So You Think You're Ready for Surgery…

Clinical Pearls for Pre-Operative Assessments

Adrijana Anderson, PA-C
Mayo Clinic Arizona

Disclosures

- This presentation has no current affiliation or financial arrangements.
- This presentation does not discuss off-label uses of products.

Objectives

- Define the concept or peri-operative risk assessment and optimization
- Review up-to-date guidelines for cardiac assessment
- Introduce the concept of post-operative pulmonary complications, and some tips on how to prevent them
- List several risk calculators that can be helpful clinically
- Discuss medication management in the perioperative setting

"Can you **clear** my patient for surgery?"

Your Objective:

Peri-operative risk assessment and reduction

Is this patient **stable and optimized** for this particular surgery?

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

Lee A. Fleisher, Kirsten E. Fleischmann, Andrew D. Auerbach, Susan A. Barnason, Joshua A. Beckman, Biykem Bozkurt, Victor G. Davila-Roman, Marie D. Gerhard-Herman, Thomas A. Holly, Garvan C. Kane, Joseph E. Marine, M. Timothy Nelson, Crystal C. Spencer, Annemarie Thompson, Henry H. Ting, Barry F. Uretsky and Duminda N. Wijeysundera

Journal of the American College of Cardiology
Volume 64, Issue 22, December 2014
DOI: 10.1016/j.jacc.2014.07.944

Considerations:

1. How emergent is this surgery?
2. How "risky" is this surgery?
3. What are the patient's risks and how can we optimize them?

How emergent is this surgery?

Emergency Procedure	life or limb is threatened if not in the OR within < 6hrs
Urgent Procedure	life or limb threatened between 6-24hrs; limited time for clinical evaluation
Time-sensitive Procedure	a delay of >1- 6 weeks to allow for evaluation would have negative outcome (eg. oncologic procedures)
Elective Procedure	procedure could be delayed up to 1 year

Fleisher LA, et al. PMID: 25091544

How "risky" is this surgery?

Low risk surgery	Risk of a major adverse cardiac event (MACE) of death or MI of < 1% • Cataract surgery • Plastic surgery
Elevated risk surgery	Procedures with risk of MACE of ≥ 1%

** Operations for **Peripheral Vascular Disease** generally have the highest perioperative risk

Fleisher LA, et al. PMID: 25091544

What are this patient's risks?

Functional Status Assessment
in METs (metabolic equivalents)

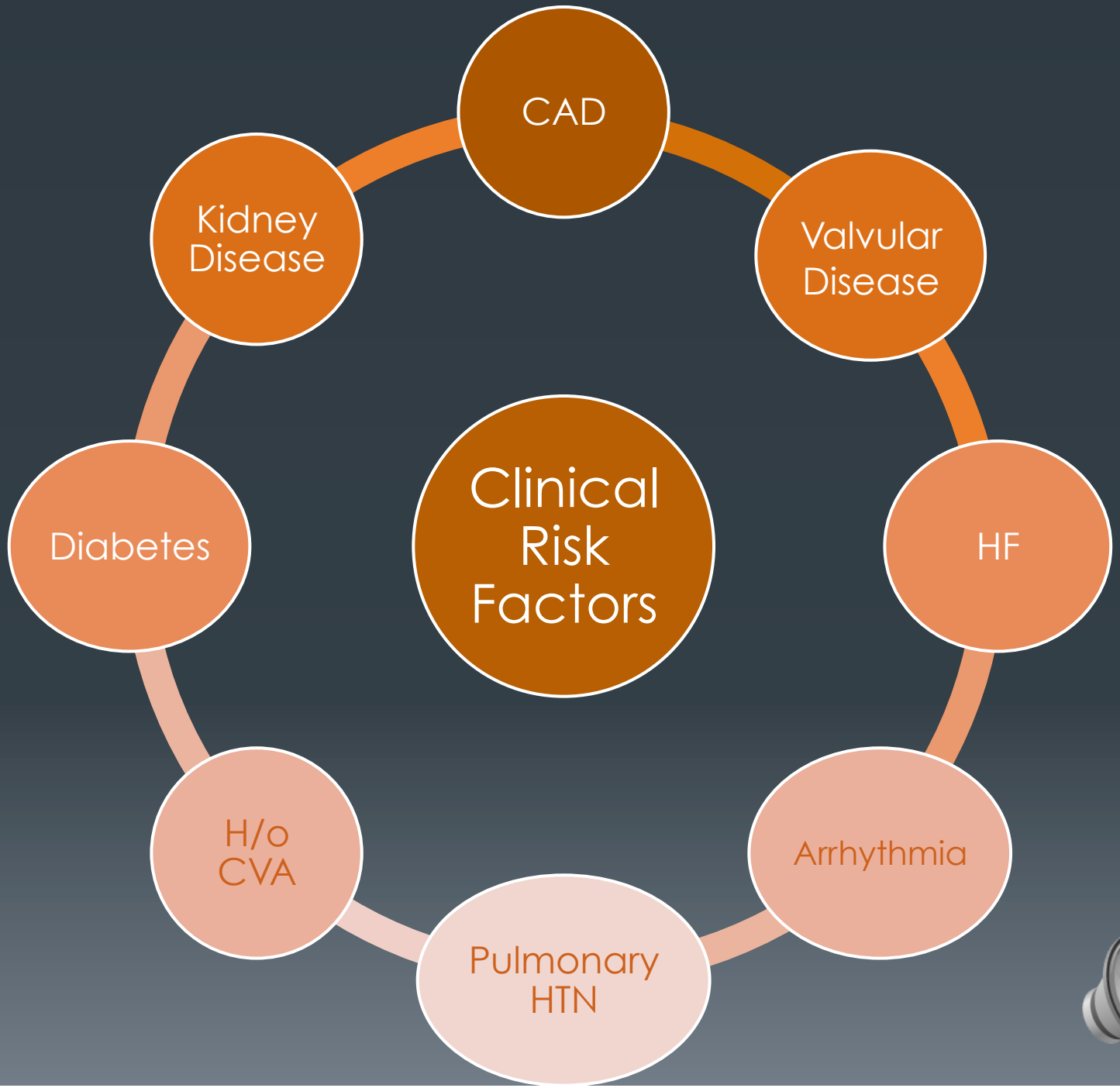
Functional Status	METs	Examples
Excellent	>10	Running, strenuous hiking/mountain climbing
Good	7-10	Jogging, squash, tennis
Moderate	4-6	Biking, climbing a flight of stairs, golf, yardwork
Poor	<4	Can't climb a flight of stairs or do heavy housework. Able to walk slowly.

