

Perioperative Medicine in the Inpatient Setting

Karen F. Mauck, MD, MSc, FACP
Associate Professor of Medicine
Division of General Internal Medicine
Mayo Clinic

Objectives

- What is the role of preoperative cardiac testing for inpatients?
- What are some pearls of perioperative medication management in the hospitalized patient?
 - Anti-rheumatic drugs (DMARDs/ Biologics)
 - Antiplatelet management in patients with stents

Disclosures

- Nothing to disclose

Case

- 78 year old female with R hip fracture
- Known CAD with a history of a NSTEMI 2 years ago, which was treated medically
- DSE 2 years ago revealed stress induced hypokinesia in the mid inferoseptal and mid inferior segments.
- Poor functional capacity from a prior stroke 10 yrs ago (some residual hemiparesis), but does ambulate with a walker in her home; denies chest pain episodes since NSTEMI

Case

- Meds: metoprolol, lisinopril, low dose aspirin, calcium and vitamin D
- BP 122/72 P 67
- Labs: normal CBC, lytes Creatinine 0.7
- ECG: normal sinus rhythm, non-specific ST-T wave abnormalities

You are asked to provide preoperative risk assessment prior to the planned bipolar hemiarthroplasty to repair the hip fracture. What do you recommend?

1. Delay surgery, recommend DSE
2. Delay surgery, recommend a nuclear stress test
3. Delay surgery, recommend a cardiac catheterization
4. Proceed with surgery

