# Welcome to the 7th European Bifurcation Club 14-15 October 2011 - LISBON

## LM Bifurcation Studies of Importance in 2011

European Bifurcation Club

EBC

Alaide Chieffo, MD
Invasive Cardiology Unit
San Raffaele Scientific Institute
Milan, Italy

# ESC/EACTS 2010 Guidelines on Myocardial Revascularization

| | CABG | PCI |
|---|---|---|
| Left Main (isolated or 1VD, ostium/shaft) | IA | IIa B |
| Left Main (isolated or 1VD, distal bifurcation) | IA | IIb B |
| Left Main + 2VD or 3VD and SYNTAX score <32 | IA | IIb B |
| Left Main + 2VD or 3VD and SYNTAX score ≥33 | IA | IIIB |

EBC

Wijns W et al. Eur Heart 2010 Oct;31(20):2501

# ASAN-MAIN Registry

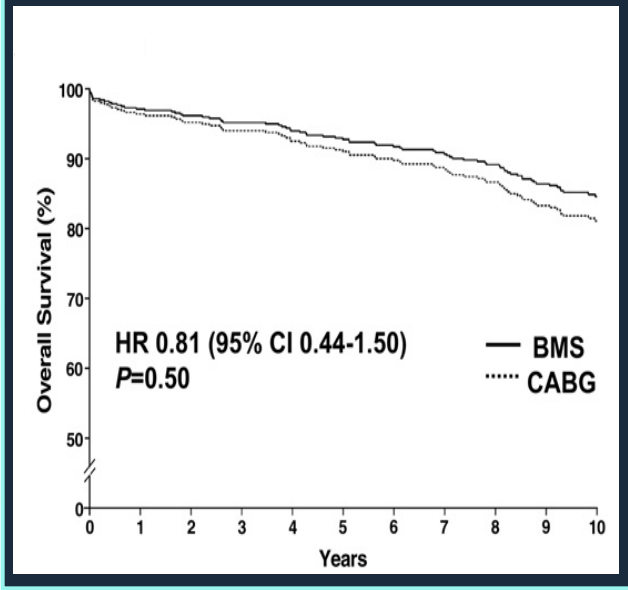
| | Cumulative 10-year Outcome | | | Cumulative 5-year Outcome | | |
|---|---|---|---|---|---|---|
| | BMS n=100 (%) | CABG n=250 (%) | P value | DES n=176 (%) | CABG n=219 (%) | P value |
| Death | 15 (15.9) | 59 (24.1) | 0.02 | 10 (5.9) | 24 (11.2) | 0.03 |
| Cardiac | 6 (6.9) | 25 (11) | 0.10 | 6 (3.7) | 13 (6.1) | 0.22 |
| Non Cardiac | 9 (9.6) | 34 (14.8) | 0.08 | 4 (2.3) | 11 (5.4) | 0.06 |
| MI | 15 (16) | 29 (12.1) | 0.43 | 27 (15.7) | 21 (9.7) | 0.12 |
| Q-wave | 7 (7.8) | 20 (8.5) | 0.72 | 9 (5.5) | 12 (5.6) | 0.67 |
| Non Q-wave | 8 (8.3) | 9 (3.6) | 0.09 | 18 (10.2) | 9 (4.1) | 0.02 |
| Stroke | 5 (5.5) | 18 (8.8) | 0.22 | 3 (1.7) | 12 (5.9) | 0.04 |
| Death, Q-wave MI or Stroke | 24 (25.2) | 78 (32.1) | 0.04 | 17 (10) | 41 (19.9) | 0.004 |
| TLR | 24 (24.9) | 11 (4.9) | <0.0001 | 26 (16.2) | 6 (2.9) | <0.001 |