What are this patient's risks?

ASA Physical Status Classification

Class	Definition	Mortality
1	Normally healthy patient	0.2 %
2	Mild systemic disease	0.5 %
3	Severe systemic disease	1.9 %
4	Severe systemic disease that is a constant threat to life	4.9 %
5	Moribund patient, not expected to survive >24 hrs with or without operation	N/A

What are this patient's risks?



Cardiac Considerations

Mr. Clarke

Mr. Clarke is a 71 year old male who is expected to undergo a right THA. He has a history of hypertension, diabetes, and CHF and has noticed his symptoms worsening over the past three months. He cannot go up a flight of stairs without experiencing significant dyspnea. What would you recommend for Mr. Clarke?

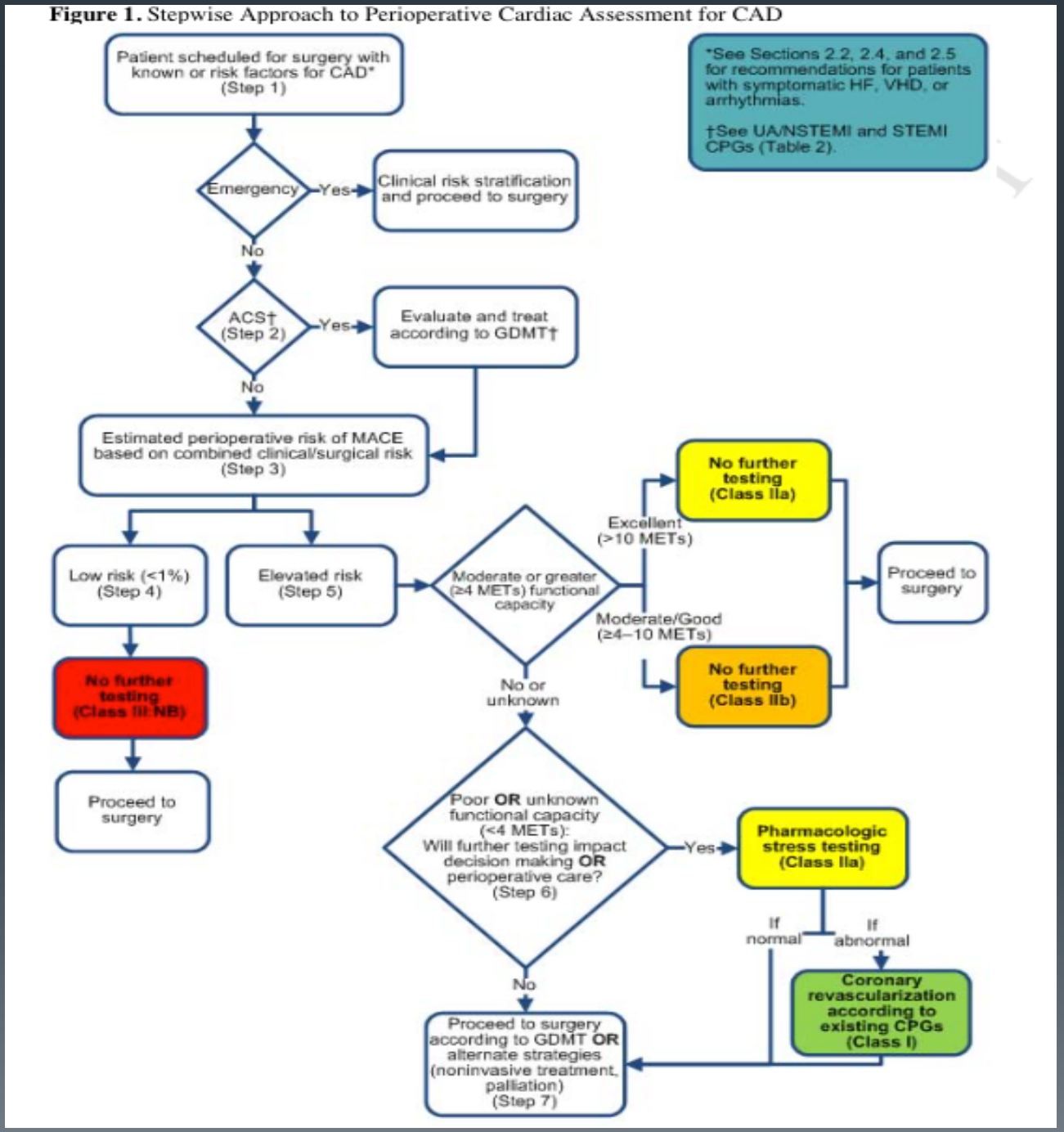
A. Proceed with surgery, without any further workup
B. Order an echocardiogram
C. Order a pharmacologic stress test
D. Recommend coronary angiography prior to surgery

Coronary Artery Disease

- MACE after surgery are often associated with prior CAD
- **≥ 60 days** should elapse after an MI before surgery
  - An MI within **6 months** of surgery increases perioperative risk of stroke and causes an 8-fold increase in mortality rate.

