Preoperative Evaluation-Overview

Objective

- Who does not need preop eval?
- Preop cardiac evaluation components (2014 AHA)
  - Identifying high risk cardiac patients
    - Testing they need, cards involvement, approach to anesthesia
  - Risk stratification by scores (RCRI/Gupta)
  - Exercise tolerance
  - Further cardiac testing preop? (ie stress)
- Preop pulmonary and liver eval basics

Who **does not** need preop eval?

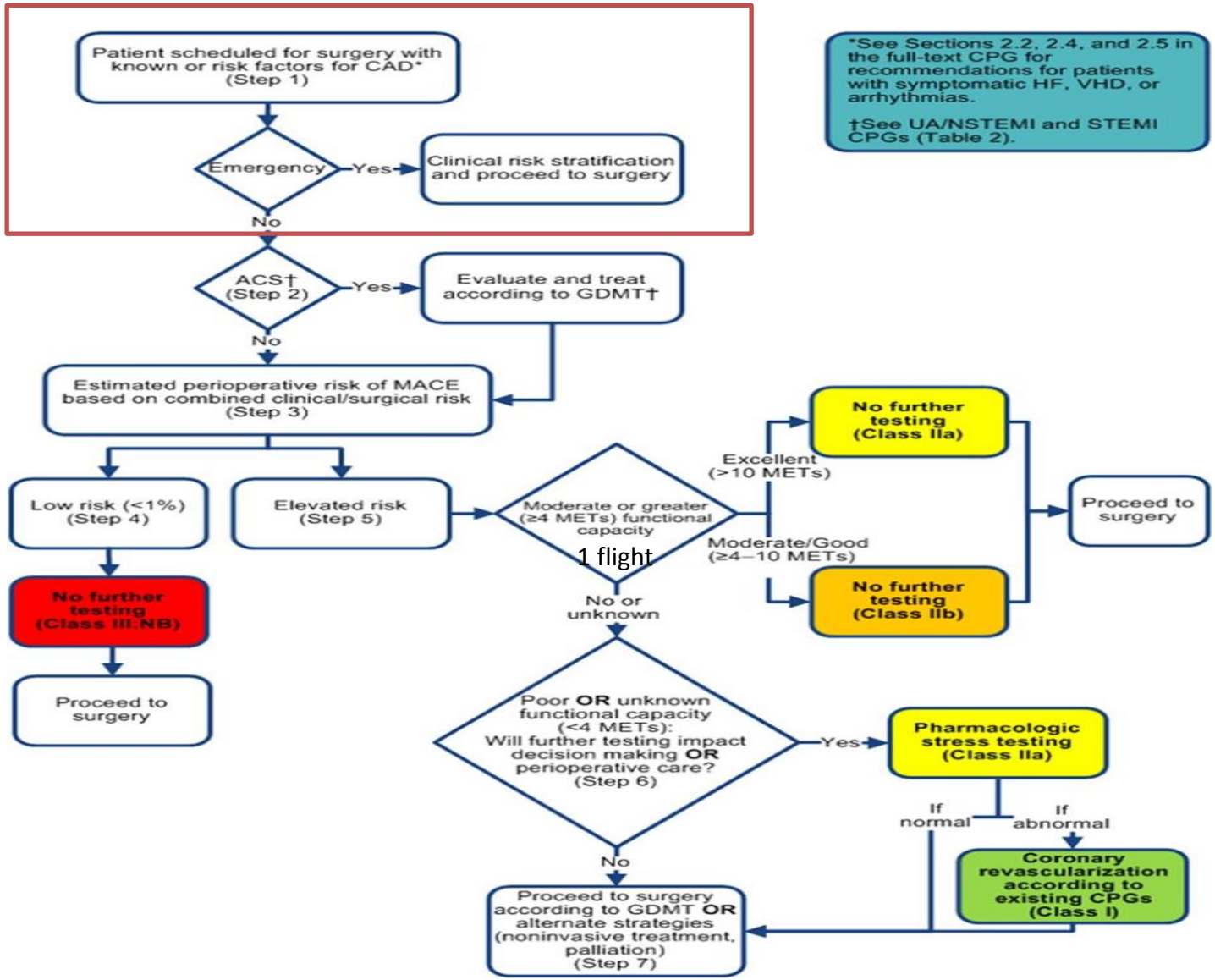
A) Low risk surgeries do not require preop eval and testing:

Endoscopic surgery
Superficial surgery
Ambulatory surgery
Cataract surgery
Breast surgery

B) Emergent surgeries- (less than 6 hours)

https://www.cochrane.org/CD007293/EYES_routine-preoperative-medical-testing-cataract-surgery
https://www.aafp.org/afp/2013/0315/p414.html

2014 AHA Algorithm



Objective

- Who does not need preop eval?
- Preop cardiac evaluation components (2014 AHA)
  - **Identifying high risk cardiac patients**
    - Testing they need, cards involvement, approach to anesthesia
  - Risk stratification by scores (RCRI/Gupta)
  - Exercise tolerance
  - Further cardiac testing preop? (ie stress)
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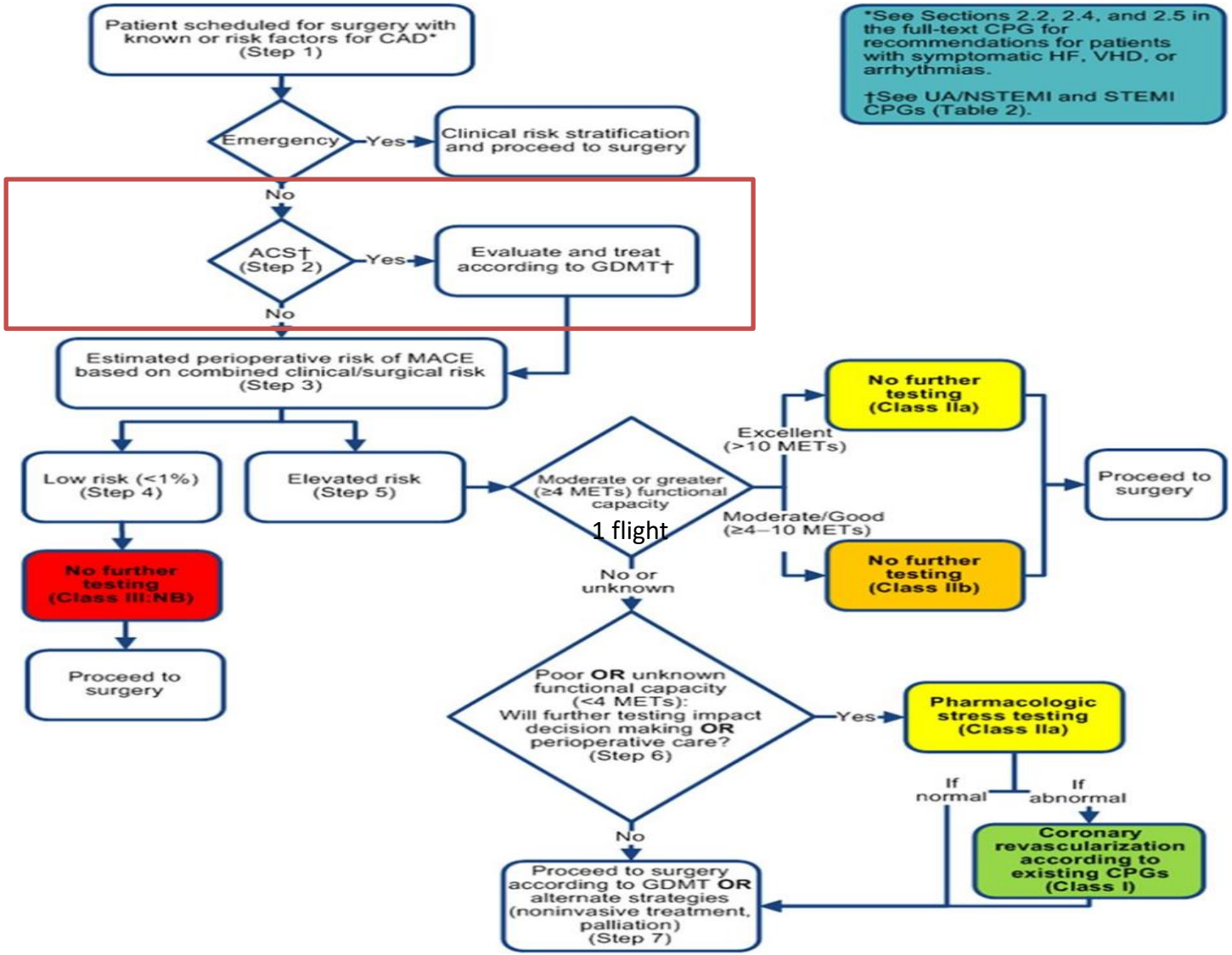
2014 AHA Algorithm

Cardiac Contraindications?



