Pre-op Evaluation of the Geriatric Patient: Frailty and other predictors of operative complications

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Geriatrics, CHUM
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The speaker has no conflict of interest to disclosure
Objectives

• Define the principle of frailty in the context of preoperative evaluation

• Identify and apply a comprehensive geriatric assessment to evaluate elderly patients preoperatively

• Recommend strategies to reduce perioperative complications in the geriatric population
Plan

• Introduction
• Best Practice Guidelines
  - Frailty
  - Cognition/ Depression/ Substance abuse
  - Functional status
  - Nutritional status
  - Medication / Polypharmacy
  - Clinical case
• Conclusion
Introduction

• Preop evaluation usually centered on specific systems impairments

• Risk stratification by system

• Less appealing to the elderly

• Heterogenous population

• Specific physiology
Introduction
Age related changes

- Neurological (↓ cognitive reserve, ↑ sensitivity to anesthesia – delirium ...)
- Cardiovascular (↓ contractility – tolerance to arrhythmia...)
- Pulmonary (↓ diffusion ...)
- Renal (↓ glomerular filtration...)
- Hepatic (↓ mass and perfusion ...)
- ...
Surgical Outcomes for Patients Aged 80 and Older: Morbidity and Mortality from Major Noncardiac Surgery

Mary Beth Hamel, MD, MPH, * William G. Henderson, PhD, ‡‡§ Shukri F. Khuri, MD, † and Jennifer Daley, MD *

• 2005 Journal of the American Geriatrics Society (JAGS)

• Prospective, 1991-1999, VA centers

• Issues: survival and complications at 30 days

• 26,648 patients ≥ 80, 568,263 patients < 80
• Deaths from any cause 8% (≥ 80) vs 3% (< 80)
• 20% ≥ 1 complication, higher mortality in these patients (26% vs 4%)
• ASA best predictor
• ↑ 5% of mortality risk for each additional year after 80
• Comorbidités and functional status had impact on risk of complications and mortality
Frailty

• Complex Concept:
  – biologic syndrome of decreased reserve and resistance to stressors resulting from cumulative declines across multiple physiologic systems, and causing vulnerability to adverse outcomes
  – (Fried et al, J Gerontol: Med Sci 2001)

• Vulnerability

• Fried criteria

• Rockwood criteria
Clinical Frailty Scale

1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 Well – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g., seasonally.

3 Managing Well – People whose medical problems are well controlled, but are not regularly active beyond routine walking.

4 Vulnerable – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up”, and/or being tired during the day.

5 Mildly Frail – These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 Moderately Frail – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.

7 Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9 Terminally Ill – Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In severe dementia, they cannot do personal care without help.
Survival According to Frailty Status
Cardiovascular Health Study


Canadian Initiative on Frailty and Aging / Initiative canadienne sur la fragilité et le vieillissement
www.frail-fragile.ca
# Frailty

## Frailty Score: Operational Definition

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrinkage</td>
<td>Unintentional weight loss $\geq 10$ pounds in past year</td>
</tr>
<tr>
<td>Weakness</td>
<td>Decreased grip strength</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>Self-reported poor energy and endurance</td>
</tr>
<tr>
<td>Low physical activity</td>
<td>Low weekly energy expenditure</td>
</tr>
<tr>
<td>Slowness</td>
<td>Slow walking</td>
</tr>
</tbody>
</table>

## Interpretation of the Frailty Score

The patient receives 1 point for each criterion met.

- 0–1 = Not Frail
- 2–3 = Intermediate Frail (Pre-frail)
- 4–5 = Frail

Frail patients are at much higher risk of adverse health outcomes.

Intermediate frail patients are at elevated risk (less than frail ones) but are also at more than double the risk of becoming frail over three years.

