Phase of Care Mortality Analysis
-an initiative to lower the cardiac surgery mortality rate in Washington State

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Pat Ryan, MD – Providence Regional Medical Center Everett

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History of Mortality Analysis

- Northern New England CVD Study Group
  - “Seminal Event” triggers cascade of events leading to mortality
  - HF found to be seminal event in 70% cardiac surgery deaths from 1987-1989
  - System-wide protocols developed leading to 24% reduction in mortality in subsequent 2 years
**POCMA Review**

*(PHASE OF CARE MORTALITY ANALYSIS)*

**Phase of Care Mortality Analysis:** Please select one PHASE (pre-op, intra-op, etc) and circle one subcategory (Judgment or Patient Preparation).

<table>
<thead>
<tr>
<th>Pre-Operative Phase</th>
<th>Intra-Operative Phase</th>
<th>Post-Op ICU Phase</th>
<th>Post-Op Floor Phase</th>
<th>Discharge Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiac risk factor profile</strong> e.g.</td>
<td><strong>Anesthesia</strong></td>
<td><strong>Hemodynamic management</strong></td>
<td><strong>Pharmacologic management</strong></td>
<td><strong>Appropriate disposition:</strong> e.g.</td>
</tr>
<tr>
<td>CHF</td>
<td>Technical (lines, TEE, ET)</td>
<td>Inotrope titration</td>
<td>Coumadin</td>
<td>Nursing home/ECF vs. home</td>
</tr>
<tr>
<td>Cardiogenic shock</td>
<td>Pharmacologic management</td>
<td>Adequate OP delivery</td>
<td>Other</td>
<td>Pharmacologic details</td>
</tr>
<tr>
<td>Myocardial viability</td>
<td>Recognition/treatment of issues</td>
<td>Respiratory care</td>
<td>Surveillance/recognition/Rx of</td>
<td>In Adequate instruction and</td>
</tr>
<tr>
<td>Non-cardiac risk factor</td>
<td>ICU care (Keystone criteria)</td>
<td>Respiratory care</td>
<td>decompression</td>
<td>support network e.g.</td>
</tr>
<tr>
<td>profile: ≥ 2 major risk factors</td>
<td>HOB elevated 30 degrees</td>
<td>ICU care (Keystone criteria)</td>
<td>Sepsis prevention/treatment</td>
<td>Visiting Nurse</td>
</tr>
<tr>
<td>e.g.</td>
<td>DVT prophylaxis</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Renal failure on dialysis</td>
<td>Sepsis prevention/treatment</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>Nutritional support</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>Glycemic control</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>PUD Prophylaxis</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td><strong>Judgment</strong></td>
<td>Surveillance/recognition/Rx of</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Timing of surgery</td>
<td>Decompression</td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Risk &gt; benefit</td>
<td><strong>Catastrophic event (specify):</strong></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td><strong>Patient preparation</strong></td>
<td><strong>Other:</strong></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Medical status optimized</td>
<td></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Patient evaluation</td>
<td></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td>Functional class</td>
<td></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
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<tr>
<td>Risk identification e.g. cancer</td>
<td></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
<tr>
<td><strong>Other:</strong></td>
<td></td>
<td>ICU care (Keystone criteria)</td>
<td>Catastrophic event (specify):</td>
<td></td>
</tr>
</tbody>
</table>

**As identified in the Phase of Care above: was this pre-terminal “Seminal event” Avoidable?**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>If Yes: How:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Was Surgical Death Avoidable**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Relative Strength this seminal event triggered fatal Outcome:**

- Certain
- Most Likely
- Uncertain

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Shannon, et al - conclusions

- Develops and refines mortality reviews
- Provides a reproducible, structured platform for discussion, education, quality improvement, and improved outcomes
- Found a recurrence of potentially avoidable mortalities (41%) in all phases of care
  - Largest absolute number occurred in preoperative phase (39% 2006, 23% 2010)
Background

• At PRMCE we were concerned about an upward trend in Valve mortalities
  – Reviewed 10 years of valve deaths
  – Worked with COAP to use POCMA methodology
• Based on article by Shannon, et al.
• In 2010 started reviewing all cardiac surgery deaths
• 2011 COAP Statewide meeting presentation
Prov Everett Experience

- 10 year review of valve mortalities
- Full year (2010) of all cardiac surgical procedures
- 2011 - Ongoing monthly review within surgeon practice
- 2012 – multidisciplinary review at quality team meetings
## PreOperative Phase