Fleisher LA, et al. PMID: 25091544

Figure 1. Stepwise Approach to Perioperative Cardiac Assessment for CAD

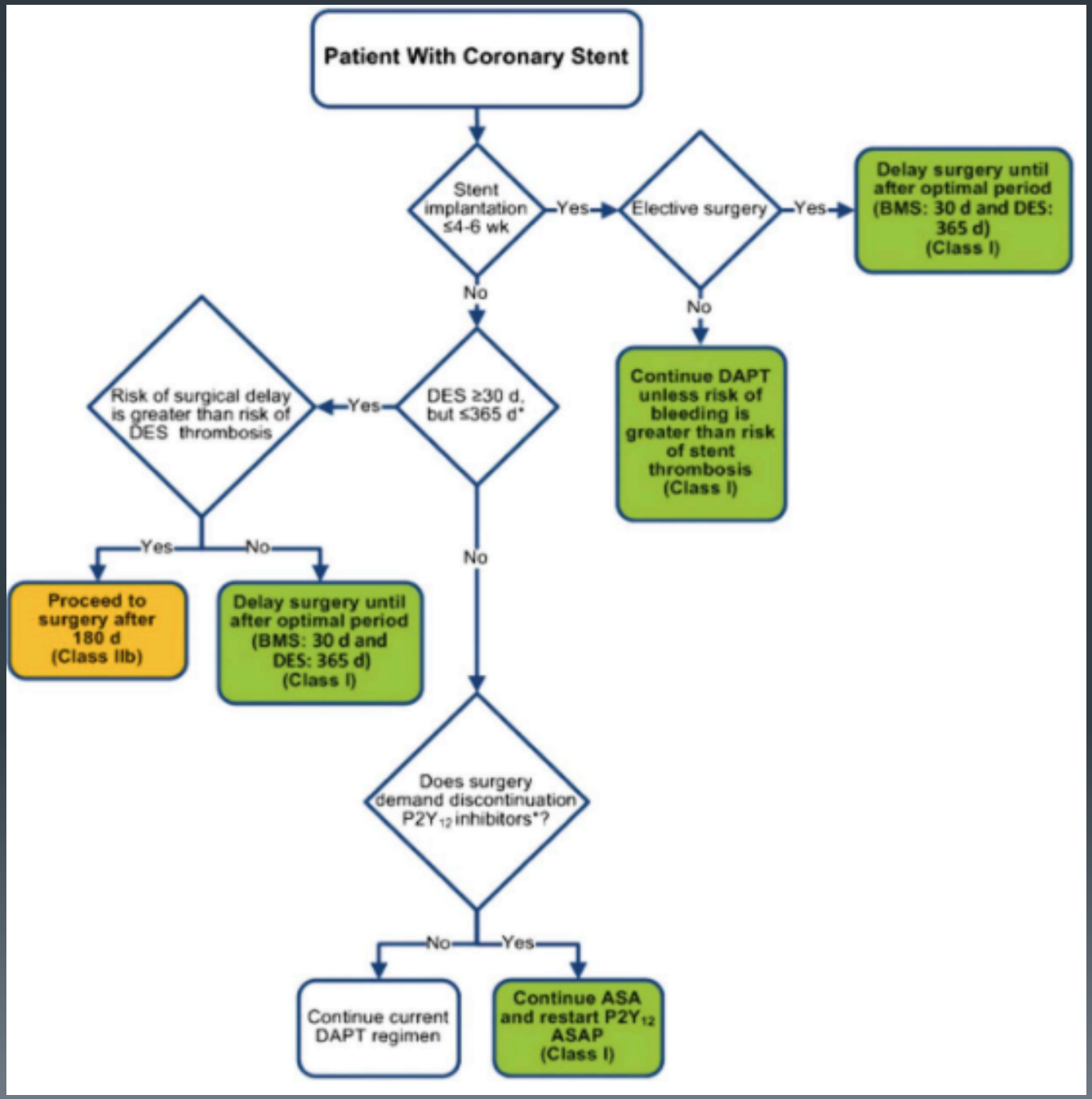


Fleisher LA, et al. PMID: 25091544

Coronary Artery Disease

- Non-cardiac surgery should be delayed after PCI if possible:
  - 14 days after balloon angioplasty
  - 30 days after BMS implantation
  - 365 days after DES implantation

Fleisher LA, et al. PMID: 25091544



Fleisher LA, et al. PMID: 25091544

Valvular Disease

- Consider preoperative echocardiogram if moderate to severe valvular disease is suspected AND:
  - No prior echo within 1 year
  - Significant change in clinical status or exam since last evaluation

** Recommend valve repair for symptomatic/severe disease before ELECTIVE noncardiac surgery

Fleisher LA, et al. PMID: 25091544

Heart Failure

- 90 day mortality in heart failure patients undergoing non-cardiac surgery:
  - Heart failure AND symptoms: 10.1%
  - Heart failure NO symptoms: 4.9%
  - No heart failure: 1.2%

Lerman BJ, et al. PMID: 30747965.

