

# How to start a CHIP program?

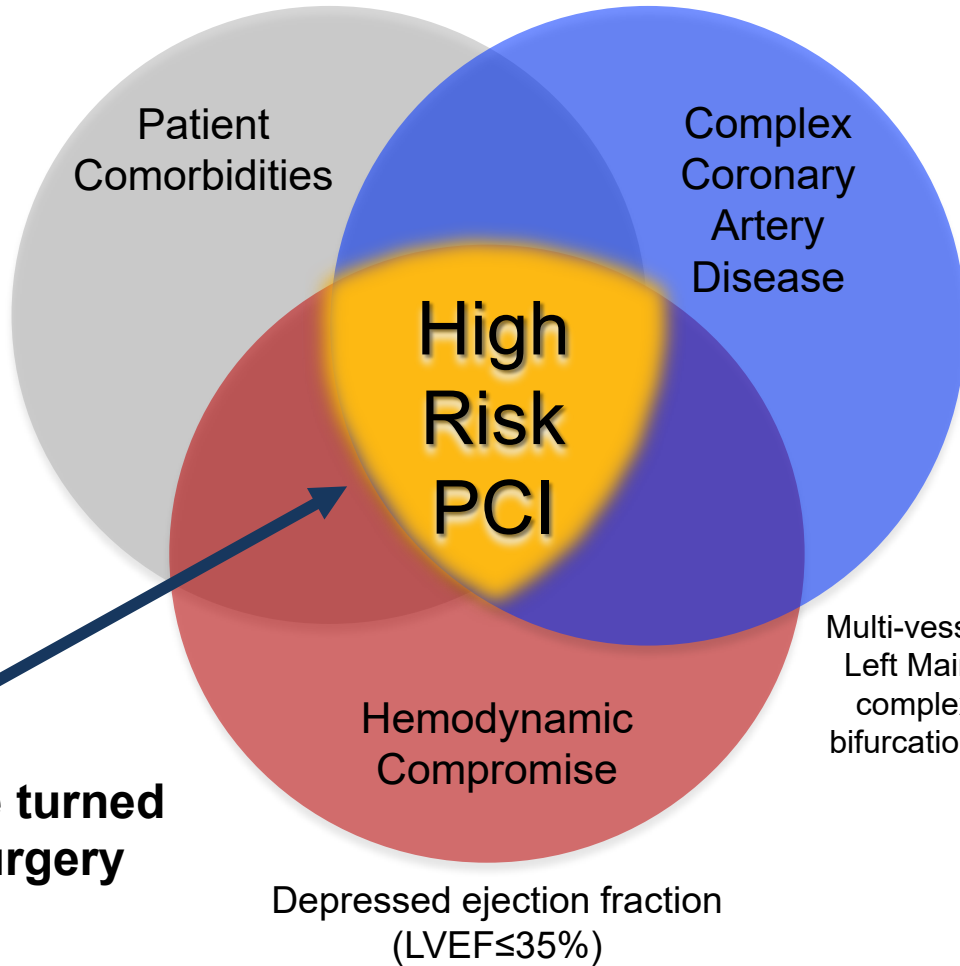
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# High Risk PCI



Heart failure, diabetes, advanced age, peripheral vascular disease, unstable angina/NSTEMI, prior surgery

**2/3 of these patients are turned down for surgery**

Multi-vessel disease, Left Main disease, complex lesions, bifurcations, calcium

Depressed ejection fraction (LVEF ≤ 35%)

## WHITE PAPER

### Treatment of Higher-Risk Patients With an Indication for Revascularization

Evolution Within the Field of Contemporary Percutaneous Coronary Intervention

**ABSTRACT:** Patients with severe coronary artery disease with a clinical indication for revascularization but who are at high procedural risk because of patient comorbidities, complexity of coronary anatomy, and/or poor hemodynamics represent an understudied and potentially underserved patient population. Through advances in percutaneous interventional techniques and technologies and improvements in patient selection, current percutaneous coronary intervention may allow appropriate patients to benefit safely from revascularization procedures that might not have been offered in the past. The burgeoning interest in these procedures in some respects reflects an evolutionary step within the field of percutaneous coronary intervention. However, because of the clinical complexity of many of these patients and procedures, it is critical to develop dedicated specialists within interventional cardiology who are trained with the cognitive and technical skills to select these patients appropriately and to perform these procedures safely. Preprocedural issues such as multidisciplinary risk and treatment assessments are highly relevant to the successful treatment of these patients, and knowledge gaps and future directions to improve outcomes in this emerging area are discussed. Ultimately, an evolution of contemporary interventional cardiology is necessary to treat the increasingly higher-risk patients with whom we are confronted.

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Coronary artery disease (CAD) is a leading cause of morbidity and mortality in the developed world, affecting 15.5 million adults in the United States, with 635 000 Americans projected to have a new coronary event (either first hospitalized myocardial infarction or CAD death) this year.<sup>1</sup> The profound burden of CAD, coupled with these high event rates, underscores the need to identify and offer treatment to patients with CAD at higher risk for these adverse clinical events. Unfortunately, despite the availability and implementation of disease-modifying guideline-directed medical therapy (GDMT; eg, lifestyle modification, aspirin, statins, and control of risk factors such as blood pressure and diabetes mellitus), a significant proportion of patients still present with prognostically important and anatomically severe CAD as their initial manifestation of CAD.<sup>2</sup>

For these higher-risk CAD patients, coronary revascularization (in addition to GDMT) can both improve quality of life and reduce adverse clinical events.<sup>3-6</sup> A strategy of offering revascularization to patients with high-risk clinical presentations (acute coronary syndromes or stable ischemic heart disease with high-risk anatomy or refractory symptoms) is supported in current clinical practice guidelines and appropriate use documents.<sup>7-10</sup> Nonetheless, the rate of revascularization

