

Pre-operative Assessment and Optimization

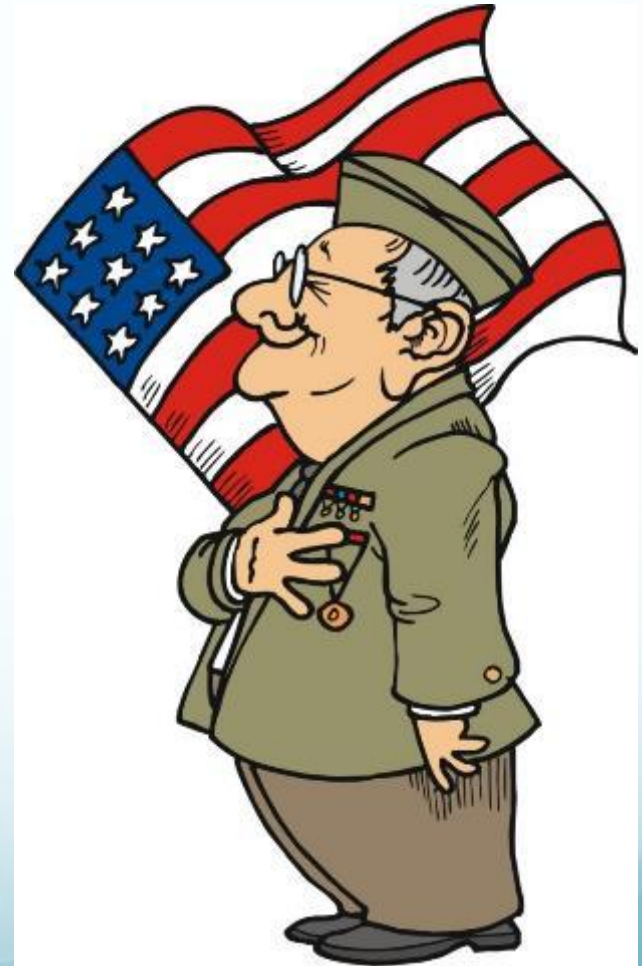
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Department of Anesthesiology

October 21, 2023

Case Presentation

- Mr. FA is a 72 year old male veteran with DM, HTN, who presented with 5 weeks of DOE,
 - found to be :
 - in left ventricular heart failure 2/2 recent MI
 - AKI
- Cath revealed triple vessel CAD
 - Planning for CABG.



Definition of Urgency

Emergency	Urgent	Time-Sensitive	Elective
<ul style="list-style-type: none">• Life or limb is threatened if not in the operating room within <6 hours.• Time for no or minimal clinical evaluation	<ul style="list-style-type: none">• Life or limb is threatened if not in the operating room, between 6 and 24 hours.• Time for a limited clinical evaluation	<ul style="list-style-type: none">• A delay of >1 to 6 weeks to allow for an evaluation and significant changes in management will negatively affect outcome.• Most oncologic procedures	<ul style="list-style-type: none">• The procedure could be delayed for up to 1 year.

What can we optimize before CABG?

- Diabetes
 - Last A1c 7.5%.
 - The target glucose 140-180 with insulin
 - Hold Metformin
- Hypertension
 - 109/54
 - BB, ACE later
 - Short acting afterload reduction if hypertensive
- Acute systolic heart failure
 - Diuresis
 - Afterload reduction if hypertensive
 - Repeat echo?
 - Pre-op intra-aortic balloon pump?



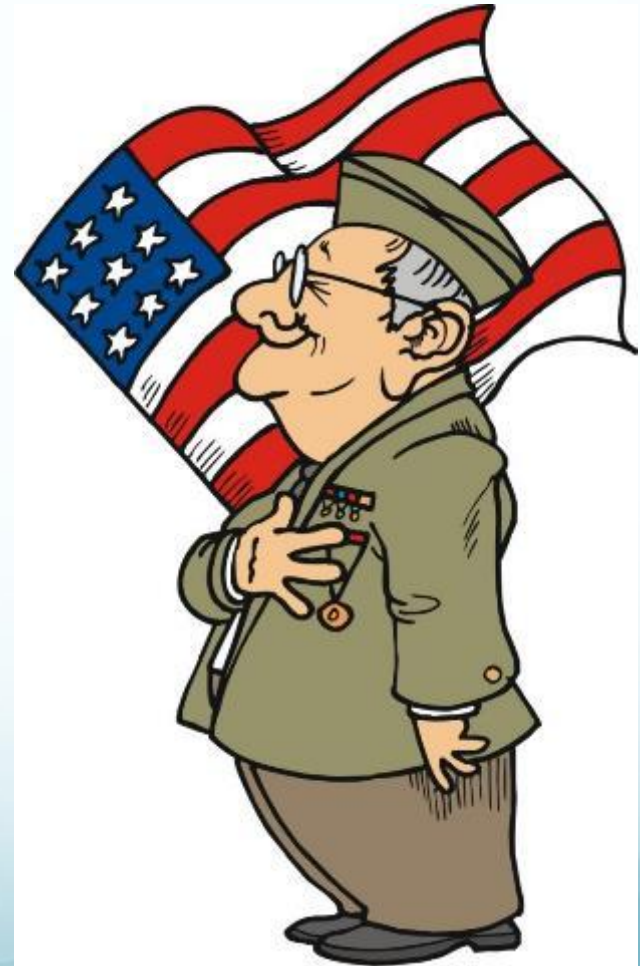
What can we optimize before CABG?

- AKI
 - Likely preload in origin- gentle diuresis
 - Gentle hydration while NPO
 - Renally dose meds, avoid renally toxic meds
- Smoking/alcohol cessation
 - Counseling/ provide resources
 - Smoking cessation- how long is long enough?



Case Presentation

- FA is a 72 year old male veteran with DM, HTN, who presented with 5 weeks of DOE, found to be in left ventricular heart failure 2/2 recent ACS, AKI.
- Cath revealed triple vessel CAD, planning for CABG.
- **Delay or not to delay?
Additional testing?**



10 years later...

- Mr. FA -82 year old male veteran with DM, HTN
 - MI 10 years ago s/p 3V CABG
 - Known CHF with last echo 2 years ago
 - EF 35%, moderate aortic stenosis
 - ICD implanted 5 years ago
- adenocarcinoma of the descending colon for colectomy



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2014 ACC/AHA Guidelines

- Assessment of risk and need for optimization
 - Change medical therapies
 - Perform further CV assessment and/or interventions
 - Recommendations for postop monitoring
 - Optimal location
 - Optimal timing



Circulation

Volume 130, Issue 24; Pages e278-e333
<https://doi.org/10.1161/CIR.000000000000106>



ACC/AHA CLINICAL PRACTICE GUIDELINE

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

How is this clinically relevant to my practice?

All patients scheduled to undergo **non-cardiac surgery** should have an *assessment of the risk of a perioperative cardiac event*.

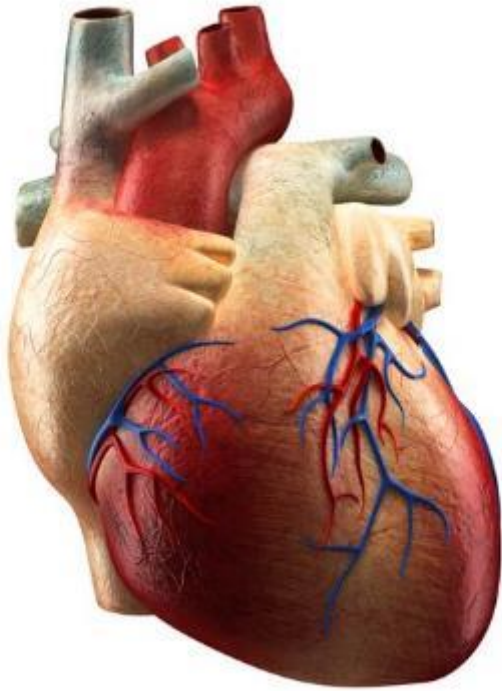


- To weigh the benefits and risks of the surgery
- Optimize the timing of the surgery
- Develop an estimate of perioperative cardiac risk.

Why do we care?

- Worldwide 1 in every 30-40 adults has major noncardiac surgery annually
- **> 10 million of the > 200,000,000 patients having surgery will suffer a major cardiac complication**
 - **in the first 30 days after surgery.**
- Major perioperative cardiac complications are important because:
 - they account for at least a third of perioperative deaths
 - prolonged hospitalization
 - increased cost
 - affect intermediate and long-term prognosis

Recognition of Clinical Risk Factors: Coronary Artery Disease



- **Stable CAD:**
 - Pre-op revascularization does NOT change outcomes.
- **HOWEVER if recent MI:**
 - **≥60 days** should elapse after a MI before noncardiac surgery (in absence of intervention)
 - Revascularization CAN mitigate risk.