Heart Failure

- Consider preoperative evaluation of LV function (echocardiogram) if:
  - Dyspnea of unknown origin
  - Heart failure with worsening dyspnea or other change in clinical status
  - H/o LV dysfunction, if there has been no assessment within a year

Fleisher LA, et al. PMID: 25091544

Arrhythmia

- **Atrial fibrillation** is the most common sustained tachyarrhythmia (esp. in elderly)

- Patients with clinically stable preoperative AF do not require modification of medications or special evaluation, other than adjustment of anticoagulation.

Fleisher LA, et al. PMID: 25091544

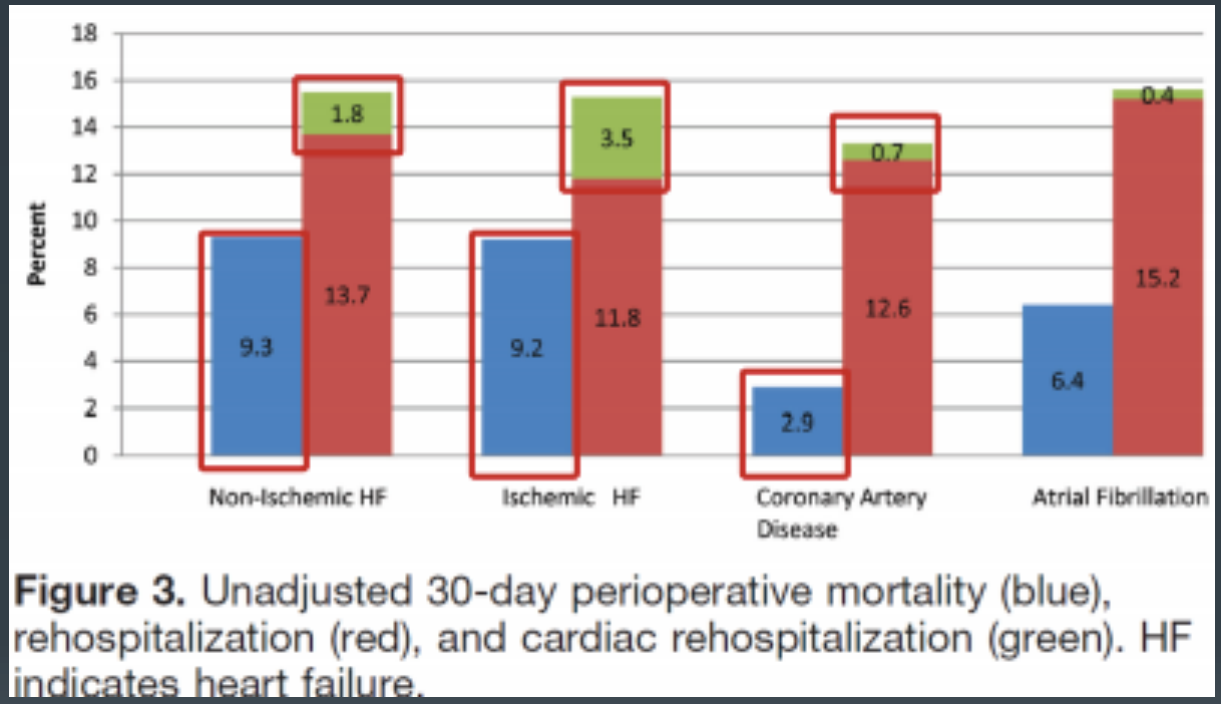


Figure 3. Unadjusted 30-day perioperative mortality (blue), rehospitalization (red), and cardiac rehospitalization (green). HF indicates heart failure.

Heart failure has the highest perioperative mortality, followed by atrial fibrillation, and CAD has the lowest mortality of these cardiac conditions.

Van Diepen S, et al. PMID: 21709059.

Pulmonary Considerations

Mrs. Smith

Mrs. Smith is a 57 year old female who is planning to have a left knee replacement. She has a history of hypertension and hyperlipidemia. She has a BMI of 40. Her husband often can't sleep next to her on account of her snoring. What would you recommend for Mrs. Smith?

A. Proceed with surgery as she is low risk from a pulmonary perspective
B. Order an echocardiogram
C. Order a formal sleep study
D. Recommend that she start using CPAP

Post-operative Pulmonary Complications (PPCs)

- Pulmonary complications are actually more common than cardiac!
- Mortality is increased in both the short and long term in patients with PPC.
  - 1 in 5 pts (14-30%) who have a PPC will die within 30 days of major surgery compared with 0.2 - 3% without a PPC.
  - 90 day mortality is also significantly increased in those with PPC: 24.4% vs 1.2%.
- Can also prolong hospital LOS by 13 – 17 days.

Dimick JB, et al. PMID: 15454134.

Post-op Pulmonary Complications (PPCs)

