PCI vs CABG for Multivessel Disease: Calculation of Risk and Long Term Outcome

Pawel Buszman, MD, PhD, FESC, FACC
Professor of Medicine,
Medical University of Silesia,
Katowice, Poland

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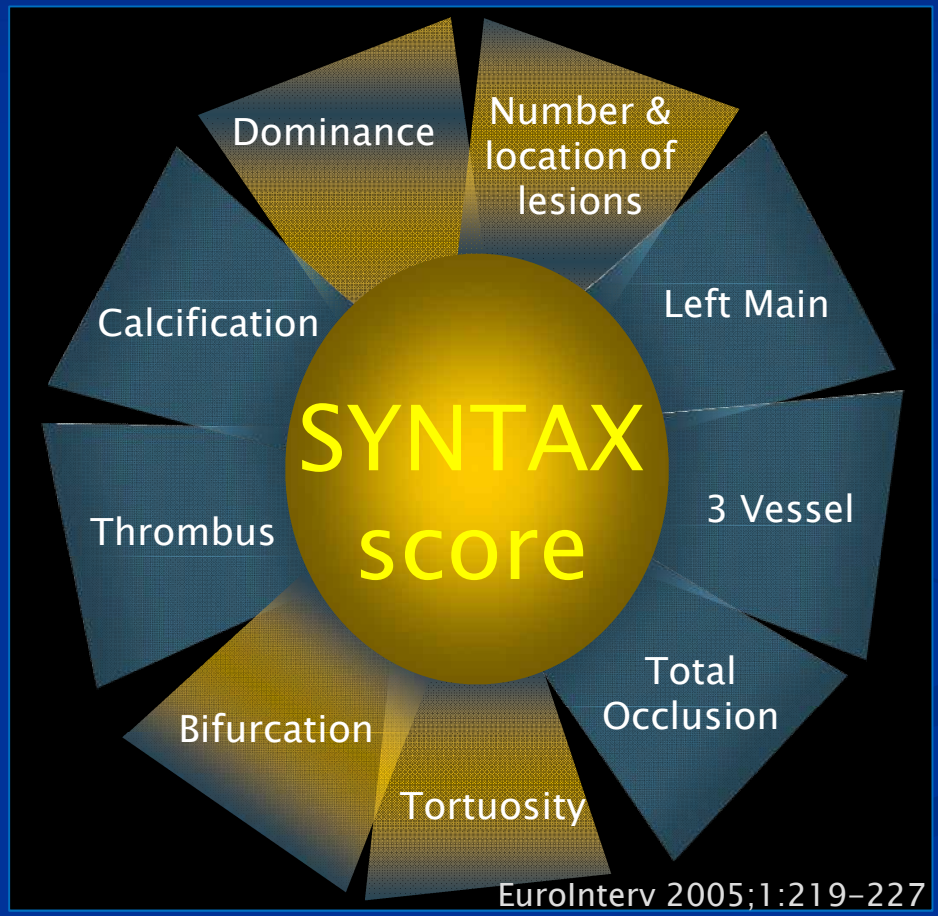
Strategy

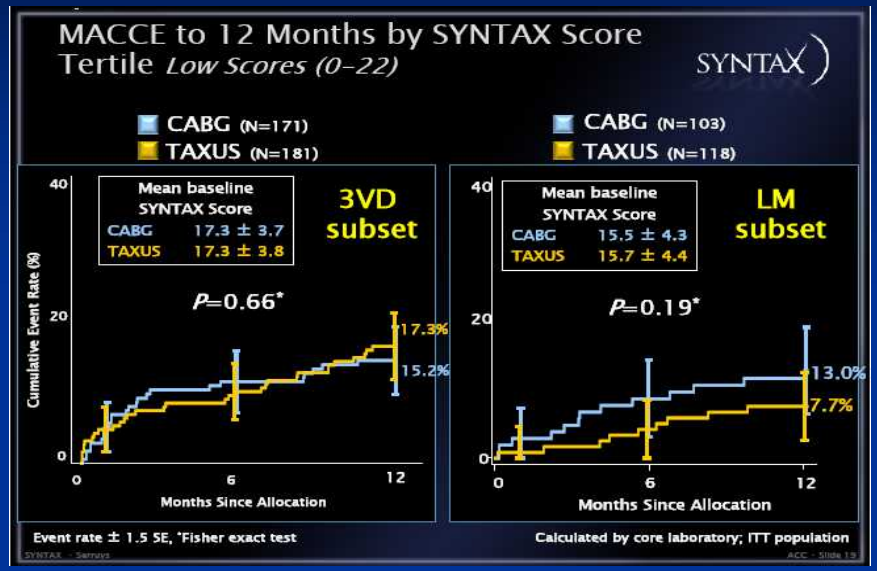
- Local Heart team (surgeon & interventional cardiologist) assessed each patient in regards to:
  - Patient's operative risk (EuroSCORE & Parsonnet score, Cleveland score)
    - Operative risk scores predict perioperative and in-hospital surgical risk of death or sever complications
  - Coronary lesion complexity (SYNTAX score)
    - SYNTAX score provides guidance on optimal revascularization strategies for patients with high-risk lesions based on results of SYNTAX Study
    - PCI risk score: risk of technical failure and hemodynamic collapse
    - Prediction of long term outcome (1-5-10 years) after PCI and CABG

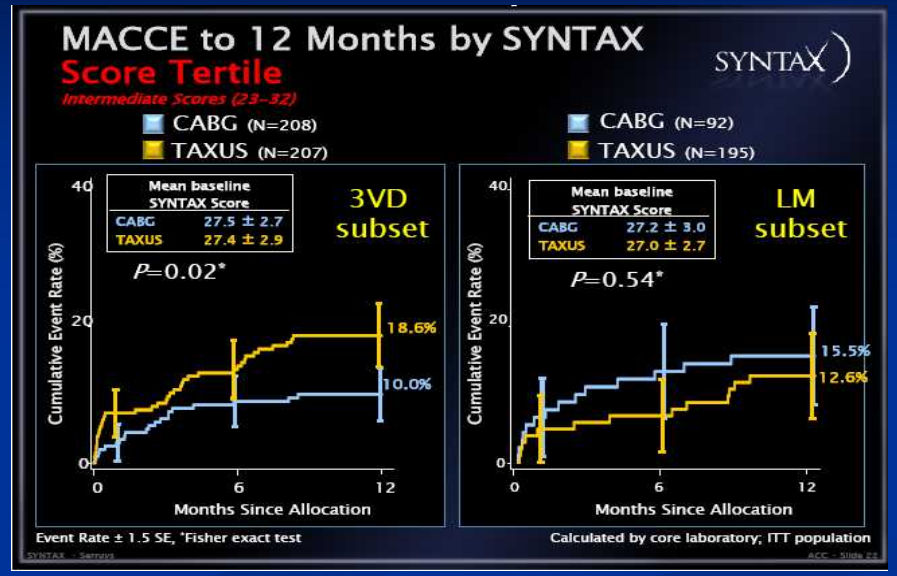
Assessement of extent of coronary artery disease

