No,
I do not have enough time to calculate SYNTAX Score

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Disclosure

- Nothing to disclose related with this presentation

Prof. Corrado Tamburino

Prof.Corrado Tamburino Libero Professionista Intramoenia presso L'Azienda Ospedaliero - Universitaria Policlinico "Vittorio Emanuele" P.IVA: 04721290874 - Privacy Content licensed under Creative Commons Attribution 2.5 License - ETNA Image courtesy of Commons Wikipedia

TCTAP 2011

SYNTAX score before decision making!

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Ferrarotto Hospital
University of Catania

SYNTAX SCORE

Search...

Welcome to the SYNTAX Score website. The SYNTAX Score is a unique tool to score complexity of coronary artery disease. However, it is very important to use this new scoring tool correctly, hence, it is strongly recommended to complete the tutorial first.

TUTORIAL

Knowledge of definitions is vital. Please use the tutorial prior to first calculator use.

Start tutorial...

CALCULATOR

Start using the calculator when you have successfully completed the tutorial.

Start calculator...

Calculator updated to version 2.11: four-year outcomes

Version 2.11 of the SYNTAX Score calculator contains the latest four-year SYNTAX trial results. The SYNTAX Score website now uses this version.

Unlike the online calculator, the standalone calculator is not automatically updated. Be sure to check our website regularly to ensure you are using the latest calculator version. The current version can be downloaded here:

SYNTAX Score Calculator 2.11

For a detailed changelog select *read more* below.

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STATE-OF-THE-ART PAPER

Prediction of Coronary Risk by SYNTAX and Derived Scores

Synergy Between Percutaneous Coronary Intervention With Taxus and Cardiac Surgery

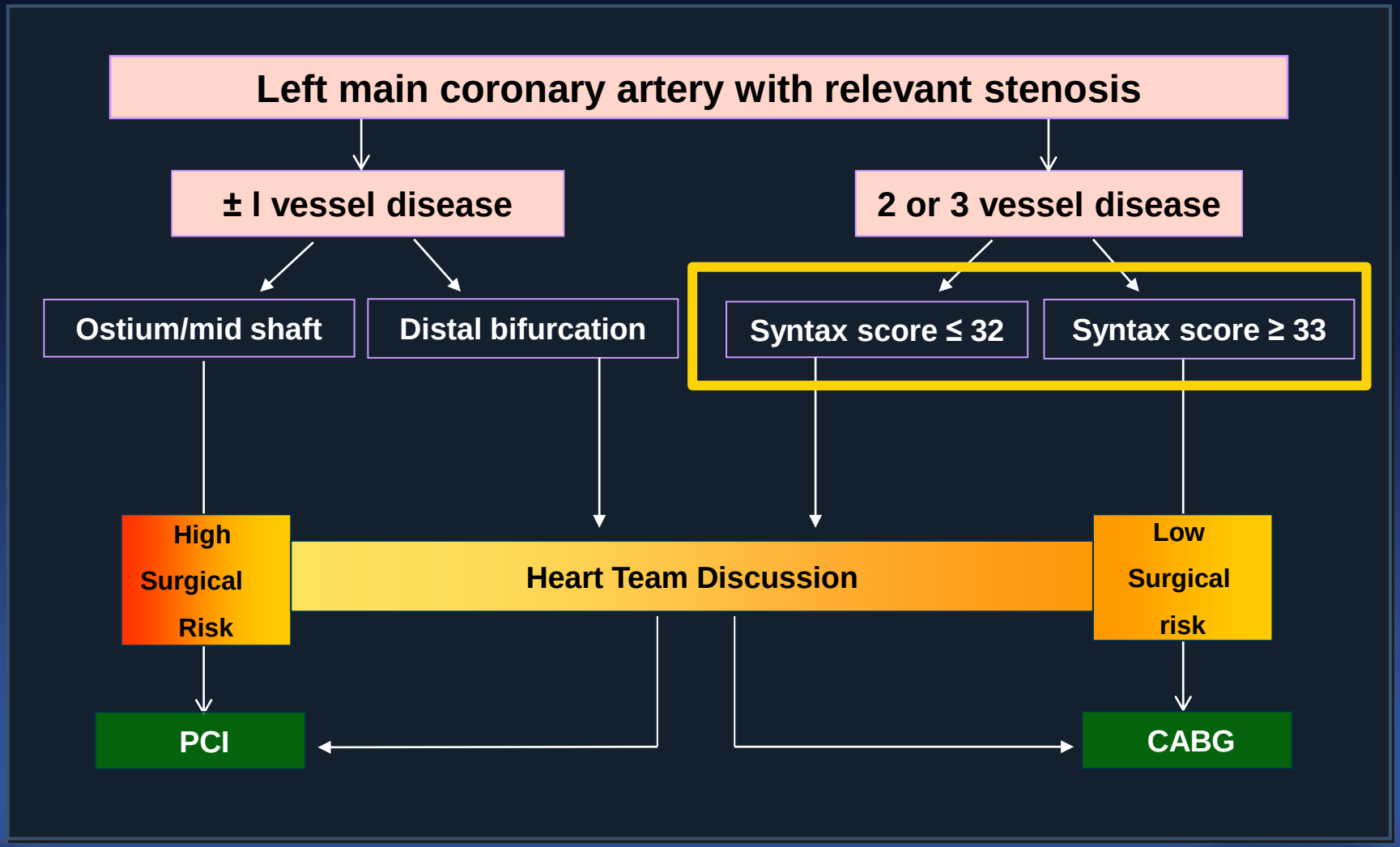
New York, Italy, Brazil, Canada

Mayank Yadav, MD,* Tullio Palmerini, MD,† Adriano Caixeta, MD, PhD,‡
Mahesh V. Madhavan, BA,* Elias Sanidas, MD, PhD,* Ajay J. Kirtane, MD, SM,*
Gregg W. Stone, MD,* Philippe Généreux, MD*§

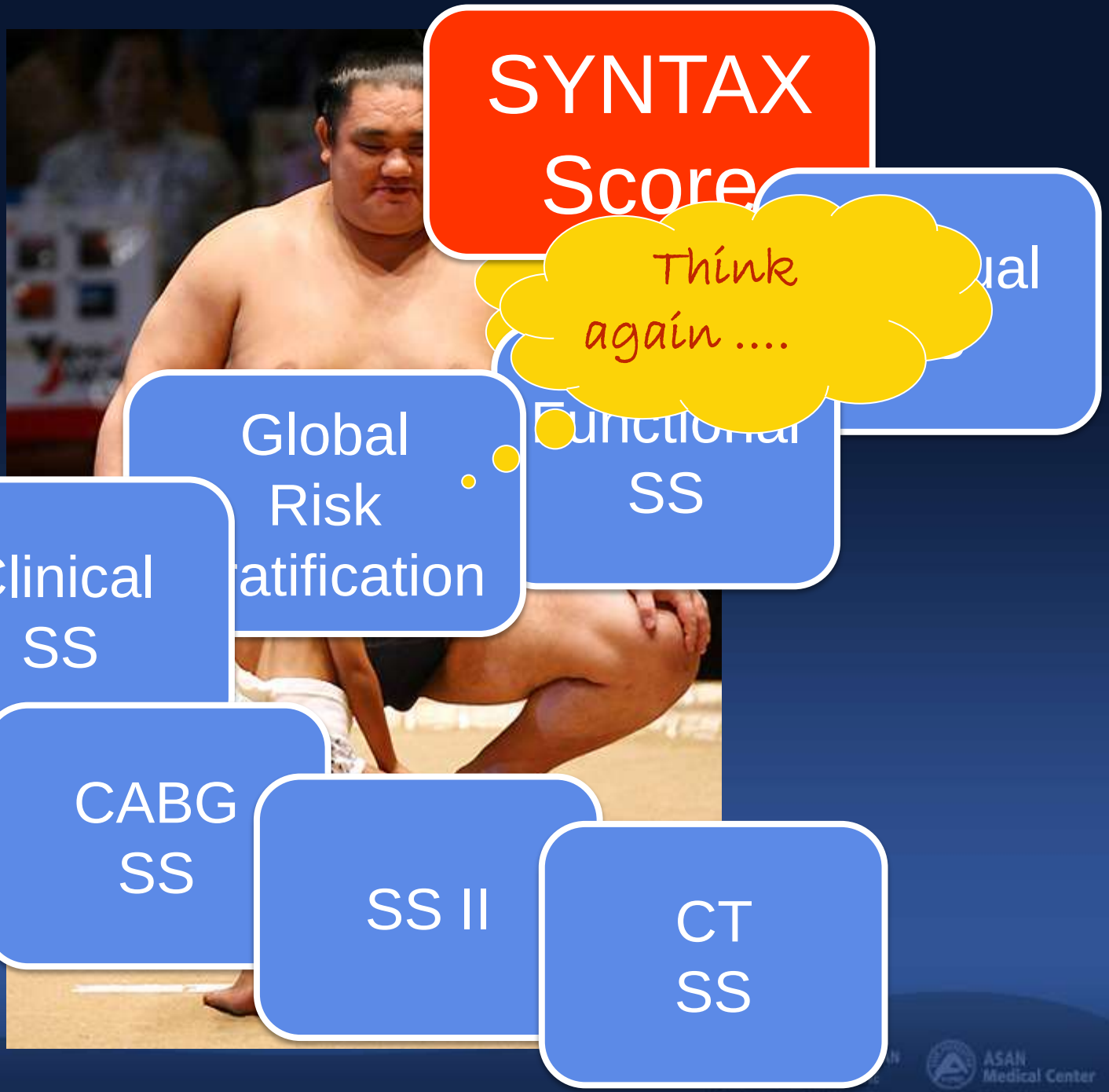
New York, New York; Bologna, Italy; Sao Paulo, Brazil; and Montréal, Québec, Canada

The introduction of the SYNTAX (Synergy Between PCI With Taxus and Cardiac Surgery) score has prompted a renewed interest for angiographic risk stratification in patients undergoing percutaneous coronary intervention. Syntax score is based on qualitative and quantitative characterization of coronary artery disease by including 11 angiographic variables that take into consideration lesion location and characteristics. Thus far, this score has been shown to be an effective tool to risk-stratify patients with complex coronary artery disease undergoing percutaneous coronary intervention in the landmark SYNTAX trial, as well as in other clinical settings. This review provides an overview of its current applications, including its integration with other nonangiographic clinical scores, and explores future applications of the SYNTAX and derived scores. (J Am Coll Cardiol 2013;62:1219–30) © 2013 by the American College of Cardiology Foundation

ESC Guideline for LM Revascularization



European Heart Journal 2013;34:2949


SYNTAX Score
Think again ....
Global Risk atification
Clinical SS
CABG SS
SS II
CT SS

