Frailty: A Specialist’s Perspective

Thomas Robinson MD MS
General Surgery
University of Colorado / Denver VA
Integrating Frailty Research into the Specialties

“We have chosen to focus on [frailty which is a] topic critical to the aging/specialty interface, where the bulk of research has been done in the field of geriatrics, and specialty researchers are actively trying to integrate this [frailty] research into issues pertinent to the specialty population.”
FRAILTY IN THE SURGICAL LITERATURE

FRAILTY IN THE SURGICAL LITERATURE

LETTERS

Acute Postoperative Frailty

Luigi Ferrucci, MD, PhD, Marcello Maggio, MD, PhD
Baltimore, MD

Gian Paolo Ceda, MD, Cesare Beghi, MD,
Giorgio Valenti, MD
Parma, Italy

Giuseppe De Cicco, MD
Brescia, Italy

We read with great interest the article by Dr Wolfe concerning the influence of surgical stress on muscle mass in the elderly. The author underlines that the catabolic re-

terone, sex hormone-binding globulin, and insulin-like growth factor-1 were measured the day before, on the day of the procedure, and 1, 2, 3, and 4 days after operation. We found a substantial decrease in serum insulin-like growth factor-1 levels along with increased levels of cortisol, dehydroepiandrosterone, and estradiol in both men and women. A dramatic drop in serum testosterone levels (<200 ng/dL, considered a cut-off for hypogonadism) was also observed in older men after operation. Reduction in anabolic hormones such as testosterone and insulin-like growth factor-1 can be explained and can also contribute to an increase in inflammatory cytokines, such as interleukin (IL)-6, tumor necrosis factor-α, IL-1β, a chain of events that can lead to sarcopenia after operation. In addition, inflammation plays an important role in muscle catabo-

FRAILTY IN THE SURGICAL LITERATURE

Redefining Geriatric Preoperative Assessment Using Frailty, Disability and Co-Morbidity

Thomas N. Robinson, MD,*† Ben Eiseman, MD,*† Jeffrey I. Wallace, MD,‡ Skotti D. Church, BS,* Kim K. McFann, PhD,§ Shirley M. Pfister, RN, MS, NP,¶ Terra J. Sharp, NP-C,¶ and Marc Moss, MD‡

Objectives: (1) Determine the relationship of geriatric assessment markers to 6-month postoperative mortality in elderly patients. (2) Create a clinical prediction rule using geriatric markers from preoperative assessment. confers increased susceptibility to poor outcomes. Clinical markers of frailty are widely recognized by geriatricians as predictors of poor outcomes. With more than half of all operations in the United States
TWO APPROACHES TO FRAILTY

**Accumulation of Deficits**
- disability
- cognition
- multi-morbidity
- social vulnerability

**Phenotypic Frailty**
- slow walking speed
- impaired grip strength
- self-report of declining activity levels
- unintended weight loss
- exhaustion

CMAJ 2005;173(5):489-95

FRAILTY IN THE SURGICAL LITERATURE

Frailty in the Surgical Literature

Frailty as a Predictor of Surgical Outcomes in Older Patients

Martin A Makary, MD, MPH, FACS, Dorry L Segev, MD, PhD, FACS, Peter J Pronovost, MD, PhD, Dora Syin, MD, Karen Bandeen-Roche, PhD, Purvi Patel, MD, MPH, Ryan Takenaga, MD, Lara Devgan, MD, MPH, Christine G Holzmueller, BLA, Jing Tian, MS, Linda P Fried, MD, MPH

BACKGROUND: Preoperative risk assessment is important yet inexact in older patients because physiologic reserves are difficult to measure. Frailty is thought to estimate physiologic reserves, although its use has not been evaluated in surgical patients. We designed a study to determine if frailty predicts surgical complications and enhances current perioperative risk models.
FRAILTY IN THE SURGICAL LITERATURE

Articles

Calendar Year

2006 2007 2008 2009 2010 2011 2012 2013 2014

Integrating Frailty Research into the Specialties

“Gaps in knowledge remain regarding how to apply these [frailty] principles to specialty research, such as –

(1) the identification and optimal treatment of frail older adults who are undergoing medical and/or surgical interventions

(2) the development of additional outcomes (i.e. surgical complications, chemotherapy toxicity) that may be utilized by specialists to identify individuals who are considered frail.”
Integrating Frailty Research into the Specialties

“Gaps in knowledge remain regarding how to apply these [frailty] principles to specialty research, such as –

(1) the identification and optimal treatment of frail older adults who are undergoing medical and/or surgical interventions

(2) the development of additional outcomes (i.e. surgical complications, chemotherapy toxicity) that may be utilized by specialists to identify individuals who are considered frail.”