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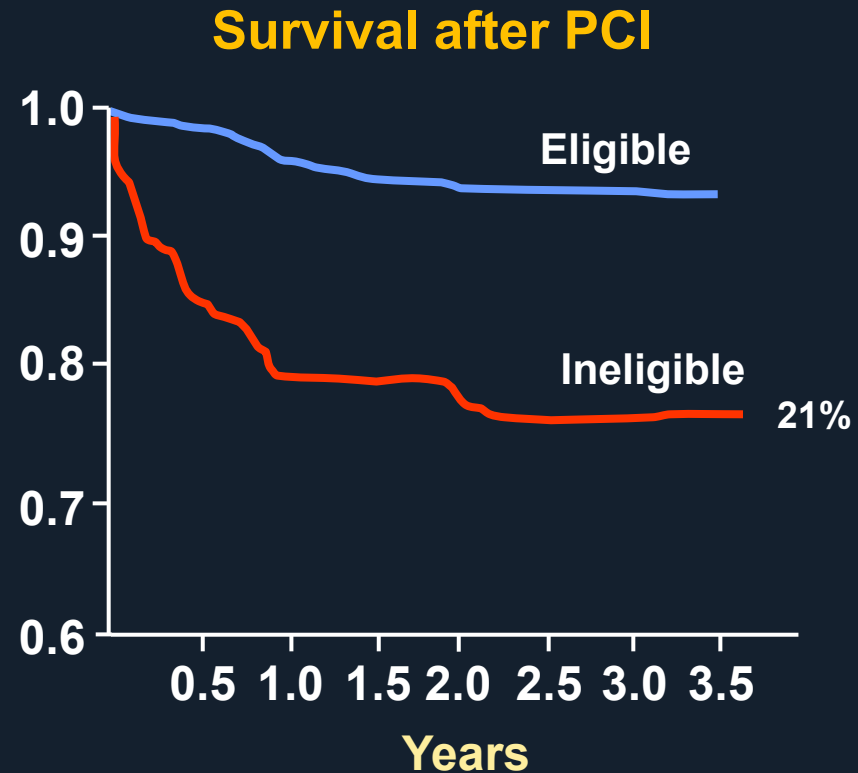
**Key Words:** angioplasty  
 ■ coronary artery disease  
 ■ coronary occlusion ■ heart failure ■ percutaneous coronary intervention

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# Surgical Ineligibility and Risk

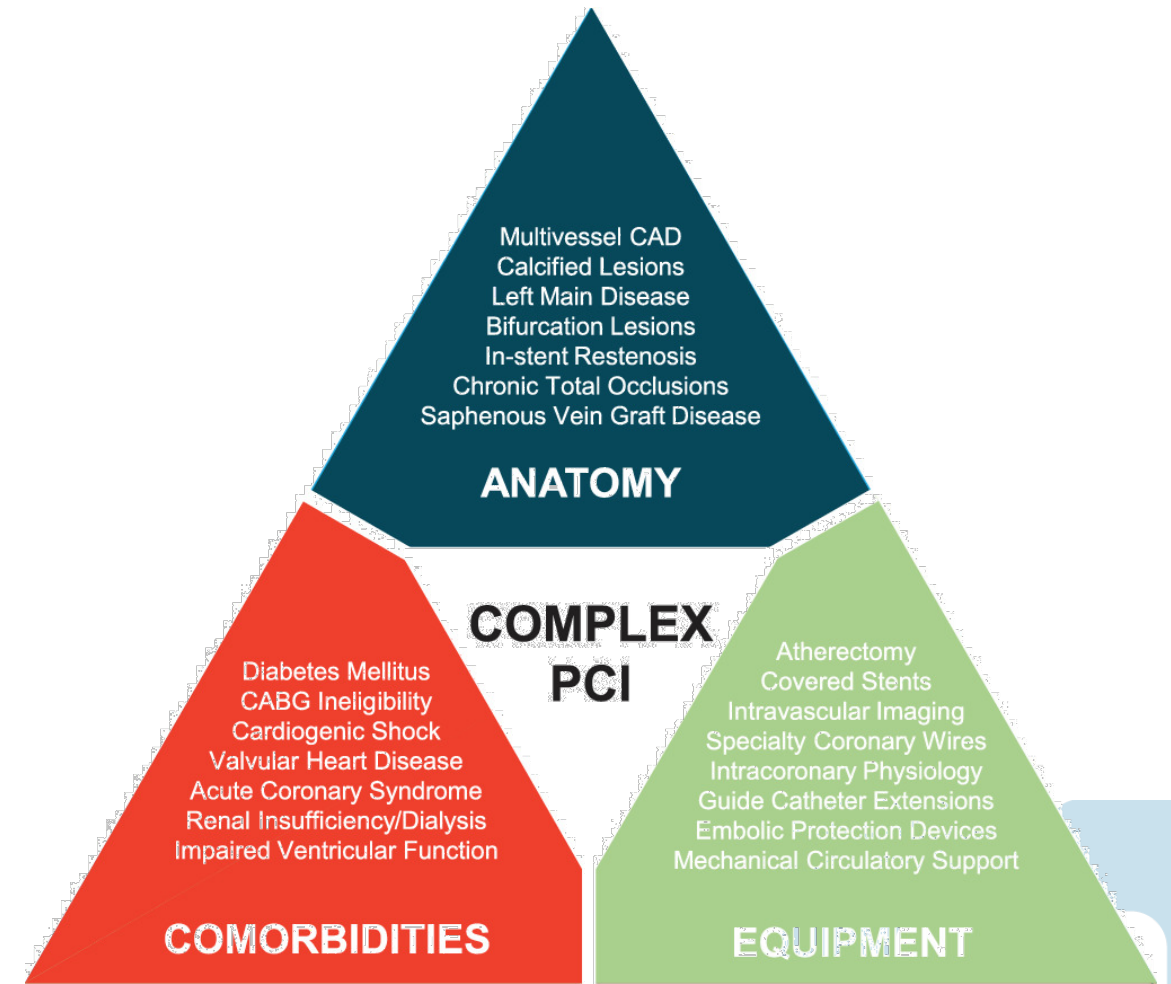
1013 patients with surgical anatomy, 22% ineligible, and underwent PCI with 6-fold increased risk of in hospital mortality  
(OR 6.26; 95% confidence interval, 2.16–18.15;  $P<0.001$ )

Criteria	Prevalence
Poor targets	24%
Advanced age	16%
Renal insufficiency	16%
Severe lung disease	15%
Severe LV dysfunction	14%
Malignancy	11%
Other	49%



# High Risk PCI & Operator Skills

- Left Main, CTO, bifurcation, SVGs, calcium skills
- Understand Hemodynamic Goals
  - High risk PCI
  - Cardiogenic shock
- Device knowledge and troubleshooting
- Advanced intravascular imaging
  - IVUS
  - OCT
- Best practices for vascular access
  - Large bore femoral access and closure skills
  - Single femoral access technique for PCI and MCS (Impella)
  - Large guiding catheters – Sheathless techniques for radial access