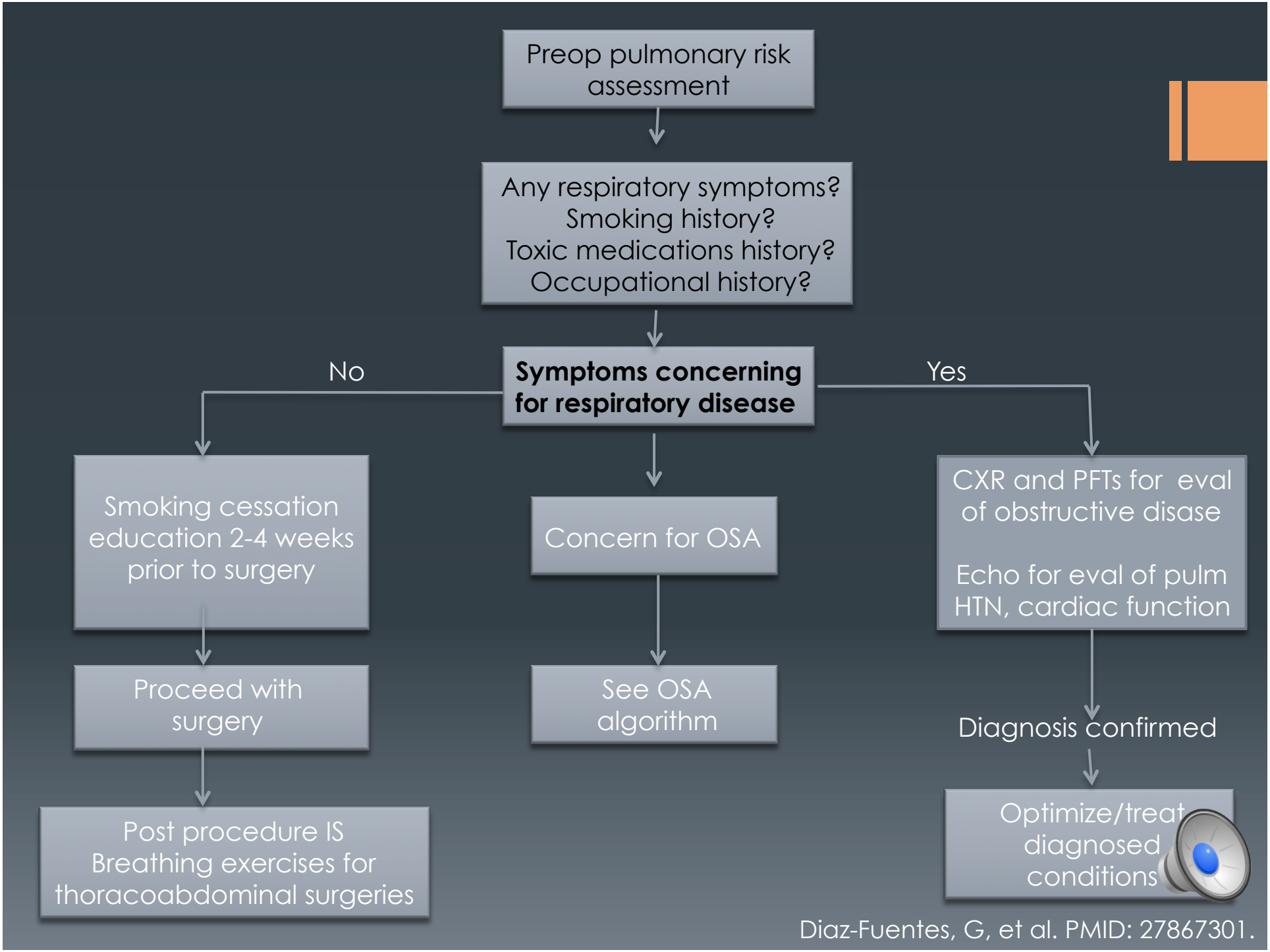
- Respiratory infection (pneumonia)
- Respiratory failure (hypoxic, hypercarbic)
- ARDS
- **Atelectasis**
  - **occurs in >75% of pts receiving a neuromuscular blocking drug with anesthesia**
- Pleural effusion
- Pneumothorax
- Bronchospasm
- Aspiration pneumonitis
- Pulmonary edema
- Pulmonary embolism
- Exacerbation of pre-existing lung condition

Dimick JB, et al. PMID: 15454134.

PPC Risk factors

Patient-related risk factors	Intraoperative risk factors
• COPD • Age (>60 yo) • Inhaled tobacco use • NYHA class II pulm HTN • Mod/severe OSA • Nutrition status	• Surgery site (thoracic or abdominal) • Duration of surgery • General anesthesia • Use of long-acting neuromuscular blockers • Emergency surgery

Diaz-Fuentes, G, et al. PMID: 27867301.



Diaz-Fuentes, G, et al. PMID: 27867301.

Obstructive Sleep Apnea (OSA)

- Our patient population is becoming more obese, and aging with more co-morbidities, increasing risk of undiagnosed OSA.