See Appendix III for a more detailed description of the validated frailty score for surgical patients.
<table>
<thead>
<tr>
<th>Frailty Criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>Unintentional weight loss ≥10 pounds in the past year.</td>
</tr>
<tr>
<td>Decreased grip strength (Weakness)</td>
<td>Grip strength in the lowest 20th percentile by gender and BMI. Three trials are performed with a hand-held dynamometer and the average value is used.</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td><strong>Women</strong></td>
</tr>
<tr>
<td>BMI</td>
<td>Kg Force</td>
</tr>
<tr>
<td>≤24</td>
<td>≤29</td>
</tr>
<tr>
<td>24.1–26</td>
<td>≤30</td>
</tr>
<tr>
<td>26.1–28</td>
<td>≤30</td>
</tr>
<tr>
<td>&gt;28</td>
<td>≤32</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>For the following two statements:</td>
</tr>
<tr>
<td></td>
<td>* &quot;I felt that everything I did was an effort.&quot; *</td>
</tr>
<tr>
<td></td>
<td>* &quot;I could not get going.&quot;</td>
</tr>
<tr>
<td></td>
<td>The patient is asked: &quot;How often in the last week did you feel this way?&quot;</td>
</tr>
<tr>
<td>0 = rarely or none of the time (&lt;1 day)</td>
<td></td>
</tr>
<tr>
<td>1 = some or a little of the time (1–2 days)</td>
<td></td>
</tr>
<tr>
<td>2 = a moderate amount of the time (3–4 days)</td>
<td></td>
</tr>
<tr>
<td>The criterion is met if patient answers 2 or 3 to either statement.</td>
<td></td>
</tr>
<tr>
<td>Low physical activity</td>
<td>Weekly energy expenditure, determined with the short version of the Minnesota Leisure Time Activities Questionnaire (see Taylor et al.) in the lowest 20th percentile by gender:</td>
</tr>
<tr>
<td></td>
<td><strong>Men:</strong> &lt;383 kcal/week. <strong>Women:</strong> &lt;270 kcal/week.</td>
</tr>
<tr>
<td>Slowed walking speed</td>
<td>Walking speed in the lowest 20th percentile by gender and height. Time is measured for a distance of 15 feet at normal pace. The average of three trials is used.</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td><strong>Women</strong></td>
</tr>
<tr>
<td>Height</td>
<td>Time</td>
</tr>
<tr>
<td>≤173 cm</td>
<td>≥7 sec</td>
</tr>
<tr>
<td>&gt;173 cm</td>
<td>≥6 sec</td>
</tr>
</tbody>
</table>

Frailty

- Geriatric preop evaluation also includes frailty markers
  - Functional status
  - **Nutritional status**
  - Mobility (TUG, **gait speed**, falls)
  - Hand grip
  - Polypharmacy
  - Cognition
Cognition
Cognitive impairment

- Preexisting cognitive impairment is an important risk factor for delirium

- Delirium ↑ postoperative complications
  ↑ length of stay
  ↑ mortality
  ↑ functional decline
**ASSESSING COGNITIVE ABILITY**

Cognitive Ability:

- For any patient older than age 65 without a known history of cognitive impairment or dementia, a history and cognitive assessment, such as the Mini-Cog (see below), are essential.

- If possible, a knowledgeable informant, such as a spouse or a family member, should be interviewed about the evolution of any cognitive or functional decline in the patient.\(^{16}\)

- If the patient has experienced a decline, they should be referred for further evaluation to a primary care physician, geriatrician, or mental health specialist.

- Postoperative cognitive dysfunction is common but difficult to quantify without documentation of the patient’s baseline cognitive status.\(^{17,18}\)

The cognitive assessment should be performed early in the patient evaluation because any evidence of cognitive impairment or dementia may indicate that subsequent assessment of functional status and/or medication use may be unreliable.
COGNITIVE ASSESSMENT: MINI-COG

Mini-Cog: 3 Item Recall and Clock Draw

1. GET THE PATIENT’S ATTENTION, THEN SAY:

“I am going to say three words that I want you to remember now and later. The words are Banana Sunrise Chair

Please say them for me now.”

Give the patient 3 tries to repeat the words. If unable after 3 tries, go to next item.

