



# ***Interruption of DAPT Due to Need For Surgery***

**Subhash Banerjee, MD**

*Professor of Medicine, UT Southwestern Med. Ctr.*

*Chief of Cardiology, VA North Texas*

*Dallas, TX*



ACC 2017

# Disclosures

- Consultant/honoraria: Medtronic, CSI, Gore
- Grants:
  - Research (institutional): Boston Scientific; Merck
  - VA CCTA, NIH RO1
- Intellectual property: HygeiaTel

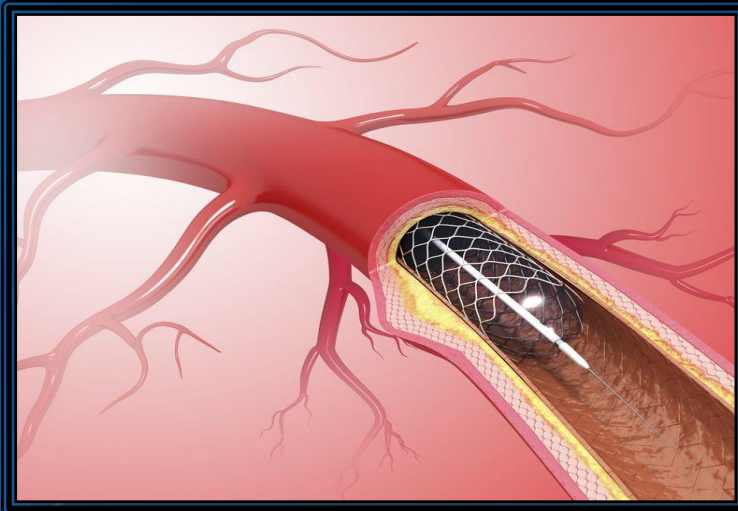


# Perioperative DAPT: Setting the Stage

- 5-12% patients post-PCI with DES require non-cardiac surgery procedures (NCS) over an ensuing 12-month period
- Peri-operative dual anti-platelet therapy (DAPT) ↑bleeding & its interruption is associated with a heightened risk of ischemic complications
- Spectrum of peri-operative complications post-PCI inextricably related to: indication for PCI, timing of surgery, anti-platelet therapy (APT) status, PCI factors (DES, complexity, h/o ST etc) & risk of surgery-ischemic/hemorrhagic



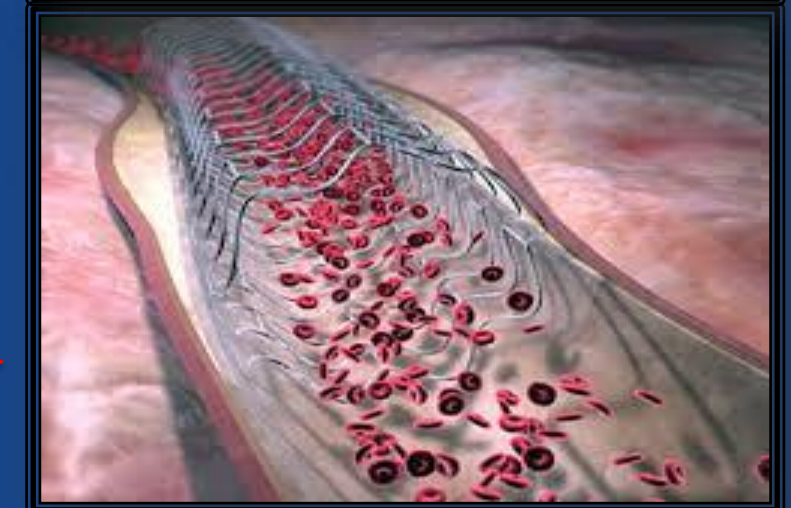
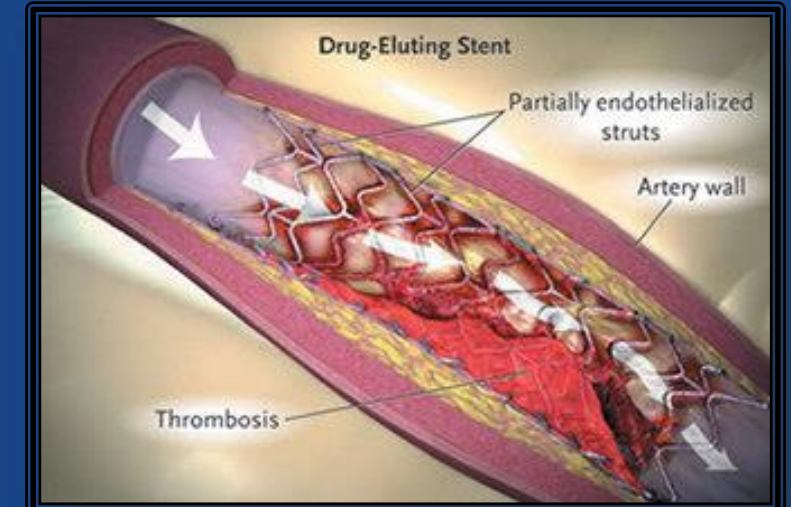
# Antiplatelet Therapy Considerations in Post-PCI Patients During Non-Cardiac Surgery