High Risk Cardiac Issues- Hit the Brakes!

- **Acute Coronary Syndrome or Recent PCI**
  - "I have chest pain"- need ACS rule out (trop x2, tele)…also PE?
  - If PCI lt 1 year- involve cards

- **Decompensated HF or Hx of severe CHF hx (EF lt30)**
  - TTE, esp if decompensated/no recent
  - Diurese to be ideally on RA, able to lie flat for OR
  - Consider cards consult + tele monitoring
  - Recommend regional anesthesia vs general

- **Symptomatic/Severe Valvular Heart Disease**
  - Murmur on exam – TTE if symptomatic + murmur or loud new murmur
  - Known severe vavular disease- cards consult, cardiac anesthesia

- **Pulmonary HTN (esp advanced)**
  - Cardiac consult for preop eval if moderate-severe
  - Avoid general anesthesia- regional preferred

- **Arrhythmias- Active Atrial Arrythmia/ICD/PPM**
  - Rate control preop, unlikely to need anticoag right away
  - Tele monitoring preop/postop
  - Ask team to call EP re PPM or ICD (turn off)

Guide for Encounter:

Chart check for high risk issues listed*

Hx:
-chest pain/sob at rest or with exertion
-Any cardiac hx
-ET (>1 flight of stairs) and has it changed

PE
-CHF
-Murmur

EKG
- q's, arrythmia, HOCM?

Objective

- Who does not need preop eval?
- Preop cardiac evaluation components (2014 AHA)
  - Identifying high risk cardiac patients
    - Testing they need, cards involvement, approach to anesthesia, tele?
  - **Risk stratification by scores (RCRI/Gupta)**
  - Exercise tolerance
  - Further cardiac testing preop? (ie stress)
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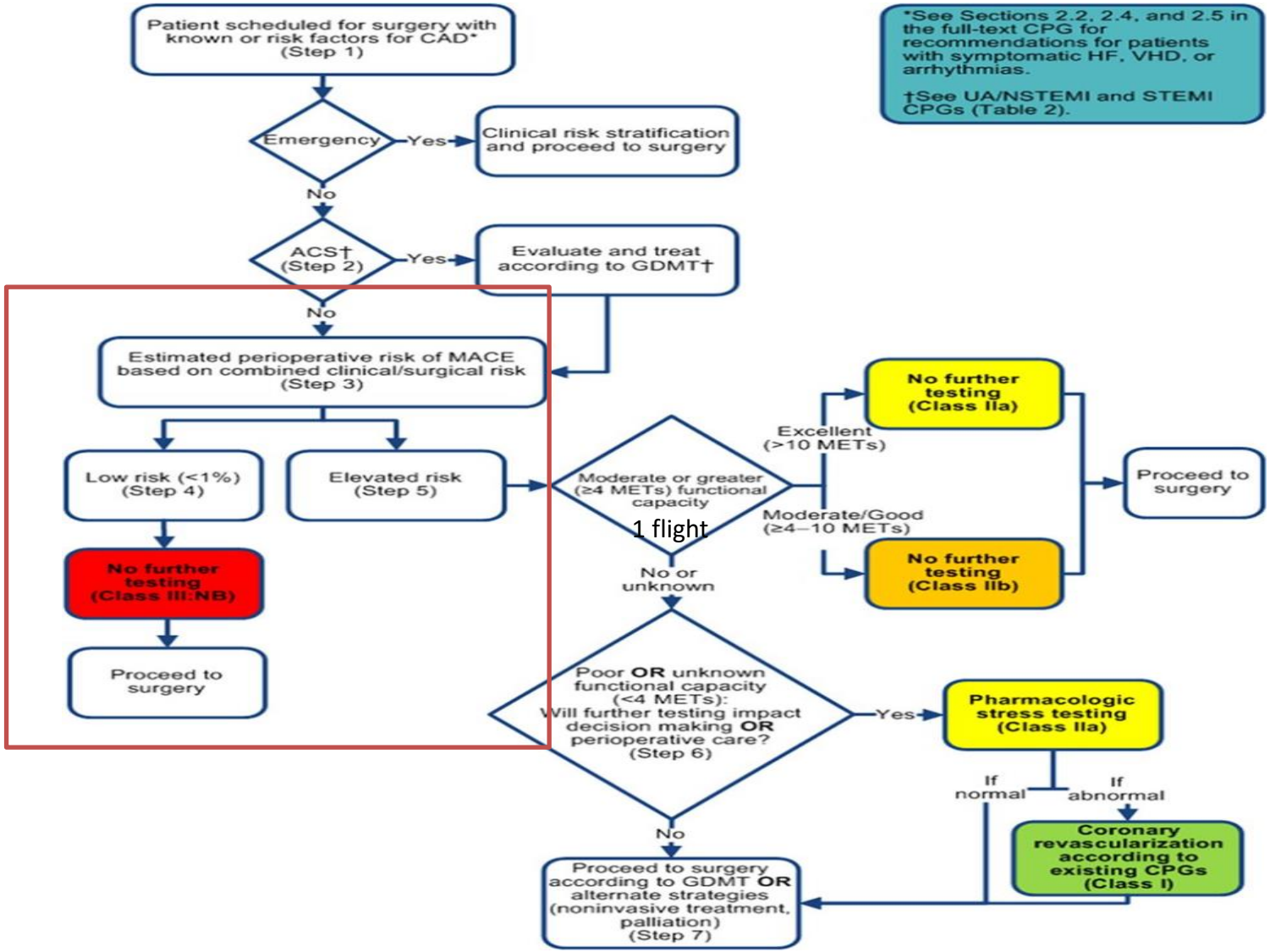
2014 AHA Algorithm



MACE Risk Scores: RCRI and Gupta (NSQIP)

Table 1. Revised Cardiac Risk Index

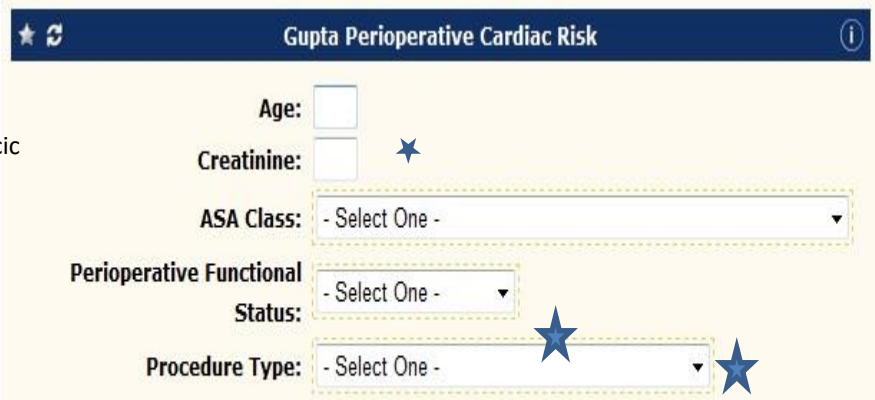
Lee Variables	
1	High-risk type of surgery Supra-inguinal vascular, intraperitoneal, intrathoracic
2	Ischemic heart disease (includes any of the following: history of myocardial infarction; history of positive exercise test; current complaint of chest pain that is considered to be secondary to myocardial ischemia; use of nitrate therapy; electrocardiography with pathologic Q waves)
3	Congestive heart failure
4	History of cerebrovascular disease
5	Preoperative treatment with insulin
6	Preoperative serum creatinine > 2.0 mg/dL

No. of Variables	Risk of Major Postoperative Cardiac Complication	Risk of major cardiac event
0	0.4%	3.9% (2.8-5.4%)
1	0.9%	6.0% (4.9-7.4%)
2	7.0%	10.1% (8.1-12.6%)
≥ 3	11.0% High risk	15% (11.1-20.0%)

Adapted from reference 19.