2. SAY ALL THE FOLLOWING PHRASES IN THE ORDER INDICATED:

“Please draw a clock in the space below. Start by drawing a large circle. Put all the numbers in the circle and set the hands to show 11:10 (10 past 11).”

If subject has not finished clock drawing in 3 minutes, discontinue and ask for recall items.

3. SAY: “What were the three words I asked you to remember?”
# Interpretation of the Mini-Cog

## SCORING:

- **3 item recall (0-3 points):** 1 point for each correct word
- **Clock draw (0 or 2 points):** 0 points for abnormal clock
  2 points for normal clock

## A NORMAL CLOCK HAS ALL OF THE FOLLOWING ELEMENTS:

- All numbers 1–12, each only once, are present in the correct order and direction (clockwise) inside the circle.
- Two hands are present, one pointing to 11 and one pointing to 2.

**ANY CLOCK MISSING ANY OF THESE ELEMENTS IS SCORED ABNORMAL. REFUSAL TO DRAW A CLOCK IS SCORED ABNORMAL.**

## Total Score of 0, 1, or 2 suggests possible impairment.

## Total Score of 3, 4, or 5 suggests no impairment.

If the patient has evidence of cognitive impairment on the Mini-Cog, consider a referral to a primary care physician, geriatrician, or mental health specialist.\textsuperscript{20,21}
Cognition
Delirium

• Frequent complication, incidence varies 5.1% - 52.2% (hip fx– aortic sx)

• Identify risk factors

• Avoid benzodiazepines and antihistamines

• ↑ mortality, complications, institutionalisation, cost and use of hospital resources, length of stay, functional decline
# Risk Factors for Postoperative Delirium

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Functional Impairments</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive and Behavioral Disorders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive impairment and dementia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Untreated or inadequately controlled pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
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<tr>
<td>Alcohol use</td>
<td></td>
<td></td>
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<tr>
<td>Sleep deprivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disease/Illness Related</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe illness/comorbidities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypoxia</td>
<td></td>
<td></td>
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<tr>
<td><strong>Metabolic</strong></td>
<td></td>
<td></td>
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<tr>
<td>Poor nutrition</td>
<td></td>
<td></td>
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<tr>
<td>Dehydration</td>
<td></td>
<td></td>
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<tr>
<td>Electrolyte abnormalities</td>
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<td></td>
</tr>
</tbody>
</table>

In patients at risk for postoperative delirium, administration of benzodiazepines and antihistamines (for example, diphenhydramine) should be avoided, except in certain circumstances (see Section VII).
**Table 29.4**  Etiology of acute confusion in surgical patients

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
<td>Infection</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>Metabolic</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Cognitive, sensory</td>
</tr>
<tr>
<td><strong>O</strong></td>
<td>Oxygenation</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>Nutrition, swallowing</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Function, pharmacy, Foley catheter</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>Unfamiliar environment</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>Stress, pain</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Electrolytes/fluids</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Dysfunction lung, liver, kidney, brain</td>
</tr>
</tbody>
</table>
Cognition
Delirium prevention

• 1- Orientation and cognitive stimulation
• 2- Promote sleep with non pharmacological methods
• 3- Mobilize
• 4- Correct visual deficits (visual aid and adapted equipment)
• 5- Correct hearing deficits (hearing aids, pocket talker…)
• 6- Prevent and correct dehydration
• 7- Avoid / limit use of benzodiazepines and antihistamines
• 8- Assure pain control, minimize narcotics
• 9- Minimize indwelling catheters
• 10- …
To determine the patient's decision-making capacity, the physician should confirm that the patient is able to describe (in his or her own words) the important features of the discussion, including his or her medical condition, and the indications/benefits/risks/alternatives to surgical operations.

The four legally-relevant criterion for decision-making capacity:

1. The patient can clearly indicate his or her treatment choice.
2. The patient understands the relevant information communicated by the physician.
3. The patient acknowledges his or her medical condition, treatment options, and the likely outcomes.
4. The patient can engage in a rational discussion about the treatment options.