CLINICAL PRACTICE GUIDELINE

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

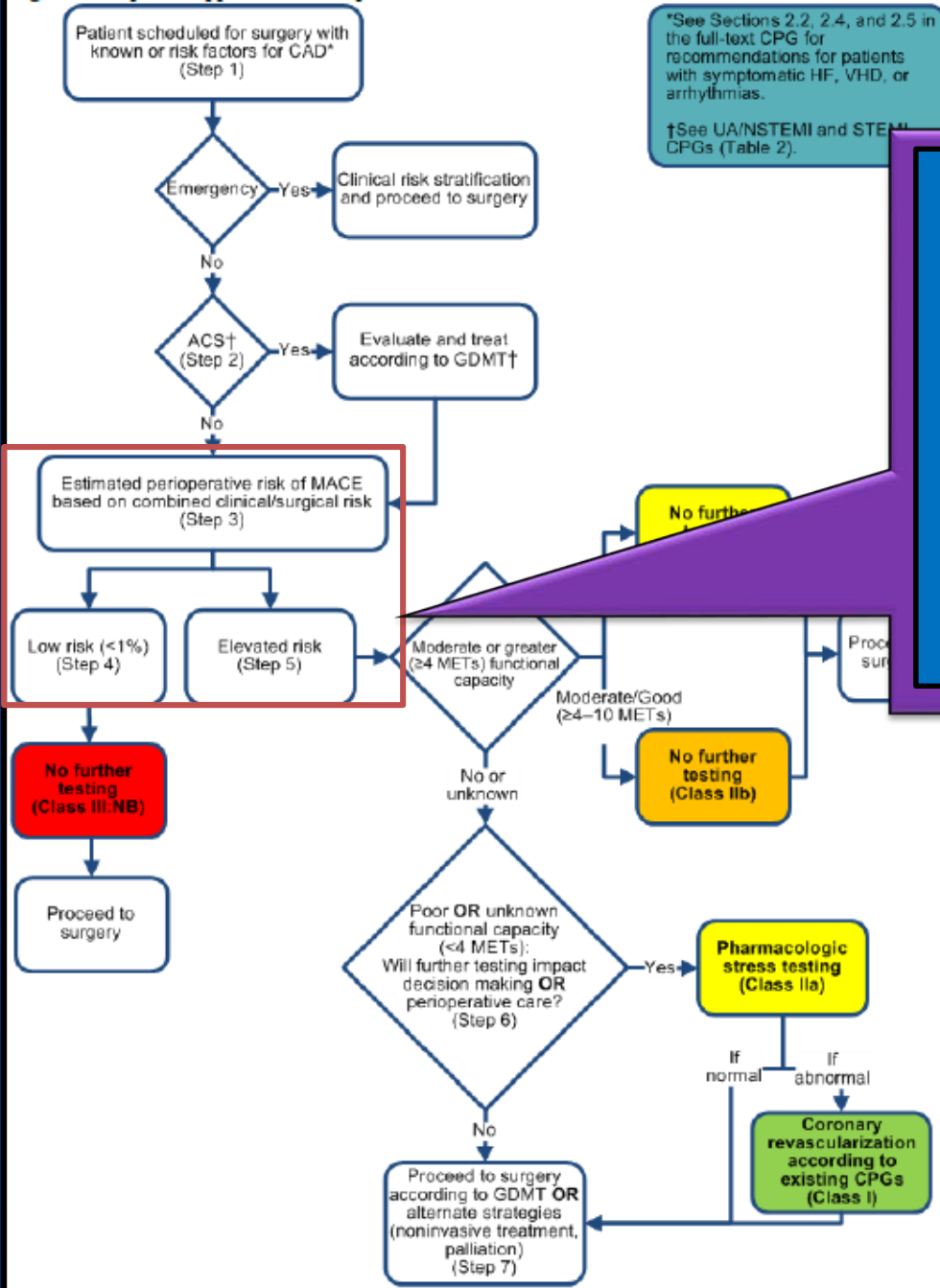


A Report of the American College of Cardiology/American Heart Association
Task Force on Practice Guidelines

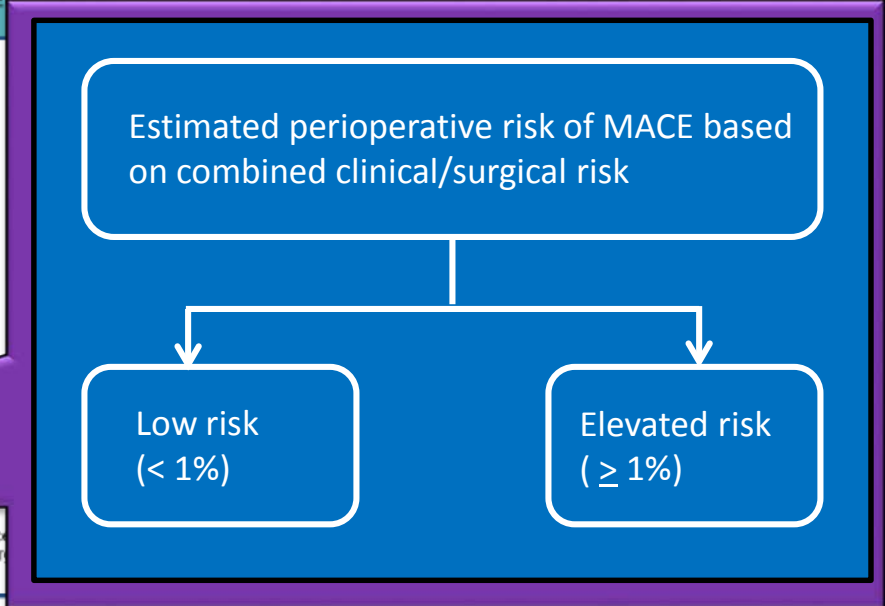
Developed in Collaboration With the American College of Surgeons, American Society of
Anesthesiologists, American Society of Echocardiography, American Society of Nuclear Cardiology,
Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions,
Society of Cardiovascular Anesthesiologists, and Society of Vascular Medicine