Thought Again on SYNTAX Score

- Basics as a risk classifier
  - Development
  - Reproducibility
  - Simplicity
- Clinical role
  - To classify risk of patients
  - To predict prognosis
  - To guide revascularization strategy

Thought Again on SYNTAX Score

- **Basics as a risk classifier**
  - **Development**
  - **Reproducibility**
  - **Simplicity**
- Clinical role
  - To classify risk of patients
  - To predict prognosis
  - To guide revascularization strategy

Development of SYNTAX Score

EuroIntervention

The SYNTAX Score: an angiographic tool grading the complexity of coronary artery disease

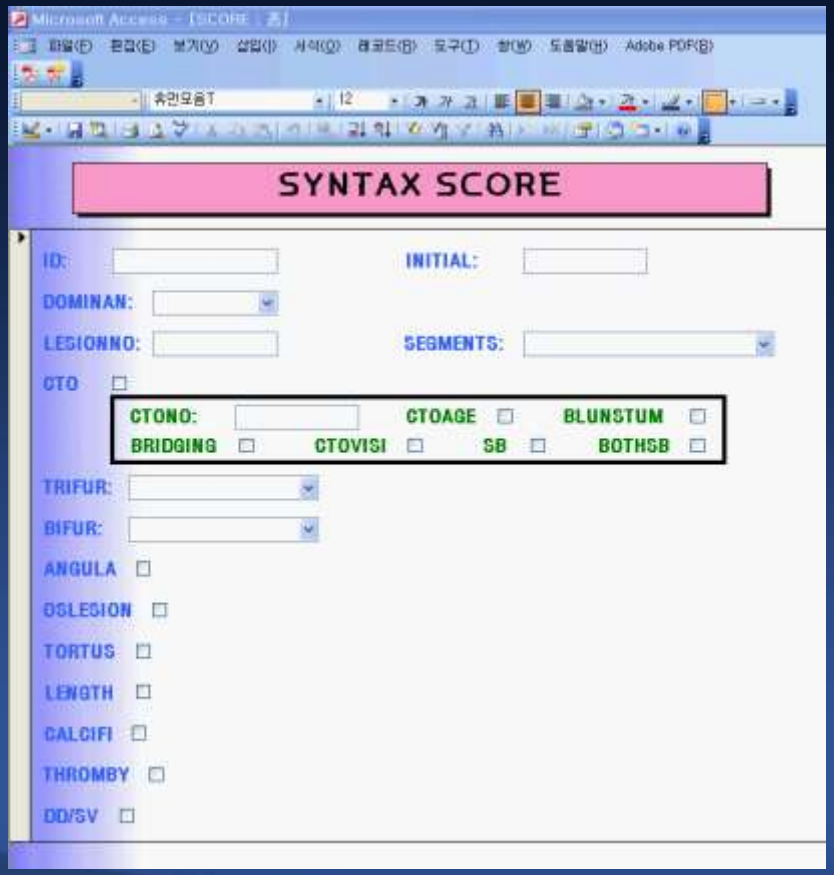
Georgios Sianos[1], MD, PhD; Marie-Angèle Morel[2], BSc; Arie Pieter Kappetein[3], MD, PhD; Marie-Claude Morice[4], MD; Antonio Colombo[5], MD; Keith Dawkins[6], MD; Marcel van den Brand[7], MD, PhD; Nic Van Dyck[8], RN; Mary E Russell[9], MD; Friedrich W. Mohr[10], MD; Patrick W Serruys[1*] MD, PhD

- Based on the previous angiographic scores of
  1. AHA classification of the coronary tree segments modified for the ARTS study
  2. Leaman score
  3. ACC/AHA lesions classification system
  4. Total occlusion classification system
  5. Duke and ICPS classification systems for bifurcation lesions
- **NOT** was created or validated with the usual statistical modeling of risk score using population studies

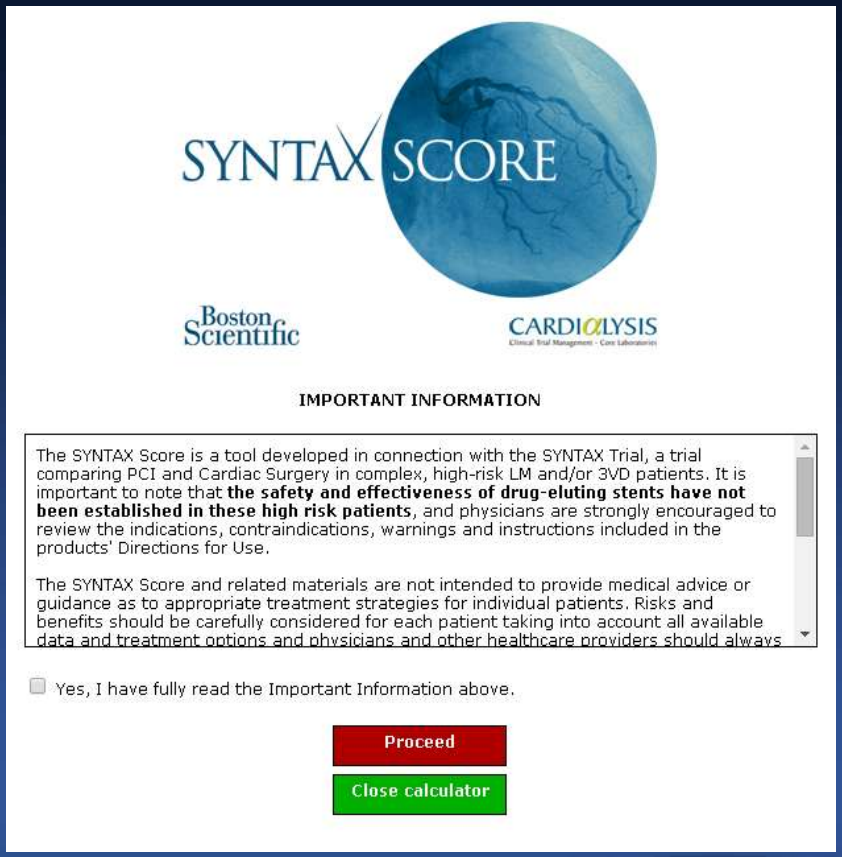
Was developed by creative researchers on the table… probably scientific but not with an usual way …

Is it easy to measure ?

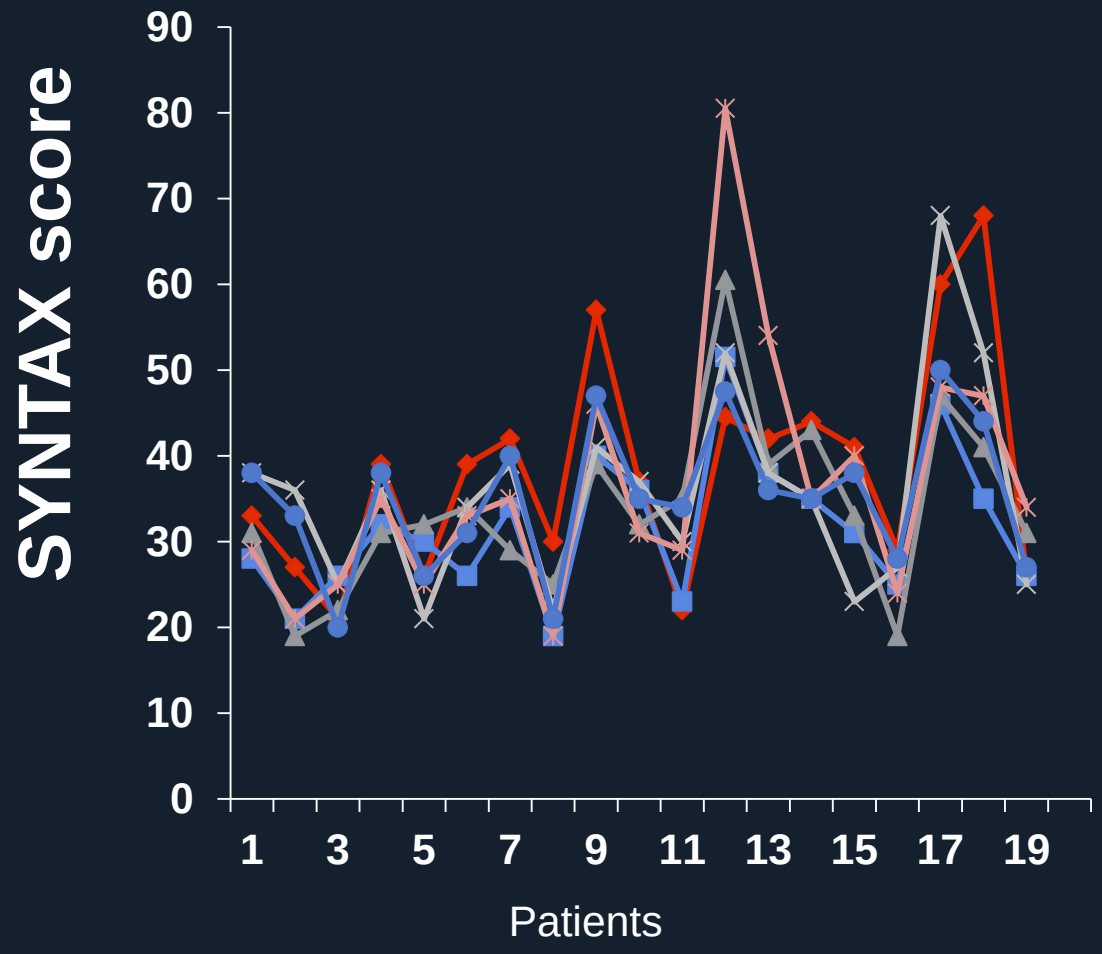
Hand-made in AMC
for Core Lab analysis



web-version SS Calculator



Is the SCORE reproducible across observers?



