



SYNTAX score before decision making!

Corrado Tamburino, MD, PhD

Full Professor of Cardiology, Director of Postgraduate School of Cardiology
Chief Cardiovascular Department, Director Cardiology Division, Interventional Cardiology and
Heart Failure Unit, University of Catania, Ferrarotto Hospital, Catania, Italy



Ferrarotto Hospital
University of Catania



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Integrating the Synergy between percutaneous coronary intervention with Taxus and Cardiac Surgery (SYNTAX) score into practice: Use, pitfalls, and new directions

Davide Capodanno, MD,^{a,b} and Corrado Tamburino, MD, PhD^{a,b} *Catania, Italy*

Risk stratification is key in optimizing care of patients undergoing percutaneous coronary intervention (PCI). Score algorithms, in particular, are useful prognostic tools to select the most appropriate strategy of treatment and help patients and their families to get a better understanding of issues relevant to treatment strategies and subsequent risks. Most scores tested in the setting of PCI focus on clinical variables. The SYNTAX score is a semiquantitative angiographic score developed to prospectively characterize the disease complexity of the coronary vasculature. This scoring system has recently been assessed in numerous cohorts of patients undergoing coronary revascularization by PCI or bypass surgery. When using the SYNTAX score, however, physicians are still challenged with a labor-intensive calculation and conflicting results from validation studies. Understanding how the SYNTAX score works, for which patients it works best, and whether it predicts accurately enough for its purpose is of paramount importance to get the maximum benefit from its application. The present article provides an overview of the background and the currently available evidences on the use of the SYNTAX score in patients undergoing coronary revascularization along with its limitations. (Am Heart J 2011;161:462-70.)



Why do we need risk stratification in complex coronary artery disease?

- **Diagnostic and prognostic models:**
 - **Drive informed clinical decisions** because they allow the selection of the most appropriate strategy of treatment based on the patient's individual characteristics
 - **Help patients and their families** to get a better understanding of issues relevant to treatment strategies and subsequent risks as part of the process to obtain informed consent
 - **Assist quality-of-care monitoring** and facilitate a fair comparison of procedures performed in different clinical scenarios
 - **Are valuable aids** for stratifying patients by disease severity in clinical trials

