



**Diabetes and vascular disease: from mechanisms to treatment**

# **Coronary Atherosclerotic Burden And Prognosis In Type 2 Diabetes**

***Davide Capodanno, MD, PhD***

***Ferrarotto Hospital, University of Catania, Italy***



# Disclosure of Financial Interest

- I, **Davide Capodanno**, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.



# Questions Surrounding Revascularization For Coronary Artery Disease in Type 2 Diabetes

**1**

**What are the contemporary outcomes of patients with coronary artery disease and diabetes?**

**2**

**Does the coronary atherosclerotic burden impact on prognosis in diabetes?**

**3**

**Does diabetes independently weigh into decision making for revascularization by PCI or CABG?**

# Questions Surrounding Revascularization For Coronary Artery Disease in Type 2 Diabetes

**1**

**What are the contemporary outcomes of patients with coronary artery disease and diabetes?**

**2**

**Does the coronary atherosclerotic burden impact on prognosis in diabetes?**

**3**

**Does diabetes independently weigh into decision making for revascularization by PCI or CABG?**



# Questions Surrounding Revascularization For Coronary Artery Disease in Type 2 Diabetes

1

**What are the contemporary outcomes of patients with coronary artery disease and diabetes?**

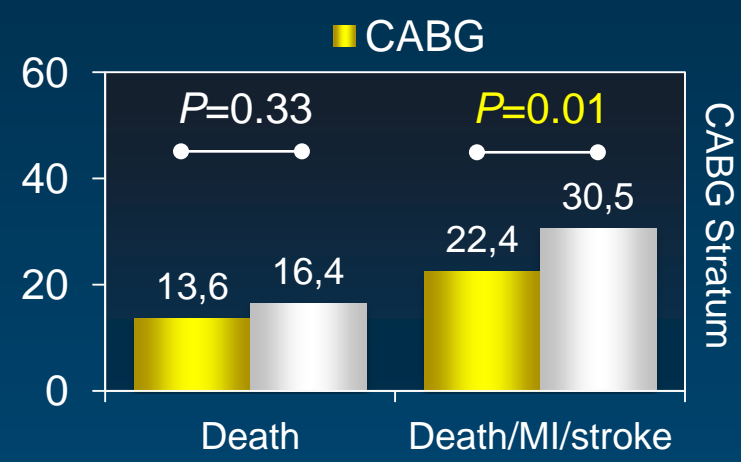
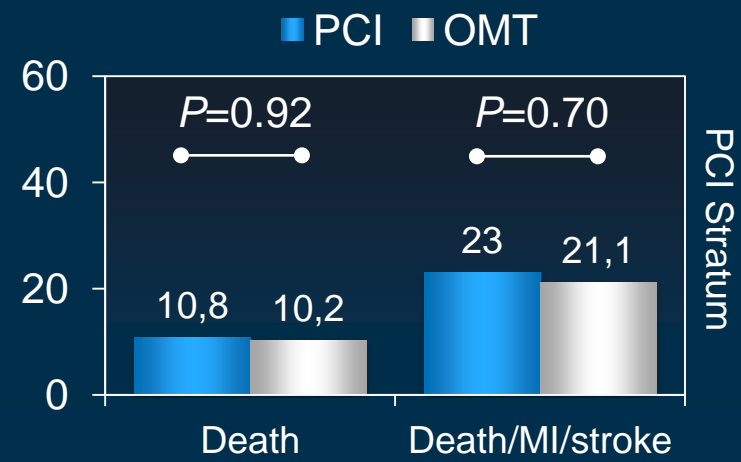
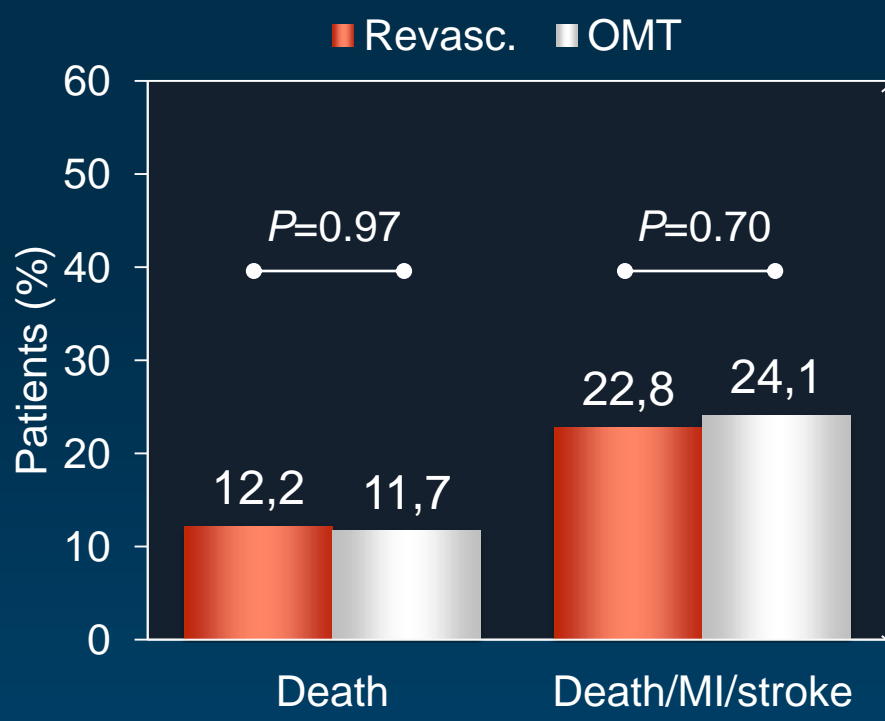
Does the coronary atherosclerotic burden impact on prognosis in diabetes?

Does diabetes independently weigh into decision making for revascularization by PCI or CABG?



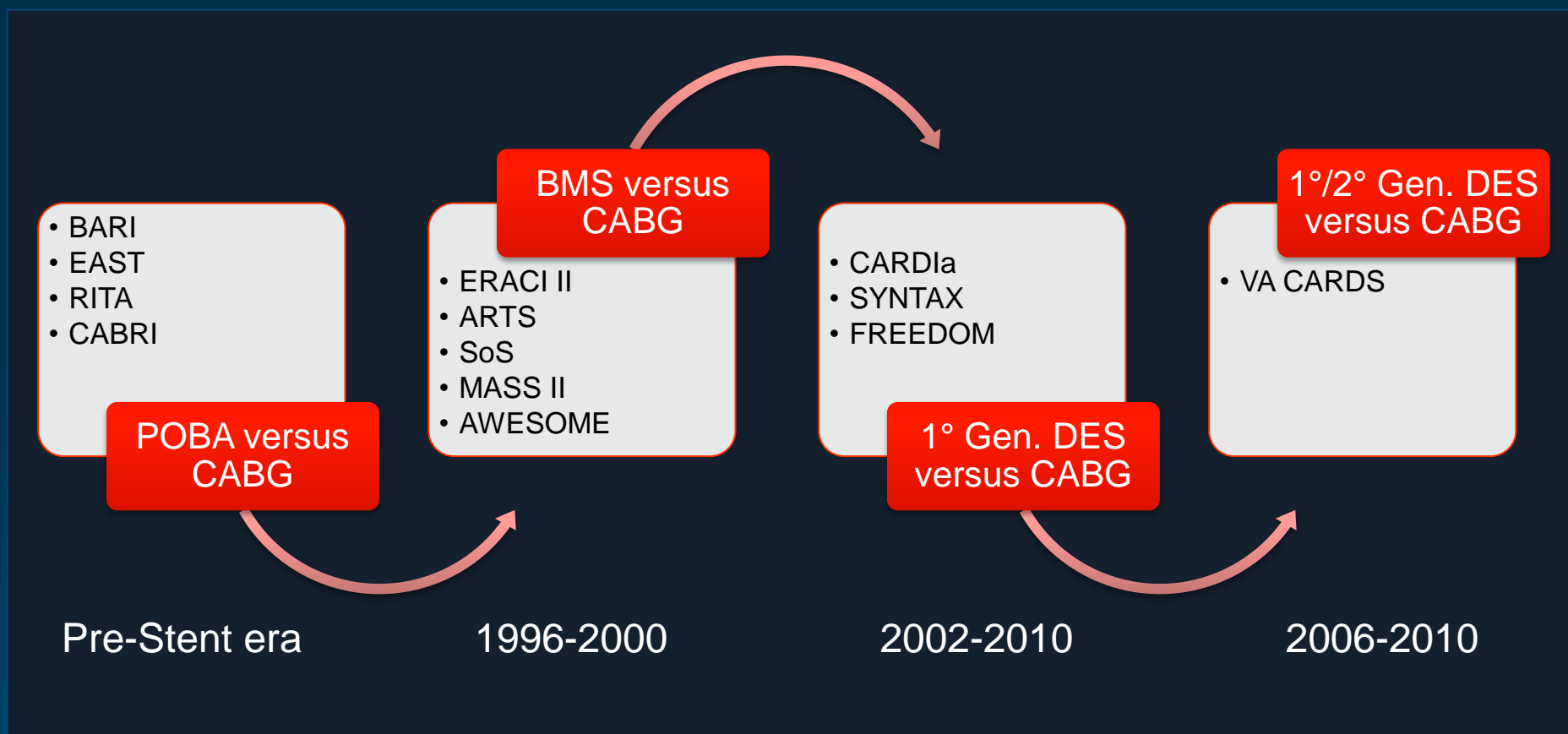
# Revascularization versus Medical Therapy