RCRI 0 = low risk
RCRI 1 or more = elevated risk
RCRI 3 or more = high risk

-Easy, not as good for vascular



Class	Physical status	Example
I	A healthy patient	A fit patient with an inguinal hernia
II	A patient with mild systemic disease	Essential hypertension, mild diabetes without end organ damage
III	A patient with severe systemic disease that is a constant threat to life	Angina, moderate-to-severe chronic obstructive pulmonary disease (COPD)
IV	A patient with an incapacitating disease that is a constant threat to life	Advanced COPD, cardiac failure
V	A moribund patient who is not expected to live 24 hours with or without surgery	Ruptured aortic aneurysm, massive pulmonary embolism
E	Emergency case	

Source: Adapted from American Society of Anesthesiologists (2013)

-Less than 1% low risk,
-Otherwise elevated risk, >10% high

-More complex, surg specific, lower % risk than RCRI (death +arrest not ?MI*)

Risk Scores: RCRI and Gupta (NSQIP)

-Simply write out both scores and % in your note
(RCRI 0, Gupta __% risk of periop MACE)

-Be aware of low risk (RCRI0 or Gupta <1%), can likely proceed

-Be mindful of high risk scores:
- -Refer back to high risk cardiac section
- -Can suggest regional anesthesia
- -May consider if procedure truly needed

Objective

- Who does not need preop eval?
- Preop cardiac evaluation components (2014 AHA)
  - Identifying high risk cardiac patients
    - Testing they need, cards involvement, approach to anesthesia, tele?
  - Risk stratification by scores (RCRI/Gupta)
  - **Exercise tolerance**
  - **Further cardiac testing preop? (ie stress)**
- Preop pulmonary and liver eval basics

2014 AHA Algorithm- Exercise Tolerance

Credit- Steve Embry

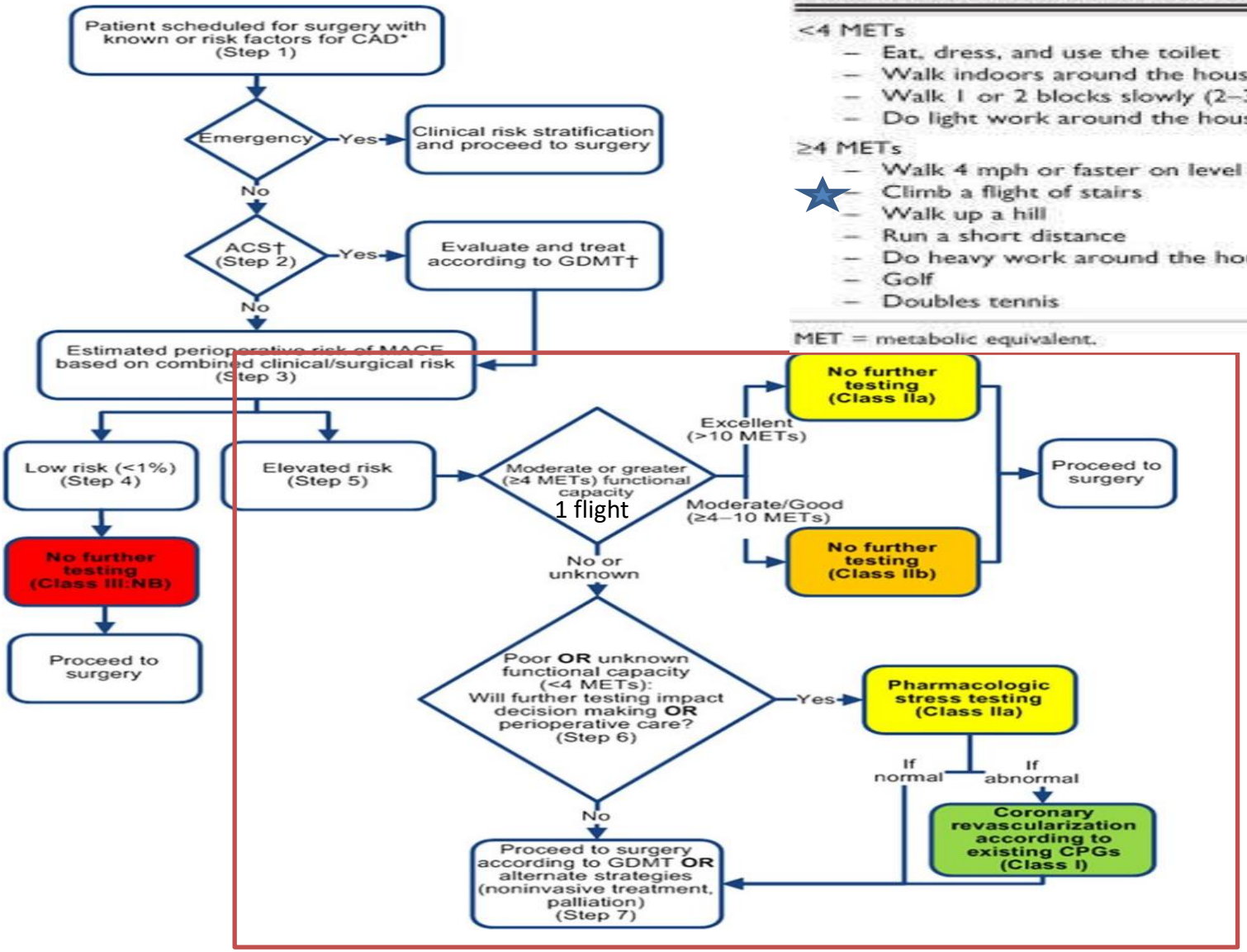


Table 3. Measures of Functional Capacity

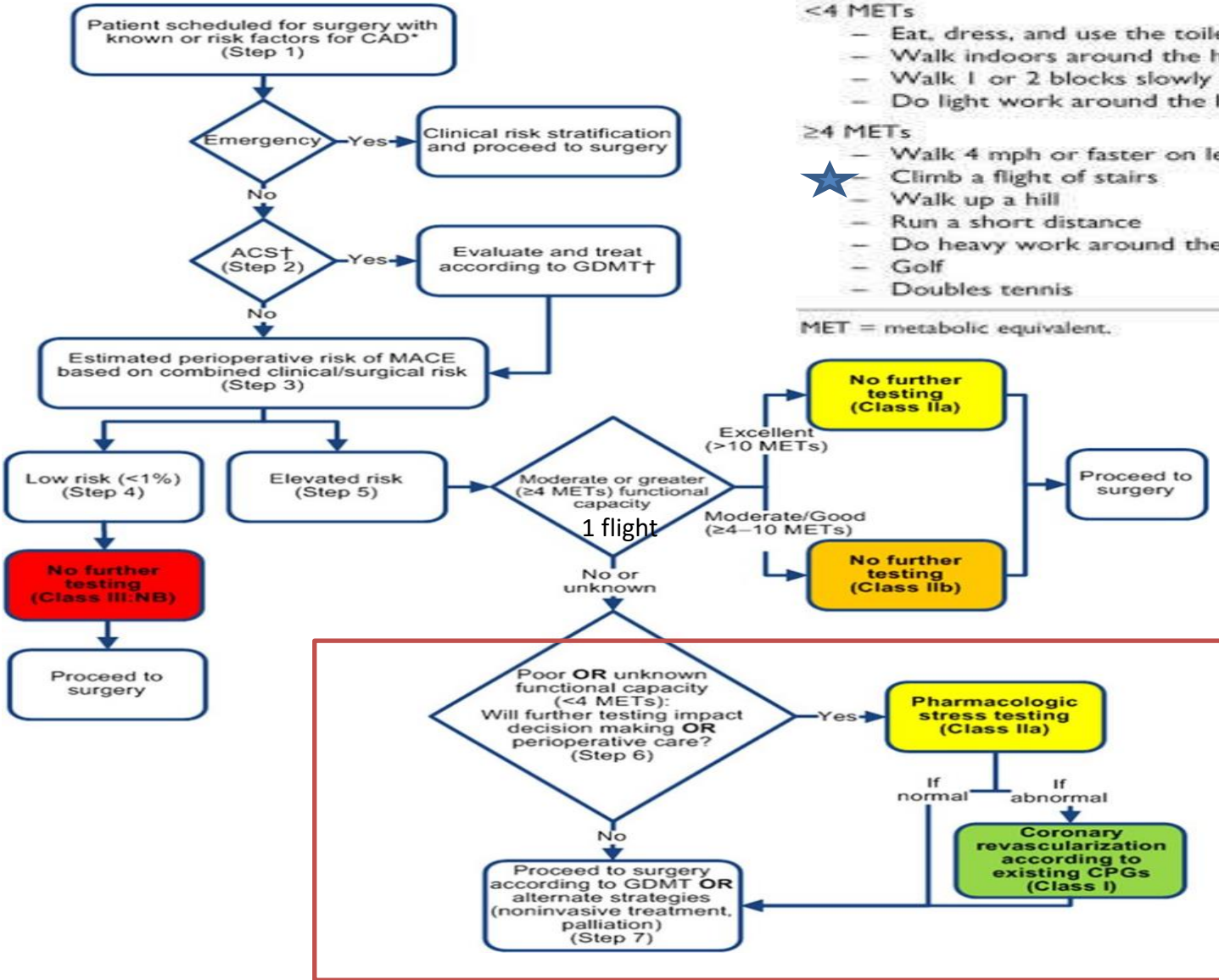
<4 METs
- Eat, dress, and use the toilet
- Walk indoors around the house
- Walk 1 or 2 blocks slowly (2–3 mph)
- Do light work around the house

≥4 METs
- Walk 4 mph or faster on level ground
- Climb a flight of stairs
- Walk up a hill
- Run a short distance
- Do heavy work around the house
- Golf
- Doubles tennis

MET = metabolic equivalent.