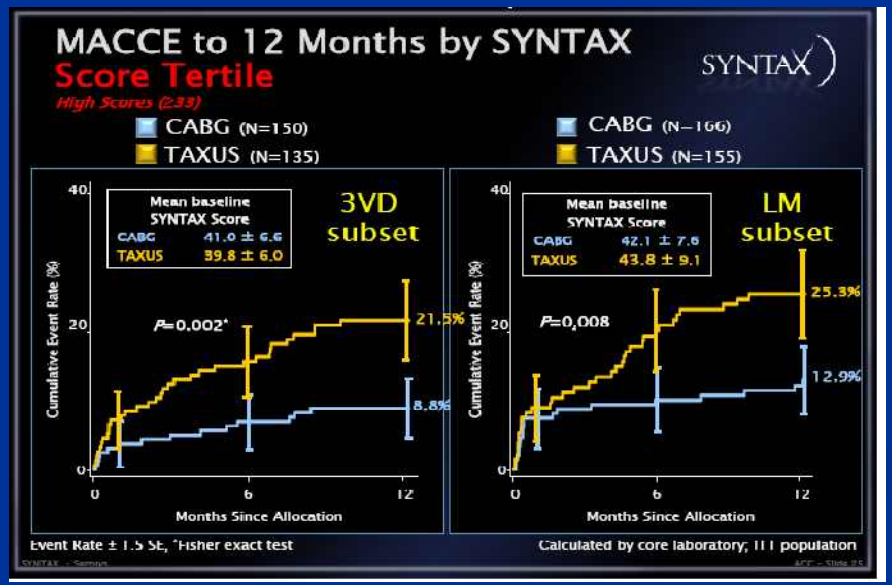
- SYNTAX Score: www.syntaxscore.com

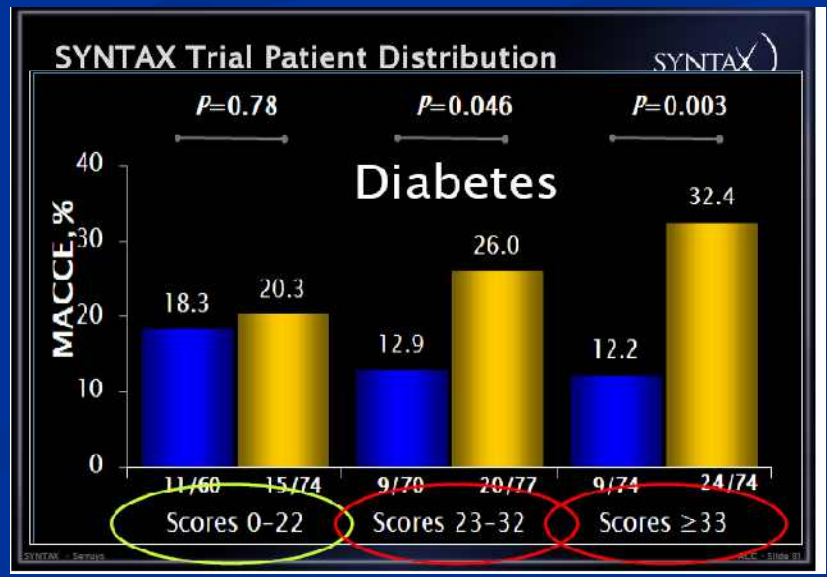


Syntax score vs 12/12 outcome





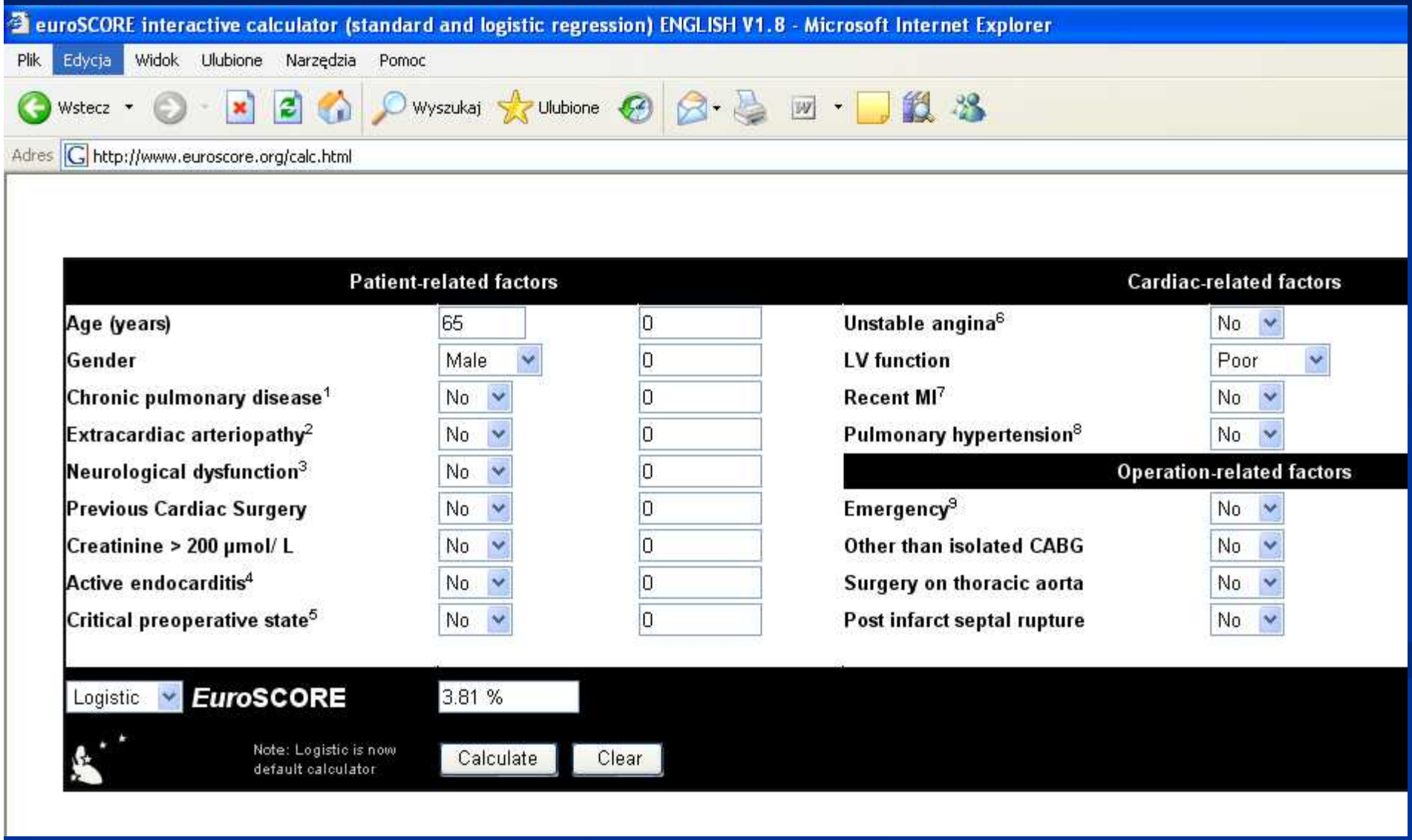




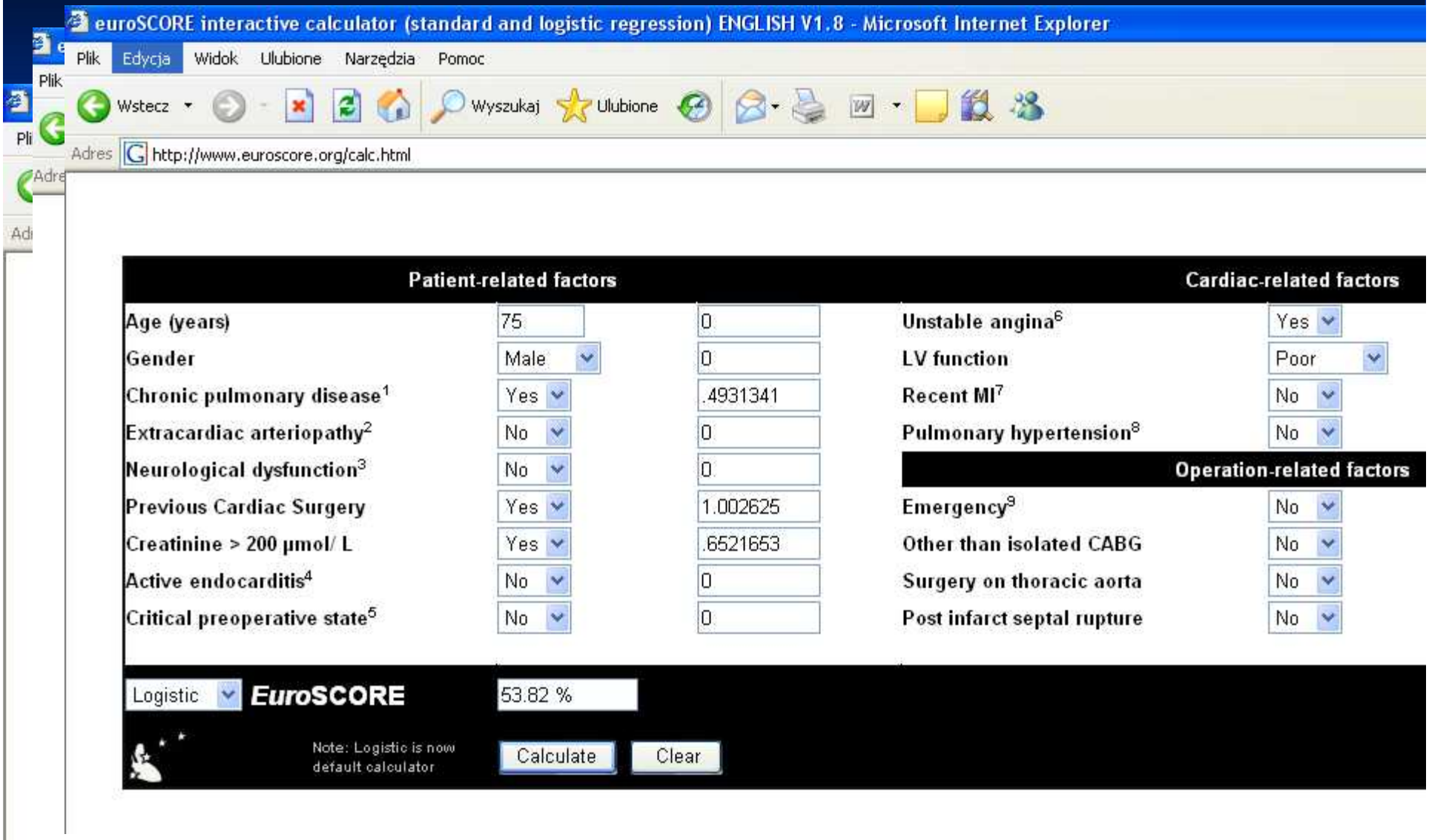
Logistic EuroScore

- Age (per 5 years or part thereof over 60 years) 1
- Sex female
- Chronic pulmonary disease longterm use of bronchodilators or steroids for lung disease 1
- Extracardiac arteriopathy any one or more of the following: claudication, carotid occlusion or >50% stenosis, previous or planned intervention on the abdominal aorta,limb arteries or carotids 2
- Neurological dysfunction disease severely affecting ambulation or day-to-day functioning 2
- Previous cardiac surgery requiring opening of the pericardium 3
- Serum creatinine >200m micromol/L preoperatively 2
- Active endocarditis patient still under antibiotic treatment for endocarditis at the time of surgery 3
- Critical preoperative state any one or more of the following: ventricular tachycardia or fibrillation or aborted sudden death, preoperative cardiac massage, preoperative ventilation before arrival in the anaesthetic room,preoperative inotropic support, intraaortic balloon counterpulsation or preoperative acute renal failure (anuria or oliguria<10 ml/hour) 3
- *Cardiac-related factors* *Score*
- Unstable angina rest angina requiring iv nitrates until arrival in the anaesthetic room 2
- LV dysfunction moderate or LVEF30-50% 1
- poor or LVEF <30 3
- Recent myocardial infarct (<90 days) 2
- Pulmonary hypertension Systolic PA pressure>60 mmHg 2
- *Operation-related factors* *Score*
- Emergency carried out on referral before the beginning of the next working day *2*
- Other than isolated CABG major cardiac procedure other than or in addition to CABG *2*