Recognition of Clinical Risk Factors: CHF

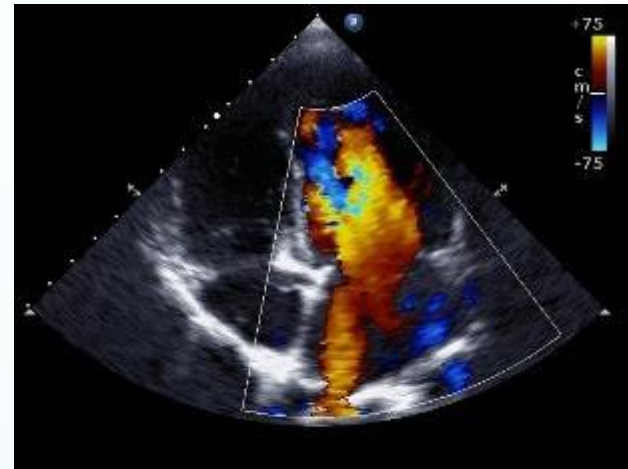
Heart Failure

- HF patients have higher risk of perioperative death (EF<30%) and hospital readmission than do other patients (even with CAD!)
- **New echo?**
 - dyspnea of unknown origin
 - change in clinical status
 - **if there has been no assessment within a year.**



Recognition of Clinical Risk Factors: Valvular Heart Disease

- \geq moderate valvular stenosis or regurgitation
- New Echo?
 - 1. no prior echo within 1 year OR**
 - 2. a significant change** in clinical status or physical examination since last evaluation



Recognition of Clinical Risk Factors: CIEDs (Pacemakers/ICDs)

- Periop management is complex
- Communicate in advance to plan interrogation and management of the CIED.
- Bovie:
 - Pacers: bradycardia
 - ICD: shock!



Definition of Risk

- **Low Risk:**
 - Procedures with a predicted risk of MACE of **<1%**.
- **Elevated Risk:**
 - Procedures with a predicted risk of MACE of **≥1%**



Calculation of Risk to Predict Perioperative Cardiac Morbidity

A **validated risk-prediction tool** can be useful in predicting the risk of MACE

Three common tools

- RCRI
- NSQIP MICA
- ACS NSQIP Surgical Risk Calculator



RCRI (Revised Cardiac Risk Index)

RCRI	Number of Factors	Risk of major event
History of ischemic heart disease	0	0.4%
History of CHF	1	0.9%
History of cerebrovascular disease (stroke or TIA)	2	6.6%
History of DM requiring preop insulin	>= 3	> 11%
Chronic Kidney Disease (Cr > 2 mg/dL)		
Undergoing suprainguinal vascular, intraperitoneal or intrathoracic surgery		

- Death
- MI
- pulmonary edema
- ventricular fibrillation
- primary cardiac arrest
- complete heart block

Gupta MICA Perioperative Cardiac Risk

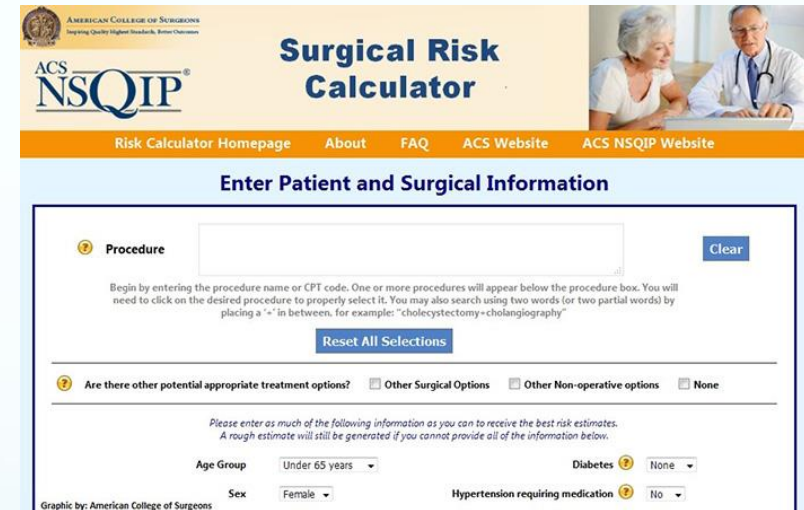
The NSQIP Myocardial Infarction and Cardiac Arrest (MICA) risk index

Perioperative Myocardial Infarction or Cardiac Arrest Risk Calculator

Age	<input type="text" value="60"/>	Enter actual age in years	Estimated risk probability for perioperative MICA:	3.86%														
ASA Class	<input type="text" value="3"/>	Enter 1 - 5 for American Society of Anesthesiologists' Class																
		<p>ASA Classification:</p> <ol style="list-style-type: none"> 1. A normal healthy patient. 2. A patient with mild systemic disease. 3. A patient with severe systemic disease. 4. A patient with severe systemic disease that is a constant threat to life. 5. A moribund patient who is not expected to survive without the operation. 																
				<table border="1"> <thead> <tr> <th>Percentile</th> <th>Percent Risk</th> </tr> </thead> <tbody> <tr> <td>25th percentile</td> <td>0.05%</td> </tr> <tr> <td>50th percentile</td> <td>0.14%</td> </tr> <tr> <td>75th percentile</td> <td>0.61%</td> </tr> <tr> <td>90th percentile</td> <td>1.47%</td> </tr> <tr> <td>95th percentile</td> <td>2.60%</td> </tr> <tr> <td>99th percentile</td> <td>7.69%</td> </tr> </tbody> </table>	Percentile	Percent Risk	25th percentile	0.05%	50th percentile	0.14%	75th percentile	0.61%	90th percentile	1.47%	95th percentile	2.60%	99th percentile	7.69%
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Creatinine (preoperative)	<input type="text" value="1"/>	Enter 2 for missing value 1 for ≥ 1.5 mg/dL 0 for < 1.5 mg/dL																
Functional Status (preoperative)	<input type="text" value="2"/>	Enter 2 for patients with totally dependent functional status 1 for patients who have partially dependent functional status 0 for those who are totally independent																
Procedure:	<input type="text" value="15"/>	Enter 1 for Anorectal 2 for Aortic 3 for Bariatric 4 for Brain 5 for Breast 6 for Cardiac 7 for ENT (except thyroid/parathyroid) 8 for Foregut/Hepatopancreatobiliary 9 for Gallbladder, appendix, adrenal and spleen 10 for Hernia (ventral, inguinal, femoral) 11 for Intestinal 12 for Neck (Thyoid and Parathyroid) 13 for Obstetric/Gynecologic 14 for Orthopedic and non-vascular Extremity 15 for Other abdominal 16 for Peripheral Vascular 17 for Skin 18 for Spine 19 for non-esophageal Thoracic 20 for Vein 21 for Urology																

NSQIP Surgical Risk Calculator

- 21 predictors (age, BMI,....)
- Risk specific to procedure
- Predicts multiple outcomes
 - MACE, Death, Pneumonia, VTE...
- *Best estimation of surgery-specific risk*



The screenshot displays the ACS NSQIP Surgical Risk Calculator interface. At the top, the American College of Surgeons logo and the ACS NSQIP logo are visible. The main heading is "Surgical Risk Calculator". Below this, there are navigation links: "Risk Calculator Homepage", "About", "FAQ", "ACS Website", and "ACS NSQIP Website". The main content area is titled "Enter Patient and Surgical Information". It features a "Procedure" input field with a "Clear" button. Below the input field, there is a "Reset All Selections" button. A section titled "Are there other potential appropriate treatment options?" includes radio buttons for "Other Surgical Options", "Other Non-operative options", and "None". Below this, there are dropdown menus for "Age Group" (set to "Under 65 years"), "Sex" (set to "Female"), "Diabetes" (set to "None"), and "Hypertension requiring medication" (set to "No"). A small note at the bottom left of the form area reads "Graphic by: American College of Surgeons".



Calculator



[Risk Calculator Homepage](#) [About](#) [FAQ](#) [ACS Website](#) [ACS NSQIP Website](#)

Enter Patient and Surgical Information

Procedure

Begin by entering the procedure name or CPT code. One or more procedures will appear below the procedure box. You will need to click on the desired procedure to properly select it. You may also search using two words (or two partial words) by placing a '+' in between, for example: "cholecystectomy+cholangiography"

Are there other potential appropriate treatment options? Other Surgical Options Other Non-operative options None

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.

