TCTAP Pre-workshop Course - III. Complex PCI I

Choosing Left Main Treatment and Predicting Outcomes Using Clinical, Anatomic or New Scores

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Disclosure of financial interest

Within the past 12 months, I, **Davide Capodanno**, have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial relationship	Company
• **Speakers' honoraria**	Abbott Vascular, Aspen, AstraZeneca, Bayer, Cordis, Daiichi Sankyo, Eli-Lilly
• **Consulting**	Abbott Vascular, Stentys
• **Advisory Board**	AstraZeneca

ESC Guidelines for Left Main Disease

Recommendation for the type of revascularization in patients with LM stable CAD, suitable coronary anatomy for both procedures and low predicted surgical mortality

	PCI		CABG	
Left main disease with a SYNTAX score ≤22	I	B	I	B
Left main disease with a SYNTAX score 22-32	IIa	B	I	B
Left main disease with a SYNTAX score >32	III	B	I	B

Supporting references

1. Mohr et al. Lancet 2013;381:629–38. (SYNTAX trial 5 year)
2. Capodanno et al, JACC 2011;58:1426-32 (Meta-analysis of RCT)
3. Bittl et al. Circulation. 2013;127:2177-2185 (Bayesian and network meta-analysis of RCT and OSs)

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Windecker S., et al. Eur Heart J. 2014;35:2541-619

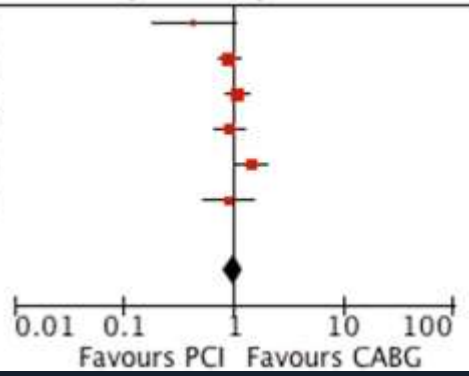
PCI vs CABG for Left Main Disease

Updated 5-year outcomes meta-analysis of 2 RCTs (SYNTAX, PRECOMBAT) and 4 adjusted observational studies encompassing 7,840 patients

5-Year Death/MI/Stroke

Study or Subgroup	log[Hazard Ratio]	SE	PCI Total	CABG Total	Weight	Hazard Ratio IV, Random, 95% CI	Year
Chieffo et al	-0.844	0.444	107	142	5.0%	0.43 [0.18, 1.03]	2004
ASAN	-0.105	0.121	1547	1495	23.9%	0.90 [0.71, 1.14]	2005
MAIN-COMPARE	0.068	0.125	1102	1138	23.4%	1.07 [0.84, 1.37]	2006
SYNTAX	-0.094	0.171	357	348	18.3%	0.91 [0.65, 1.27]	2007
CREDO-KYOTO-2	0.392	0.166	364	640	18.8%	1.48 [1.07, 2.05]	2008
PRECOMBAT	-0.117	0.274	300	300	10.6%	0.89 [0.52, 1.52]	2009
Total (95% CI)			**3777**	**4063**	**100.0%**	**0.99 [0.80, 1.23]**	

Heterogeneity: $Tau^2 = 0.03$; $Chi^2 = 10.70$, df = 5 (P = 0.06); $I^2 = 53\%$
Test for overall effect: Z = 0.07 (P = 0.95)



Outcome	OR (PCI:CABG)	Outcome	OR (PCI:CABG)
Death	1.02 (0.88-1.18)	**Stroke**	1.35 (0.65-2.80)
Myocardial infarction	0.59 (0.29-1.17)	**Revascularization**	**3.06 (2.12-4.41)**

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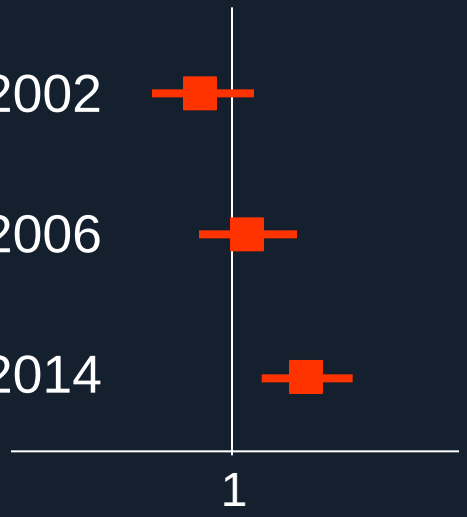
Gargiulo G, Capodanno D. Int J Cardiol. 2015;195:79-81

Trends in Outcomes of Left Main PCI

2,618 patients with ULMCA stenosis undergoing revascularization by PCI or CABG at the ASAN Medical Center (South Korea)