# CTO PCI: What You and Your Team Needs

## SHEATHS

7-8F, 45-55 cm length

## GUIDE CATHETERS

6-8F 90cm length ±SH  
JR4, AL 0.75, AL 1,  
EBU 3.5, 3.75, 4.0, 4.5

## GUIDE EXTENSIONS

GuideLiner/Guidezilla

## GUIDE WIRES

Fielder FC, Fielder XT,  
Pilot 200, Miracle Bros,  
Gaia 1-3, Confianza Pro 12,  
Hornet 14, Scion, Viper



## MICROCATHETERS

Corsair, Tornus, Finecross,  
Turnpike, Caravel, Twin Pass

## SNARES

EN Snare,  
GooseNeck

## BRIDGEPOINT SYSTEM

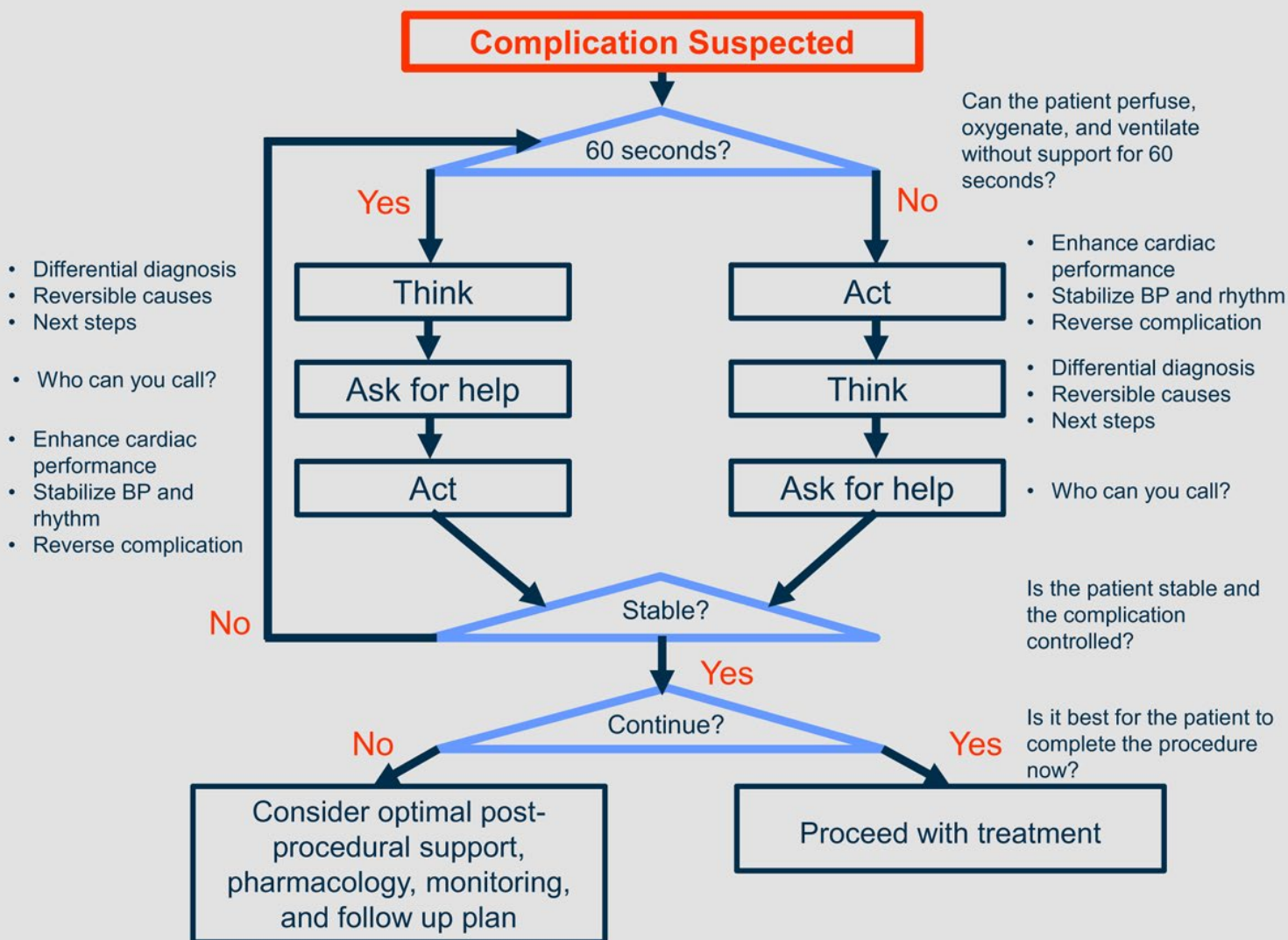
CrossBoss,  
Stingray Balloon,  
Stingray wire

## COMPLICATION MANAGEMENT

Papyrus, iCAST,  
Viabahn, Coils,  
Pericardiocentesis tray

# Percutaneous Coronary Intervention Complications: Algorithms for Successful Recognition and Management

## Resources for the Management of PCI Complications



<b>In the cart</b>	<ul style="list-style-type: none"> <li>Pericardiocentesis tray</li> <li>Covered stents</li> <li>Coils and microcatheters for coil delivery</li> <li>Snare</li> <li>Thrombin or microspheres</li> </ul>
<b>In the room</b>	<ul style="list-style-type: none"> <li>Mechanical circulatory support devices</li> <li>ACLS drugs and defibrillator</li> <li>Contact information for individuals providing emergency support or advice</li> </ul>
<b>In the hospital</b>	<ul style="list-style-type: none"> <li>Cardiothoracic surgery and/or perfusion team backup</li> <li>Peripheral vascular specialist</li> <li>Echocardiography</li> <li>Experienced cardiac ICU care</li> </ul>

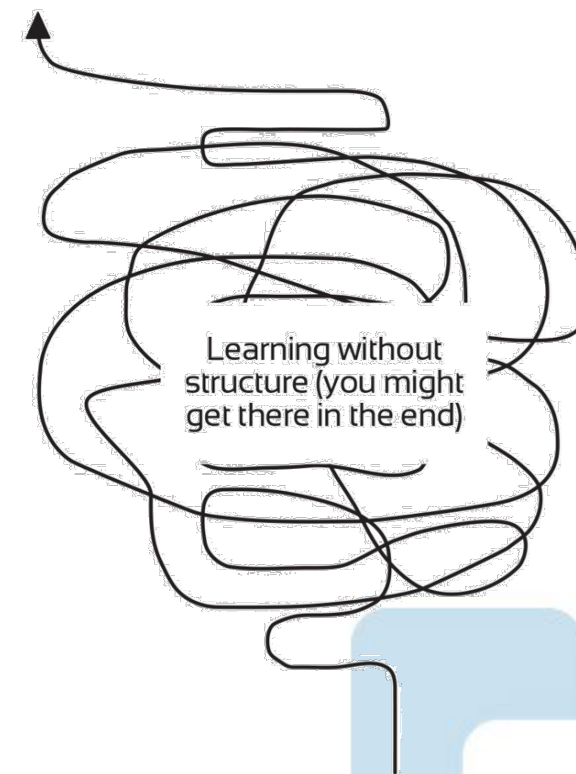
# Predictive Scores of Success in CTO PCI