Age Group	<input type="text" value="Under 65 years"/>	Diabetes	<input type="text" value="None"/>
Sex	<input type="text" value="Female"/>	Hypertension requiring medication	<input type="text" value="No"/>
Functional status	<input type="text" value="Independent"/>	Previous cardiac event	<input type="text" value="No"/>
Emergency case	<input type="text" value="No"/>	Congestive heart failure in 30 days prior to surgery	<input type="text" value="No"/>
ASA class	<input type="text" value="I - Healthy patient"/>	Dyspnea	<input type="text" value="None"/>
Wound class	<input type="text" value="Clean"/>	Steroid use for chronic condition	<input type="text" value="No"/>
Ascites within 30 days prior to surgery	<input type="text" value="No"/>	Current smoker within 1 year	<input type="text" value="No"/>
Systemic sepsis within 48 hours prior to surgery	<input type="text" value="None"/>	History of severe COPD	<input type="text" value="No"/>
Ventilator dependent	<input type="text" value="No"/>	Dialysis	<input type="text" value="No"/>
Disseminated cancer	<input type="text" value="No"/>	Acute Renal Failure	<input type="text" value="No"/>
		BMI Calculation:	Height (in) <input type="text"/>
			Weight (lbs) <input type="text"/>

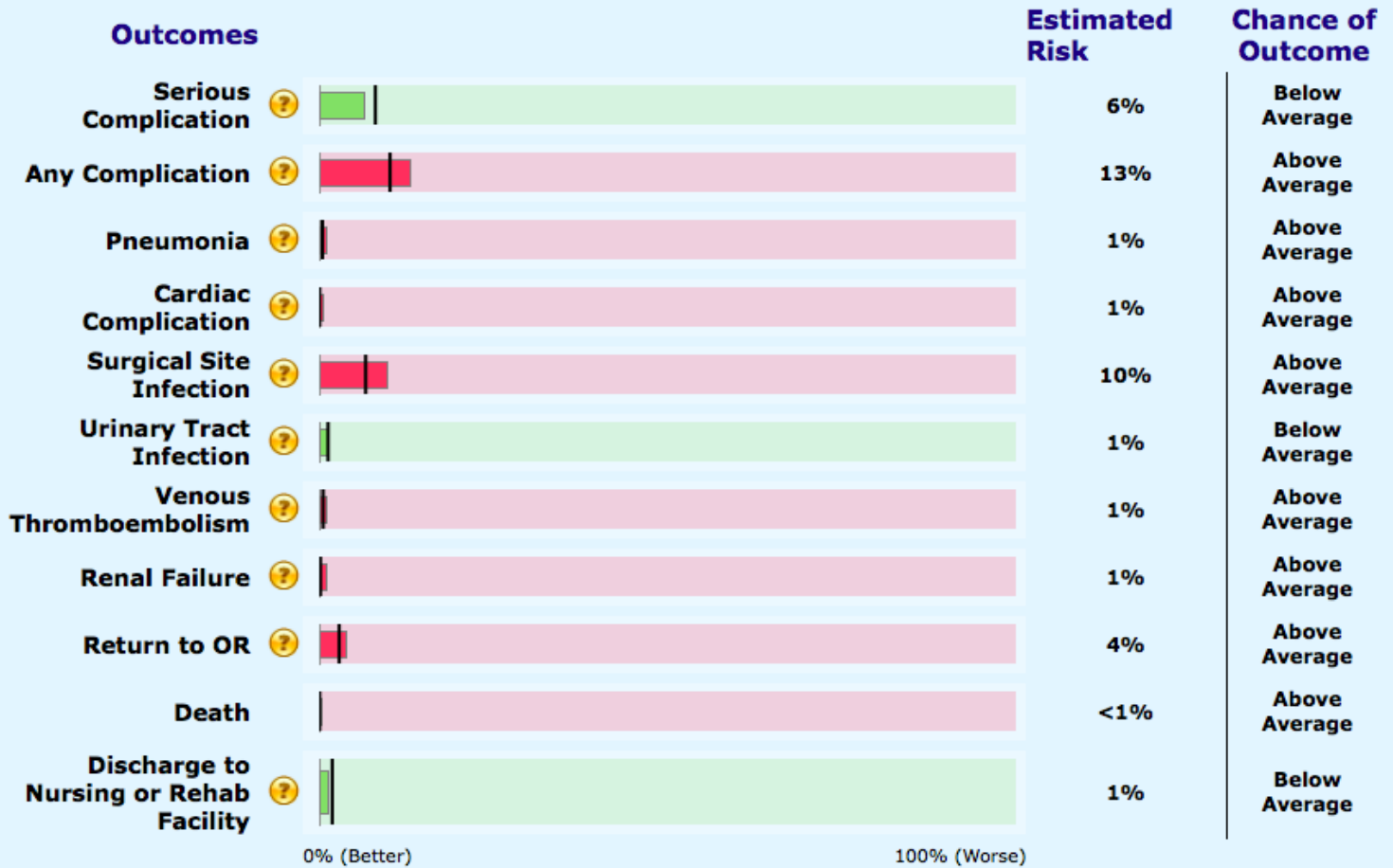
Procedure

44204 - Laparoscopy, surgical; colectomy, partial, with anastomosis

Risk Factors

Age: Under 65, Male, ASA III, Diabetes (oral), HTN, Obese (Class2)

Change Patient Risk Factors



Predicted Length of Hospital Stay: 3.5 days

Outcomes i

		Your Risk	Average Risk	Chance of Outcome
Serious Complication		80.2%	18.5%	Above Average
Any Complication		86.7%	25.1%	Above Average
Pneumonia		33.2%	1.3%	Above Average
Cardiac Complication		30.5%	0.5%	Above Average
Surgical Site Infection		11.8%	12.5%	Average
Urinary Tract Infection		5.3%	1.3%	Above Average
Venous Thromboembolism		6.2%	1.3%	Above Average
Renal Failure	This outcome is inapplicable to patients with pre-op renal failure or dialysis.			
Readmission		48.1%	18.2%	Above Average
Return to OR		19.4%	5.2%	Above Average
Death		94.5%	1.3%	Above Average
Discharge to Nursing or Rehab Facility		98.7%	9.5%	Above Average
Sepsis		0.0%	3.0%	Below Average
T Proctectomy Ileus		84.9%	20.3%	Above Average

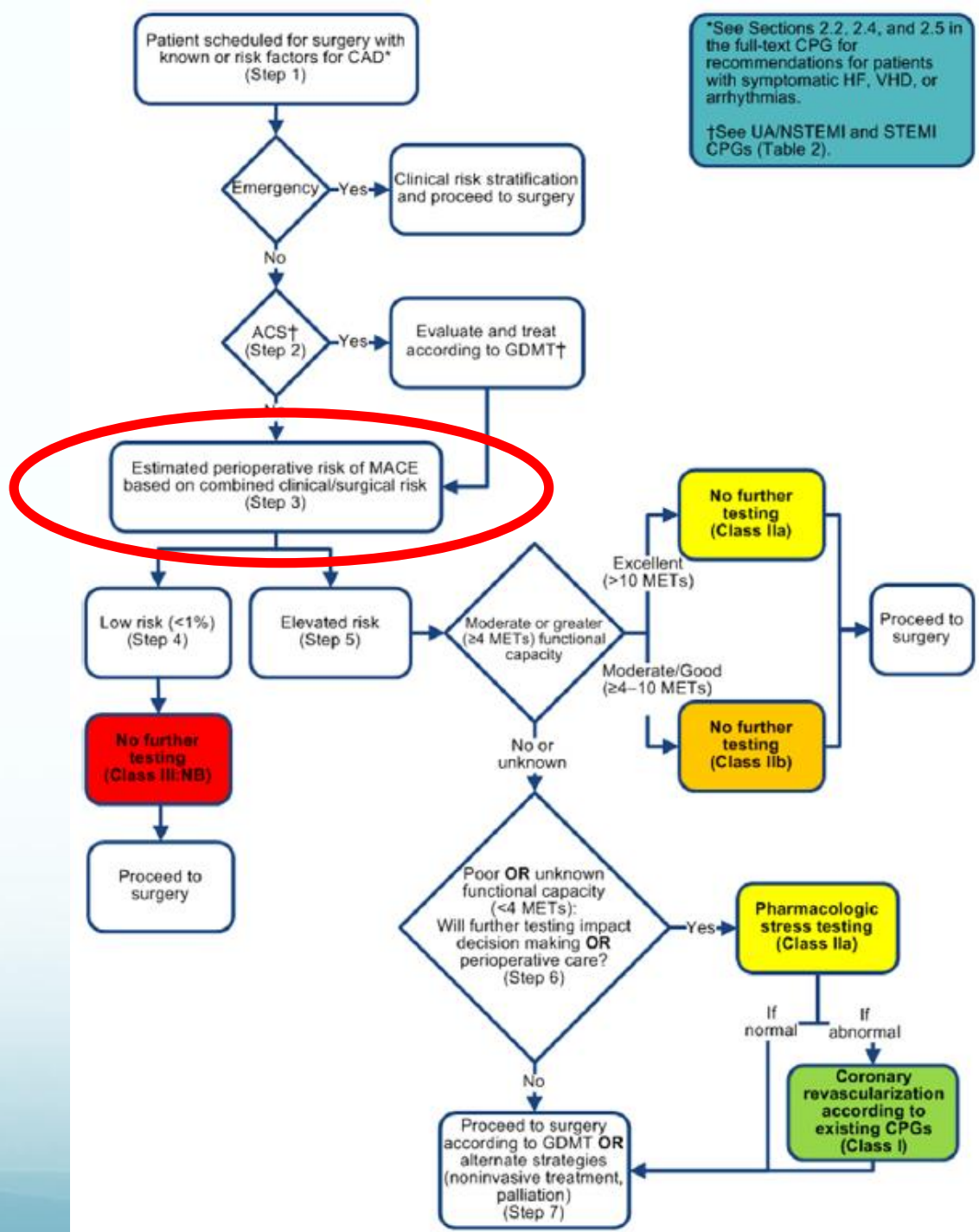
Predicted Length of Hospital Stay: 30 days