In 2008

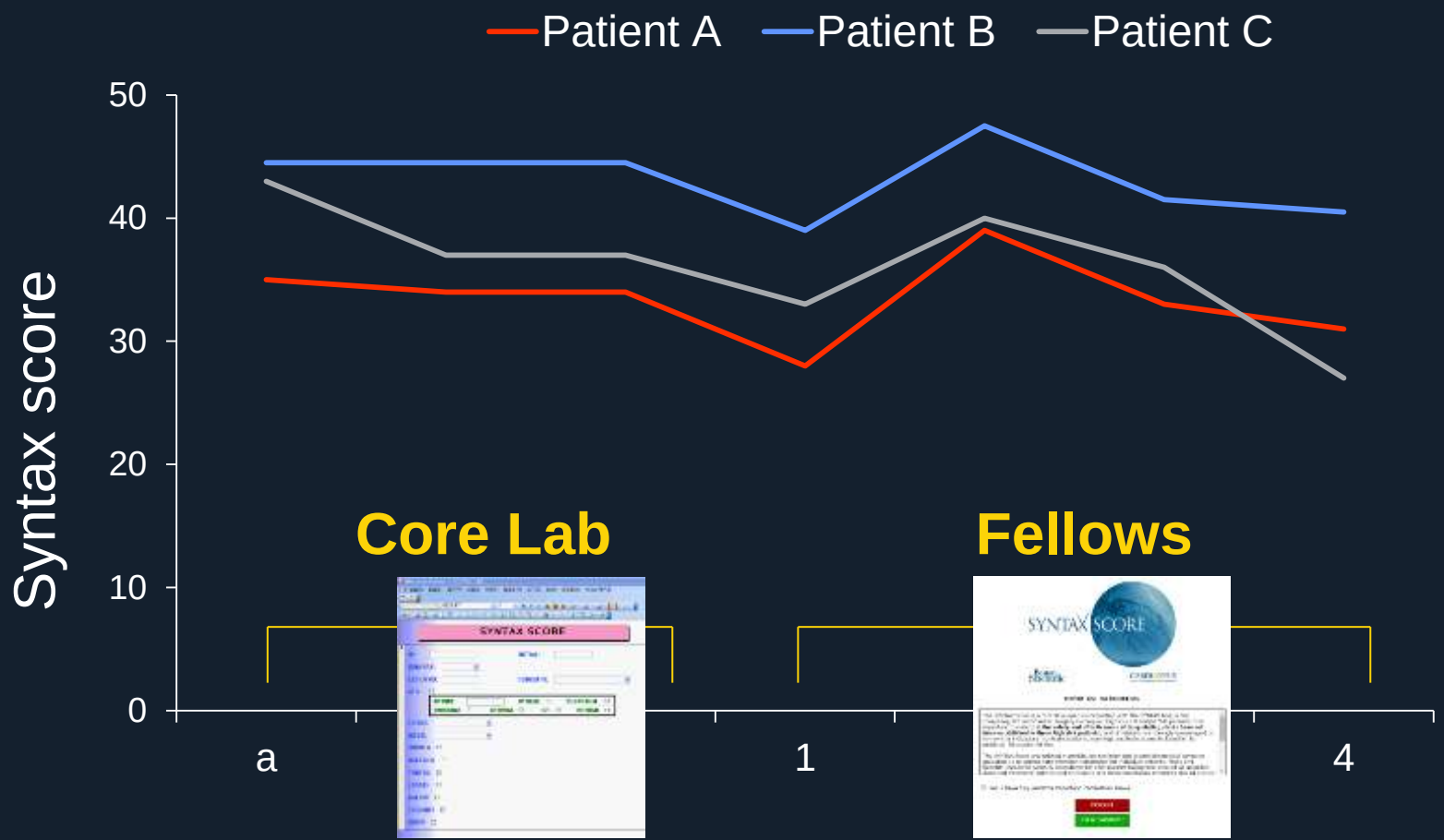
To validate the SYNTAX score

20 pts from MAIN-COMPARE registry

6 aniographers in core lab of CVRF

Kappa = 0.67

Measurement for LM + MVD in 2014



Inter-observer Variability

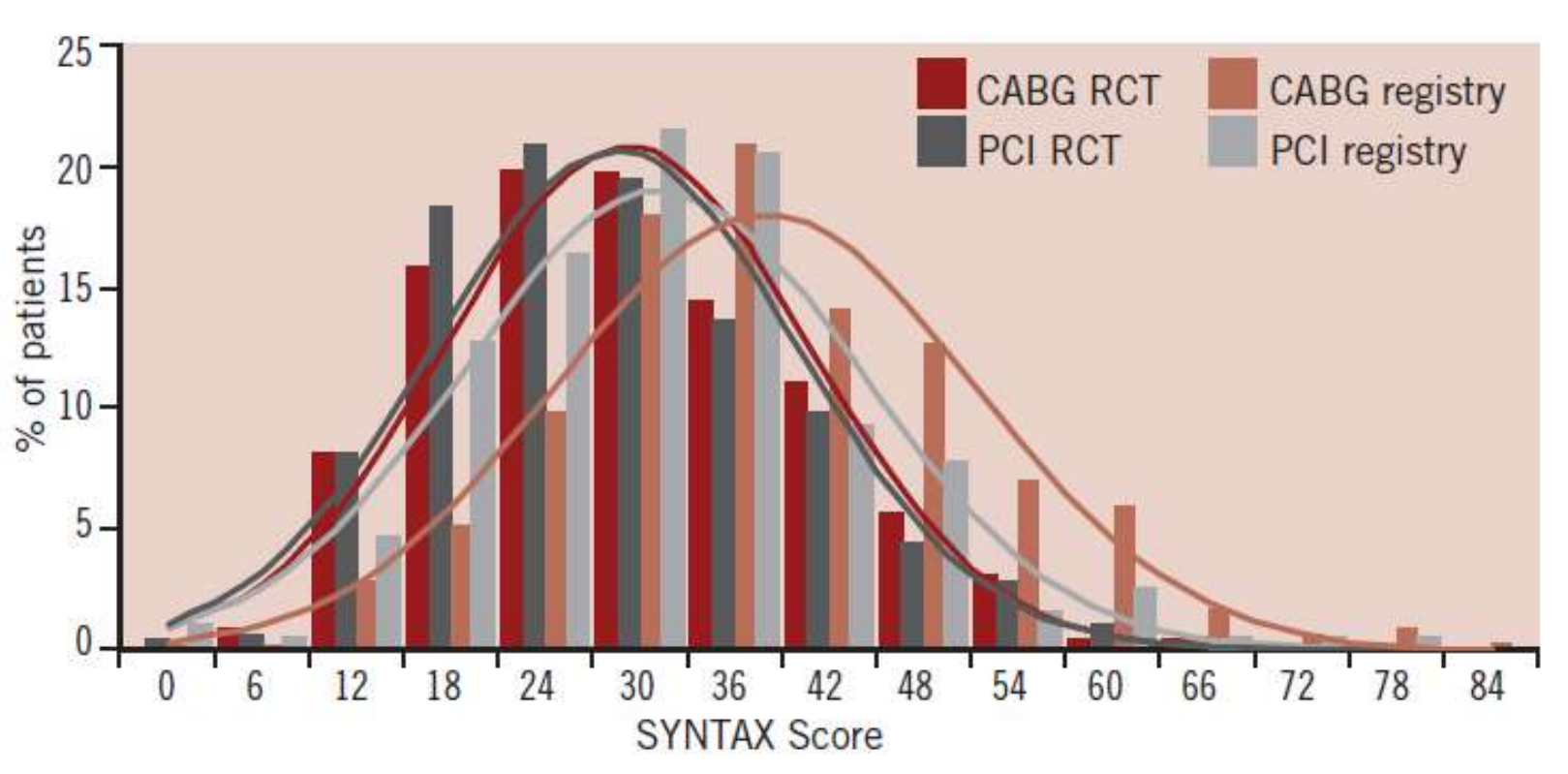
Kappa of SS ranged from **0.4 to 0.8** in Literatures.

Kappa	Agreement
< 0	Less than chance agreement
0.01 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 0.99	Almost perfect agreement

SS Distribution in SYNTAX Study

Gaussian Distribution with Terciles of

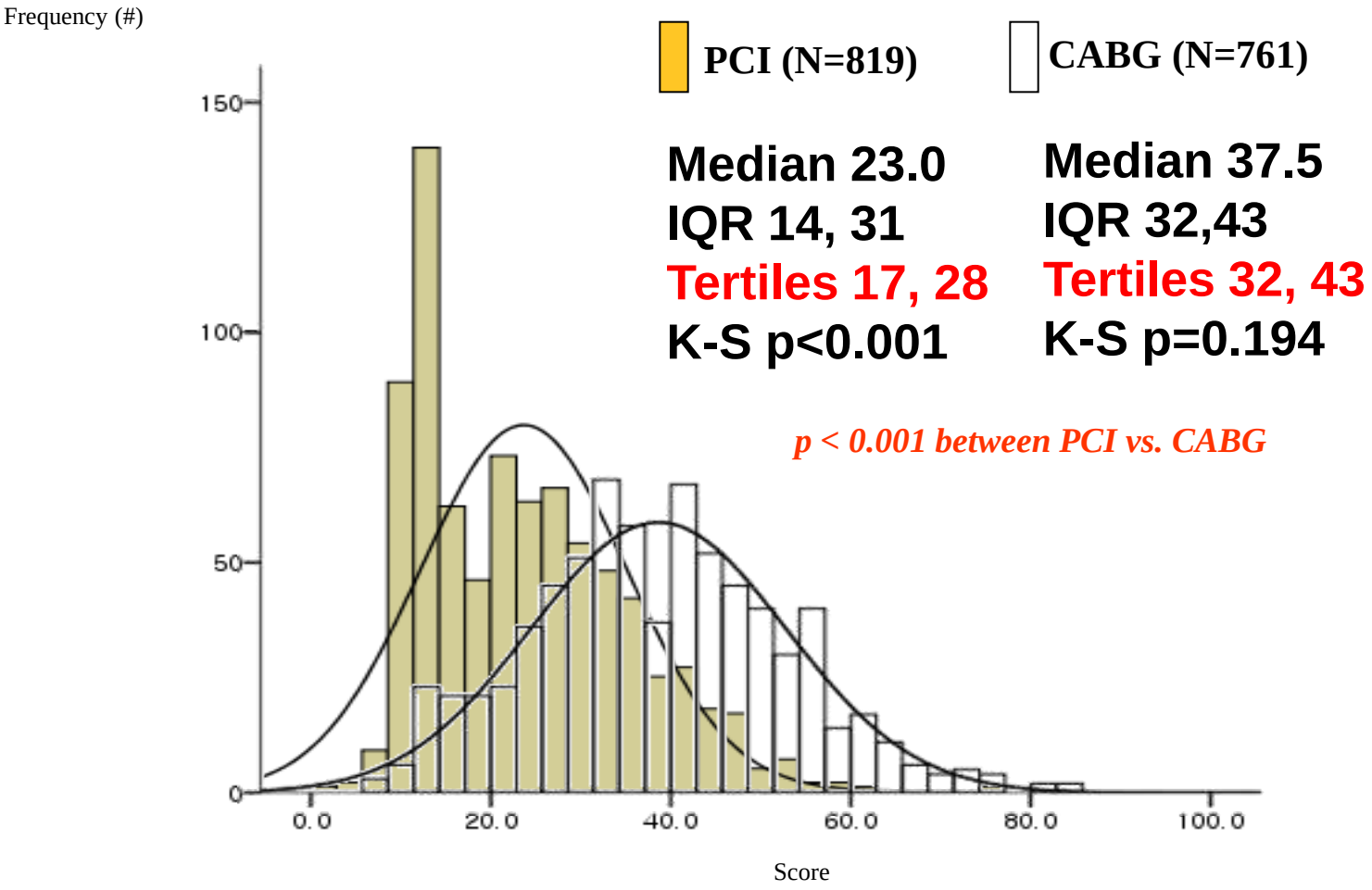
Low (~22), Int. (23-32), High (>32)



Serruys PW et al. EuroIntervention 2009;5:50

Validity of Low (~22) Int. (23-32) High (>32) ?