Death/MI/Stroke



		HR (95% CI)	P value
BMS era	1995-2002	0.70 (0.42-1.17)	NS
Early DES era	2003-2006	1.18 (0.71-1.98)	NS
Late DES era	2007-2014	**2.09 (1.27-3.44)**	**<0.05**

CABG better **PCI better**

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Park SJ, et al. Circ Cardiovasc Interv. 2015 Mar;8(3):e001846

EXCEL and NOBLE (TCT 2016)

	SYNTAX	EXCEL	NOBLE
All-comers	Yes	No	No
Left main patients	705	1,905	1,200
SYNTAX score	Any	≤32	Low
Primary endpoint	MACE	Death/MI/CVA	MACE
Follow up	1 year	3 year	2 year
IVUS	Infrequent	Recommended	Recommended
FFR guidance	Infrequent	Recommended	Recommended
Stent	PES	EES	BES recommended
Angiographic FU	At discretion	Not recommended	Not recommended

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Campos CM, et al. EuroIntervention. 2015;11:V115-9 (Adapted)

While we wait for EXCEL and NOBLE…

HOW SHOULD WE SELECT LM PATIENTS FOR PCI OR CABG?

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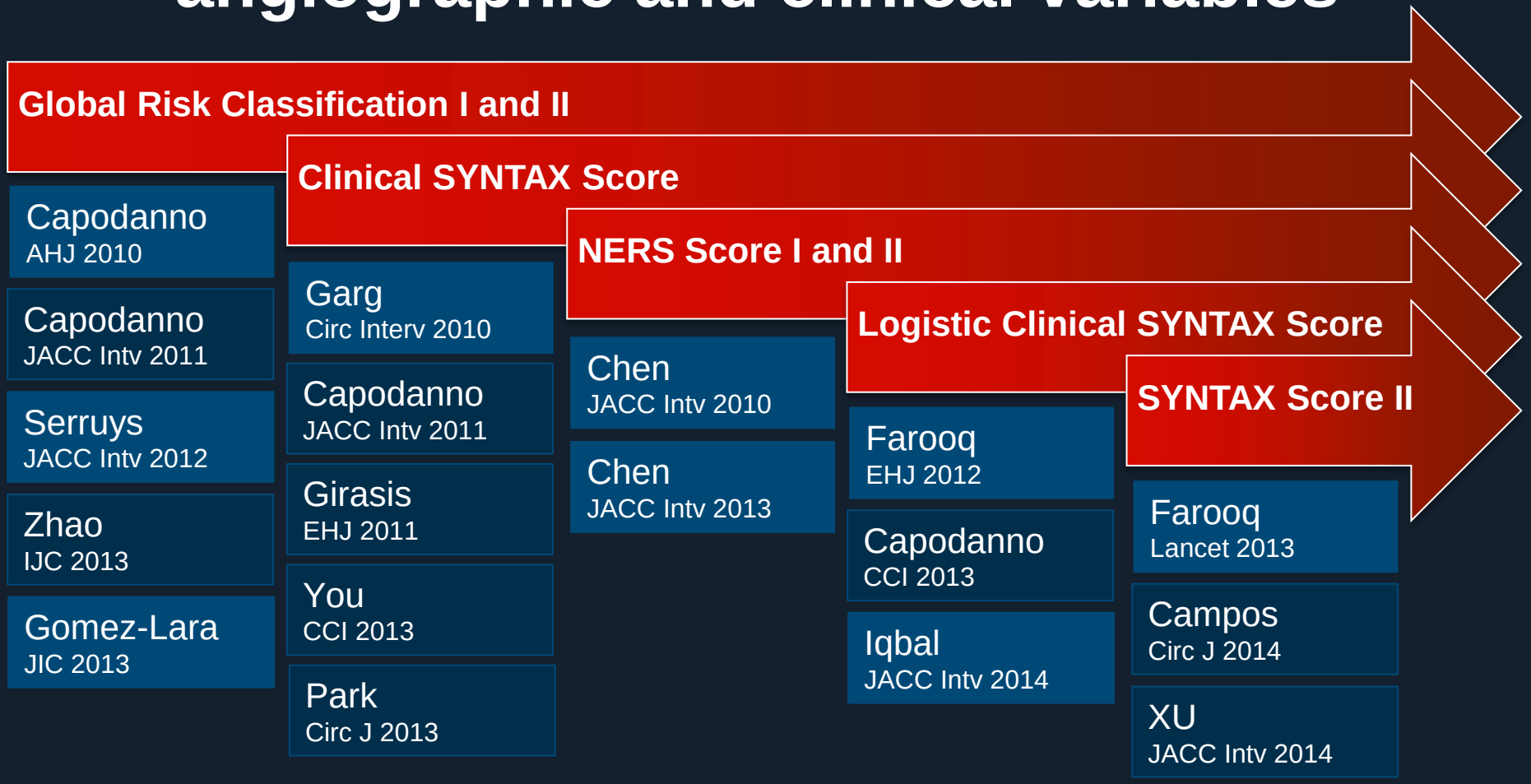
Evolution of risk models encompassing angiographic and clinical variables