Definition of Risk

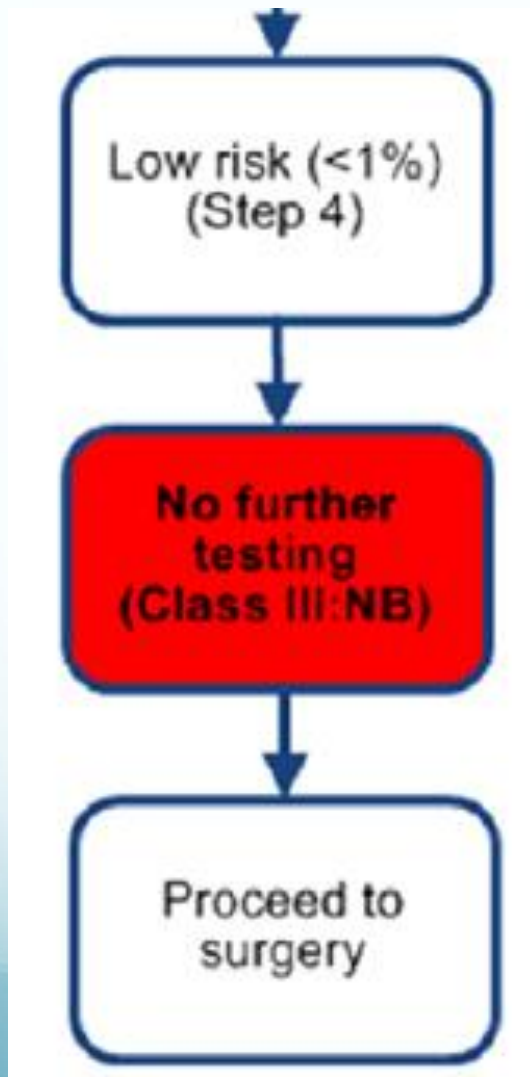
- **Low Risk:**
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Stepwise Approach to Perioperative Cardiac Assessment: Treatment Algorithm

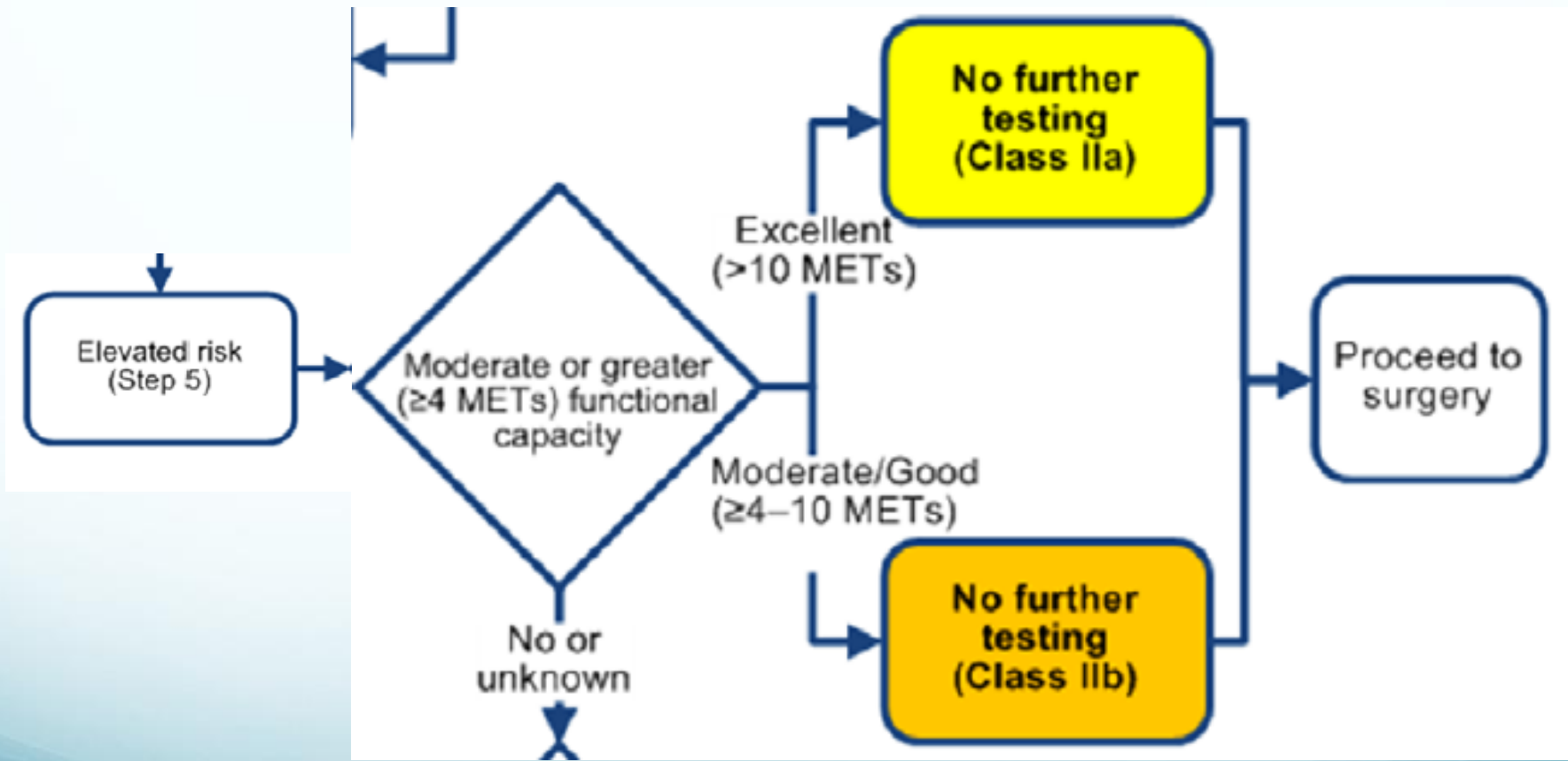


Step 4



Low Risk – no further testing is required)

Step 5



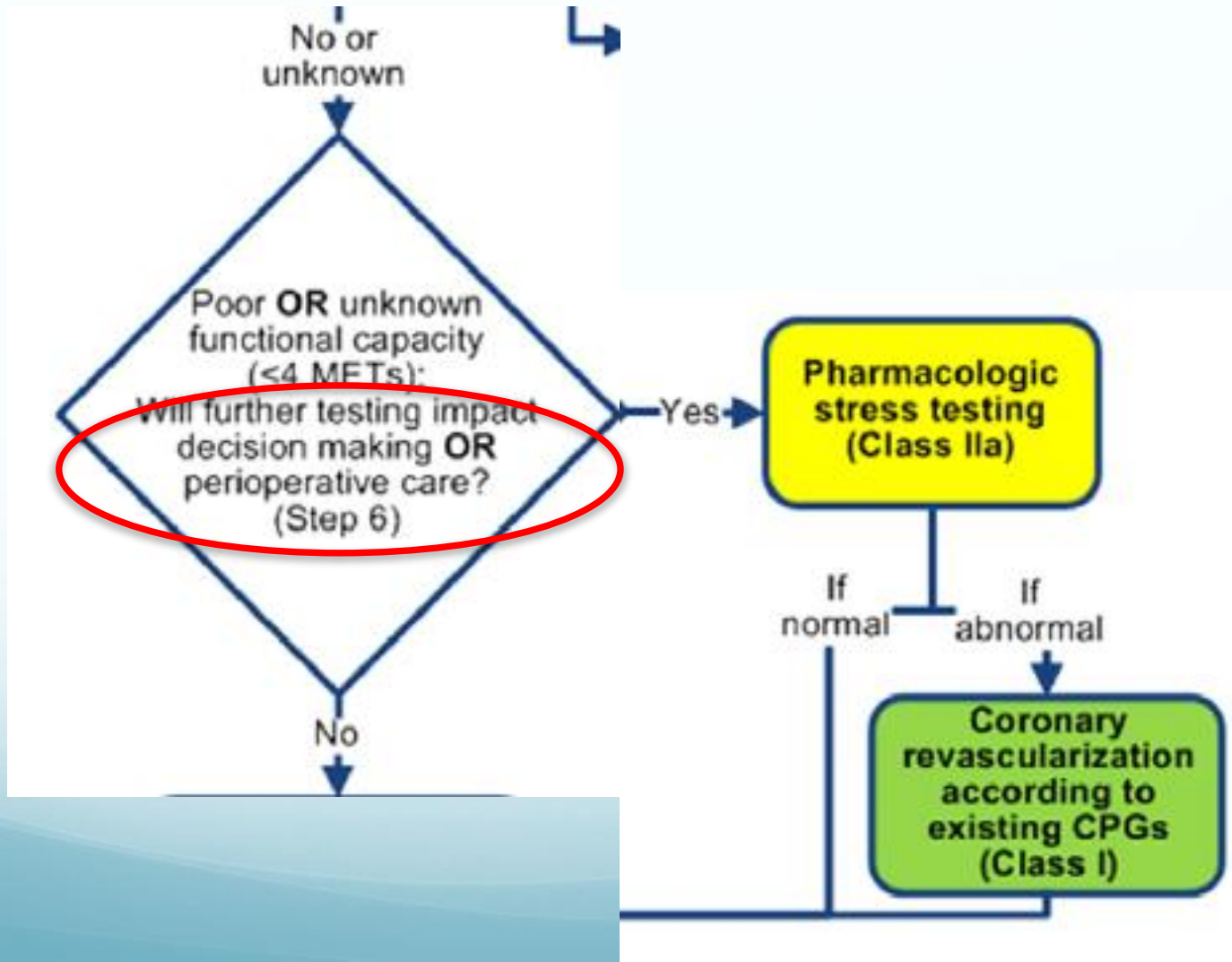
Exercise Capacity and Functional Status

Classification:

- excellent (>10 METs)
- good (7 METs to 10 METs)
- moderate (4 METs to 6 METs)
- **poor (<4 METs)**



Step 6



Step 7

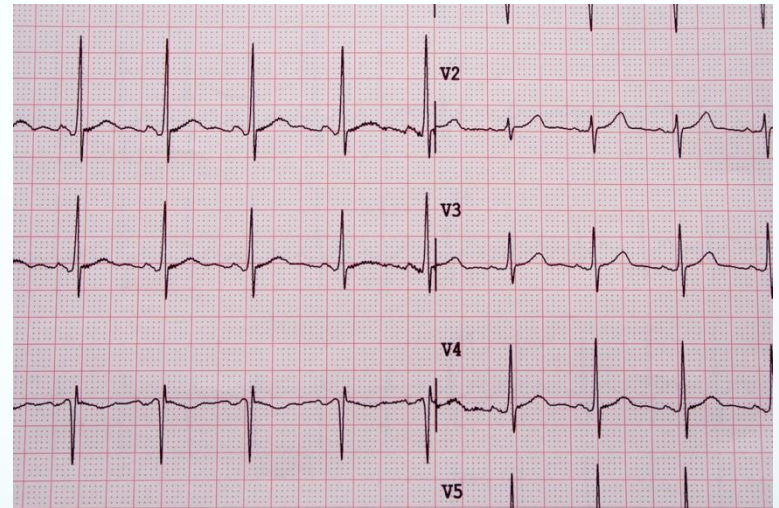
**No impact on decision
making or care**



**Proceed to surgery according to
GDMT OR alternative strategies
(noninvasive treatment, palliation)**

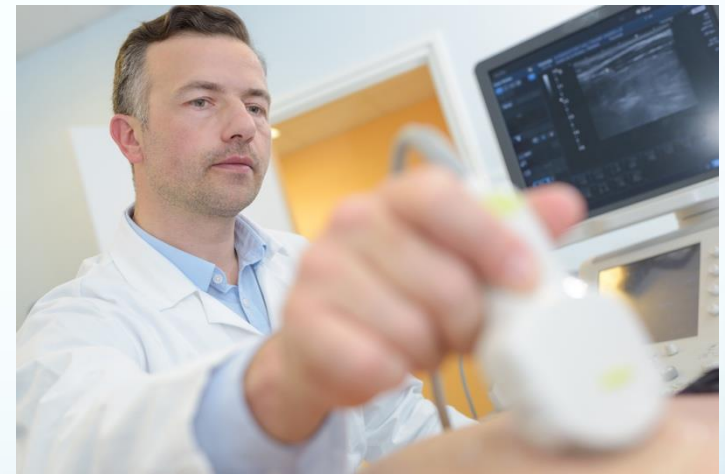
Resting ECG?

- *Reasonable:*
 - known CAD, structural heart disease (except low risk surgery)
- *Can consider:*
 - asymptomatic patients (except low risk surgery)
- ***A standard age*** or risk cutoff for use of preoperative ECG has ***NOT*** been defined.



New Echo?

- Dyspnea with unknown origin
- HF with worsening dyspnea or change in status
- \geq moderate valvular stenosis or regurgitation
- if there has been no assessment within a year.



Stress Test?

Status	Action
Excellent Functional capacity (> 10 METS)	Reasonable to forgo stress testing
For patients with elevated risk and poor (<4 METS) or unknown functional capacity	may be reasonable to perform stress test IF it will change management.
For patients with elevated risk and moderate to good (4-10 METS) functional capacity	may be reasonable to forgo stress and proceed.
Routine stress for low risk patients	not recommended

Preop Left Heart Cath?

Coronary Revascularization Before Noncardiac Surgery

PCI Limited to

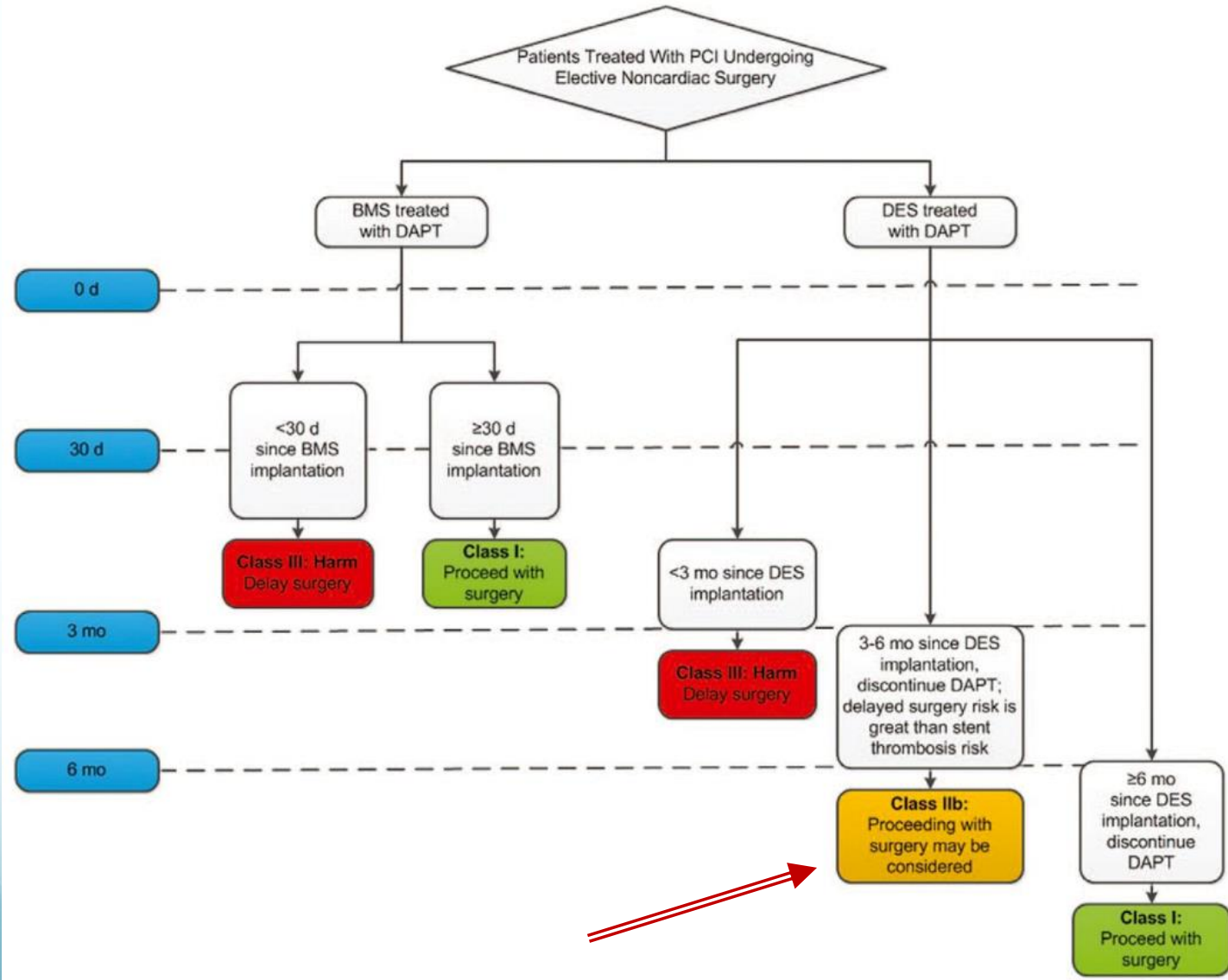
- Left main disease (too sick for CABG)
- Unstable CAD (STEMI/NSTEMI)

CARP Trial: no difference in outcomes **EXCEPT** :

- Left Main disease
- LVEF <20%
- Severe AS



2016 ACC/AHA Antiplatelet Guidelines²



10 years later...

- Mr. FA -82 year old male veteran with DM, HTN
 - MI 10 years ago s/p 3V CABG
 - Known CHF with last echo 2 years ago
 - EF 35%, moderate aortic stenosis
 - ICD implanted 5 years ago
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10 years later...