SS Distribution in MAIN-COMPARE Registry



Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

My Thought 1
Basic Function as a Risk Score

- I am convinced that …
  - good to represent angiographic complexity
  - good agreement across observers with training

- But …
  - still complex to calculate it in daily practices
  - more inter-observe variability for high SS
  - gap between core-lab and on-site
  - inherent limitation as not based on the pts DB
  - varying tercile groups according to the cohorts

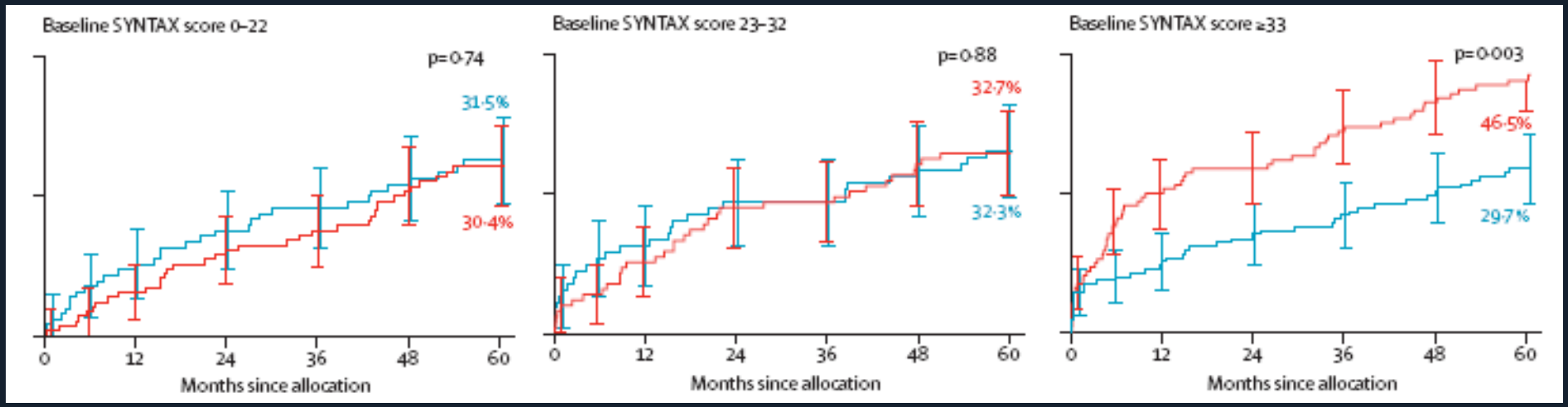
Thought Again on SYNTAX Score

- Basics as a risk classifier
  - Development
  - Reproducibility
  - Simplicity
- **Clinical role**
  - **To classify risk of patients**
  - **To predict prognosis**
  - **To guide revascularization strategy**

5-Y MACCE in SYNTAX LM

Low	Intermediate	High
0 – 22	23 – 32	≥ 33

— CABG — PCI



- ✓ Gradual increase after PCI: **30.4** vs. **32.7** vs. **46.5**
- ✓ No change after CABG: **31.5** vs. **32.3** vs. **29.7**

Mohr FW et al. Lancet 2013; 381: 629

MAIN-COMPARE
Unprotected LM Disease

Validation of SYNTAX (Synergy between PCI with Taxus and Cardiac Surgery) Score for Prediction of Outcomes After Unprotected Left Main Coronary Revascularization

Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Clinical Profiles according to SS

	Low (N=518)	Intermediate (N=352)	High (N=662)	P value
Age (yrs)	58.5 ± 11.5	63.0 ± 10.0	64.5 ± 9.4	< 0.001
Male gender	347 (67.0)	253 (71.9)	493 (74.5)	0.018
Hypertension	217 (41.9)	183 (52.0)	363 (54.8)	< 0.001
Diabetes mellitus	121 (23.4)	111 (31.5)	254 (38.4)	< 0.001
(Insulin-treated)	20 (3.9)	28 (8.0)	39 (5.9)	0.036
Hypercholesterolemia	154 (29.7)	122 (34.7)	264 (39.9)	0.003
Current smoking	143 (27.6)	102 (29.0)	161 (24.3)	0.218

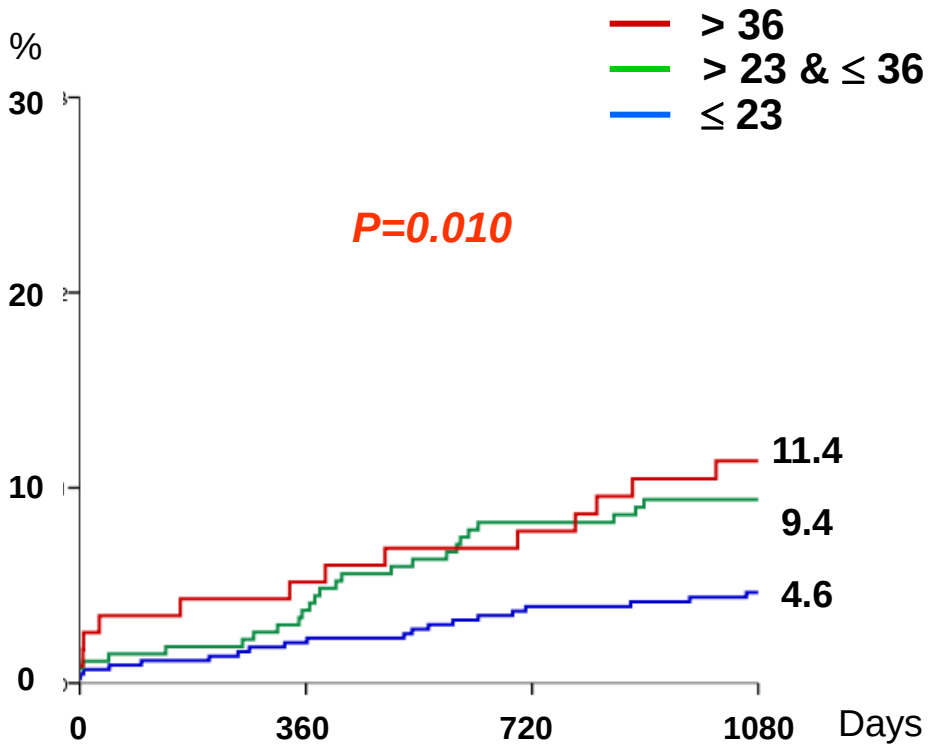
Clinical Profiles according to SS

	Low (N=518)	Intermediate (N=352)	High (N=662)	P value
Previous MI	27 (19.1)	38 (27.0)	76 (53.9)	0.001
Previous CHF	10 (1.9)	6 (1.7)	24 (3.6)	0.093
History of CVA	27 (5.2)	26 (7.4)	63 (9.5)	0.021
Peripheral disease	11 (2.1)	10 (2.8)	36 (5.4)	0.007
Chronic lung disease	10 (1.9)	7 (2.0)	15 (2.3)	0.913
CRF (Cr > 2.0 mg/dl)	9 (1.7)	9 (2.6)	29 (4.4)	0.027
Euro Score	3.6 ± 2.2	4.1 ± 2.3	4.6 ± 2.3	< 0.001
LV Ejection Fraction (%)	61.5 ± 9.6	59.4 ± 11.7	56.6 ± 11.8	< 0.001

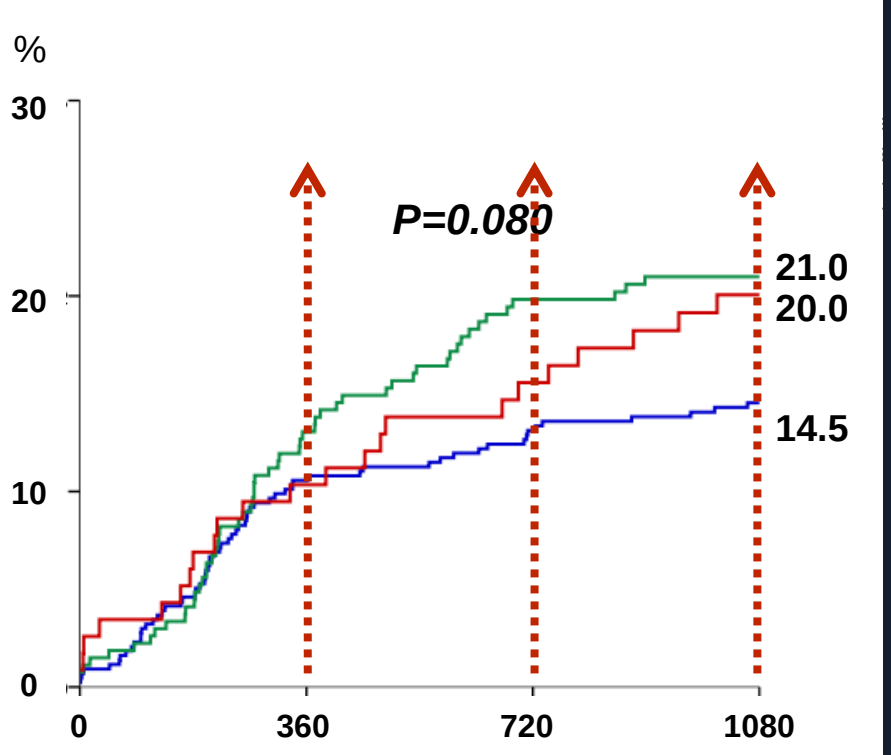
Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Outcomes by SYNTAX Score
MAIN-COMPARE *PCI* Patients (N=819)

