ROPER ST. FRANCIS HEALTHCARE

The Latest in Preoperative Management

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Perioperative Risk Management

Identify and optimize risk factors during preoperative evaluation

Stratification of surgical risk as low, intermediate, or high

Using cardiovascular risk factors for an approach to CV testing

Management of patient at increased risk and specific scenarios

Recovery of patients after noncardiac surgery

Cardiovascular complications dramatically impact prognosis. This is influenced by:

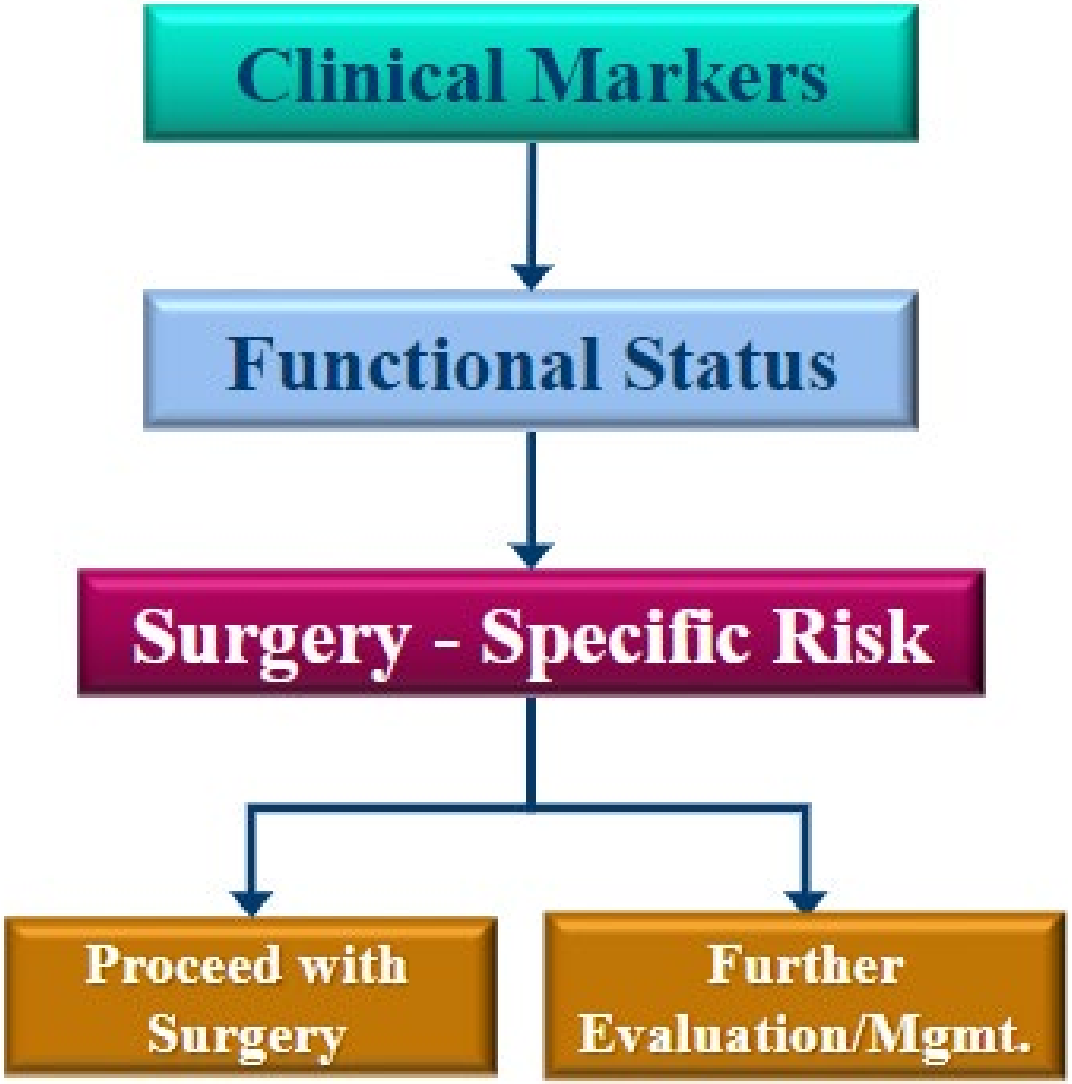
1) Presence and optimization of patient- specific comorbidities
2) Complexity of the planned surgical procedure
3) Clinical urgency of surgery

Definitions of Urgency and Risk

- An **urgent procedure** is one in which there may be time for a limited clinical evaluation, usually when life or limb is threatened if not in the operating room, typically between 6 and 24 hours
- A **time-sensitive procedure** is one in which a delay of > 1 to 6 weeks to allow for an evaluation and significant changes in management will negatively affect outcome
- An **elective procedure** is one in which the procedure could be delayed for up to 1 year
- A **low-risk procedure** is one in which the combined surgical and patient characteristics predict a risk of major adverse cardiac event (MACE) of death and myocardial infarction (MI) of <1
- **Elevated risk procedures** are considered when a risk of MACE is ≥1%

Fleisher LA, et al. JACC2014.