- FA -82 year old male veteran with DM, HTN
 - MI 10 years ago s/p 3V CABG
 - Known CHF with last echo 2 years ago
 - EF 35%, moderate aortic stenosis
 - ICD implanted 5 years ago
- EKG
- ECHO
- ICD information/interrogation reports
- Stress?



Pre-Operative Testing Grid- CUH and Zale Pavilion¹⁻⁴

(not a permanent part of patient chart)

- White areas indicate **required** tests, Dark grey areas indicate tests **not required**

Please check in MEDIA section first, as it is NOT necessary to repeat outside labs performed within designated time frame.

*Asterisks indicate that lab must be completed within 30 days. Repeat preg test required w/in 24 hours of surgery, pt can refuse.

All other labs may be completed within 3 months. EKGs are valid for 6 months pending no change in health history.

Labs?

	CBC	PTT/ PT/ INR	BMP	Heparin Assay (UFH)	Type & Screen**	Preg Test	EKG	MRSA
Patient Specific**								
Cardiovascular Disease (other than well-controlled HTN) Poorly controlled HTN is >140/90 OR <140/90 on ≥ 2 medications)								
Pulmonary Disease (other than mild-moderate asthma)								
Cerebrovascular Disease (CVA, TIA)								
* History of Bleeding Disorders								
Diabetes Mellitus (POC glucose always checked on DOS)								
* History of Renal Dysfunction/Failure								
* History of Liver Dysfunction/Cirrhosis								
Pacemaker/ Defibrillator								
AGE >65 for intermediate or high risk procedure								
* Female pts ≤ 60 unless hysterectomy or post-menopausal for 1yr								
Medications								
* Chemotherapy within last 6 months or any anticoagulant								
* Use of Diuretics, Digoxin, Potassium, ACEI or ARB								
* Coumadin therapy (INR only, PTT not necessary)								
* Heparin therapy (PTT no longer needed, heparin assay preferred)								
Procedure Specific								
Cardiac- all cases								
Thoracic- all cases except bronch and EGD								
ENT- neck dissection***, extensive head and neck cancer resections								
IR- TIPS, trans-splenic procedures, thrombolysis								
General- colorectal, splenectomy, gastric bypass/ band, robotics								
Surg/Onc- liver resection, pancreaticoduodenectomy, gastrectomy								
Gynecology- hysterectomy, laparotomy, myomectomy								
Gyn/Onc- above plus robotic/laparoscopic staging procedures								
Plastics- major tissue flaps								
Urology- robotics, open- nephrec/prostatec/cystec-tomy, PCNL								
Vascular- all except AV fistula and lower extremity angiograms								
Neurosurg-all except shunts, rhizotomy, DBS, intrathecal pumps								
Ortho- arthroplasty (knee/hip/shoulder), spine procedures								

** Information should be gathered from patient's medical record or from patient self-reported health history.

Hot/Dackiw/Nwariaku- central neck dissections do NOT require T&S unless ordered by surgeon, *All cochlear implant procedures require PT/INR, PTT

Grid Created by the UTSW Medical Center Pre-Surgery Assessment

Disclaimer: The content of this grid is provided as an aid and may be adapted by individual hospitals. This grid is not a standard of medical care and it is not intended to be a comprehensive statement concerning the ordering of preoperative tests, nor meant to replace clinical judgement of individual cases. Neither the Task Force Members nor the Surgical Services Executive Committee assume any responsibility for liability arising from any error or omission from this tool grid or from the use of any information contained here within.

1. Fleisher et al. 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. Volume 64. Issue 22. December 2014.
2. Practice Advisory for Preanesthesia Evaluation: An Updated Report by the American Society of Anesthesiologists Task Force on Preanesthesia Evaluation. Anesthesiology 3 2012. Vol. 116, 522-538.
3. Feely et al. Preoperative Testing Before Noncardiac Surgery: Guidelines and Recommendations, Am Fam Physician. 2013 Mar 15;87(5):414-418.
4. Frank et al. Reducing Unnecessary Preoperative Blood Orders and Costs by Implementing an Updated institution-specific Maximum Surgical Blood Order Schedule and a Remote Electronic Blood Release System. Anesthesiology 2014; 121:501-9.

Geriatric Specific Calculator

ORIGINAL RESEARCH



Derivation and Validation of a Geriatric-Sensitive Perioperative Cardiac Risk Index

Rami Alrezk, MD, MS, FACP; Nicholas Jackson, MPH, MA; Mohanad Al Rezk, MD; Robert Elashoff, PhD; Nancy Weintraub, MD; David Elashoff, PhD; Gregg C. Fonarow, MD

Background—Surgical patients aged 65 and over face a higher risk of cardiac complications from noncardiac surgery. The Revised Cardiac Risk Index (RCRI) and the Gupta Myocardial Infarction or Cardiac Arrest (MICA) calculator are widely used to predict this risk, but they are not specifically designed to predict MICA in geriatric patients. Our hypothesis is that a new geriatric-sensitive index, derived from geriatric data, will capture this population's unique response to risk factors.

Methods and Results—The model was developed using the NSQIP (National Surgical Quality Improvement Program) 2013 geriatric cohort (N=584,931) (210,914 age ≥ 65) and validated on the NSQIP 2012 geriatric cohort (N= 485,426) (172,905 age ≥ 65). Least Angle Shrinkage and Selection Operator regression was used for initial variable selection. The Geriatric-Sensitive Cardiac Risk Index (GSCRI) was then evaluated in the 2012 data set. The area under the curve (AUC) was compared among the GSCRI, RCRI, and Gupta MICA in the 2012 data set. The GSCRI had an AUC of 0.76 in the validation cohort among geriatric patients. When the Gupta MICA was tested on geriatric patients in the validation cohort, a significant deterioration ($\approx 17\%$) was noted, as well as a significant underestimation of the risk. The GSCRI AUC of 0.76 in the geriatric subset was significantly greater ($P < 0.001$) than those in the RCRI (AUC=0.63) or Gupta MICA (AUC=0.70) models, outperforming the RCRI and Gupta MICA models in geriatric patients by 13% and 6%, respectively, with a Δ AUC and P -value of 0.13 ($P < 0.001$), and 0.06 ($P < 0.001$).

Conclusions—The GSCRI is a significantly better predictor of cardiac risk in geriatric patients undergoing noncardiac surgery. (*J Am Heart Assoc.* 2017;6:e006648. DOI: 10.1161/JAHA.117.006648)

Key Words: geriatrics • myocardial infarction • perioperative risk model • risk prediction • risk stratification • surgery

ARISCAT Pulmonary Risk

Age, years	≤50 0	51-80 +3	>80 +16
Preoperative SpO ₂	≥96% 0	91-95% +8	≤90% +24
Respiratory infection in the last month Either upper or lower (i.e., URI, bronchitis, pneumonia), with fever and antibiotic treatment	No 0	Yes +17	
Preoperative anemia (Hgb ≤10 g/dL)	No 0	Yes +11	
Surgical incision	Peripheral 0	Upper abdominal +15	Intrathoracic +24
Duration of surgery	<2 hrs 0	2-3 hrs +16	>3 hrs +23
Emergency procedure	No 0	Yes +8	

32 points

ARISCAT Score

Intermediate risk

13.3% risk of in-hospital post-op pulmonary complications (composite including respiratory failure, respiratory infection, pleural effusion, atelectasis, pneumothorax, bronchospasm, aspiration pneumonitis)

Copy Results 📄

Next Steps »»»

ARISCAT Score	Risk group	Risk of in-hospital postoperative pulmonary complications*
<26	Low	1.6%
26-44	Intermediate	13.3%
≥45	High	42.1%

*Complications were defined as a composite including respiratory failure, respiratory infection, pleural effusion, atelectasis on chest x-ray, pneumothorax, bronchospasm treated with bronchodilators, and aspiration pneumonitis.

[Anesthesiology](#). 2010 Dec;113(6):1338-50. doi: 10.1097/ALN.0b013e3181fc6e0a.

Prediction of postoperative pulmonary complications in a population-based surgical cohort.

[Canet J¹](#), [Gallart L](#), [Gomar C](#), [Paluzie G](#), [Vallès J](#), [Castillo J](#), [Sabaté S](#), [Mazo V](#), [Briones Z](#), [Sanchis J](#); [ARISCAT Group](#).