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Capodanno D. Personal communication

Risk models to assess ≥1 year outcomes

Score	Development	Outcome	Recommendation	
			CABG	PCI
SYNTAX score	None, consensus	MACCE	I B	I B
SYNTAX score 2	1,800 Multicentre	4-Y mortality	IIa B	IIa B
ASCERT CABG	174,506 Multicentre	>2-Y mortality	IIa B	
ASCERT PCI	206,081 Multicentre	>1-Y mortality		IIa B
Logistic Clinical SYNTAX score	6,508 Multicentre	1-Y MACE and mortality		IIa B

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Windecker S., et al. Eur Heart J. 2014;35:2541-619

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SYNTAX Score And SYNTAX Score 2 In Confrontation With Everyday Clinical Pratice

ARE THEY WORKABLE TOOLS?

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Workability: SYNTAX Score

Left Main

- Segment 5 — 10 points
- Segment 6 — 7 points
- Segment 11 — 3 points
- Medina 1,1,1 — 2 points
- Heavy Calcification — 1 point

Obtuse Marginal

- Segment 12a — 2 points
- Severe Tortuosity — 2 points

Right Coronary Artery

- Segment 2 — 2 points
- Length >20 mm — 1 points

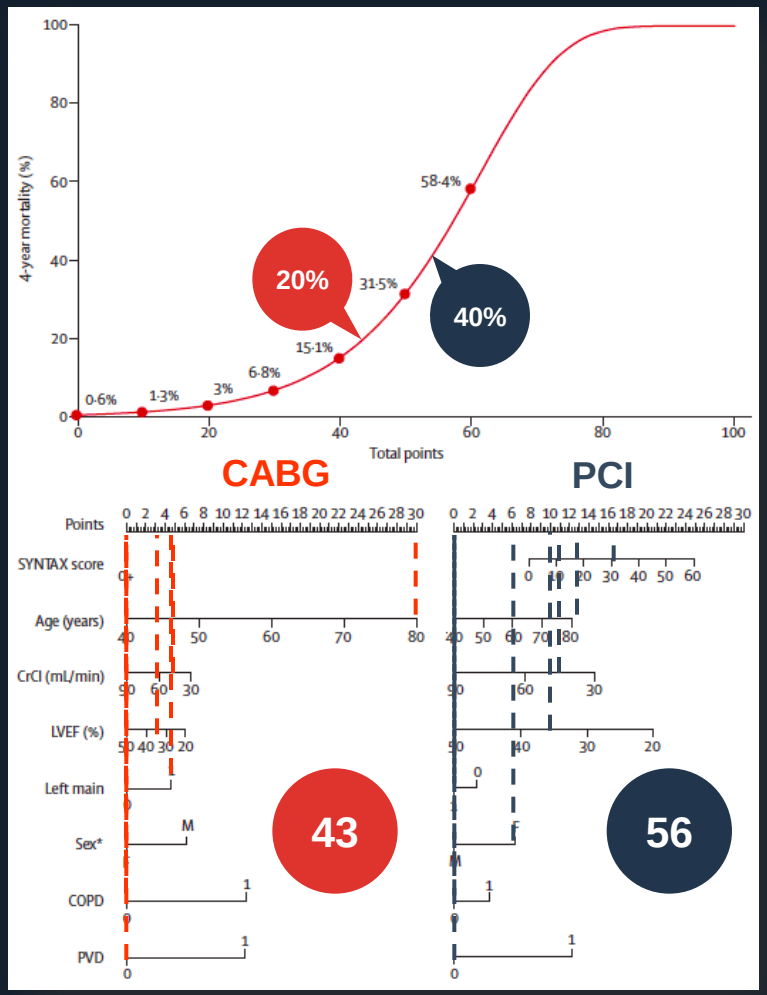
SYNTAX Score

31

Limitations

- ★ Site vs core-lab disagreement
- ★ Significant variability
- ★ Cannot be calculated by a smartphone app

Workability: SYNTAX Score 2



Limitations

- ★ Unfriendly (no website or app)
- ★ Requires twice calculation
- ★ The “nomogram and curve” system generates inaccuracy and inconsistency
- ★ Does not account for frailty or achievable complete revascularization (cannot overrule heart team discussion)

SYNTAX Score And SYNTAX Score 2 In Confrontation With Everyday Clinical Pratice

ARE THEY USEFUL TOOLS?