![Surgical Risk Calculator](image)

<table>
<thead>
<tr>
<th>Procedure: 44140 - Colectomy, partial with anastomosis</th>
<th></th>
</tr>
</thead>
</table>

**Please enter as much of the following information as you can to receive the best risk estimates.**

A rough estimate will still be generated if you cannot provide all of the information below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Group</strong></td>
<td>75-84 years</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>Female</td>
</tr>
<tr>
<td><strong>Functional status</strong></td>
<td>Partially Dependent</td>
</tr>
<tr>
<td><strong>Emergency case</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>ASA class</strong></td>
<td>III - Severe systemic disease</td>
</tr>
<tr>
<td><strong>Wound class</strong></td>
<td>Clean/Contaminated</td>
</tr>
<tr>
<td><strong>Steroid use for chronic condition</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Ascites within 30 days prior to surgery</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Systemic sepsis within 48 hours prior to surgery</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Ventilator dependent</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Disseminated cancer</strong></td>
<td>No</td>
</tr>
</tbody>
</table>

**Diabetes:** Oral

**Hypertension requiring medication:** No

**Previous cardiac event:** No

**Congestive heart failure in 30 days prior to surgery:** Yes

**Dyspnea:** None

**Current smoker within 1 year:** Yes

**History of severe COPD:** No

**Dialysis:** No

**Acute Renal Failure:** No

**BMI Calculation:** Height (in) 66, Weight (lbs) 264
**Surgical Risk Calculators**  

---  

http://riskcalculator.facs.org/

---

**Procedure**: 44140 - Colectomy, partial, with anastomosis

**Risk factors**:
- Age: 75-84
- Female: Partially dependent functional status
- ASA III
- Clean/Contaminated wound
- Diabetes (Non) CHP
- Smoker: Overweight

### Outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Estimated Risk</th>
<th>Chance of Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Complication</td>
<td>24%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Any Complication</td>
<td>39%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Cardiac Complication</td>
<td>2%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Surgical Site Infection</td>
<td>14%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td>8%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Venous Thromboembolism</td>
<td>2%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>2%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Return to OR</td>
<td>8%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Death</td>
<td>5%</td>
<td>Above Average</td>
</tr>
<tr>
<td>Discharge to Nursing or Rehab Facility</td>
<td>34%</td>
<td>Above Average</td>
</tr>
</tbody>
</table>

**Predicted Length of Hospital Stay**: 7.5 days
Receiver Operating Characteristic (ROC) Curve

<table>
<thead>
<tr>
<th>Source of the Curve</th>
<th>AUC</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>0.500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Calculator</td>
<td>0.638</td>
<td>0.520, 0.755</td>
<td>0.026</td>
</tr>
<tr>
<td>Frailty Score</td>
<td>0.700</td>
<td>0.581, 0.817</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
## Current GEMSSTAR Projects With Easy Links to Frailty

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOWLING, CHRIST</td>
<td>EMORY UNIVERSITY</td>
<td>Reasons for the Excess Mortality and Functional Decline in Older Adults with CKD</td>
</tr>
<tr>
<td>BROWN, CHARLES</td>
<td>JOHNS HOPKINS UNIV</td>
<td>The impact of impaired cerebral autoregulation on postoperative delirium</td>
</tr>
<tr>
<td>BRUMMEL, NATHA</td>
<td>VANDERBILT UNIVERSITY</td>
<td>Early Prediction of Long-Term Cognitive Impairment Following Critical Illness</td>
</tr>
<tr>
<td>CHAER, RABIH A.</td>
<td>UNIVERSITY OF PITTSBURGH</td>
<td>Effect of Aging and Aortic Wall Behavior as Predictors of Aortic Aneurysm Growth</td>
</tr>
<tr>
<td>DODSON, JOHN A.</td>
<td>NEW YORK UNIVERSITY</td>
<td>Determinants of fall-related bleeding among older adults with atrial fibrillation</td>
</tr>
<tr>
<td>DONOVAN, NANCY</td>
<td>BRIGHAM AND WOMEN'S</td>
<td>Loneliness and biomarkers of Alzheimer's disease in clinically normal elderly</td>
</tr>
<tr>
<td>GARCIA, JOSE M.</td>
<td>BAYLOR COLLEGE OF MED</td>
<td>The role of ghrelin and the ghrelin receptor GHSR1a in sarcopenia of aging</td>
</tr>
<tr>
<td>HSIEH, SHI-JUN</td>
<td>ALBERT EINSTEIN</td>
<td>Intranasal insulin for neuroprotection in elderly cardiac surgery patients</td>
</tr>
<tr>
<td>JUMP, ROBIN</td>
<td>CASE WESTERN RESERVE</td>
<td>Colonization resistance and older adults vulnerability to C. difficile infection</td>
</tr>
<tr>
<td>KAPOOR, ALOK</td>
<td>BOSTON MEDICAL CENTER</td>
<td>Older Adult Safety in Surgery (OASIS)</td>
</tr>
<tr>
<td>KENNEDY, MAURA</td>
<td>BETH ISRAEL DEACONESS</td>
<td>Assess Emergency Department Patients Developing Delirium after Hospital Admission</td>
</tr>
</tbody>
</table>
## Current GEMSSTAR Projects With Easy Links to Frailty