Coronary stent implant



Non-cardiac surgery



Stent thrombosis & ischemic complications



Bleeding

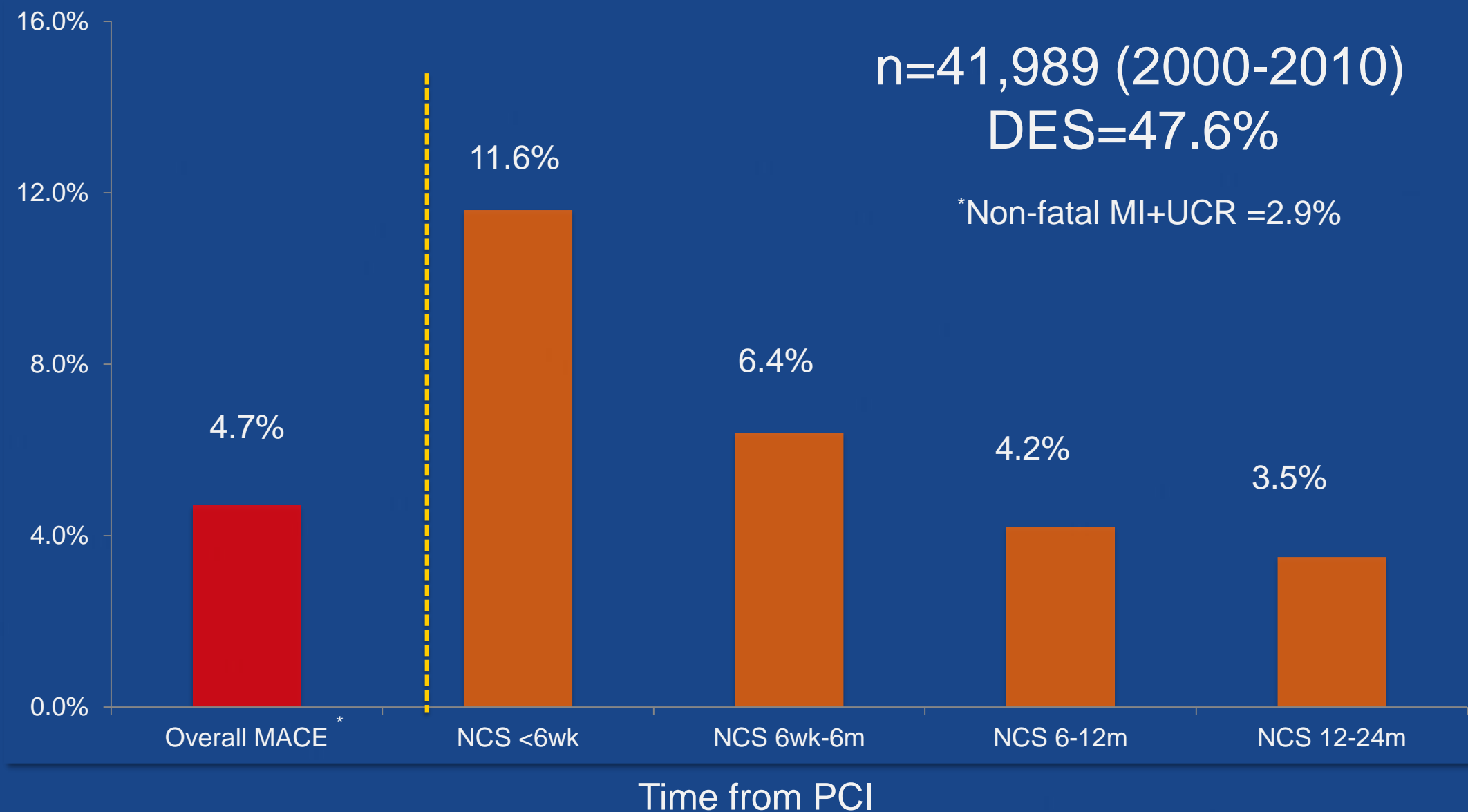


Hypercoagulable state

APT continued

APT stopped

# MACE\*: Early Surgery After Stenting Carries Higher Risk Of Ischemic Events



# Underlying Ischemic Risk Key Driver of MACE Following NCS

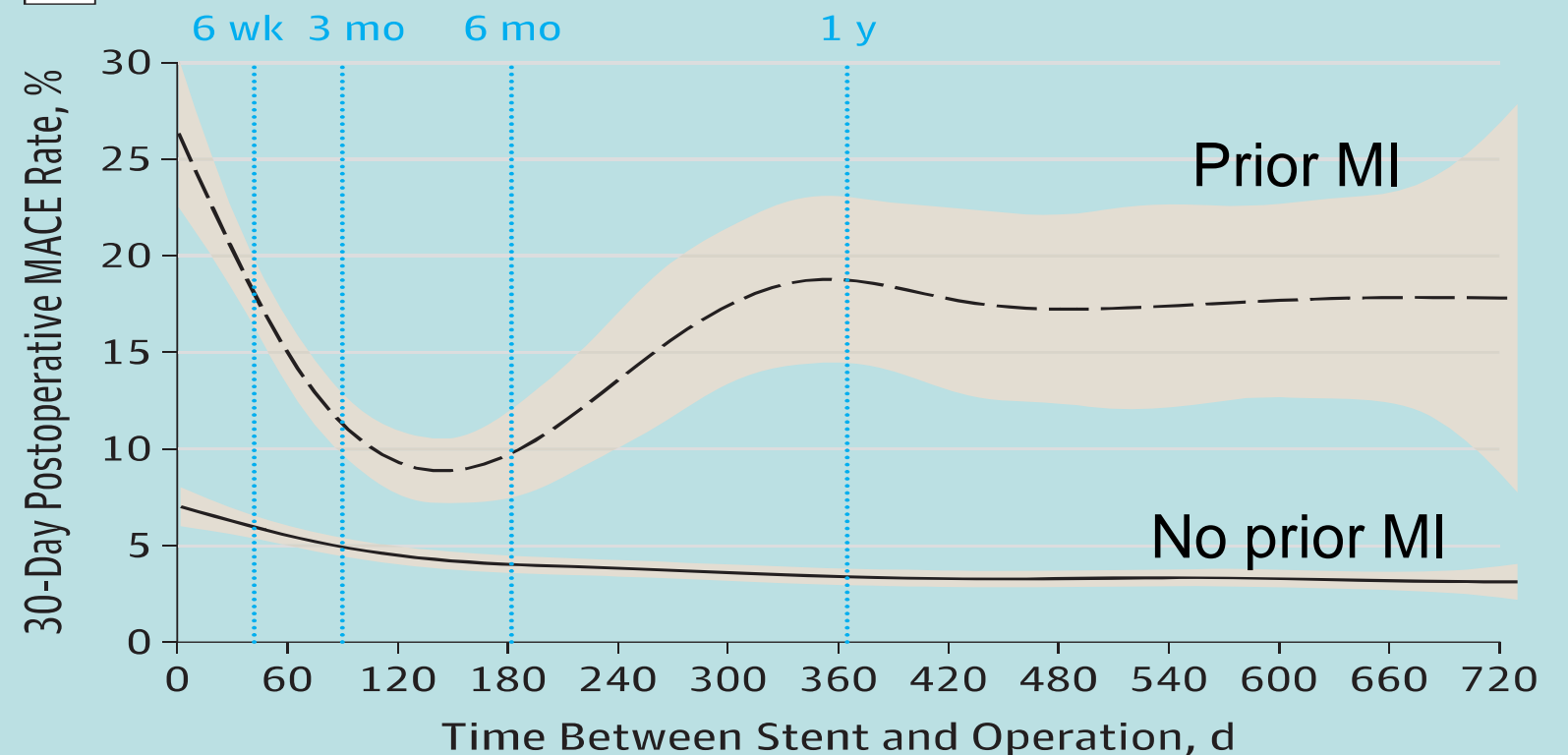
## Predictors of MACE:

- Timing of NCS
- Non-elective surgery
- Prior MI
- Cardiac risk index

## Did not predict MACE:

- Preoperative APT
- Cessation of DAPT
- Stent type
- Type of surgery

**D** Myocardial infarction within 6 mo prior to surgery



Most perioperative ischemic complications driven by non-stented vessel MI & urgent coronary revascularization, *not ST*



# Peri-operative Antiplatelet Therapy Bridge

## Options:

- Continue low-dose aspirin through the peri-operative period
- ASA + P2Y<sub>12</sub> continuation associated with higher bleeding complications
- Peri-operative UF heparin or LMW heparin not acceptable: associated with ↑↑ MACE
- Short-active (reversible) IV antiplatelet agents: appropriate as peri-operative bridge (tirofiban, eptifibatide, cangrelor)