<table>
<thead>
<tr>
<th>The poker analogy:</th>
<th>Otherwise stated:</th>
<th>For Example:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cards face up</td>
<td>Complete evaluation available</td>
<td>Risks known, but decision to proceed anyway</td>
</tr>
<tr>
<td>Not enough cards</td>
<td>Incomplete evaluation</td>
<td>Additional information may have further defined risks</td>
</tr>
<tr>
<td>Enough cards, but not all face up</td>
<td>Incomplete evaluation</td>
<td>Information available that was not considered</td>
</tr>
<tr>
<td>Wild card</td>
<td>Unexpected finding</td>
<td>Intraoperative findings differ from the preoperative evaluation</td>
</tr>
<tr>
<td>Arrived late to the game</td>
<td>Delay in Treatment or Referral</td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prolonged shock</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• End stage valve disease</td>
</tr>
</tbody>
</table>
INTRAOPERATIVE PHASE:

• Surgeon technical issue - potentially avoidable
  – Mishap
  – Too much surgery
  – Poor protection

• Technical – not avoidable
  – Ca++ annulus
  – Extensive dissection
  – Abscess

• Anesthesia complication

• Catastrophic Event
POST OP PHASE:

• Failure to Thrive
  – Cardiac (preop LV dysfunction)
  – Non-cardiac (respiratory, frailty)
• Delayed or unrecognized decompensation
  – Tamponade,
  – low cardiac output
  – reintubation
• Recognized, treated, but progressed
  – ARDS
  – Ischemic bowel
  – Multi-system organ failure
• Catastrophic event
DISCHARGE PHASE

- Poor transition management
- Delayed recognition of complications
- Catastrophic event
Lesson Learned

Benefits
• Learning something ‘actionable’
• Measureable results
• Identify trends, recurring themes
• Helps focus our interventions and improve processes
• Guides discussion with referral partners

Challenges
• Picking ONE cause
• Overcome culture of blame
• Need to be disciplined about it
• Need more than one review participant
Challenges to Implementation

Finding time and resources

• Who can you collaborate with?
• Setting up a routine and discipline
• Local facility quality infrastructure
  – QI committee?
  – Medical Staff committee?
  – Other support?
An opportunity for collaboration on POCMA

• POCMA steering committee?
• Regional Case Review?
• Establish a Collaborative – model NNE
An opportunity for collaboration on POCMA

“When reviewed as a single institution, such incidents may be regarded as isolated, but when viewed across an entire state, collectively, quality improvement opportunities become obvious”
Reservations Regarding Collaborative POCMA Group

- Collaborative composed of Multi D team with interest in quality improvement processes
- Hopefully have buy-in from multiple groups to avoid bias against one group
- NNE showed relative increase in self-disclosure of intraoperative errors in judgment or execution over time
Regional POCMA Case Review Collaborative Group

- Online review
- Cases blinded to reviewers
- Back end linkage to COAP/STS data
- Yearly summaries and focus area for statewide improvement
IF we could predict who would not survive or do well post operatively, would it change our practice?
Frailty Assessment as a predictor of Mortality and Morbidity

• Elderly are fastest growing patient group referred for cardiac surgery

• Risk-benefit dichotomy: Elderly
  – Greater burden of comorbid conditions
  – Derive “sizeable” benefits from cardiac surgery

• Frailty – impaired resiliency to stressors

• Disability – impaired ability to carry out functional tasks

Frailty Assessment as a predictor of Mortality and Morbidity

- “Prediction of operative risk using available risk scores is less accurate in elderly patients referred for cardiac surgery
- Elderly patients often present with a heavy burden of co-morbidity, disability, and perceived frailty
- Multiple scales exist to measure surgical risk as well as frailty and disability, yet the optimal combination of scales remains unknown”

Addition of Frailty and Disability to Cardiac Surgery Risk Scores Identifies Elderly Patients at High Risk of Mortality or Major Morbidity

Jonathan Afilalo, MD, MSc; Salvatore Mottillo, MD; Mark J. Eisenberg, MD, MPH; Karen P. Alexander, MD; Nicolas Noiseux, MD; Louis P. Perrault, MD, PhD; Jean-Francois Morin, MD; Yves Langlois, MD; Samuel M. Ohayon, BSc; Johanne Monette, MD, MSc; Jean-Francois Boivin, MD, ScD; David M. Shahian, MD; Howard Bergman, MD

Background—Cardiac surgery risk scores perform poorly in elderly patients, in part because they do not take into account frailty and disability which are critical determinants of health status with advanced age. There is an unmet need to combine established cardiac surgery risk scores with measures of frailty and disability to provide a more complete model for risk prediction in elderly patients undergoing cardiac surgery.