2014 AHA Algorithm- Exercise Tolerance

Credit- Steve Embry



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- Run a short distance
- Do heavy work around the house
- Golf
- Doubles tennis

MET = metabolic equivalent.

CARP

CARP Study

Inclusion Criteria: One or more arteries with greater than 70% stenosis

Baseline characteristics:

- 38% with baseline stable angina
- 42% with prior MI

Intervention: Cath All- Stent or No Stent

Outcomes: No difference

- Mortality at 2.7 years
- 30 day postop MI

Exclusion:

- Left main disease
- EF less than 20%

Coronary-Artery Revascularization before Elective Major Vascular Surgery

Edward O. McFalls, M.D., Ph.D., Herbert B. Ward, M.D., Ph.D., Thomas E. Moritz, M.S., Steven Goldman, M.D., William C. Krupski, M.D.,* Fred Littooy, M.D., Gordon Pierpont, M.D., Steve Santilli, M.D., Joseph Rapp, M.D., Brack Hattler, M.D., Kendrick Shunk, M.D., Ph.D., Connie Jaenicke, R.N., B.S.N., Lizy Thottapurathu, M.S., Nancy Ellis, M.S., Domenic J. Reda, Ph.D., and William G. Henderson, Ph.D.

ABSTRACT

BACKGROUND

The benefit of coronary-artery revascularization before elective major vascular surgery is unclear.

METHODS

We randomly assigned patients at increased risk for perioperative cardiac complications and clinically significant coronary artery disease to undergo either revascularization or no revascularization before elective major vascular surgery. The primary end point was long-term mortality.

RESULTS

Of 5859 patients scheduled for vascular operations at 18 Veterans Affairs medical centers, 510 (9 percent) were eligible for the study and were randomly assigned to either coronary-artery revascularization before surgery or no revascularization before surgery. The indications for a vascular operation were an expanding abdominal aortic aneurysm (33 percent) or arterial occlusive disease of the legs (67 percent). Among the patients assigned to preoperative coronary-artery revascularization, percutaneous coronary intervention was performed in 59 percent, and bypass surgery was performed in 41 percent. The median time from randomization to vascular surgery was 54 days in the revascularization group and 18 days in the group not undergoing revascularization ($P<0.001$). At 2.7 years after randomization, mortality in the revascularization group was 22 percent and in the no-revascularization group 23 percent (relative risk, 0.98; 95 percent confidence interval, 0.70 to 1.37; $P=0.92$). Within 30 days after the vascular operation, a postoperative myocardial infarction, defined by elevated troponin levels, occurred in 12 percent of the revascularization group and 14 percent of the no-revascularization group ($P=0.37$).

CONCLUSIONS

Coronary-artery revascularization before elective vascular surgery does not significantly alter the long-term outcome. On the basis of these data, a strategy of coronary-artery revascularization before elective vascular surgery among patients with stable cardiac symptoms cannot be recommended.

From the Minneapolis Veterans Affairs (VA) Medical Center (E.O.M., H.B.W., G.P., S.S., C.J.) and the Department of Medicine, Division of Cardiology (E.O.M., G.P.), and the Department of Surgery (S.S.), Division of Cardiovascular and Thoracic Surgery (H.B.W.), University of Minnesota — all in Minneapolis; the Cooperative Studies Program Coordinating Center (T.E.M., L.T., N.E., D.J.R.) and the Division of Peripheral Vascular Surgery (F.L.), VA Medical Center, Hines, Ill.; Southern Arizona VA Health Care System and the University of Arizona Sarver Heart Center — both in Tucson (S.G.); the Denver VA Medical Center, Denver (W.C.K., B.H.); the Department of Surgery (J.R.) and the Division of Cardiology (K.S.), University of California, San Francisco; San Francisco VA Medical Center, San Francisco (J.R., K.S.); and the University of Colorado Health Outcomes Program, Aurora, and the Department of Preventive Medicine and Biometrics, University of Colorado, Denver (W.G.H.). Address reprint requests to Dr. McFalls at the Division of Cardiology, VA Medical Center, 1 Veterans Dr., Minneapolis, MN 55417, or at mcfal001@tc.umn.edu.

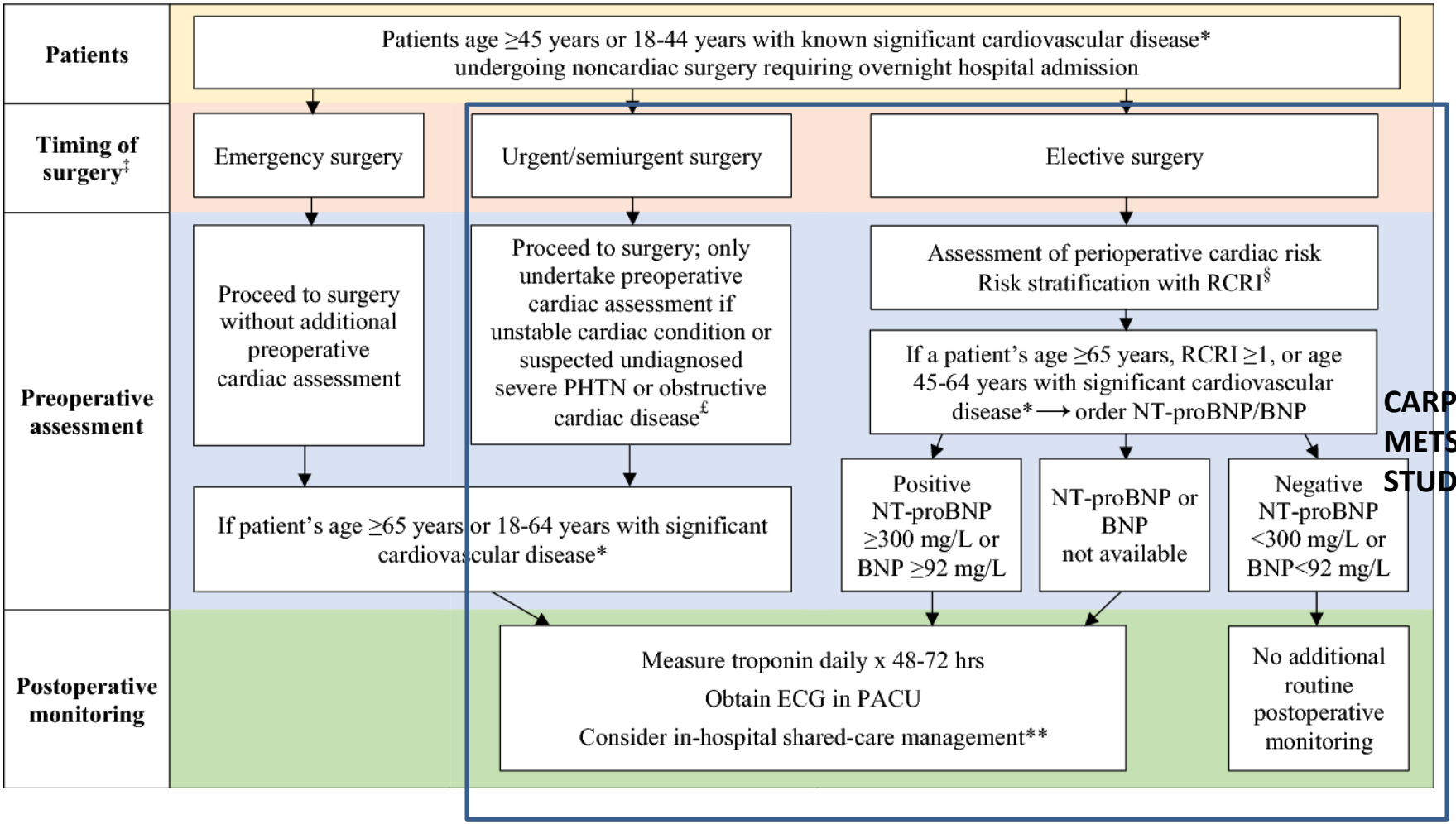
*Deceased.

N Engl J Med 2004;351:2795-804.

So who to stress before inpatient surgery?