## 5-Year Outcomes of the BARI-2D Trial (2,368 with T2DM and CAD)



# POBA/PCI versus CABG

## Overview of Trials and Post-Hoc Analyses With Focus on Diabetes



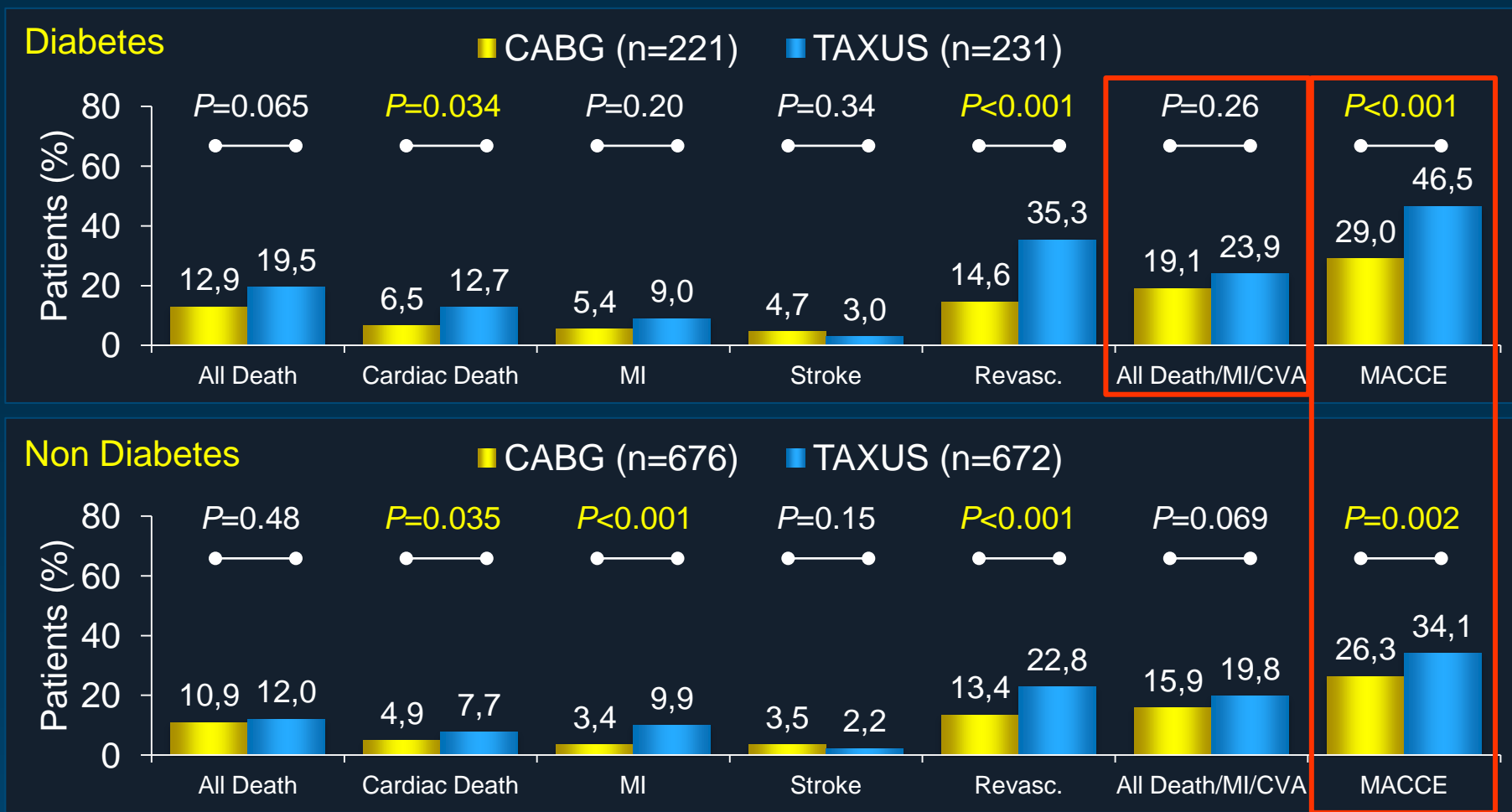
	<b>SYNTAX DM</b>	<b>FREEDOM</b>
Study type	Subgroup analysis	RCT
Patients, n	452	1,900
Follow up	5 years	5 years
DES	PES	SES/PES
Age	65.4±9.2	63.1±9.1
Insulin treated Diabetes	40%	32%
Haemoglobin A1c ≥7.0%	57%	64%
Chronic kidney disease	3%	5%
Acute coronary syndromes	30%	31%
EuroSCORE	4 (mean)	1.9 (median)
Coronary lesions	4.6±1.8	5.7±2.2
Left main	29%	Excluded
3VD	83%	83%





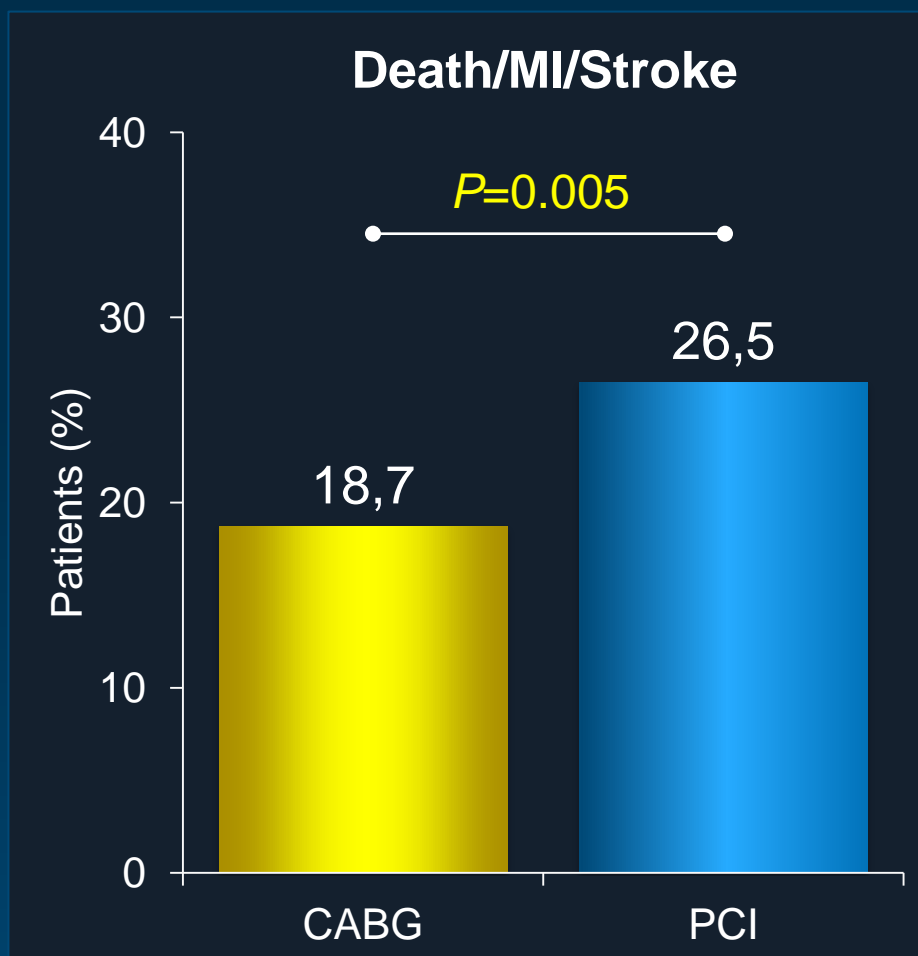
# SYNTAX Trial: Impact of Diabetes at 5 Years