See Appendix I for more details about the assessment of decision-making capacity.
Depression

- Prevalence of 11% ≥ 71 ans (1-3% in general population)
- Main risk factors: female gender, disability, bereavement, sleep disturbance, prior depression, in addition to poor health status, cognitive impairment, living alone, new medical illness
- ↑ mortality and length of stay (cardiac sx)
- ↑ use of pain medication, higher pain perception
# Screening for Depression

**Patient Health Questionnaire-2 (PHQ-2)** ³⁰

1. In the past 12 months, have you ever had a time when you felt sad, blue, depressed, or down for most of the time for at least two weeks?

2. In the past 12 months, have you ever had a time, lasting at least two weeks, when you didn’t care about the things that you usually care about or when you didn’t enjoy the things that you usually enjoy?

**Interpretation of PHQ-2**

If the patient answers YES to either question, then further evaluation by a primary care physician, geriatrician, or mental health specialist is recommended.

**NOTE:** This screening test has not been validated in extremely frail elderly patients, those with severe concurrent medical illnesses, those who are suffering from medication side effects, or those with impaired communication skills.
Alcohol and drug abuse

- Prevalence 13-14.5% in men ≥ 65, 3.3-8.1% in women for alcohol abuse

- ↑ mortality and postoperative complications (pneumonia, sepsis, wound infection, length of stay)
SCREENING FOR ALCOHOL AND SUBSTANCE ABUSE

Modified Version of CAGE\textsuperscript{43-46}

Ask the patient the following four questions:

1. Have you ever felt you should Cut down on your drinking or drug use?
2. Have people Annoyed you by criticizing your drinking or drug use?
3. Have you ever felt bad or Guilty about your drinking or drug use?
4. Have you ever had a drink or drug first thing in the morning (Eye-opener) to steady your nerves or to get rid of a hangover?

Interpretation of Modified CAGE

If YES to any of these questions, consider perioperative prophylaxis for withdrawal syndromes.

If operation can be delayed, consider referring motivated patients to substance abuse specialist for preoperative abstinence or medical detoxification.

Patients with alcohol use disorder should receive perioperative daily multivitamins (with folic acid) and high-dose oral or parental thiamine (100 mg).
Functional status

• Studies have shown that functional decline is a predictor of postoperative mortality

• Associated to institutionalisation, wound infection, delirium and further functional decline
1. Assess patient’s ability to perform daily activities (functional status).

### ASSESSING BASELINE AND CURRENT FUNCTIONAL STATUS IN AMBULATORY PATIENTS

#### Short Simple Screening Test for Functional Assessment

Ask the patient the following four questions:

1. Can you get out of bed or chair yourself?
2. Can you dress and bathe yourself?
3. Can you make your own meals?
4. Can you do your own shopping?

#### Interpretation of Functional Screening Test

- If NO to any of these questions, more in-depth evaluation should be performed, including full screening of ADLs and IADLs.
- Deficits should be documented and may prompt perioperative interventions (for example, referral to occupational therapy and/or physical therapy) and proactive discharge planning.

**NOTE:** Patient's responses may not be reliable in the presence of cognitive impairment or dementia.

2. Document deficits in vision, hearing, or swallowing.

3. Inquire about history of falls (“Have you fallen in the past year?”).

4. Evaluate the patient for limitations in gait and mobility and determine risk for falls.
ASSESSING GAIT AND MOBILITY IMPAIRMENT AND FALL RISK IN AMBULATORY PATIENTS

**Timed Up and Go Test (TUGT)**

Patients should sit in a standard armchair with a line 10 feet in length in front of the chair. They should use standard footwear and walking aids and should not receive any assistance.