Methods and Results—This was a prospective, multicenter cohort study of elderly patients (≥70 years) undergoing coronary artery bypass and/or valve surgery in the United States and Canada. Four different frailty scales, 3 disability scales, and 5 cardiac surgery risk scores were measured in all patients. The primary outcome was the STS composite end point of in-hospital postoperative mortality or major morbidity. A total of 152 patients were enrolled, with a mean age of 75.9±4.4 years and 34% women. Depending on the scale used, 20–46% of patients were found to be frail, and 5–76% were found to have at least 1 disability. The most predictive scale in each domain was: 5-meter gait speed ≥6 seconds as a measure of frailty (odds ratio [OR], 2.63; 95% confidence interval [CI], 1.17–5.90), ≥3 impairments in the Nagi scale as a measure of disability (OR, 2.98; 95% CI, 1.35–6.56) and either the Parsonnet score (OR, 1.08; 95% CI, 1.04–1.13) or Society of Thoracic Surgeons Predicted Risk of Mortality or Major Morbidity (STS-PROMM) (OR, 1.05; 95% CI, 1.01–1.09) as a cardiac surgery risk score. Compared with the Parsonnet score or STS-PROMM alone, (area under the curve, 0.68–0.72), addition of frailty and disability provided incremental value and improved model discrimination (area under the curve, 0.73–0.76).

Conclusions—Clinicians should use an integrative approach combining frailty, disability, and risk scores to better characterize elderly patients referred for cardiac surgery and identify those that are at increased risk. (Circ Cardiovasc Qual Outcomes. 2012;5:222-228.)
Afilalo, et al – findings

- 152 patients enrolled – for each:
  - 4 frailty scales,
  - 3 disability scales,
  - 5 cardiac risk scores were measured and compared

- Optimal combination appears to be
  - Parsonnet (surgical risk),
  - 5-meter gait (frailty),
  - Nagi (disability)

- Clinicians should use an integrated approach to frailty assessment
Frailty Assessment

• Case Selection and mitigation of challenging cases
  – Should this patient have surgery?
  – Flag patients with high scores for intentional deviation from the standard care processes
    • Considerations for all team members to use in planning care of individual patients
    • Assist with staffing assignments

• Limitations of mathematical Risk Models
• Initiate conversations about goals of care, alternatives to surgery
Expert Consensus

- Jenny Tessier RN, BSN
- Marnie Anderson, RN, CCRN, CSC
- Joy Paul, RN, BS
- Kathy Petett, RN, BSN, CCRN
- Brie Paolillo, RN, BSHCA
- Jim Phillips, PT, NCS
- Nicolae Vidan, PA-C
- Katherine Hillis, RN
- Sherry Marchi, RN
- Sheila Bleakney, RN, BSN, CCRN, CSC
- Lorrie Nelson
- Caroline Blanford, BS, CCRN
- Julie McDonald, RN, BSN, CPHQ
- Pat Ryan, MD

320+ years of Multidisciplinary Experience
PRMCE’s Tool and Approach to Frailty Assessment

- Patient is seen in MD office and scheduled for pre-operative teaching day.
- During pre-op clinic day, the patient is seen by interdisciplinary team, including Physical Therapy, Nutrition, Discharge planning, Anesthesiology, Respiratory Therapy, Chaplain and Critical Care Nurse to discuss surgery and recovery.
- If patient falls into yellow or red zone, we will implement high level recovery progression plan which may include assignment to specific nurse during recovery, specific discharge plan, or other identified strategies to maximize recovery.
Approach to process development

• CT Surgery, for a significant amount of time, has worked to identify and intervene in high risk populations that are predisposed to poor outcomes after Open Heart Surgery.

• This work coordinates with development of POCMA review by CT Surgery Staff, preoperative clinic for open heart patients, and several CT Best Practice work groups and projects to maximize outcomes.

• In review of the current literature and data, several frailty indices and approaches to high risk populations were identified, but did not entirely fit the need of the groups.