## There Is No Substitute for Operator Experience and Skill\*

Nicholas J. Lembo, MD, Raja Hatem, MD, Dimitri Karmpaliotis, MD, PhD

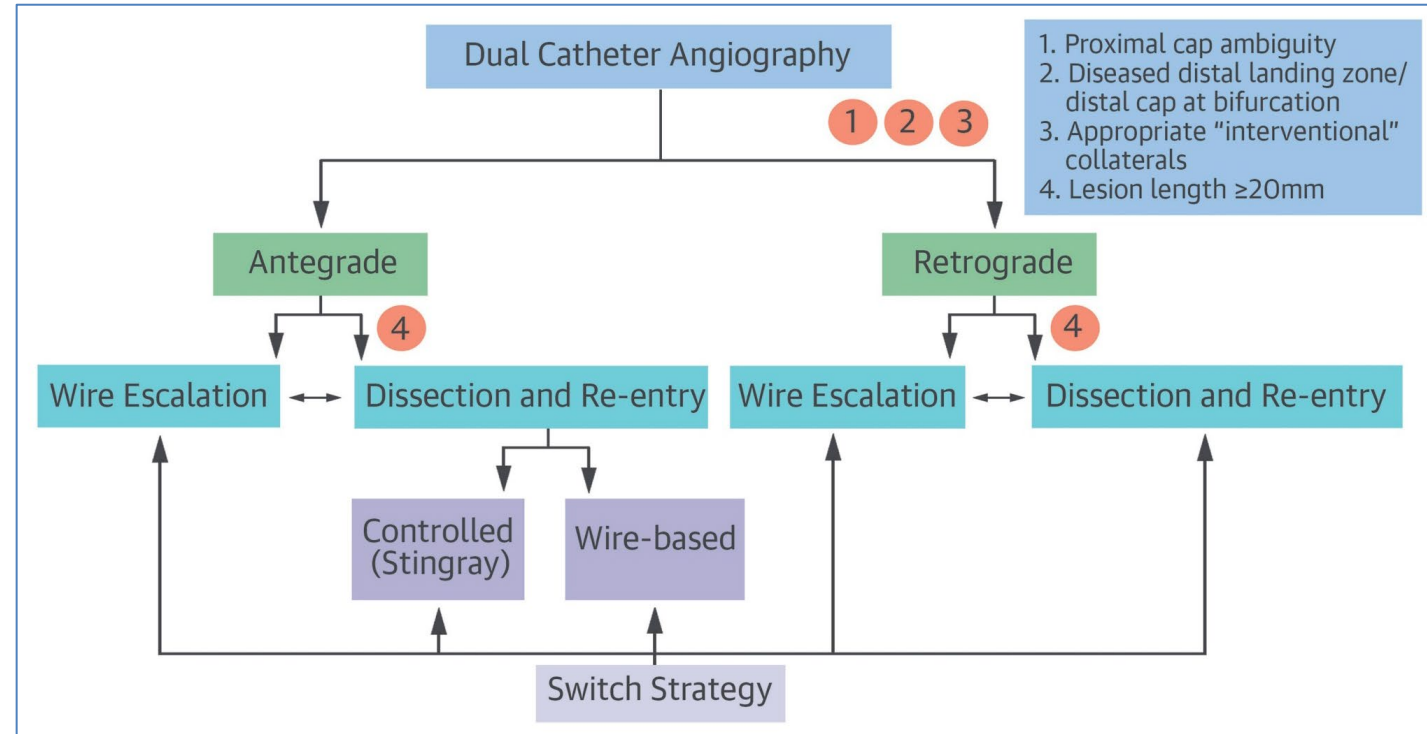
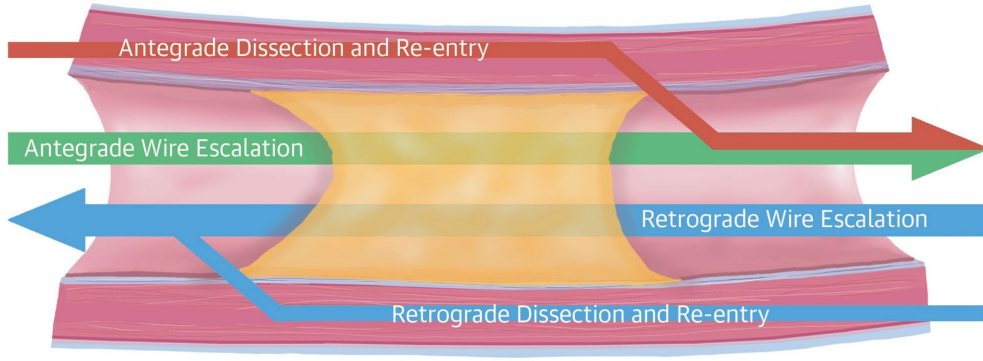