*DW Park et al J. Am. Coll. Cardiol. 2010;56;1366-1375*

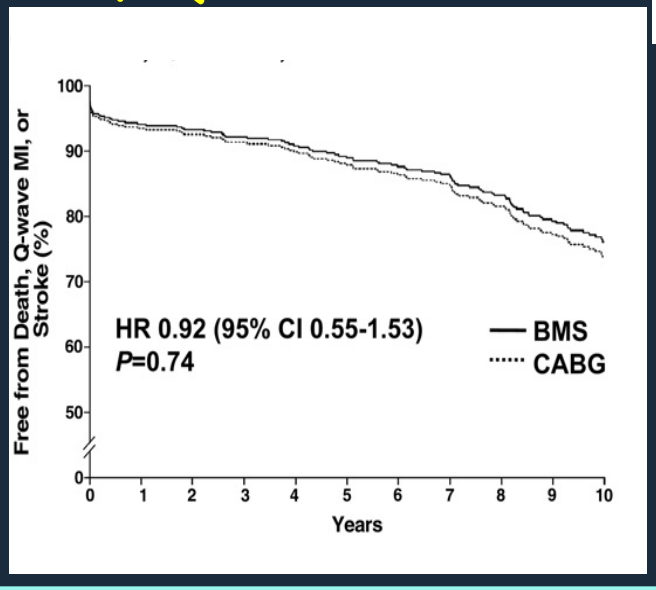
# ASAN-MAIN Registry

## Adjusted Survival Curves:
## BMS (n=100) vs. CABG (n=250)

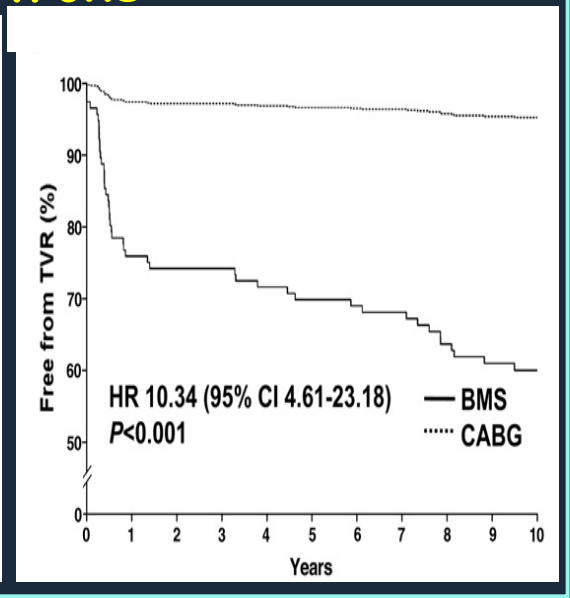
**Death**




**Death, Q-Wave MI and Stroke**




**TVR**



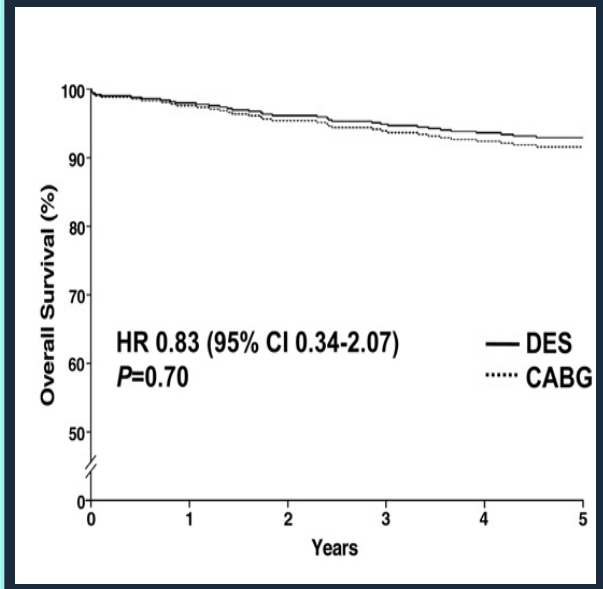

EBC

*DW Park et al J. Am. Coll. Cardiol. 2010;56;1366-1375*

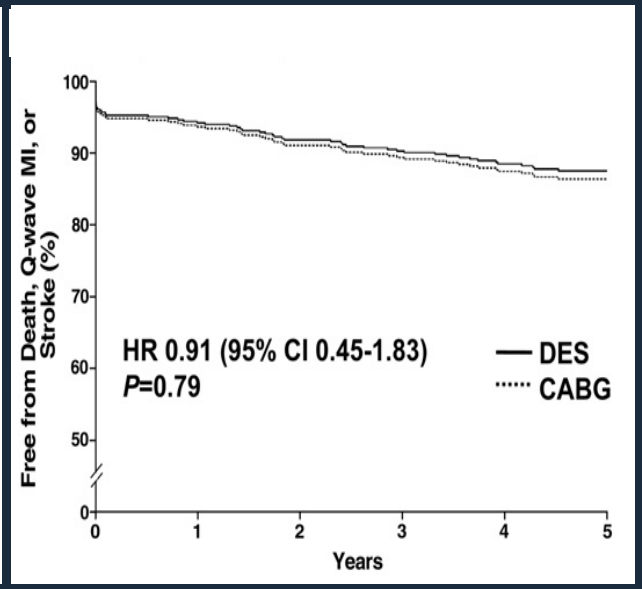
# ASAN-MAIN Registry

## Adjusted Survival Curves: DES (n=176) vs. CABG (n=219)

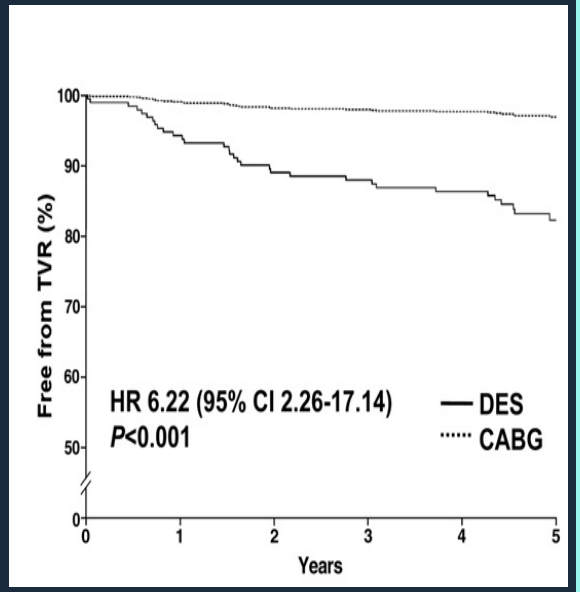
**Death**




**Death, Q-Wave MI and Stroke**



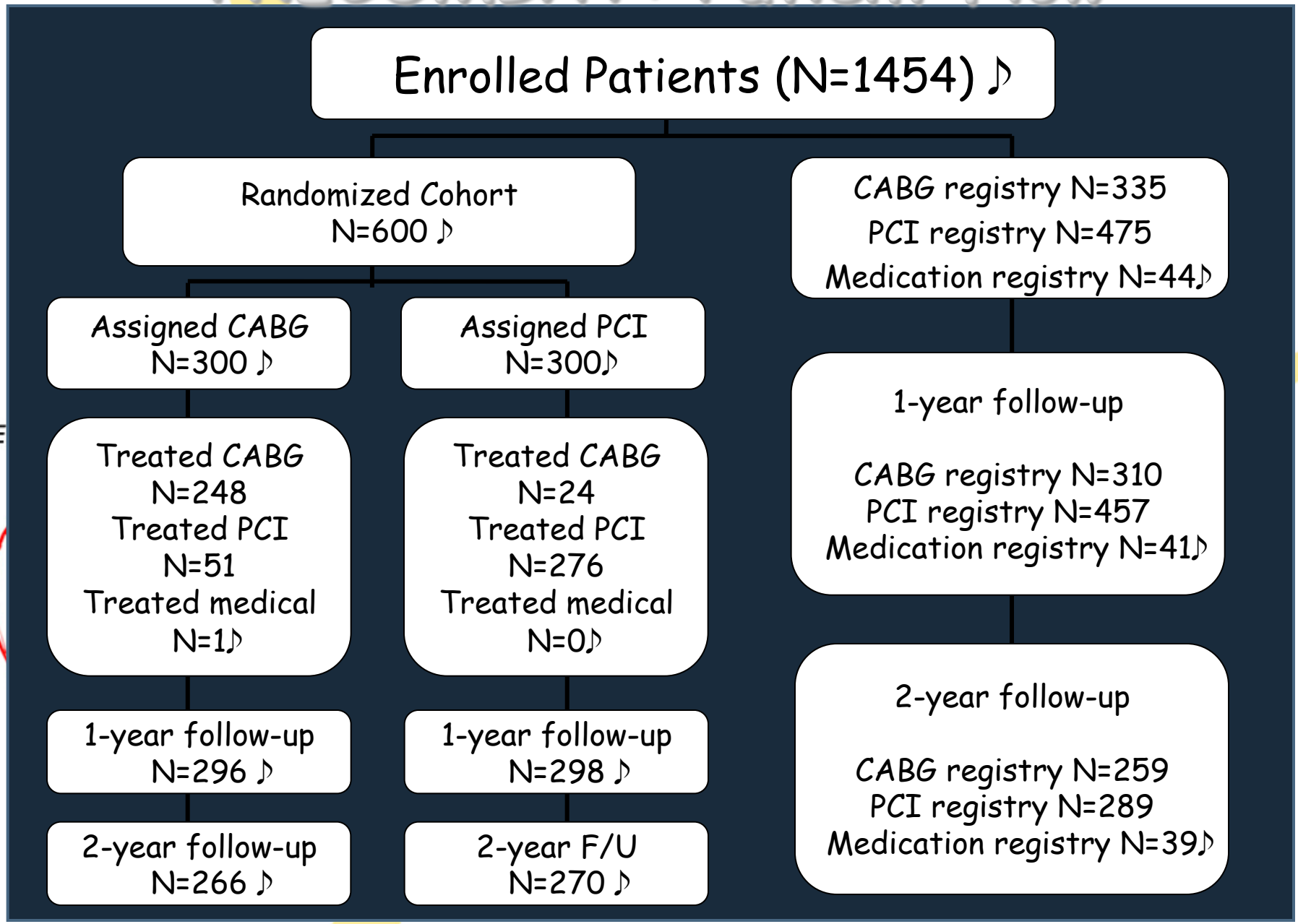

**TVR**



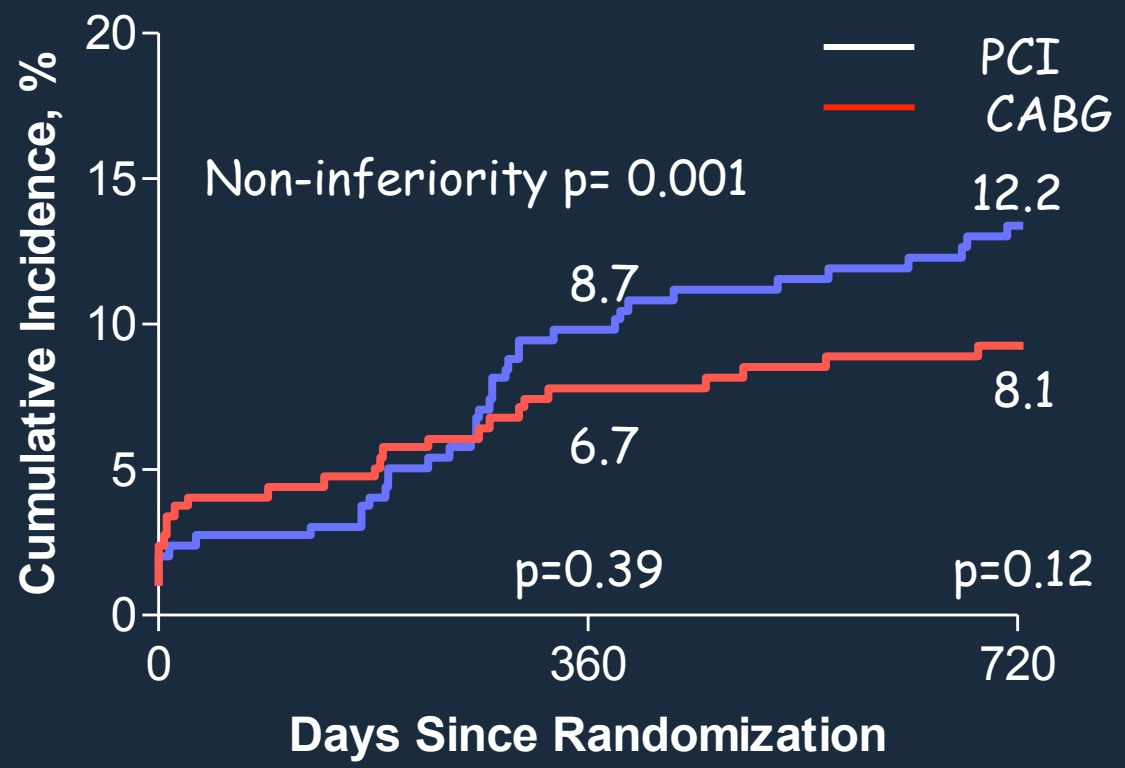

EBC

*DW Park et al J. Am. Coll. Cardiol. 2010;56;1366-1375*

# PRECOMBAT: Patient Flow



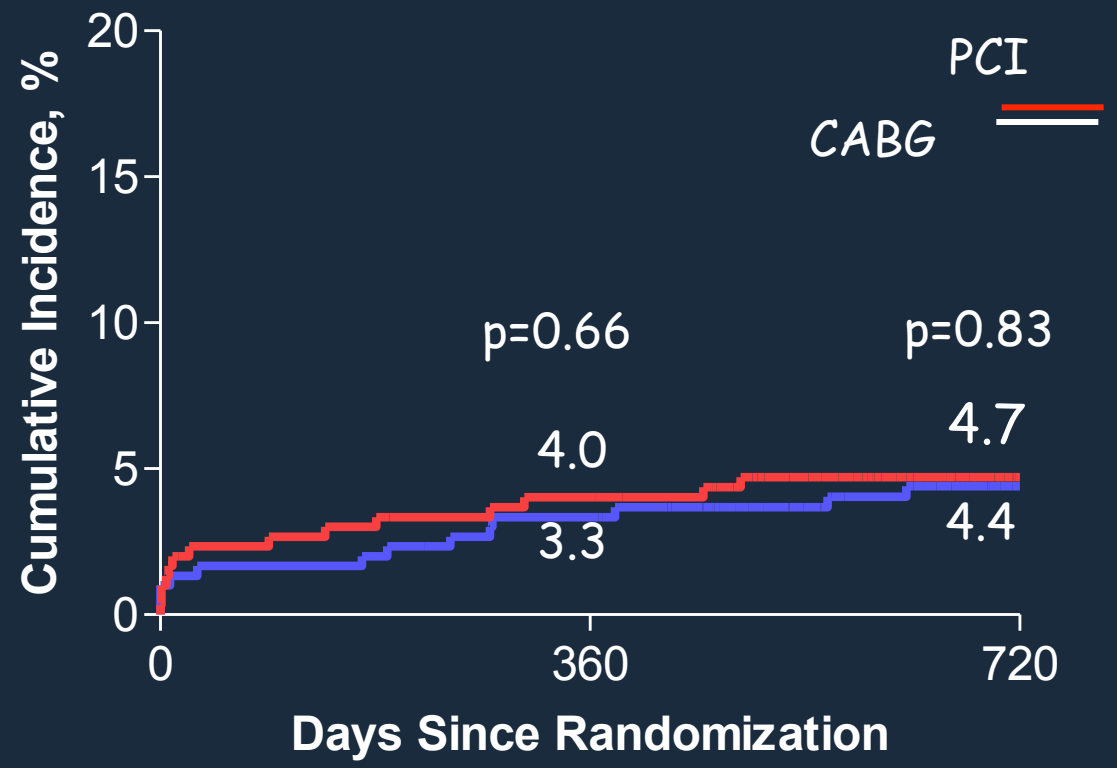
# PRECOMBAT: MACCE




| No. at Risk | | | |
|---|---|---|---|
| PCI | 300 | 272 | 236 |
| CABG | 300 | 276 | 239 |