Strengths of the tool

- Interdisciplinary Team Approach that includes the patient in decision-making
- Tool formulated after looking at current literature and work around frailty
- Built upon current processes and teachings
- Asks about the PATIENT’S goals of care
- Assesses patient affective status
- Patient acceptance has been great
- Typically takes less than 5 minutes to administer
Weaknesses of the tool

• *Affect* assessment is key – but very challenging
• Relies on patient’s honest answers and may need more private setting
  – Don’t ask the questions in front of family members (?)
  – Pts who are on antidepressants may not feel depressed...
• Stratification not clear
• At this time is a hypothesis versus a validated tool
• Implementation may be complicated for some programs (*but could be done in surgeon’s office...*)
An ongoing development process
(revisions May 2)

Becomes a three part assessment:

• **Surgeon** - Factor in the STS Risk Score when available

• **Staff** – Meet with the patient
  – Conversation: What is your main reason for having this surgery?
  – Observe: 5 meter walk -> pass/fail

• **Patient** - Complete survey: have patient answer questions in private
  – Their perception of functional status (4 questions)
  – Social support / network (4 questions)
  – Affective screening (2 questions)
  – Add nutrition screen?
THE PATIENT COMPLETES A BRIEF SURVEY

• “Please help us care better for you after your heart surgery. Pick the one most accurate answer in each box in this questionnaire.

Thank you,
Your cardiac care team
<table>
<thead>
<tr>
<th>Right now I am able to:</th>
<th>Right now I Participate in the management of my home, such as simple cleaning, bill paying.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get into and out of bed</td>
<td>do not</td>
</tr>
<tr>
<td>_ with someone’s help</td>
<td>With help</td>
</tr>
<tr>
<td>_ slowly with self-assist</td>
<td>Without help</td>
</tr>
<tr>
<td>_ easily</td>
<td></td>
</tr>
<tr>
<td>Get into and out of a chair</td>
<td></td>
</tr>
<tr>
<td>_ with someone’s help</td>
<td></td>
</tr>
<tr>
<td>_ slowly with self-assist</td>
<td></td>
</tr>
<tr>
<td>_ easily</td>
<td></td>
</tr>
<tr>
<td>Walk outdoors at least 80 feet</td>
<td></td>
</tr>
<tr>
<td>_ (about 10 parking spaces)</td>
<td></td>
</tr>
<tr>
<td>_ with someone’s help</td>
<td></td>
</tr>
<tr>
<td>_ slowly with self-assist</td>
<td></td>
</tr>
<tr>
<td>_ easily</td>
<td></td>
</tr>
<tr>
<td>Do you have 24 hour in home</td>
<td></td>
</tr>
<tr>
<td>_ support of family or friends,</td>
<td></td>
</tr>
<tr>
<td>_ at discharge for a minimum of</td>
<td></td>
</tr>
<tr>
<td>_ 2 weeks?</td>
<td></td>
</tr>
<tr>
<td>_ No help</td>
<td></td>
</tr>
<tr>
<td>_ Some help but not 24/7</td>
<td></td>
</tr>
<tr>
<td>_ Has help</td>
<td></td>
</tr>
<tr>
<td>Are you currently using Home</td>
<td></td>
</tr>
<tr>
<td>Health (HH) or Visiting Nurse</td>
<td></td>
</tr>
<tr>
<td>Services (VNS)?</td>
<td></td>
</tr>
<tr>
<td>_ Yes</td>
<td></td>
</tr>
<tr>
<td>_ recently used HH (in the last</td>
<td></td>
</tr>
<tr>
<td>6 months)</td>
<td></td>
</tr>
<tr>
<td>_ are not using HH</td>
<td></td>
</tr>
<tr>
<td>I have Pain or stiffness that</td>
<td></td>
</tr>
<tr>
<td>impairs my mobility and / or</td>
<td></td>
</tr>
<tr>
<td>ability to get out of the home</td>
<td></td>
</tr>
<tr>
<td>_ over 90% of the time</td>
<td></td>
</tr>
<tr>
<td>_ 30-90% of the time</td>
<td></td>
</tr>
<tr>
<td>_ Less than 30% of the time</td>
<td></td>
</tr>
<tr>
<td>I have little interest or</td>
<td></td>
</tr>
<tr>
<td>pleasure in doing things</td>
<td></td>
</tr>
<tr>
<td>_ not at all</td>
<td></td>
</tr>
<tr>
<td>_ several days</td>
<td></td>
</tr>
<tr>
<td>_ more than half the days,</td>
<td></td>
</tr>
<tr>
<td>_ nearly everyday</td>
<td></td>
</tr>
<tr>
<td>I feel down, depressed, or</td>
<td></td>
</tr>
<tr>
<td>hopeless</td>
<td></td>
</tr>
<tr>
<td>_ not at all</td>
<td></td>
</tr>
<tr>
<td>_ several days</td>
<td></td>
</tr>
<tr>
<td>_ more than half the days,</td>
<td></td>
</tr>
<tr>
<td>_ nearly everyday</td>
<td></td>
</tr>
</tbody>
</table>
Staff assesses and scores