Have the patient perform the following commands:

1. Rise from the chair (if possible, without using the armrests)
2. Walk to the line on the floor (10 feet)
3. Turn
4. Return to the chair
5. Sit down again

**Interpretation of TUGT**

Any person demonstrating difficulty rising from the chair or requiring more than 15 seconds to complete the test is at high risk for falls. Consider preoperative referral to physical therapy for more detailed gait assessment.
Your poll will show here

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Gait Speed as an Incremental Predictor of Mortality and Major Morbidity in Elderly Patients Undergoing Cardiac Surgery

Jonathan Afilalo, MD, MSC,*† Mark J. Eisenberg, MD, MPH,*‡ Jean-François Morin, MD,§
Howard Bergman, MD,¶ Johanne Monette, MD, MSC,¶ Nicolas Noiseux, MD,#
Louis P. Perrault, MD, PHD,** Karen P. Alexander, MD,†† Yves Langlois, MD,§
Nandini Dendukuri, PHD,† Patrick Chamoun, RRT,§ Georges Kasparian, BSC,‡‡
Sophie Robichaud, RRT,** S. Michael Gharacholou, MD,†† Jean-François Boivin, MD, SCD†‡
Montreal, Quebec, Canada; and Durham, North Carolina

• 131 pts ≥ 70 ans

• 4 academic centers

• Coronary artery bypass / valve replacement or repair

• Gait speed (< 0.83 m/s) independent predictor of mortality and major morbidity
“Timed Up & Go”: A Screening Tool for Predicting 30-Day Morbidity in Onco-Geriatric Surgical Patients? A Multicenter Cohort Study

Monique G. Huisman1*, Barbara L. van Leeuwen1, Giampaolo Ugolini2, Isacco Montroni2, John Spiliotis3,4, Cesare Stabilini5, Nicola de’Liguori Carino6, Eriberto Farinella7,8, Geertruida H. de Bock9, Riccardo A. Audisio10

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- TUG vs ASA

- 280 ≥ 70 ans, elective surgery for solid tumor

- TUG and ASA are both independent predictors of major complications

- TUG identifies 2X patients with major complications
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Nutritional status

- Malnutrition found in 38.7% hospitalized elderly patients, 50.5% in rehabilitation

- Malnutrition ↑ risk of infections, wound infections and length of stay in GI sx
1. Document height and weight and calculate body mass index (BMI).\textsuperscript{20,21}

2. Measure baseline serum albumin, prealbumin levels.\textsuperscript{20,21}

3. Inquire about unintentional weight loss in the last year.

4. Consider preoperative nutritional support for patients at severe nutritional risk (see Appendix IV).
PREOPERATIVE INTERVENTIONS FOR MALNUTRITION

ESPEN Recommendations\textsuperscript{95,126}

- Use nutritional support in patients with severe nutritional risk for 10–14 days prior to a major surgical operation even if the operation has to be delayed (Grade A).
- Initiate nutritional support (by the enteral route if possible) without delay:
  - Even in patients without obvious under-nutrition, if it is anticipated that the patient will be unable to eat for more than 7 days perioperatively (Grade C).
  - In patients who cannot maintain oral intake above 60% of recommended intake for more than 10 days (Grade C).
- Consider combination with parenteral nutrition in patients in whom there is an indication for nutritional support and in whom energy needs cannot be met (<60% of caloric requirement) via the enteral route (Grade C).
- Encourage patients who do not meet their energy needs from normal food to take oral nutritional supplements during the preoperative period (Grade C).
- Administer preoperative enteral nutrition preferably before admission to the hospital (Grade C).
- Preoperative parenteral nutrition is indicated in severely undernourished patients who cannot be adequately orally or enterally fed for 7–10 days preoperatively (Grade A).
- NOTE: The enteral route is preferred except for the following contraindications: Intestinal obstructions or ileus, severe shock, intestinal ischemia.

Other Recommendations

- Vitamin supplementation for alcohol-related malnourished patient: B12 and folate\textsuperscript{21} thiamine.
Medication - Polypharmacy

- Review complete list of medication
- Identify RX to stop or avoid
- Consider starting some medications
- Adjust dosage according to renal function
- Monitor for polypharmacy and adverse interactions
- Polypharmacy is associated to ↑ risk of cognitive impairment, morbidity, mortality, adverse interactions, ↓ medication compliance
Mrs P

82 endometrial cancer stage II
PMH : HTN, DB, CRD, DLP, cholecystectomy, osteoarthrosis
Rx : Amlodipine 10 mg DIE, Metformin 500 mg BID, Rosuvastatine 10 mg HS,  Oxazepam 15 mg HS, Calcium and Vitamin D.
Lives with husband, independent for ADL’s, shares IADL’s with husband. Ambulates without any assistive device, one fall last year. Slightly forgetful in the past 2 years. Sleeps well with medication, in good spirits. Active, walks regularly. Non smoker, non drinker, no use of drugs. Lost 5 kg in the past year.