Park et al NEJM 2011; 364: 1718-27

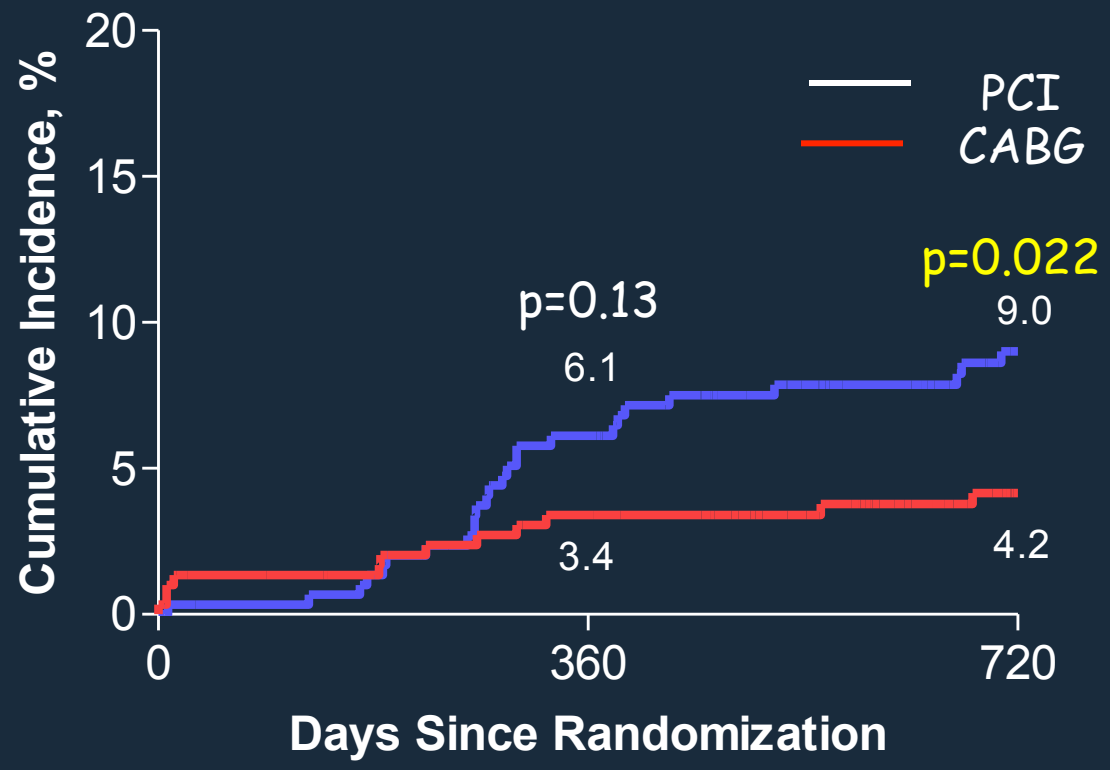
# PRECOMBAT: Death, MI or Stroke




| No. at Risk | | | |
|---|---|---|---|
| PCI | 300 | 288 | 256 |
| CABG | 300 | 284 | 248 |

Park et al NEJM 2011; 364: 1718-27

# PRECOMBAT: Ischemia-Driven TVR




| No. at Risk | | | |
|---|---|---|---|
| PCI | 300 | 274 | 237 |
| CABG | 300 | 279 | 242 |

Park et al NEJM 2011; 364: 1718-27

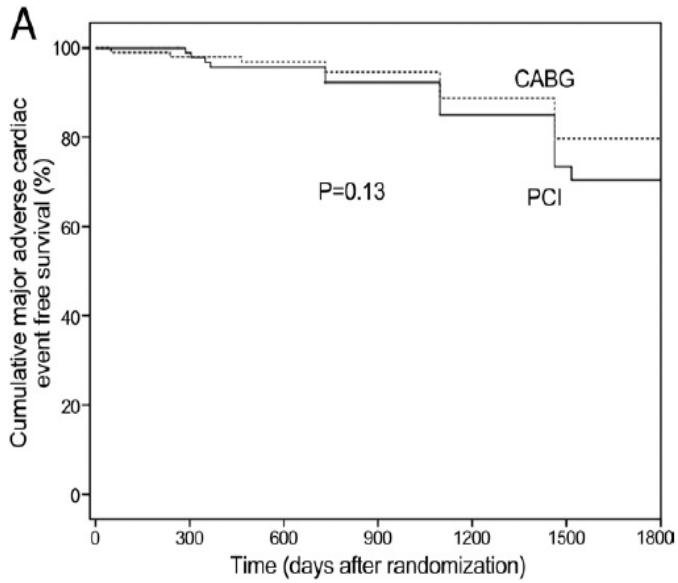
# Randomized Comparison of Percutaneous Coronary Intervention With Sirolimus-Eluting Stents Versus Coronary Artery Bypass Grafting in Unprotected Left Main Stem Stenosis

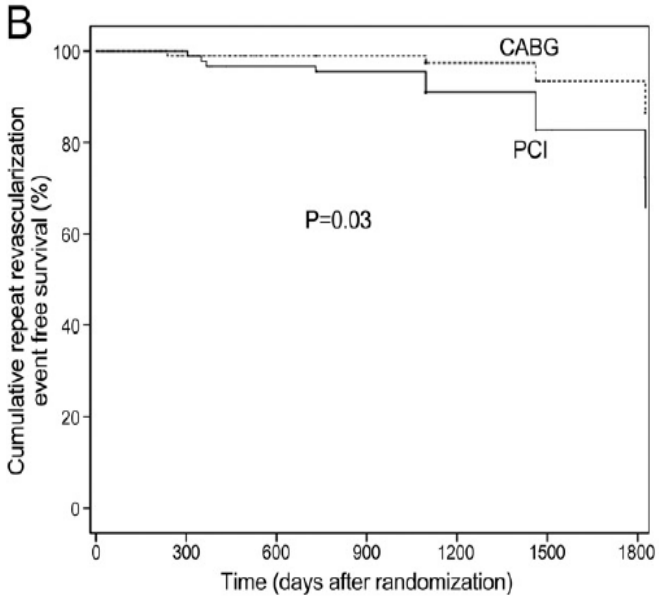
Enno Boudriot, MD,* Holger Thiele, MD,* Thomas Walther, MD,† Christoph Liebetrau, MD,* Peter Boeckstegers, MD,‡ Tilmann Pohl, MD,‡ Bruno Reichart, MD,§ Harald Mudra, MD,‖ Florian Beier, MD,‖ Brigitte Gansera, MD,¶ Franz-Josef Neumann, MD,# Michael Gick, MD,# Thomas Zietak, MD,** Steffen Desch, MD,* Gerhard Schuler, MD,* Friedrich-Wilhelm Mohr, MD†

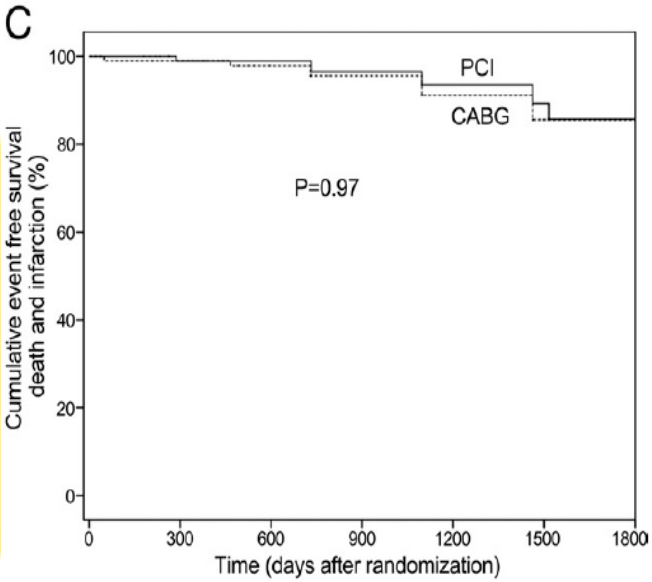
*Leipzig, Munich, and Bad Krozingen, Germany*