Death, MI, or Stroke



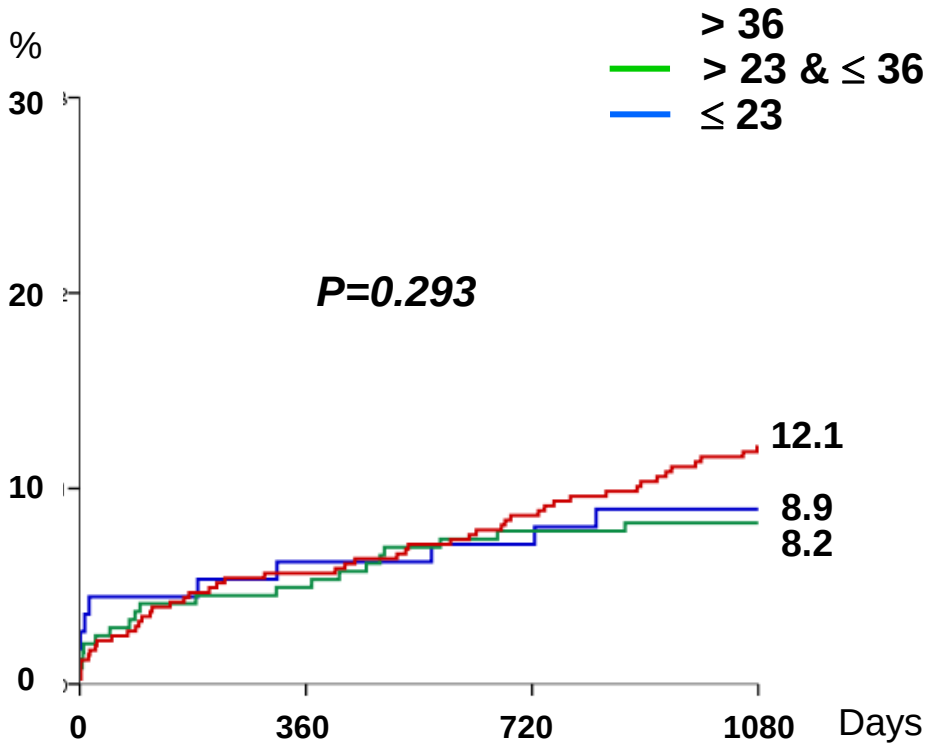
MACCE



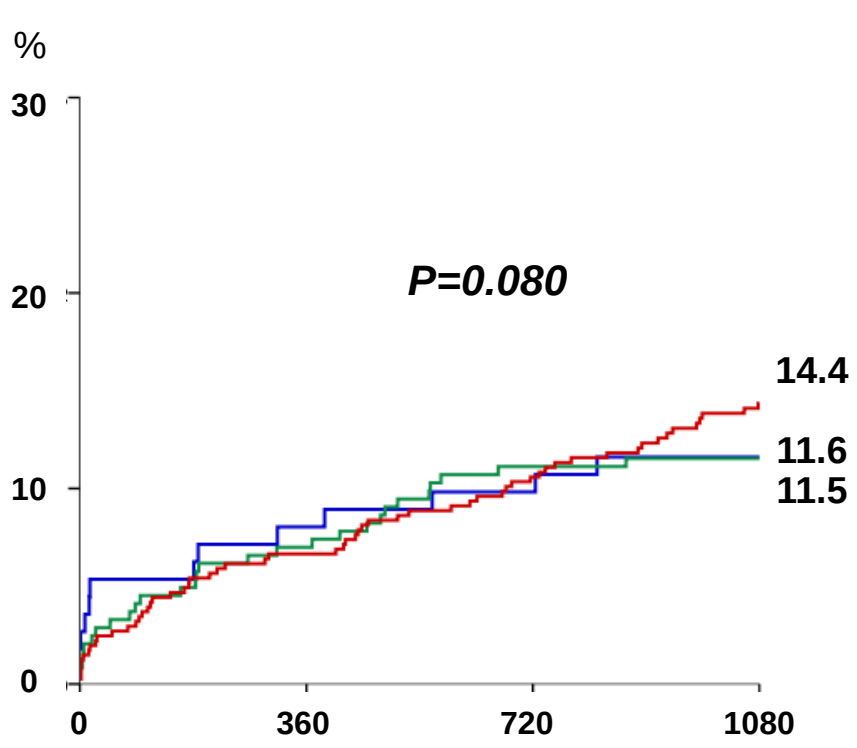
Outcomes by SYNTAX Score

CABG Patients (N=761)

Death, MI, or Stroke



MACCE



Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

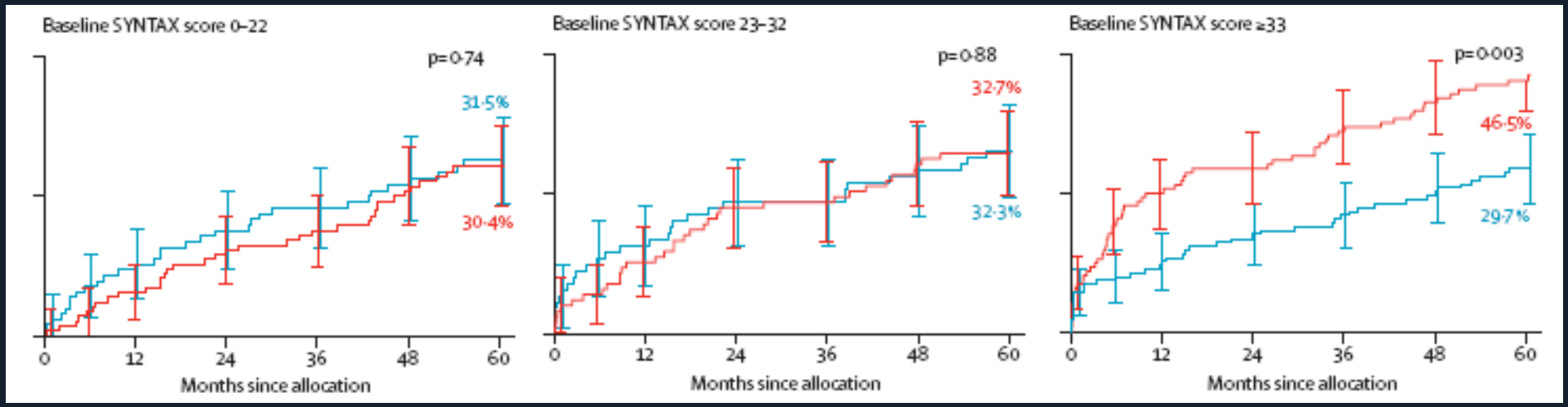
My Thought 2
Prognostic Ability of SS for LM

- Correlation with clinical risks
- PCI prognostics: heterogeneous
  - Good in SYNTAX trial
  - Modest in MAN-COMPARE registry
- CABG prognostics
  - NOT good

5-Y MACCE in SYNTAX LM

Low	Intermediate	High
0 – 22	23 – 32	≥ 33

CABG PCI



P for interaction = NS

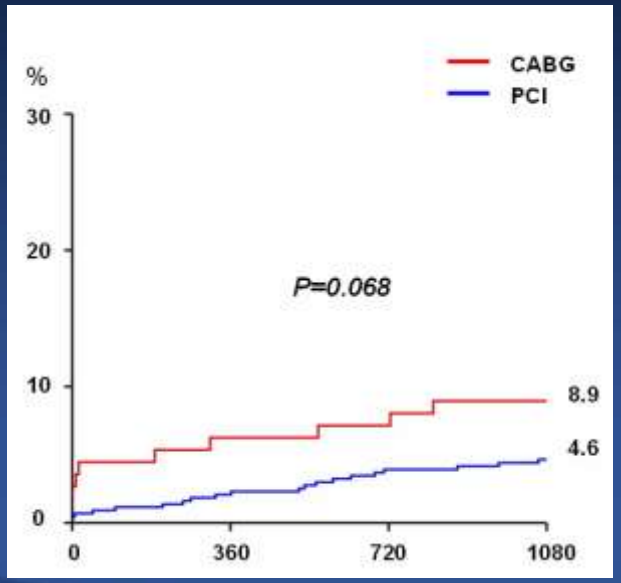
Mohr FW et al. Lancet 2013; 381: 629

Different Treatment Effects between PCI and CABG

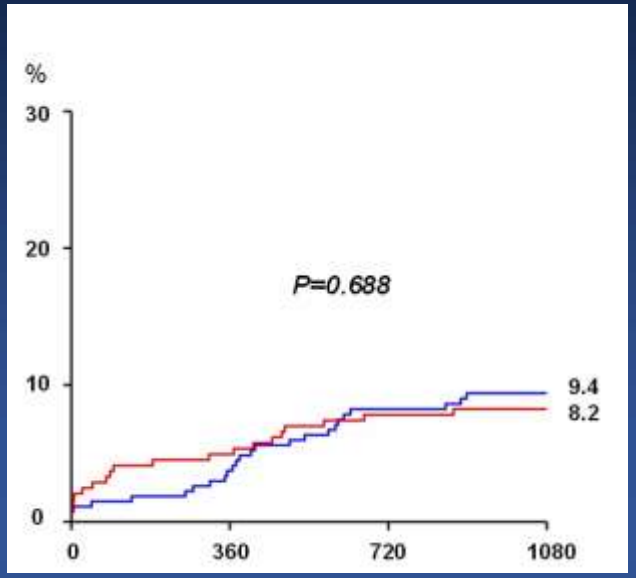
Death, MI, or Stroke

Interaction P=0.25 in MAIN-COMPARE

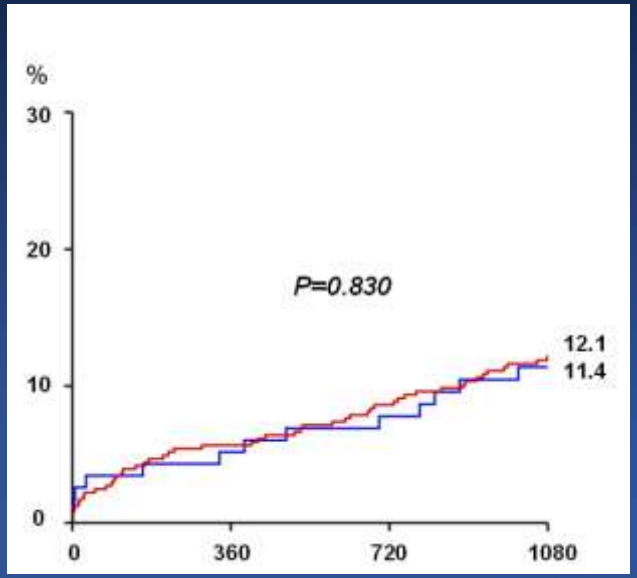
Low



Intermediate



High



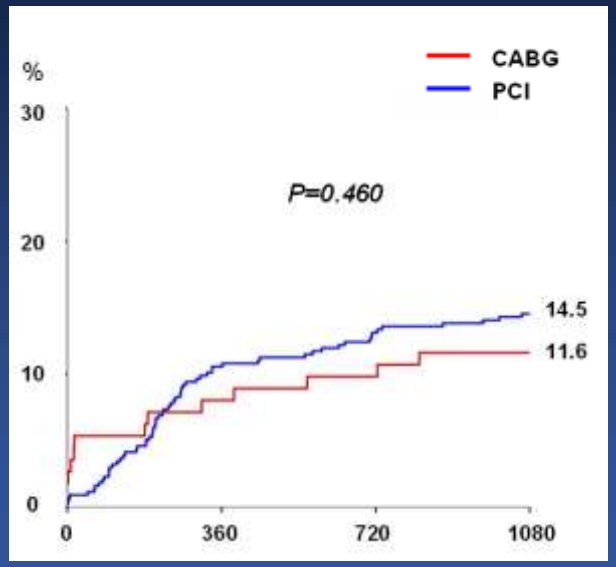
Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Different Treatment Effects between PCI and CABG