- Stress those newly sig reduced EF, CAD risk + new exertional symptoms or reduced exercise tolerance
- If you would not stress otherwise, likely do not stress
- Even if do not need stress/cannot fix risk with cath, be aware of high risk postop

For Comparison: Canadian 2017 Guidelines:



Examples of Preop Risk Eval (Cardiac):

Example 1:

- **75yo M with hx of x here for x, medicine consulted for preop eval**
- **RCRI 3 (CVA hx, Q waves, IDDM) and Gupta 8% risk of periop MACE**
- **ET less than 4 mets, bur limited by immobility in LE, low concern for severe CAD**
- **No further cardiac testing prior to procedure but rmains high risk consider regional anesthesia**
- **Medical management listed as below….**

Example 2:

- **75yo M with hx of x here for x, medicine consulted for preop eval**
- **With hx of severe HFrEF and valvular disease and reporting chest pain- tropx2, EKG stat, recommend cards consult for preop eval, TTE, diuresis with IV lasix 20mg bid**
- **COPD flare- needs standing nebs now**
- **Cirrhosis with tense ascites- LVP**

Objective

- Who does not need preop eval?
- Preop cardiac evaluation components (2014 AHA)
  - Identifying high risk cardiac patients
    - Testing they need, cards involvement, approach to anesthesia
  - Risk stratification by scores (RCRI/Gupta)
  - Exercise tolerance
  - Further cardiac testing preop? (ie stress)
- **Preop pulmonary and liver eval basics**

Pulmonary Assessment

- Highest risk:
  - Active COPD/Asthma flare
  - Hypoxic Resp Failure on high 02
  - Advanced Pulm HTN

- Risk Assessment? Surgery type + Hx – ARISCAT, Arozullah

- Testing? CXR (if symptoms!!)

- Risk Reduction?
  - Identify OSA (STOP-BANG)–CPAP post?
  - Incentive Spirometry
  - Local anesthesia/regional block
  - Involve Pulm

TABLE 2
STOP-BANG questionnaire*

STOP		
S (snore)	Do you *snore* loudly (louder than talking or loud enough to be heard through closed doors)?	Yes/No
T (tired)	Do you often feel *tired*, fatigued, or sleepy during daytime?	Yes/No
O (observed)	Has anyone *observed* you stop breathing during sleep?	Yes/No
P (blood pressure)	Do you have or are you being treated for high blood *pressure*?	Yes/No
BANG		
B (body mass index [BMI])	*BMI* > 35 kg/m^2?	Yes/No
A (age)	*Age* > 50 years?	Yes/No
N (neck)	*Neck* circumference > 40 cm?	Yes/No
G (gender)	*Gender* male?	Yes/No

Yes to ≥ 3 questions = high risk of obstructive sleep apnea
Yes to < 3 questions = low risk of obstructive sleep apnea
*Adapted from Chung et al.[20]

Liver Assessment-Basics

- Contraindications:
  - Acute fulminant hepatitis
  - Acute liver failure
  - Acute alcoholic hepatitis high DF
  - Cirrhosis Child-Pugh class C or MELD score >15
    - Class C – 70-80% mortality
    - MELD 15- 50-60% mortality
- Estimating Risk:
  - MELD and Childs-Pugh
- Periop management
  - Ascites
  - INR

Objective

- Who does not need preop eval?
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  - Exercise tolerance
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Preoperative Medication Management

Objectives:

Obtain Comfort With Periop Meds Management:

A) Cardiac Meds Including Anticoagulation

B) Endocrine Meds

C) Other Meds

Case 1:

- 87yo M with history of atrial fibrillation on eliquis, HTN, IDDM, COPD on home steriods, CAD s/p stent 8 months ago, PAD s/p stent 4 months ago,

- Medication List:
  - ASA 81mg
  - Plavix 75mg
  - Lipitor 80mg
  - Gemfibrozil
  - Losartan 50mg daily
  - Metoprolol 25mg XL daily
  - Lasix 20mg
  - Eliquis 5mg bid
  - Lantus 40 units nightly
  - Prednisone 20mg daily
  - MAO inhibitor for depression
  - Synthroid 100mcg

Please indicate medical management for above med list, for surgery tomorrow am

ASA and ASA/Plavix (DAPT)

- Aspirin for Primary Prevention (HTN, HL)
  - Can hold safely (POISE2 2014)- ideally 5 days before
- Aspirin + Plavix (DAPT) after Cardiac Stent
  - Do not hold aspirin
  - BMS or DES post ACS – 1 year
  - BMS or DES post stable CAD- 1 month vs 3 months
- Aspirin Plavix (DAPT) after Vascular Stent
  - Angioplasty with stent? (1-2 months)- consult vascular

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5638576/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5545142/

http://interventions.onlinejacc.org/content/jint/10/9/955.full.pdf

POISE 2 (perioperative ischemic eval)

ORIGINAL ARTICLE

Aspirin in Patients Undergoing Noncardiac Surgery

P.J. Devereaux, M. Mrkobrada, D.I. Sessler, K. Leslie, P. Alonso-Coello, A. Kurz, J.C. Villar, A. Sigamani, B.M. Biccard, C.S. Meyhoff, J.L. Parlow, G. Guyatt, A. Robinson, A.X. Garg, R.N. Rodseth, F. Botto, G. Lurati Buse, D. Xavier, M.T.V. Chan, M. Tiboni, D. Cook, P.A. Kumar, P. Forget, G. Malaga, E. Fleischmann, M. Amir, J. Eikelboom, R. Mizera, D. Torres, C.Y. Wang, T. VanHelder, P. Paniagua, O. Berwanger, S. Srinathan, M. Graham, L. Pasin, Y. Le Manach, P. Gao, J. Pogue, R. Whitlock, A. Lamy, C. Kearon, C. Baigent, C. Chow, S. Pettit, S. Chrolavicius, and S. Yusuf, for the POISE-2 Investigators*

ABSTRACT

BACKGROUND

There is substantial variability in the perioperative administration of aspirin in patients undergoing noncardiac surgery, both among patients who are already on an aspirin regimen and among those who are not.

METHODS

Using a 2-by-2 factorial trial design, we randomly assigned 10,010 patients who were preparing to undergo noncardiac surgery and were at risk for vascular complications to receive aspirin or placebo and clonidine or placebo. The results of the aspirin trial are reported here. The patients were stratified according to whether they had not been taking aspirin before the study (initiation stratum, with 5628 patients) or they were already on an aspirin regimen (continuation stratum, with 4382 patients). Patients started taking aspirin (at a dose of 200 mg) or placebo just before surgery and continued it daily (at a dose of 100 mg) for 30 days in the initiation stratum and for 7 days in the continuation stratum, after which patients resumed their regular aspirin regimen. The primary outcome was a composite of death or nonfatal myocardial infarction at 30 days.

RESULTS

The primary outcome occurred in 351 of 4998 patients (7.0%) in the aspirin group and in 355 of 5012 patients (7.1%) in the placebo group (hazard ratio in the aspirin group, 0.99; 95% confidence interval [CI], 0.86 to 1.15; P=0.92). Major bleeding was more common in the aspirin group than in the placebo group (230 patients [4.6%] vs. 188 patients [3.8%]; hazard ratio, 1.23; 95% CI, 1.01, to 1.49; P=0.04). The primary and secondary outcome results were similar in the two aspirin strata.

CONCLUSIONS

Administration of aspirin before surgery and throughout the early postsurgical period had no significant effect on the rate of a composite of death or nonfatal myocardial infarction but increased the risk of major bleeding. (Funded by the

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Address reprint requests to Dr. Devereaux at the Population Health Research Institute, David Braley Cardiac, Vascular, and Stroke Research Institute, Rm. C1-116, Perioperative Medicine and Surgical Research Unit, Hamilton General Hospital, 237 Barton St. East, Hamilton, ON L8L 2X2, Canada, or at philipj@mcmaster.ca.

*A complete list of the investigators in the Perioperative Ischemic Evaluation 2 (POISE-2) trial is provided in the Supplementary Appendix, available at NEJM.org.

This article was published on March 31, 2014, at NEJM.org.

N Engl J Med 2014;370:1494-503.
DOI: 10.1056/NEJMoa1401105

-<u>200mg dose</u> before and 100mg after for 30 days vs placebo

-20% with CAD- **<u>6% with PCI,</u>** 6% with CABG

-all cause death/MI unchanged, in any group

-**increased bleeding risk in ASA group vs. placebo**

-upto day 6-7 post op bleeding risk

ASA and ASA/Plavix (DAPT)

- Aspirin for Primary Prevention (HTN, HL)
  - Can hold (POISE2 2014) periop

- **Aspirin + Plavix (DAPT) after Cardiac Stent**
  - Do not hold aspirin
  - BMS or DES post ACS – 1 year of DAPT
  - BMS or DES post stable CAD- 1 vs 6 months of DAPT

- Aspirin Plavix (DAPT) after Vascular Stent
  - Angioplasty with stent? (1-2 months)- consult vascular