Euro

# Survivals from MACCE, Death+MI and TVR

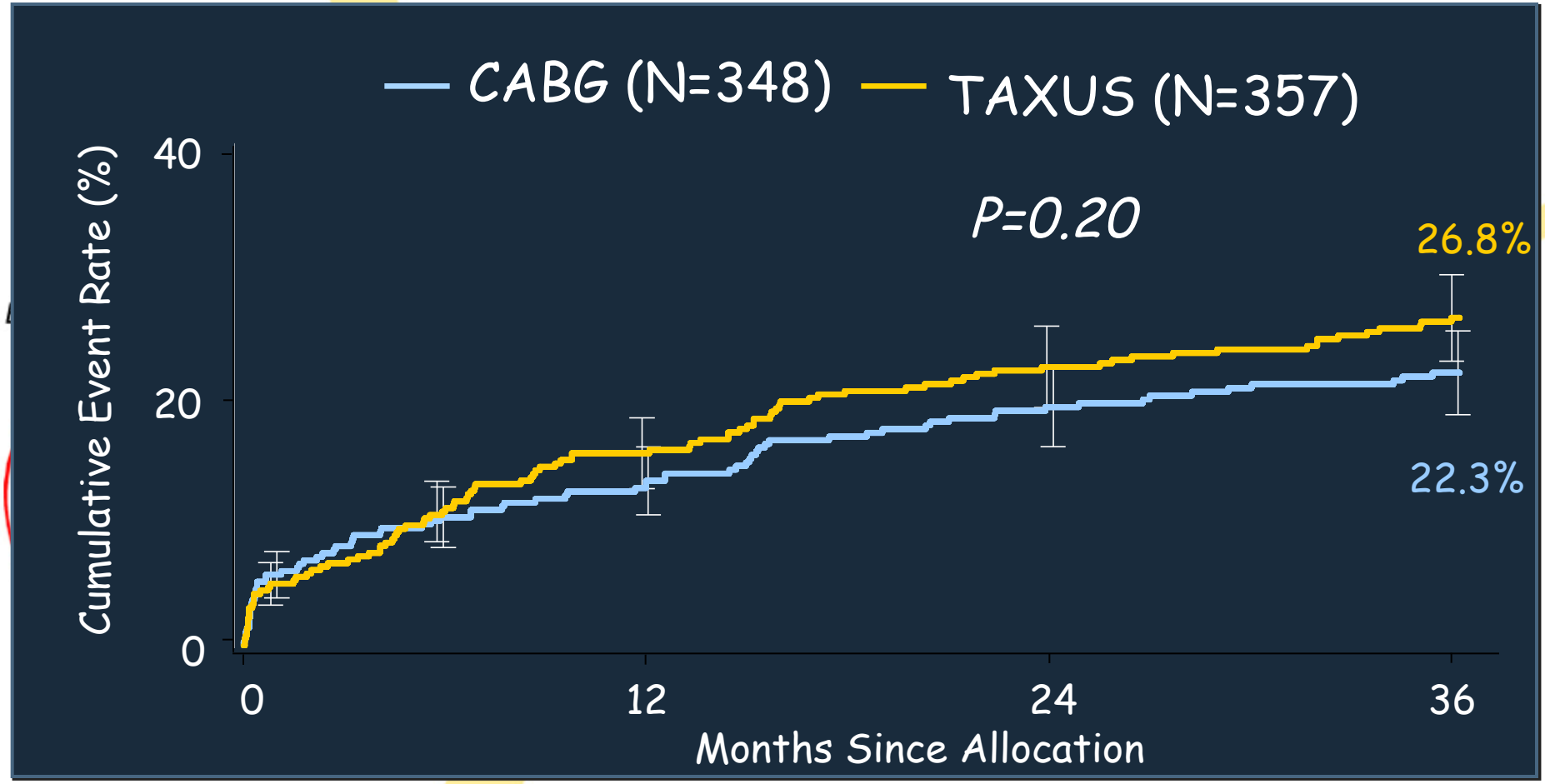





Boudriot et al J Am Coll Cardiol 2011;57:538-45

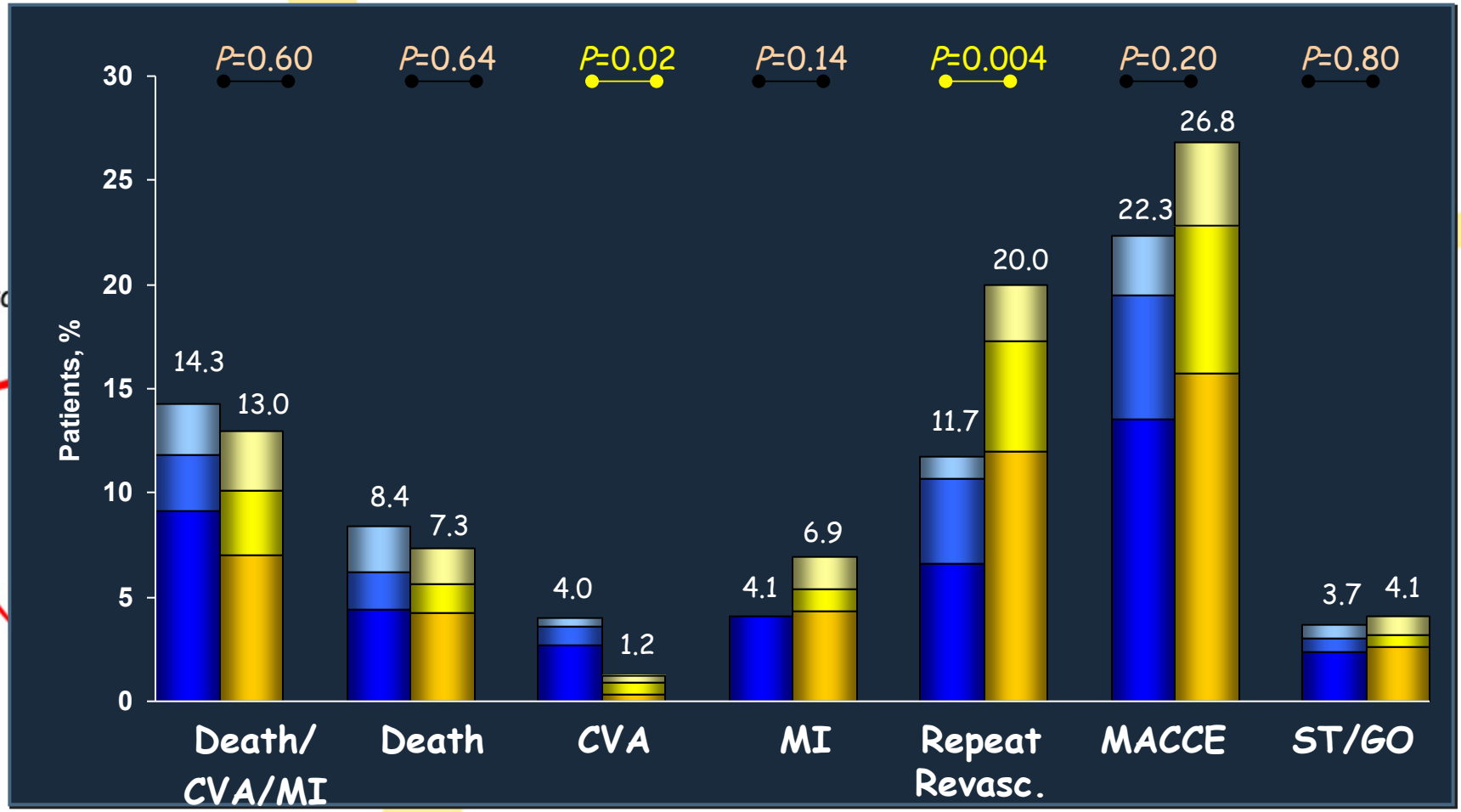
# SYNTAX
# MACCE to 3 Years
## *Left Main Subset*




Cumulative KM Event Rate ± 1.5 SE;

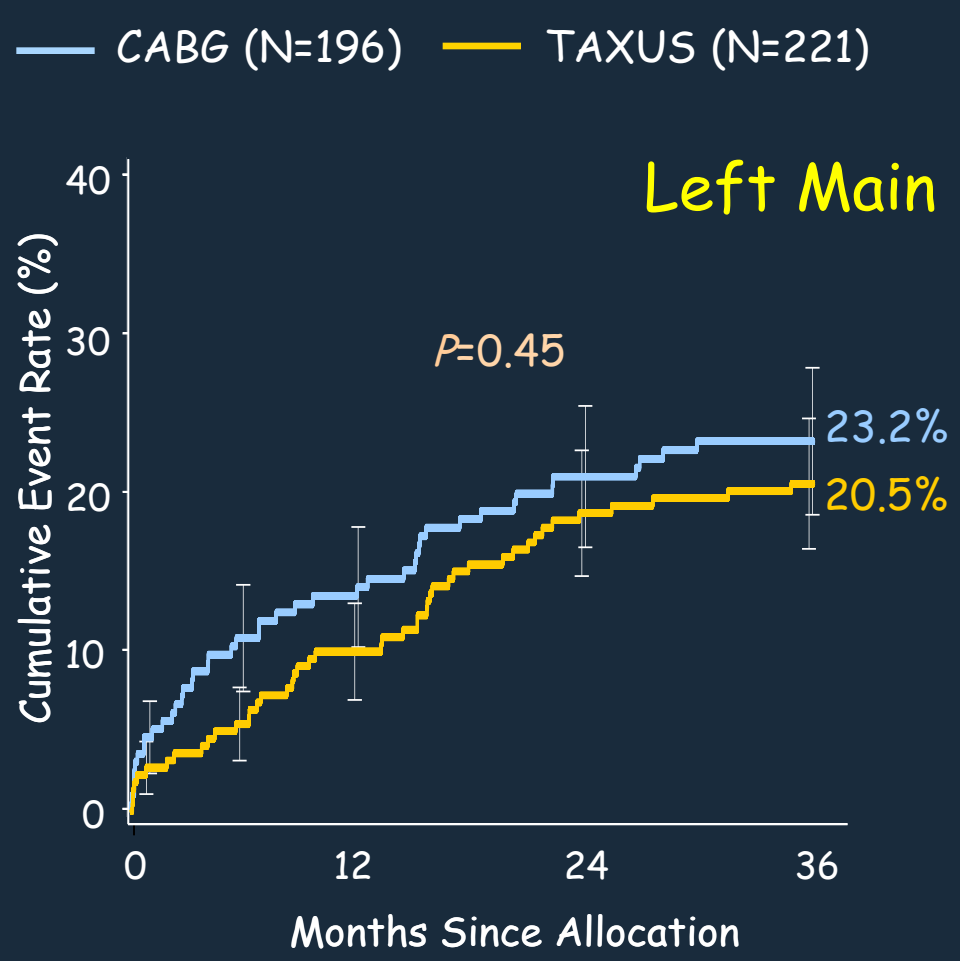
Kappetein. Eur Heart Journal 2011; 32: 2125-2134