EuroScore – calculator: additive and logistic



Euroscore - calculator



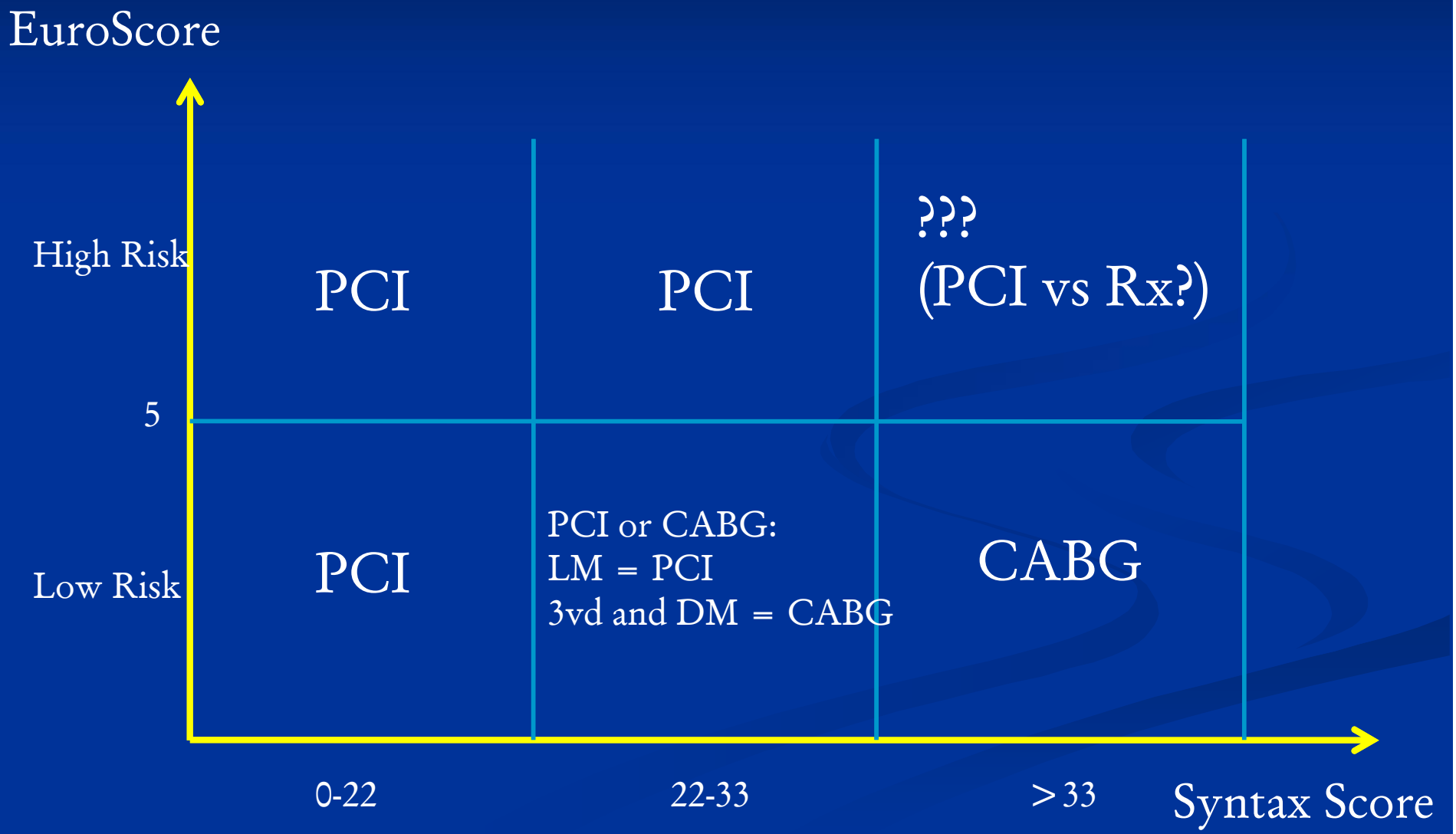
SYNTAX TRIAL: Predictors of 12 month MACCE: Pre-procedure

	Variable	Odds Ratio [95% CI]	*P* value†
CABG	COPD	2.45 [1.25, 4.80]	0.009
	Unstable Angina	1.88 [1.14, 3.09]	0.01
	Moderate or Poor LVEF	1.98 [1.13, 3.47]	0.02
	SYNTAX Score	0.97 [0.95, 1.00]	0.02
	Race	0.33 [0.14, 0.82]	0.02
	Emergent Revasc.	2.78 [1.08, 7.17]	0.03
	Prior MI	0.57 [0.33, 0.99]	0.045
	Age	1.03 [1.00, 1.05]	0.047
TAXUS	Medically Treated Diabetes	2.07 [1.40, 3.05]	< 0.001
	SYNTAX Score	1.02 [1.00, 1.04]	0.02
	Age	1.02 [1.00, 1.04]	0.03

Syntax Trial

	Euroscore additive	Syntax Score	1 year mortality	1 year MACE
PCI RCT	3,8	28,4	4,3	17,8
CABG RCT	3,8	29,1	3,5	12,1
PCI Reg.	5,8	31,6	7,4	20,5
CABG Reg	3,8	35,5	2,5	8,8

Decision diagram



High risk population

- Acute coronary syndrome patients
- LMCA disease
- Depressed LV function
- Diabetes, Renal Failure etc.

LE MANS Registry (n = 252)

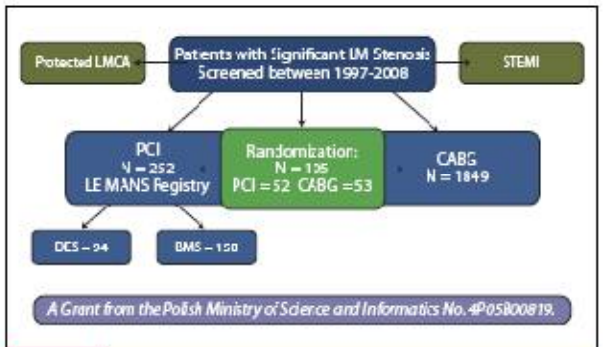
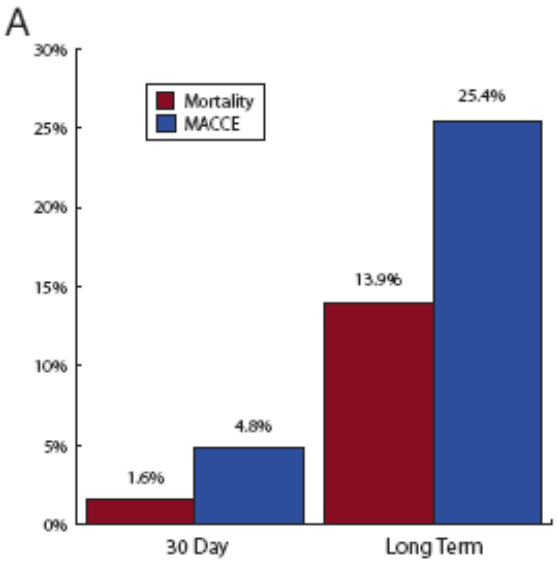


Figure 1 **The LE MANS Study Algorithm**

The LE MANS algorithm is from Bustman et al. (24) but is based on new data. BMS = bare-metal stent(s); CABG = coronary artery bypass grafting; DES = drug-eluting stent(s); LMCA = left main coronary artery; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.



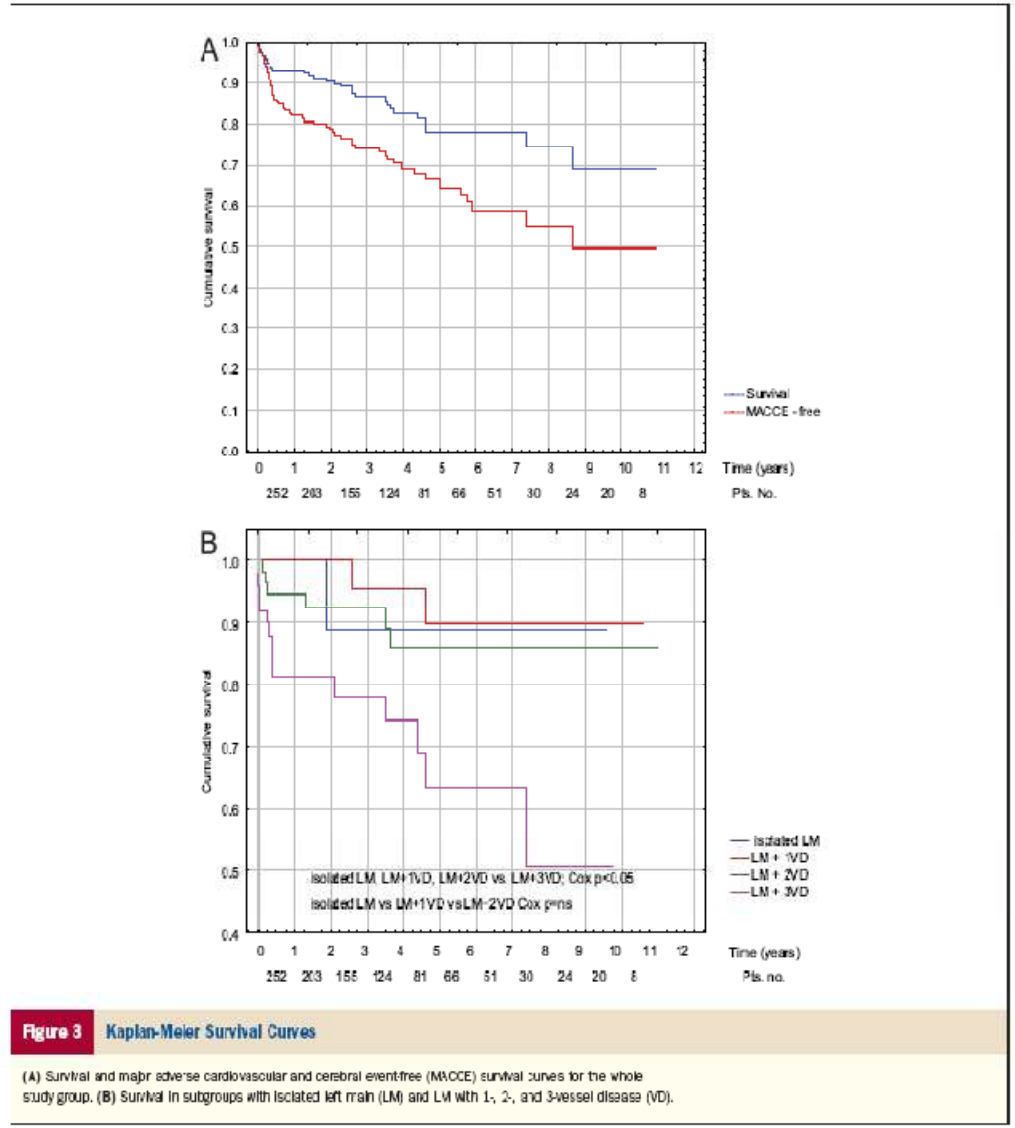
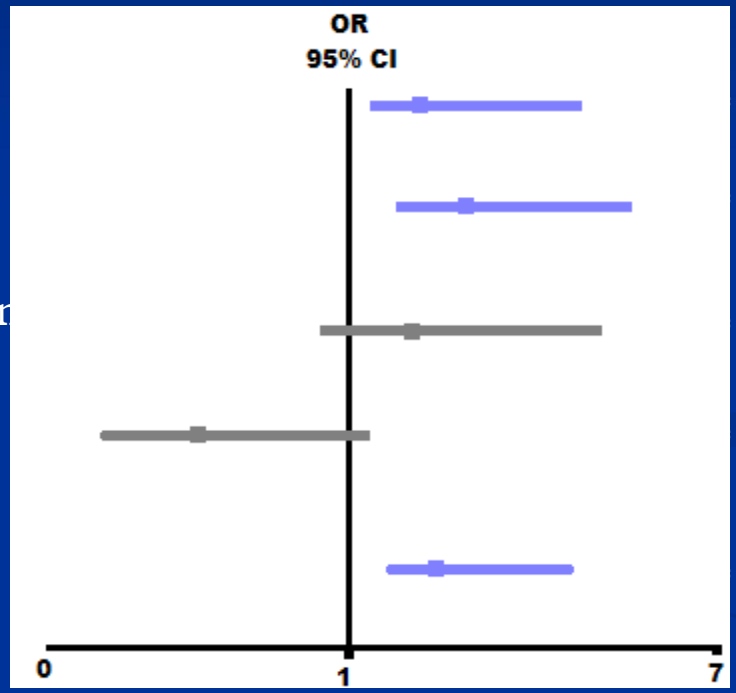


Figure 3 **Kaplan-Meier Survival Curves**

(A) Survival and major adverse cardiovascular and cerebral event-free (MACCE) survival curves for the whole study group. (B) Survival in subgroups with isolated left main (LM) and LM with 1-, 2-, and 3-vessel disease (VD).