Well groomed, overall well being
BP : 120/60, pulse : 80/min
Weight 60kg, height 160 cm
Physical examination non focal
MMSE 29/30, MoCA 26/30

Hg 105, albumine 36, creatinine 90.
Right handgrip at 22 kg, left 21 kg
Gait speed of 1,0 m/s, TUG 9 sec
Mrs P

- Frailty
  - weight loss of 5 Kg
  - handgrip 22 Kg
  - gait speed 1,0 m/s
  - overall well being
  - active

- Cognition
  - MiniCog 2/5
  - MMSE / MoCA
  - in good spirit
  - EtOH -
Mrs P

- Functional
  - Shared IADL’s
  - 1 fall
  - Gait speed 1.0 m/s
- Nutrition
  - BMI 23
  - Weight loss of 5 kg (11 lbs)
  - Albumine 36
- Medication
  - Oxazepam
  - Usual recommendations
Discontinue before surgery:

- Nonessential medications that increase surgical risk should be discontinued.96
- Medications with potential for drug interactions with anesthesia should be discontinued or substituted.96
- See Beers Criteria (see Appendix V) for additional list of medications that may need to be discontinued perioperatively.97
- Herbal medications should be stopped at least 7 days before a surgical operation due to uncertainty of contents.96 See Appendix VI for more specific recommendations.

Continue perioperatively:

- Medications with withdrawal potential, including selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, benzodiazepines, antipsychotics, monoamine oxidase inhibitors (MAOIs), beta blockers, clonidine, statins, and corticosteroids, should be continued.96
- Angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers should be continued unless their only indication is for hypertension and the patient’s blood pressure is well controlled.96

Additional considerations in patients at risk for postoperative delirium:

- Avoid starting new prescriptions for benzodiazepines and consider reducing benzodiazepines when possible.33,34
- Avoid using meperidine for treatment of pain.98 Ensure that pain is adequately controlled to reduce risk for developing postoperative delirium.35-38
- Use caution when prescribing antihistamine H1 antagonists (especially diphenhydramine/ Benadryl®) and other medications with strong anticholinergic effects.33,34
- No increased risk associated with neuroleptics (antipsychotics) and digoxin.33
- No conclusive evidence for H2 antagonists, tricyclic antidepressants, anti-Parkinson medications, steroids, NSAIDs, and antimuscarinics.33

For all other cases: Exercise clinical judgment.
ACC/AHA GUIDELINES FOR PERIOPERATIVE BETA BLOCKERS \textsuperscript{21,52}

Summary of Recommendations on Beta Blockers

**Indications:** The guidelines support administration of beta blockers to:

- Patients who are already on beta blockers, particularly those with independent cardiac indications for these medications (such as arrhythmia or history of myocardial infarction).
- Patients undergoing intermediate risk or vascular surgery with known coronary artery disease or with multiple clinical risk factors for ischemic heart disease.

**Initiation and Titration:**

If beta blockers are indicated, when feasible, they should be started at least days to weeks before elective surgery, titrated to a heart rate of 60–80 beats/minute in the absence of hypotension. Titrated rate control with beta blockers should continue during the intraoperative and postoperative periods.

**Discontinuation:**

Beta blockers should be tapered off slowly to minimize risk of withdrawal.

*At the time of this writing, the current ACC/AHA guidelines state that routine administration of high-dose beta-blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta-blockers who are undergoing noncardiac surgery.*

See Appendix VII for full recommendations.

INITIATION OF STATIN THERAPY \textsuperscript{21,52,99}

**Recommendation on Statins**

Preoperative statins should be started as soon as possible prior to a surgical operation for patients who have known vascular disease, elevated low-density lipoprotein cholesterol, or ischemia on thallium testing.