# 3-Year Outcomes: *LM Subset*




Kappetein. Eur Heart Journal 2011; 32: 2125-2134

# MACCE to 3 Years by SYNTAX Score Tercile
## *Low to Intermediate Scores (0-32)*



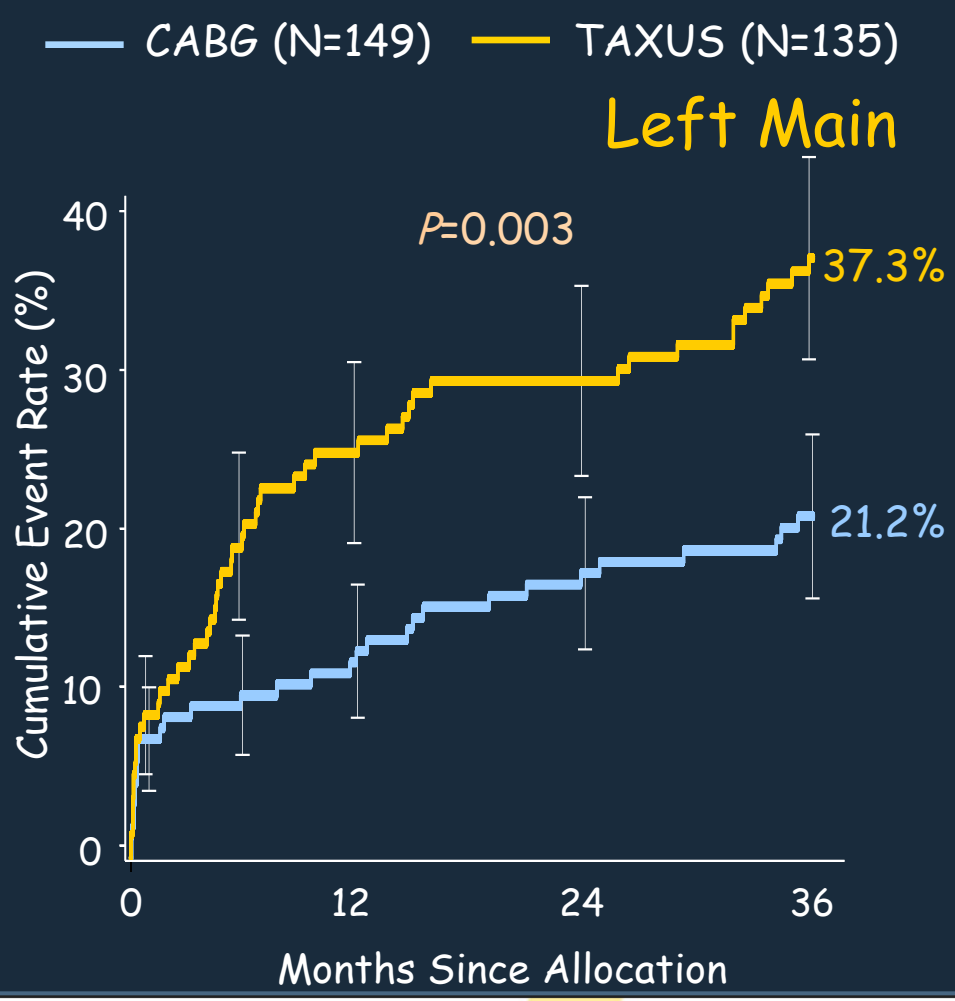

| | CABG | PCI | *P* value |
|---|---|---|---|
| Death | 9.0% | 3.7% | 0.02 |
| CVA | 3.3% | 0.9% | 0.09 |
| MI | 2.6% | 4.6% | 0.33 |
| Death, CVA or MI | 13.2% | 8.7% | 0.12 |
| Revasc. | 13.7% | 15.7% | 0.61 |

Cumulative KM Event Rate ± 1.5 SE; log-rank *P* value

Site-reported Data; ITT population

Kappetein. Eur Heart Journal 2011; 32: 2125-2134

# MACCE to 3 Years by SYNTAX ScoreTercile
## *Left Main SYNTAX Score ≥33*




| | CABG | PCI | *P* value |
|---|---|---|---|
| Death | 7.6% | 13.4% | 0.10 |
| CVA | 4.9% | 1.6% | 0.13 |
| MI | 6.1% | 10.9% | 0.18 |
| Death, CVA or MI | 15.7% | 20.1% | 0.34 |
| Revasc. | 9.2% | 27.7% | <0.001 |

Cumulative KM Event Rate ± 1.5 SE; log-rank *P* value

Kappetein. Eur Heart Journal 2011; 32: 2125-2134

# Percutaneous Coronary Intervention Versus Coronary Artery Bypass Graft Surgery in Left Main Coronary Artery Disease

## A Meta-Analysis of Randomized Clinical Data

Davide Capodanno, MD,* Gregg W. Stone, MD,† Marie C. Morice, MD,‡ Theodore A. Bass, MD,§ Corrado Tamburino, MD, PHD*

*Catania, Italy; New York, New York; Massy, France; and Jacksonville, Florida*

EBC

Ca

**Table 1** Studies Included in the Meta-Analysis

| Study | Year | Design | N | PCI, n | DES, % | CABG | LIMA to LAD, % | Primary Outcome |
|---|---|---|---|---|---|---|---|---|
| LEMANS (4) | 2008 | RCT | 105 | 52 | 35 | 53 | 81 | Cardiac death, MI, CVA, repeat revascularization, and/or acute/subacute in-stent thrombosis |
| SYNTAX Left Main (5) | 2009 | Pre-specified subanalysis from RCT | 705 | 357 | 100 | 348 | 97 | All-cause death, CVA, MI, and repeat revascularization |
| Boudriot et al. (8) | 2010 | RCT | 201 | 100 | 100 | 101 | 99 | All-cause death, MI, and repeat revascularization |
| PRECOMBAT (9) | 2011 | RCT | 600 | 300 | 100 | 300 | 94 | All-cause death, CVA, MI, and repeat revascularization |

*European Bifurcation Club*

**Table 2** Patients and Procedural Characteristics of Included Studies

| Study | Age, yrs | Male, % | Diabetes, % | Distal LMCA Disease, % | No. of Diseased Vessels, 0/1/2/3, % | SYNTAX Score, mean n | Logistic EuroSCORE, mean % | Complete Revascularization, overall/PCI/CABG, % |
|---|---|---|---|---|---|---|---|---|
| LEMANS (4) | 61 | 67 | 18 | 58 | 0/9/23/68 | 25 | 3.4 | 84/79/89 |
| SYNTAX Left Main (5) | 65 | 74 | 25 | 61 | 13/20/31/36 | 30 | 3.9 | 68/65/73 |
| Boudriot et al. (8) | 68 | 75 | 36 | 71 | 29/31/27/14 | 24 | 2.5 | 98/98/97 |
| PRECOMBAT (9) | 62 | 77 | 32 | 65 | 10/17/32/41 | 25 | 2.7 | 69/68/70 |

Capodanno et al, *JACC* 2011;58:1426–32

**Table 3** 1-Year Outcomes in Left Main Patients Revascularized by PCI or CABG

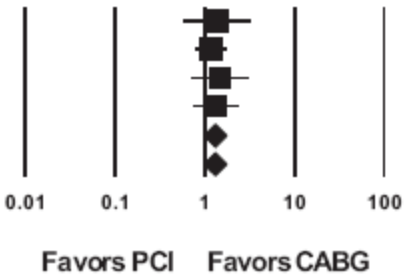
| Endpoint | PCI (n = 809) | CABG (n = 802) | Absolute Difference (95% CI) | Number Needed to Treat | Number Needed to Harm | p Value |
|---|---|---|---|---|---|---|
| MACCE | 14.5 (117/807) | 11.8 (93/790) | 2.7 (−0.6, 6.0) | — | 37 | 0.11 |
| Death/MI/CVA | 5.3 (35/655) | 6.8 (43/636) | −1.5 (−4.1, 1.2) | 67 | — | 0.26 |
| Death | 3.0 (24/807) | 4.1 (32/790) | −1.1 (−3.0, 0.8) | 91 | — | 0.29 |
| MI | 2.8 (23/807) | 2.9 (23/790) | −0.1 (−1.8, 1.6) | 1,000 | — | 0.95 |
| CVA | 0.1 (1/707) | 1.7 (12/689) | −1.6 (−2.9, −0.6) | 63 | — | 0.013 |
| TVR | 11.4 (92/807) | 5.4 (43/790) | 6.0 (3.3, 8.7) | — | 17 | <0.001 |