Endorsed by the Society of Hospital Medicine

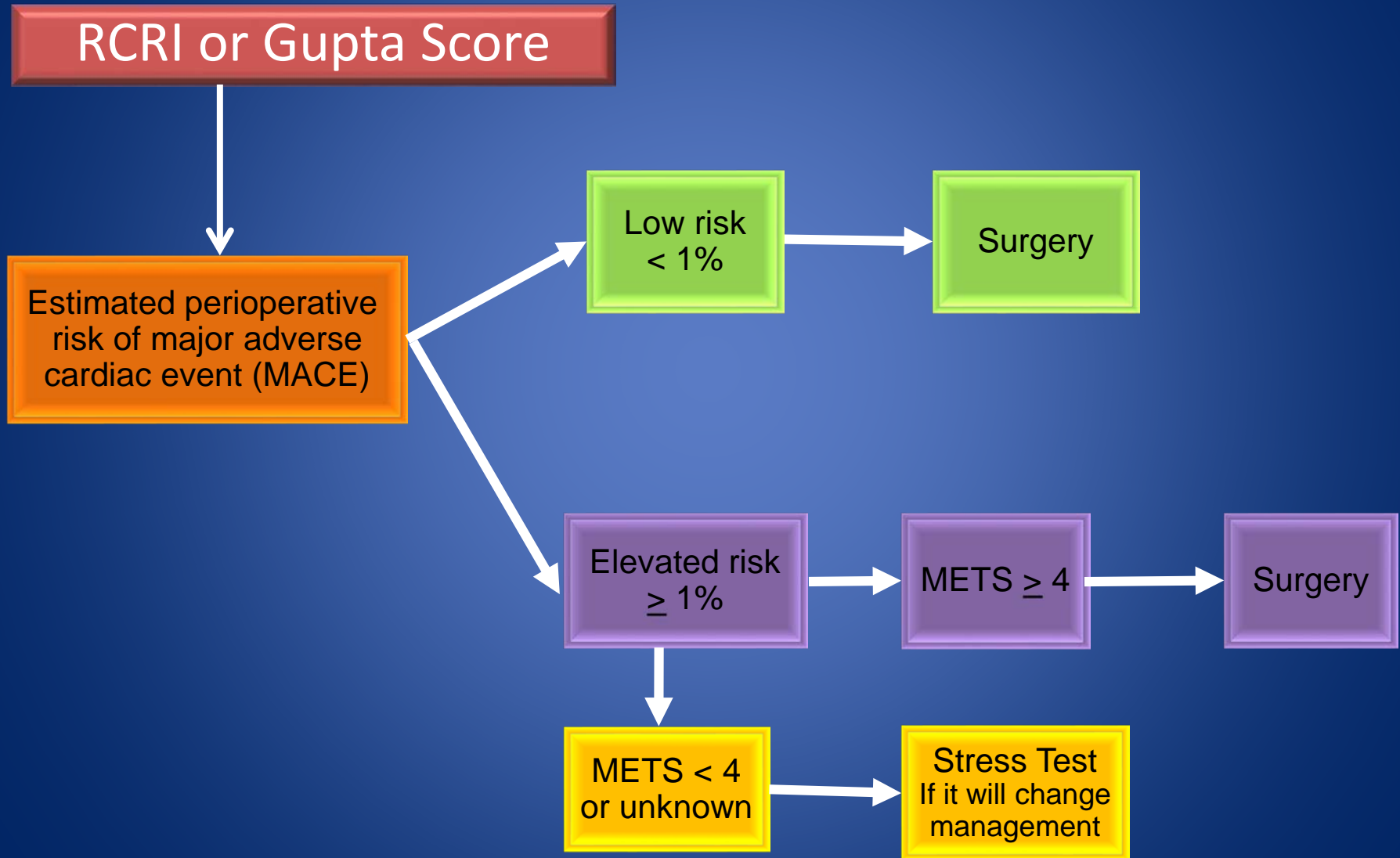
Figure 1. Stepwise Approach to Perioperative Cardiac Assessment for CAD



*See Sections 2.2, 2.4, and 2.5 in the full-text CPG for recommendations for patients with symptomatic HF, VHD, or arrhythmias.
 †See UA/NSTEMI and STEMI CPGs (Table 2).



Bottom Line



Lee Revised Cardiac Risk Index (RCRI)

POINTS

- High risk surgery (intraperitoneal, intrathoracic or suprainguinal vascular procedures) 1
- History of ischemic heart disease 1
- History of congestive heart failure 1
- History of cerebrovascular disease 1
- Diabetes on insulin 1
- Renal insufficiency ($Cr \geq 2$) 1

RCRI Score to Estimate Risk of MACE

* Cardiac Death, Nonfatal MI, Cardiac Arrest

RCRI Score	Risk of Major Cardiac Outcomes*
0	0.4% (0.1-0.8)
1	1% (0.5-1.4)
2	2.4% (1.3-3.5)
≥ 3	5.4% (2.8-7.9)

Important Limitations: RCRI

- Derived from fairly small subset of patients
- Overestimates risk in lower risk surgery
- Underestimates risk in vascular surgery
- Different versions

Gupta (NSQIP) Perioperative Risk Calculator:

5 factors contributed to risk of MI and cardiac arrest

- Age
- Creatinine
- ASA class
- Procedure Type
- Dependent Functional Status

Where to find:

<http://www.surgicalriskcalculator.com> (download for desktop)

ASA Class

Classification	Description
Class I	Normal, healthy patient
Class II	Patient with mild systemic disease—a mild to moderate systemic disorder related to the condition to be treated or to some other, unrelated process
Class III	Patient with severe systemic disease that limits activity but is not incapacitating
Class IV	Patient with incapacitating systemic disease that is life threatening
Class V	Moribund patient not expected to survive 24 hr without an operation

Perioperative Myocardial Infarction or Cardiac Arrest Risk Calculator

Age	<input type="text" value="78"/>	Enter actual age in years	Estimated risk probability for perioperative MICA:	3.29%														
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%
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%																	
Creatinine (preoperative)	<input type="text" value="0"/>	Enter 2 for missing value 1 for ≥ 1.5 mg/dL 0 for < 1.5 mg/dL																
Functional Status (preoperative)	<input type="text" value="1"/>	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="14"/>	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															

Where Can I Find the Calculator?