# Determination of Thrombotic Risk

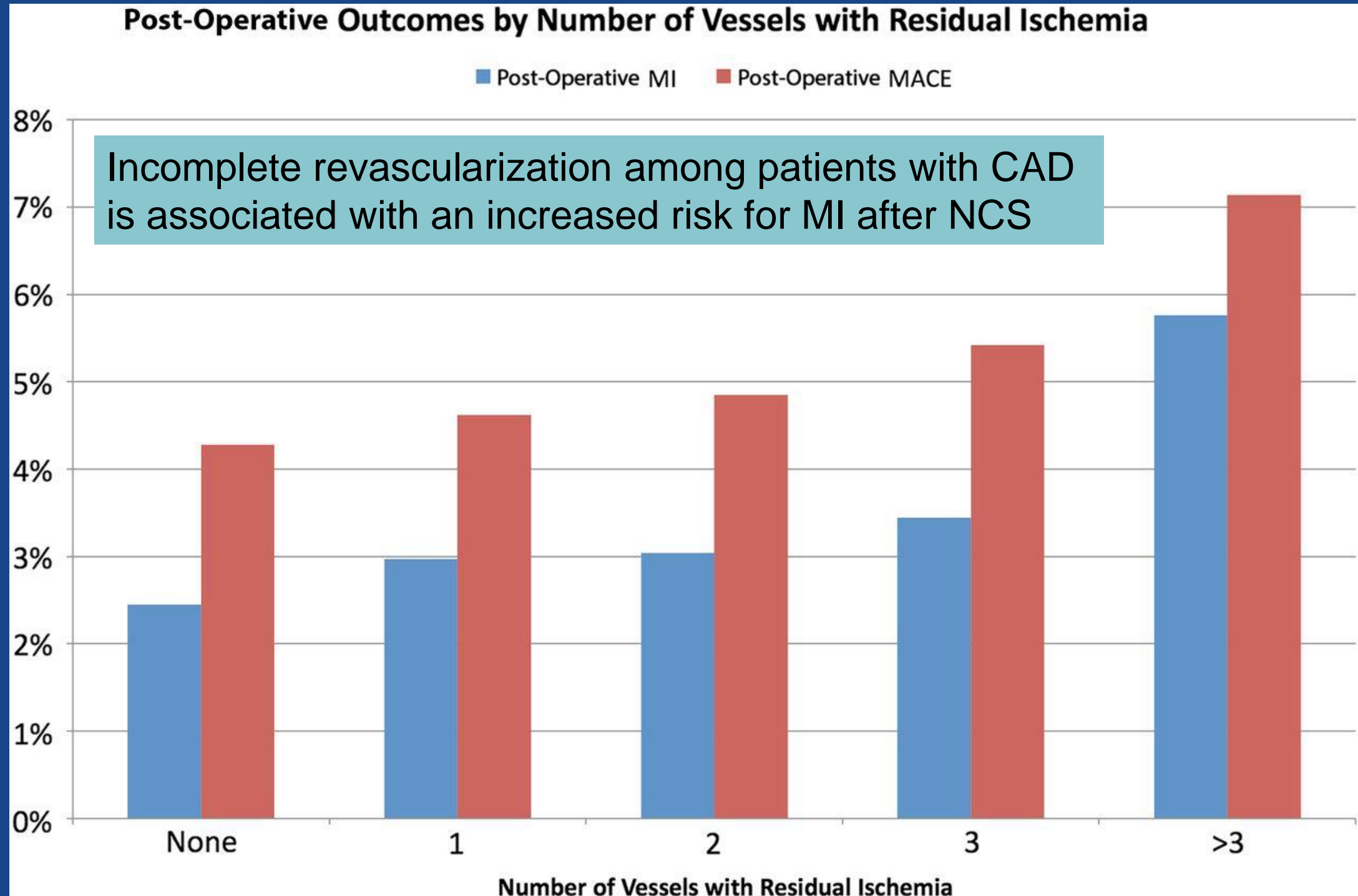
Low Risk ( $<1\%$ )*	Intermediate Risk (1- 5%)*	High Risk ( $>5\%$ )*
<ul style="list-style-type: none"><li>&gt;4 weeks after PCI with POBA</li><li>&gt;6 months after PCI with BMS</li><li>&gt;12 months after PCI with DES</li></ul>	<ul style="list-style-type: none"><li>&gt;2 weeks <math>\leq</math>4 weeks after PCI with POBA</li><li>&gt;1 month <math>\leq</math>6 months after PCI with BMS</li><li>&gt;6 month <math>\leq</math>12 months after PCI with DES</li><li>&gt;12 months after complex PCI with DES (long stents, multiple stents, overlapping, small vessels, bifurcations, left main, last remaining vessel)</li></ul>	<ul style="list-style-type: none"><li><math>\leq</math>2 weeks after PCI with POBA</li><li><math>\leq</math>1 month after PCI with BMS</li><li><math>\leq</math>6 months after PCI with DES</li><li><math>\leq</math>12 months after complex PCI with DES</li><li><math>\leq</math>6 months after PCI for MI</li><li>Previous ST</li></ul>

\*30-day ischemic event rates of cardiovascular death and MI; PCI: percutaneous coronary intervention; POBA: plain old balloon angioplasty; BMS: bare metal stent; DES; drug-eluting stent; MI: myocardial infarction; ST: stent thrombosis





# Incomplete Coronary Revasc. & Perioperative Ischemia



Incomplete revascularization among patients with CAD is associated with an increased risk for MI after NCS

Armstrong et al.  
JACC 2017



ACC 2017

# Determination of Hemorrhagic Risk of Non-cardiac and Cardiac Surgeries

## Low Risk

## Intermediate Risk

## High Risk

### General, Orthopedic and Urologic Surgeries

Hernioplasty, plastic surgery of incisional hernias, cholecystectomy, appendectomy, colectomy, gastric resection, intestinal resection, breast surgery, hand surgery, arthroscopy, cystoscopy and ureteroscopy

Hemorrhoidectomy, splenectomy, gastrectomy, bariatric surgery, rectal resection, thyroidectomy, prosthetic shoulder, knee, foot and major spine surgery, prostate biopsy, orchiectomy

Hepatic resection, duodenocephalopancreasectomy, hip, major pelvic and proximal femur fracture surgery, nephrectomy, cystectomy, TIRP, TURBT, prostatectomy

### Vascular Surgery

Carotid endarterectomy, bypass or endarterectomy of lower extremity, EVAR, TEVAR, limb amputations