All Interaction Terms For Diabetes Status By Treatment Arm = NS



# FREEDOM Trial: 5-Year Outcomes

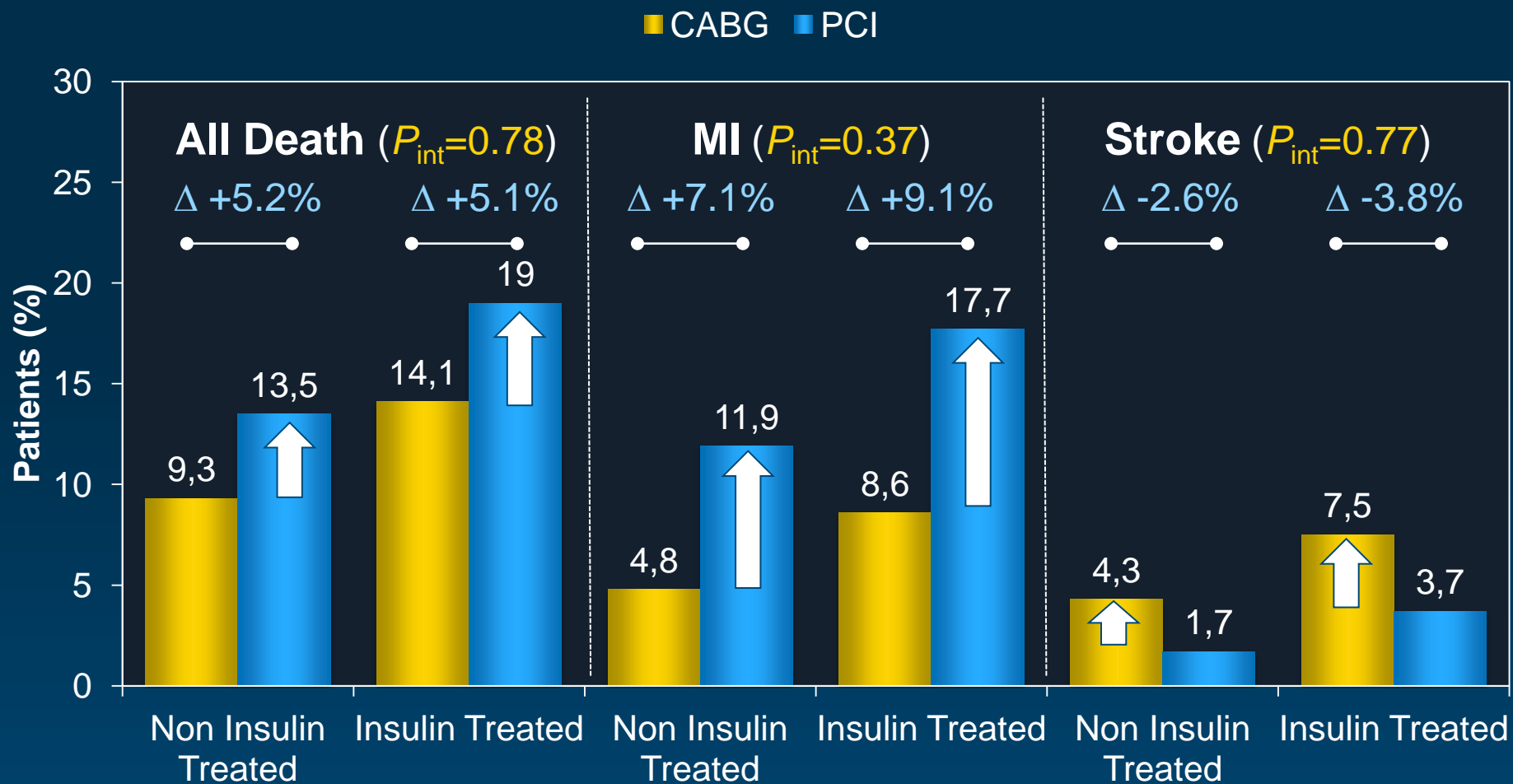
Death and MI increased with PCI; 5-Year stroke increased with CABG



	PCI	CABG	P value
All Death	16.3%	10.9%	0.049
CV Death	10.9%	6.8%	0.12
MI	13.9%	6.0%	<0.001
Stroke	2.4%	5.2%	0.03

# FREEDOM Trial: 5-Year Outcomes

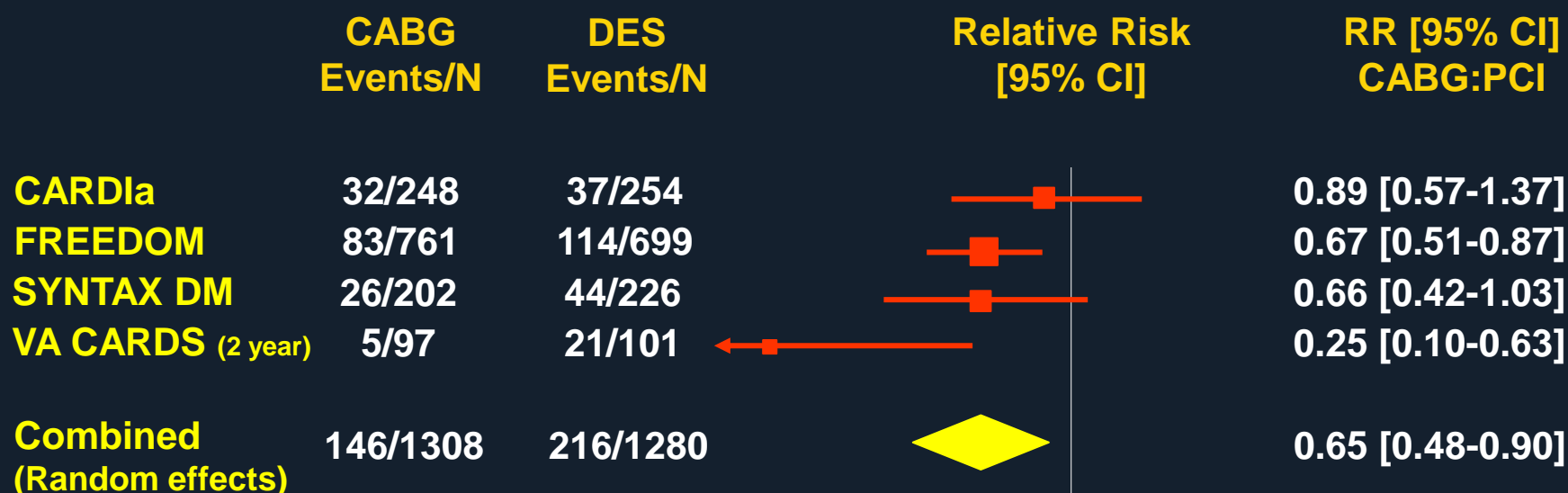
## No Interactions With Insulin Treatment