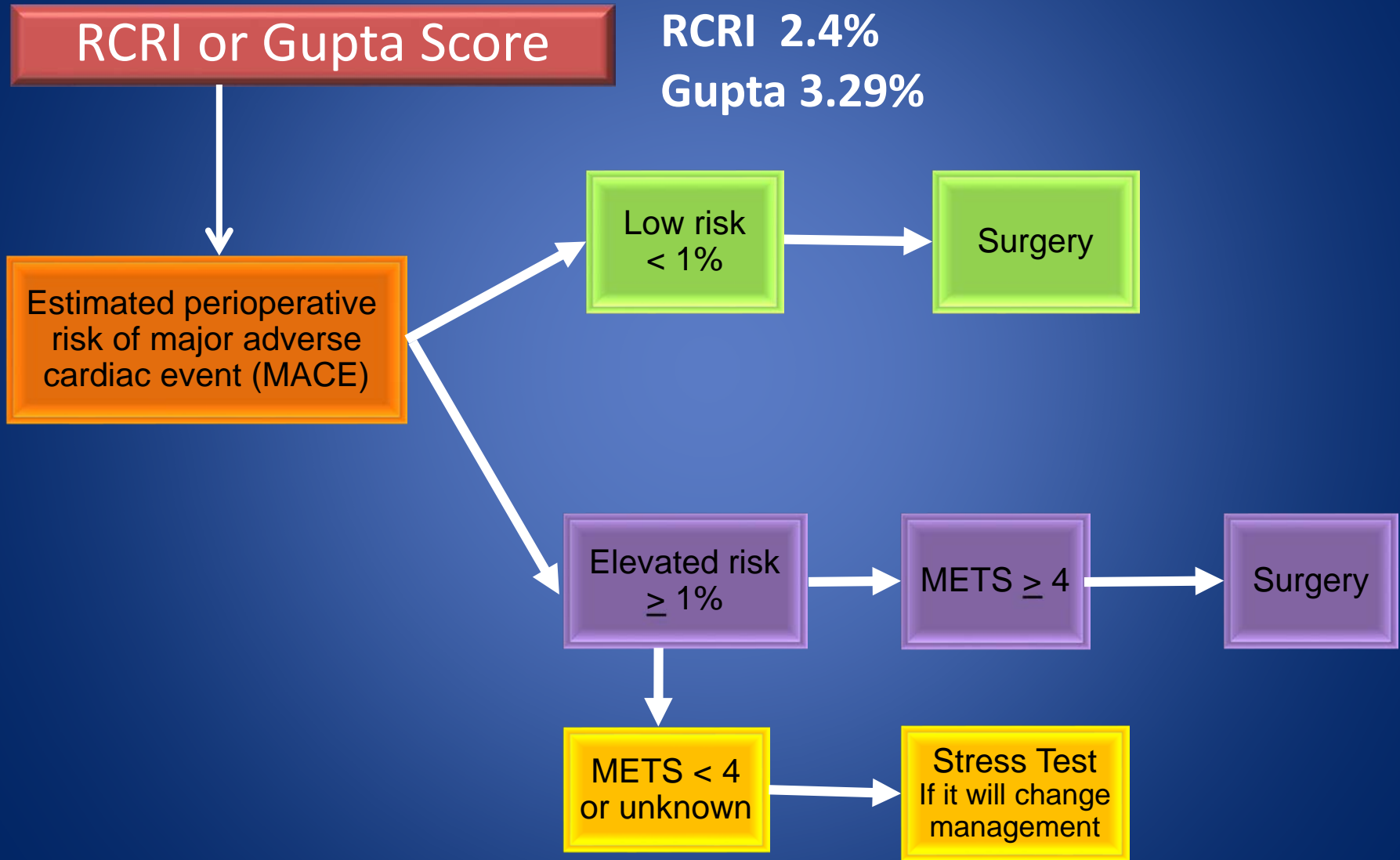
- Qx Calculate
 - <http://www.qxmd.com>
 - Free app for phone
- <http://www.surgicalriskcalculator.com>
 - Free download for desktop
 - Request for password accepts anything



Important Limitations: GUPTA

- Likely underestimates risk because of how cardiac outcomes were defined in the dataset
 - ECG changes of acute MI
 - New elevation in troponin greater than 3 times normal in the setting of suspected myocardial ischemia
- Majority of postop cardiac outcomes are asymptomatic NSTEMIs
- Not externally validated beyond the original dataset

Bottom Line



Will Stress Testing Change Management?

- 78 years old with a hip fracture
- There is risk for delay of surgery
 - Increased risk of VTE, delirium
 - Increased risk of further debility
- Would I delay surgery for a coronary stent or angioplasty if the test were positive?
- What does the patient and family want?

Case

- 72 year old male scheduled for elective bilateral inguinal hernia surgery
- Past history significant for severe psoriasis for which he takes methotrexate 15 mg weekly. His last dose was 6 days ago

What do you recommend regarding his methotrexate perioperatively?