Open abdominal aorta surgery

Open thoracic and thoracoabdominal surgery

### Cardiac Surgery

Mini-thoracotomy, TAVR (apical approach), OPCAB, CABG, valve replacement

Reintervention, endocarditis, CABG in PCI failure, aortic dissections



# Assessment of Thrombotic & Hemorrhagic Risk

**Risk**

## Thrombotic Risk

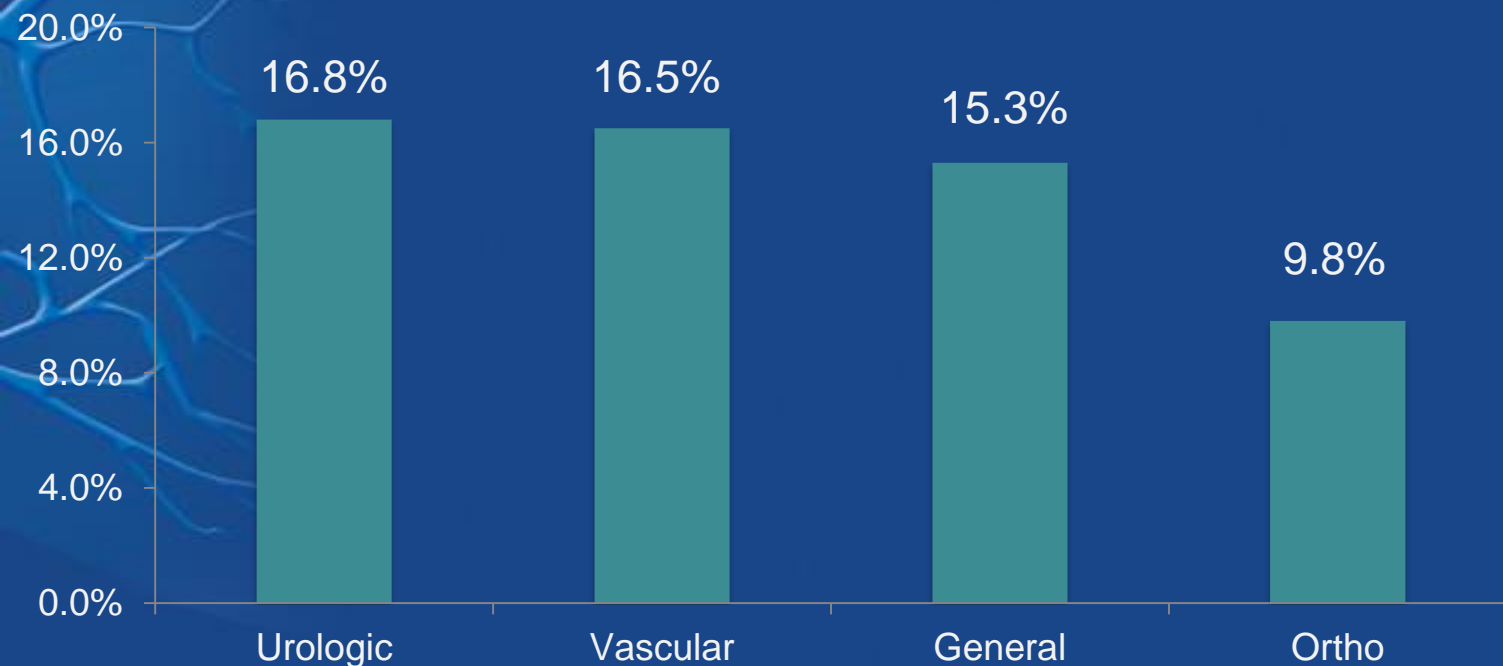
		Thrombotic Risk		
		Low	Intermediate	High
Hemorrhagic risk	Low	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> continue
	Intermediate	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	<b>IV APT Bridging*</b>
	High	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	<b>IV APT Bridging*</b>



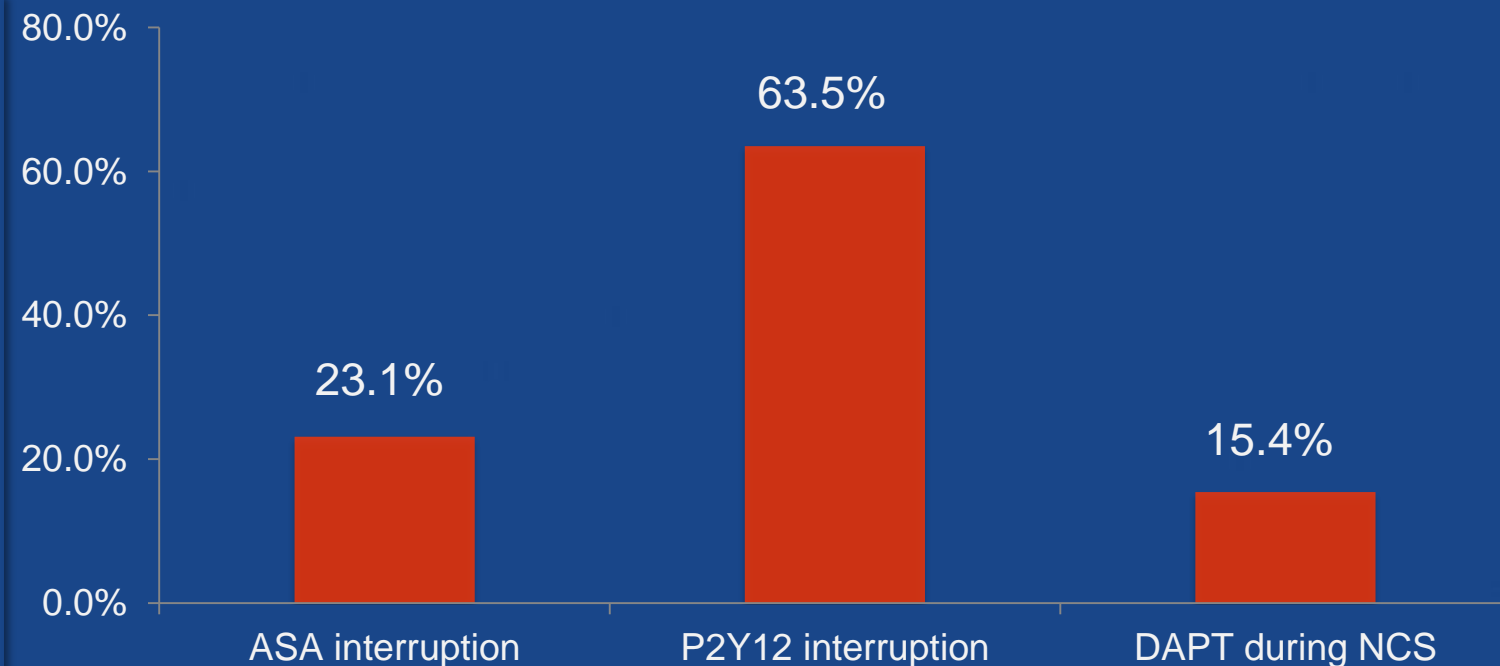
# Surgery After Stenting (SAS) Registry\*: Variability In Management