Estimation of the Patient's Risk

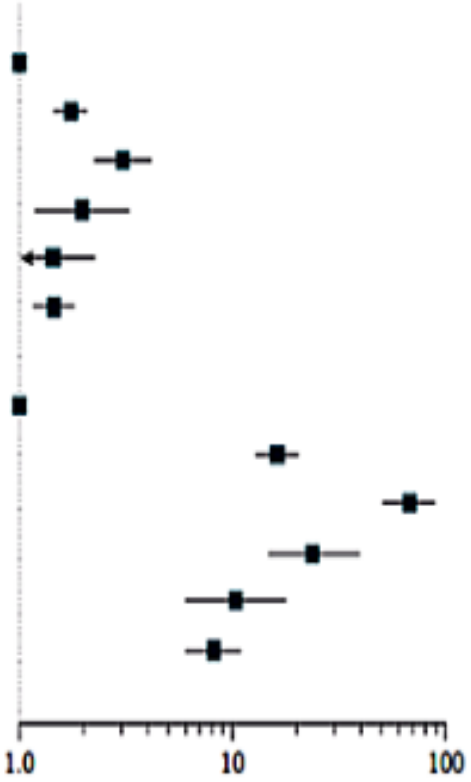


Revised Cardiac Risk Index

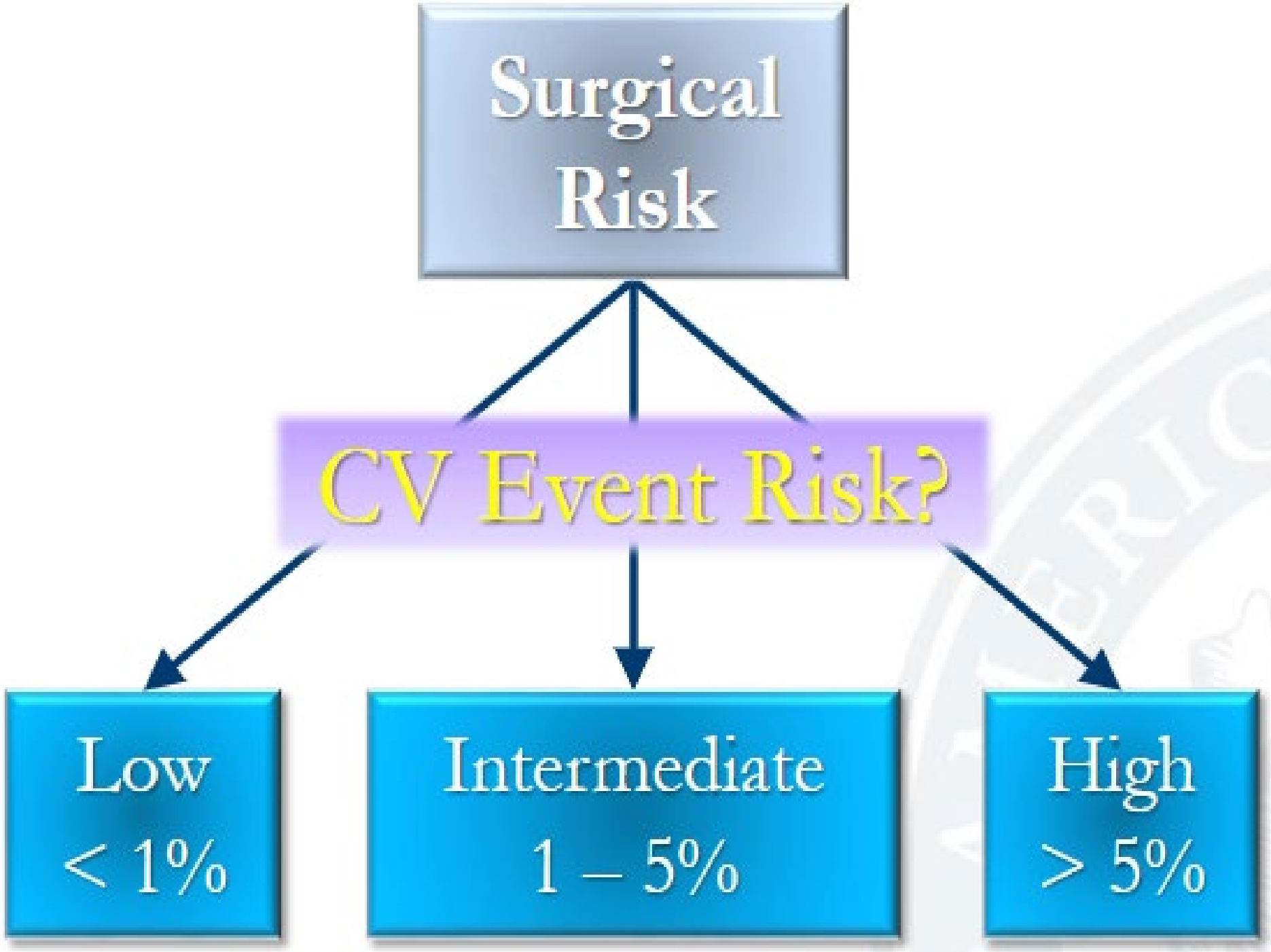
- Coronary Artery Disease
- Heart Failure
- Cerebrovascular Disease
- Diabetes Mellitus (requiring insulin)
- Renal Insufficiency (Creatinine >2mg/dl)
- High Risk Non Cardiac Surgery
(Suprainguinavascular, intrathoracic, intraperitoneal)

Adjusted Odds Ratios of 30-Day Major Adverse Cardiac Events Stratified by Stroke Prior to Surgery and Time Elapsed Between Stroke and Surgery

Source	Crude Events, No.	Sample Size, No.	Odds Ratio (95% CI)
30-d all-cause mortality			
No prior stroke	2914	474046	1 [Reference]
Prior stroke anytime	254	7137	1.75 (1.51-2.03)
Stroke <3 mo prior	66	862	3.07 (2.30-4.09)
Stroke 3 to <6 mo prior	21	469	1.97 (1.22-3.19)
Stroke 6 to <12 mo prior	29	898	1.45 (0.95-2.20)
Stroke ≥12 mo prior	138	4908	1.46 (1.21-1.77)
30-d ischemic stroke			
No prior stroke	368	474046	1 [Reference]
Prior stroke anytime	210	7137	16.24 (13.23-19.94)
Stroke <3 mo prior	103	862	67.60 (52.27-87.42)
Stroke 3 to <6 mo prior	21	469	24.02 (15.03-38.39)
Stroke 6 to <12 mo prior	16	898	10.39 (6.18-17.44)
Stroke ≥12 mo prior	70	4908	8.17 (6.19-10.80)



MACE indicates major adverse cardiac events (acute myocardial infarction, ischemic stroke, or cardiovascular death). Adjusted for sex, age, body mass index, all comorbidities, all pharmacotherapy, surgery group, and surgery risk.


Surgical Risk
CV Event Risk?
Low
< 1%
Intermediate
1 – 5%
High
> 5%

Adverse cardiac events after noncardiac surgery

Overall Event Rates

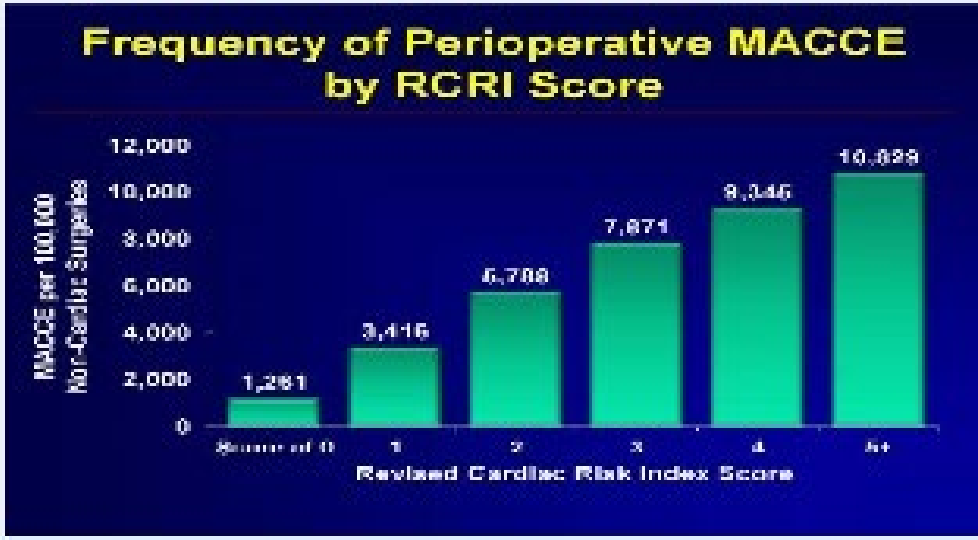
Death $\frac{176{,}959}{10{,}581{,}621}$ (1.67%)