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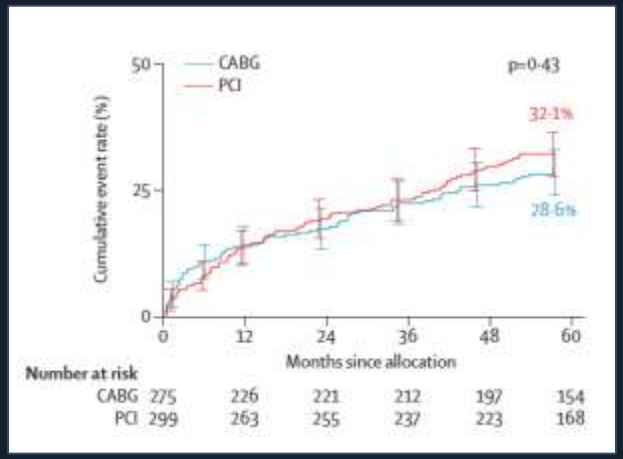
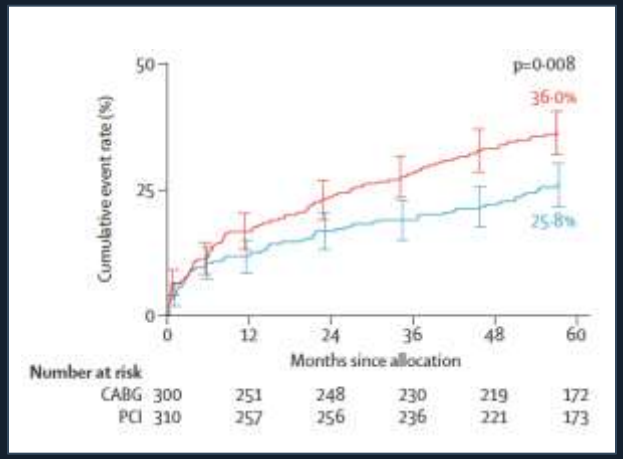
Effectiveness: SYNTAX Score

- Acts as an independent predictor of long-term MACCE in patients treated with **PCI** but not **CABG.**
- Facilitates the selection of optimal treatment by identifying patients at highest risk of adverse events following **PCI**.