# Meta-Analysis of CABG vs DES in Patients With Diabetes

## 2,588 Patients From 4 RCTs

### 5-Year (or longest FU) Mortality



Heterogeneity:  $X^2=5.89$ ,  $df=3$ ,  $P=0.12$ ,  $I^2=49\%$

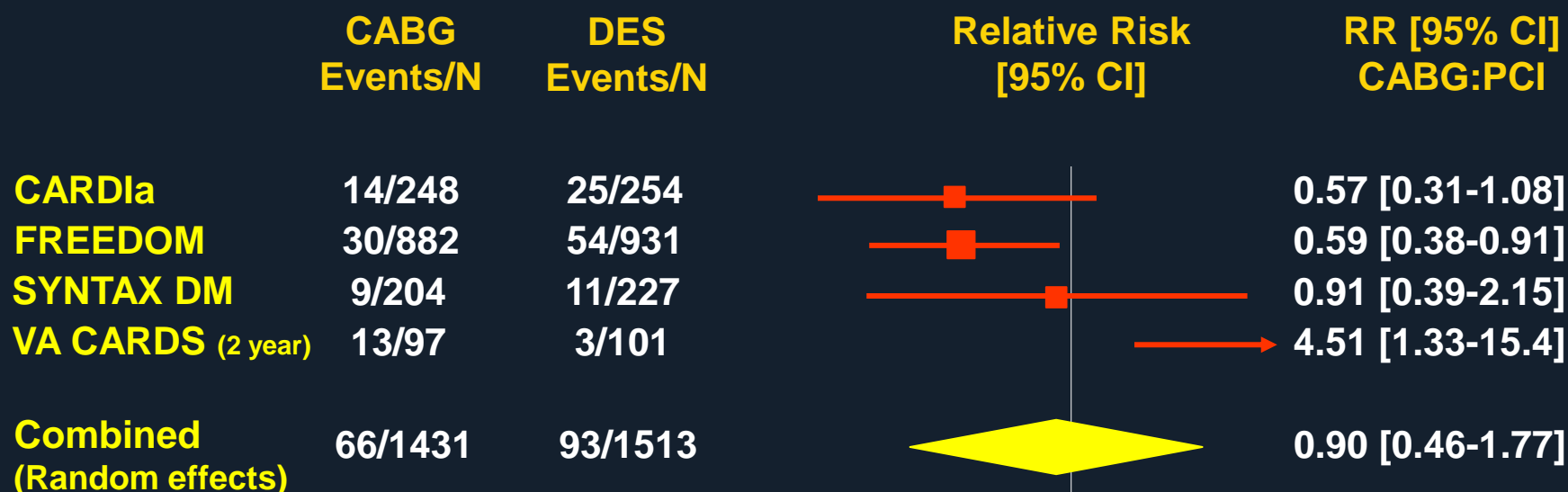
Test for overall effect:  $P=0.008$

← Favours CABG 1 Favours DES →

# Meta-Analysis of CABG vs DES in Patients With Diabetes

## 2,588 Patients From 4 RCTs

### 5-Year (or longest FU) Myocardial Infarction



Heterogeneity:  $X^2=10.26$ ,  $df=3$ ,  $P=0.02$ ,  $I^2=71\%$

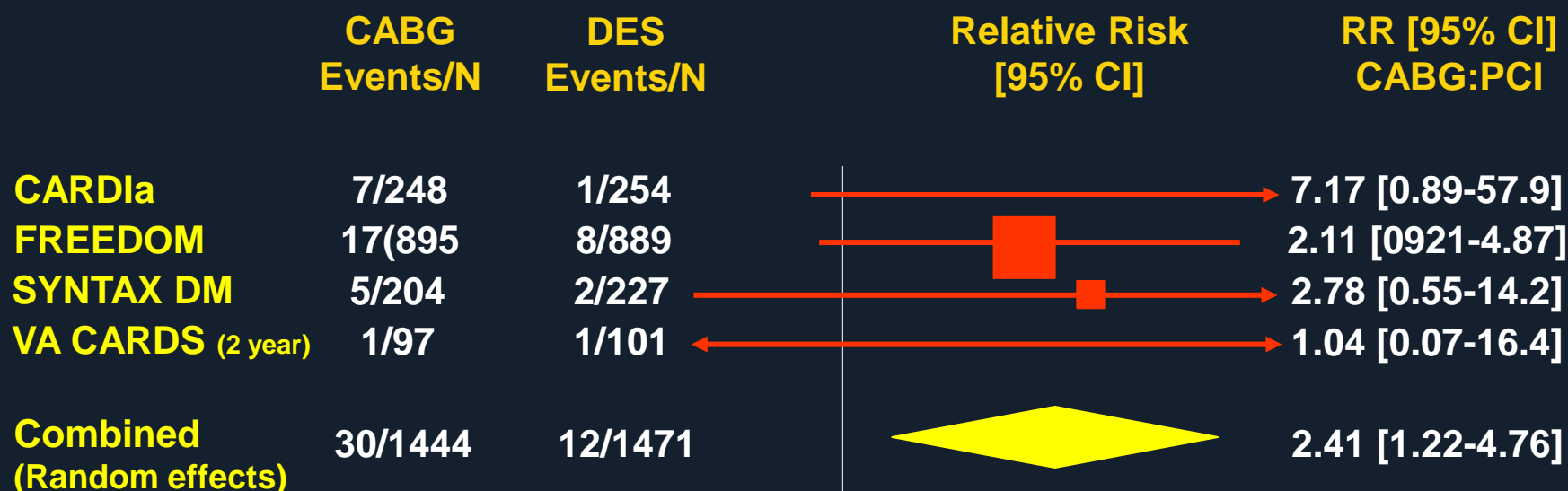
Test for overall effect:  $P=0.77$

← Favours CABG 1 Favours DES →

# Meta-Analysis of CABG vs DES in Patients With Diabetes

## 2,588 Patients From 4 RCTs

### 5-Year (or longest FU) Stroke



Heterogeneity:  $X^2=5.89$ ,  $df=3$ ,  $P=0.68$ ,  $I^2=0\%$

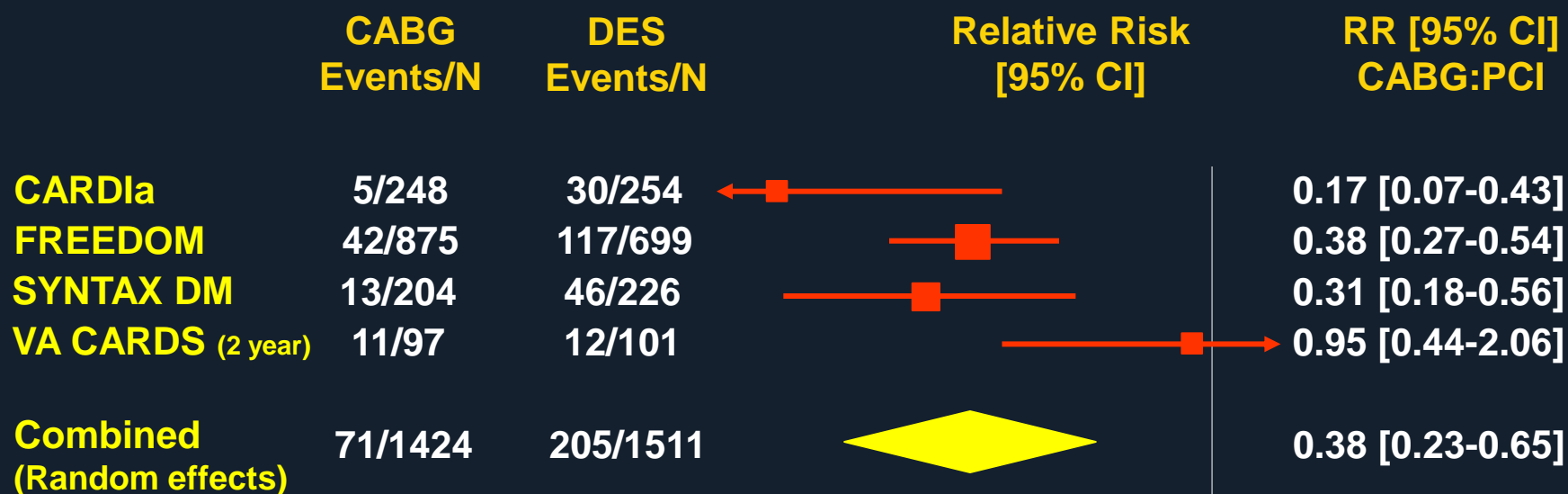
Test for overall effect:  $P=0.01$

← Favors CABG 1 Favors DES →

# Meta-Analysis of CABG vs DES in Patients With Diabetes

## 2,588 Patients From 4 RCTs

### 5-Year (or longest FU) Revascularization



Heterogeneity:  $X^2=8.75$ ,  $df=3$ ,  $P=0.03$ ,  $I^2=66\%$

Test for overall effect:  $P=0.003$

← Favours CABG 1 Favours DES →

# Why Does CABG Outperforms PCI, Especially in Diabetes?

- During CABG placing bypass grafts to the mid coronary vessel has two effects:
  1. It makes complexity of culprit lesion irrelevant
  2. Over the long term, CABG offers prophylaxis against future culprit lesions by protecting whole zones of vulnerable proximal myocardium in diffusely unstable coronary endothelium (especially diabetes)
- In contrast, PCI with stents only treats suitable localised proximal culprit lesions but has no prophylactic benefit against new disease (proximal to, within or distal to the stent)



# Questions Surrounding Revascularization For Coronary Artery Disease in Type 2 Diabetes



What are the contemporary outcomes of patients with coronary artery disease and diabetes?