Prospective, June 2013-Dec 2014: n=1137; 18 centers

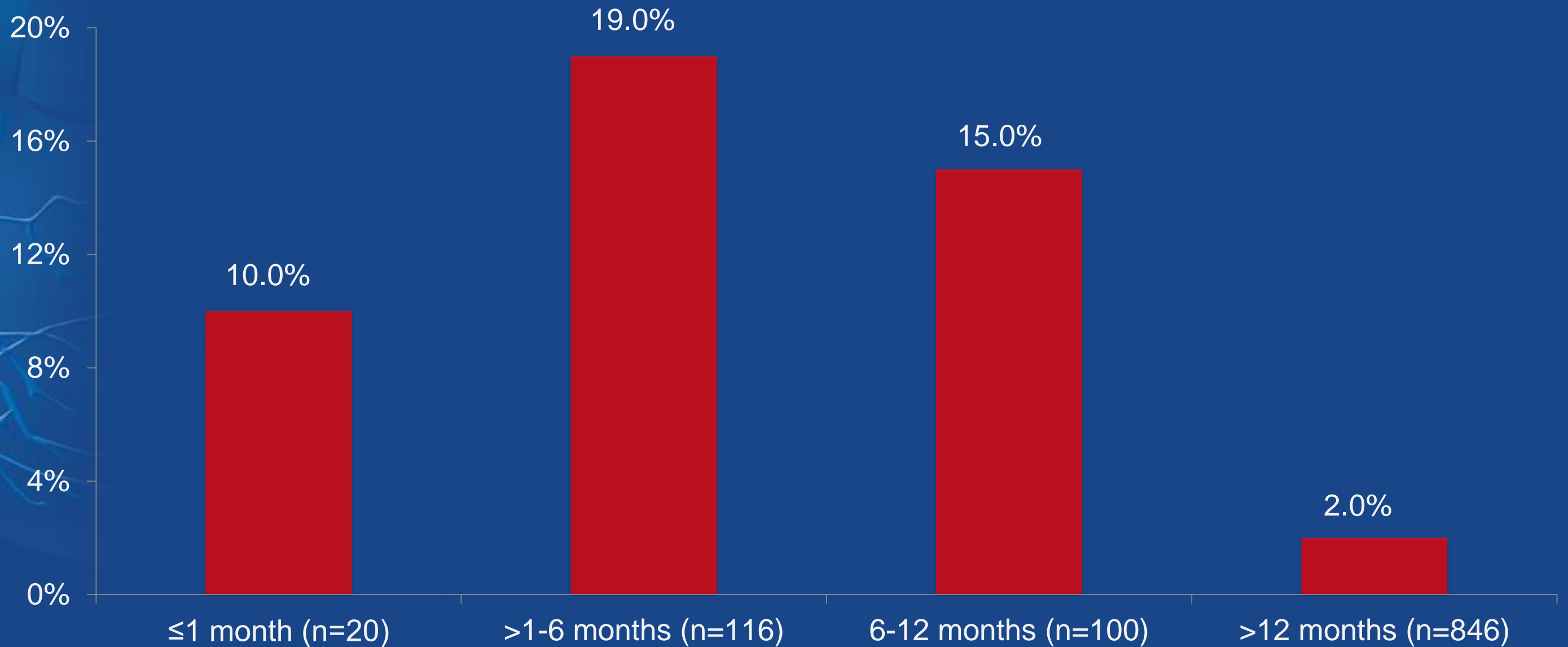
Top four NCS



Perioperative DAPT management



# IV Bridging Based On Time Interval From Stenting To Surgery

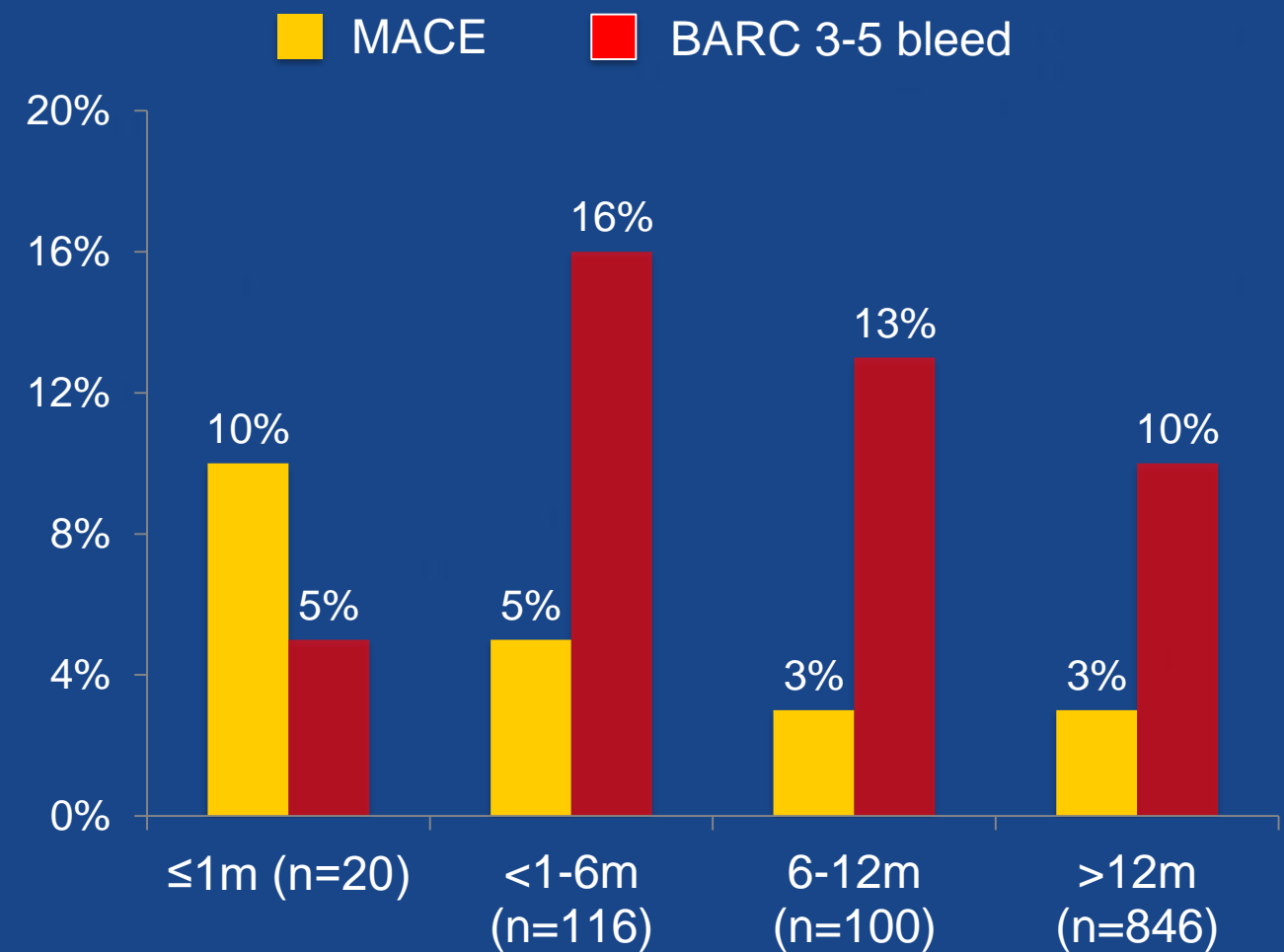


# Prospective SAS Registry Results

Outcomes	Event Rates
In-hospital NACE (Ischemic events + BARC 3-5 bleed)	12.7%
30d-MACE; ST	3.5%; 0.2%
30d-BARC $\geq 3$ bleeding	11.3%
30d-MACE in high thrombotic, intermediate-high bleeding risk group	3.0%

DAPT or P2Y12 inhibitor during surgery not an independent predictor of MACE; ASA  $\uparrow$  bleeds