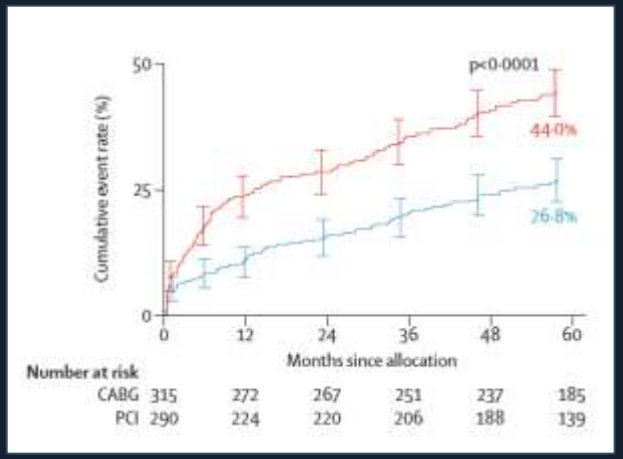
0-22



23-32



≥33



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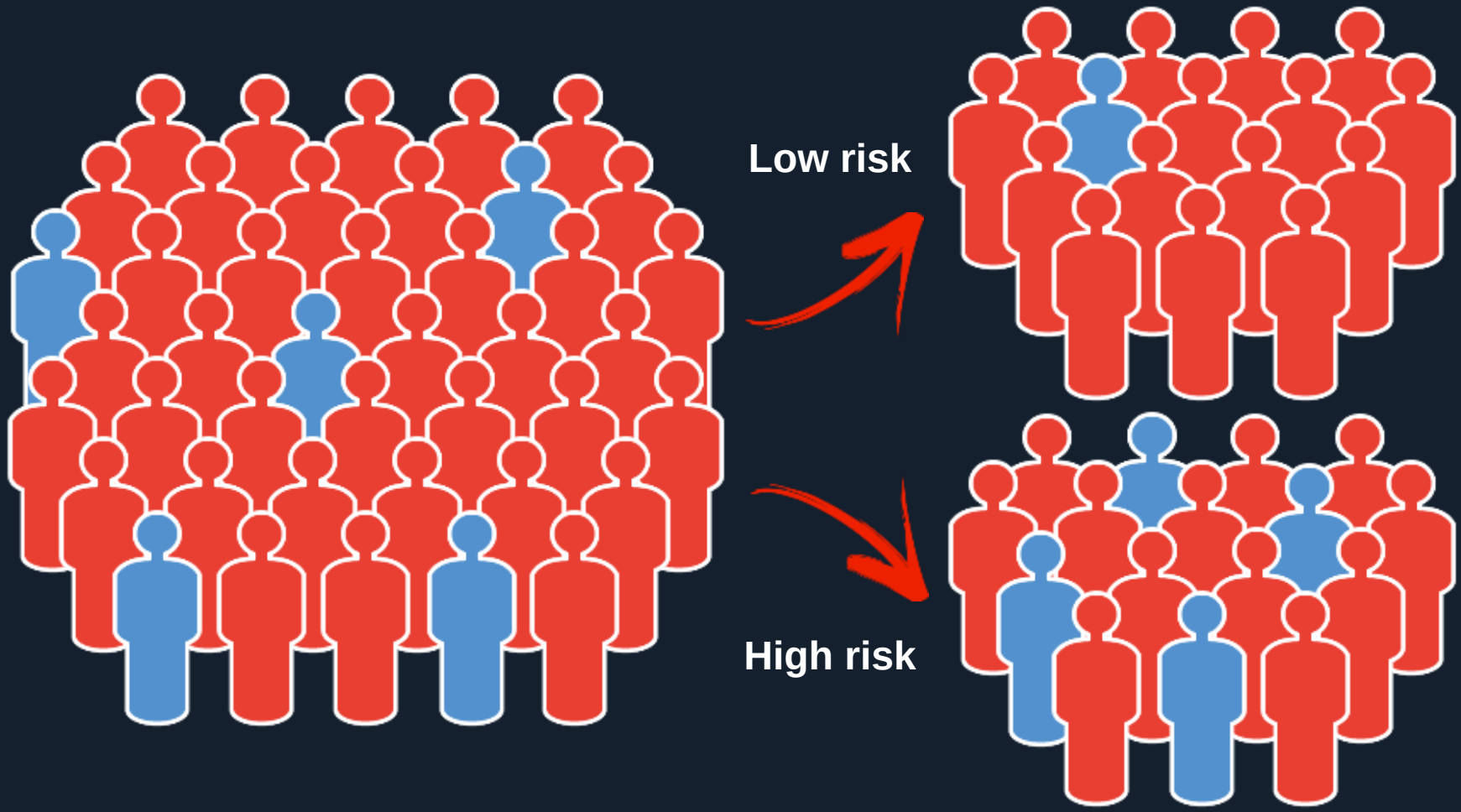
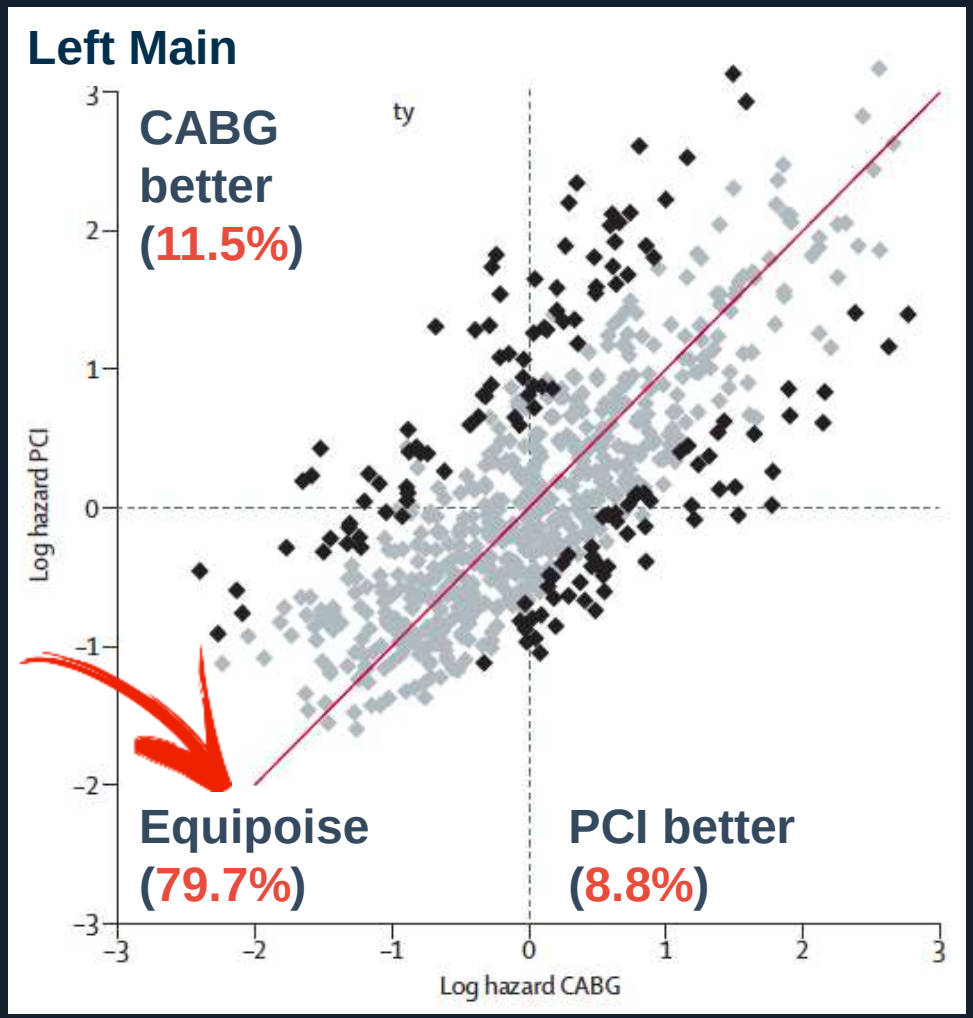
Mohr FW, et al. Lancet. 2013;381:629-38