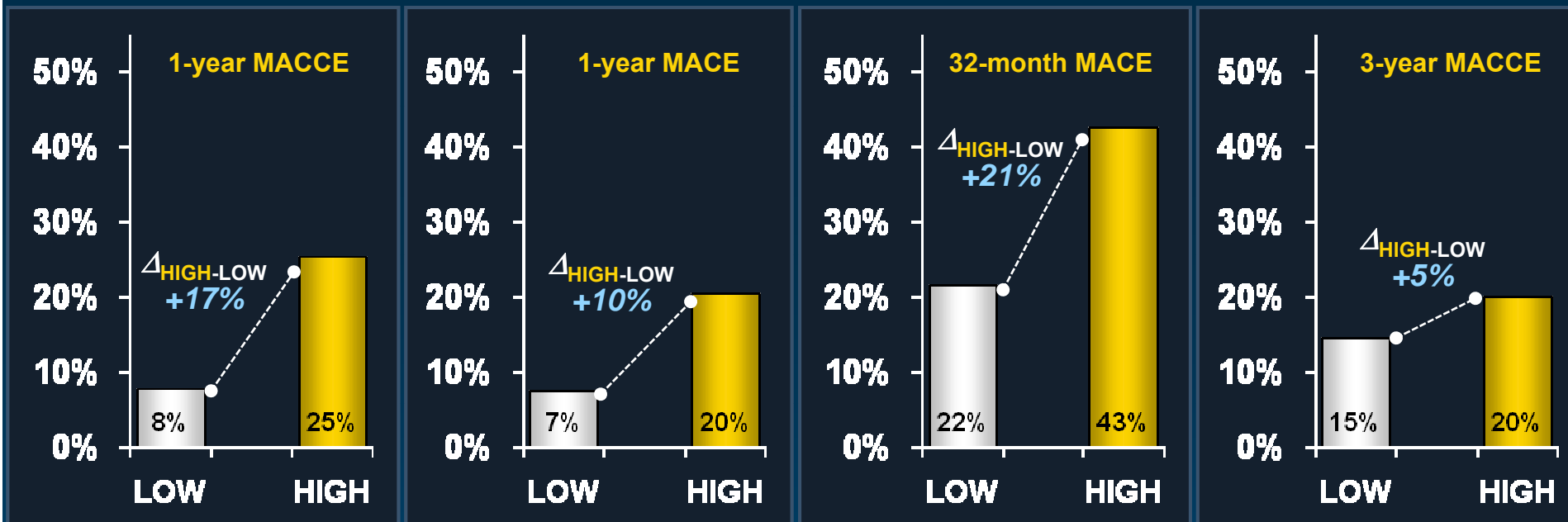


Currently used Clinical and Angiographic Scores in Left Main Disease

Score	Calculation	Number of variables used to calculate risk		Validated outcomes	Class ^a /level ^b		Ref. ^c
		Clinical	Angiographic		PCI	CABG	
EuroSCORE	www.euroscore.org/calc.html	17	0	Short- and long-term mortality	IIb B	I B	2, 3, 6
SYNTAX score	www.syntaxscore.com	0	II (per lesion)	Quantify coronary artery disease complexity	IIa B	III B	4
Mayo Clinic Risk Score	(7, 8)	7	0	MACE and procedural death	IIb C	III C	—
NCDR CathPCI	(5)	8	0	In-hospital mortality	IIb B	—	5
Parsonnet score	(9)	16	0	30-day mortality	—	III B	9
STS score ^d	http://209.220.160.181/STSWebRiskCalc261/	40	2	Operative mortality, stroke, renal failure, prolonged ventilation, deep sternal infection, re-operation, morbidity, length of stay <6 or >14 days	—	I B	10
ACEF score	[Age/ejection fraction (%)] + 1 (if creatinine >2 mg/dL)(11)	2	0	Mortality in elective CABG	—	IIb C	—



The SYNTAX score usefully discriminates MACE and MACCE between patients at low risk and those at high risk in patients undergoing left main PCI



SYNTAX
Circulation 2010

Capodanno et al.
Circ Card Interv 2009

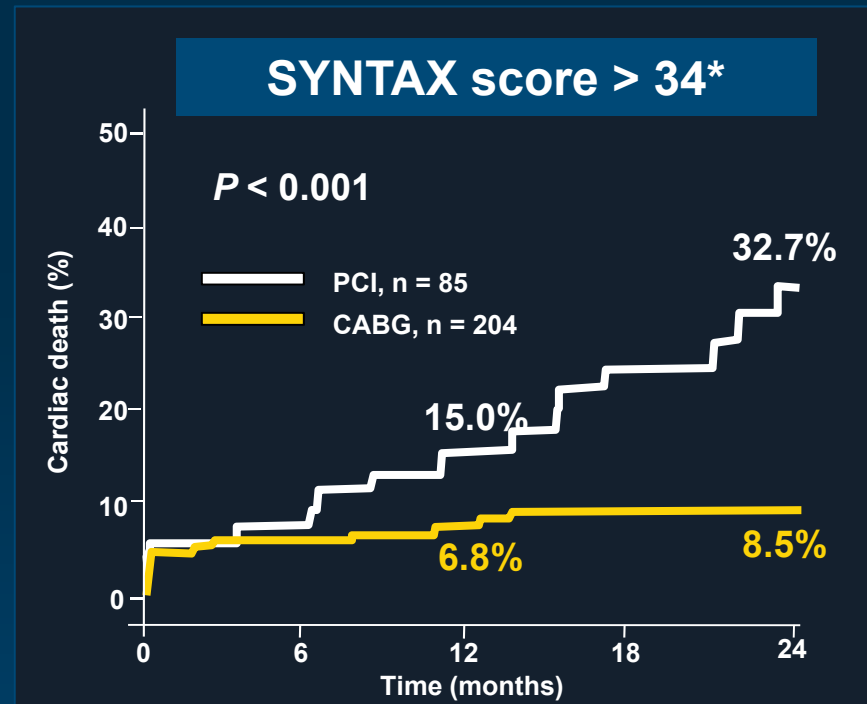
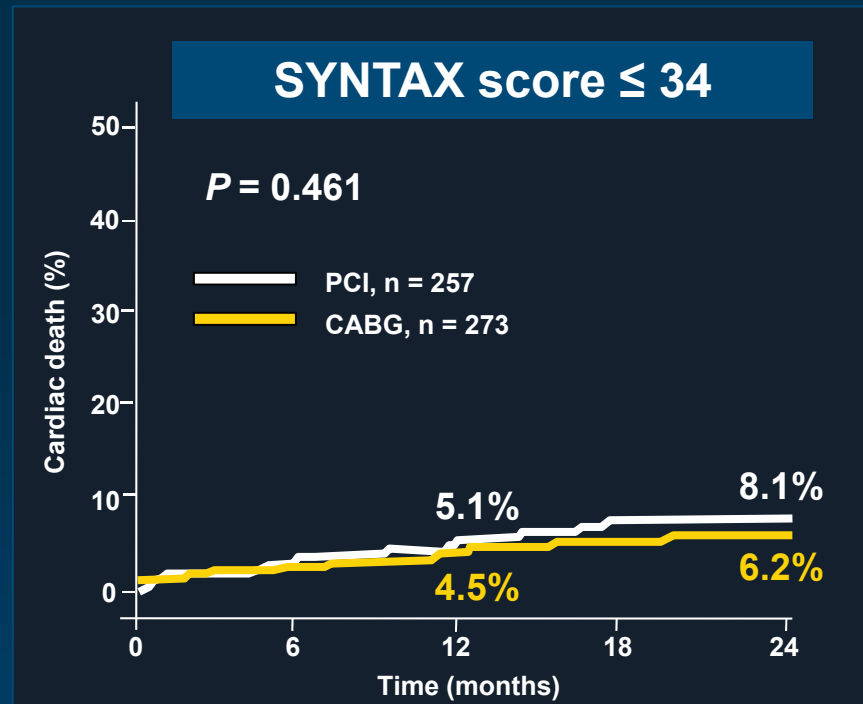
Brito et al.
EuroPCR 2010