For patients undergoing noncardiac surgery who are currently taking statins, statin therapy should be continued. Statin use may also be considered for patients undergoing vascular and intermediate-risk surgical operations.
Cockcroft-Gault Formula

\[
eGFR = \frac{(140-\text{Age}) \times \text{Body Weight [in kg]} \times [0.85 \text{ if female}]}{72 \times \text{Serum Creatinine [in mg/dl]}}
\]

Modification of Diet in Renal Disease (MDRD) Study Equation

\[
eGFR = \frac{175 \times \text{Serum Creatinine [in mg/dl]}^{-1.154} \times \text{Age}^{-0.203}}{[1.212 \text{ if black}] \times [0.742 \text{ if female}]}
\]

These equations have their limitations (for example, in patients with significant muscle wasting and ones with rapidly changing kidney function). In these cases, more accurate measures of GFR can be obtained with exogenous filtration markers.\(^{100}\)

Recommendations for Medications Regarding Renal Function

Medications that are renally cleared should have dosages adjusted based on the patient’s estimated GFR.
Patient counselling

It is highly recommended to:

• Advance directives and health care proxy
• Discuss treatment goals and plan, as well as preferences and expectations
• Discuss expected postoperative course, possibility of functional decline, rehabilitation ...
• Determine patient’s family and social support, involve social worker if needed
Conclusion

• Heterogenous population with specific needs
• Multiple factors can affect mortality and morbidity
• Functional status and frailty are prognostic factors
• Capacity and patient preferences to keep in mind
Preoperative Assessment

In addition to conducting a complete and thorough history and physical examination of the patient, the following assessments are strongly recommended:

☐ Assess the patient’s **cognitive ability** and **capacity** to understand the anticipated surgery (see Section I.A, Section I.B, and Appendix I).

☐ Screen the patient for **depression** (see Section I.C).

☐ Identify the patient’s risk factors for developing postoperative **delirium** (see Section I.D).

☐ Screen for **alcohol** and other **substance abuse/dependence** (see Section I.E).

☐ Perform a preoperative **cardiac** evaluation according to the American College of Cardiology/American Heart Association (ACC/AHA) algorithm for patients undergoing noncardiac surgery (see Section II and Appendix II).

☐ Identify the patient’s risk factors for postoperative **pulmonary** complications and implement appropriate strategies for prevention (see Section III).

☐ Document **functional status** and history of **falls** (see Section IV).

☐ Determine baseline **frailty** score (see Section V and Appendix III).

☐ Assess patient’s **nutritional status** and consider preoperative interventions if the patient is at severe nutritional risk (see Section VI and Appendix IV).

☐ Take an accurate and detailed **medication history** and consider appropriate perioperative adjustments. Monitor for **polypharmacy** (see Section VII, Appendix V, Appendix VI, and Appendix VII).

☐ Determine the patient’s **treatment goals** and **expectations** in the context of the possible treatment outcomes (see Section VIII).

☐ Determine patient’s **family** and **social support system** (see Section VIII).

☐ Order appropriate preoperative **diagnostic tests** focused on elderly patients (see Section IX).
ACC/AHA ALGORITHM FOR CARDIAC EVALUATION AND CARE FOR NONCARDIAC SURGERY

Step 1: Need for emergency noncardiac surgery?
- Yes → Operating room
  - Perioperative surveillance and postoperative risk stratification and risk factor management
- No → Step 2

Step 2: Active cardiac conditions?
- Yes → Evaluate and treat per ACC/AHA guidelines
  - Consider operating room
- No → Step 3

Step 3: Low risk surgery?
- Yes → Proceed with planned surgery
- No → Step 4

Step 4: Functional capacity ≥ 4 METs without symptoms?
- Yes → Proceed with planned surgery
  - Intermediate-risk surgery
  - Risk stratification of surgery
- No or unknown
  - ≥ 3 clinical risk factors → Intermediate-risk surgery
  - 1-2 clinical risk factors → Proceed with planned surgery, with heart rate control for appropriate patients or consider noninvasive cardiac testing if it will change management
  - No clinical risk factors → Vascular surgery