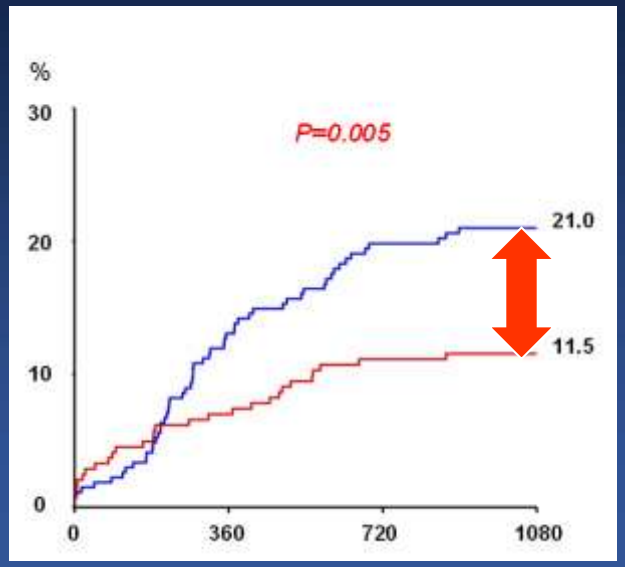
Death, MI, Stroke, or TVR

Interaction P=0.66 in MAIN-COMPARE

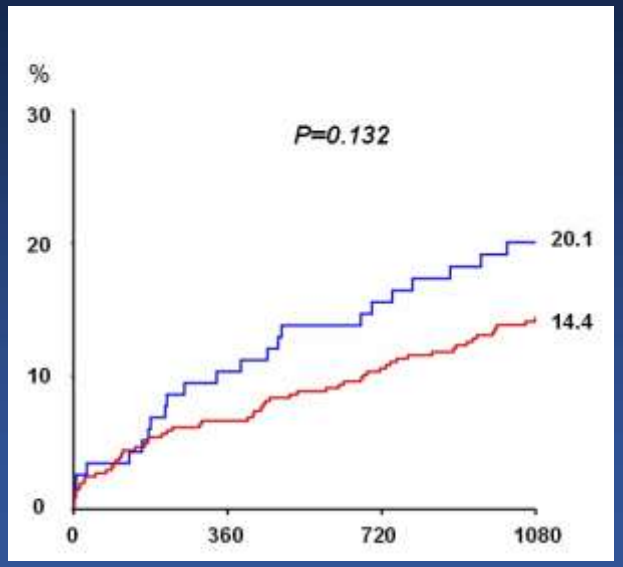
Low



Intermediate



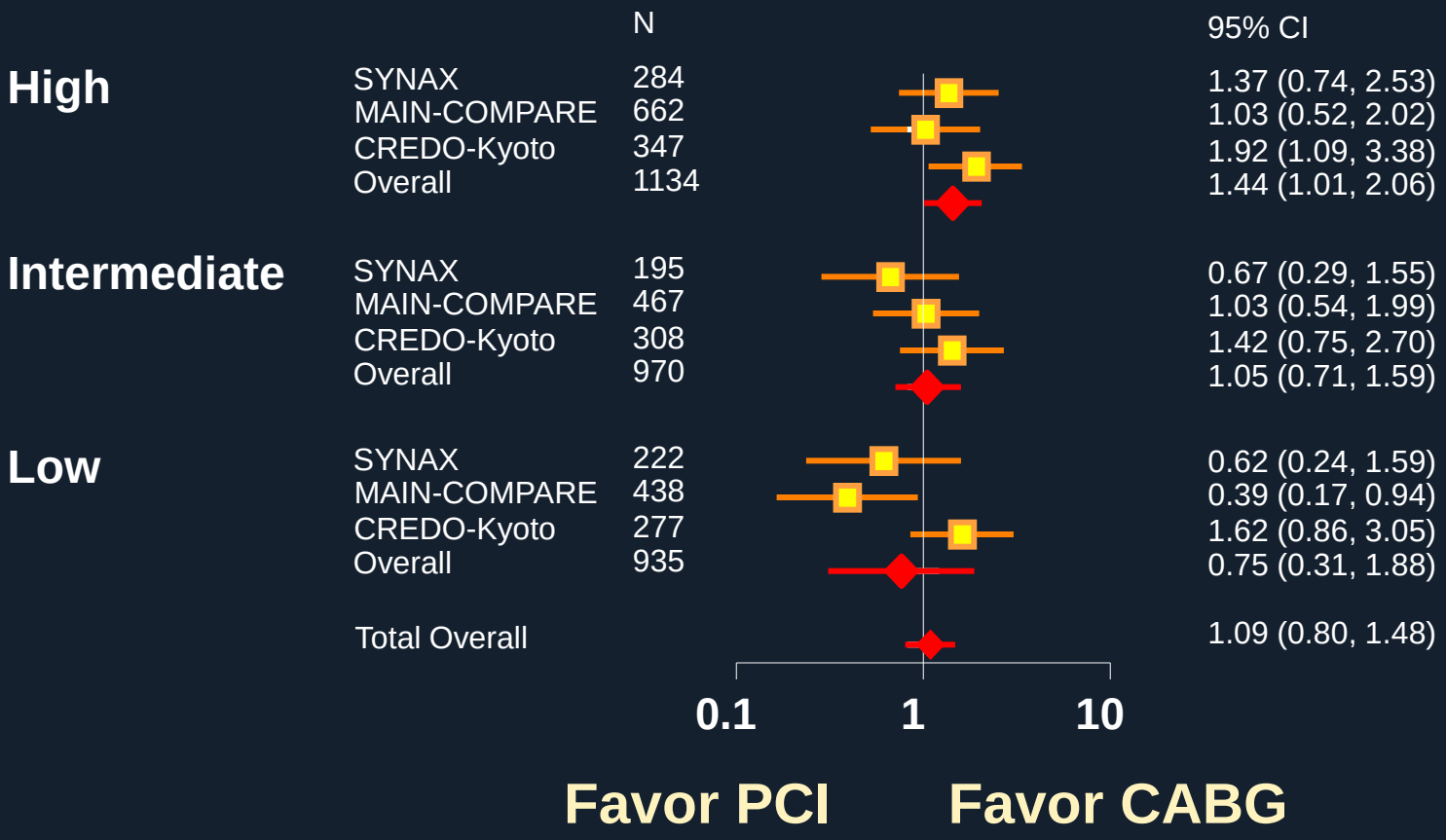
High



Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Meta-analysis in LM PCI by SYNTAX Terciles

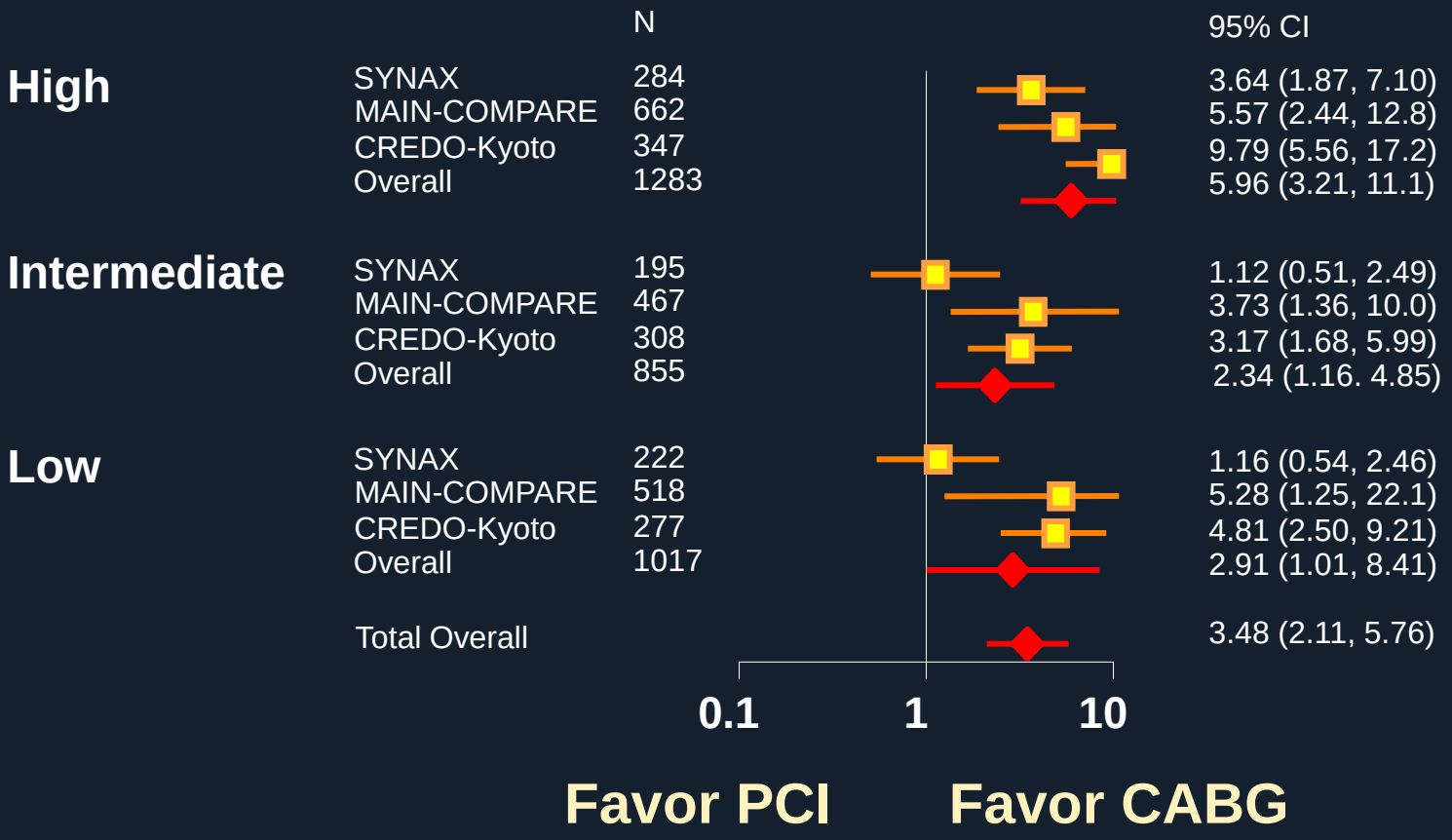
3 Year MACE



Athappan et al. JACC: Cardiovascular Interventions 2013;1219-30

Meta-analysis in LM PCI by SYNTAX Terciles

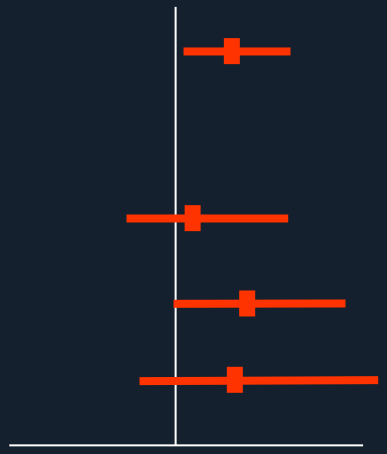
3 Year TVR



Athappan et al. JACC: Cardiovascular Interventions 2013;1219-30

FREEDOM Study
DM with Multivessel

Subgroup	No.	5-Yr Rate		Hazard Ratio (95%CI)	P for Interaction
		PCI	CABG		
		%			
All patients	**1900**	**27**	**19**		
SS					**0.58**
≤ 22	**669**	**23**	**17**		
23-32	**844**	**27**	**18**		
≥ 33	**374**	**31**	**23**		