Categorization is simplistic



Effectiveness: SYNTAX Score 2



In the SYNTAX trial

Favored CABG in 50.1%
(**11.5%** > 95% CI)

Favored PCI in 49.9%
(**8.8%** > 95% CI)

Equipoise in **79.7%**

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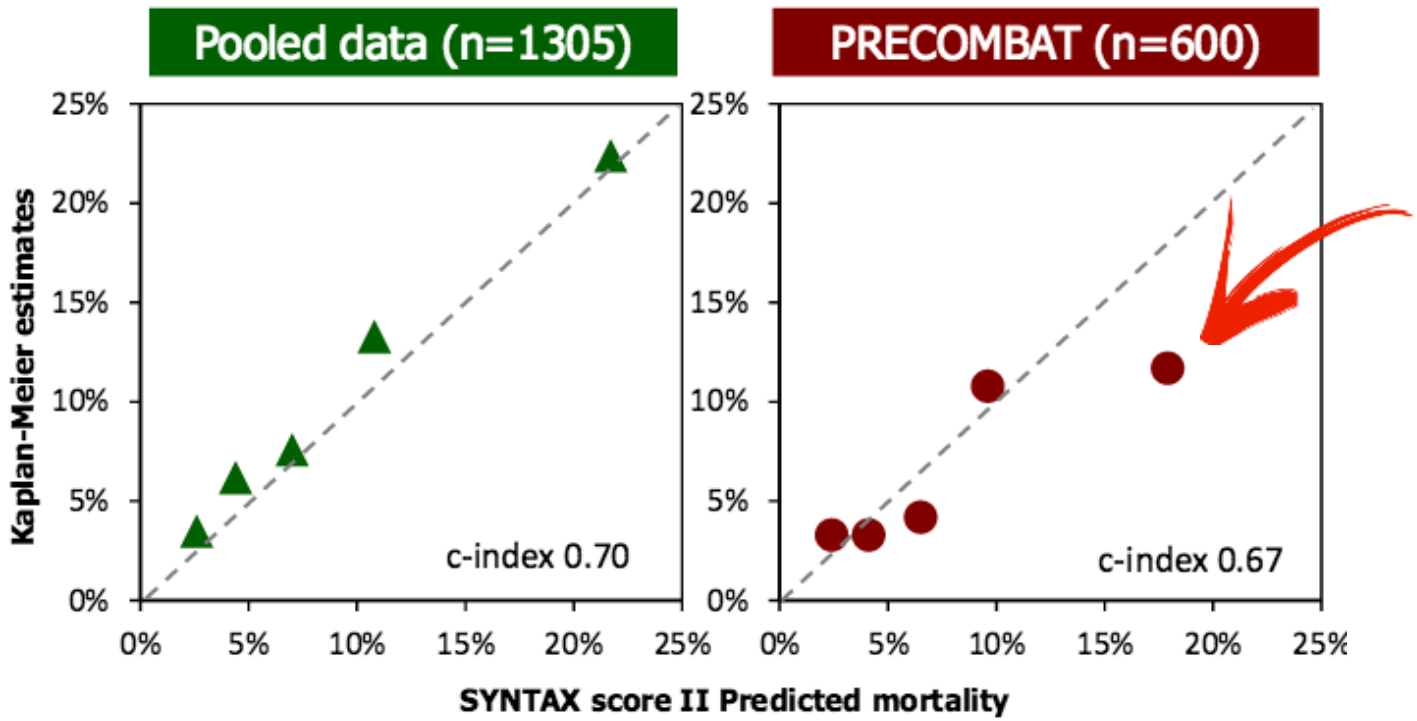
Farooq V, et al. Lancet. 2013;381:639-50