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAI, JENNIFER C.</td>
<td>UNIV OF CA SAN FRANCISCO</td>
<td>Global Functional Status in the Older Liver Transplant Candidate</td>
</tr>
<tr>
<td>LEE, RICHARD H.</td>
<td>DUKE UNIVERSITY</td>
<td>Metabolomics of low-trauma fracture among older women with diabetes</td>
</tr>
<tr>
<td>MOSELEY, KENDALL</td>
<td>JOHNS HOPKINS UNIVERSITY</td>
<td>Glycemic derangement and osteogenic cells:A model of Premature skeletal aging</td>
</tr>
<tr>
<td>RAO, ARATI V</td>
<td>DUKE UNIVERSITY</td>
<td>Clinico-Genomic Assessment of Performance Status in Elderly AML Patients</td>
</tr>
<tr>
<td>RIANON, NAHID</td>
<td>UNIVERSITY OF TEXAS HOUSTON</td>
<td>Effects of ACE Inhibitor (ACEI) use on bone turnover in humans: a clinical trial</td>
</tr>
<tr>
<td>RONDINA, MATTHEW</td>
<td>UNIVERSITY OF UTAH</td>
<td>The Regulation of Inflammatory Gene Responses in Aging</td>
</tr>
<tr>
<td>SAFDAR, NASIA</td>
<td>UNIV OF WISCONSIN-MADISON</td>
<td>Probiotics to Improve Outcomes of Clostridium difficile</td>
</tr>
<tr>
<td>SCALES, CHARLES D</td>
<td>DUKE UNIVERSITY</td>
<td>Urinary Dysfunction in the Elderly: Informing Accountable Urologic Care</td>
</tr>
<tr>
<td>WILDES, TANYA M</td>
<td>WASHINGTON UNIVERSITY</td>
<td>PILOT STUDY OF GERIATRIC ASSESSMENTS IN SENIOR ADULTS WITH MULTIPLE MYELOMA</td>
</tr>
</tbody>
</table>
Integrating Frailty Research into the Specialties

“Gaps in knowledge remain regarding how to apply these [frailty] principles to specialty research, such as –

(1) the identification and **optimal treatment** of frail older adults who are undergoing medical and/or surgical interventions

(2) the development of additional outcomes (i.e. surgical complications, chemotherapy toxicity) that may be utilized by specialists to identify individuals who are considered frail.”
**Should We Start Preventing Complications Preoperatively?**

<table>
<thead>
<tr>
<th>Pre-Op Visit</th>
<th>Time Before Operation</th>
<th>Operation</th>
<th>Hospital Outcomes</th>
<th>30-Day Outcomes</th>
<th>One-Year Outcomes</th>
</tr>
</thead>
</table>

**Need Surgery? You Might Have to Get Healthier First**

After learning that he needed surgery to remove a golf-ball size tumor in his lung, 67-year-old Doug Rice expected to go under the knife right away. But his doctor told him he'd have to make an important change first: Quit smoking for 2½ weeks to reduce the chance of dangerous complications.

*Wall Street Journal  Oct 22\textsuperscript{nd} 2012.*
THE CONCEPT OF STARTING BEFORE SURGERY TO IMPROVE OUTCOMES
THE CONCEPT OF STARTING BEFORE SURGERY TO IMPROVE OUTCOMES
STRONG FOR SURGERY

- state-wide initiative bringing pre-surgery checklists to doctors’ offices to improve clinical outcomes

- Optimize nutrition
- Smoking cessation
- Glucose control
- Medication review

TRAINING THE FRAIL ELDERLY TO SURVIVE SURGERY

- Log-roll transfer from bed
- Gait training (stairs and curbs)
- Walking patterns
- Motor learning
- Strength training
- Inspiratory muscle training
## Current GEMSSTAR Projects With Easy Links to Frailty