CTO mastery



- Bill Lombardi

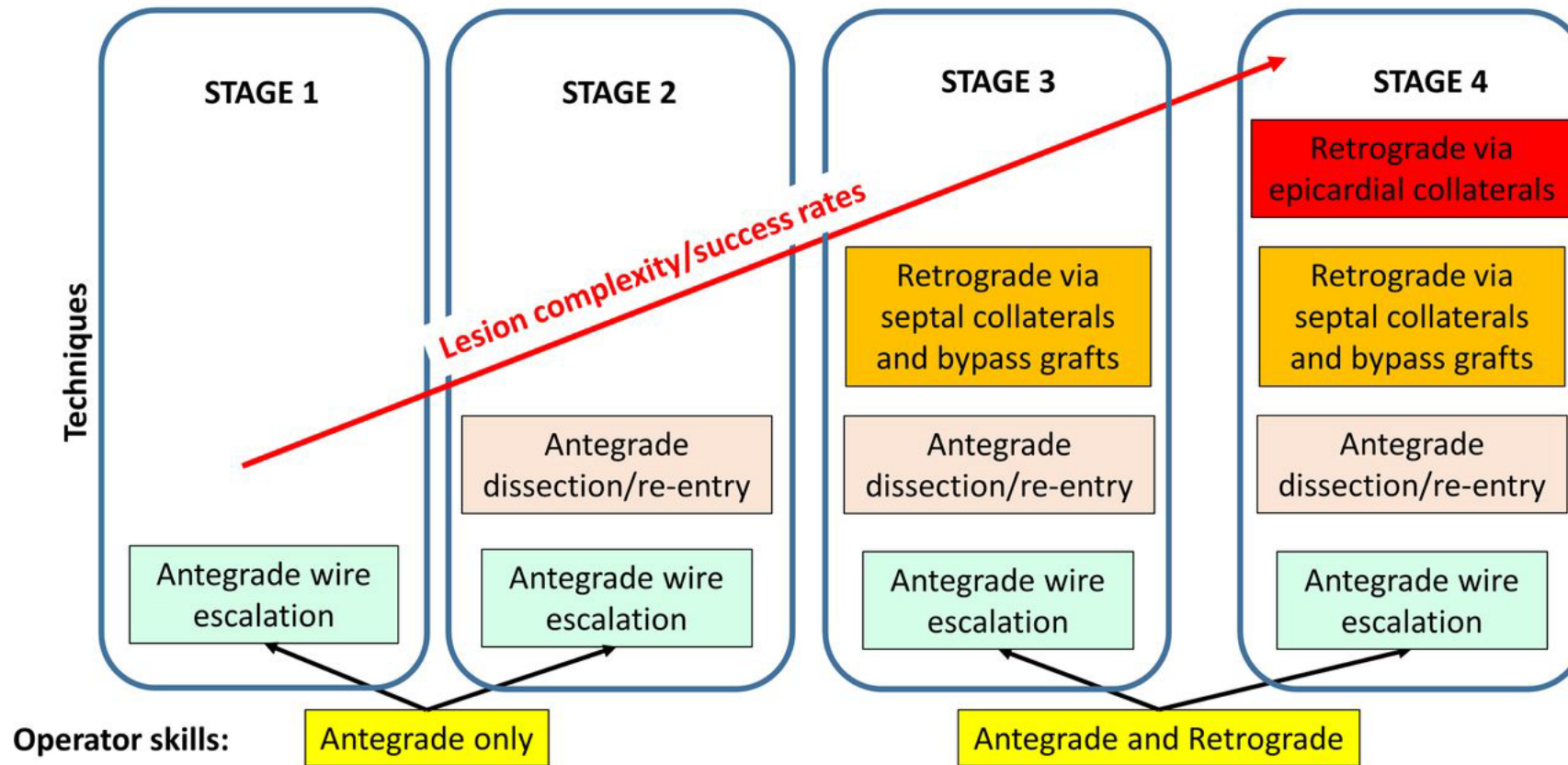
# Hybrid CTO Algorithm





# Learning the Technique

## The Four Stages of Learning CTO PCI

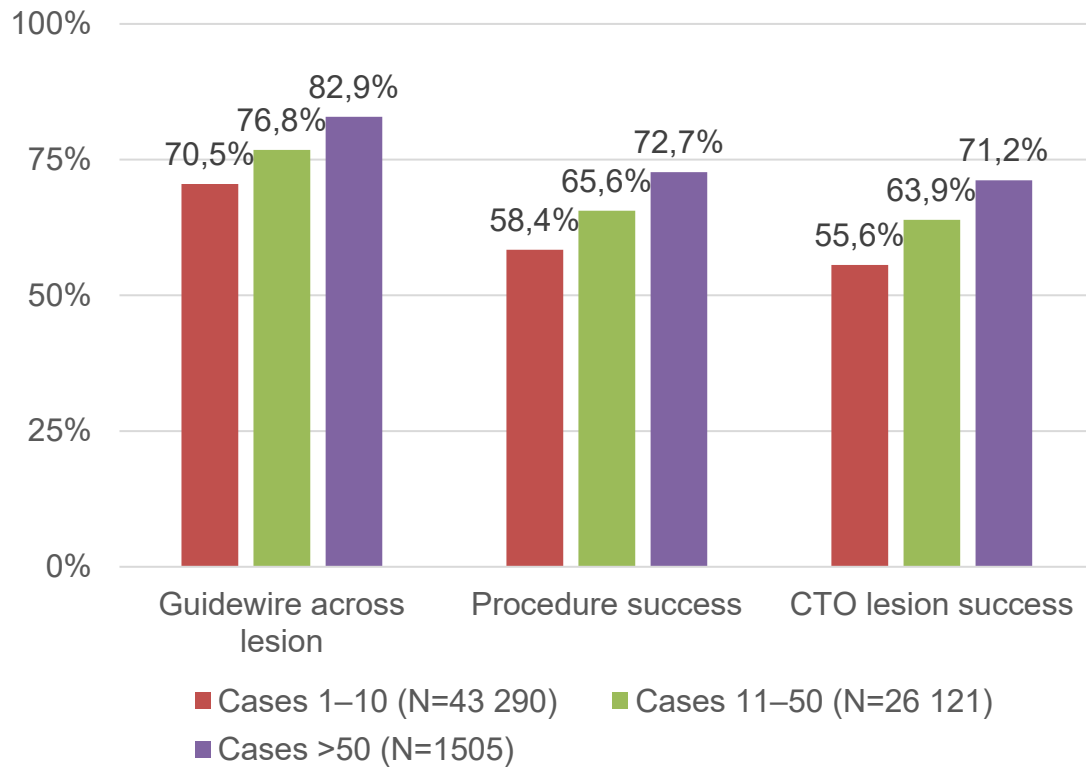


# Examining the Operator Learning Curve for Percutaneous Coronary Intervention