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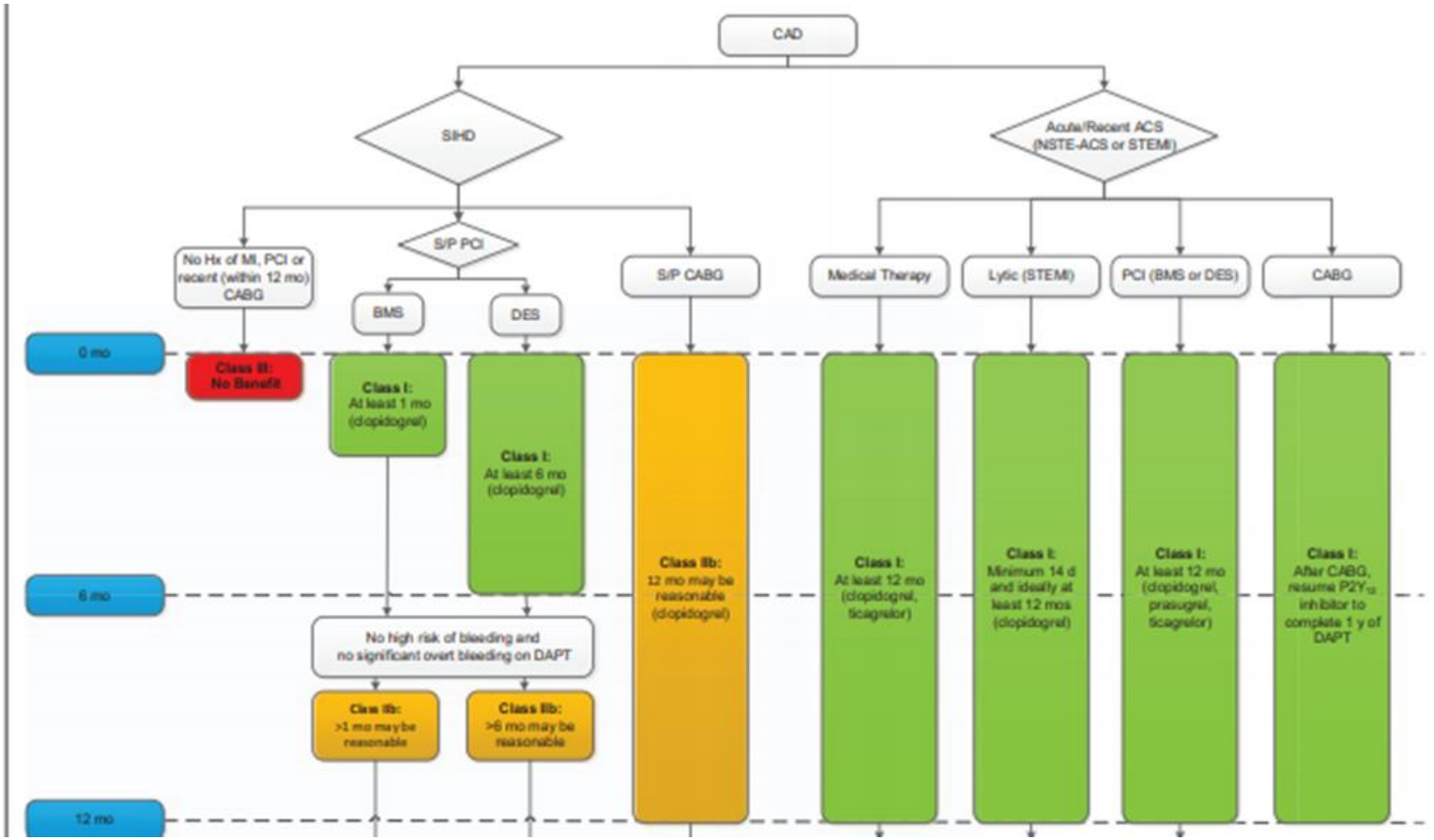
http://interventions.onlinejacc.org/content/jint/10/9/955.full.pdf

2016 ACC/AHA Update



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Other Cardiac Meds

- ACE/ARB
  - **Hold on day of procedure unless HTN (VISION 2017)**
- Beta-Blocker
  - Continue day of procedure, avoid starting day of* (POISE 2008)
- Calcium Channel Blocker
  - Limited data of harm, continue
- Lasix/Diuretics
  - Limited evidence- hold if not overloaded or BP low
- Statin/Anti-Cholesterol
  - Statins safe
  - Naicin, Fenofibrate, Gemfibrozil likely hold

Peri-op Medication Management- ACE/ARB

PERIOPERATIVE MEDICINE

Withholding *versus* Continuing Angiotensin-converting Enzyme Inhibitors or Angiotensin II Receptor Blockers before Noncardiac Surgery

An Analysis of the Vascular events In noncardiac Surgery patIents cOhort evaluatioN Prospective Cohort

A

Medication withheld	Outcome	Events in withheld *vs.* continued	aRR (95% CI), p–value
ACEI/ARBs	Death, MINS, or stroke	150/1245 (12.0%) *vs.* 459/3557 (12.9%)	0.82 (0.70–0.96), 0.01
	Death	25/1245 (2.0%) *vs.* 74/3557 (2.1%)	0.69 (0.39–1.24), 0.21
	MINS	132/1245 (10.6%) *vs.* 399/3541 (11.3%)	0.84 (0.70–0.998), 0.048
	Stroke	8/1245 (0.6%) *vs.* 26/3557 (0.7%)	0.91 (0.30–2.2), 0.68
	Intraop. hypotension	290/1245 (23.3%) *vs.* 1017/3557 (28.6%)	0.80 (0.73–0.88), <0.001
	Postop. hypotension	242/1245 (19.4%) *vs.* 719/3557 (20.2%)	0.92 (0.77–1.10), 0.36
	MI (Exploratory)	57/1245 (4.6%) *vs.* 148/3557 (4.2%)	0.91 (0.66–1.27), 0.59
	Death, MI, or stroke (Exploratory)	79/1245 (6.3%) *vs.* 221/3557 (6.2%)	0.81 (0.62–1.03), 0.08

Other Cardiac Meds

- ACE/ARB
  - Hold on day of procedure unless HTN (VISION 2017)
- Beta-Blocker
  - **Continue day of procedure, avoid starting day of* (POISE 2008)**
- Calcium Channel Blocker
  - Limited data of harm, continue
- Lasix/Diuretics
  - Limited evidence- hold if not overloaded or BP low
- Statin/Anti-Cholesterol
  - Statins safe
  - Naicin, Fenofibrate, Gemfibrozil likely hold

POISE

Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomised controlled trial

POISE Study Group*

Summary

Background Trials of β blockers in patients undergoing non-cardiac surgery have reported conflicting results. This randomised controlled trial, done in 190 hospitals in 23 countries, was designed to investigate the effects of perioperative β blockers.

Methods We randomly assigned 8351 patients with, or at risk of, atherosclerotic disease who were undergoing non-cardiac surgery to receive extended-release metoprolol succinate (n=4174) or placebo (n=4177), by a computerised randomisation phone service. Study treatment was started 2–4 h before surgery and continued for 30 days. Patients, health-care providers, data collectors, and outcome adjudicators were masked to treatment allocation. The primary endpoint was a composite of cardiovascular death, non-fatal myocardial infarction, and non-fatal cardiac arrest. Analyses were by intention to treat. This trial is registered with ClinicalTrials.gov, number NCT00182039.

Findings All 8351 patients were included in analyses; 8331 (99·8%) patients completed the 30-day follow-up. Fewer patients in the metoprolol group than in the placebo group reached the primary endpoint (244 [5·8%] patients in the metoprolol group *vs* 290 [6·9%] in the placebo group; hazard ratio 0·84, 95% CI 0·70–0·99; p=0·0399). Fewer patients in the metoprolol group than in the placebo group had a myocardial infarction (176 [4·2%] *vs* 239 [5·7%] patients; 0·73, 0·60–0·89; p=0·0017). However, there were more deaths in the metoprolol group than in the placebo group (129 [3·1%] *vs* 97 [2·3%] patients; 1·33, 1·03–1·74; p=0·0317). More patients in the metoprolol group than in the placebo group had a stroke (41 [1·0%] *vs* 19 [0·5%] patients; 2·17, 1·26–3·74; p=0·0053).

Interpretation Our results highlight the risk in assuming a perioperative β-blocker regimen has benefit without substantial harm, and the importance and need for large randomised trials in the perioperative setting. Patients are unlikely to accept the risks associated with perioperative extended-release metoprolol.

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See Comment page 1813

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-8K patients

-Intervention group assigned 100xl metop day of surgery, then 200 xl for 30 days

-Placebo no Metop

-Decrease CV outcomes

-Increase in CVA (Hypotension)

Other Cardiac Meds

- ACE/ARB
  - Hold on day of procedure unless HTN (VISION 2017)
- Beta-Blocker
  - **Continue day of procedure, avoid starting day off/when admitted (POISE)**
- Calcium Channel Blocker
  - Limited data of harm, continue
- Lasix/Diuretics
  - Limited evidence- hold if not overloaded or BP low
- Statin/Anti-Cholesterol
  - Statins safe
  - Naicin, Fenofibrate, Gemfibrozil likely hold

Anticoagulants: Bridge or not?