MAIN COMPARE
JACC Interv 2010



Unadjusted 2-Year incidence of mortality stratified by SYNTAX score

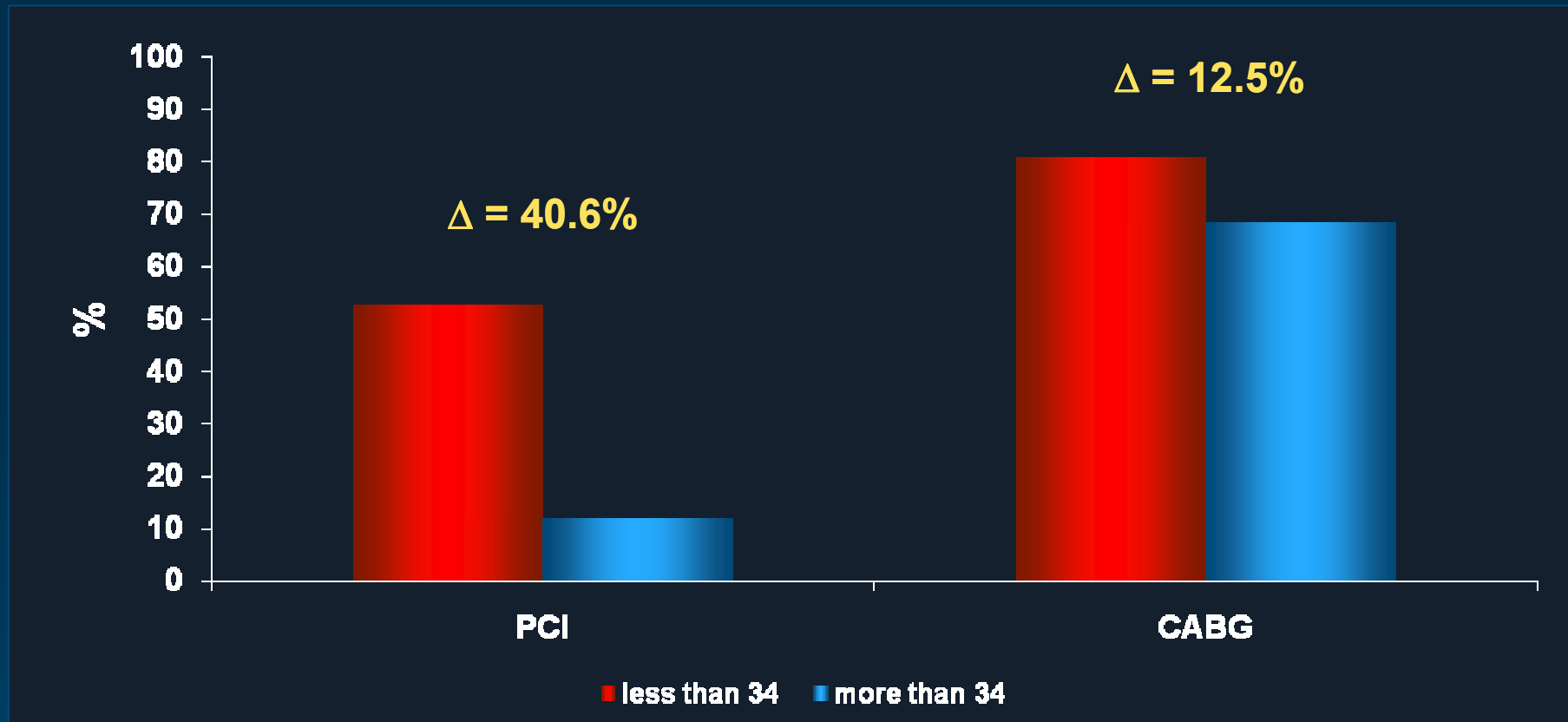
CUSTOMIZE Registry (n = 819)