EBC

Capodanno et al, *JACC* 2011;58:1426–32

## Major Adverse Cardiac and Cerebrovascular Events

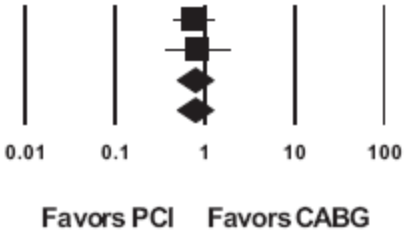
| Model | Study name | Statistics for each study: Odds ratio | Lower limit | Upper limit | p-Value | Events / Total: PCI | CABG |
|---|---|---|---|---|---|---|---|
| | LEMANS | 1.368 | 0.579 | 3.229 | 0.475 | 16 / 52 | 13 / 53 |
| | SYNTAX left main | 1.181 | 0.774 | 1.801 | 0.440 | 56 / 355 | 46 / 336 |
| | Boudriot et al. | 1.458 | 0.686 | 3.098 | 0.327 | 19 / 100 | 14 / 101 |
| | PRECOMBAT | 1.328 | 0.725 | 2.436 | 0.359 | 26 / 300 | 20 / 300 |
| Fixed | Pooled estimate | 1.276 | 0.950 | 1.715 | 0.106 | | |
| Random | Pooled estimate | 1.276 | 0.950 | 1.715 | 0.106 | | |
| | $I^2 = 0\%$ | | | | | | |




European

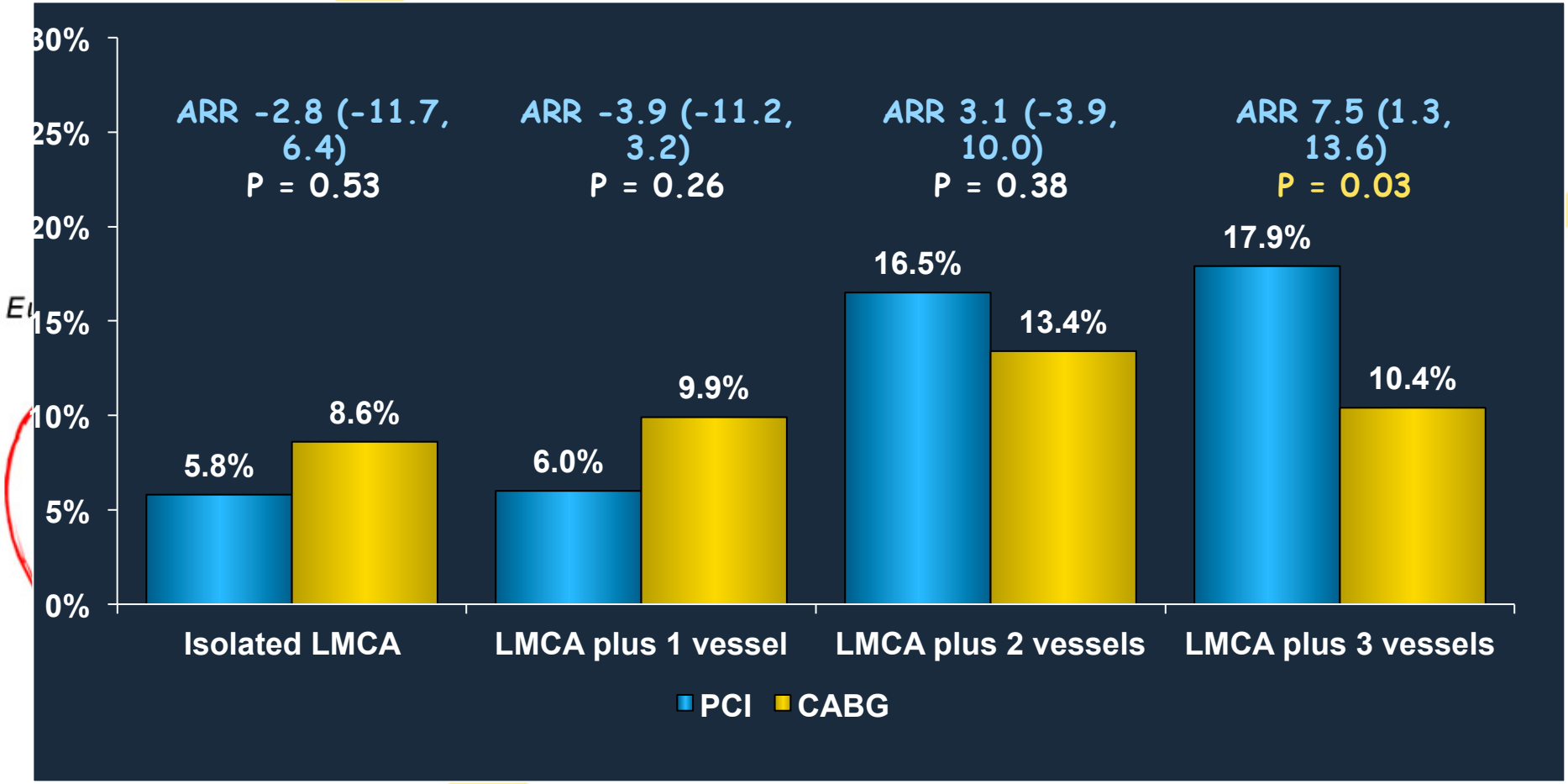
## Death, Myocardial Infarction or Stroke

| Model | Study name | Statistics for each study: Odds ratio | Lower limit | Upper limit | p-Value | Events / Total: PCI | CABG |
|---|---|---|---|---|---|---|---|
| | SYNTAX left main | 0.745 | 0.430 | 1.291 | 0.294 | 25 / 355 | 31 / 336 |
| | PRECOMBAT | 0.828 | 0.352 | 1.946 | 0.664 | 10 / 300 | 12 / 300 |
| Fixed | Pooled estimate | 0.769 | 0.484 | 1.220 | 0.264 | | |
| Random | Pooled estimate | 0.769 | 0.484 | 1.220 | 0.264 | | |
| | $I^2 = 0\%$ | | | | | | |




Capodanno et al, *JACC* 2011;58:1426–32

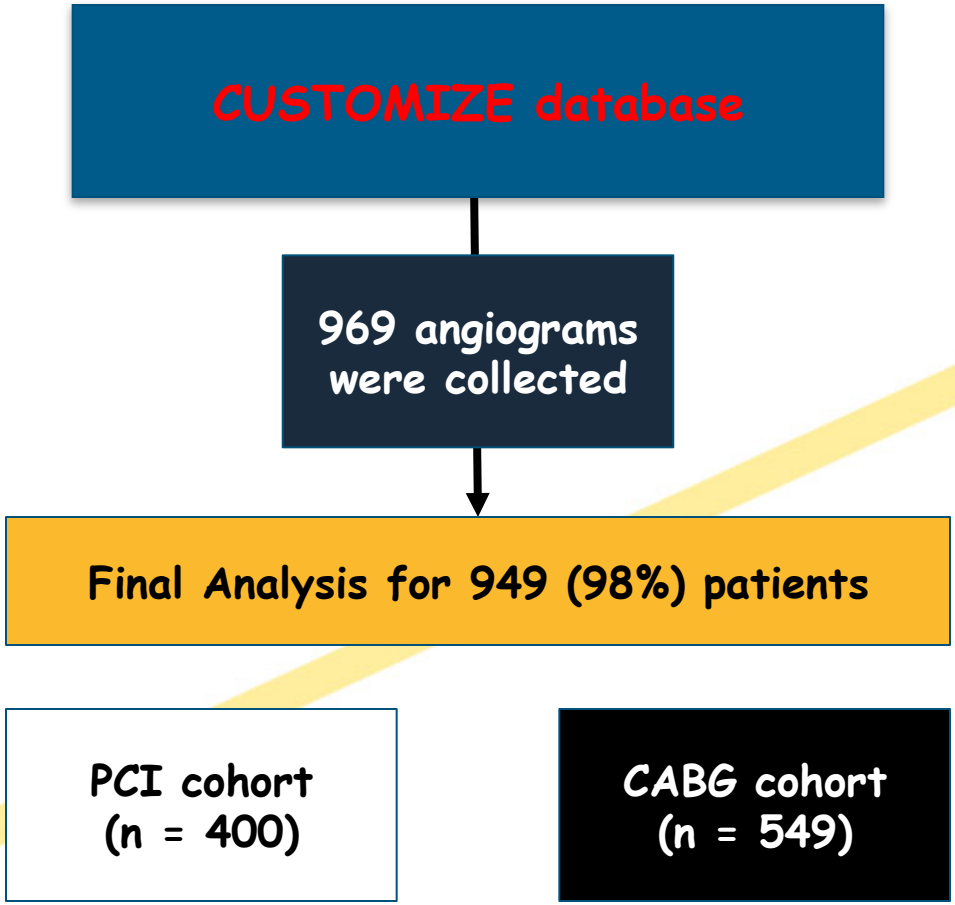
# Differences in 1-year MACCE between PCI and CABG in the pooled analysis of the SYNTAX and PRECOMBAT trials after stratification by number of vessels




Capodanno et al, *JACC* 2011;58:1426–32

# Global Risk Classification and Clinical SYNTAX score in patients undergoing PCI OR CABG.

- How do the Global Risk Classification (GRC) and the Clinical SYNTAX score (CSS) perform in LM PCI?
- What is their value in risk stratification and decision making compared to other stand alone tools (SYNTAX score, ACEF score, EuroSCORE)?