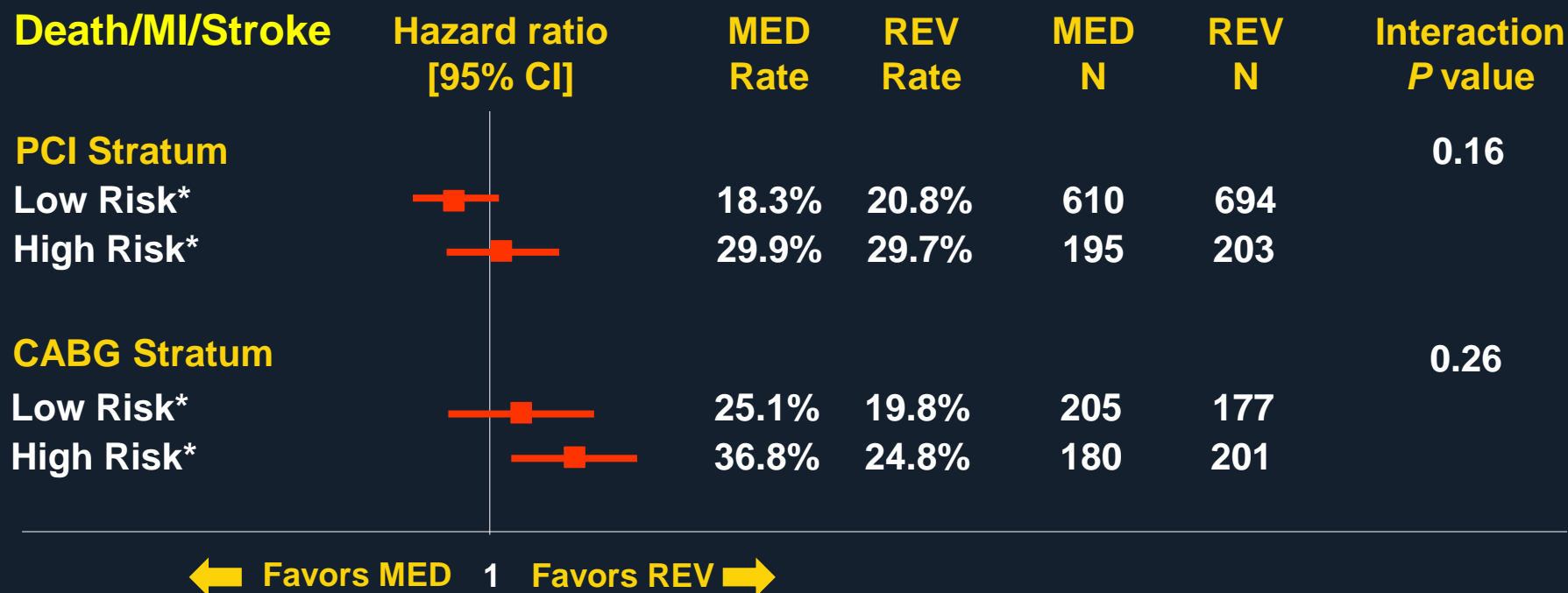
2

**Does the coronary atherosclerotic burden impact on prognosis in diabetes?**

Does diabetes independently weigh into decision making for revascularization by PCI or CABG?

# Does the Coronary Burden Modify The Outcomes of Revascularization?

## 1. Revascularization versus Medical Therapy



\*Based on BARI 2D Angiographic Risk Score

# The SYNTAX Score

Diameter  
reduction

1

Total  
Occlusion

2

Trifurcation

3

Bifurcations

4

Aorto-ostial  
stenosis

5

Severe  
tortuosity

6

Long lesion

7

Heavy  
calcification

8

Thrombus

9

Diffuse  
disease

10



# The SYNTAX Score

## Diameter reduction

- Total occlusion **x5**
- Significant lesion (50-99%) **x2**

## Total Occlusion

- Age >3 months **+1**
- Blunt stump **+1**
- Bridging **+1**
- First segment visible beyond TO **+1/seg.**
- SB <1.5mm **+1**
- SB < & ≥ 1.5mm **+1**

## Trifurcation

- 1 segment **+3**
- 2 segments **+4**
- 3 segments **+5**
- 4 segments **+6**

## Bifurcations

- Type A,B,C **+1**
- Type D,E,F,G **+2**
- Angulation <70 **+1**

## Aorto-ostial stenosis

- Aorto-ostial **+1**

## Severe tortuosity

- Severe tortuosity **+2**

## Long lesion

- Length >20mm **+1**

## Heavy calcification

- Heavy calcification **+1**

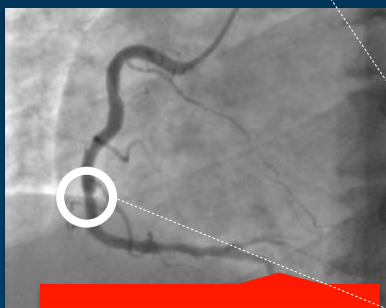
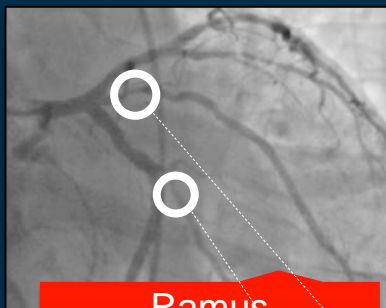
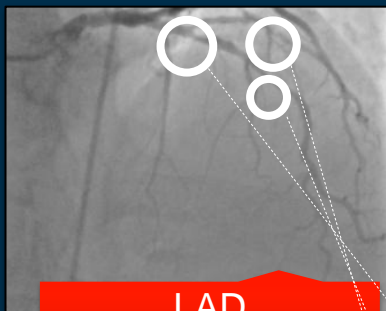
## Thrombus