Non Fatal MI $\frac{80{,}076}{10{,}581{,}621}$ **(0.76%)**

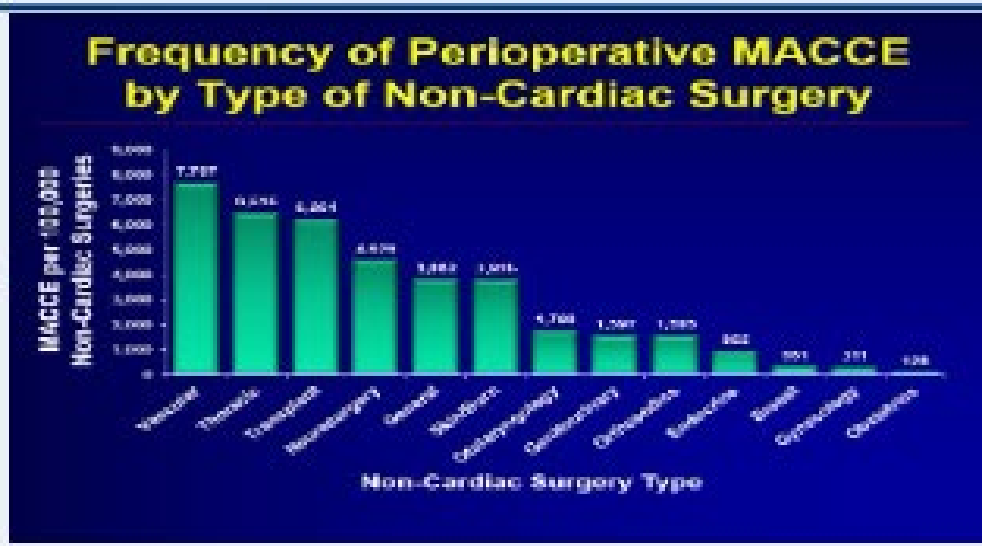
Non Fatal Stroke $\frac{57{,}350}{10{,}581{,}621}$ **(0.54%)**

Hazard in Groups of Interest

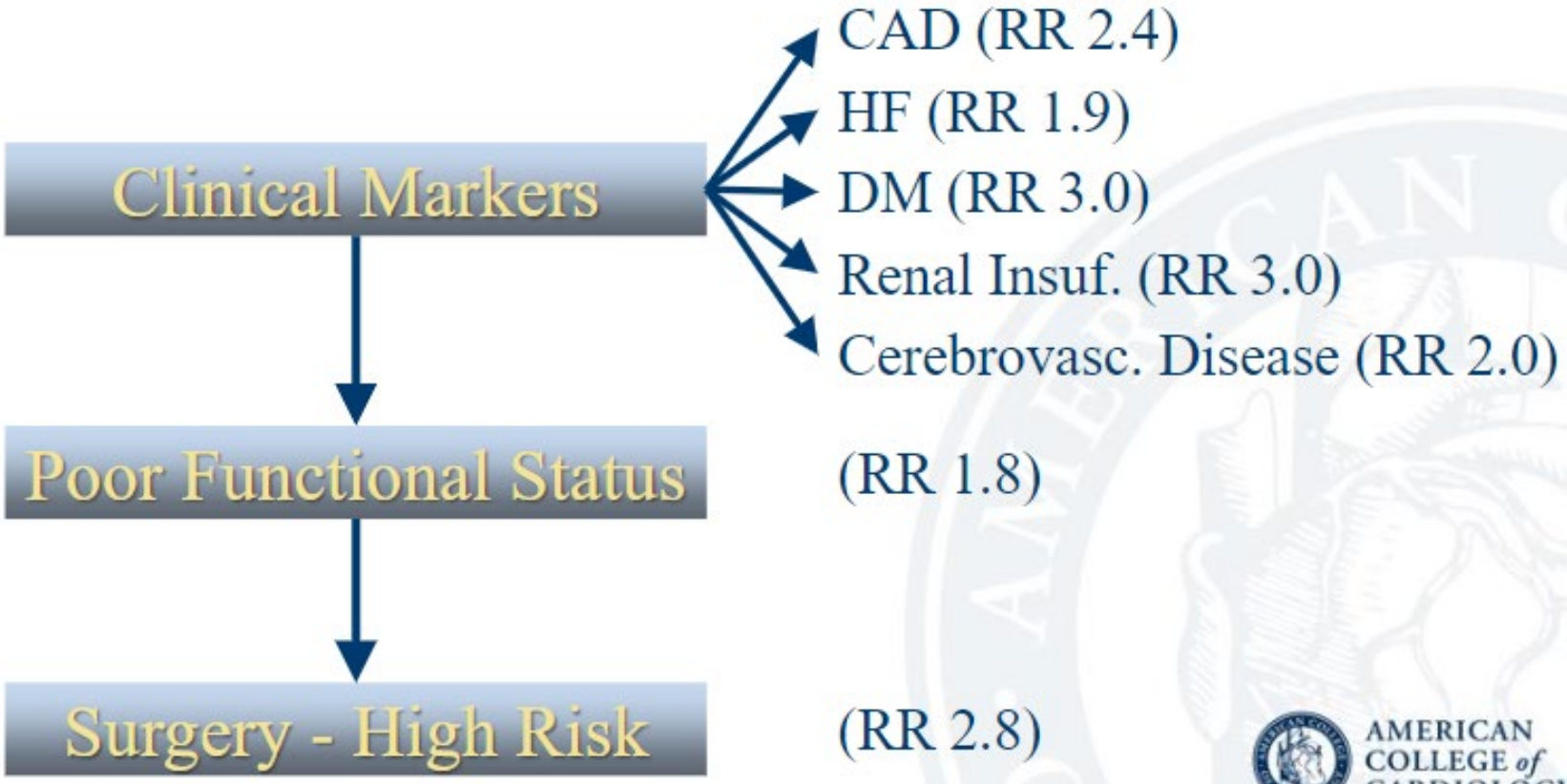
Revised Cardiac Risk Index



Type of NonCardiac Surgery



Independent Predictors of Risk



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Risk Indices for Predicting Cardiac Complications

