

Composition, structure, and function of heart teams

A joint position paper of the ACVC, EAPCI, EACTS and EACTA focused on the management of patients with complex coronary artery disease requiring myocardial revascularization.

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Supplementary Appendix

A. Questions & Answers

1. Timing of decision in a patient with stabilized NSTEMI

Q1. Jeff is a 63-year-old diabetic patient without history of heart problems. He is admitted for a suspected NSTEMI (a single self-resolving episode of chest pressure 6 hours before admission, a troponin elevation of 3 times the local URL and no ST-segment changes). No recurrent symptoms after admission. He is started on aspirin and fondaparinux and a coronary angiography is planned. Jeff has an active life without major comorbidities. Transthoracic echocardiography documents a left ventricular ejection fraction of 35% with no clear segmental akinesia or scarring and no advanced remodeling (indexed end diastolic volume 90 ml/m²). When consenting for coronary angiography, Jeff indicates a preference to do the less invasive PCI rather than surgery, but he does not exclude CABG *a priori*. Coronary angiography documents severe three-vessel CAD with good distal conduits and no clear culprit lesion. The SYNTAX score is 28. The interventional cardiologist says that PCI is feasible and would like to proceed and administer a loading dose of P2Y₁₂ inhibitor. What should you do?

A1. This patient has a strong indication for CABG due to LV systolic dysfunction with presumably viable myocardium, complex CAD and concomitant diabetes. The STS score has not been calculated but surgical risk is likely low. Even if the patient expressed a preference, PCI is not urgent due to lack of culprit and clinical stability. This patient should be brought back to his bed, discussed timely within HT and – if no clear contraindications emerge – proposed CABG as treatment option.

2. Appropriate Heart Team Indication

Q2. Chantal is a 83-year old patient living in a hospice. She is admitted for new onset angina at rest 2 days ago. The history is hard to assess carefully as she starts to have first signs of dementia and there are no other family members but you learn from the Hospice staff that she is being given aspirin, has quite limited functional capacity and a recent suspicion of colorectal cancer (she is awaiting the results of the biopsies of colorectal clinical polyps next week). The first test labs documented normal renal function, a normal hemoglobin and an elevation of 10 times the local URL of troponin. The echocardiogram is unremarkable with good left ventricular systolic function so you decide to perform a coronary angiography the next day. No recurrent symptoms or ECG changes after admission. The angiography shows a significant 3-vessel disease involving the proximal LAD, which is amenable for PCI.

Does Chantal require an assesement by the heart team?

A2. While Chantal is a patient with a stabilized NSTEMI, she is unlikely a good surgical candidate for the advanced age, initial dementia, limited functional capacity, and suspected cancer. Therefore it is reasonable to proceed to ad *hoc* PCI without heart team consultation. Alternatively, medical therapy only might be considered as initial step, considering the possibility of increased bleeding risk. This decision should be shared with the patient (to the extent that is possible) and her caregivers and also based on the possibility to optimize medications and lifestyle based on her prior pharmacological therapy. Patients like these should be reported as exception in the written institutional protocol and thus excluded from quality initiatives on optimal heart team implementation.

3. Management of Disagreements

Q3. You are the clinical cardiologist of Chris, a 67 year-old patient admitted to your hospital for an elective coronary angiography for suspected exertional angina in the last 3 months. Chris is already receiving 10 mg of rosuvastatin, aspirin in primary prevention and 5 mg bisoprolol. He had a high pre-test probability of CAD with typical symptoms of myocardial ischemia and no functional assessment (stress ECG or imaging) was performed before admission. After angiography, the interventional cardiologist report a stenosis of 50% in the proximal LAD, a long 80% disease in the mid tract of a dominant RCA and a 90% discrete lesion in the proximal tract of a quite large obtuse marginal. The cardiac surgeon says Chris is a good surgical candidate for his 3-vessel CAD, he thinks the LAD lesion is actually worse than what the interventional cardiologist report and would like to propose CABG but the interventional cardiologist disagrees.

How should you manage this situation ?

A3. While Chris' symptoms are likely due to myocardial ischemia, he has multivessel CAD and no documented location of ischemia. He is already on adequate medical therapy. So myocardial revascularization appears indicated. In this situation an invasive functional assessment of coronary ischemia should be considered. If the LAD lesion is functionally significant (eg. FFR < 0.80), CABG or PCI may be further discussed while if LAD is non significant, PCI is most likely preferable.

In general, when there is disagreement on subjective data (ie visual degree of coronary stenosis) objective quantification may be helpful to find a consensus and guide treatment options.

B. Data elements to systematically consider in patients with complex and stable (or stabilized) CAD considered for myocardial revascularization

Clinical Patient Profile

Diabetes?	YES	NO
High Bleeding Risk contraindicating adequate DAPT duration? ¹	YES	NO
Cerebrovascular Disease (eg. stroke, TIA)?	YES	NO

Severity of Coronary Lesions

Anatomical assessment (ie SYNTAX score) performed? <i>If YES, provide value= XX</i>	YES	NO
Functional assessment performed?	YES	NO
Estimated Surgical Mortality ² (Preferably use STS score).		
30 day Mortality	: _____	
30 day Morbidity or Mortality	: _____	
Risk of sternal wound infection	: _____ ³	

Are there other relevant comorbidity or conditions not included in risk score such as dementia, frailty?	YES	NO
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If YES, please specify _____

Left Ventricular Systolic Function

Assessment Performed ?	YES	NO
If YES: What type of imaging was used?		
cMRI	SPECT	Echo
		LV Angiography