- Thrombus **+1**

## Diffuse disease

- Aorto-ostial **+1**

# The SYNTAX Score Forces The Heart Team To Focus on Anatomy

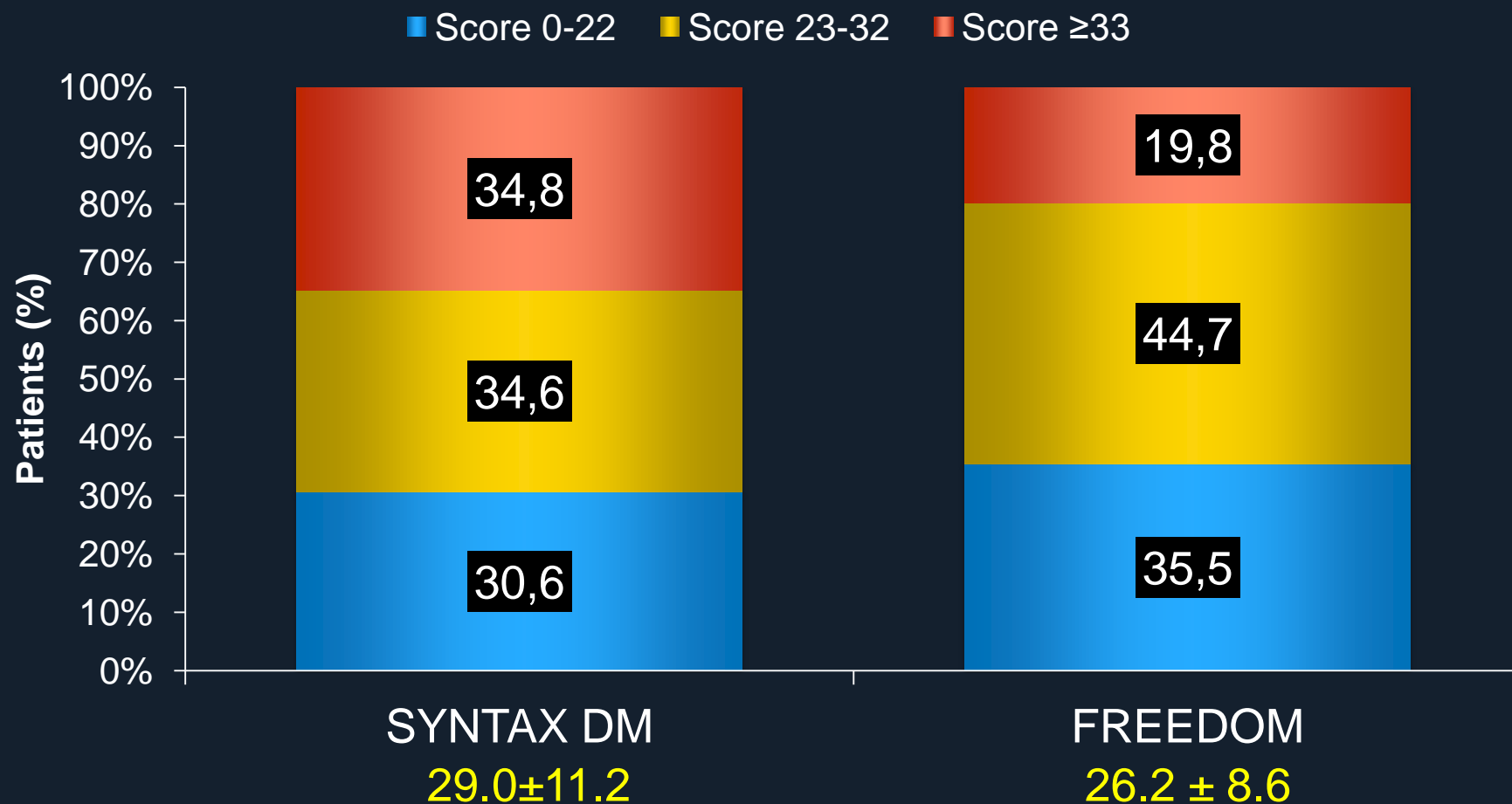


L1	(Segment 7): 2.5x2	5
	Medina 0,1,0	1
	Angulation <70°	1
L2	(Segment 7): 2.5x2	5
	Length >20 mm	1
L3	(Segment 9): 1x2	2
	Length >20 mm	1
L4	(Segment 12): 1x2	2
	Medina 0,0,1	2
L5	(Segment 12a): 1x2	2
	Medina 0,0,1	2
L6	(Segment 2): 1x2	2

Total Lesion 1	7
Total Lesion 2	6
Total Lesion 3	3
Total Lesion 4	4
Total Lesion 5	4
Total Lesion 6	2

**SYNTAX Score 26**

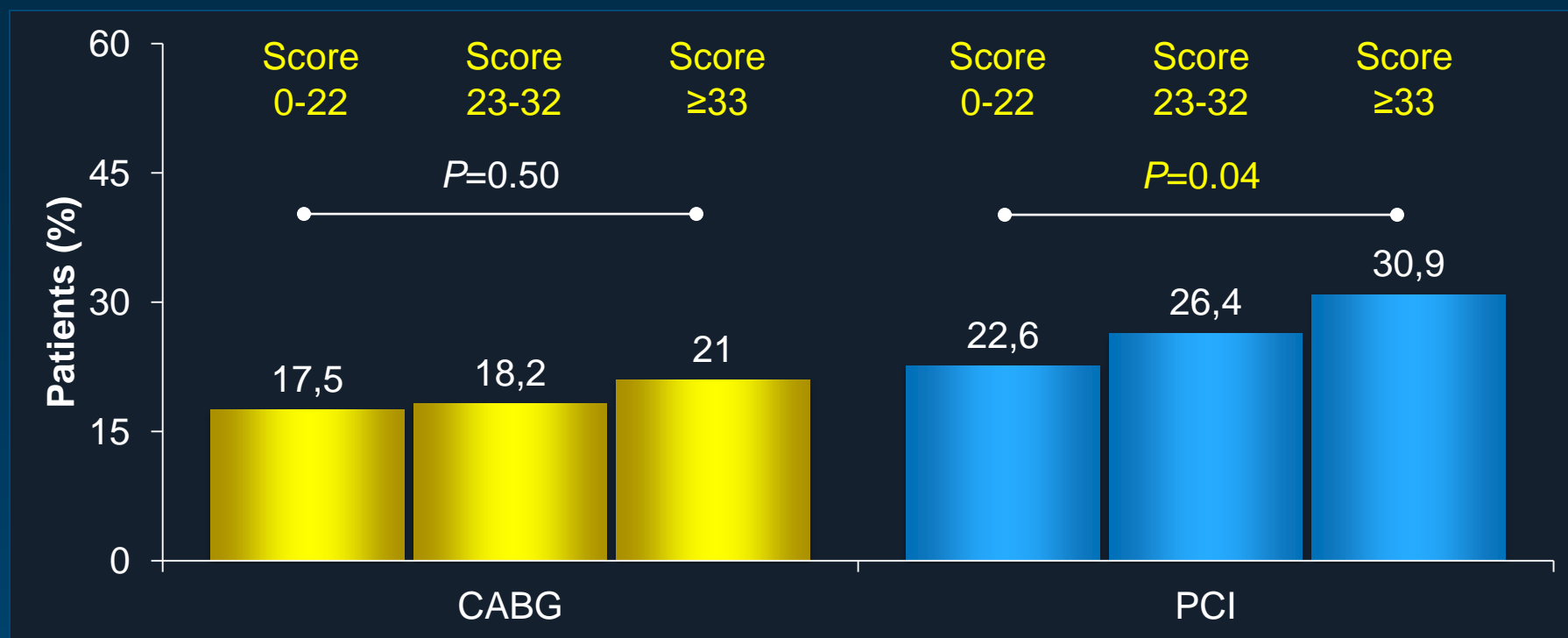
# Risk Stratification By SYNTAX Score



# Does the Coronary Burden Modify The Outcomes of Revascularization?

## 2. PCI versus CABG

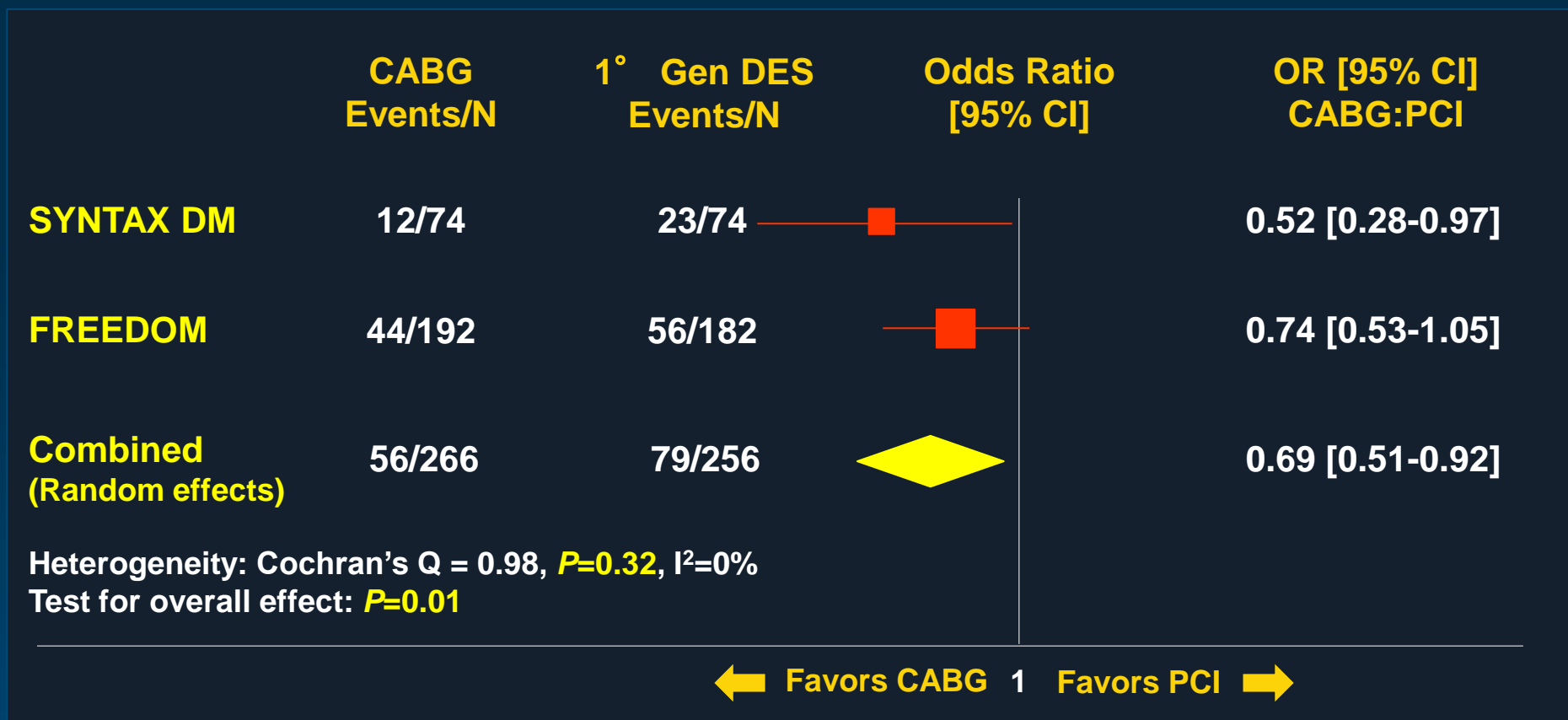
5-Year Death/MI/Stroke in Pooled analyses of FREEDOM and SYNTAX DM