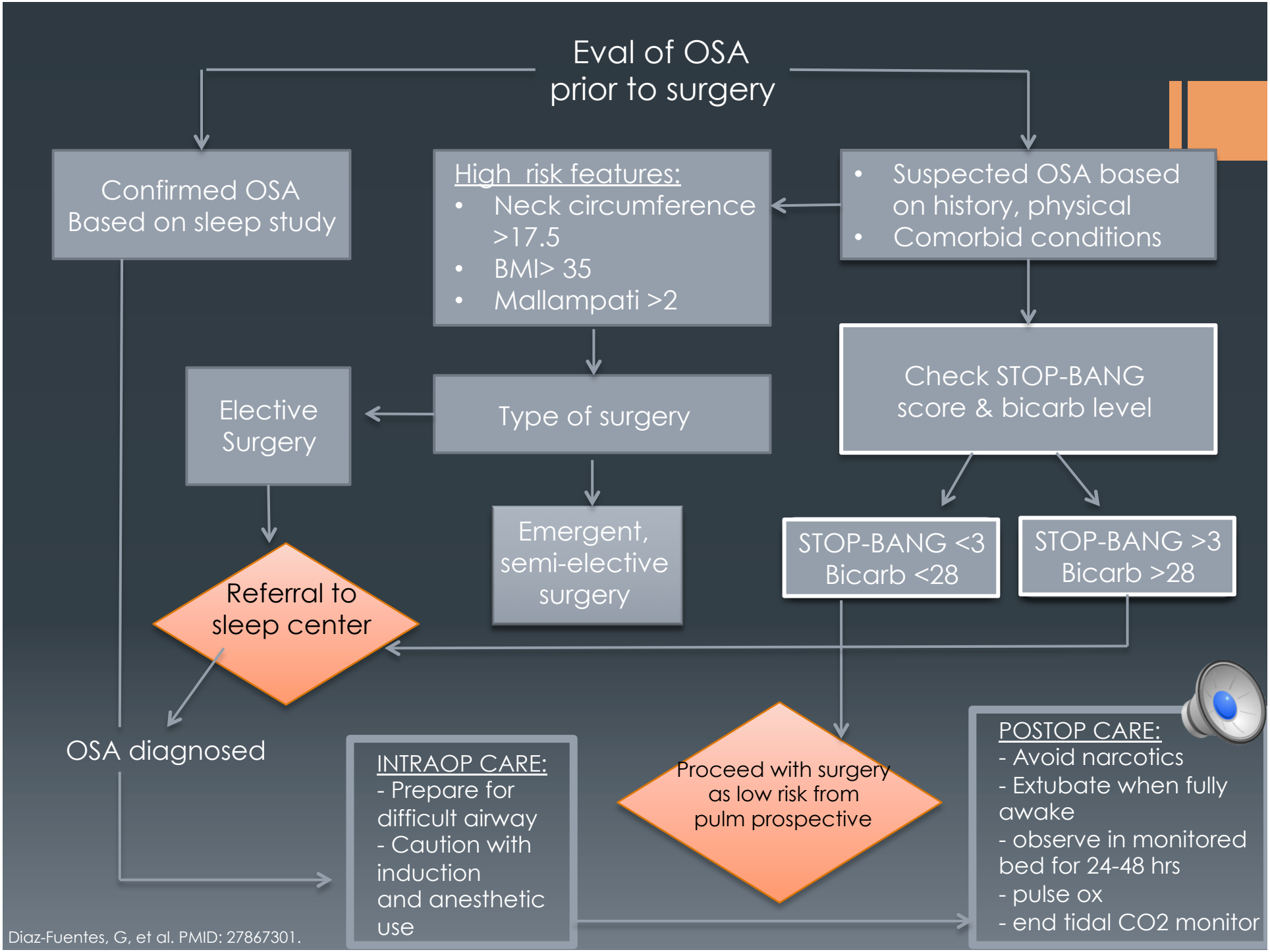
- Estimated **22%** of preop patents have OSA, up to 70% of of those pts hare **undiagnosed** before their perioperative evaluation
  - Even higher numbers involving bariatric surgery

Finkel KJ, et al. Sleep Med. 2009;10(7):753-758.
Singh M et al BJA 2013; 110: 629-36.

STOP-BANG Score for OSA

Snoring?	Do you snore loudly? (partner notices, can be heard in another room)
Tired?	Do you often feel tired, fatigued or sleepy during the day?
Observed?	Has anyone observed you stop breathing or gasping in sleep?
Pressure?	Do you have/being treated for high blood pressure?
BMI	BMI > 35
Age	Age >50
Neck size	Shirt collar > 16 in or 40 cm
Gender	Male Gender

Low Risk: 0 – 2 Intermediate Risk: 3 – 4 High Risk: 5 - 8


Eval of OSA prior to surgery
Confirmed OSA Based on sleep study
High risk features:
• Neck circumference >17.5
• BMI> 35
• Mallampati >2
• Suspected OSA based on history, physical
• Comorbid conditions
Elective Surgery
Type of surgery
Check STOP-BANG score & bicarb level
Emergent, semi-elective surgery
STOP-BANG <3 Bicarb <28
STOP-BANG >3 Bicarb >28
Referral to sleep center
OSA diagnosed
INTRAOP CARE:
- Prepare for difficult airway
- Caution with induction and anesthetic use
Proceed with surgery as low risk from pulm prospective
POSTOP CARE:
- Avoid narcotics
- Extubate when fully awake
- observe in monitored bed for 24-48 hrs
- pulse ox
- end tidal CO2 monitor
Diaz-Fuentes, G, et al. PMID: 27867301.