1. Take methotrexate without interruption during the perioperative period
2. Hold methotrexate for 1-2 weeks prior to surgery; resume after wound healing
3. Hold methotrexate 2 days prior to surgery; resume postoperatively before hospital discharge

DMARDs Perioperatively: Issues

- Increased wound and bone infection
- Decreased wound healing and increased wound dehiscence
- Concern for disease flare if stopped
- When to restart
- Very little high quality data to inform practice

Methotrexate

- Small observational studies have suggested MTX not associated with increased risk of postop complications
- Several experts recommend continuing MTX
- Issues to consider
 - Many studies had lower dose MTX than used now
 - Patients with renal insufficiency and diabetes at higher risk of toxicity (cytopenias)
 - Only ~8% of patients have disease flare when MTX held
 - No patients die of disease flare

Methotrexate

- Probably safe to continue in most situations
 - Multiple drug-drug interactions
 - Check CBC, liver enzymes, albumin, creatinine
 - Avoid volume depletion
- Consider holding is significant concern for perioperative infection or history of previous or severe septic complications
 - Hold 1-2 weeks preop
 - Resume 2 weeks postop or after complete wound healing

Non-Biologic DMARDs

- These are usually continued in the perioperative setting
- Caveats:
 - Studies suggest increased risk of infection
 - Penicillamine, Cyclosporine, Hydroxychloroquine
 - Some agents can cause leukopenia
 - Cyclophosphamide, Azathioprine, Sulfasalazine
 - Leflunomide often held (2 weeks)
- Check CBC, liver enzymes, creatinine
- Check for drug-drug interactions

Case

- 57 year old woman with rheumatoid arthritis scheduled to undergo multi-level lumbar spinal fusion
- Current medications include adalimumab (Humira) 40 mg every other week
- No other significant medical problems or past medical history
- Last dose of adalimumab was 13 days ago

What do you recommend regarding her adalimumab perioperatively?

1. Take adalimumab without interruption during the operative period
2. Hold next dose, and resume per regular schedule postoperatively
3. Hold for 3 weeks preop and resume 2 weeks postop or after wound healing complete
4. Hold for 12 weeks preop and resume 2 weeks postop or after wound healing complete

Biologic Immunomodulators

- TNF alpha inhibitors
 - Infliximab (Remicade)
 - Etanercept (Enbrel)
 - Adalimumab (Humira)
 - Golimumab (Simponi)
 - Certolizumab (Cimzia)
- Non-TNF alpha inhibitors
 - Interleukin antagonists [Anakinra (Kineret), Tocilizumab (Actemra)]
 - T-cell co-stimulation blocker [Abatacept (Orencia)]
 - B-cell depleting agents [Rituximab (Remicade)]
 - Janus kinases (JAK) inhibitors [tofacitinib (Xeljanz)]

No Definitive Evidence or Guideline

- British Society for Rheumatology Standards: hold 3-5 half lives (2005)
- American College of Rheumatology: hold TNF- α inhibitors for ≥ 1 week (2008)
- Canadian Rheumatology Association: hold for 2 half lives (2012)

Rule of Thumb for Managing Biologics Perioperatively

- Balance risk of disease flare vs infection and wound healing
- Hold for 1-2 half lives prior to surgery
- For most, resume after 2 weeks or after **COMPLETE** wound healing and **NO** evidence of ongoing infection

Goodman SM. Optimizing Perioperative Outcomes for Older Patients with RA Undergoing Arthroplasty. Drugs Aging 2015. 32:361-9

Perioperative Management of DMARDs in NON-Transplant Patients

Abatacept (Orencia)	<ul style="list-style-type: none">• Hold for 2 weeks preop for SC dosing• Hold for 4 weeks preop for IV dosing
Adalimumab (Humira)	<ul style="list-style-type: none">• Hold 3 weeks preop
Anakinra (Kineret)	<ul style="list-style-type: none">• Hold for 2 days preop• Check CBC
Certolizumab (Cimzia)	<ul style="list-style-type: none">• Hold for 6 weeks preop
Etanercept (Enbrel)	<ul style="list-style-type: none">• Hold 2 weeks preop• Check CBC
Golimumab (Simponi)	<ul style="list-style-type: none">• Hold for 6 weeks preop• Check CBC
Hydroxychloroquine (Plaquenil)	<ul style="list-style-type: none">• Continue perioperatively• Check CBC• Multiple drug-drug interactions
Infliximab (Remicade)	<ul style="list-style-type: none">• Hold 6 weeks preop• Check CBC
Purine analogues (6-mercaptopurine/ Azathioprine)	<ul style="list-style-type: none">• Continue preoperatively• Check CBC, liver enzymes• Monitor renal function