National Surgical Quality Improvement Program (NSQIP)

- Type of surgery
- Functional status
- Creatinine >1.5mg/dL
- American Society of Anesthesiologists Class (1-4)
- Age
- Sex
- Emergency case
- Diabetes
- COPD
- Current smoker
- Acute renal failure
- Steroids –chronic

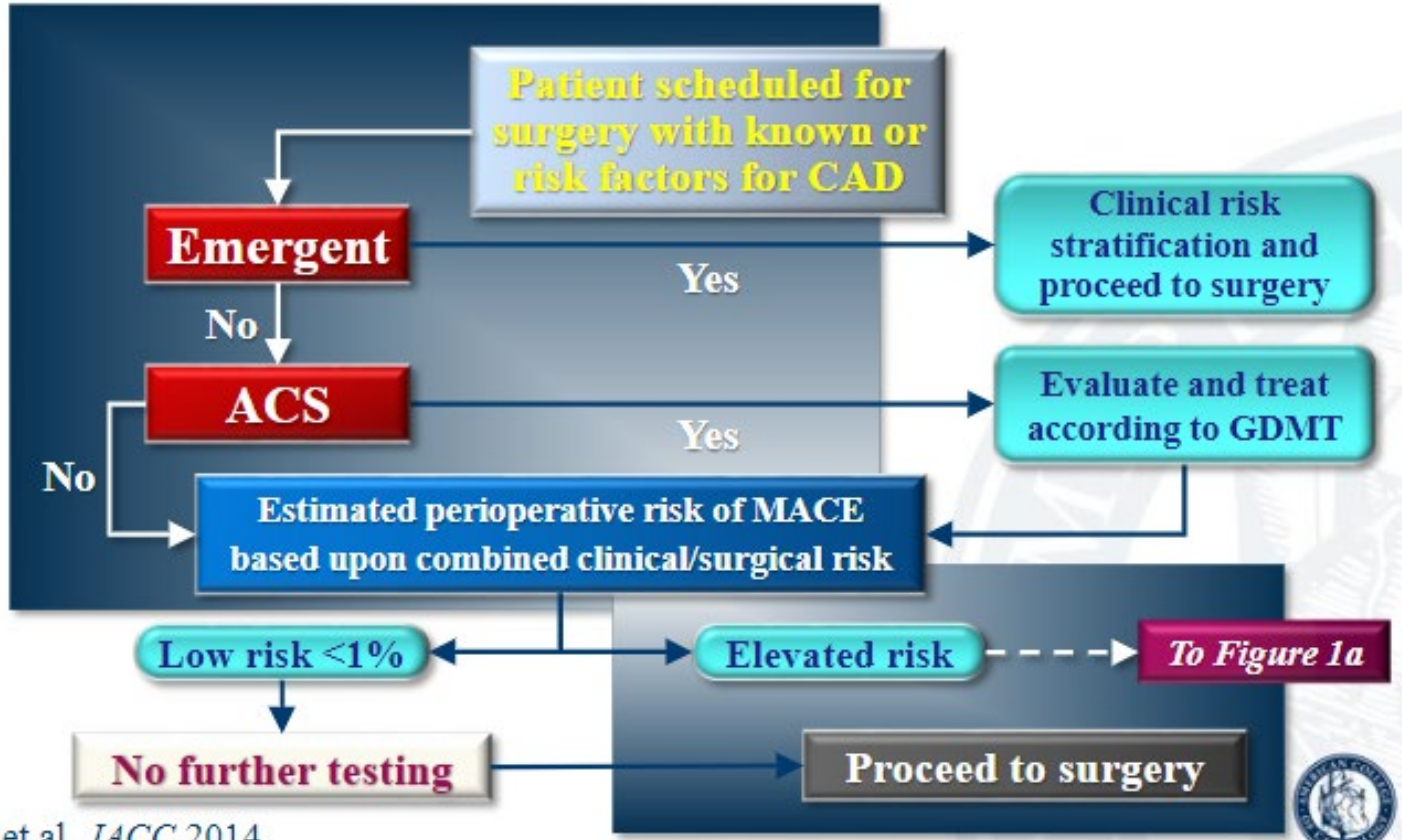
Steroids-chronic
On ventilator
Recent ascites
Hypertension
Prior cardiac event
Recent heart failure (<30d)
Dialysis
Dyspnea
BMI Class
Sepsis within 48 hrs
Recent sepsis
Disseminated cancer

Who Needs Further Non-Invasive Testing?

Questions:

1. Will test results lead to change in care?
2. Has the patient been tested recently?
3. Is the concern related to CAD or is LV Dysfunction a concern?
4. Can the patient do an exercise test?

Clinical Risk Factors: *Recommendations*



Fleisher LA, et al. *JACC* 2014.