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Project Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERCELES, AVELINO</td>
<td>UNIVERSITY OF MARYLAND BALT</td>
<td>The Multimodal Rehabilitation of Older Ventilated Survivors Of Critical Illness</td>
</tr>
<tr>
<td>REGENBOGEN, SCOT</td>
<td>UNIVERSITY OF MICHIGAN</td>
<td>Toward More Effective Enhanced Recovery Protocols for Major Surgery in Older Adults</td>
</tr>
<tr>
<td>SCHWARZE, GRETCHE</td>
<td>UNIV OF WISCONSIN-MADISON</td>
<td>A communication tool to assist older adults facing difficult surgical decisions</td>
</tr>
</tbody>
</table>
Integrating Frailty Research into the Specialties

“Gaps in knowledge remain regarding how to apply these [frailty] principles to specialty research, such as –

(1) the identification and optimal treatment of frail older adults who are undergoing medical and/or surgical interventions

(2) the development of additional outcomes (i.e. surgical complications, chemotherapy toxicity) that may be utilized by specialists to identify individuals who are considered frail.”
TAILORING SURGICAL OUTCOMES DATASETS TO OLDER ADULTS

**NSQIP VARIABLES**
Amenable to collection by chart review

- COPD
- Smoking
- Bilirubin
- Stroke
- Heart Failure
- Creatinine
- Angina
- Diabetes
- Dyspnea
TAILORING SURGICAL OUTCOMES DATASETS TO OLDER ADULTS

**NSQIP VARIABLES**
Amenable to collection by chart review
- COPD
- Smoking
- Bilirubin
- Stroke
- Heart Failure
- Creatinine
- Angina
- Diabetes
- Dyspnea

**FRAILTY VARIABLES**
Cannot be collected by chart review
- Activity
- Fatigue
- Walking Speed
- Grip Strength
TAILORING SURGICAL OUTCOMES DATASETS TO OLDER ADULTS

**NSQIP VARIABLES**
Amenable to collection by chart review
- COPD
- Smoking
- Bilirubin
- Stroke
- Dyspnea
- Heart Failure
- Creatinine
- Angina
- Diabetes

**FRAILTY VARIABLES**
Cannot be collected by chart review
- Activity
- Fatigue
- Walking Speed
- Grip Strength

**GERIATRIC-NSQIP VARIABLES**
Collectable by chart review & reflect geriatric vulnerability
- Prior falls
- Walking Aids
- Dementia
- Pressure ulcers
- Shrinking
- Function
# Tailoring NSQIP Variables to the Older Adult

## Function
1. Origin from home with support
2. Discharge functional health status
3. Discharge with / without services
4. Pre-op use of mobility aid
5. Pre-op history of prior falls

## Mobility
6. Postoperative pressure ulcer
7. Fall risk on discharge
8. New mobility aid on discharge

## Cognition
9. History of dementia
10. Competency status on admission
11. Postoperative delirium

## Healthcare Goals
12. Palliative care on admission
13. DNR order during hospitalization
14. Postop palliative care consult
OPERATIONALIZING FRAILTY INTO SURGICAL QUALITY PROGRAMS

Achieving the Highest Quality Geriatric Surgical Care for All Older Adults

Define what it means to be a: Geriatric Surgery Center of Excellence

LAUNCH Geriatric Surgery Centers of Excellence with ongoing quality measure data collection

Evaluate / Re-Evaluate Local processes & resources to ensure optimal outcomes

Record outcomes Quality Measurement

Analyze Data Understand outcomes locally

Compare Outcomes Compare data across hospitals to identify areas in need of improvement
## Current GEMSSTAR Projects With Easy Links to Frailty

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Institution</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper, Zara</td>
<td>Brigham and Women's Hosp</td>
<td>The one year trajectory of elderly patients after cervical spine fracture</td>
</tr>
<tr>
<td>Deiner, Stacie</td>
<td>Mount Sinai School of Med</td>
<td>The geriatric surgical patient: stress, anesthetics, and functional outcomes</td>
</tr>
<tr>
<td>Hughes, Chris</td>
<td>Vanderbilt University Med</td>
<td>Role of Endothelial and Brain Injury in Acute and Long-term Brain Dysfunction</td>
</tr>
<tr>
<td>Manno, Rebecca</td>
<td>Johns Hopkins University</td>
<td>The PRESS ERA: Protein &amp; Resistance Exercise Supplement Study for Elderly with RA</td>
</tr>
<tr>
<td>Verceles, Avelino</td>
<td>University of Maryland Balt</td>
<td>The Multimodal Rehabilitation of Older Ventilated Survivors Of Critical Illness</td>
</tr>
<tr>
<td>Regenbogen, Scot</td>
<td>University of Michigan</td>
<td>Toward More Effective Enhanced Recovery Protocols for Major Surgery in Older Ad</td>
</tr>
<tr>
<td>Pavon, Juliessa M</td>
<td>Duke University</td>
<td>Adherence to Venous Thromboembolism Prophylaxis Guidelines in Hospitalized Elders</td>
</tr>
</tbody>
</table>