LE MANS REGISTRY
Results:
uni and multivariate analysis with Odds Ratio for long term follow-up

Age > 60 y.o.	0,03 OR:2,48 (1,03-5,95
LVEF < 50%	0,01 OR:3,25 (1,45-7,27)
Stent diam. < 3,8mm	0,04 OR:2,48 (0,99-5,7)
DES	0,11 OR:0,53 (0,23-1,18)
Euroscore > 9	0,04 OR:2,48 (1,1-4,56)



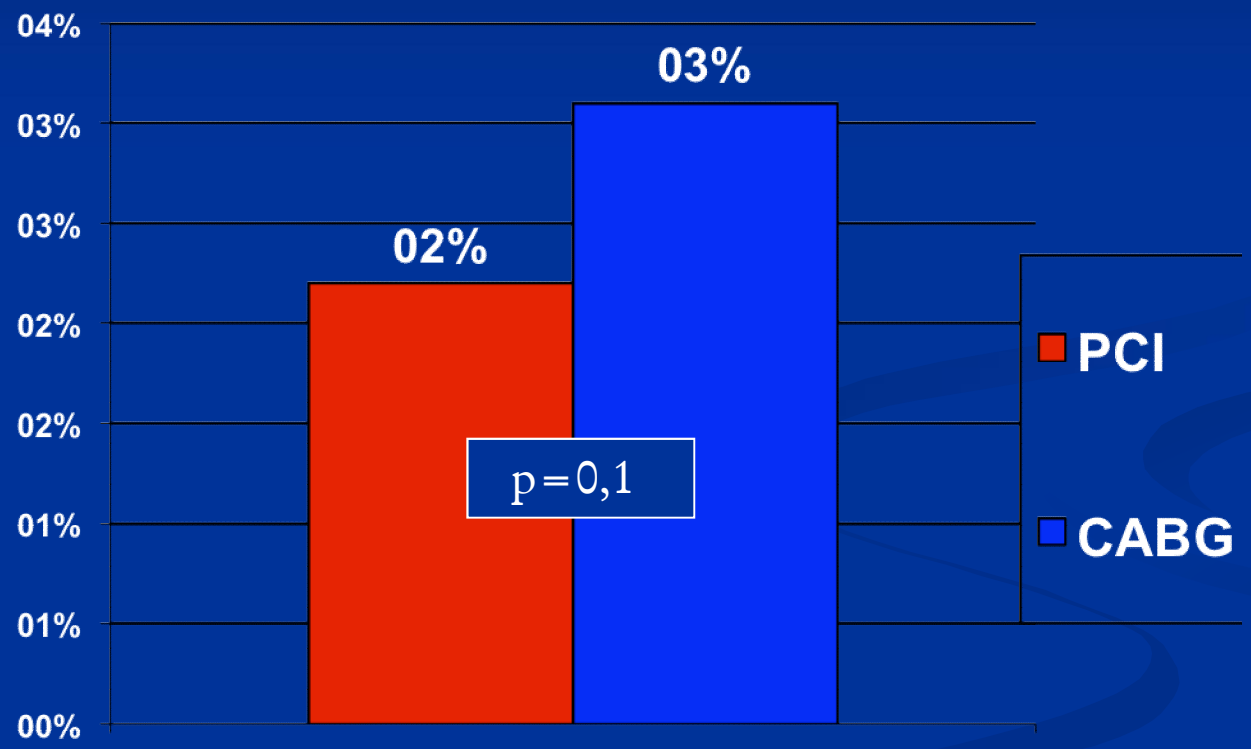
The Cox multivariate analysis for independent risk factors showed that EF < 50% decreased survival rate, while DES implantation decreased and stent diameter < 3,8mm increased the risk of MACCE.

ACS Registry

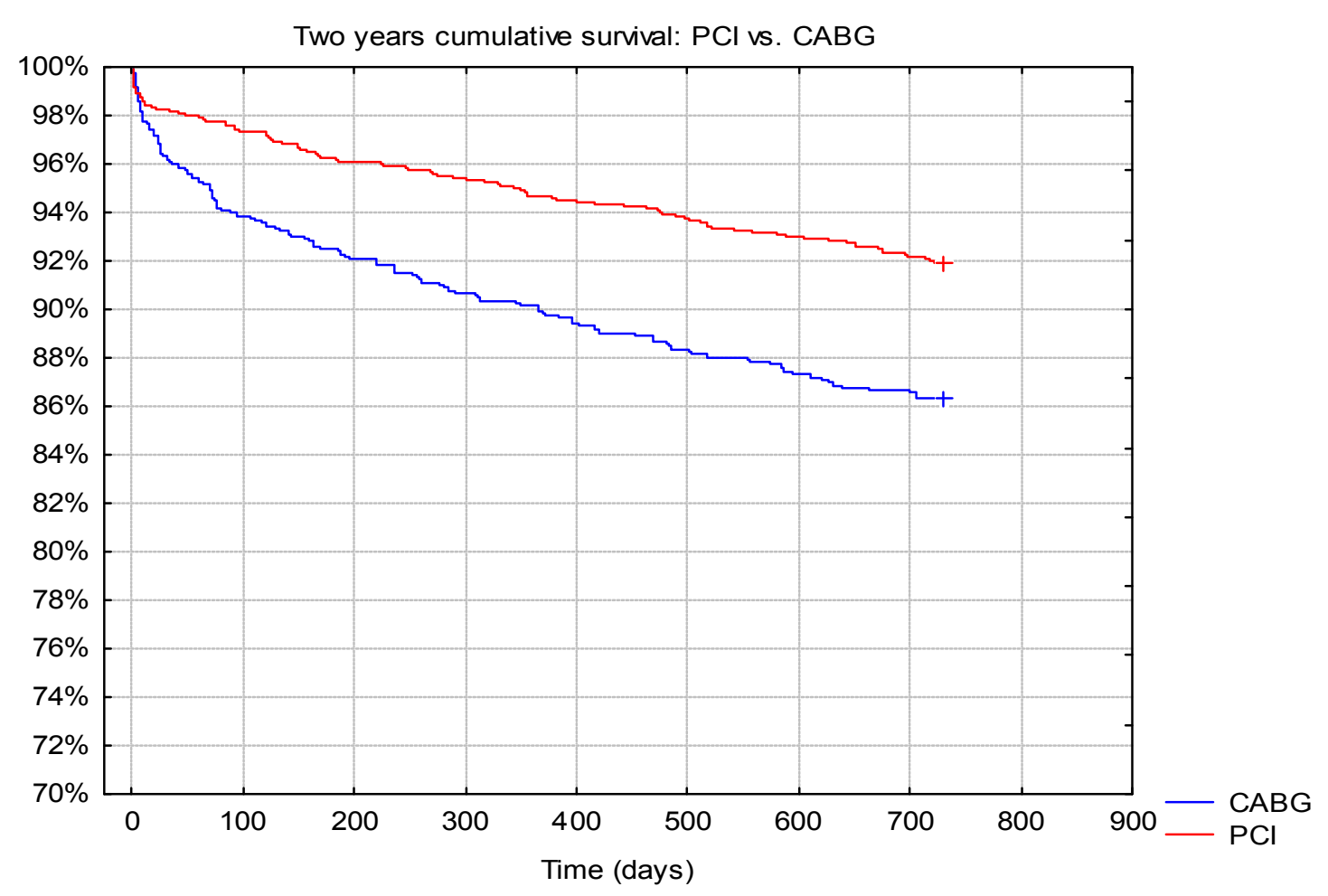
PL-ACS (150 000 pts in Poland)

Substudy: revascularization for MVD in 3787 pts (Years 2003-2009)

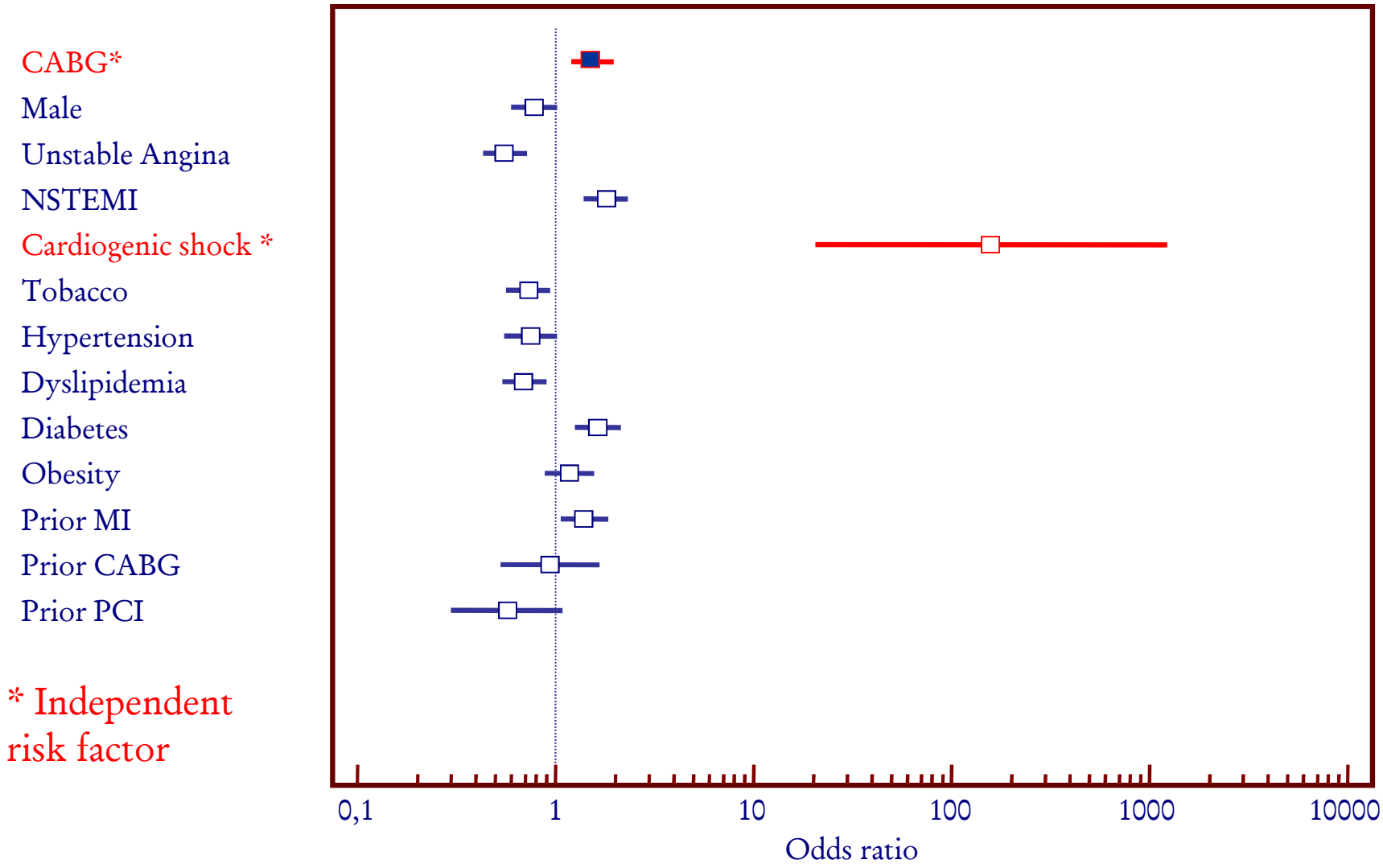
Results – 30 day mortality



PCI better than CABG for MVCAD and NST-ACS?