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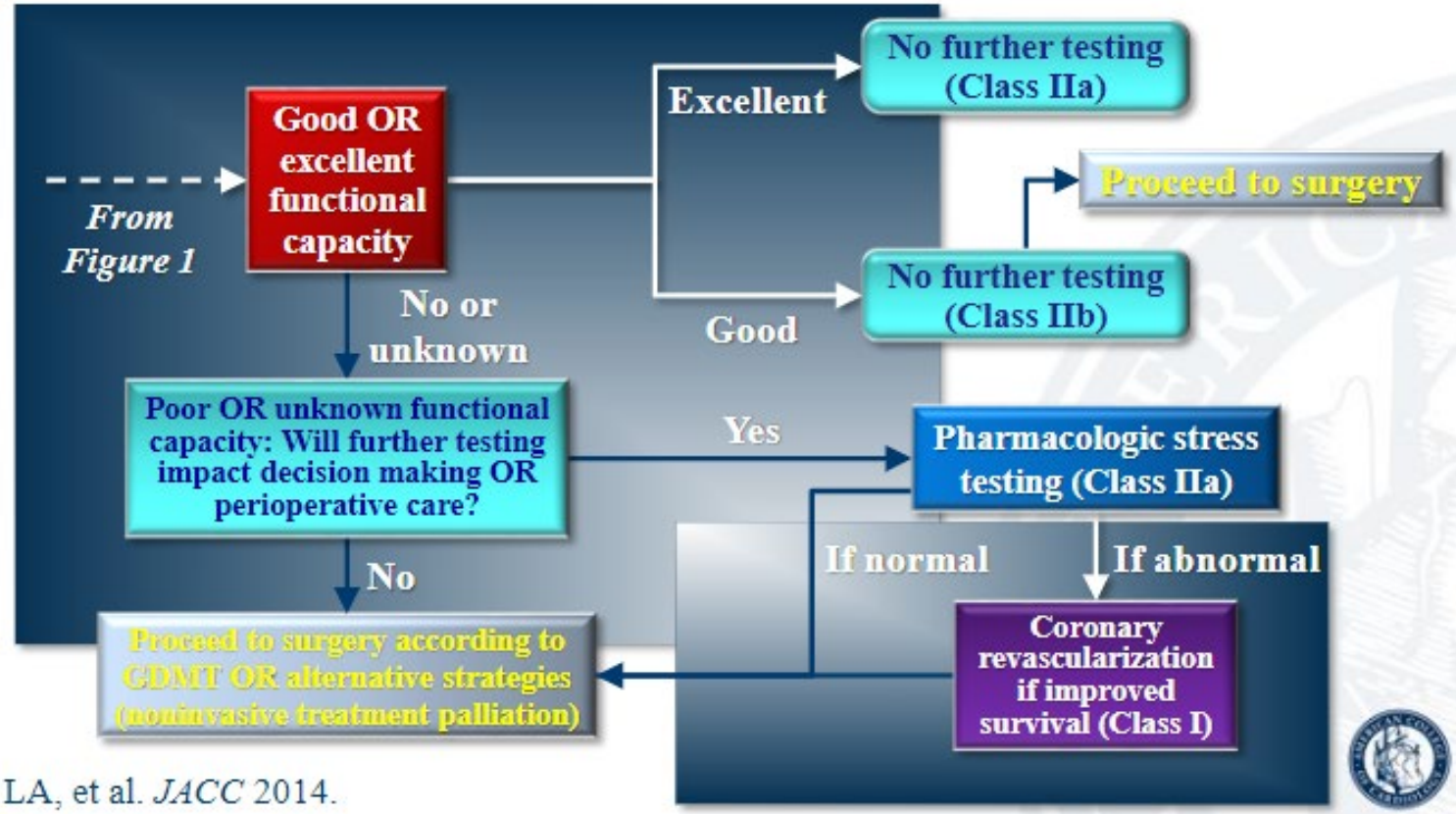
Clinical Risk Factors: *Recommendations*

Figure 1a



Fleisher LA, et al. *JACC* 2014.

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Preoperative Thallium Study Performance

	N	PPV	NPV
Boucher '85	48	19%	100%
Cutler '87	116	20%	100%
Fletcher '88	67	20%	100%
Sachs '88	46	14%	100%
Eagle '89	200	16%	98%
McEnroe '90	95	9%	96%
Younis '90	111	15%	100%
Mangano '91	60	5%	95%
Strawn '91	68	6%	100%
Watters '91	26	20%	100%
Hendel '92	327	14	99%
Lette '92	355	17%	99%
Madsen '92	65	11%	100%
Brown '93	231	13%	99%
Kresowik '93	170	4%	98%
Baron '94	457	4%	96%
Bry '94	237	11%	100%
Koutelou '95	106	6%	100%
Marshall '95	117	16%	97%
Van Damme '97	142	N/A	N/A
Huang '98	106	13%	100%
Cohen '03	153	4%	100%
TOTAL	3303	12%	99%

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Cardiac Conditions that are critical to identify and treat prior to surgery (Class 1, level B)

Unstable coronary syndromes

Decompensated heart failure

Severe valvular heart disease

Significant cardiac arrythmias

Cardiac Risk of Non-Cardiac Surgery: How to Deal with Significant Valve Disease

- Symptomatic valve disease –prefer to deal with the heart before elective non-cardiac surgery
- Stenotic valve disease:
  - –Symptomatic aortic valve stenosis
    - Peri-op mortality –10%
  - –Severe, asymptomatic aortic valve stenosis
    - Acceptable risk with careful hemodynamic attention
    - Avoid low preload
  - –Severe mitral valve stenosis
    - Try to avoid unusual tachycardia

Severe regurgitant valves better tolerated if asymptomatic

Clinical Risk Factors: *Recommendations*

Class I:

1. It is recommended that patients with clinically suspected moderate or greater degrees of valvular stenosis or regurgitation undergo preoperative echocardiography if there has been either 1) no prior echocardiography within 1 year or 2) a significant change in clinical status or physical examination since last evaluation. *(Level of Evidence: C)*
2. For adults who meet standard indications for valvular intervention (replacement and repair) based on symptoms and severity of stenosis or regurgitation, valvular intervention is effective before elective noncardiac surgery in reducing perioperative risk. *(Level of Evidence: C)*

Supplemental Preoperative Evaluations

The 12-Lead Electrocardiogram

Class III: No Benefit

1.Routine preoperative resting 12-lead ECG is not useful for asymptomatic patients undergoing low-risk surgical procedures. (Level of Evidence: B)

Assessment of Left Ventricular Function

Class III: No Benefit

1.Routine preoperative evaluation of LV function is not recommended. (Level of Evidence: B)

Exercise Testing

Class III: No Benefit

1.Routine screening with noninvasive stress testing is not useful for patients at low risk for noncardiac surgery. (Level of Evidence: B) Supplemental Preoperative Evaluation: Recommendations

Supplemental Preoperative Evaluations

Noninvasive Pharmacological Stress testing

Class III: No Benefit

1.Routine screening with noninvasive stress testing is not useful for patients undergoing low risk non-cardiac surgery.

(Level of Evidence: B)

Preoperative Coronary Angiography

Class III: No Benefit

1.Routine preoperative coronary angiography is not recommended. (Level of Evidence: B)

Pulmonary Hypertension

Very high risk surgical group

Continue vascular bed therapy:

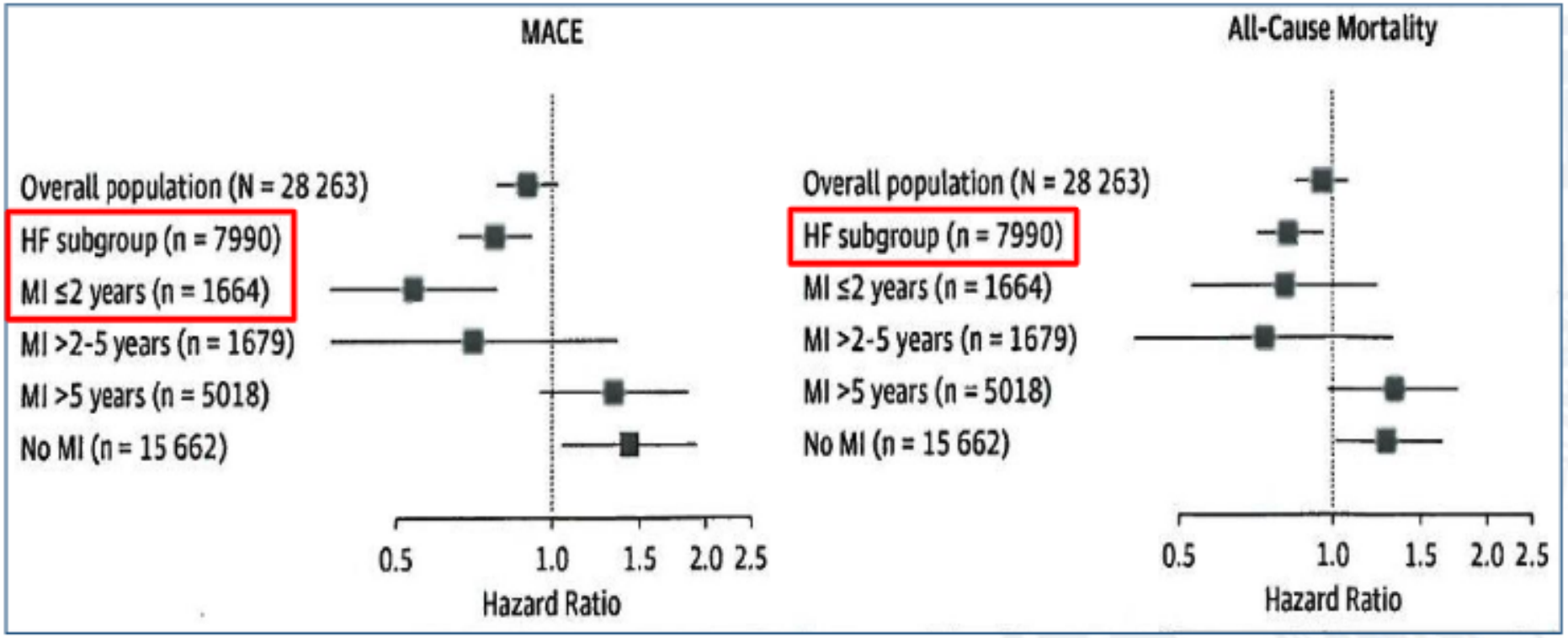
–phosphodiesterase type 5 inhibitors, guanylate cyclase stimulators, endothelin receptor antagonists and prostanoids

Critical to involve anesthesia and pulmonary teams

Medical Therapy to Reduce Perioperative Events

- Beta Adrenergic Blockers
- Statins
- Aspirin
- Clonidine
- Hemodynamic Monitoring

Hazard Ratios Associated with Beta Blockers in Different Patients Groups



Medical Therapy to Reduce Perioperative Events

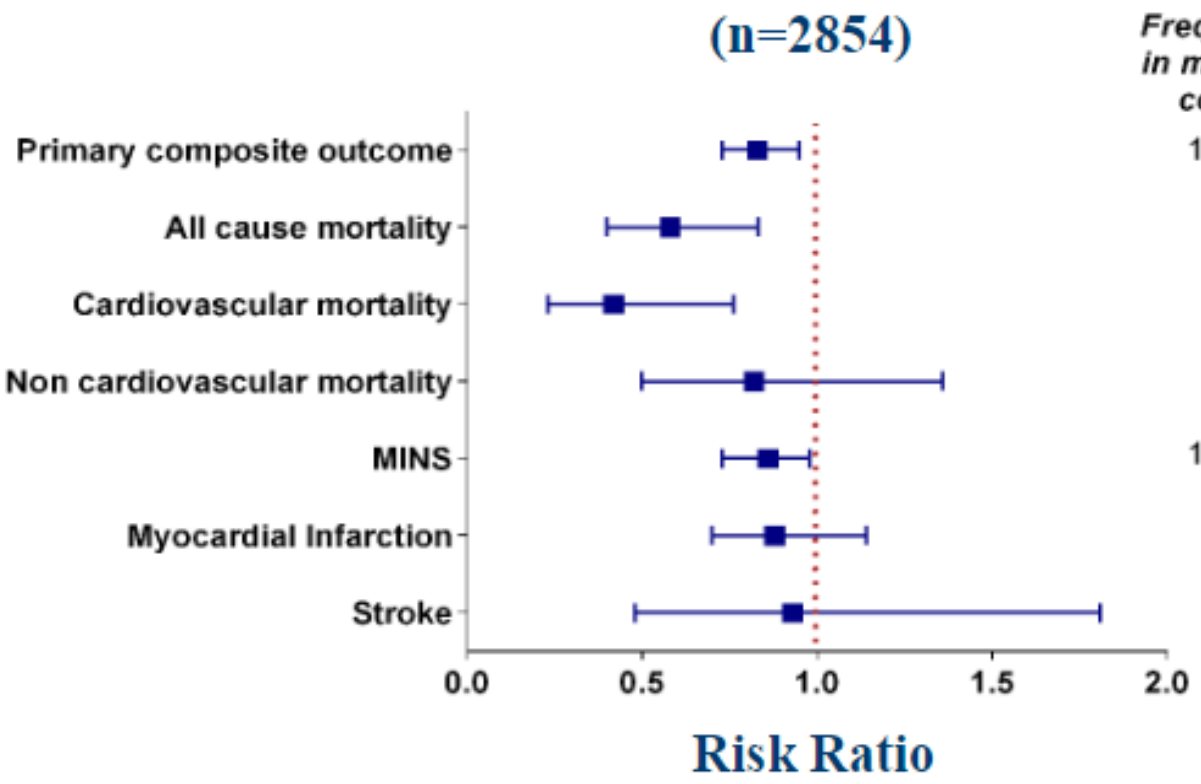
- Patients already on B-blockers for HTN, CAD, heart failure, and/or arrhythmias (Class I)
- Patients with:
  - –High risk surgery and either ≥ 2 risk markers or ASA status 3 or 4
  - Dose titration recommended
  - (Class II –may be considered)
- Preferred B-blocker?
  - B-1 selective (atenolol or bisoprolol) preferred
  - Avoid fixed high doses; initiate and titrate over 1-4 weeks

Who Should be on Statin?