*p for interaction between SYNTAX score >34 and treatment < 0.001 ; adjusted HR for SYNTAX score > 34 2.54 (95% CI 1.09-5.92), $p = 0.031$



Differences of complete revascularization rates per revascularization treatment *



* when forced into the Cox multivariable proportional hazard regression model, **complete revascularization** was found to be an independent predictor of lower mortality (HR 0.55, 95% CIs 0.31-0.98, p = 0.041), but this finding did not affect the prognostic significance of a SYNTAX score. Conversely, **treatment type** was no longer a significant predictor of mortality



Indications for CABG vs PCI in stable patients with lesions suitable for both procedures and low predicted surgical mortality

Subset of CAD by anatomy	Favours CABG	Favours PCI
1VD or 2VD – non proximal LAD	IIb C	I C
1VD or 2VD – proximal LAD	I A	IIa B
3VD simple lesions, full functional revascularization achievable with PCI, SYNTAX score ≤ 22	I A	IIa B
3VD complex lesions, incomplete revascularization achievable with PCI, SYNTAX score > 22	I A	III A
Left main (isolated or 1VD, ostium/shaft)	I A	IIa B
Left main (isolated or 1VD, bifurcation)	I A	IIb B
Left main + 2VD or 3VD, SYNTAX score ≤ 32	I A	IIb B
Left main + 2VD or 3VD, SYNTAX score ≥ 33	I A	III B

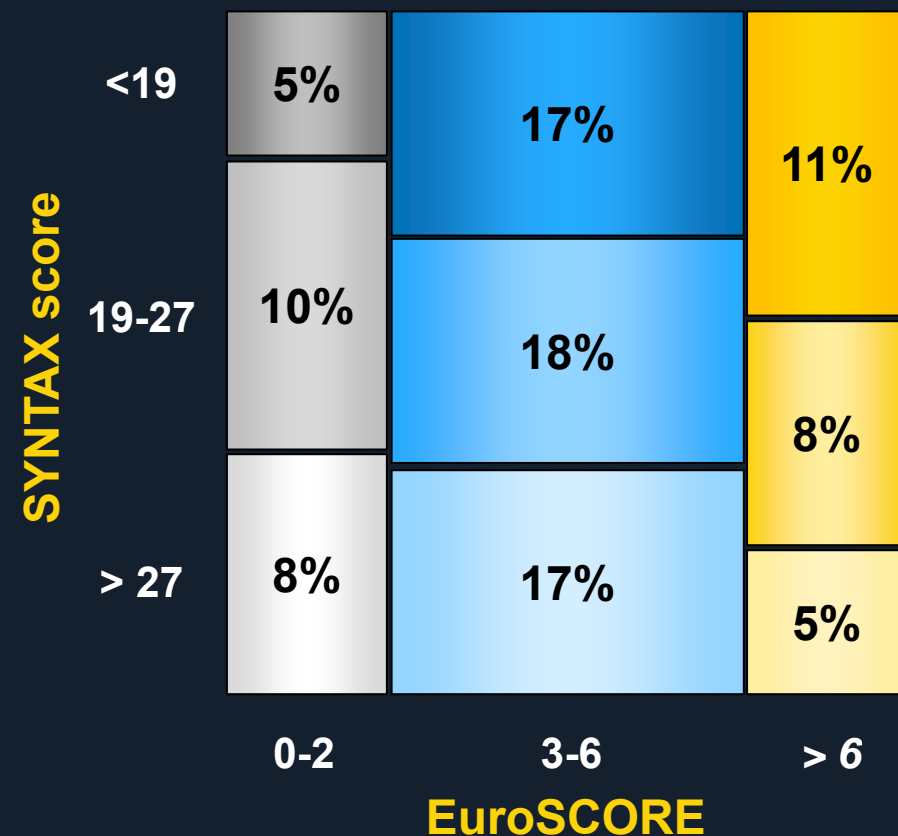


Pitfalls and issues relevant to SYNTAX score application in clinical practice

- **Does not include any subset of lesions** (i.e. in-stent restenosis, stenotic bypass grafts, coronary anomalies, muscular bridges, aneurysms)
- **Time-consuming**
- **Interobserver and intraobserver variability**
- **Does not account for clinical or procedural variables** that are known for impacting the outcomes during and after PCI



Why do we need both clinical and angiographic variables?