Society Guidelines

Canadian Cardiovascular Society Guidelines on Perioperative Cardiac Risk Assessment and Management for Patients Who Undergo Noncardiac Surgery

Emmanuelle Duceppe, MD,^{a,b,c} Joel Parlow, MD, MSc (Co-chair),^d Paul MacDonald, MD,^c
 Kristin Lyons, MDCM,^f Michael McMullen, MD,^d Sadeesh Srinathan, MD, MSc,^g
 Michelle Graham, MD,^h Vikas Tandon, MD,ⁱ Kim Styles, MD,^j Amal Bessissow, MD, MSc,^k
 Daniel I. Sessler, MD,^l Gregory Bryson, MD, MSc,^{m,n} and P.J. Devereaux, MD, PhD (Co-chair)^{b,c,i}

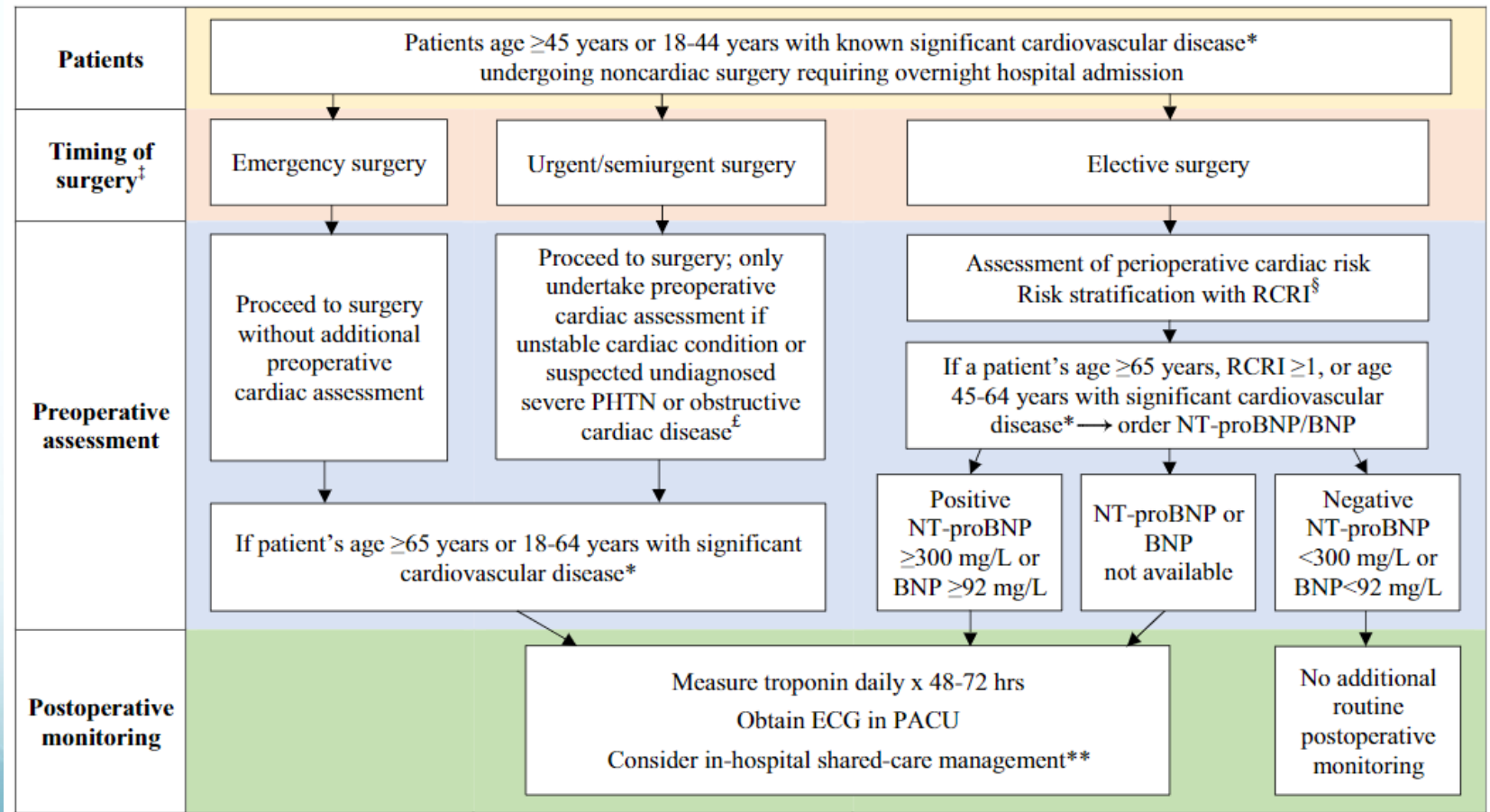


Figure 1. E. Duceppe, J. Parlow, P. MacDonald, *et al.* Canadian Cardiovascular Society guidelines on perioperative cardiac risk assessment and management for patients who undergo noncardiac surgery. Can J Cardiol, 33 (2017), pp. 17-32



Anesthesia for the Older Adult

Elderly Patients and Surgery

- The elderly (≥ 65 yr) population is the fastest growing
- Aging increases the probability of a person to undergo surgery.
- Moreover, perioperative morbidity becomes more frequent in the elderly with steep increases after the age of 75
- Preoperative comorbidity and invasiveness of the surgical procedure are important predictors of mortality in this age

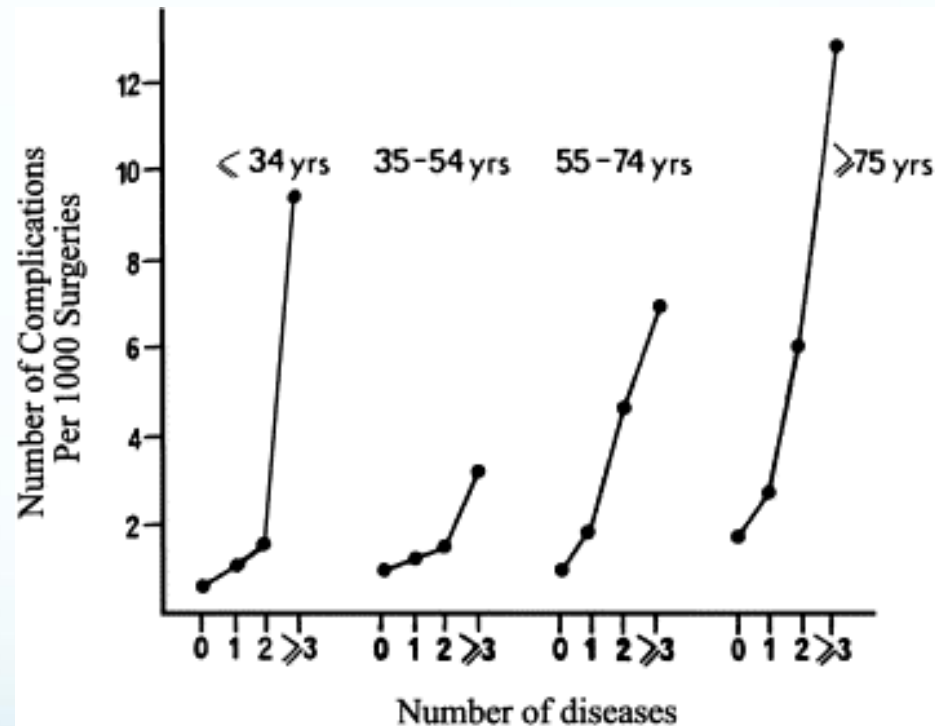


Fig 1. Rooke GA. Cardiovascular aging and anesthetic implications. *J Cardiothorac Vasc Anesth.* 2003;17(4):512.

Physiologic Considerations of Aging and Anesthesia: Cardiovascular

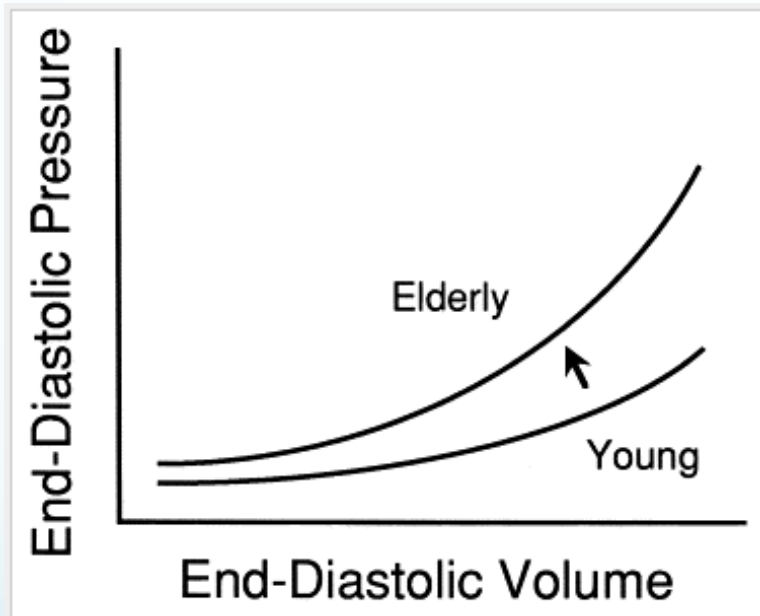


Fig 3 Rooke GA. Cardiovascular aging and anesthetic implications. J Cardiothorac Vasc Anesth. 2003;17(4):512.

- Perioperative hypotension
 - Greater lability
 - Dependent upon atrial kick
- Stiffening vasculature and myocardium → diastolic dysfunction
 - over resuscitation → pulmonary edema.
- “Dysautonomia of aging:”
 - Impaired beta receptor responsiveness
- Fibrosis of cardiac conduction pathways.