- Already on statin for appropriate indication (Class I)

- Patients undergoing vascular surgery (atherosclerotic) –prefer to begin ≥ 2 weeks pre-op (Class IIa)

Effects of Statins on 30 Day Outcomes



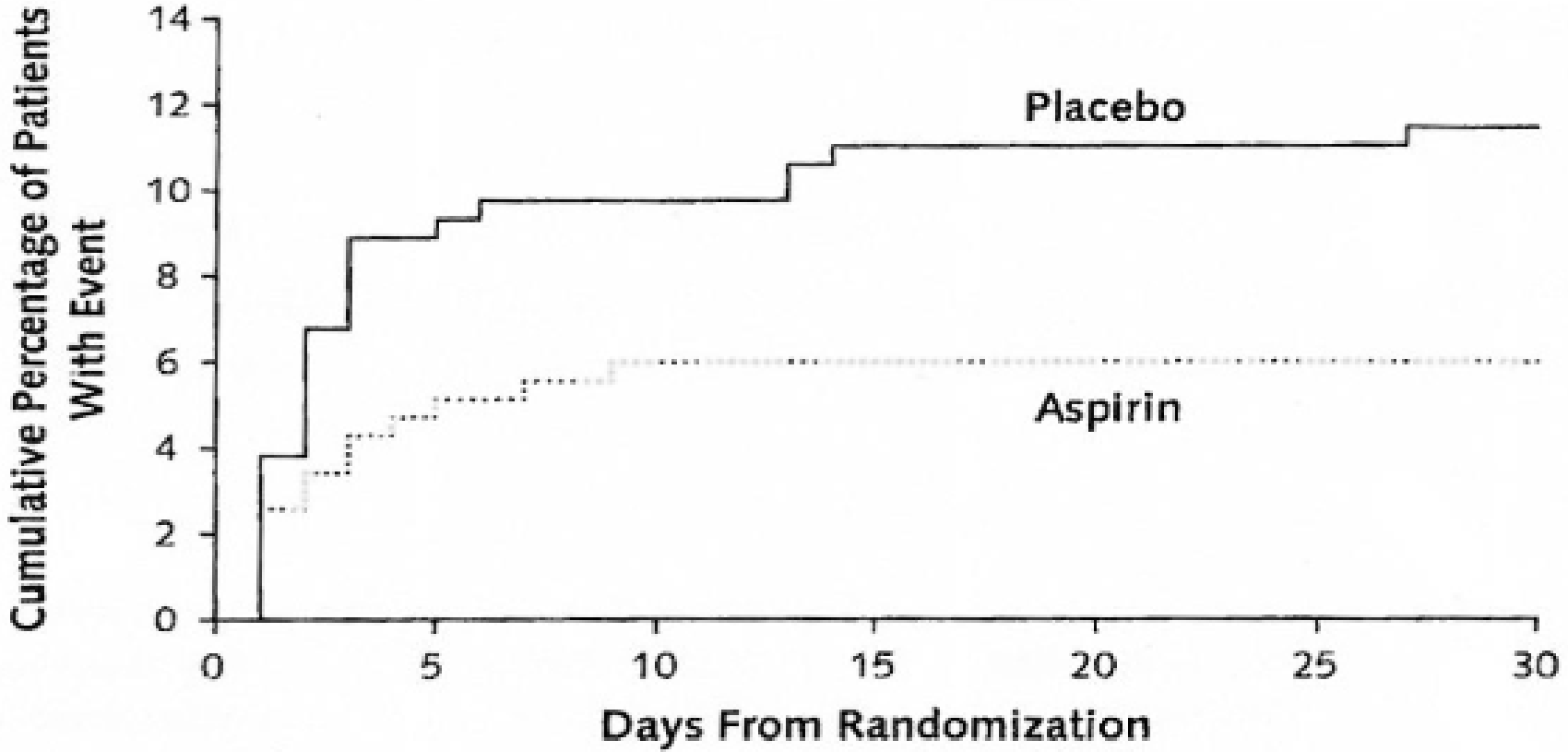
	Frequency in matched cohort	RR 95% CI	P value
Primary composite outcome	11.8%	0.83 (0.73, 0.95)	P=0.007
All cause mortality	1.8%	0.58 (0.40, 0.83)	P=0.003
Cardiovascular mortality	0.8%	0.42 (0.23, 0.76)	P=0.004
Non cardiovascular mortality	0.9%	0.82 (0.50, 1.36)	P=0.45
MINS	10.6%	0.86 (0.73, 0.98)	P=0.02
Myocardial Infarction	3.6%	0.88 (0.70, 1.14)	P=0.35
Stroke	0.5%	0.93 (0.48, 1.81)	P=0.84

Poise 2: Aspirin* to Reduce CV Risks

Outcome	Aspirin *(4998)*	Placebo *(5012)*	HR *(95% CI)*	P
Mortality	65 (1.3)	62 (1.2)	1.05 (0.74-1.49)	0.78
MI	309 (6.2)	315 (6.3)	0.98 (0.84-1.15)	0.85
PE	33 (0.7)	31 (0.6)	1.07 (0.65-1.74)	0.79
DVT	25 (0.5)	35 (0.7)	0.72 (0.43-1.20)	0.20
AKI → Dialysis	33 (0.7)	19 (0.4)	1.75 (1.00-3.09)	0.05
Major Bleed	229 (4.6)	187 (3.7)	1.23 (1.01-1.49)	0.04
Life Threat Bleed	87 (1.7)	73 (1.5)	1.19 (0.88-1.63)	0.26
Stroke	16 (0.3)	19 (0.4)	0.84 (0.43-1.64)	0.62

*Initiation – 200mg preop → 30days (100mg), Continuation – 200mg preop → 100mg x 7d

POISE 2: Aspirin with PCI*`



Patients at risk, *n*							
Placebo	236	215	212	209	209	209	208
Aspirin	234	223	221	221	221	221	221

P for interaction = 0.036

Poise 2: Clonidine* to Reduce CV Risks

Outcome	Clonidine *(5009)*	Placebo *(5001)* *(95% CI)*	HR	P
Mortality	64 (1.3)	63 (1.3)	1.01 (0.72-1.44)	0.94
MI	329 (6.6)	295 (5.9)	1.11 (0.95-1.30)	0.18
Non Fatal Cardiac Arrest	16 (0.3)	5 (0.1)	3.20 (1.17-8.73)	0.02
Clinically Important Hypotension	2385 (48)	1854 (37)	1.32 (1.24-1.40)	<0.001
Clinically Important Bradycardia	600 (12)	403 (8)	1.49 (1.32-1.69)	<0.001
Stroke	18 (0.4)	17 (0.3)	1.06 (0.54-2.05)	0.87

Preoperative Medication Recommendations

Perioperative Statin Therapy

Class I:

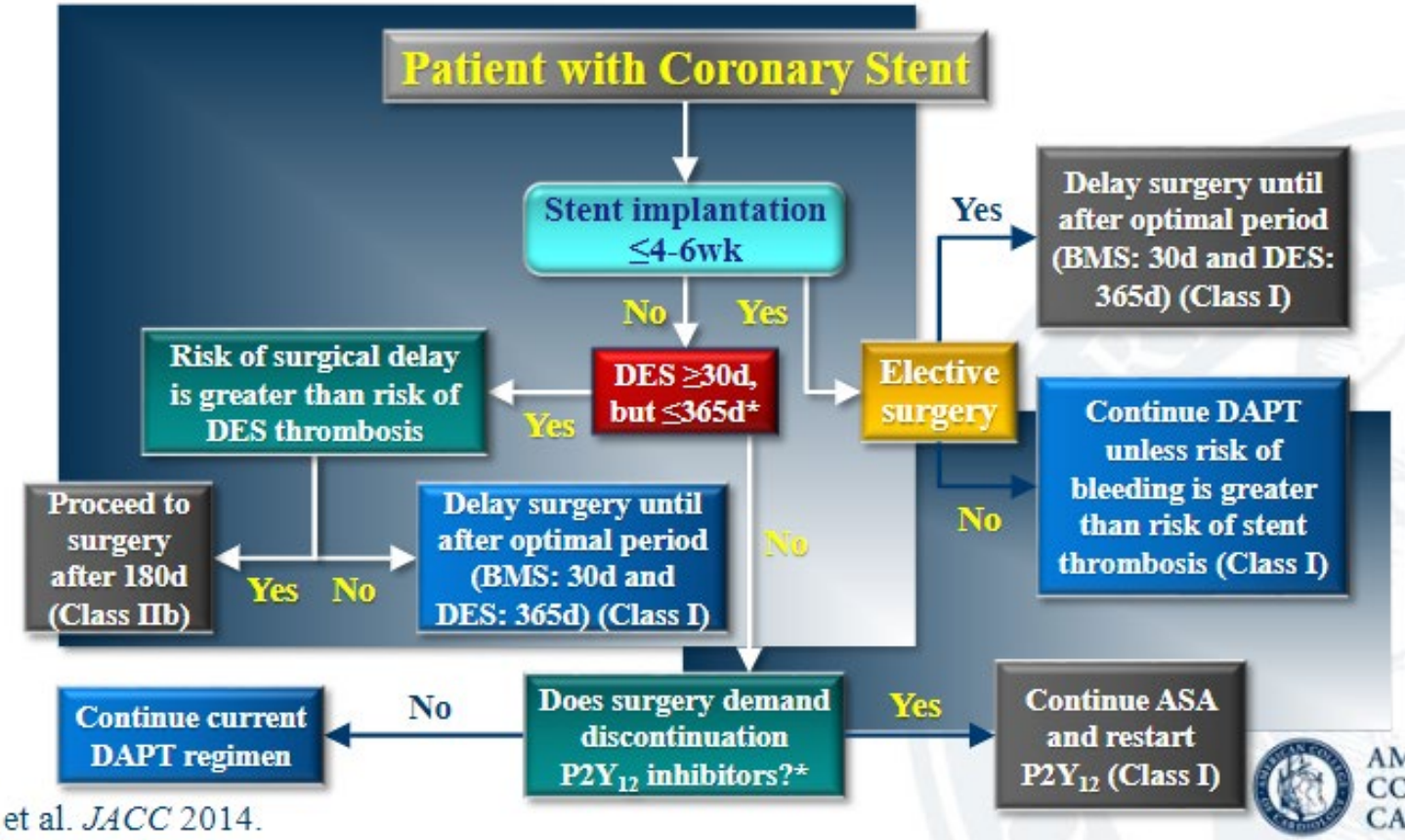
1. Statins should be continued in patients currently taking statins and scheduled for noncardiac surgery (Level of Evidence: B)

Alpha 2 Angonists

Class III: No Benefit

1.Alpha-2 agonists for the prevention of cardiac events are not recommended . (Level of Evidence: B)

Perioperative Therapy: *Recommendations*



*Assuming patient is currently on DAPT.

Fleisher LA, et al. *JACC* 2014.

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Antiplatelet Agents

Class I: Recommendations

1.In patients undergoing urgent noncardiac surgery during the first 4 to 6 weeks after BMS and DES implantation, dual anti platelet therapy should be continued unless the relative risk of bleeding outweighs the benefit of the prevention of stent thrombosis. (Level of Evidence: C)

2.In patients who have received coronary stents and must undergo surgical procedures that mandate the discontinuation of P2Y12platelet receptor inhibitor therapy, it is recommended to continue aspirin if possible and restart the P2Y12platelet receptor inhibitor as soon as possible after surgery. (Level of Evidence: C)

3.Management of the perioperative antiplatelet therapy should be determined by a consensus of the surgeon, anesthesiologist, cardiologist, and patient weighing the relative risk of bleeding versus prevention of stent thrombosis. (Level of Evidence: C)

Timing of Elective Noncardiac Surgery in Patients With Previous PCI

Class I:

1.Elective noncardiac surgery should be delayed 14 days after balloon angioplasty (Level of Evidence: C) and 30 days after BMS implantation. (Level of Evidence: B)

2.Elective noncardiac surgery should optimally be delayed 365 days after drug-eluting stent DES implantation. (Level of Evidence: B)

Class IIb*

- Elective noncardiac surgery after DES implantation may be considered after 180 days (90with newer) if the risk of further delay is greater than the expected risks of ischemia and stent thrombosis. (Level of Evidence: B)

(urgency, recent MI, high revised cardiac risk indices,not stent type or antiplatelet treatment)

Perioperative Beta-Blocker

Class1.Beta blockers should be continued in patients undergoing surgery who have been on beta blockers chronically. (Level of Evidence: B)

Perioperative Therapy: Coronary Revascularization

Class III: No Benefit

1.It is not recommended that routine coronary revascularization be performed prior to noncardiac if surgery exclusively to reduce perioperative cardiac events. (Level of Evidence: B)

Class III: Harm

1.Elective noncardiac surgery should not be performed within 30 days after BMS implantation or within 12 months of DES implantation in patients in whom dual antiplatelet therapy will need to be discontinued perioperatively. (Level of Evidence: B)

2.Elective noncardiac surgery should not be performed within 14 days of balloon angioplasty in patients in whom aspirin will need to be discontinued perioperatively. (Level of Evidence: C)

Bridging Recommendation

<10% of all patients should need this

- –AF with recent stroke (<3 months)
- –AF with very high stroke risk (CHADS2=5/6)
- –Recent VTE (<3-12 months)
- –Mechanical Valve
  - mitral position
  - aortic valve and high risk

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Questions?