Perioperative Management of DMARDs in NON-Transplant Patients

Leflunomide (Arava)	<ul style="list-style-type: none">• Hold 2 weeks preop• Check CBC, liver enzymes, creatinine• If infection occurs, use cholestyramine purge to clear drug
Methotrexate	<ul style="list-style-type: none">• Continue for most surgical procedures• Hold 1-2 weeks preop if significant risk for infection• Check CBC, liver enzymes, albumin, creatinine• Multiple drug-drug interactions
Rituximab* (Rituxan)	<ul style="list-style-type: none">• Continue preoperatively• Check CBC, creatinine
Sulfasalazine	<ul style="list-style-type: none">• Continue preoperatively• Check CBC, liver enzymes, creatinine
Tocilizumab (Actemra)	<ul style="list-style-type: none">• Hold for 3 weeks preop for SC dosing• Hold for 4 weeks preop for IV dosing• Check CBC, liver enzymes
Tofacitinib (Xeljanz)	<ul style="list-style-type: none">• Hold for 3 days preop• Check CBC, liver enzymes

*some references recommend holding for 4 weeks preop and waiting 4 weeks before resuming

Some Help is on the Way....

- Pending: American College of Rheumatology/ American Association of Hip and Knee Surgeons: *Recommendations for Perioperative Management of Rheumatic Disease Medications in Total joint arthroplasty of the Hip and Knee (anticipated 2017)*

Case

- 68 year old woman with obesity, DM2, CKD stage 3 with NSTEMI 4 weeks ago; DES placed in the proximal LAD and started on ASA and clopidogrel
- Developed uterine bleeding and diagnosed with FIGO grade 2 uterine adenocarcinoma
- Her cardiologist stopped her ASA and clopidogrel 5 days ago in the setting of moderate bleeding
- No transfusions were necessary
- You are consulted by gynecology for a preoperative evaluation prior to planned robotic hysterectomy/BSO with sentinel LN biopsy