Farkouh ME et al. N Engl J Med. 2012;367:2375

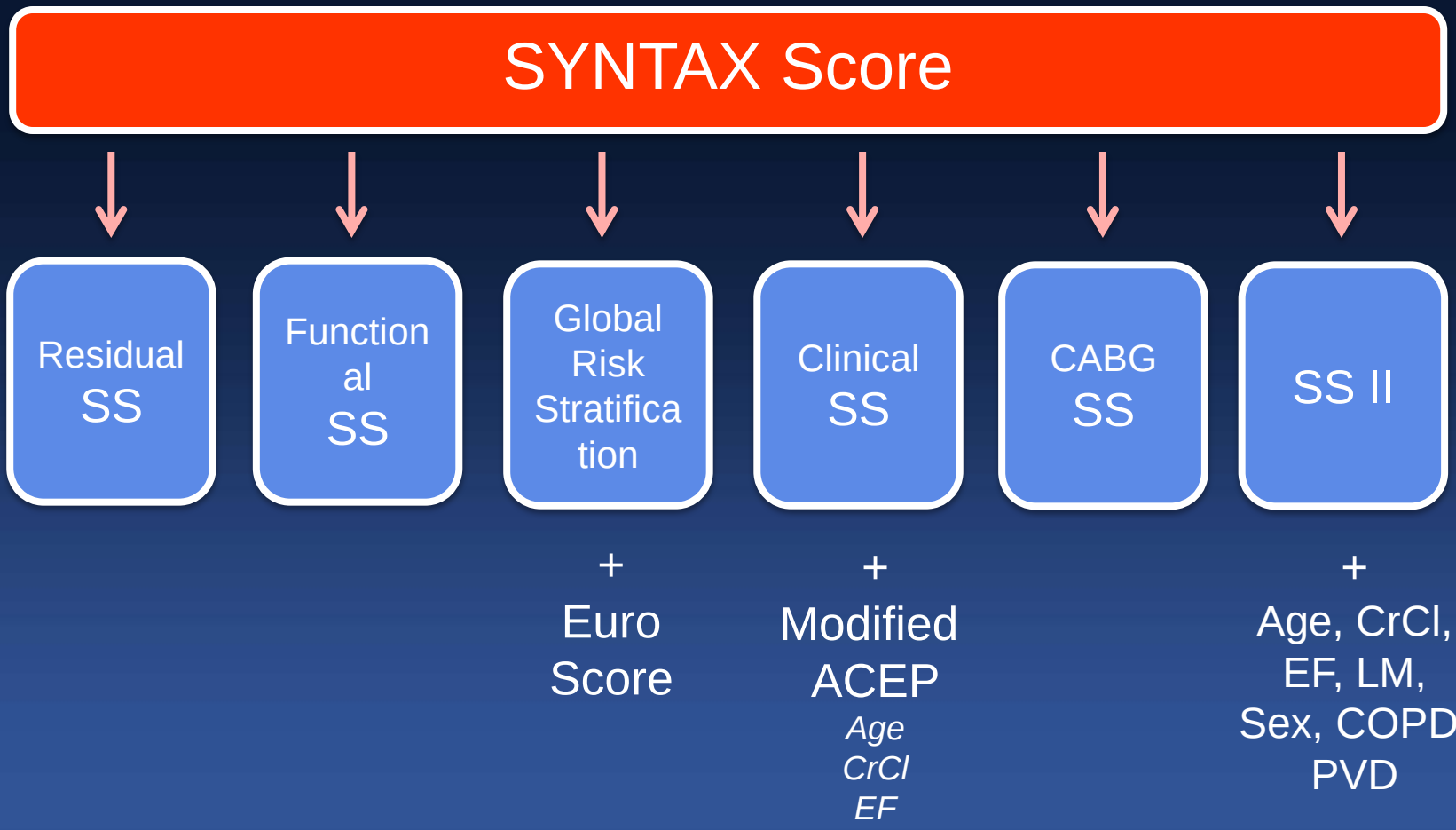
My Thought 3
Guidance of Revascularization Strategy

- Treatment effect was not significantly interacted between the revascularization strategy and SS terciles.
- Treatment effect between PCI and CABG does not proportionally change with SS.

A caution is required to select revascularization strategy using the SS.

SYNTAX Score and Modifiers

with combination of clinical parameters



Cox Model For Death, MI, or Stroke
MAIN-COMPARE Registry

Outcomes	Hazard Ratio	95% CI	P value
Overall patients			
EuroSCORE	1.25	1.16, 1.34	<0.001
Chronic lung disease	2.14	1.07, 4.29	0.032
Chronic renal failure	2.67	1.54, 4.63	<0.001
Atrial fibrillation	2.21	1.11, 4.42	0.024
PCI patients			
EuroSCORE	1.17	1.05, 1.31	0.004
Prior congestive heart failure	3.86	1.58, 9.44	0.003
Chronic renal failure	6.15	2.90, 13.01	<0.001
CABG patients			
EuroSCORE	1.27	1.16, 1.39	<0.001
Diabetes mellitus	1.76	1.13, 2.75	0.013
Chronic lung disease	4.03	1.79, 9.05	<0.001
Prior cerebrovascular disease	2.36	1.29, 4.31	0.005
Hyperlipidemia	0.60	0.36, 0.99	0.043

Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Cox Model For MACCE
MAIN-COMPARE Registry

Outcomes	Hazard Ratio	95% CI	P value
Overall patients			
EuroSCORE	1.10	1.04, 1.16	<0.001
CABG	0.71	0.54, 0.92	0.010
Chronic renal failure	2.32	1.40, 3.85	0.001
Prior cerebrovascular disease	1.58	1.08, 2.33	0.020
Use of intra-aortic balloon pump	2.00	1.09, 3.64	0.024
PCI patients			
Prior congestive heart failure	2.98	1.44, 6.16	0.003
Use of intra-aortic balloon pump	2.25	1.23, 4.10	0.008
Chronic renal failure	4.17	2.27, 7.64	<0.001
CABG patients			
EuroSCORE	1.22	1.12, 1.33	<0.001
Chronic lung disease	2.52	1.15, 5.49	0.021
Prior MI	1.76	1.06, 2.94	0.030
Prior cerebrovascular disease	2.32	1.36, 3.99	0.002

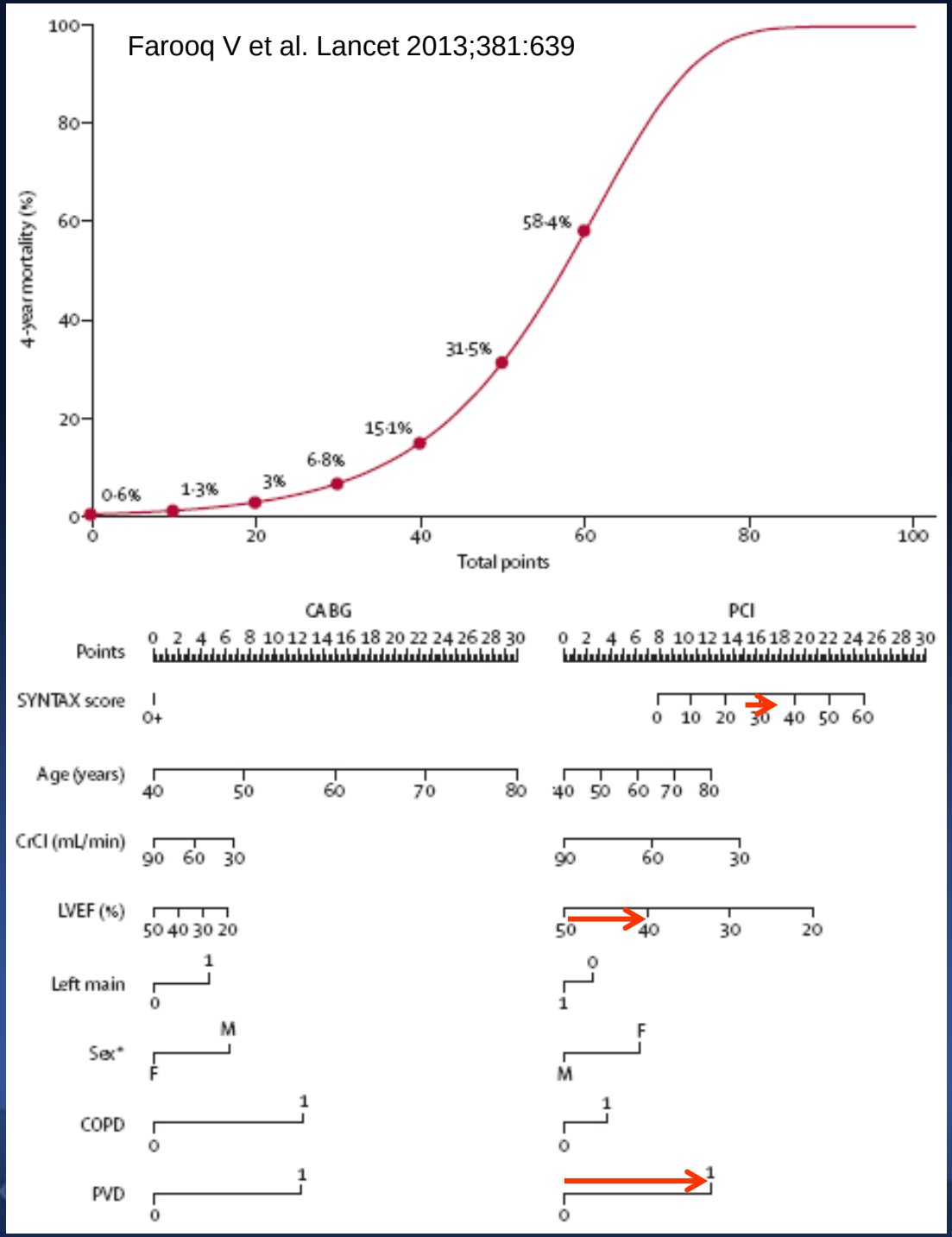
Kim YH et al. J Am Coll Cardiol Intv 2010;3:612