Single and independent risk factors influencing long term mortality in ACS + MVCAD

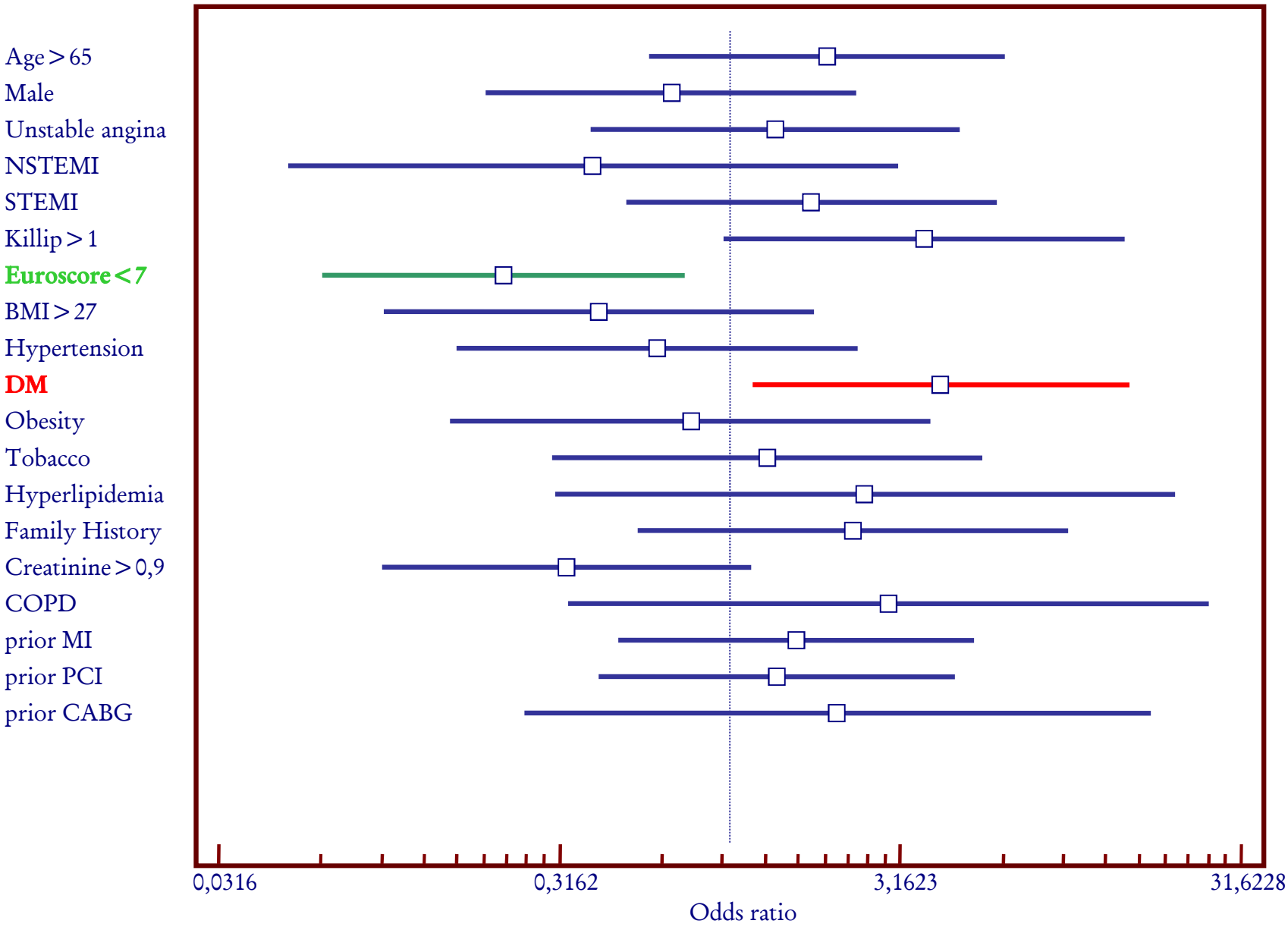


* Independent risk factor

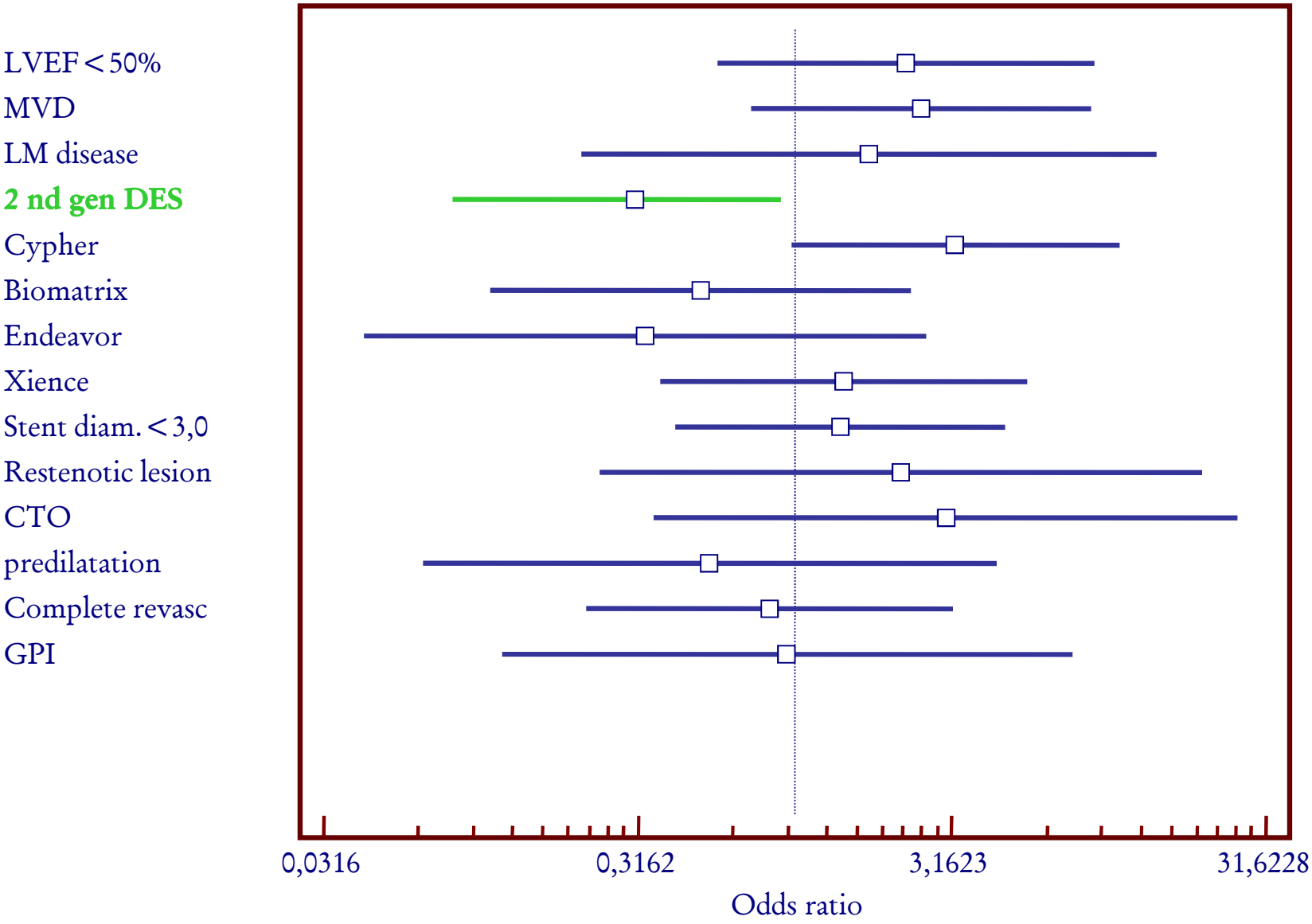
DES for ACS subanalysis of all comers studies