## 1-month MACE & BARC 3-5 Bleed



ACC 2017

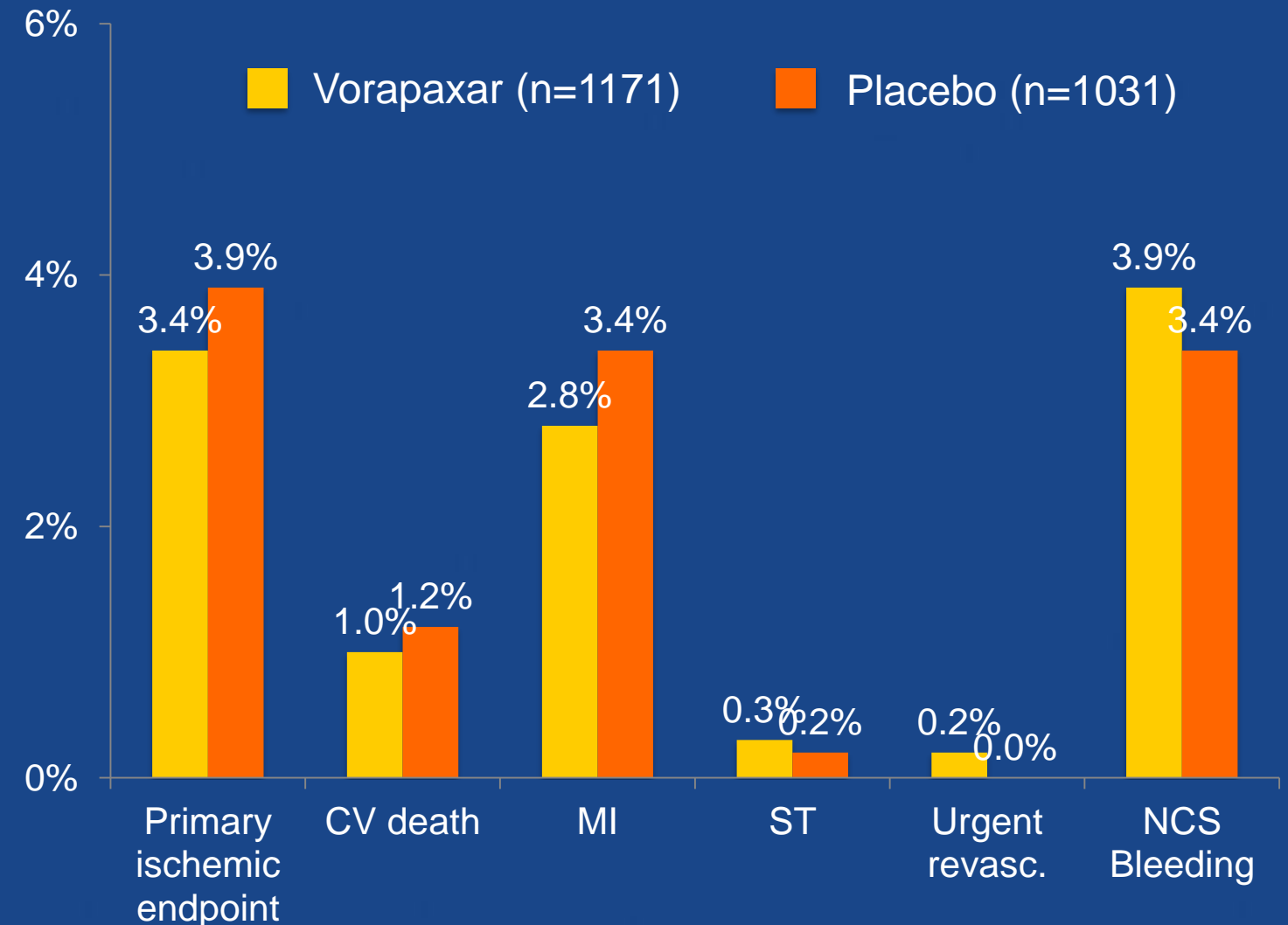
Rossini *et al.* Euro PCR 2015; CCI 2017

# Vorapaxar in ACS Patients Undergoing Surgery

ACS	Vorapaxar	Placebo	p
Preoperative thienopyridine	89%	86%	0.036
Study drug held	23%	20%	0.102
Surgery ≤6m	50%	47%	0.165
Median time to surgery	13d	15d	0.431

PCI=70%; DES=40%;

## 30-day Clinical Outcomes



ACC 2017

Diepen et al. JAHA 2015

# Frequency of Complications with Bridging Therapy

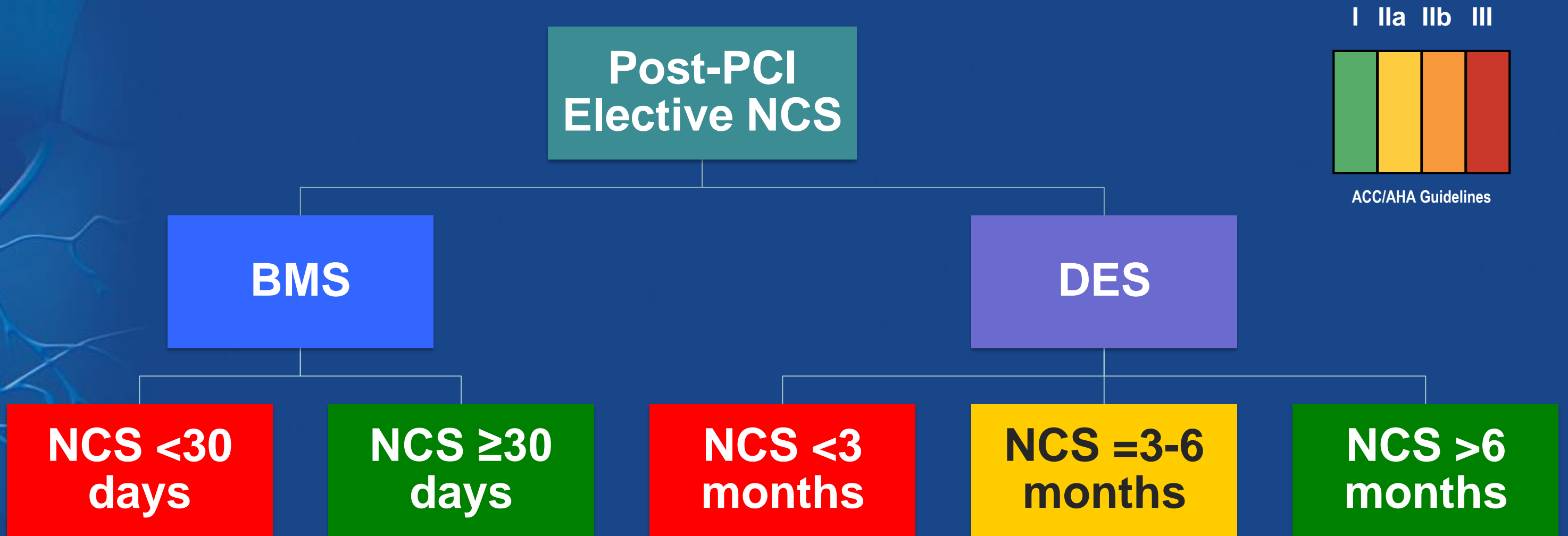
Meta-analysis of 8 published studies between 2002-2013; n=280