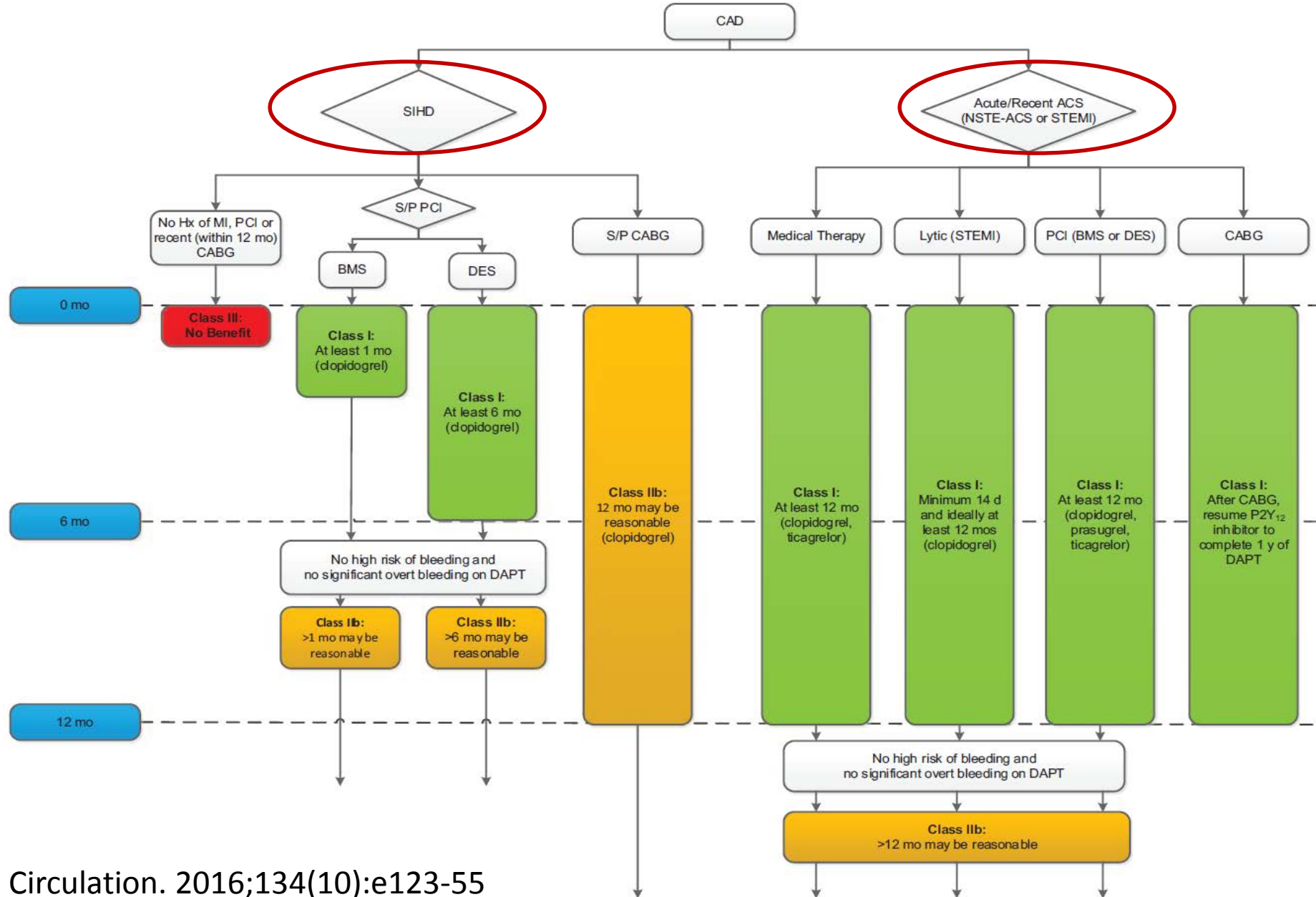
Case

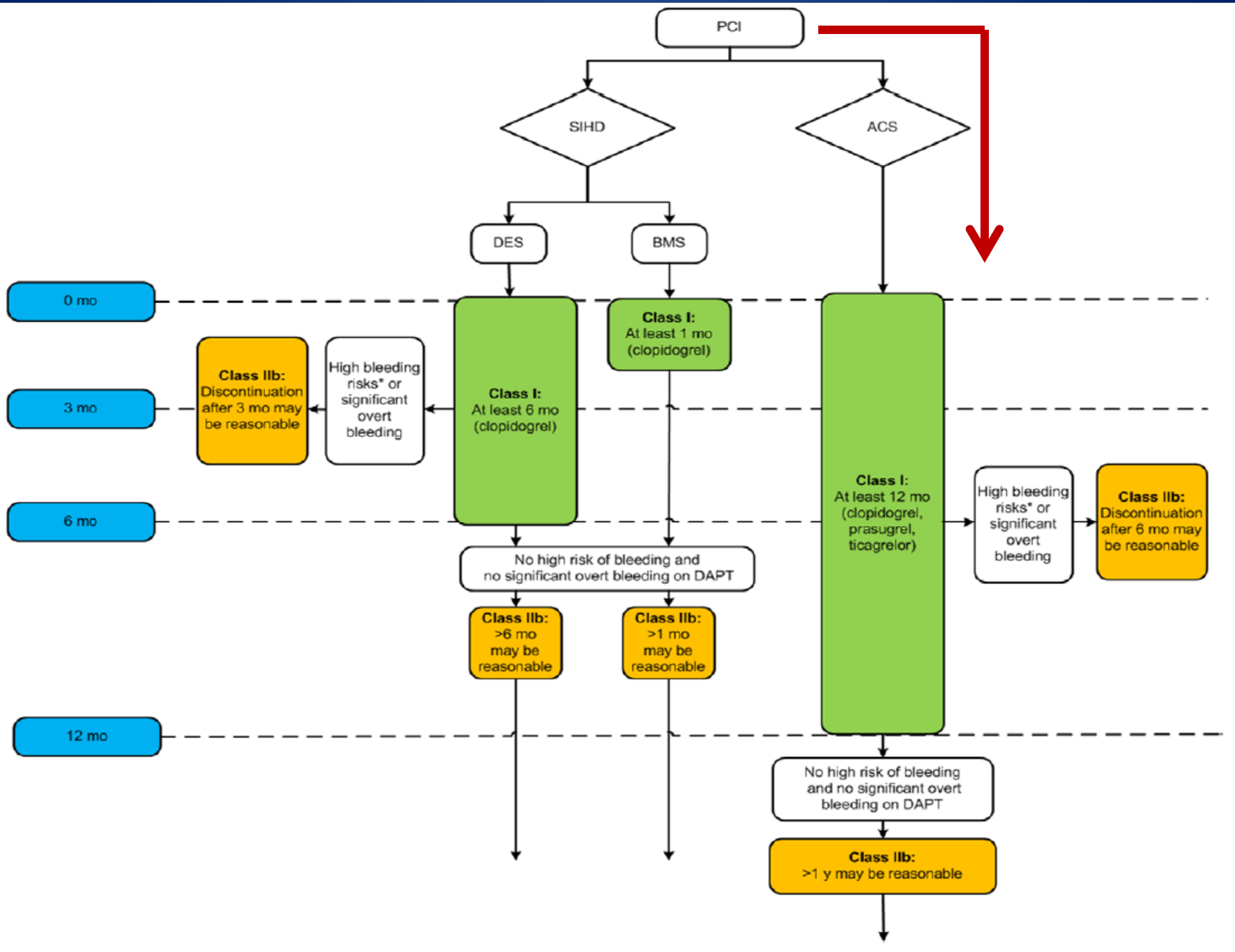
- BP 162/69, P 78, regular, BMI 42, Asymptomatic
- CBC normal, A1C 7.2%, creatinine 1.3
- ECG: Rate 73, NSR, Nonspecific ST and T wave abnormality
- Exam unremarkable

In addition to having a discussion with the surgeon about alternative treatment options, what do you recommend?