SYNTAX Score 2 in Clinical Trials

Validation of the SYNTAX score 2 in SYNTAX and PRECOMBAT



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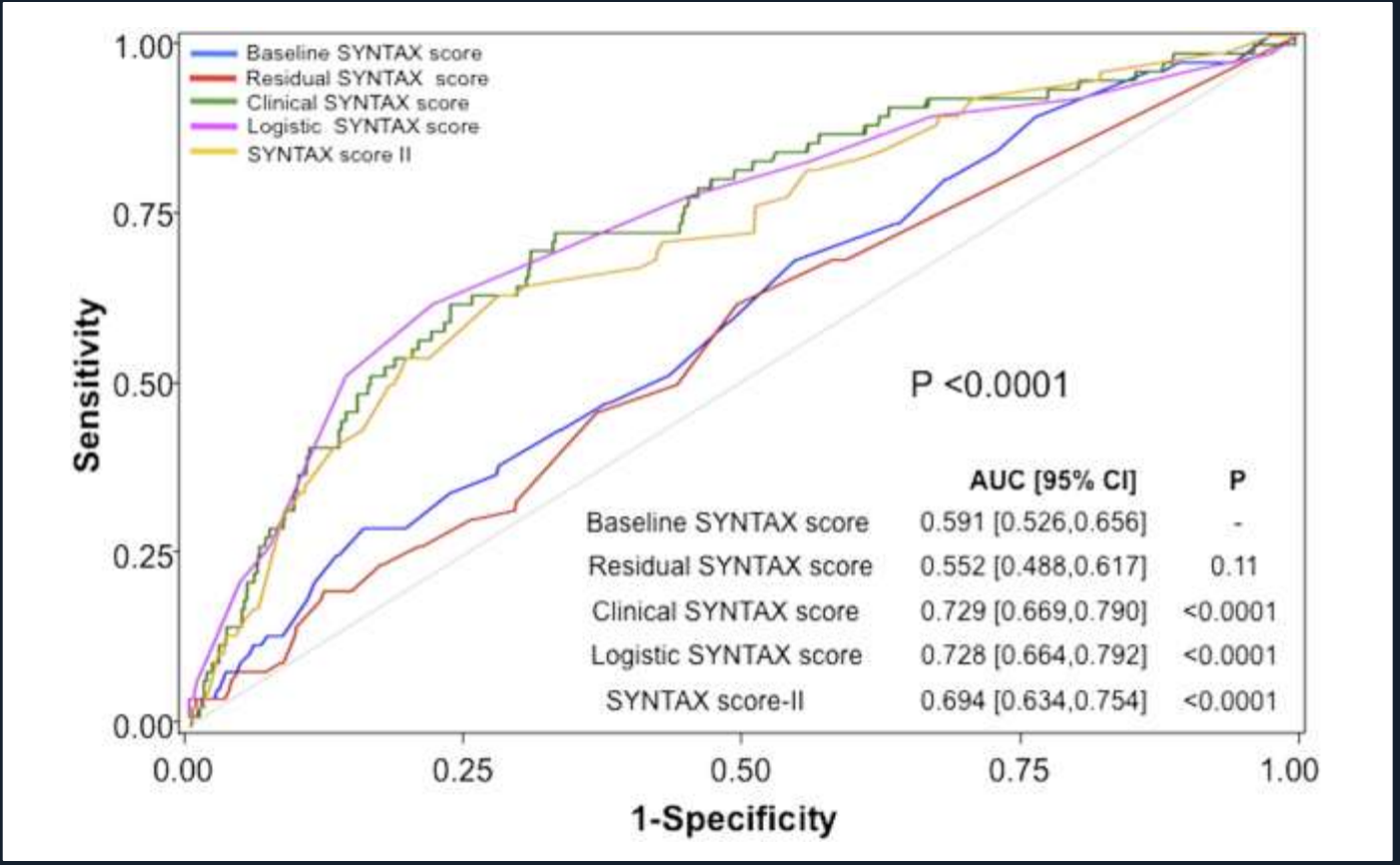
Serruys PW, TCT 2015. San Francisco

SYNTAX Score 2 in Daily Practice

1,528 consecutive patients from a single, high-volume Chinese center undergoing unprotected left main PCI