Is viability testing clinically required? ⁴	YES	NO
IF PCI, is the revascularization anticipated to be anatomically complete (eg. residual SYNTAX score < 8)?	YES	NO
If CABG, is the revascularization anticipated to be anatomically complete (eg. residual SYNTAX score < 8)?	YES	NO
If CABG, is radial artery grafting anticipated?	YES	NO
If NOT, please explain ____		

Treatment Decision Recommended by the Team:

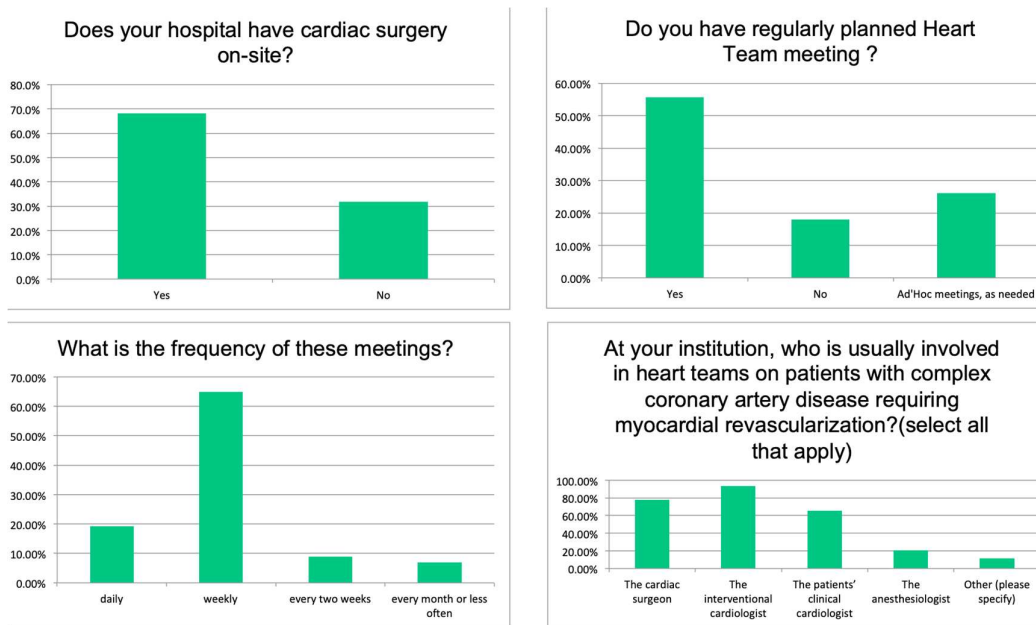
1. CABG 2. PCI 3. Medical Therapy Only (NO revascularization)

Comments:

1: eg. a PRECISE-DAPT score of ≥ 25
 2: Guidance for (30-day) mortality interpretation STS: low, intermediate, high risk.
 3: If the risk is low, bilateral arterial grafting may be considered.
 4: Viability testing may be required in case of severe systolic dysfunction or suspected non viable myocardium (Q waves in multiple leads on ECG; scarring by conventional imaging, such thin myocardium, increased echogenicity)

B. e-Figure and e-Table

Survey on Heart Team Implementation in European Countries



1096 responders.

e-Table. American Society of Anesthesiologists physical status classification system*

ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), well-controlled DM/HTN, mild lung disease
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (<3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis
ASA V	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

From <https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system> (last access on 27th February 2019)

* Last approved by the ASA House of Delegates on October 15, 2014

** The addition of “E” denotes Emergency surgery (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part)

E. Supplementary Sections

Definition of Complex CAD

According to the 2018 ESC/EACTS guidelines on myocardial revascularization,¹ an epicardial lesion is considered angiographically significant if $\geq 50\%$. These lesions are considered intermediate-grade stenosis if $\geq 50\%$ but $\leq 90\%$ and haemodynamically significant if $> 90\%$ by visual assessment.¹ Complex CAD involve at least one of three anatomical settings (as assessed visually by coronary angiography in the “worst view” angiographic projection): i) a significant ($\geq 50\%$) involvement of the proximal left anterior descending artery, ii) a left main stenosis $\geq 50\%$, and iii) three vessel disease ($\geq 50\%$ in the three epicardial coronary arteries). In the last two settings the calculation of the SYNTAX score is recommended and should be routinely performed (*Class I, LoE B*).¹ In case of intermediate-grade stenosis in epicardial locations, a functional assessment (fractional flow reserve or instantaneous wave-free ratio) should be considered (*Class I, LoE B*).

Utility and limitations of current risk scores to estimate surgical risk in patients undergoing CABG

A systematic review identified over 50 prediction models that have been developed to predict the short-term mortality after CABG, but many have been criticized for methodological issues including inappropriate sample sizes and lack of external validation. The most widely used models are the *European System for Cardiac Operative Risk Evaluation* [EuroSCORE II] and the *Society for Thoracic Surgeons 2008 Cardiac Surgery Risk Models* [STS] score. Both are multivariable models that have been derived and comprehensively validated. Meta-analyses demonstrated that, in general, both scores seem to perform similarly. Some studies have raised concerns that the EuroSCORE II overestimates mortality (in particular in patients with the lowest and the highest risks and for non-elective surgery). Calculation of the STS score requires a more detailed data entry. In contrast to the EuroSCORE II, the STS score does not only predict mortality, but calculates also risks for renal failure, stroke, prolonged ventilation and length of stay, reoperation, deep sternal wound infection and a composite of morbidity and mortality providing a more comprehensive risk assessment. Moreover it is regularly recalibrated. For all these reasons the STS score is currently recommended over the EuroScore II by the ESC/EACTS guidelines (*Class I LoE B STS; Class IIb LoE B for EuroSCORE II*).