Clinical and angiographic scores summarize very different information in 255 patients with unprotected LM

Low Spearman rank correlation coefficient between SYNTAX score and EuroSCORE ($R_s=0.204$, $p = 0.001$)

The frequency of patients for each cross-tabulation cell is shown within a rectangle that is proportional in size to the frequency



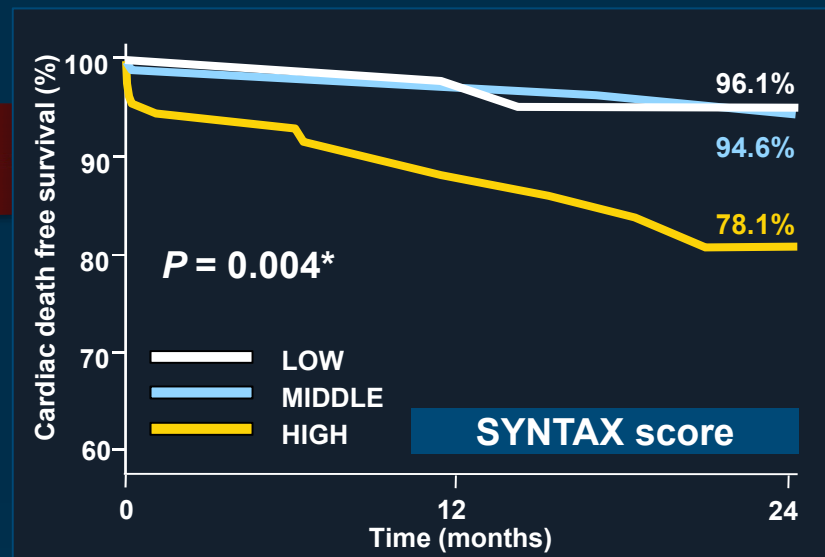
The Global Risk Classification (GRC)

5 %	17%	11 %
10 %	18%	8 %
8 %	17%	5 %

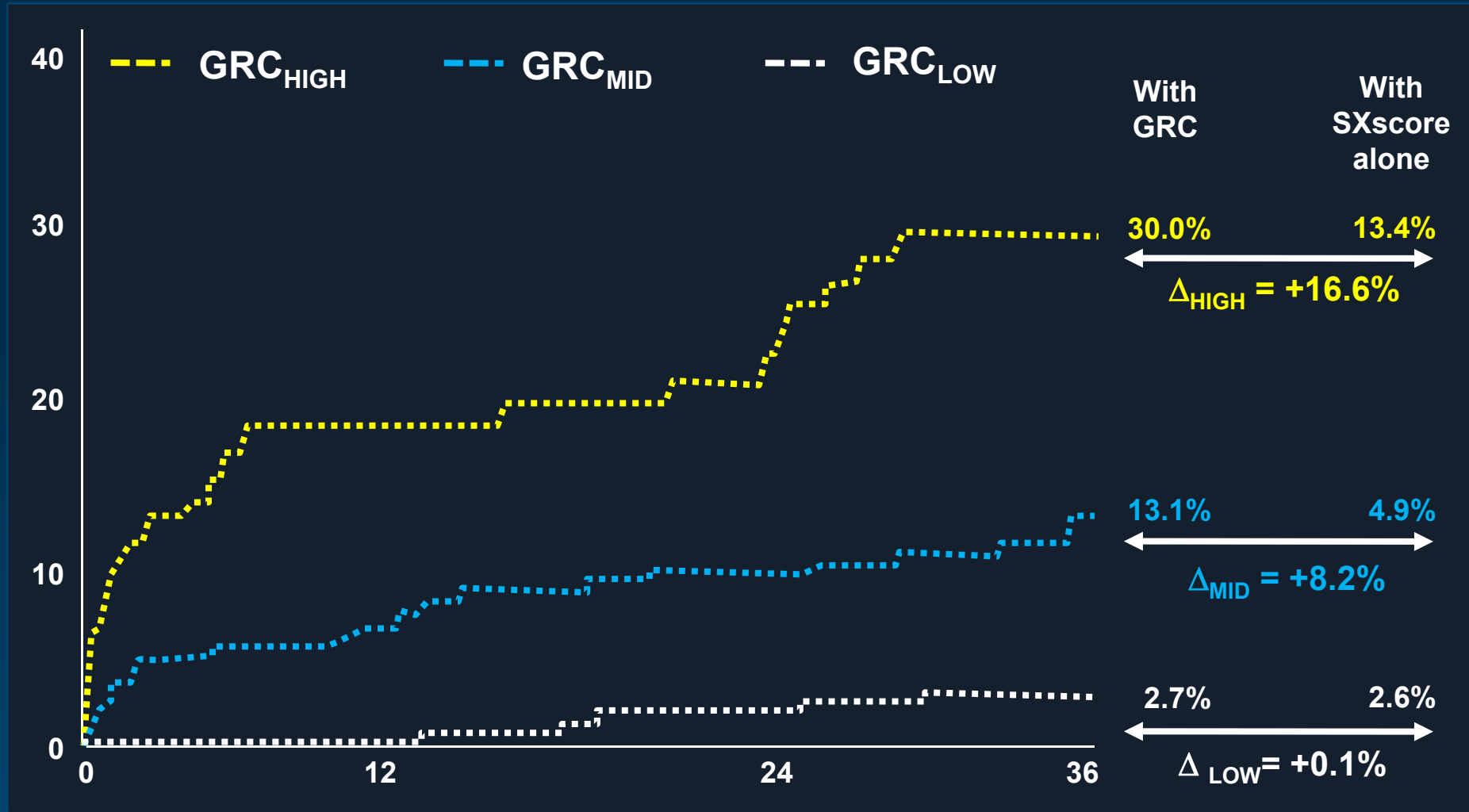
		SYNTAX score		
		< 19	19-27	> 27
EuroSCORE	0-2	L	L	I
	3-6	L	L	I
	> 6	I	I	H