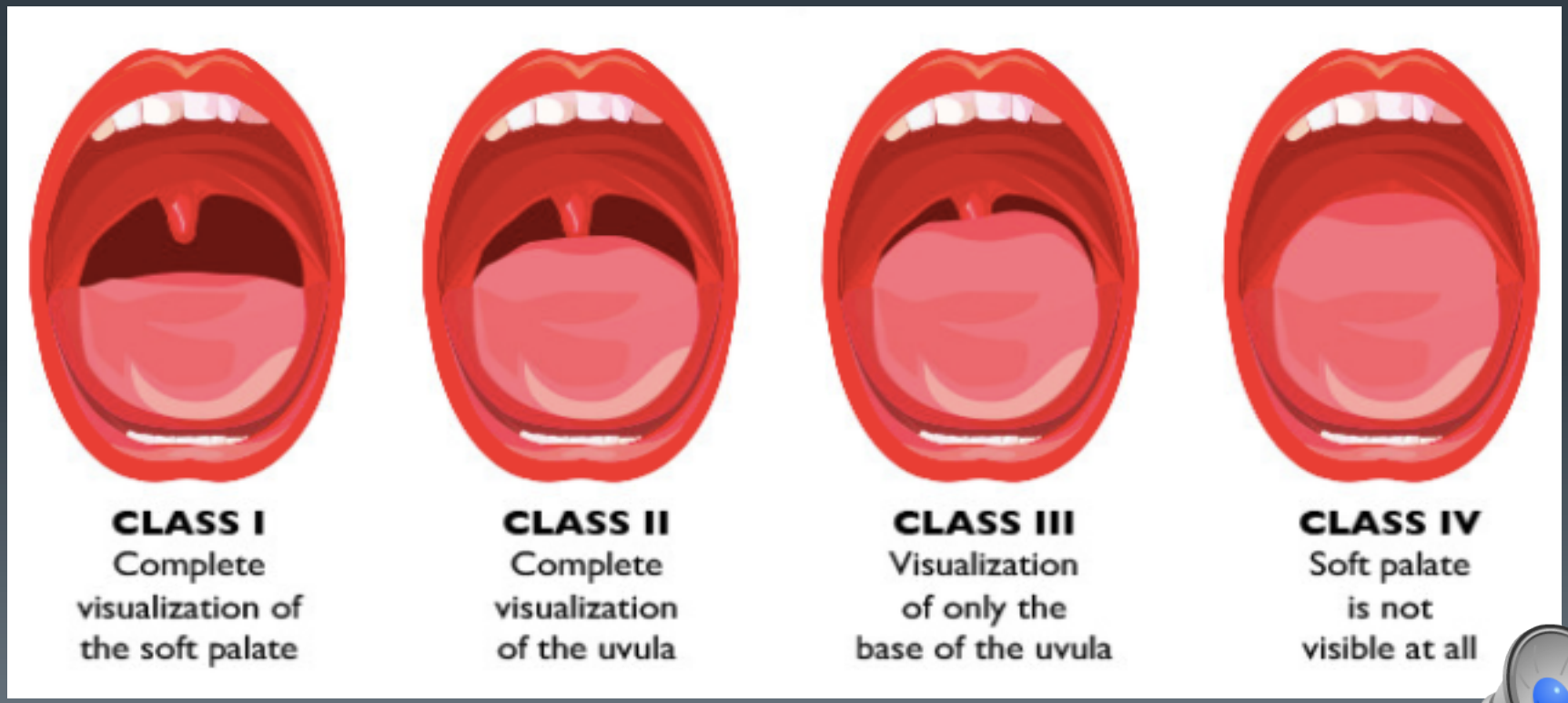
Avoiding PPC

- Pre-op: smoking cessation interventions, correction of severe anemia
  - No strong evidence in favor of ordering pre-op CXRs, PFTs, or ABGs in asymptomatic patients.
- Anesthesia: minimizing neuromuscular blocking drugs, regional over general anesthesia if possible
- **Lung Expansion Maneuvers**
  - Deep breathing exercises (DBE)
  - Incentive spirometry (IS)
  - Inspiratory muscle training (IMT)
  - **Continuous positive airway pressure (CPAP)**
- Other post-op strategies: good analgesia, PT, early mobilization, good oral hygiene

Dimick JB, et al. PMID: 15454134.

Other Considerations

Mallampati Score



Alcohol Withdrawal Risk

Admission **AUDIT-PC** score can be used to predict those at risk for alcohol withdrawal syndrome (AWS) while hospitalized.

- Scores ≥ 4 were associated with higher risk of AWS

Pecoraro, A, et al. PMID: 23959745.

AUDIT-PC Score

Questions	Scoring system					Your score
	0	1	2	3	4	
How often do you have a drink containing alcohol?	Never	Monthly or less	2 - 4 times per month	2 - 3 times per week	4+ times per week	
How many units of alcohol do you drink on a typical day when you are drinking?	1 -2	3 - 4	5 - 6	7 - 8	10+	
How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
How often during the last year have you failed to do what was normally expected from you because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested that you cut down?	No		Yes, but not in the last year		Yes, during the last year	

Risk Calculators!

Revised Cardiac Risk Index (RCRI)

Risk Factors

- CAD
- CHF
- Diabetes on insulin
- CKD (Cr > 2)
- CVA/TIA
- High-risk surgery

Risk of cardiac death, nonfatal MI, nonfatal cardiac arrest:

- No risk factors - 0.4 %
- 1 risk factor – 1 %
- 2 risk factors – 2.4 %
- 3+ risk factors 5.4%

Risk of MI, pulm edema, Vfib, primary cardiac arrest, complete heart block:

- No risk factors - 0.5 %
- 1 risk factor – 1.3 %
- 2 risk factors – 3.6 %
- 3+ risk factors – 9.1 %

Gupta/MICA

5 Factors

- Type of surgery
- Functional status
- Abnormal creatinine (>1.5)
- ASA class
- Increased age

- Predicts MI or cardiac arrest (MICA)
- Much higher predictive ability than the RCRI
- Model derived from >450,000 pts in NSQIP database, multicenter, prospective

http://www.surgicalriskcalculator.com/miorcardiacarrest

ACS NSQIP Surgical Risk Calculator

- Uses CPT codes for risk assessment
- The procedure is defined as emergent or non-emergent
- Includes **21** patient-specific variables
  - Age, gender, functional status, ASA class, steroid use?, ascites? Sepsis? Cancer, diabetes, HTN, CHF, COPD, dyspnea, ventilator dependent, AKI, dialysis, current smoker, BMI, etc.
- This calculator may offer the best estimation of surgery-specific risk of MACE and death

http://www.riskcalculator.facs.org

Procedure: 47570 - Laparoscopy, surgical; cholecystoenterostomy

Risk Factors: 65-74 years, ASA Severe systemic disease, HTN, Acute renal failure, Over Weight

Note: Your Risk has been rounded to one decimal point.