<b>30d-Outcomes</b>	<b>Pooled estimate rate (%)</b>	<b>95% CI</b>
ST	1.3%	0.3-3.0
Major bleeding	7.4%	2.8-14.1
Any bleeding	20.6%	4.8-43.2
Transfusion	13.9%	1.0-38.2
Death	3.5%	1.7-5.9
MI	1.6%	0.3-3.6
MACE*	4.6%	2.5-7.3

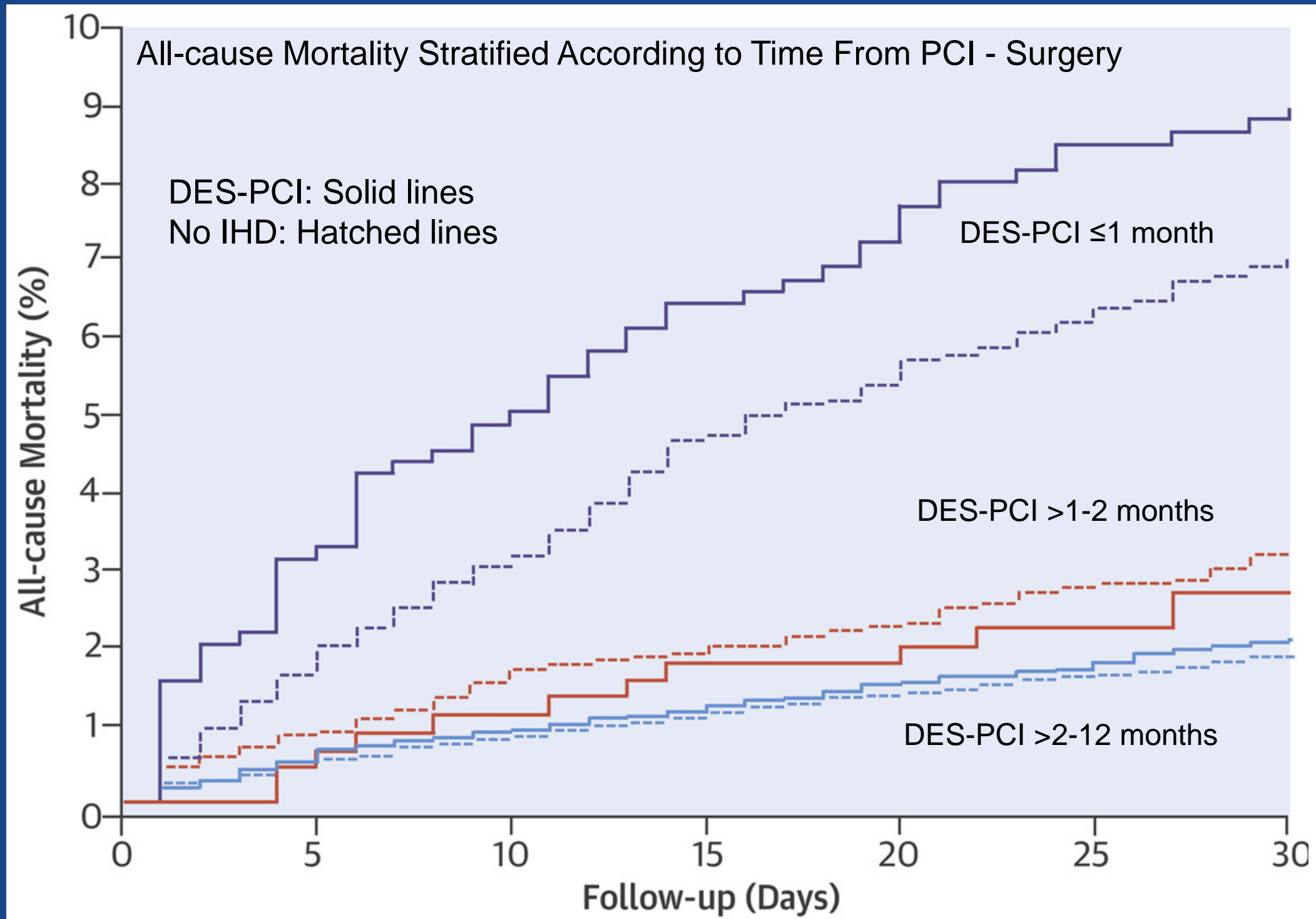




# Guideline Recommendations On Timing of Non-cardiac Surgery Post-PCI



# Western Denmark Heart Registry & Danish National Patient Register



Egholm et al. JACC  
Volume 68, Issue 24,  
2016, 2622–2632



ACC 2017

# Western Denmark Heart Registry & Danish National Patient Register

- Surgery in patients treated with DES-PCI is associated with an increased 30-day risk of MI
- Surgery among DES-PCI–treated patients did not increase 30-day all-cause mortality
- Beyond the first month after DES-PCI, these patients had same perioperative risk as surgery in patients without IHD
- **Surgery after DES-PCI might be performed earlier without an increased risk**



# Options For Managing Perioperative DAPT

		Thrombotic Risk		
		Low	Intermediate	High
Hemorrhagic risk	Low	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> continue
	Intermediate	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	<b>IV APT Bridging</b>
	High	ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	Postpone; ASA, P2Y <sub>12</sub> interruption 5d, resume 24-72h	<b>IV APT Bridging</b>



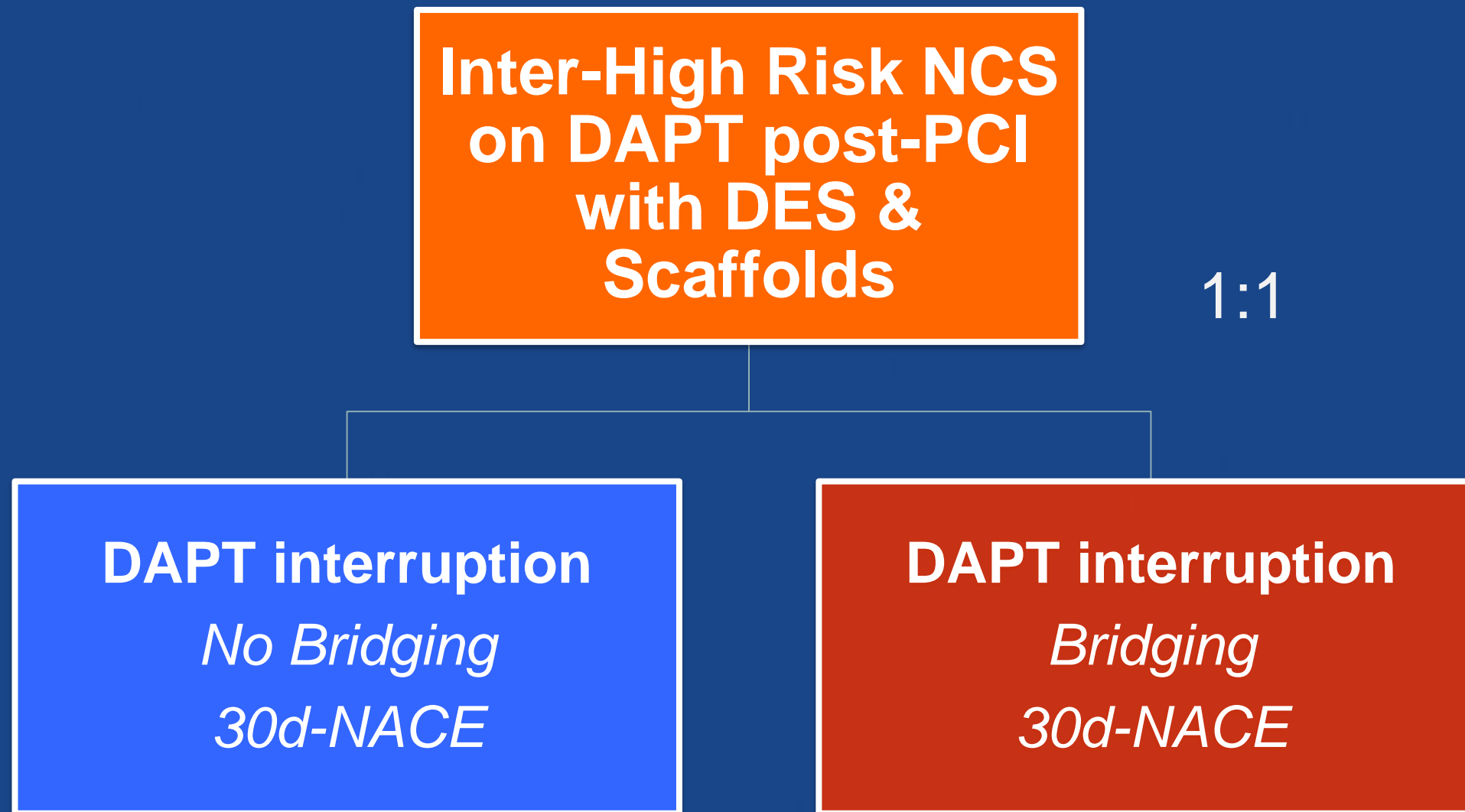
# Management of Peri-operative DAPT Post-PCI

