PCI vs. CABG
Left Main Disease and Multi-Vessel Disease

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PCI vs. CABG
for Left Main Disease

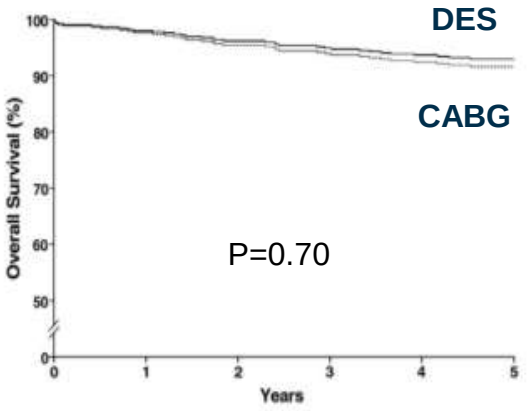
1. MAIN COMPARE Registry
2. SYNTAX, LM subgroup
3. PRECOMBAT
4. Combined Patient Level Meta-Analysis
5. Temporal Changes of LM Revascularization (*AMC Main Registry, IRIS Main Registry)*
6. EXCEL, NOBLE

MAIN COMPARE, 5 Year

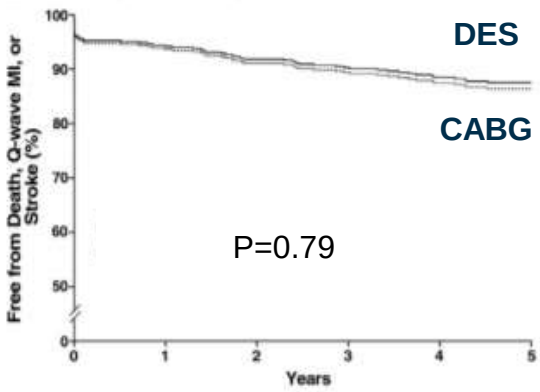
Propensity Match Patients (n=542)