Physiologic Considerations of Aging and Anesthesia: Pulmonary

TABLE I Age-related changes in respiratory function and their relationships to perioperative pulmonary complications

<i>Age-related change in respiratory function</i>	<i>Clinical consequence</i>
<ul style="list-style-type: none"> ↓ Chest wall compliance ↑ Lung compliance ↑ Respiratory system resistance 	<ul style="list-style-type: none"> ↑ Work of breathing ↓ Ventilatory response to exercise
<ul style="list-style-type: none"> ↑ Residual volume ↑ Small airways closure ↑ Ventilation-perfusion mismatch 	Impaired gas exchange
<ul style="list-style-type: none"> ↓ Respiratory muscle strength ↓ Protective cough and swallowing reflexes 	<ul style="list-style-type: none"> ↓ Secretion clearance ↑ Aspiration risk
<p><i>Altered control of breathing</i></p> <ul style="list-style-type: none"> ↓ Responsiveness to imposed respiratory loads ↓ Responsiveness to hypoxemia and hypercarbia ↑ Sensitivity to anesthetic agents and opioids 	<ul style="list-style-type: none"> Hypoventilation Hypoxemia and hypercarbia Respiratory failure in early postoperative period
<p>Symbols: ↓ = decreased; ↑ = increased.</p>	

Physiologic Considerations of Aging and Anesthesia

- Renal

- Reduced renal blood flow and kidney mass → increase the risk of renal failure.
- Predisposed to dehydration and fluid overload.

- CNS

- The normal ventilatory response of the central nervous system to hypercapnia, and especially to hypoxemia, is diminished.
- Higher risk for postoperative delayed emergence and delirium.

Preoperative Evaluation

- Close attention to home medications
- Preoperative fasting should be minimized.
- Encourage hydration
- **Consider careful documentation of baseline mental status and cognition.**



Premedication

- **Avoidance of:**
 - Benzodiazepines
 - Preoperative opioid administration only if severe pain
 - Anticholinergics (scopolamine, diphenhydramine) H₂ antagonists (ranitidine, famotidine)
 - Metoclopramide should be used selectively
 - Gabapentinoids (i.e., gabapentin and pregabalin)
- **Consider pre-op oral acetaminophen and COX-2 specific inhibitors.**

Choice of Anesthetic: Regional vs. General

David C. Wartier, M.D., Ph.D., Editor

Anesthesiology 2007; 106:572-90

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Postoperative Cognitive Dysfunction after Noncardiac Surgery

A Systematic Review

Stanton Newman, D.Phil., Dip. Psych., A.F.B.P.S., M.R.C.P. (Hon.),* Jan Stygall, M.Sc.,† Shashivadan Hirani, M.Sc.,‡ Shahzad Shaeefi, M.B.B.S.,§ Mervyn Maze, F.R.C.A., F.R.C.P., F.Med.Sci., Ph.D.||

- Insufficient evidence to recommend a single “best” anesthetic plan for all older adults.
- No evidence supports the choice of one anesthetic or technique over another.
 - Post operative delirium or long term cognitive dysfunction
 - Short term postoperative cognitive dysfunction appears to be more common after general anesthesia.

Intra-op Management Considerations

- Monitoring

- Consider invasive blood pressure monitoring
 - significant pre-existing cardiac disease
 - hemodynamic instability
 - or when the surgical procedure is likely to cause significant rapid cardiovascular changes, rapid blood loss, or large fluid shifts.
- EEG-based monitoring (e.g., BIS monitor) to titrate inhaled anesthetic or propofol infusion.

SPECIAL ARTICLE

Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society



The American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults

Inouye, K, et al. Postoperative delirium in older adults: best practice statement from the American Geriatrics Society. American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults. J Am Coll Surg. 2015;220:136-48.e1.

Depth of Anesthesia?

BJA

British Journal of Anaesthesia, 127 (5): 704–712 (2021)

doi: 10.1016/j.bja.2021.07.021

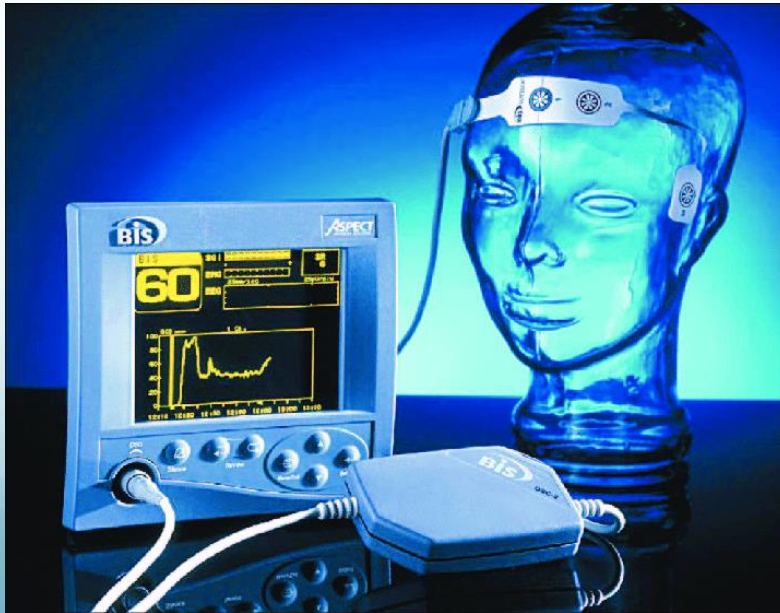
Advance Access Publication Date: 28 August 2021

Neuroscience and Neuroanaesthesia

NEUROSCIENCE AND NEUROANAESTHESIA

Anaesthetic depth and delirium after major surgery: a randomised clinical trial

Lisbeth A. Evered^{1,2,3,*†}, Matthew T. V. Chan⁴, Ruquan Han⁵, Mandy H. M. Chu⁴, Benny P. Cheng⁴, David A. Scott^{2,3}, Kane O. Pryor¹, Daniel I. Sessler⁶, Robert Veselis^{1,7}, Christopher Frampton⁸, Matthew Sumner⁹, Ade Ayeni⁹, Paul S. Myles¹⁰, Douglas Campbell^{9,11}, Kate Leslie^{3,12,13} and Timothy G. Short^{9,11}



- Does targeting bispectral index (BIS) readings of 50 (light anesthesia) was associated with a lower incidence of POD than targeting BIS readings of 35 (deep anesthesia)?
- Lower incidence of postop delirium (19% vs 28%) and at 1 year, better cognitive function

Multimodal pain control and Opioids

- Dose reduction
 - Opioids twice as potent in older patients
 - Clearance is reduced
- Consider acetaminophen and/or non-steroidal anti-inflammatory drugs, if no contraindications.
- Consider regional/local analgesia techniques when possible
- Lidocaine infusions (at 1.5mg/kg/hr)

Post Operative Nausea and Vomiting

SUMMARY OF MEDICATIONS COMMONLY USED FOR PONV PROPHYLAXIS AND TREATMENT IN ADULTS ^{58,68}		
Drug	Beers criteria recommendation	Caution
5-HT ₃ receptor antagonists (for example, ondansetron)	Use as alternative	Serotonin syndrome QT prolongation
Corticosteroids (for prophylaxis)	Avoid in older adults with or at high risk for delirium	May induce or worsen delirium
Transdermal scopolamine (for prophylaxis)	Avoid unless no other alternatives	Strong anticholinergic properties (increased risk for delirium/cognitive impairment) Can worsen constipation
Metoclopramide	Avoid, unless for gastroparesis	Risk of extrapyramidal effects may be increased in frail older adults
Low-dose promethazine	Avoid	Anticholinergic (increased risk for delirium/cognitive impairment) Increased risk of constipation
Prochlorperazine	Avoid	Anticholinergic (increased risk for delirium/cognitive impairment)
PONV, postoperative nausea and vomiting		

PACU Considerations: Pulmonary Complications

- Substantial risk of pulmonary complications
 - atelectasis
 - pneumonia
 - respiratory failure
- Prevention of complications:
 - Elevate head of the bed
 - encourage deep breathing and coughing
 - use home CPAP if appropriate.



PACU Considerations: Delirium Prevention

- Non pharmacologic:
 - Cognitive stimulation
 - maintenance of sensory input (glasses, hearing aids)
 - mobilization
 - early eating and drinking
 - early ambulation as possible
 - For severe delirium: haloperidol
 - Pain Control
 - For extubated patients going to ICU postoperatively,
 - dexmedetomidine infusion
- **Avoidance:**
 - dehydration and malnutrition
 - hypoxia, hypercarbia, and hemodynamic derangements.
 - benzodiazepines (except in known alcohol withdrawal related delirium).³²
 - scopolamine, diphenhydramine, phenergan, meperidine, and tramadol. ⁴
 - Parkinson's patients: Avoid metoclopramide, haloperidol, droperidol ¹⁶

Summary

- Preoperative “Clearance” should really focus on Preoperative “Optimization”.
- Guidelines exist in regards to which preoperative tests are needed.
- Ultimately our goal is to get each patient through surgery safely.

Questions?



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