- Millions of patients worldwide affected by DAPT interruption for NCS
- Improved stent safety → shorter DAPT durations, however timing of surgery from PCI (esp. post-MI) is an important determinant of perioperative ischemic events
- Proportion of patients undergoing early surgery post-DES implants is expected to increase with shorter DAPT requirements following elective PCI
- Benefit of bridging unclear, scientific equipoise, significant provider & patient uncertainty

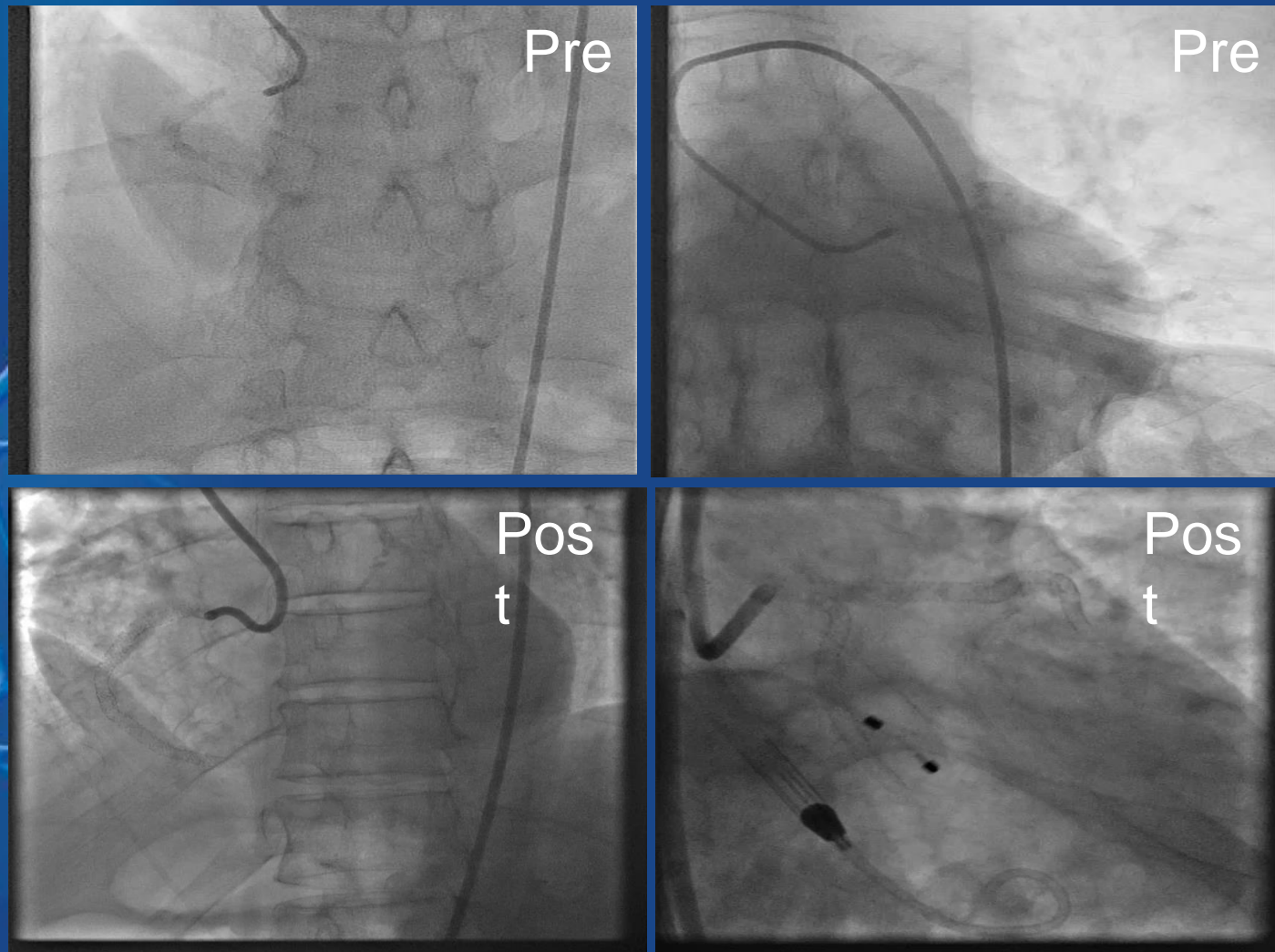


# 'To Bridge or Not to Bridge'

Proposed Management of Antiplatelet Regimen During Noncardiac Surgery (MARS) Trial



# Clinical Case Presentation



Discharged on Ticagrelor & ASA 81 mg

76 y male is referred for cor. angio/PCI. He is dyspneic; low-grade fever. PMH: HTN, CKD4. Smoker (steroids), right total hip replacement (THR) ~2m ago. **EKG**: S. tach; peak troponin 9.0 ng/mL; **ECHO**: LVEF=35%, inf-lat. HK, PASP=70 mm Hg. Readmitted on 45 day post-PCI: rt. hip pain, fever/rigor fatigue. CT & ortho eval.: possible rt. deep joint infection; surgical debridement recommended. Peri-operative DAPT management options:

1. Delay orthopedic revision by at least 3m
2. Operate on ASA + Ticagrelor
3. Hold Ticagrelor (5d), cont. ASA + Tirofiban bridge
4. Hold Ticagrelor (5d), cont. ASA
5. None of the above (*or other options*)