Outcomes

	Your Risk	Average	
Serious Complication	6.6%	4.2%	Above Average
Any Complication	7.7%	4.9%	Above Average
Pneumonia	0.6%	0.3%	Above Average
Cardiac Complication	0.6%	0.1%	Above Average
Surgical Site Infection	0.9%	0.9%	Average
Urinary Tract Infection	1.6%	0.5%	Above Average
Venous Thromboembolism	0.6%	0.4%	Above Average

Renal Failure

licable to patients with pre-op renal failure or dialysis.

	Your Risk	Average	
Readmission	5.6%	3.3%	Above Average
Return to OR	1.8%	1.4%	Above Average
Death	1.1%	0.2%	Above Average
Discharge to Nursing or Rehab Facility	13.7%	2.7%	Above Average
Sepsis	0.7%	0.3%	Above Average

Predicted Length of Hospital Stay: 3.5 days

Medication Optimization

Ms. Ryan

Ms. Ryan is a 54 year old female with a medical history of hypertension, hyperlipidemia, and atrial fibrillation. She also has breast cancer, and is planned for a mastectomy tomorrow. She currently takes: metoprolol, lisinopril, atorvastatin, and aspirin. She wants to know what meds she should take prior to surgery tomorrow….

A. She should take all of her medications
B. She should take all but the aspirin
C. She should take metoprolol and atorvastatin, but not lisinopril and aspirin
D. She should take only atorvastatin

Beta Blockers

- Beta blockers should be continued

- In pts who are high risk or have >3 RCRI factors it may be reasonable to START beta blockers
  - But do so >1day prior to surgery (they should NOT be started on the day of surgery)

Fleisher LA, et al. PMID: 25091544

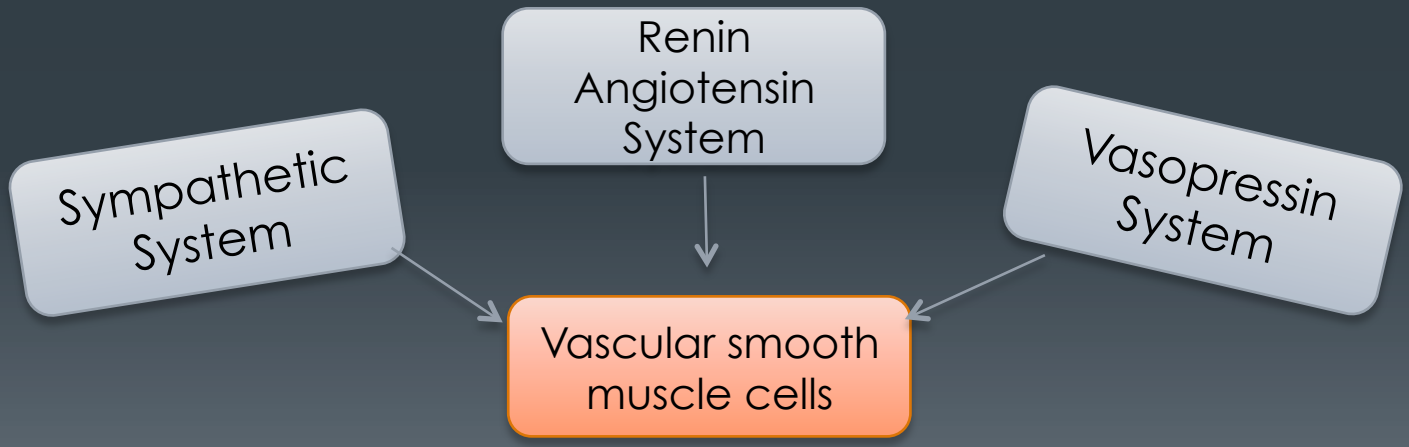
Statins

- Continue statins for patients taking statins already
- Perioperative initiation of statins is reasonable (especially if undergoing vascular surgery)

Fleisher LA, et al. PMID: 25091544

ACE inhibitors/ARBs

- From a cardiac perspective, ACE/ARB could be continued perioperatively (but should not be initiated perioperatively).
- But, from the anesthesiology perspective they increase risk of hemodynamic instability & hypotension while under anesthesia



Recommended to **hold the ACE/ARB 24 hours prior to surgery** (then resume post-op).

Fleisher LA, et al. PMID: 25091544

The Morning of Surgery	
YES	**NO**
Beta blockers Calcium channel blockers Alpha blockers Antiepileptics Chronic pain medications Mood stabilizers Thyroid medications GERD Eye drops Parkinson's medications Inhalers Chronic steroids Immunosuppression (tx pts)	ACE-I, ARBs Diuretics ADHD Medications Bowel regimen meds Insulin PO/SQ Diabetes Medications

*Stop TNF α inhibitors 2-6 weeks prior to surgery

Anticoagulant Therapy

1 week	Plavix Aspirin Prasugrel
5 days	Warfarin
3 days	NSAIDs Cilostazol
2 days	NOACs: Apixiban, Rivaroxaban, Dabigatran
24 hours	Enoxaparin
4-6 hours	Unfractionated heparin

SURGERY

*Note: These are general guidelines, each decision should be made based on individual bleeding/clotting risks for that pt

Ortel, T. PMID: 22855600

Take Home Points

- We can't "clear" anyone for surgery, but we can certainly assess their risks and optimize their medications!
- Post-op pulmonary complications are actually even more common than cardiac, and we need to screen for them.
- There are several risk calculators we can use to make our lives easier when it comes to perioperative assessments.
- On the day of surgery – continue beta blockers and statins, but hold the ACE/ARB!

Anderson.Adrijana@mayo.edu

Questions?!