DES vs. CABG

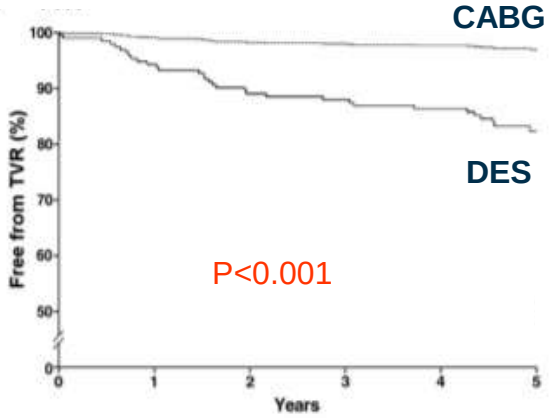
Death



Death/MI/Stroke

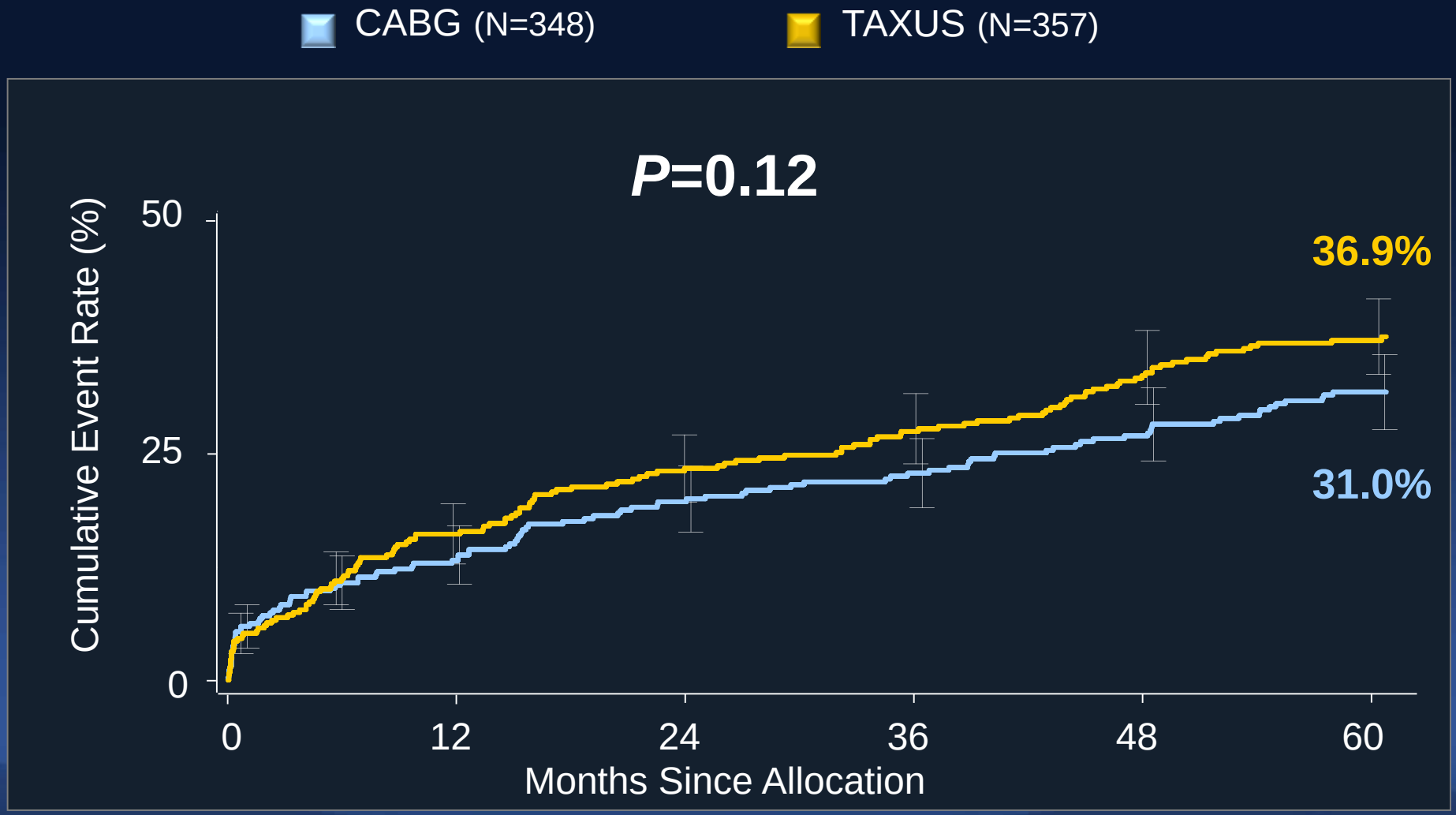


TVR



Park DW, et al. JACC 2010;56:117-24

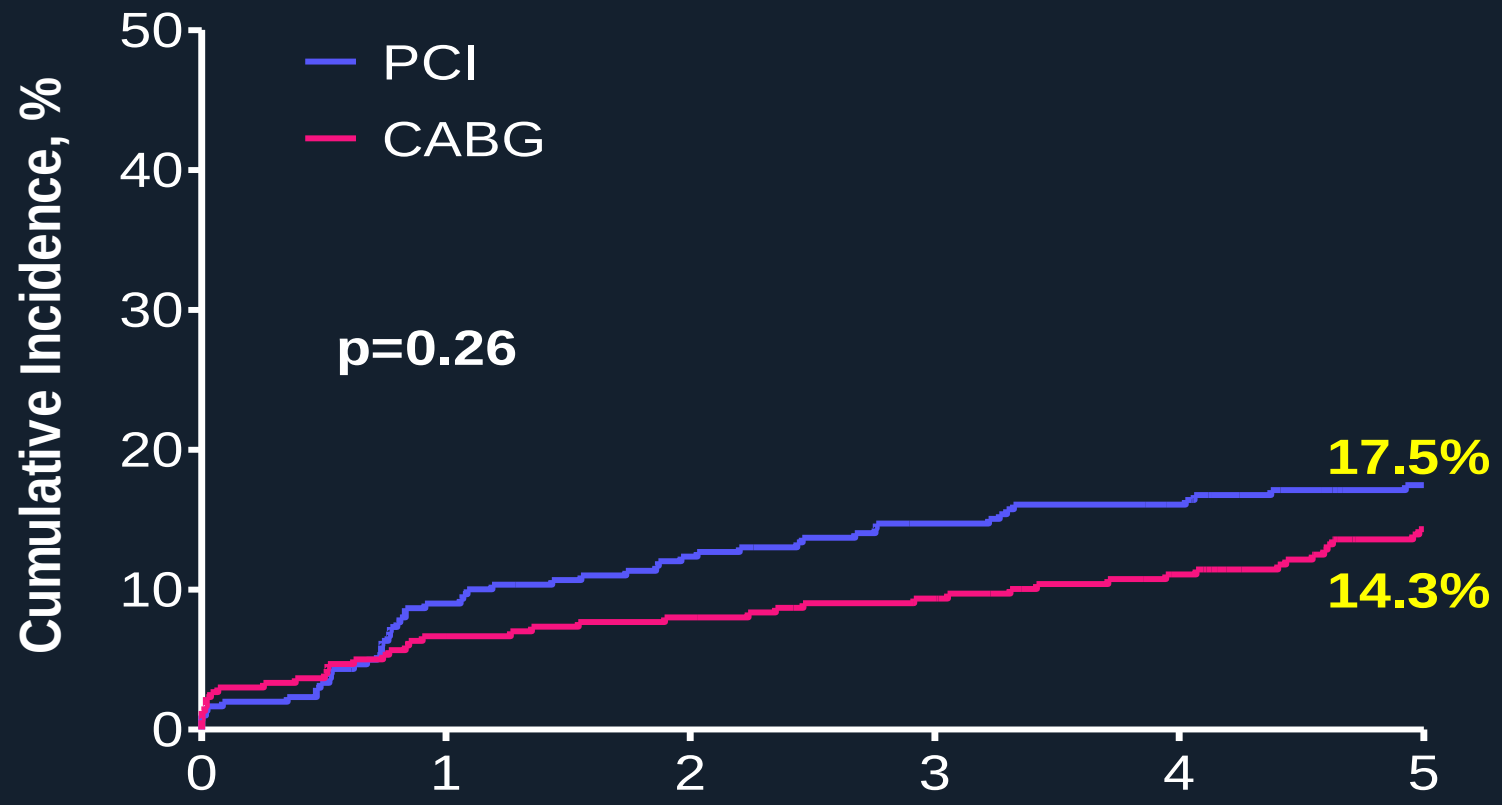
SYNTAX (LM Subset), 5 Year
Death /MI /Stroke /Repeat Revascularization



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

ITT population

PRECOMBAT, 5 Year
Death. MI, Stoke or iTVR



Patient at risk

PCI	300	272	261	252	246	231
CABG	300	279	274	267	256	235

Ahn JM et al, JACC. 2015 Mar 10.