# Meta-Analysis of PCI vs CABG in LM/MVD And Diabetes

## 5-Year Risk of Death/MI/CVA

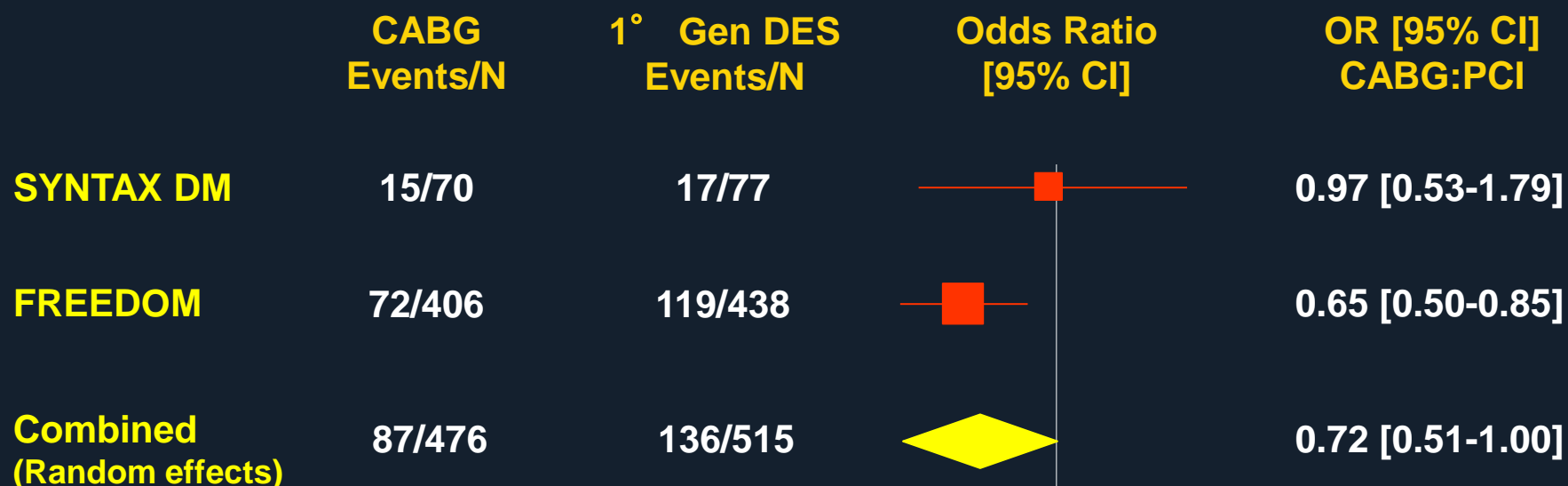
### High SYNTAX Score ( $\geq 33$ )





# Meta-Analysis of PCI vs CABG in LM/MVD And Diabetes 5-Year Risk of Death/MI/CVA

## Intermediate SYNTAX Score (23-32)



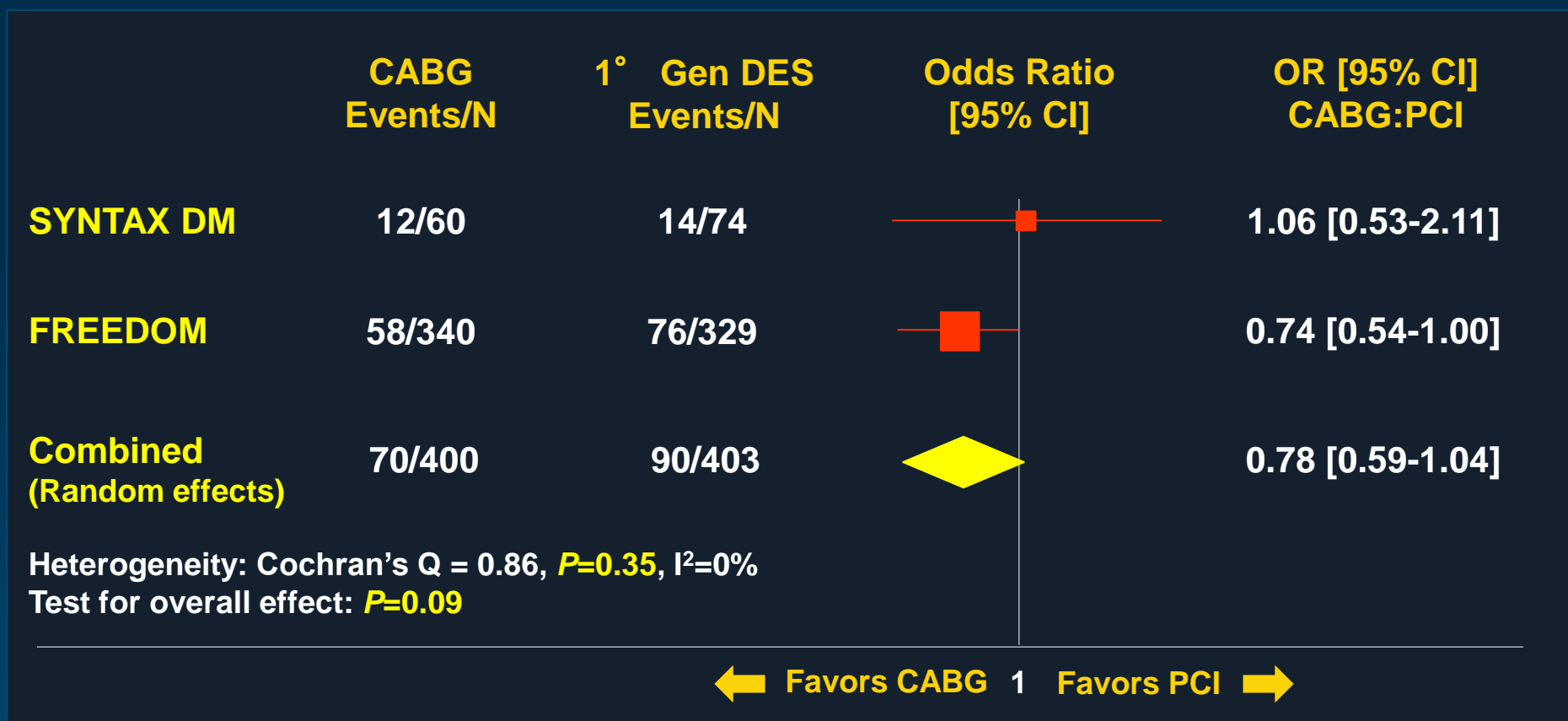
Heterogeneity: Cochran's Q = 1.36,  $P=0.24$ ,  $I^2=26\%$