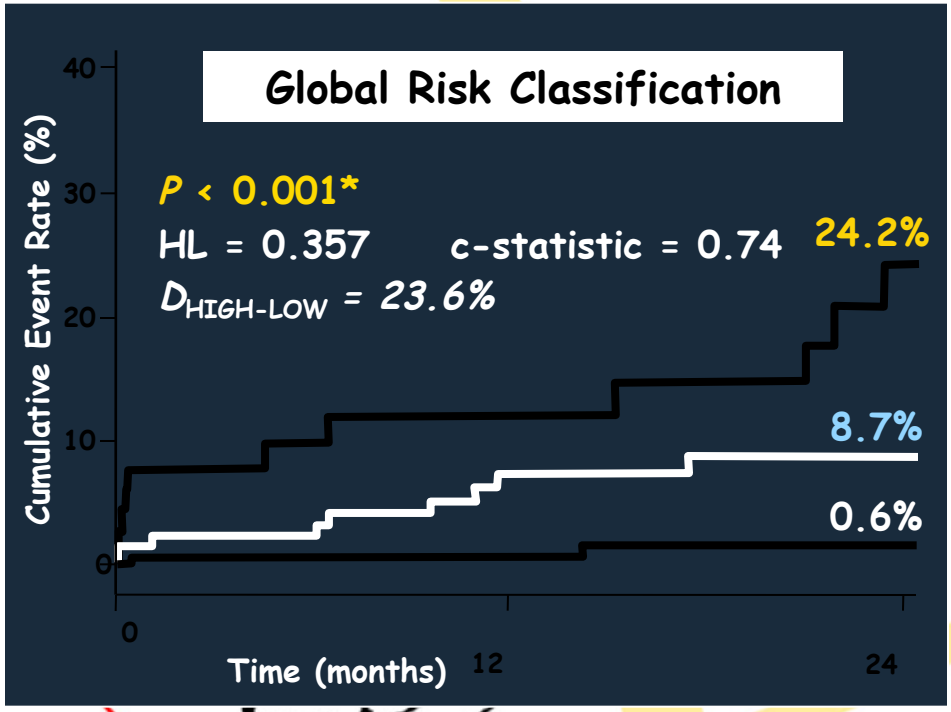


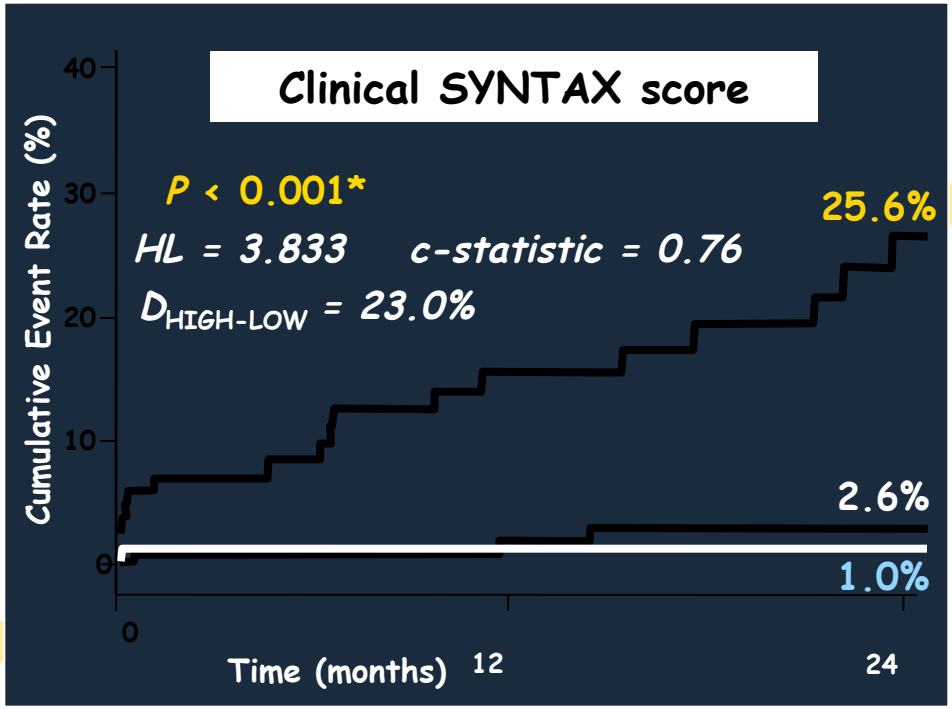

ACEF [age, creatinine, ejection fraction])
CSS= Syntaxscore+ACEF

Capodanno et al, JACC 2011;58:1426–32

# Cardiac death to 24 months by GRC and CSS strata- *PCI cohort (n = 400)*

LOW MIDDLE HIGH



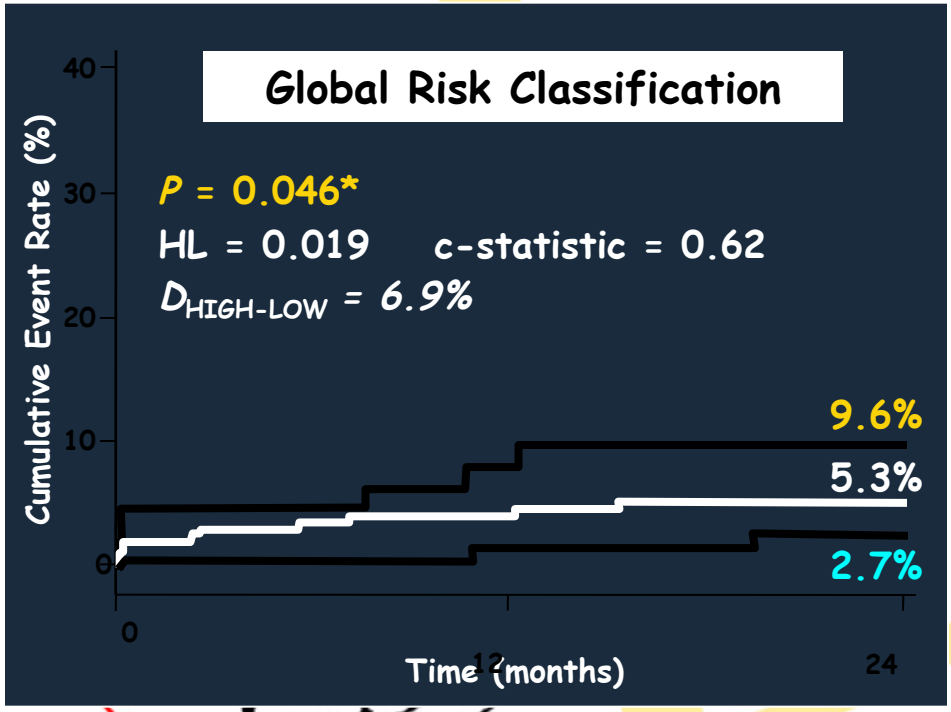

* log rank test; higher HL (Hosmer-Lemeshow) statistic indicates poorer calibration; higher $D_{HIGH-LOW}$ (Index of separation) indicates better discrimination

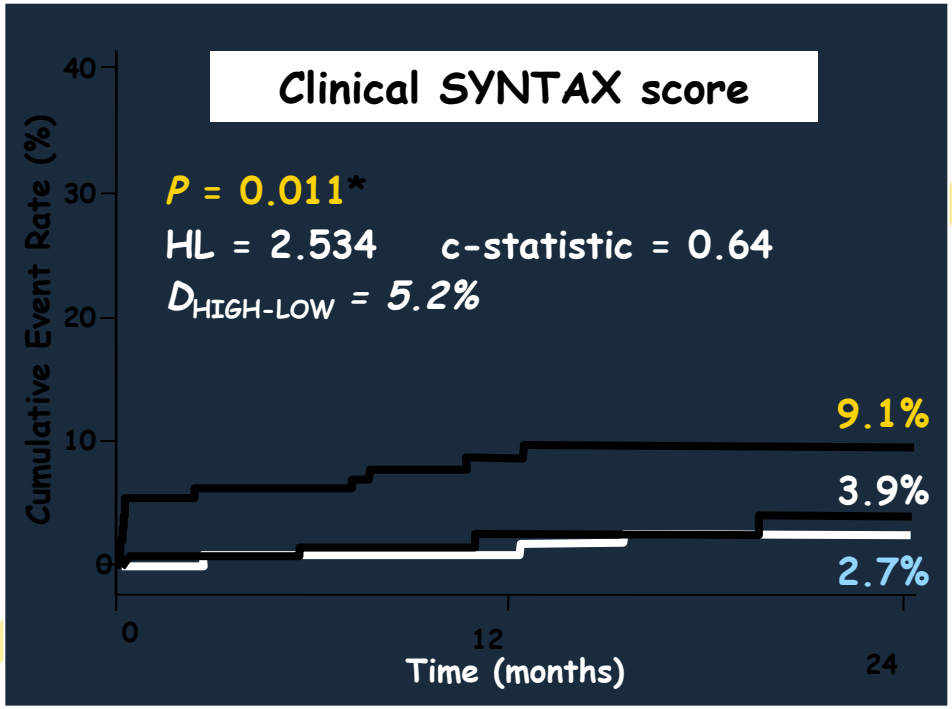
Capodanno et al JACC Cardiovasc Interv. 2011 Mar;4(3):287-97.