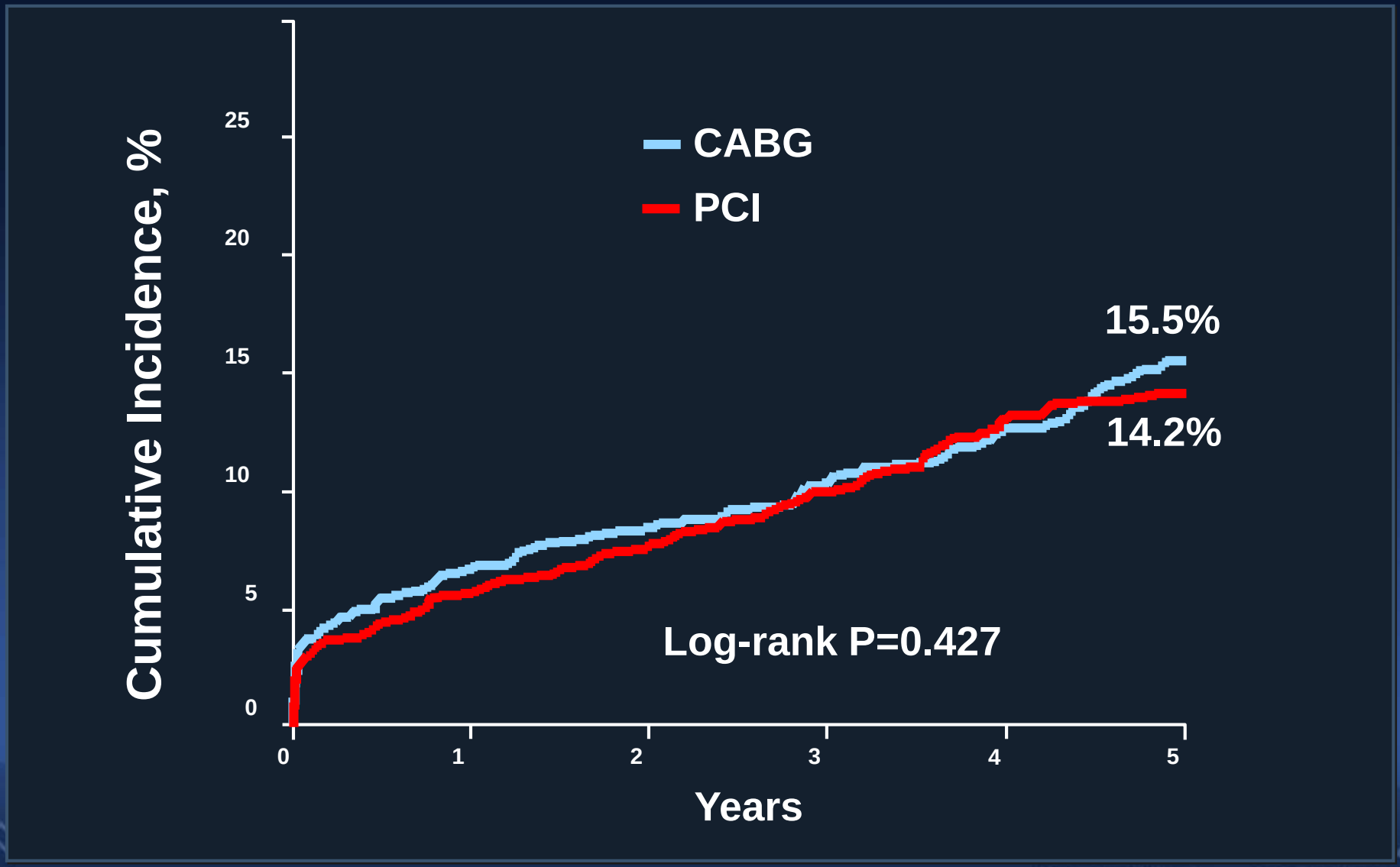
Patient-Level Meta-Analysis (n=3,280)

Database Pooling of
SYNTAX (n=1800, PES),
BEST (n=880, EES), and
PRECOMBAT (n=600, SES) trials.

Lee CW, Park SJ et al, Meta-Analysis from SYNTAX, BEST and PRECOMBAT, 2016

Patient-Level Meta-Analysis (n=1,293)