of Chronic Total Occlusions

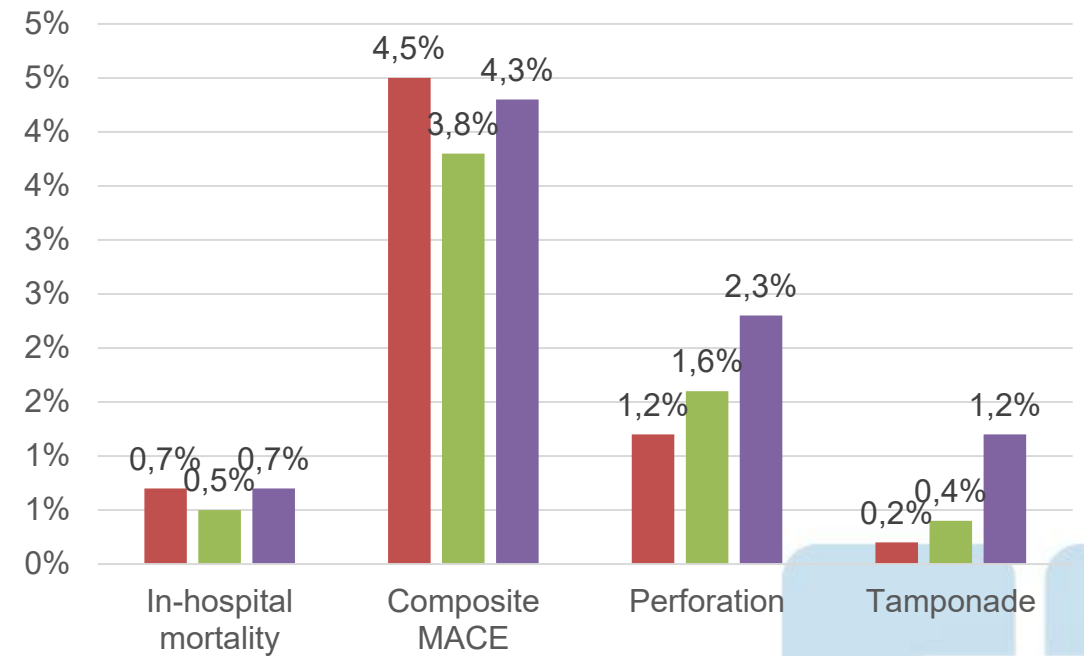
A Report From the National Cardiovascular Data Registry

Lesion crossing, stent deployment, CTO and procedure success improved in linear fashion with increasing volume, at the expense of contrast and fluoroscopy use.