# Cardiac death to 24 months by GRC and CSstrata

## *CABG cohort (n = 549)*

LOW MIDDLE HIGH



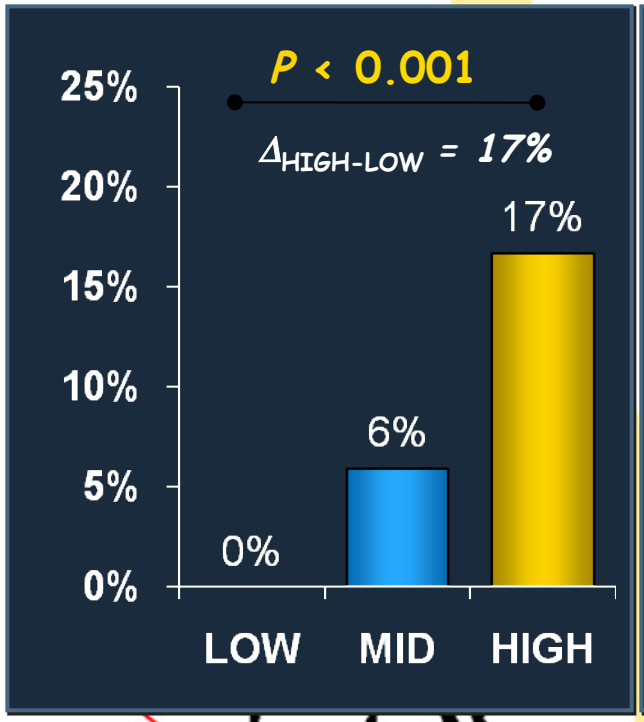

* log rank test; higher HL (Hosmer-Lemeshow) statistic indicates poorer calibration; higher $\Delta_{HIGH-LOW}$ (Index of separation) indicates better discrimination

Capodanno et al JACC Cardiovasc Interv. 2011 Mar;4(3):287-97.

# Cardiac death to 24 months by EuroSCORE, ACEF and SYNTAX score strata

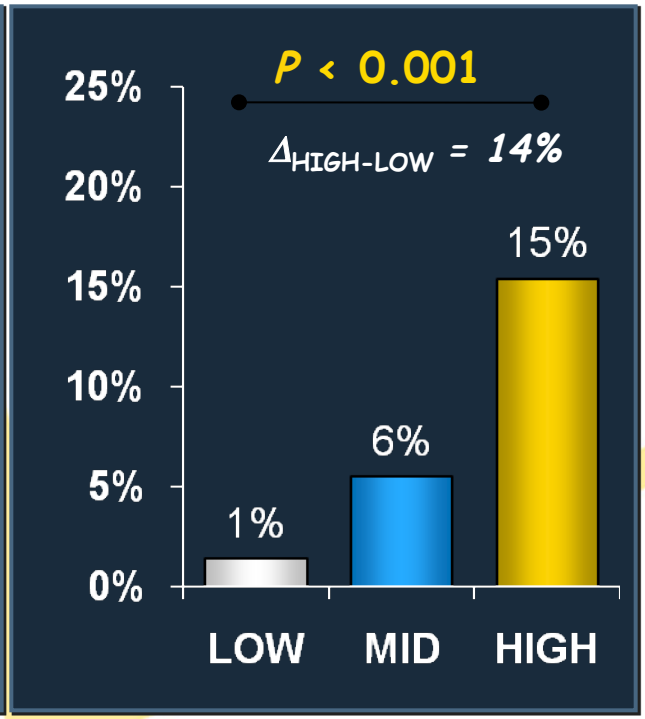
*PCI cohort (n = 400)*

EuroSCORE



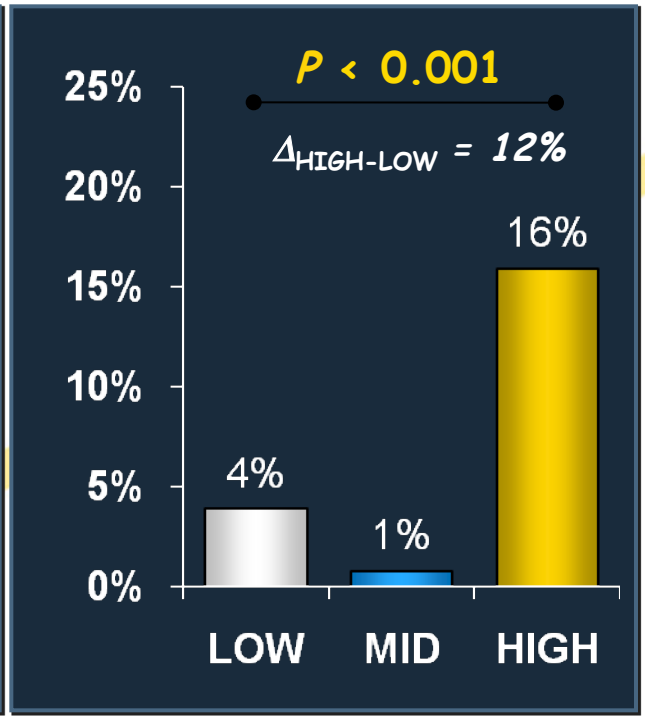

Hosmer-Lemeshow: 1.607 ☹
c-statistic: 0.69 😐

ACEF score




Hosmer-Lemeshow: 0.216 ☺
c-statistic : 0.69 😐

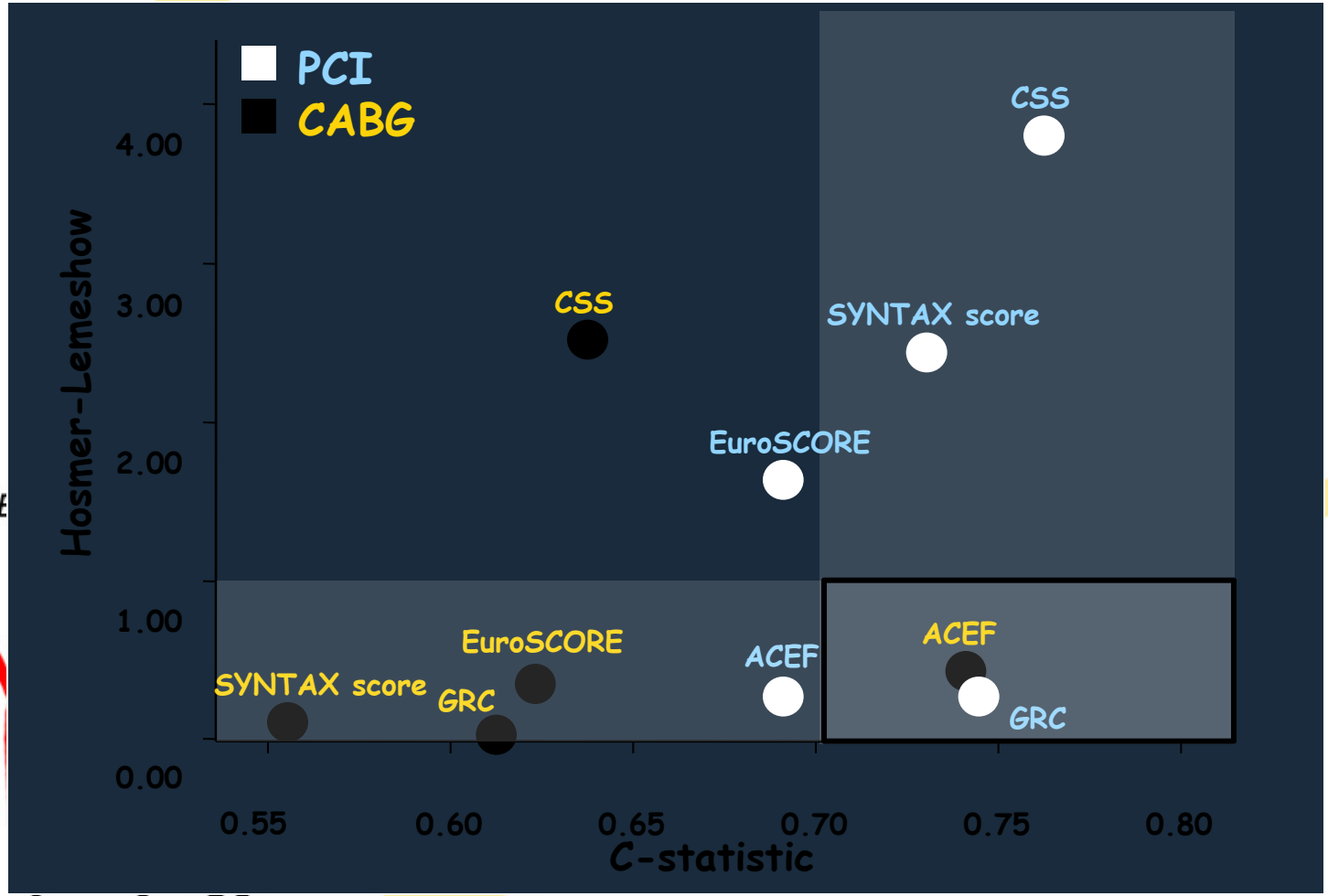
SYNTAX score




Hosmer-Lemeshow: 2.448 ☹
c-statistic : 0.73 ☺

Capodanno et al JACC Cardiovasc Interv. 2011 Mar;4(3):287-97.

# Prediction accuracy of different risk models




Calibration better

Discrimination better

Capodanno et al JACC Cardiovasc Interv. 2011 Mar;4(3):287-97.

# Conclusions

-Long term registries have demonstrated safety and efficacy of LM stenting up to 10 yrs fup

-RCT have showed no diffeences in hard end points (MI+death+CVA) but still higher revascularization rates in PCI

European Bifurcation Club

-Combined scores improve the discrimination accuracy of clinical or angiographic stand-alone tools. In CABG- LM patients, the ACEF score has the best prognostic accuracy. The good predictive ability for PCI along with the poor predictive ability for CABG still make the SYNTAX score the preferable decision-making tool in LM disease.

EBC

Awaiting for the .....

# EXCEL

European Bifurcation Club

The definitive Left Main randomized trial