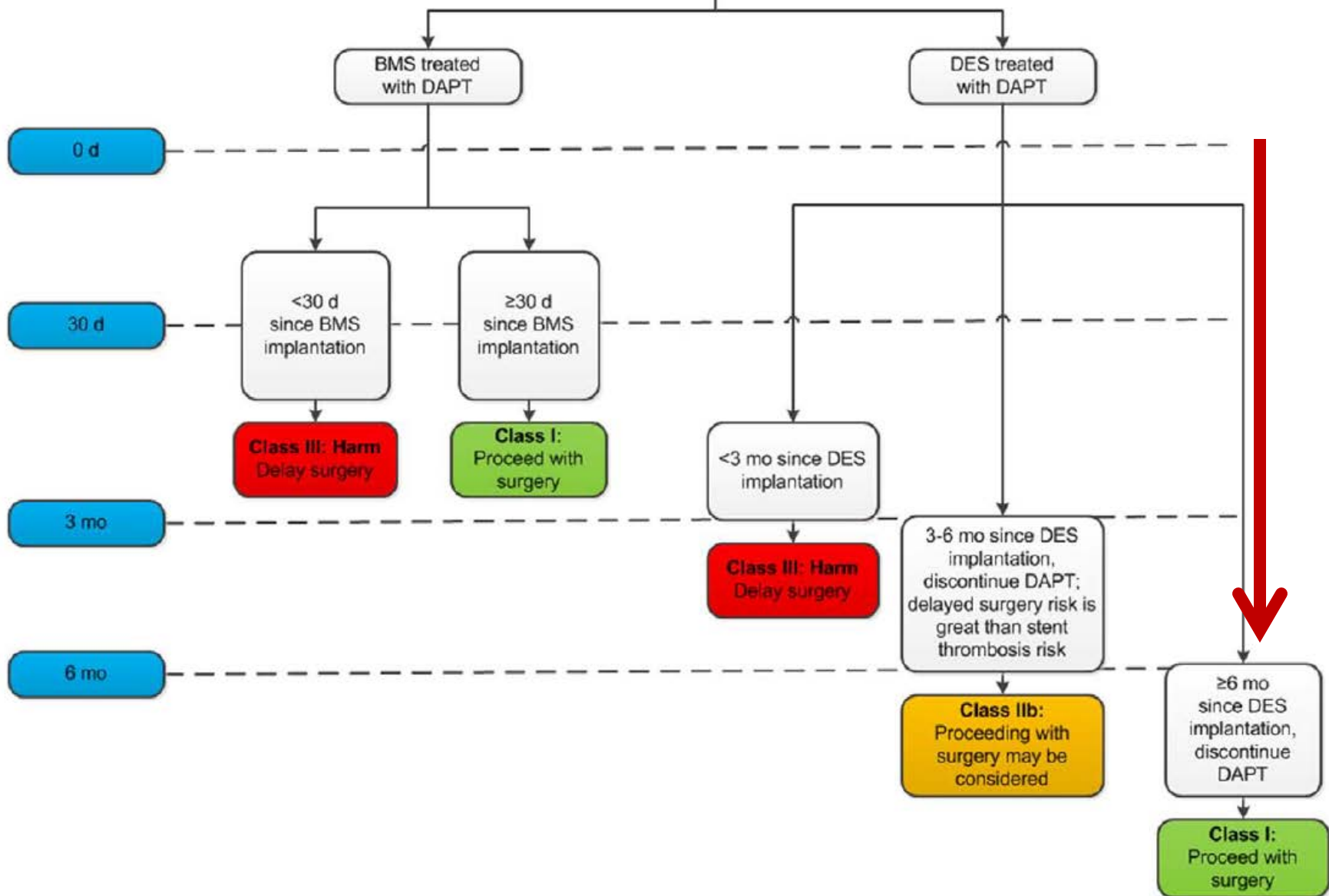
1. Proceed with surgery. Resume ASA and clopidogrel postoperatively
2. Restart ASA and clopidogrel now and proceed with surgery
3. Restart ASA and clopidogrel now and postpone surgery for at least 5 more months
4. Restart ASA and clopidogrel now and postpone surgical procedure for 11 more months

2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease





Patients Treated With PCI Undergoing Elective Noncardiac Surgery



mauck.karen@mayo.edu