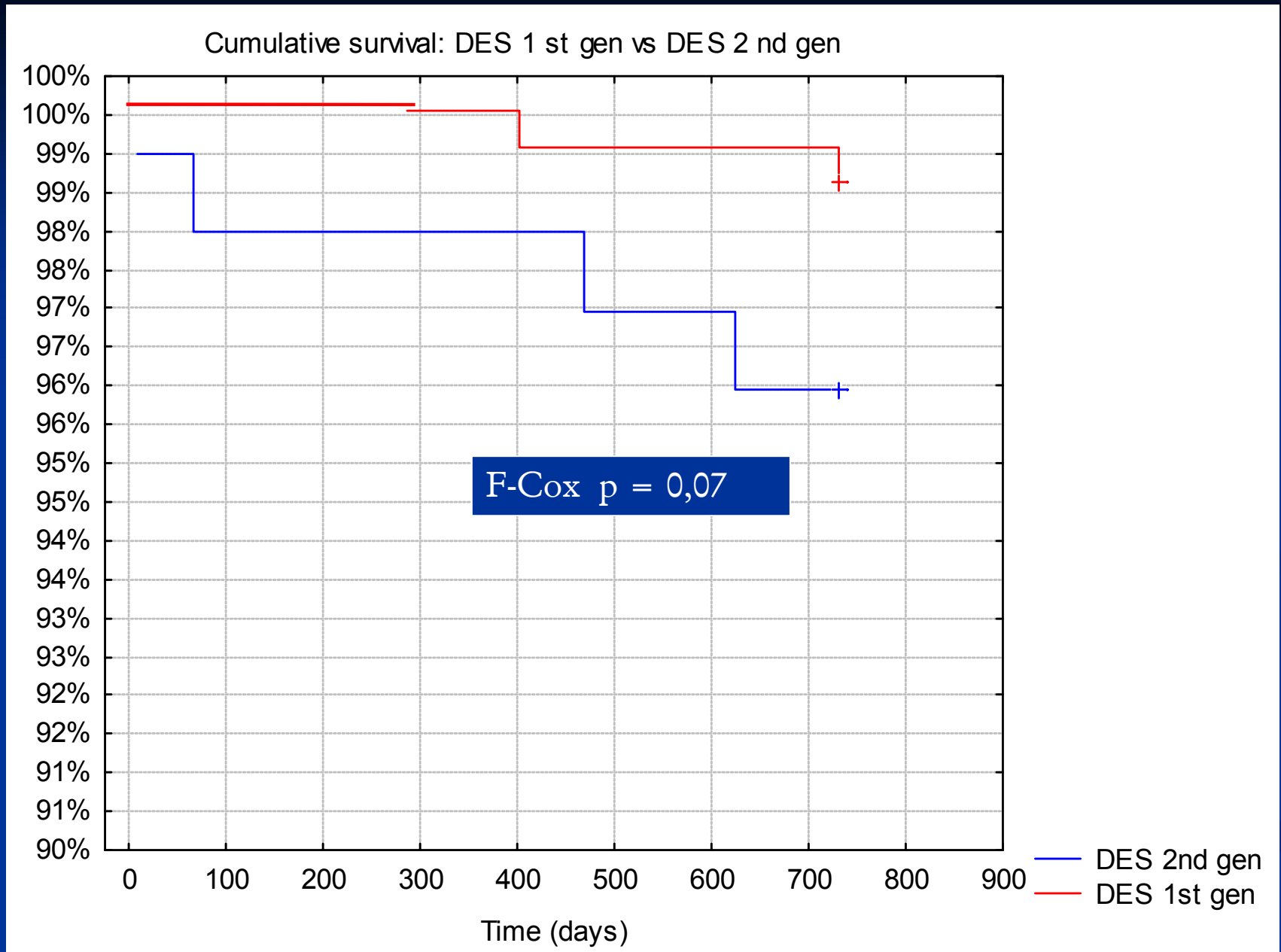
AHP Registry 2006-2009

Single risk / benefit factors influencing 2 year mortality



Single risk / benefit factors influencing 2 year mortality




Cumulative survival: DES 1 st gen vs DES 2 nd gen
100%
100%
99%
99%
98%
98%
97%
97%
96%
96%
95%
95%
94%
94%
93%
93%
92%
92%
91%
91%
90%
0
100
200
300
400
500
600
700
800
900
Time (days)
F-Cox p = 0,07
DES 2nd gen
DES 1st gen

PCI scoring system to predict early and long term outcome

- Clinical risk factors:
  - SA/UA/NSTEMI/STEMI
  - Killip class
  - LV function
  - Biomarkers
  - Risk of bleeding
  - Antiplatelet pre-treatment, bedside platelet reactivity
  - Diabetes Mellitus, Renal Failure, PAD
  - Hyperlipidemia and pre-treatment with statins

PCI scoring system to predict early and long term outcome

- Angiographic risk
  - 1-2-3 vessel CAD
  - LMCA disease
  - Syntax score!
- Peri- and post PCI risk (residual risk)
  - DES vs BMS
  - No of stents
  - Overlapping stents
  - Apposition and strut expansion, residual stenosis (IVUS!)
  - adge dissection
  - Prox/dist lesions, TIMI flow post PCI
  - Complete revascularization
  - Bleeding, MI

Algorhytm to predict outcome after PCI or CABG

- Based on data from the large registries and randomized trials (PCI, CABG) a risk calculator should be designed to predict the late outcome after PCI or CABG in a particular case!

Previous experience

- *Patient Specific Predictions and Comparisons for Patients with Coronary Artery Disease. DC Naftel, EH Blackstone, JW Kirklin*
  - *Software ver.1.0 , Summit Medical Systems*

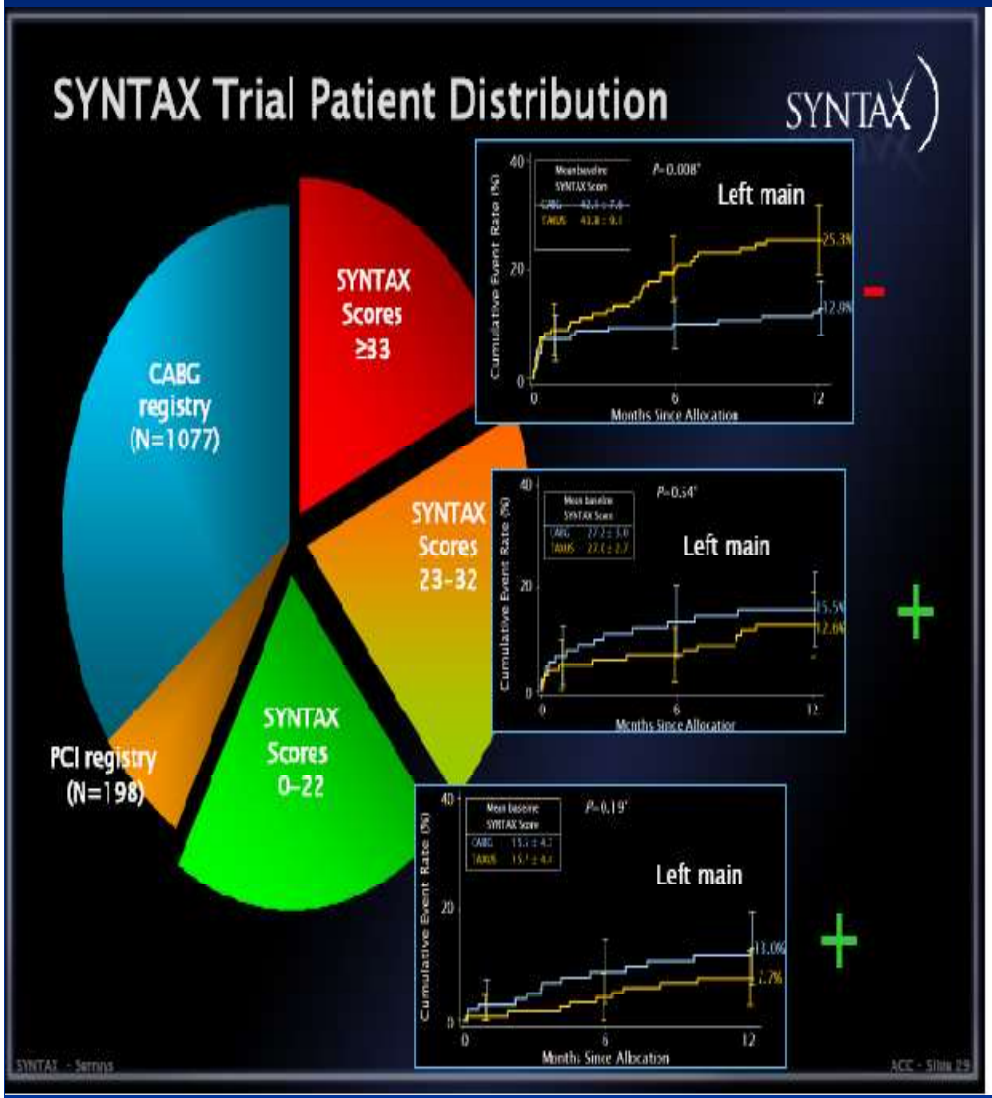
JACC 1991;17:543-89 Circulation 1991;83:1125-1173

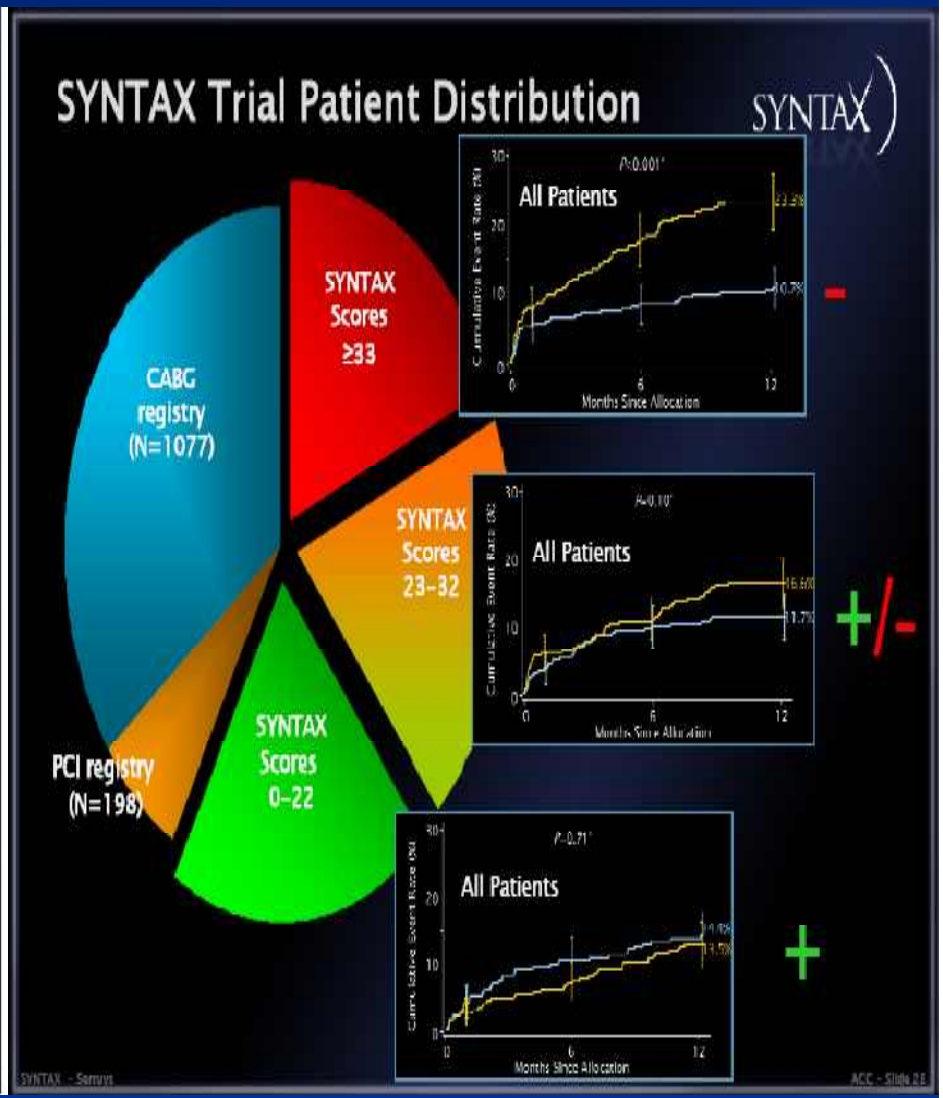
(data including ca 6000 CABG and 300 PCI pts)