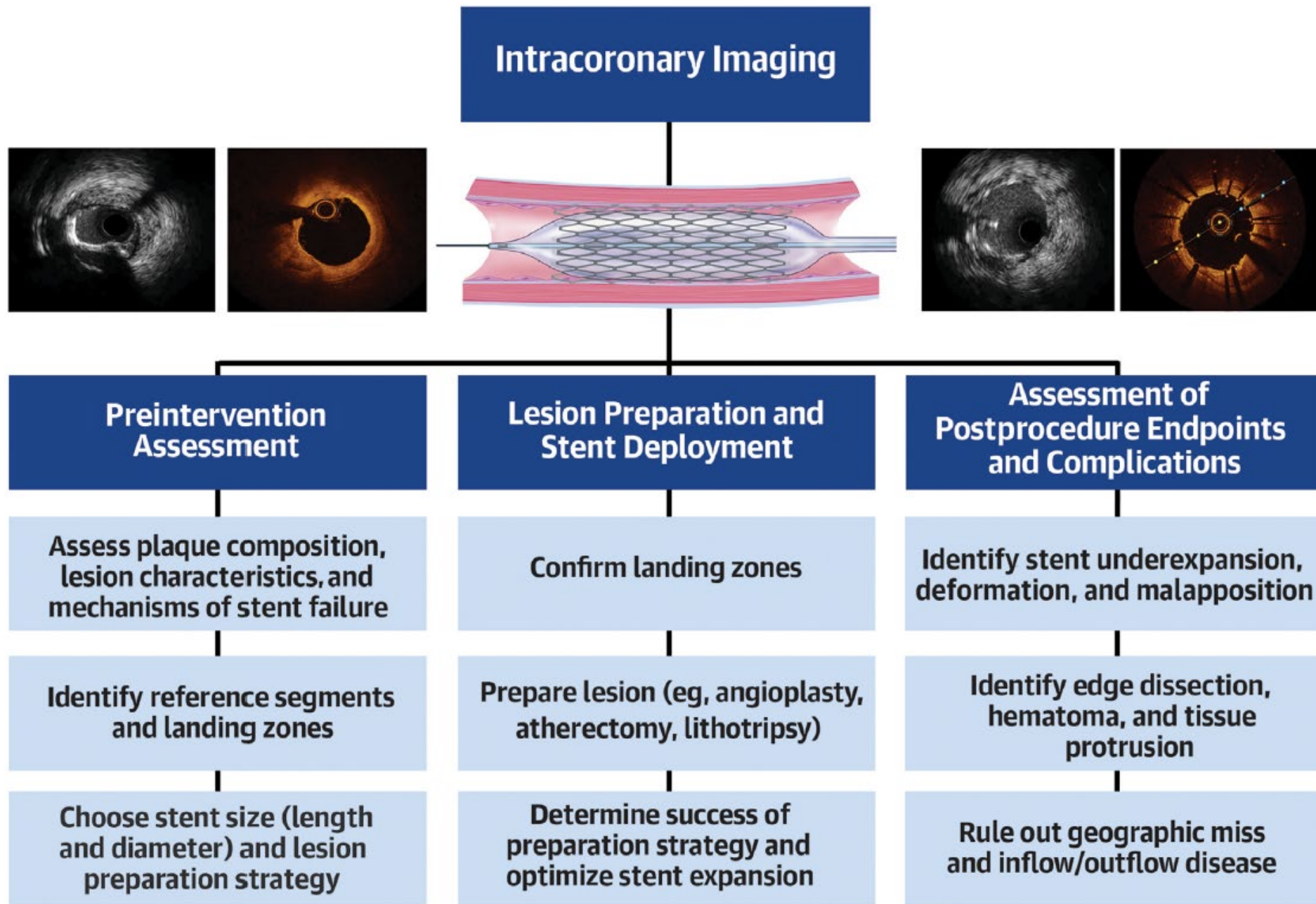
Procedural Outcomes



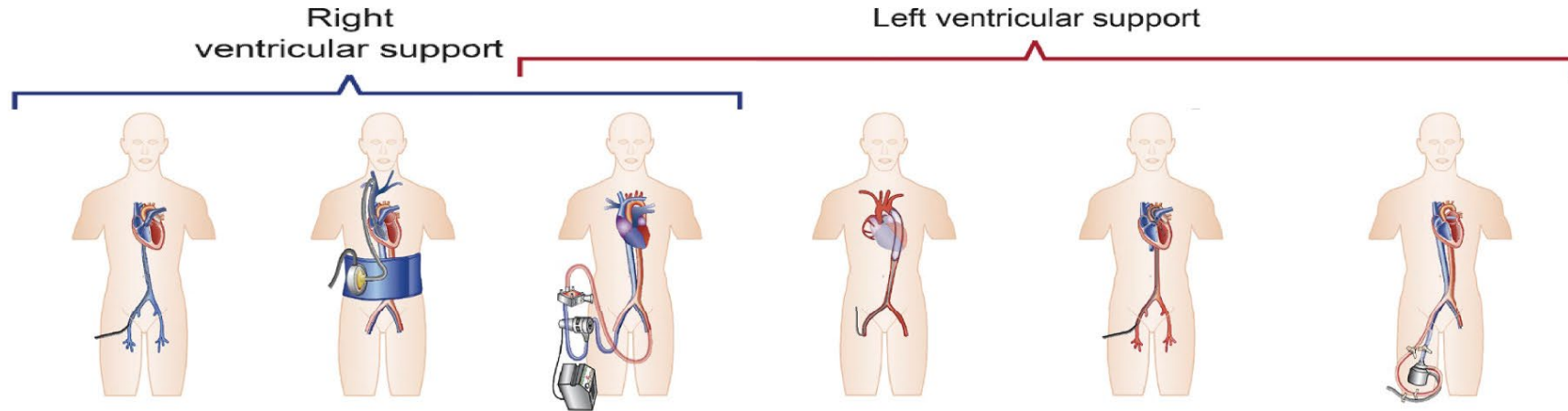
Clinical Outcomes



70,916 cases performed by 7,251 new operators



# Mechanical Circulatory Support



	Impella RP	TandemHeart RA-PA	VA-ECMO	IABP	Impella (2.5, CP, 5.0, 5.5)	TandemHeart
<b>Flow</b>	max 4.0 L/min	max 4.0 L/min	max 7.0 L/min		2.5 - 5.5 L/min	max 4.0 L/min
<b>Pump Speed</b>	33000 rpm	max 7500 rpm	max 5000 rpm		max 51000 rpm	max 7500 rpm
<b>Mechanism</b>	Axial flow continuous pump (RA-to-PA)	Centrifugal flow continuous pump (RA-to-PA)	Centrifugal flow continuous pump (RA-to-AO)	Balloon inflation-deflation (AO)	Axial flow continuous pump (LV-to-AO)	Centrifugal flow continuous pump (LA-to-AO)
<b>Cannula Size</b>	22 Fr venous	29 Fr venous	14-19 Fr arterial 17-21 Fr venous	7-8 Fr arterial	13-21 Fr arterial	12-19 Fr arterial 21 Fr venous
<b>Insertion/Placement</b>	Femoral vein	Internal jugular vein	Femoral artery Femoral vein	Femoral artery Axillary artery	Femoral artery Axillary artery	Femoral artery Femoral vein
<b>LV Unloading</b>	-	-	-	+	++ to +++	++
<b>RV Unloading</b>	+	+	++	-	-	-
<b>Miscellaneous</b>			Provides oxygenation support	Requires stable cardiac rhythm and native heart function	Contraindicated with mechanical aortic valve, presence of left ventricular thrombus	Requires transseptal access

Frequent complications that require careful assessment and management

# PROTECTED PCI ALGORITHM

**LVEF < 50%: EVALUATE ALGORITHM**

**LVEF < 40%: RECOMMEND RHC PRIOR TO PCI**

- +2 Cardiac index < 2.0 L/min/m<sup>2</sup> or PA sat < 55%
- +1 Syntax score ≥ 22
- +1 Ejection fraction < 25%
- +1 Systolic BP < 100 mm Hg at baseline
- +1 ACS presentation
- +1 Planned revascularization > 2 territories
- +1 Likely prolonged ischemia
  - Retrograde chronic total occlusion
  - Atherectomy
- +1 Severe mitral regurgitation
- +1 Decompensated state
  - LVEDP > 20 mm Hg
  - Significant new orthopnea
- 1 High-risk vascular injury/significant bleeding
- 1 Hemoglobin < 8 g/dL