Improved calibration

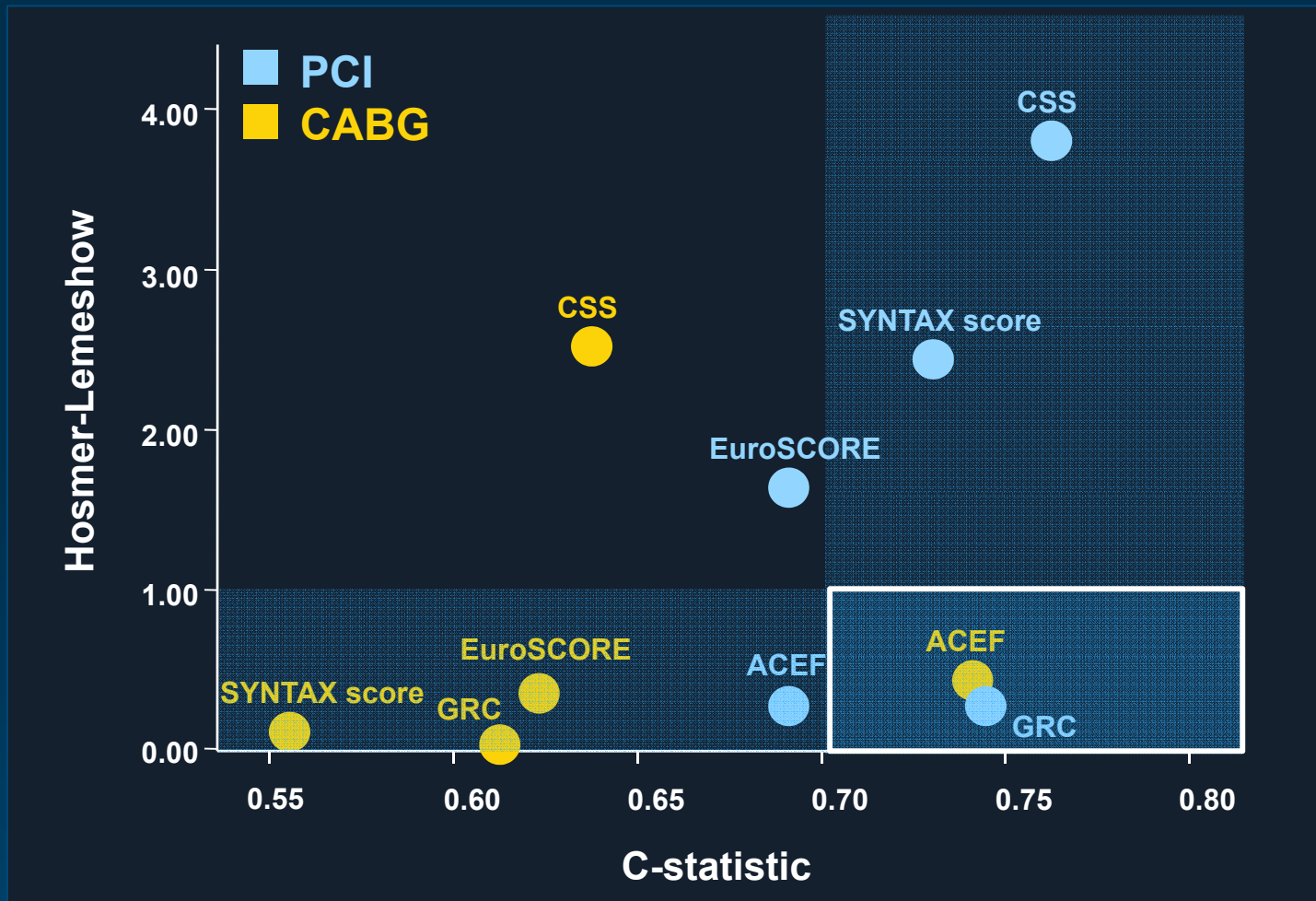
* log rank test; n = 255 LM patients undergoing PCI