The Cardiologist as a gatekeeper

- Is recascularization necessary?
  Yes, if prognostic or symptomatic indications
- Can we perform PCI?
  - Yes, if technically feasible at low periprocedural risk
- Can we do it as good as the surgeons? Long term results?
  - SYNTAX score, EUROSCORE, PCI/CABG calculator?
- Should I do it?
  - Only if the experience in multivessel, complex

SYNTAX Score: guiding selection of revascularization





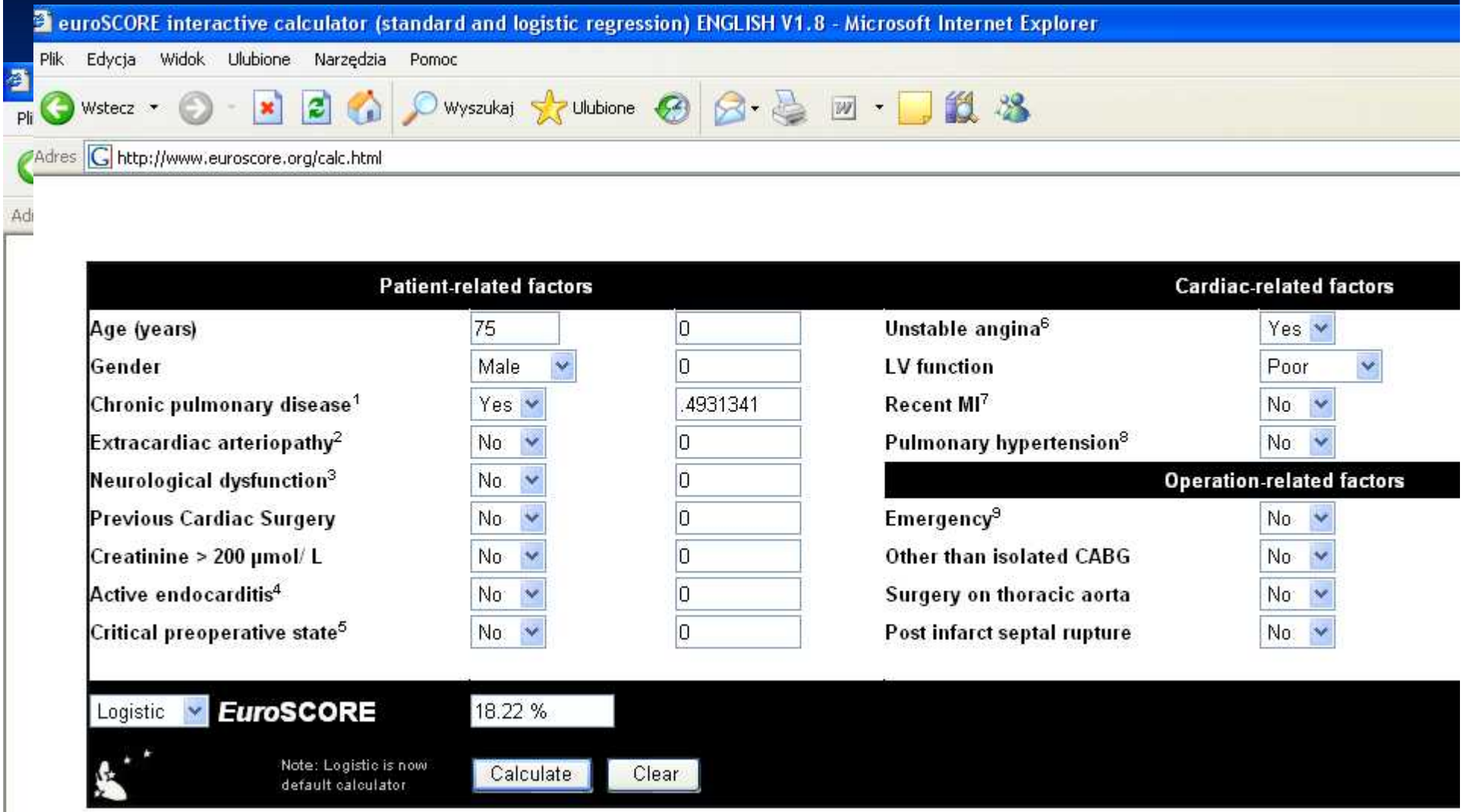
Syntax Score Examples

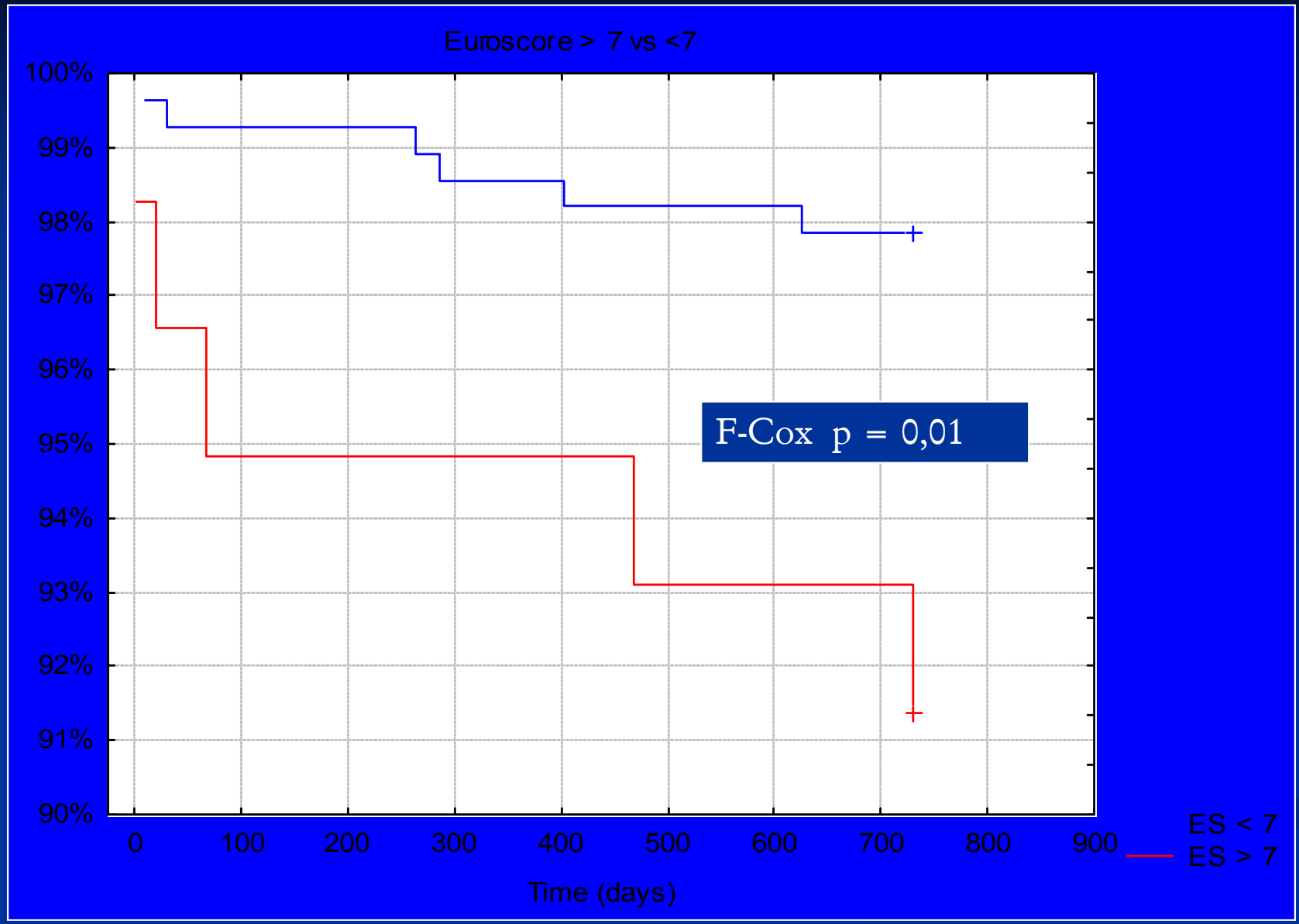
Left Main Randomized
Score 25

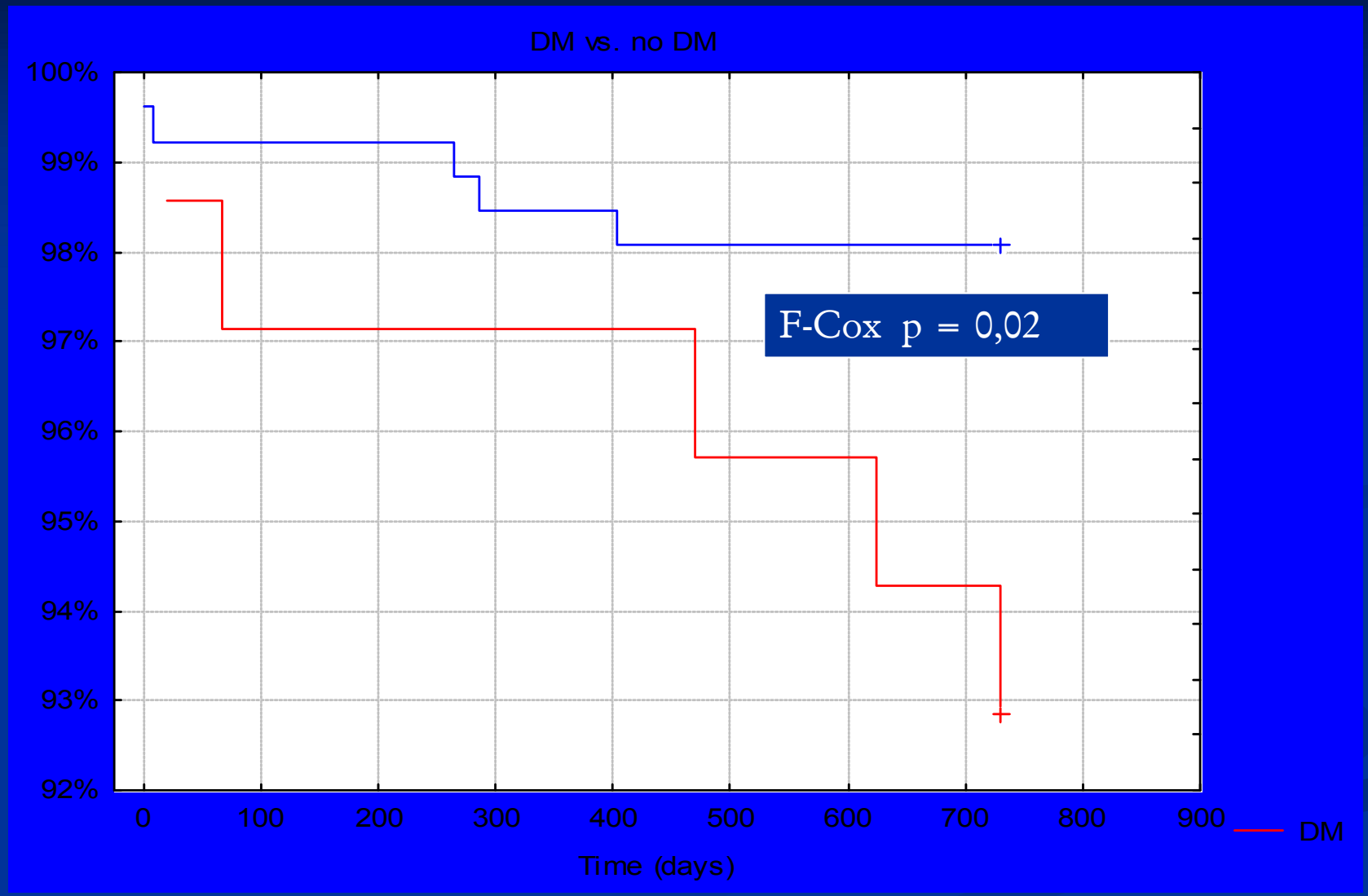
LM & 3VD Randomized
Score 39

LM & 3VD Registry
Score 50