Test for overall effect:  $P=0.05$

← Favours CABG 1 Favours PCI →

# Meta-Analysis of PCI vs CABG in LM/MVD And Diabetes 5-Year Risk of Death/MI/CVA

## Low SYNTAX Score (0-22)



# Questions Surrounding Revascularization For Coronary Artery Disease in Type 2 Diabetes



1 What are the contemporary outcomes of patients with coronary artery disease and diabetes?

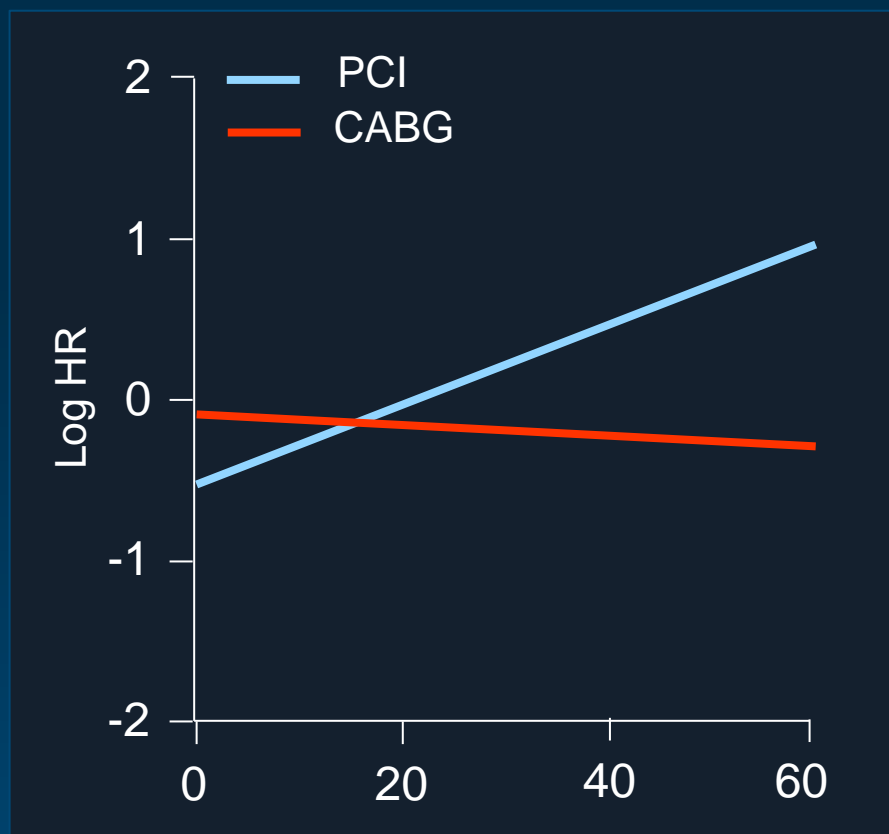
2 Does the coronary atherosclerotic burden impact on prognosis in diabetes?

3

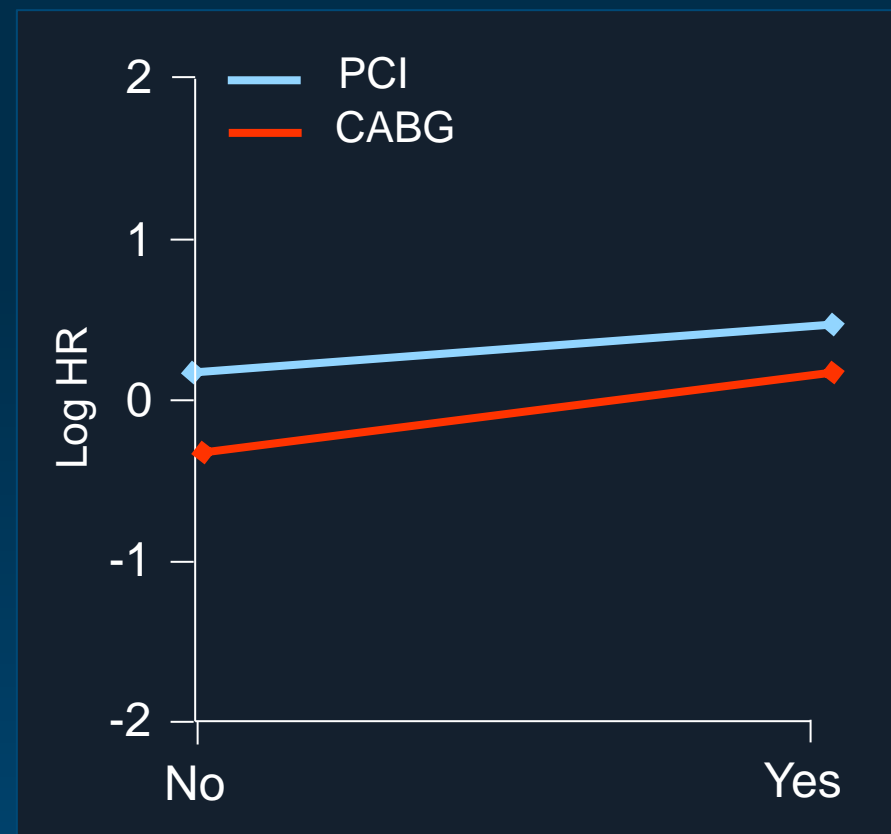
Does diabetes independently weigh into decision making for revascularization by PCI or CABG?

# Does Diabetes Independently Weigh Into the CABG:PCI Equation? **Treatment Interactions in SYNTAX**

## SYNTAX Score



## Diabetes



# The SYNTAX Score II - No Role for Diabetes

SYNTAX  
Score

1

Age

2

Gender

3

Creatinine  
clearance

4

Left Ventricular  
Ejection fraction

5

Left main  
disease

6

Chronic  
obstructive  
pulmonary  
disease

7

Peripheral  
artery disease

8



# Diabetes, Coronary Complexity And Decision-making

1. If I have a patient with diabetes and complex coronary artery disease, is it useful to calculate the SYNTAX score for prognostic stratification?

**Yes:** In pooled analyses of diabetic patients from SYNTAX and FREEDOM, there was a 8% absolute risk reduction in death/MI/stroke with PCI and a 4% absolute risk reduction with CABG between patients in the highest and lowest angiographic risk groups.

# Diabetes, Coronary Complexity And Decision-making

2. If I have a patient with diabetes and complex coronary artery disease, is it useful to calculate the SYNTAX score II for decision making?

**Unknown:** SYNTAX included only 452 patients with diabetes, while the score was derived on a population that included 75% of patients with no diabetes. Further validation of the SYNTAX score II in patients with diabetes from the FREEDOM trial is ongoing.



EUROPEAN  
SOCIETY OF  
CARDIOLOGY

# 2013 ESC Guidelines On Diabetes, Pre-diabetes And Cardiovascular Diseases

Optimal medical treatment should be considered as preferred treatment in patients with stable CAD and DM unless there are large areas of ischemia or significant left main or proximal LAD lesions.

CABG is recommended in patients with DM and multivessel or complex (**SYNTAX Score >22**) CAD to improve survival free from major cardiovascular events.

PCI for symptom control may be considered as an alternative to CABG in patients with DM and less complex multivessel CAD (**SYNTAX score  $\leq 22$** ) in need of revascularization.

IIa

B

I

A

IIb

B



# Coronary Atherosclerotic Burden And Prognosis In Type 2 Diabetes: Closing Remarks / 1

1. A quarter of procedures for coronary artery disease are performed in patients with diabetes and long-term mortality in these patients is higher than in patients without diabetes.
2. In patients with stable coronary artery disease and diabetes, routine revascularization does not improve survival over first-line medical treatment, with **the exception of CABG in patients with extensive atherosclerosis.**



# Coronary Atherosclerotic Burden And Prognosis In Type 2 Diabetes: Closing Remarks / 2

3. In patients with MVD and diabetes, revascularization by CABG rather than PCI is associated with:
  - A large (-35%) reduction in mortality at long-term
  - Reduced risk of revascularization at early and long-term
  - Increased early risk of stroke
4. This benefit seems irrespective of coronary burden and insulin status.
5. In diabetics who need revascularization, the SYNTAX score maintains some value in prognostic risk stratification, especially for PCI, but its utility in decision making between PCI and CABG is marginal. Whether the SYNTAX Score II may overcome this limitation is under investigation.