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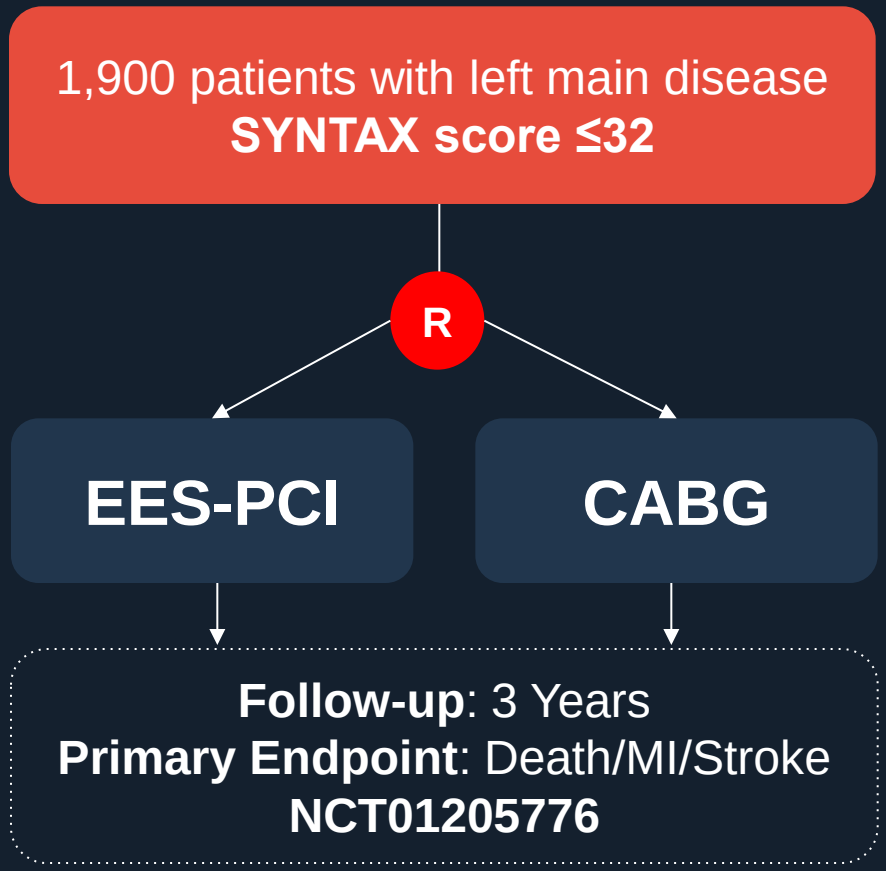
Xu B, et al. JACC Cardiovasc Interv. 2014;7:1128-37

SYNTAX Score 2: is it useful?

1. The SYNTAX score 2 has been developed as a **decision-making tool** to evaluate risk prediction under not only one treatment, but two treatments.
2. In such circumstances, conventional performance metrics (i.e. discrimination, calibration) can be **inadequate** to understand whether the model is really useful of not.
3. Using the SYNTAX score 2 **retrospectively** does not provide meaningful insights into its utility for decision-making, simply because treatment decisions have been already taken in the past.

Is the prediction correct? EXCEL will tell

EXCEL Trial (TCT 2016)



Prospective validation of the SYNTAX score 2 is a pre-specified endpoint

4-Year Mortality*

PCI **8.5%** vs CABG **10.5%**

OR **0.79** (95% CI 0.43-1.50)

*Campos CM, et al. Eur Heart J. 2015;36:1231-41

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Other SYNTAX-based scores

Score	Components	Objective	ESC 2014*	
SYNTAX score	Anatomic (angiographic)	Assessment of the location, extent and complexity of coronary artery disease	I	B
Functional SYNTAX score	Anatomic + FFR	As SYNTAX score but based on hemodynamically significant lesions		
Residual SYNTAX score	SYNTAX score after PCI	A marker of completeness of revascularization by PCI		
CABG SYNTAX score	Residual SYNTAX score after CABG	A marker of completeness of revascularization by CABG		
SYNTAX Revascul. Index	1-[rSS/bSS])×100	A marker of the proportion of CAD burden treated by PCI		
Global Risk Score	SYNTAX score + EuroSCORE	To improve the predictive power of the SYNTAX score		
Clinical SYNTAX score	SYNTAX score * ACEF score	To improve the predictive power of the SYNTAX score		
Logistic Clinical SYNTAX score	SYNTAX score + ACEF Score	To improve the predictive power of the SYNTAX score	IIa	B
SYNTAX score II	SYNTAX score + clinical variables	Decision making for PCI vs. CABG	IIa	B

Adapted from Iqbal J, et al. JACC Cardiovasc Interv. 2014;7:464-70
***Windecker S, et al. Eur Heart J. 2014;35:2541-619**

Final Considerations

- Left main disease is the only lesion subset for which revascularization is unequivocally accepted as improving survival over medical therapy.
- Guidelines give theoretically the interventionalist ample allowance to treat the left main by PCI up to a total SYNTAX score of 32 (EXCEL will validate or reject this hypothesis)
- Is clinical decision by the SYNTAX score 2 ready for the prime time? I don't think so.
- **The most important question: How to integrate evidence base medicine and guidelines in confrontation with everyday practice when selecting revascularization options for left main disease?**

"In My Daily Practice"

Clinical decision making for stable left main disease at Ferrarotto Hospital, Catania, Italy

Isolated left main disease with lower anatomical complexity (i.e. ostium or shaft only, simple distal left main bifurcation)	**Ad hoc PCI**
Complex left main disease involving the bifurcation or left main in the context of multivessel disease	**Heart Team**
✦ Low risk patients with complete revascularization achievable, high risk surgical candidates, or patient preference after discussion or pros and cons	**Elective PCI**
✦ Complete revascularization achievable with PCI at the price of complex interventions and too many stents implanted	**CABG***

*Hybrid procedures in selected patients

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