Euroscore - calculator

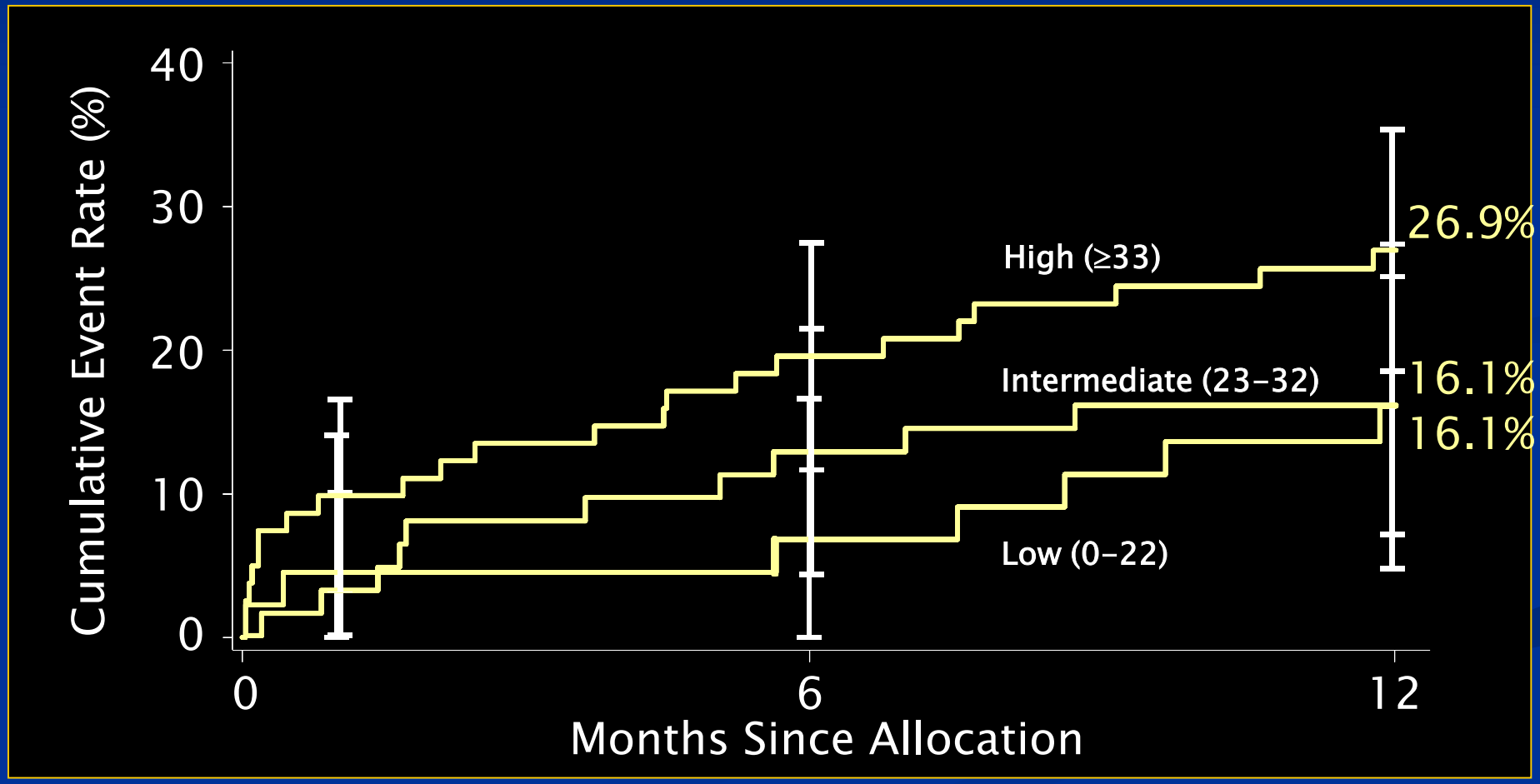



Euroscore > 7 vs <7
100%
99%
98%
97%
96%
95%
94%
93%
92%
91%
90%
0
100
200
300
400
500
600
700
800
900
Time (days)
F-Cox p = 0,01
ES < 7
ES > 7


DM vs. no DM
100%
99%
98%
97%
96%
95%
94%
93%
92%
0
100
200
300
400
500
600
700
800
900
Time (days)
F-Cox p = 0,02
DM

MACCE at 12 Months by SYNTAX Score Tercile

All Terciles PCI Registry

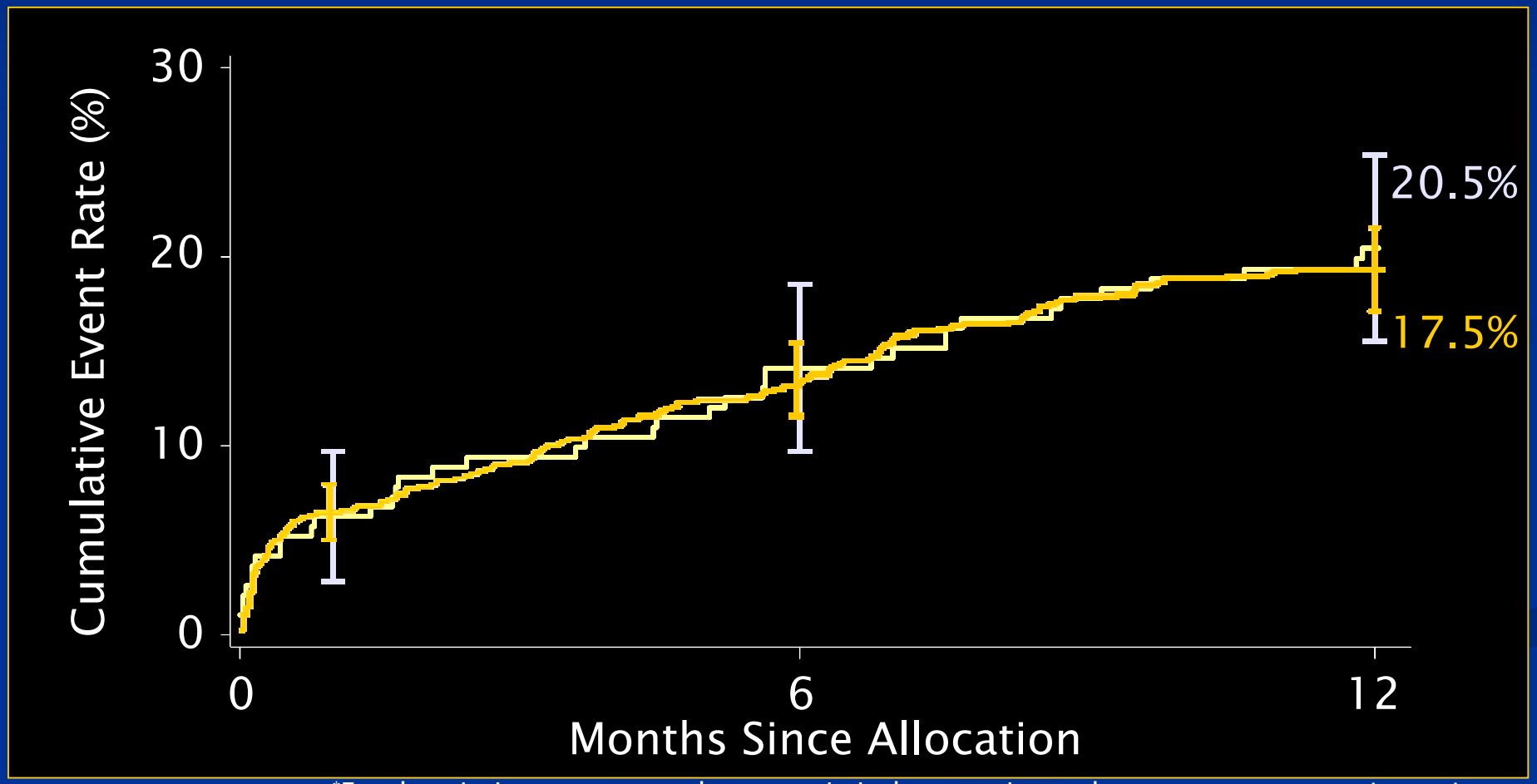


Kaplan–Meier rates

Per-protocol population

Overall MACCE to 12 Months

TAXUS RCT and PCI Registry



Event Rate ± 1.5 SE
Kaplan-Meier rates

*For descriptive purposes only; no statistical comparisons done

Per-protocol population