- Length of stay has decreased over time for some, but not all, procedures
LOS for lower extremity bypass
LOS for elective open AAA
• Utilizing the VSGNE database, we hope to identify center, provider, and patient related factors associated with increased LOS.
Variability by center
## LOS by Medical Center in Primary CEA

<table>
<thead>
<tr>
<th>LOS by Center</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
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<tbody>
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</table>

### LOS (Days) vs. Medical Center
LOS by Medical Center in Elective EVAR

<table>
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<tr>
<th>Medical Center</th>
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### LOS by Medical Center in Elective OPEN

<table>
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</table>
### LOS by Medical Center in LEB (Occlusive Disease only)

<table>
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<th>Medical Center</th>
<th>Min</th>
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<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
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<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>15</td>
<td>13</td>
<td>16</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>19</td>
<td>8</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>84</td>
<td>65</td>
<td>49</td>
<td>80</td>
<td>7</td>
<td>70</td>
<td>45</td>
<td>46</td>
<td>64</td>
<td>46</td>
<td>38</td>
<td></td>
<td>54</td>
<td></td>
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</tr>
</tbody>
</table>

**Graph:**
- The box plots represent the distribution of LOS by Medical Center.
- Each box plot shows the minimum, first quartile, median, third quartile, and maximum LOS for each center.
- The graph visually compares the LOS across different medical centers, with the x-axis representing the medical centers and the y-axis representing the LOS in days.
Variability by provider
## LOS by Surgeon in LEB (Occlusive Disease only)

| LOS by Surgeon | Min  | 1   | 0   | 2   | 2   | 0   | 1   | 1   | 4   | 2   | 2   | 1   | 5   | 5   | 6.5 | 9   | 4.5 | 3   | 6   | 9   | 11  | 9   | 25  |
|----------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Q1             | 2    | 1   | 2   | 2   | 2   | 2   | 1   | 4   | 2   | 7   | 5   | 5   | 6.5 | 9   | 4.5 | 3   | 6   | 9   | 11  | 9   | 25  |
| Q2             | 2    | 3   | 3   | 3   | 3   | 3   | 2   | 4   | 3   | 10  | 9   | 12.5| 14.5| 14  | 9.5 | 11.5| 9.5 | 11  | 12  | 25  |
| Q3             | 2    | 4   | 4   | 5   | 5   | 4   | 3   | 4   | 5   | 15  | 16  | 20  | 16  | 16  | 17.5| 25.5| 17.5| 18  | 45  |
| Max            | 2    | 0   | 7   | 5   | 7   | 14  | 15  | 64  | 4   | 13  | 37  | 44  | 20  | 23  | 29  | 70  | 32  | 64  | 43  | 45  |

**Chart Description:**

- **LOS (Days):** The horizontal axis represents the number of surgeon days, ranging from 92 to 71.
- **LOS by Surgeon:** The box plots and whiskers illustrate the distribution of LOS for each surgeon, with the median, quartiles, and outliers highlighted.

**Notes:**

This figure is based on the arithmetic mean which should not be the same as the geometric mean.

---

Dartmouth-Hitchcock Medical Center
Variability by complication
Carotid LOS without Post-op Complications

Median Days

Region 12 11 10 9 8 7 6 5 4 3 2 1

Center 1 0 1 2 3 4 5 6 7
Geometric mean LOS after post-CEA complications

- Stroke
- TIA
- Obsc Cl injury
- Ips Neuro Event
- Contr Neuro Event
- Refusion Symptoms
- IV Med for Hypertension
- IV Med for Hypotension
- Myocardial Infarction
- Dysrhythmia
- CHF, Po3-op
- Wound Infection
- Return to OR
Functional Outcome after Amputation in Lower Extremity Bypass Patients

Quality Improvement Topic
VSGNE Fall Meeting 2010

Bjoern Suckow, MD
Purpose

• Provide overview of current project

• Outline rationale for collecting index amputations in the VSGNE
Introduction – A Little About Me

• General Surgery Resident at Univ. of Utah
• 2-year research commitment
  – Mentor: Larry Kraiss, MD
• Masters of Science in Clinical Investigation
• Interest in Quality Measurement and Functional Outcomes
• Collaboration with VSGNE
  – Mentors: Philip Goodney, Jack Cronenwett, and Others
Background

- CLI - nearly one million elderly Americans
- Over 100,000 major amputations annually
- Amputation
  - Commonly feared
  - Higher incidence
    - Hemodialysis
    - Diabetes
    - Low socio-economic status
    - Older age
- Limited data describing functional outcome after amputation
**Background**

- VSGNE
  - Amputation captured as an outcome of LEB patients
- VSGNE also captures:
  - Living status
  - Ambulation Status
Our Project

- Goal
  - Characterize functional outcome of patients who undergo amputation
  - Describe pre- and peri-operative risk factors associated with a “good functional outcome”
Timing of Amputation

Critical Limb Ischemia

Revascularization

Amputation

Trauma
Timing of Amputation

Critical Limb Ischemia

Revascularization

Trauma

Amputation

Collected in VSGNE
Our Project

• Goal
  – Characterize functional outcome of patients who undergo amputation
  – Describe pre- and peri-operative risk factors associated with a “good functional outcome”
Our Project

• Goal
  – Characterize functional outcome of patients who undergo amputation after lower extremity bypass
  – Describe pre- and peri-operative risk factors associated with a “good functional outcome” (defined as independent ambulation and living at home)
Our Project

• Goal
  – Characterize functional outcome of patients who undergo amputation after lower extremity bypass
  – Describe pre- and peri-operative risk factors associated with a “good functional outcome” (defined as independent ambulation and living at home)

• Patients
  – 436 subsequent amputations
  – Type / level of amputation?
Challenges

- Traditional types of amputation
  - Toe
  - Forefoot
  - Below-knee
  - Through-knee
  - Above-knee

Collected in VSGNE

At hospital discharge from LEB
- Minor (toe + forefoot)
- Below-knee
- Above-knee

At follow-up
- Minor (toe + forefoot)
- Major (AKA + BKA)
Initial Analysis

Functional Outcome

- Only 24 known BKA patients
- 143 major amputation patients – combination of AKA and BKA
Our Project

• Thank You
  – Robert Cambria, MD at EMMC
  – Daniel Bertges, MD at FAHC
  – Jens Eldrup-Jorgensen, MD and Michelle Bergeron at MMC
  – Margaret Russell, MBA at DHMC

• Patients
  – 436 subsequent amputations
    • 224 minor
    • 105 BKA
    • 107 AKA
The odds of surviving and having a good functional outcome at 1 year:

- 88% no amp
- 81% minor amp
- 55% BKA
- 45% AKA

\( p = 0.001 \)
The odds of surviving and having a good functional outcome at 1 year:

- 88% no amp
- 81% minor amp
- 55% BKA
- 45% AKA

(p=0.001)
Future Directions

• Available Data
  – Missing primary amputations
  – Incomplete levels / types of amputation

• Outcome Measures
  – Collecting ambulation and living status
  – Missing patient-centered metric
Future Directions

- Collect primary amputations
- Specify type and level at follow-up
Thank You