Step 5: Assess clinical risk factors
- No clinical risk factors → Proceed with planned surgery
- ≥ 3 clinical risk factors → Intermediate-risk surgery
- 1-2 clinical risk factors → Proceed with planned surgery, with heart rate control for appropriate patients or consider noninvasive cardiac testing if it will change management


* See Appendix II for tables of Active Cardiac Conditions; Cardiac Risk Stratification of Surgery; Metabolic Equivalents (METs); and Clinical Risk Factors.
<table>
<thead>
<tr>
<th>Risk Factors</th>
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<tbody>
<tr>
<td><strong>Patient-Related Factors</strong></td>
</tr>
<tr>
<td>* Age &gt;60&lt;sup&gt;53-55,62-64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Chronic obstructive pulmonary disease (COPD)&lt;sup&gt;53-55,63,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* American Society of Anesthesiologists (ASA) class II or greater&lt;sup&gt;53-55&lt;/sup&gt;</td>
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<tr>
<td>* Functional dependence&lt;sup&gt;5,54,55,63,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Congestive heart failure&lt;sup&gt;53-55&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Obstructive sleep apnea&lt;sup&gt;54,55,65&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Pulmonary hypertension&lt;sup&gt;66-68&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Current cigarette use&lt;sup&gt;54,55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Impaired sensorium&lt;sup&gt;†,53-55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Preoperative sepsis&lt;sup&gt;53&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Weight loss &gt;10% in 6 months&lt;sup&gt;54,55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Serum albumin &lt;3.5 mg/dL&lt;sup&gt;53-55,63&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Blood urea nitrogen (BUN) ≥7.5 mmol/L (≥21 mg/dL)&lt;sup&gt;54,55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Serum creatinine &gt;133 μmol/L (&gt;1.5 mg/dL)&lt;sup&gt;54,69&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Surgical Procedure-Related Factors</strong></td>
</tr>
<tr>
<td>* Prolonged operation &gt;3 hours&lt;sup&gt;54,55,62&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Surgical site&lt;sup&gt;‡,53-55,63,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Emergency operation&lt;sup&gt;53-55,63,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* General anesthesia&lt;sup&gt;54,55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Perioperative transfusion&lt;sup&gt;53-55,64&lt;/sup&gt;</td>
</tr>
<tr>
<td>* Residual neuromuscular blockade after an operation&lt;sup&gt;55,70&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Not Risk Factors

- Obesity\textsuperscript{54,55}
- Well-controlled asthma\textsuperscript{54,55}
- Diabetes\textsuperscript{54,55}

* Total dependence was the inability to perform any activities of daily living. Partial dependence was the need for equipment or devices and assistance from another person for some activities of daily living.
† Acutely confused or delirious patient who is able to respond to verbal or mild tactile stimulation, or mental status changes/delirium in the context of current illness.
‡ Highest risk procedures: upper abdominal, thoracic, neurosurgical, head and neck, vascular (for example, aortic aneurysm repair).

PREOPERATIVE STRATEGIES FOR PREVENTING PPCS

Recommendations

- Preoperative optimization of pulmonary function in patients with COPD and asthma that is not well controlled\textsuperscript{71,72}
- Smoking cessation\textsuperscript{*68,73-76}
- Preoperative intensive inspiratory muscle training\textsuperscript{†68,77}
- Selective chest radiograph and pulmonary function tests\textsuperscript{‡55,72}

* Regarding the timing of smoking cessation, one study showed increased rates of PPCs in patients who stop smoking within eight weeks of a surgical operation; another study found that smoking cessation was beneficial as late as four weeks before surgery; a meta-analysis found no increased risk in PPCs with cessation within eight weeks of a surgical operation.
† Based on one single-blinded randomized control trial of patients undergoing elective CABG.
‡ Routine chest radiographs and pulmonary function tests are not recommended.