0-2

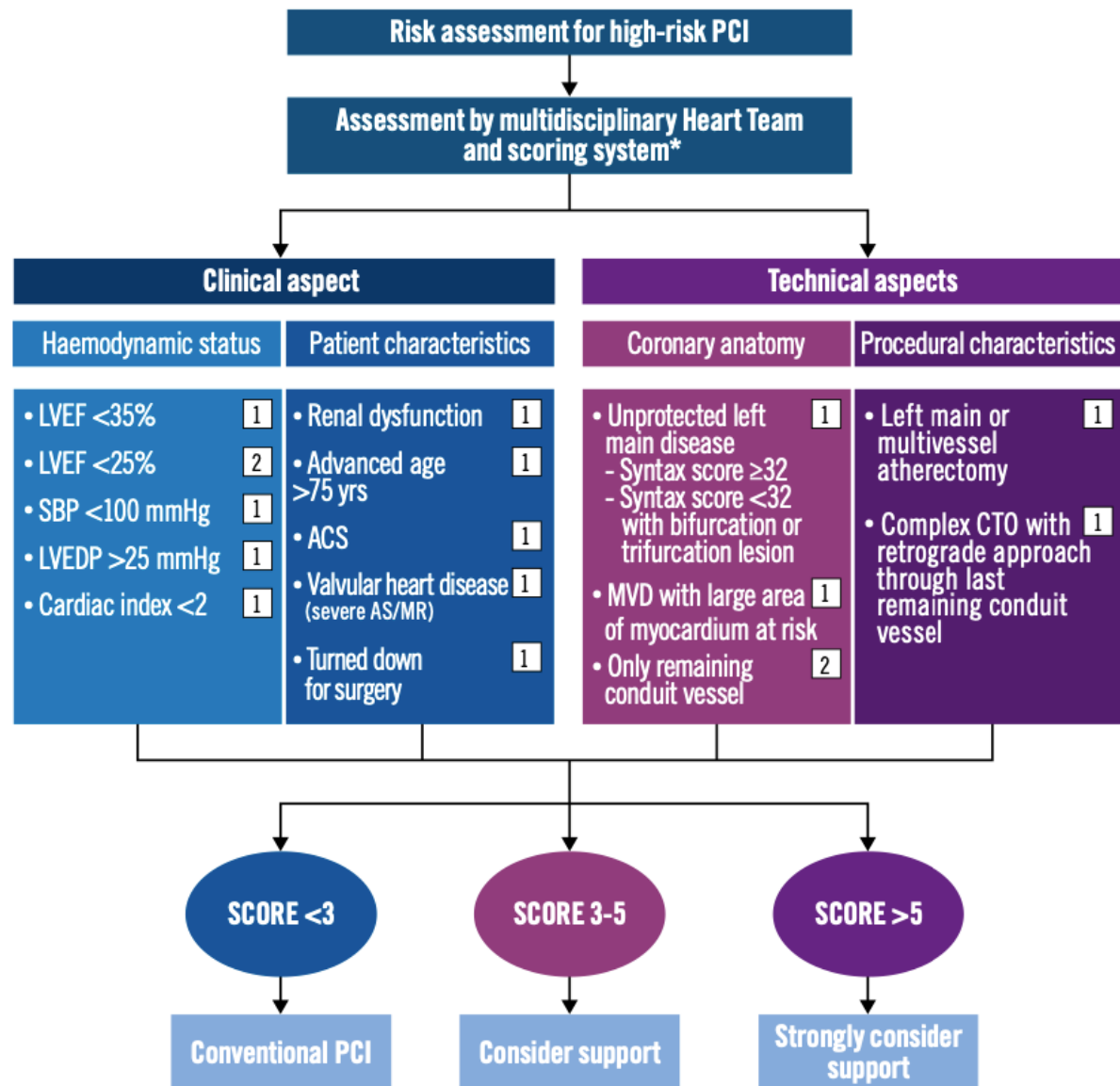
**UNLIKELY TO  
NEED SUPPORT**

3

**CONSIDER  
SUPPORT**

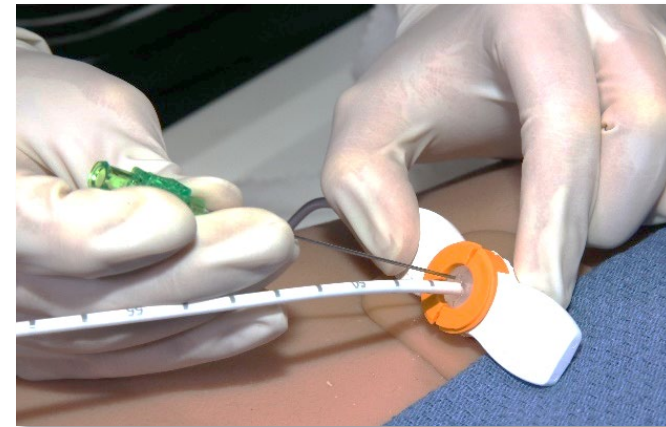
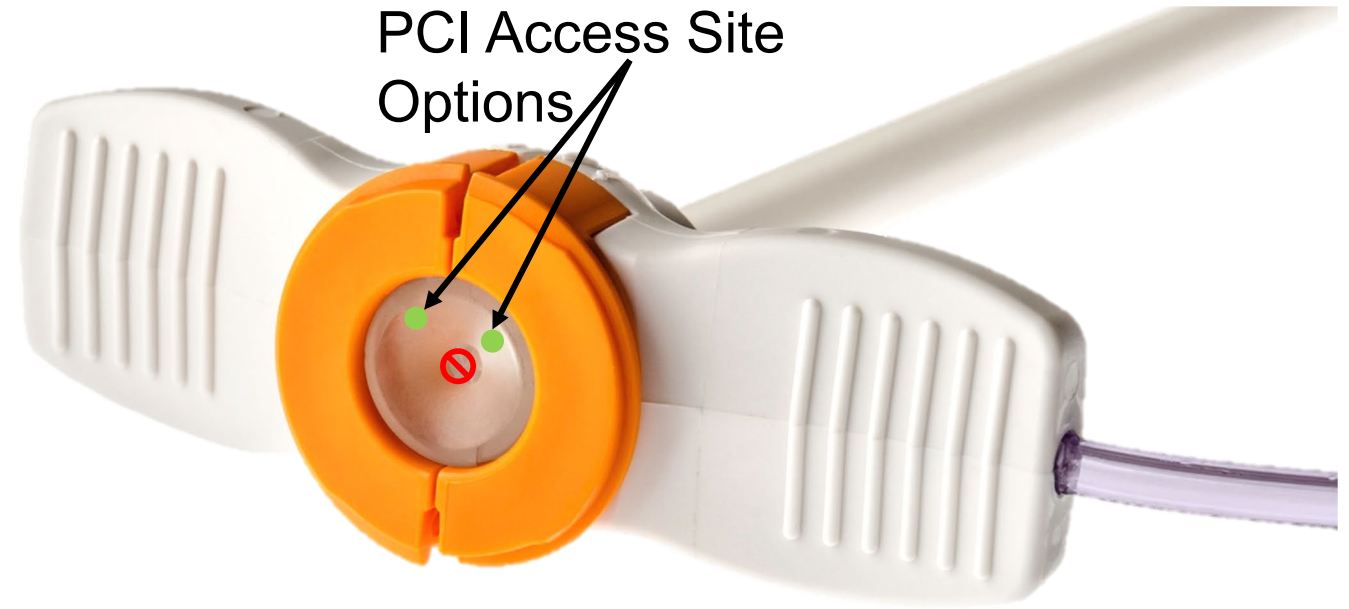
≥4

**STRONGLY  
CONSIDER  
SUPPORT**



# Single Access Technique

- Initial arterial access gained for placement of 14F Impella CP sheath<sup>∞</sup> (long or short)
- PCI access\* gained through diaphragm of Impella sheath, using 18G access needle<sup>‡</sup>, which allows for placement of 0.035 wire
- Avoid center of diaphragm where Impella catheter goes through, or bleeding could occur



<sup>∞</sup>Catalog numbers: 0052-3056, 0052-3057, 0052-3058

\*With single access, secondary access is no longer an option for management of complications

<sup>‡</sup>Can also use 21G micropuncture needle and wire to gain access



# Starting a CHIP program

- **You will be taking care of the highest risk population**
  - Expect complications
  - Learn how to recognize and manage
- **Cognitive skills can be learned in a structured fashion**
- **Do not take shortcuts – Implement protocols**
  - Use intravascular imaging
  - Best practices for vascular access
- **Systematic “Heart Team” approach for individualized care**
- **Patient centered care**
  - Determine expectations
  - Discuss risks





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**Every life deserves world class care.**