3-year Death Stratified by SXscore and GRC in the SYNTAX LM Cohort



Prediction accuracy of different risk models

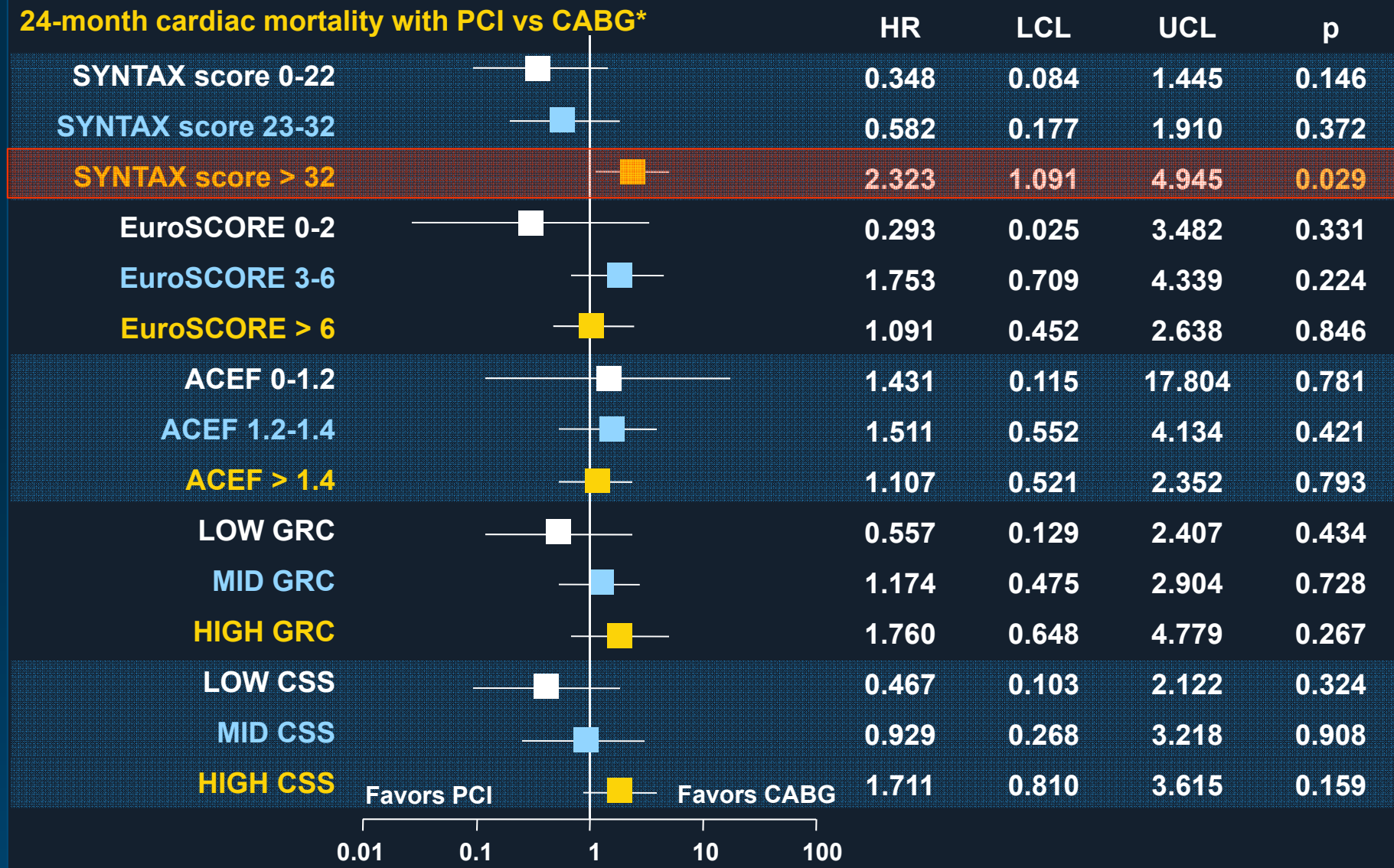


Discrimination better

Calibration better



24-month cardiac mortality with PCI vs CABG*



* adjusted by propensity score; HR indicates hazard ratio; LCL indicates lower confidence limit; UCL indicates upper confidence limit