Discrimination and Calibration
For MACCE in MAIN-COMPARE

	Discrimination		Calibration
Model	**C-index (95% CI)**	**AIC**	**SLR**
SS	**0.53** (0.48-0.55)	3511.0	**0.93**
EuroSCORE	**0.57** (0.53-0.60)	3493.9	**1.09**
SS + EuroSCORE	**0.57** (0.53-0.60)	3495.7	**1.02**

- ✓ Discrimination: power to predict outcomes
- ✓ Calibration: accuracy between predicted and observed outcomes

Kim YH et al. J Am Coll Cardiol Intv 2010;3:612



Syntax Score II

- SS 25 (Int.) → 35 (high)
- Points 15 → 18

- EF 50 → 40
- Points 0 → 7

- PVD yes
- Points 0 → 12

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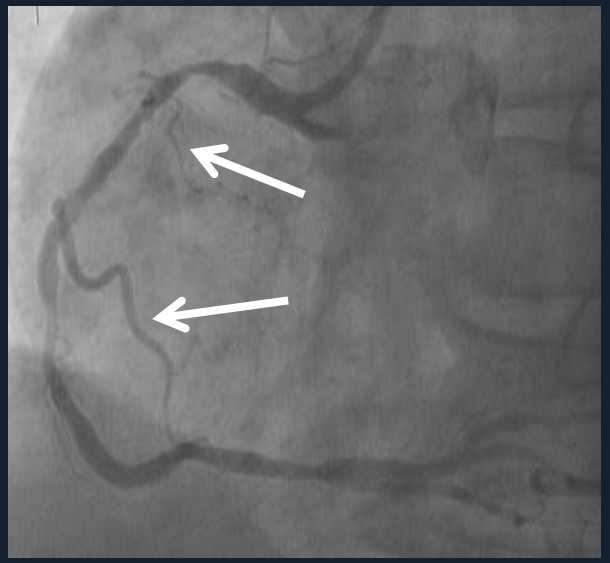
ASAN Medical Center

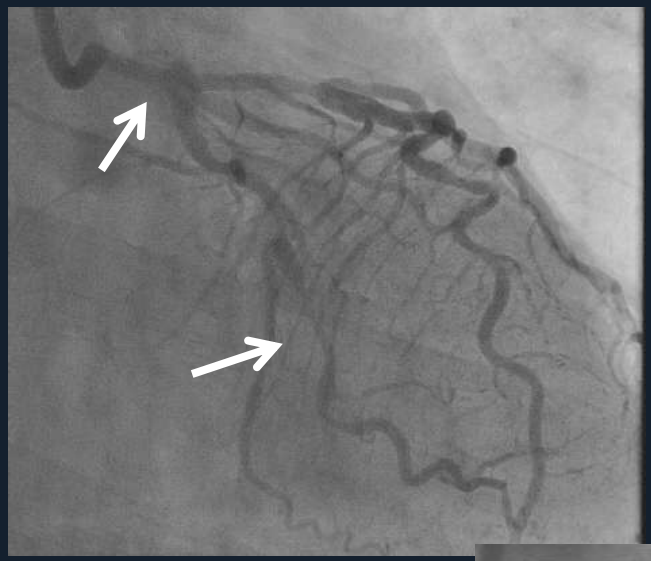
My Thought 4
SYNTAX + Clinical Parameters

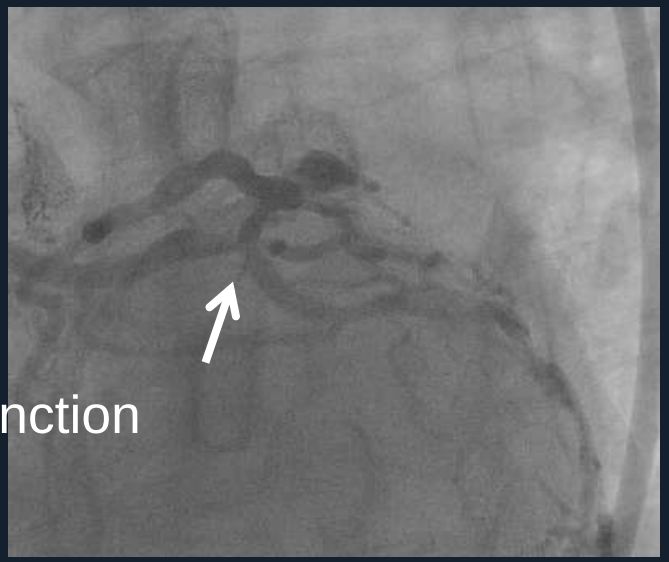
- SS is going to be just a component of predictors included in the risk model.
- Then, calculation of SS is not a prerequisite, but an option …

- Why not simpler parameters, such as # of vessel disease or ACC/AHA classification, to represent angiographic complexity ?

My Decision
SS ranging from 33 - 44 across Operators



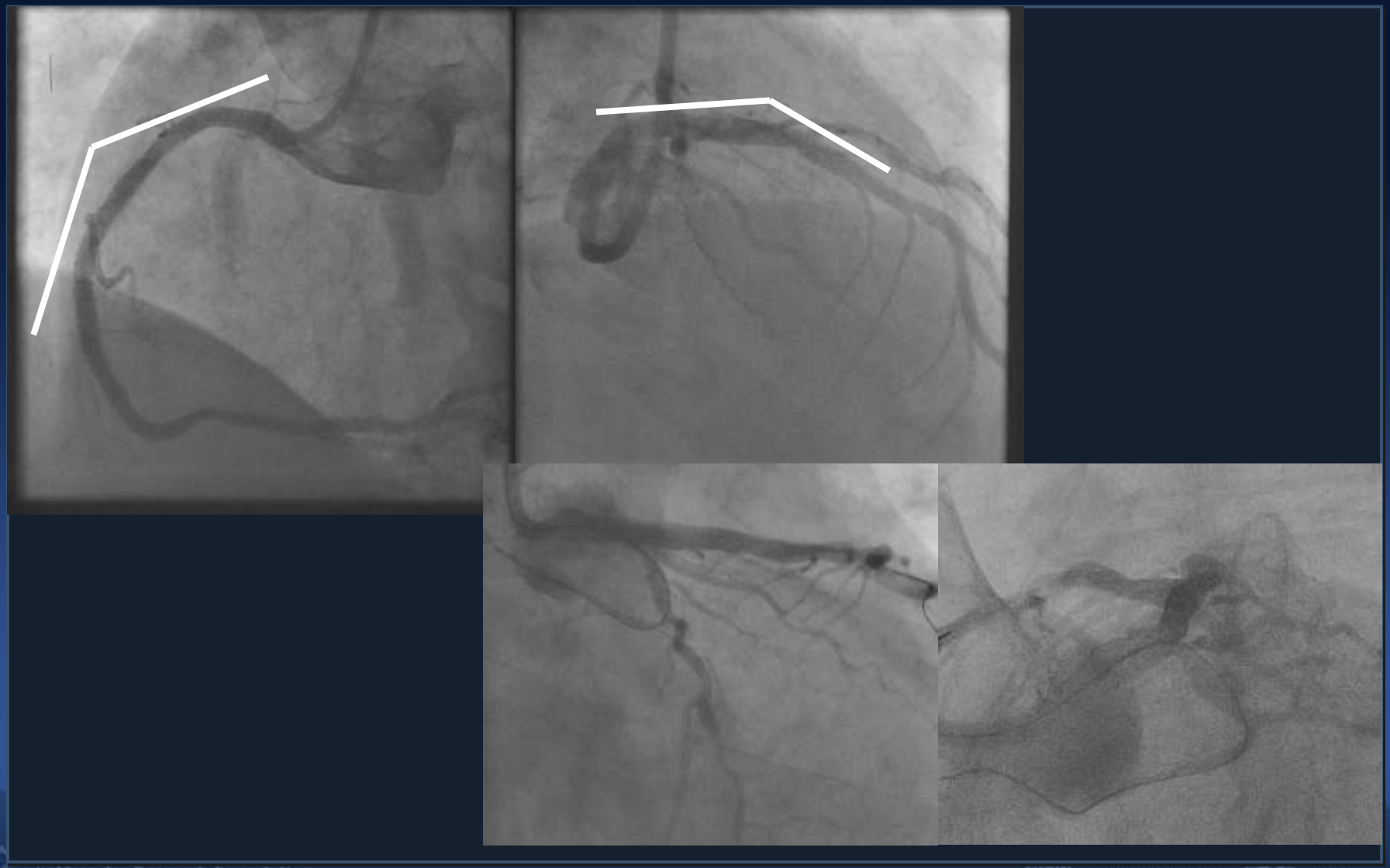




- Normal EF
- Male 68
- Non-diabetic
- Hypertension
- Normal renal function

PCI using 4 DES for LM, LAD, RCA

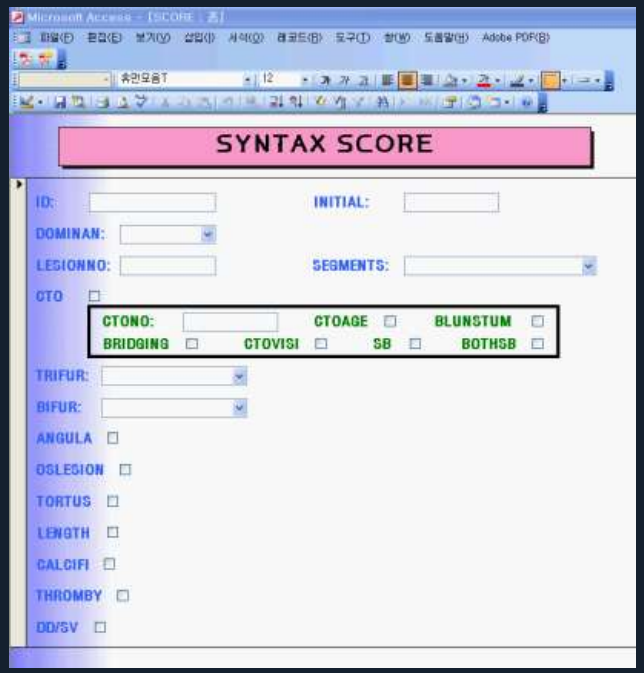
No touch for Diag and LCX



SYNTAX Score in AMC

Routinely measured
in the Core Lab

A good parameter of
angiographic complexity



But, **NOT measured**
in the Cath Lab

NOT a good parameter
for individualized care

Thank you very much