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Perioperative Bridging Anticoagulation in Patients with Atrial Fibrillation

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ABSTRACT

Source: The Bottom Line

Primary Outcome			
Measure	**Bridging (N=895)**	**No Bridging (N=918)**	**P value**
Arterial thromboembolism	3 (0.3)	4 (0.4)	0.73
Stroke	3 (0.3)	2 (0.2)	
TIA	0	2 (0.2)	
Systemic Embolism	0	0	
Major bleeding	29 (3.2)	12 (1.3)	0.005
N = number of patients (%)			

Secondary Outcomes			
Measure	**Bridging**	**No Bridging**	**P value**
Death	4 (0.4)	5 (0.5)	0.88
Myocardial Infarction	14 (1.6)	7 (0.8)	0.1
Deep vein thrombosis	1 (0.1)	0	0.25
Pulmonary embolism	1 (0.1)	0	0.25
Minor Bleeding	187 (20.9)	110 (12)	<0.001
N = number of patients (%)			

-70% CHADS2 between 2-4

STUDY LIMITATIONS:

1) Few patients CHADS 5-6
2) Excluded if stroke <3 months
3) Not relevant to mechanical valves or VTE

Anticoagulants: NOACs

JAMA Internal Medicine | Original Investigation

Perioperative Management of Patients With Atrial Fibrillation Receiving a Direct Oral Anticoagulant

James D. Douketis, MD; Alex C. Spyropoulos, MD; Joanne Duncan, BSc; Marc Carrier, MD, MSc; Gregoire Le Gal, MD; Alfonso J. Tafur, MD; Thomas Vanassche, MD; Peter Verhamme, MD; Sudeep Shivakumar, MD; Peter L. Gross, MD, MSc; Agnes Y. Y. Lee, MD, MSc; Erik Yeo, MD; Susan Solymoss, MD; Jeannine Kassis, MD; Geneviève Le Templier, MD; Stephen Kowalski, MD; Mark Blostein, MD; Vinay Shah, MD; Elizabeth MacKay, MD; Cynthia Wu, MD; Nathan P. Clark, PharmD; Shannon M. Bates, MDCM, MSc; Frederick A. Spencer, MD; Eleni Arnaoutoglou, MD, PhD; Michiel Coppens, MD, PhD; Donald M. Arnold, MD, MSc; Joseph A. Caprini, MD; Na Li, PhD; Karen A. Moffat, MLT; Summer Syed, MD, MSc; Sam Schulman, MD, PhD

Anticoagulation Management: Who to Bridge?

TABLE 1 Risk Stratification for Perioperative Thromboembolism as Suggested by ACCP

	Indication for Anticoagulation		
Risk Group	**Mechanical Heart Valve**	**Atrial Fibrillation**	**VTE**
High*	• Mitral valve prosthesis • Cage-ball or tilting disc aortic valve prosthesis • CVA/TIA <6 months prior	• $CHADS_2$ score 5 or 6 • CVA/TIA <3 months prior • Rheumatic valvular heart disease	• VTE <3 months prior • Severe thrombophilia†
Moderate	• Bileaflet aortic valve and other risk factors‡	• $CHADS_2$ score 3 or 4	• VTE 3-12 months prior • Nonsevere thrombophilia§ • Recurrent VTE • Active cancer
Low	• Bileaflet aortic valve *without* other risk factors	• $CHADS_2$ score 2 or less without prior CVA/TIA	• VTE >12 months prior without other risk factors

Bridging Anticoagulation

Primum Non Nocere

Stephen J. Rechenmacher, MD, James C. Fang, MD

When to Hold Anticoagulants:

- Coumadin- 5 days ideally, use INR to check

- Novel Anticoagulants (for most procedures)
  - Apixaban, Xeralto
    - Crcl normal 48 hours ie 2 days
    - Crcl 15-30 consider 72 hours, or check Xa level
  - Dabigitran
    - Crcl normal 48 hours ie 2 days
    - Crcl 15-30 hold 120 hours ie 5 days

http://www.onlinejacc.org/content/69/7/871

Case 1:

- 87yo M with history of atrial fibrillation on eliquis, HTN, IDDM, COPD on home steriods, CAD s/p stent 8 months ago, PAD s/p stent 4 months ago,

- Medication List:
  - ASA 81mg- continue
  - Plavix 75mg- continue- call cards as high risk
  - Lipitor 80mg- continue
  - Gemfibrozil- hold am on day of procedure
  - Losartan 50mg daily- depends on BP, hold in am if wnl
  - Metoprolol 25mg XL daily- continue
  - Lasix 20mg- continue if BP ok and euvolemic
  - Eliquis 5mg bid- hold periop as CHADS2VASC <5 or 6, if no recent CVA

  - Lantus 40 units nightly
  - Prednisone 20mg daily
  - MAO inhibitor
  - Synthroid 100 mcg

  Please indicate medical management for above med list, for surgery tomorrow am

Endo: Diabetic Meds Periop

- Contraindication to non emergent surgery in DM:
  - DKA/HHS
- Lantus and Orals:
  - Lantus- can reduce by a third or a half, but if am sugar high continue same dose
  - Insulin with meals- hold day of procedure
  - Orals- NPO sliding scale
  - If type I on insulin pump- involve endocrine

Endo: Stress Steroids?

Nonsuppressed HPA axis:
-glucocorticoids of any dose for less than three weeks
-morning prednisone (<5 mg daily or its equivalent) for any duration
-less than 10 mg of prednisone or its equivalent every other day

Suppressed HPA axis – For patients who are currently
-prednisone >20 mg/day for three weeks or more and in patients with a Cushingoid appearance

Corticosteroid coverage for surgery in patients taking exogenous corticosteroids (uptodate)

For minor procedures or surgery under local anesthesia (eg, inguinal hernia repair), take usual morning steroid dose. No extra supplementation is necessary.
For moderate surgical stress (eg, lower extremity revascularization, total joint replacement), take usual morning steroid dose. Give 50 mg hydrocortisone intravenously just before the procedure and 25 mg of hydrocortisone every eight hours for 24 hours. Resume usual dose thereafter.
For major surgical stress (eg, esophagogastrectomy, total proctocolectomy, open heart surgery), take usual morning steroid dose. Give 100 mg of intravenous hydrocortisone before induction of anesthesia and 50 mg every eight hours for 24 hours. Taper dose by half per day to maintenance level.

Case 1:

- 87yo M with history of atrial fibrillation on eliquis, HTN, IDDM, COPD on home steriods, CAD s/p stent 8 months ago, PAD s/p stent 4 months ago,

- Medication List:
  - ASA 81mg- continue
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  - Losartan 50mg daily- depends on BP, hold in am if wnl
  - Metoprolol 25mg XL daily- continue
  - Lasix 20mg- continue if BP ok and euvolemic
  - Eliquis 5mg bid- hold periop as CHADS2VASC <5 or 6

  - Lantus 40 units nightly- fsg 150s this am, so reduced to 30
  - Prednisone 20mg daily- continue am dose, dose 50 IV hydrocort before then 25q8 for 24 hours

  - MAO inhibitor
  - Synthroid 100 mcg

Please indicate medical management for above med list, for surgery tomorrow am

Miscellaneous Meds

- Psych Meds
  - Most ok to continue
  - Discuss MAO inhibitors with anesthesia- concurrent side effects
- Thyroid Meds and Seizure Meds
  - Continue
- Opioids
  - Chronic opioid patient discuss with anesthesia

Post-Operative Scenarios:

Objectives

- Approach to 4 common postop issues:
  - Pain
  - Fever
  - Tachycardia
  - Hypotension

Post-Op Pain:

- Case 1:

60 yo M with hx of Cirrhosis, Seizure Disorder, ESRD on HD, CAD s/p STEMI 1 year ago, DVT on eliquis, Depression, POD 1 after hip surgery with 7/10 pain. What options can you use:

-Tylenol 650mg
-Tramadol 25mg
-Toradol IV
-Ibuprofen 400mg
-Percocet 10-325mg
-Dilaudid 2mg po
-Tylenol #2

Post-Op Pain:

- Case 1:

60 yo M with hx of Cirrhosis, Seizure Disorder, ESRD on HD, CAD s/p STEMI 1 year ago, DVT on eliquis, Depression, POD 1 after hip surgery with 7/10 pain. What options can you use:

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-Tramadol 25mg
-Toradol IV
-Ibuprofen 400mg
-**Percocet 10-325mg**
-Dilaudid 2mg po
-Tylenol #2

Low Potency Options: Nonopioids

Name/Route	Special Considerations	Equivalence to Morphine 10mg po	Recommended starting dose:	Onset of Action:	Duration of Action:
Tylenol (po)	-Renal Failure: no issues -Hepatic Failure: avoid in acute failure, 2g cirrhosis, 4g otherwise -Elderly: no issues	appox 1000-2000mg (1:100)	Start with 500mg not less	30min to 1HR	4 hours
NSAID -Ibuprofen (po) -Torodol (IM/IV)	-Renal Failure: Avoid -Hepatic Failure: Avoid -Elderly: Avoid -Active significant bleeding/very low platelets: Avoid **-Hx of MI**** -On other meds: **blood thinners,** Gi bleed hx, steriods	appox 1000-2000mg (1:100)	Start 600 mg po ibuprofen or equivalent 30 mg IV torodol MAX DOSE 3g po DAILY	-30 minutes -30 minutes	4 hours 4 hours