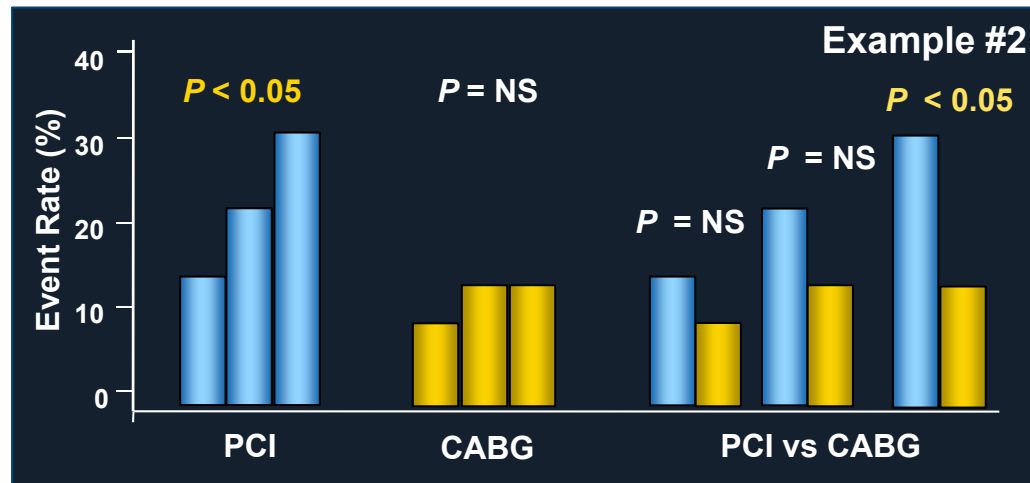
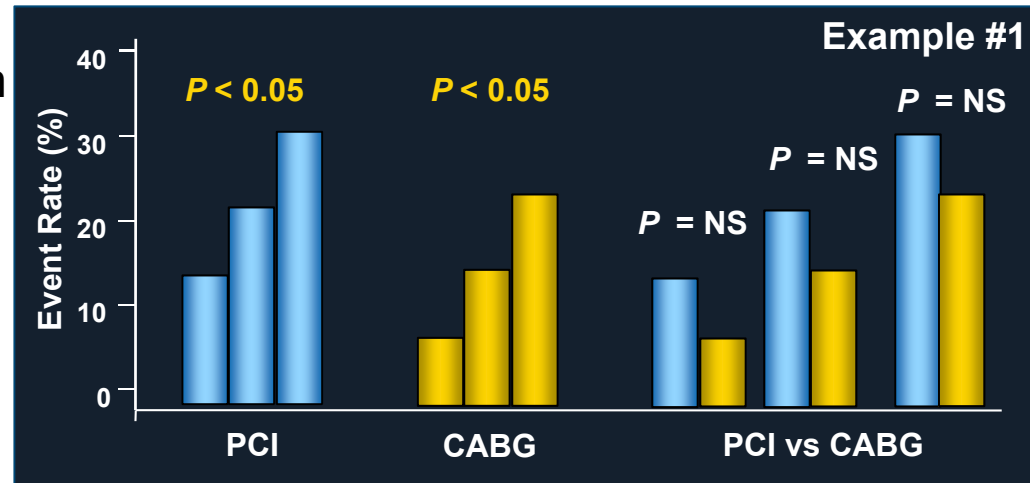


Why does it happen? An egg of Columbus

Good risk stratification both in PCI and CABG



Good risk stratification in PCI and BAD risk stratification in CABG



Closing remarks

- **Standardized risk stratification is of paramount importance in complex PCI.** Eyeball risk stratification is ok if you have Antonio Colombo in your cath lab. Otherwise, use stand-alone and combined scores
- Adding clinical variables requires more time, but improves the discrimination and calibration ability of the SYNTAX score alone for **prognostic purposes. Risk redistribution may be useful especially in low and intermediate risk patients.**
- Conversely, the good predictive ability in the PCI scenario along with the poor predictive ability in the CABG scenario make the **SYNTAX score the preferable tool to guide decision-making in LM CAD**