PRMCE Frailty Index

*What is your main reason for having open heart surgery*

- **24** I don’t want to have surgery: *complete survey and contact MD as soon as practical*
- **18** I don’t know why I am having surgery: *complete survey and contact MD as soon as practical*
- **12** My family wants me to have surgery: *complete survey, flag, notify the cardiac surgeon’s office*
- **6** My doctor says I should have surgery: *complete survey, flag, notify the cardiac surgeon’s office*
- **0** I want to feel better or live longer

<table>
<thead>
<tr>
<th>Total Score:</th>
<th>5 meter walk time average (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red: Scores 18-26</td>
<td>Unable to complete</td>
</tr>
<tr>
<td>Yellow: Scores 9-17</td>
<td>Green: less than 6 seconds</td>
</tr>
<tr>
<td>Green: Scores 0-8</td>
<td>Red: Greater than or equal to 6 seconds</td>
</tr>
</tbody>
</table>

Provide 5 meter walk time in seconds.
SCORING

- Red: $\geq 18$ on MAIN REASON question OR
- $18-26$ Total OR
- $\geq 6$ second 5 meter walk test:

- **High risk** of poor progression, limited potential to return home without significant help. If patient / family wish to proceed would need discussion and panel.

- *Call surgeon with results as soon as practical*
SCORING

- **Yellow:**
  - >=6 on the MAIN REASON question OR
  - Scores 9-17.
  - **Medium risk**: may need short to medium term help in progressing function in preparation for return home.

*Leave message for the cardiac surgeon*
SCORING

- Green: 0 on first question AND
- Scores 0-8 on second group AND
- <6 seconds for 5 meter walk test.

Low risk; will likely have successful return home from mobility and coping standpoint.
Actions Taken

- If any Red checked: Surgeon notified ASAP
- If any Yellow: Surgeon’s office notified
- Other action__________________________

- Consider family conference with reevaluation for surgery
- Implement high acuity care pathway
Limitations of the project

• The tool and scoring needs to be validated and correlated with outcomes
• A single program will take a fair amount of time to accrue enough patient data
• Benefits of collaboration with other programs / providers are missing
References


Frailty, Aging, and Cardiac Surgery Outcomes: The Stopwatch Tell the Story; Cleveland; *Journal of American College of Cardiology*; Vol. 56, No. 20, 2010.

Hlatky et al; A Brief Self-Administered Questionnaire to Determine Functional Capacity (The Duke Activity Status Index); *American Journal of Cardiology*; Vol. 64, September 1989.

Kroenke, et al. The Patient Health Questionnaire-2 Validity of a Two-Item Depression Screener. Volume 41, Number 11, pp 1284–1292

Makarv et al; Frailty As a Predictor of Surgical Outcomes in Older Patients; *Journal of American College of Surgeons*; Vol. 210, No. 6, June 2010.

Validation of PHQ-2 and PHQ-9 to Screen for Major Depression in the Primary Care Population. *Annals of Family Medicine*. [WWW.ANNFAMMED.ORG](http://WWW.ANNFAMMED.ORG) VOL. 8, NO. 4. JULY/AUGUST 2010
Proposal for statewide study of Frailty Assessment

“...although the utility of frailty [has] been highlighted, the optimal method to measure frailty [has] not been addressed and represent[s] an important void in the literature”
Proposal for statewide study of Frailty Assessment

• Consider viability as a multi-center study and grant opportunity
• Recruit Steering Committee / Champion
• Agree on model – Add 5m gate speed?
• Voluntary participation from other programs
• Data collection (Armus?) and reporting
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