Moderate Pain (5-6)- Low-intensity agents

Name/Route	Special Considerations	Equivalence to Morphine 10mg po	Recommended starting dose:	Onset of Action:	Duration of Action:
TRAMADOL (non-opoid)	-Renal Failure: Adjust interval -Hepatic Failure: Adjust interval -Elderly: Low dose 25mg -Increases seizure threshold -Avoid if SSRI/SNRI /MAO	100mg po (1:10)	-50po mg to 100mg po q6 hours	-1 hour	9 hours – prolonged in renal failure
Codeine (exists in formulation Tylenol #2 or #3. 15mg in Tylenol 2 and 30mg in Tylenol 3) 	-Renal Failure: avoid if crcl lt30, ESRD -Hepatic Failure: avoid -Elderly: lowest dose -Watchout total Tylenol	100mg po (1:10)	-Either Tylenol 2 or Tylenol 3	-30 minutes	3-6 hours

Moderate Pain- High Potency

Name/Route	Special Considerations	Equivalence to Morphine 10mg po	Recommended starting dose:	Onset of Action:	Duration of Action:
Hydrocodone -Norco 5/10 is with tylenol	-Renal Failure: adjust interval unless cclr lt30 or ESRD then avoid -Hepatic Failure: adjust interval -Elderly: low dose -Watchout total tylenol level	**10mg (1:1)**	-Either Norco 5 or Norco 10	**-10-15 minutes**	-3 to 4 hours
Morphine -3PO = 1IV -Can be IR or SR	-Renal Failure: adjust interval in mild AKI. Crcl lt 30 or ESRD then avoid -Hepatic Failure: adjust interval -Elderly: low dose	10mg (1:1)	- 7.5mg po (2-4IV) lowest dose up to 15-30mg po for **severe pain** (5 to 10IV)	-30 minutes po -5-10 IV (addictive potential, try oral)	-2-3 hours, 2 hours IV
Oxycodone (po) -IR not SR -5 or 10mg with tylenol is percocet	-Renal Failure: Adjust interval -Hepatic Failure: Adjust interval -Elderly: Low dose 2.5mg -Watchout total tylenol level	6.67 mg (3:2)- **stronger than morphine**	-5mg to 10mg	**-10 to 15 minutes**	3 hours

Severe Pain Options

Name/Route	Special Considerations	Equivalence to Morphine 10mg po	Recommended starting dose:	Onset of Action:	Duration of Action:
Dilaudid -Can be IV (5x PO dose) or PO	-Renal Failure: Adjust dose and interval -Hepatic Failure: adjust interval -Elderly: 1mg po lowest dose	**2mg (5:1)**	**2.5-5mg po or 1mg IV**	-15-30 minutes po -5-10 minutes IV	-2-3 hours

Case 2:

- 80yo with fever post-op day 2 s/p ortho surgery, asymptomatic on history, exam wnl. What workup to be done?

A) Bcx
B) UA, Ucx
C) CXR
D) All of the Above
E) None of the Above

Post-Op Fever- 15% of patients

- When is it ok?
- When to look and which infections?
- Important noninfectious causes

Key References:

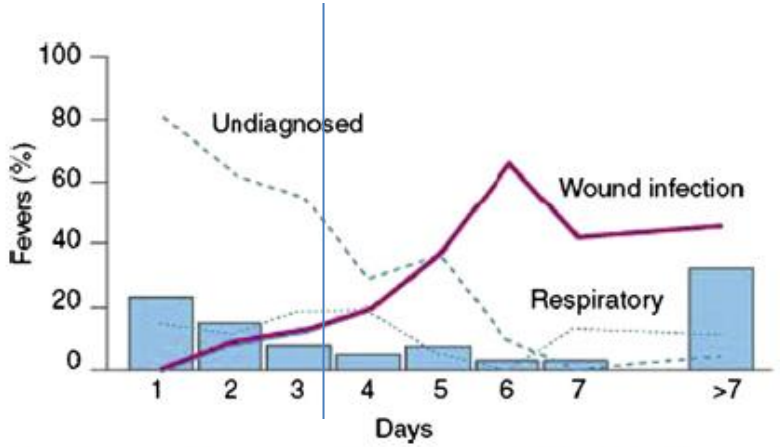
-Medical Care of Surgical Patient: Post-Operative Fever by Adams et al- https://www.proceedings.med.ucla.edu/wp-content/uploads/2018/12/Adams-A181010SA-revised-BLM-edited.pdf

-Fever in the Postoperative Patient by Narayan and Mednilli: http://www.wisconsinacep.org/resources/LLSA%20Articles/FeverInThePostopPatient.pdf

When is it ok?

Table 1
Classic "Ws" of postoperative fever

W	Cause	Timing
Wind	Atelectasis	POD 1–2
Water	Urinary tract infection	POD 2–3
Wound	Wound infection	POD 3–7
Walking	Deep vein thrombosis/thrombophlebitis	POD 5–7
Wonder drug	Drug fever	POD >7



-Day 1- 80% noninfectious

-Day 5- 90% infection with source

Fig. 1. Percentage of postoperative fevers occurring on the indicated day following an operative procedure. Lines indicate the percentage of fevers occurring on each day attributable to the cause indicated. (*From* Dellinger EP. Approach to the patient with postoperative fever. In: Gorbach S, Bartlett J, Blacklow N, editors. Infectious diseases. Philadelphia: Lippincott Williams & Wilkins; 2004. p. 817–23; with permission.)

Post-Op Fever

- When is it ok? 0-2 days usually ok
  - Simply doing infectious ROS and exam may be sufficient
  - Persistent high fever take notice
- When to look and which infections?
  - After 3 days, definitely after 5
  - Bcx, UA/Ucx + symptoms, CXR for PNA, Cdiff
  - Look at surgical site
- Rare but important noninfectious causes
  - DVT/PE if low grade fever*
  - Blood transfusions
  - Drug reaction (abx)
  - Malignant hyperthermia- within hours upto max 24 hours (PACU)

Post-Op Tachycardia

- Case 3: 88yo F with hx of HTN, HL presenting post-op vascular surgery with HR130, BP 110/80, 02 sat 100% on RA.

A) Start Metop
B) Give 1L
C) CTPE
D) Assess for pain

Post-Op Tachycardia

- Case 3: 88yo F with hx of HTN, HL presenting post-op vascular surgery with HR130, BP 110/80, 02 sat 100% on RA.

A) Start Metop
B) Give 1L
C) CTPE
D) Assess for pain

Post-Op Tachycardia- Get EKG

- Causes:
  - New Arrhythmia (Post-op Afib or Atrial Tach)
    - Rate control if BPs stable
    - Afib within 48 hours, no anticoag. If gt 48, CHADS2VASC
  - Sinus Tach (or fast HR in chronic Afib)
    - Pain
    - Hypovolemia- bleeding/volume shift- give fluids
    - Medication withdrawal (BB)
    - Alcohol/benzo withdrawal
    - Infection (SIRs)
    - Pulmonary embolism/DVT- unexplained persistent

Sigmund et al 2017- Postop Tachycardia Ortho. https://www.ncbi.nlm.nih.gov/pubmed/27890407

Post-Op Hypotension

Case 4:

69 yo F with hx of ESRD, DM, HL, presenting with hypotension morning after ortho surgery.

-Vitals: afeb, BP90/60, HR 40, 02 88% on RA Overnight vitals wnl

-Exam: Aox2 somnolent, lungs crackles at bases, CV regular, abd soft, ext cold

What is the likely cause:

A) Hypovolemia

B) Sepsis

C) MI

D) PE

E) Neurogenic

Hypotension Postop

- Common causes:
  - Volume shift/intra op bleeding- give IVF
  - Anesthesia effect- resolve in 24-48 hours
  - Aggressive BP control (watch for IV pushes)

- Causes to rule out
  - Sepsis
  - Adrenal insufficiency
  - Severe active bleed
  - Cardiac cause (MI or massive PE)
  - Neurogenic (rare), NSGY patients

Types of Shock

Types	CO	PVR (warm/cold)	HR	Examples
Distributive	Increased	Decreased -warm	Increased	-Sepsis +/- adrenal crises -Anaphylaxis
Cardiogenic	Decreased	Increased - cold	Increased or **Decreased**	-STEMI, tachy/brady arrythmias, acute valvular disease
Obstructive	Decreased	Increased-	Increased	-PE -Tamponade -Pneumothorax
Hypovolemic	Decreased	Increased	Increased	-Bleed -Sig fluid loss
Neurogenic	Decreased	Decreased	**Decreased**	-Spine trauma