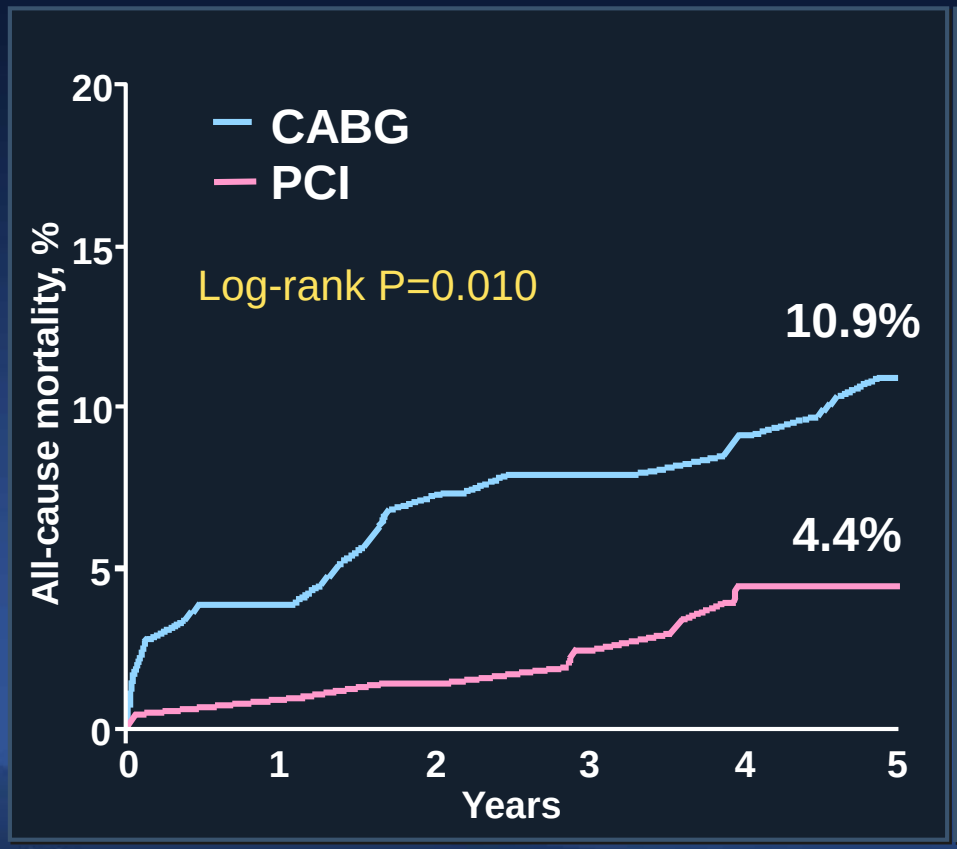
LM Subset / Death, MI or Stroke



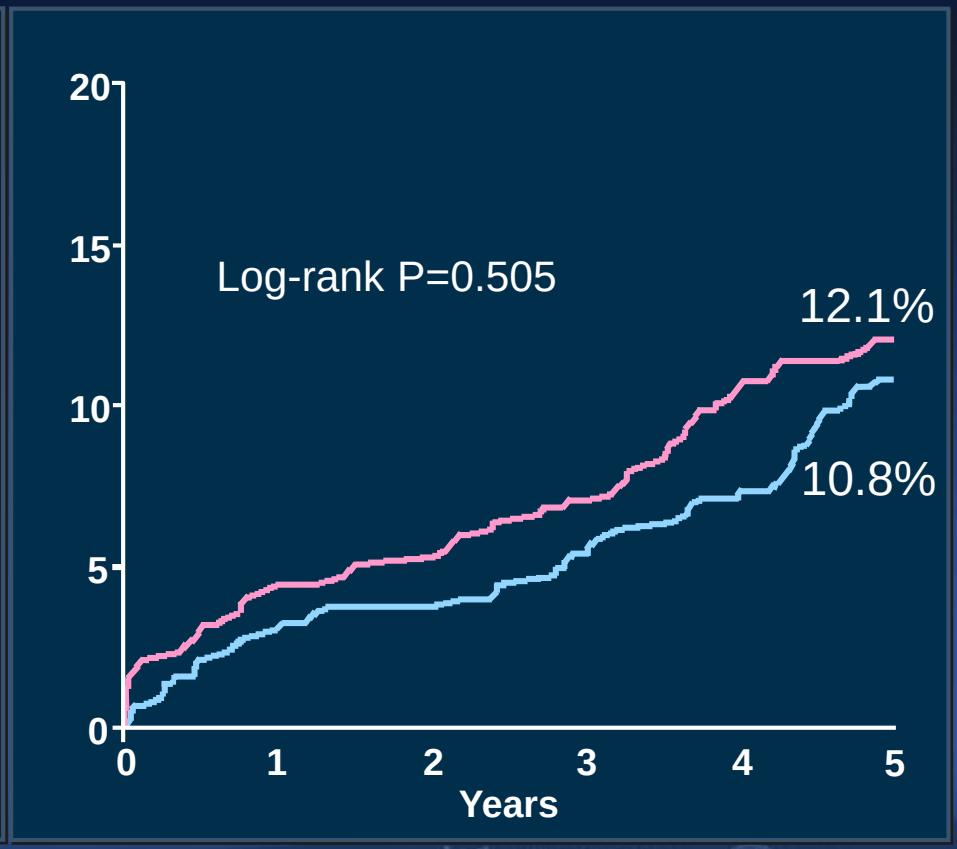
Patient-Level Meta-Analysis (n=1,293)

LM Subset / All-cause Mortality

LM alone or LM + 1-VD

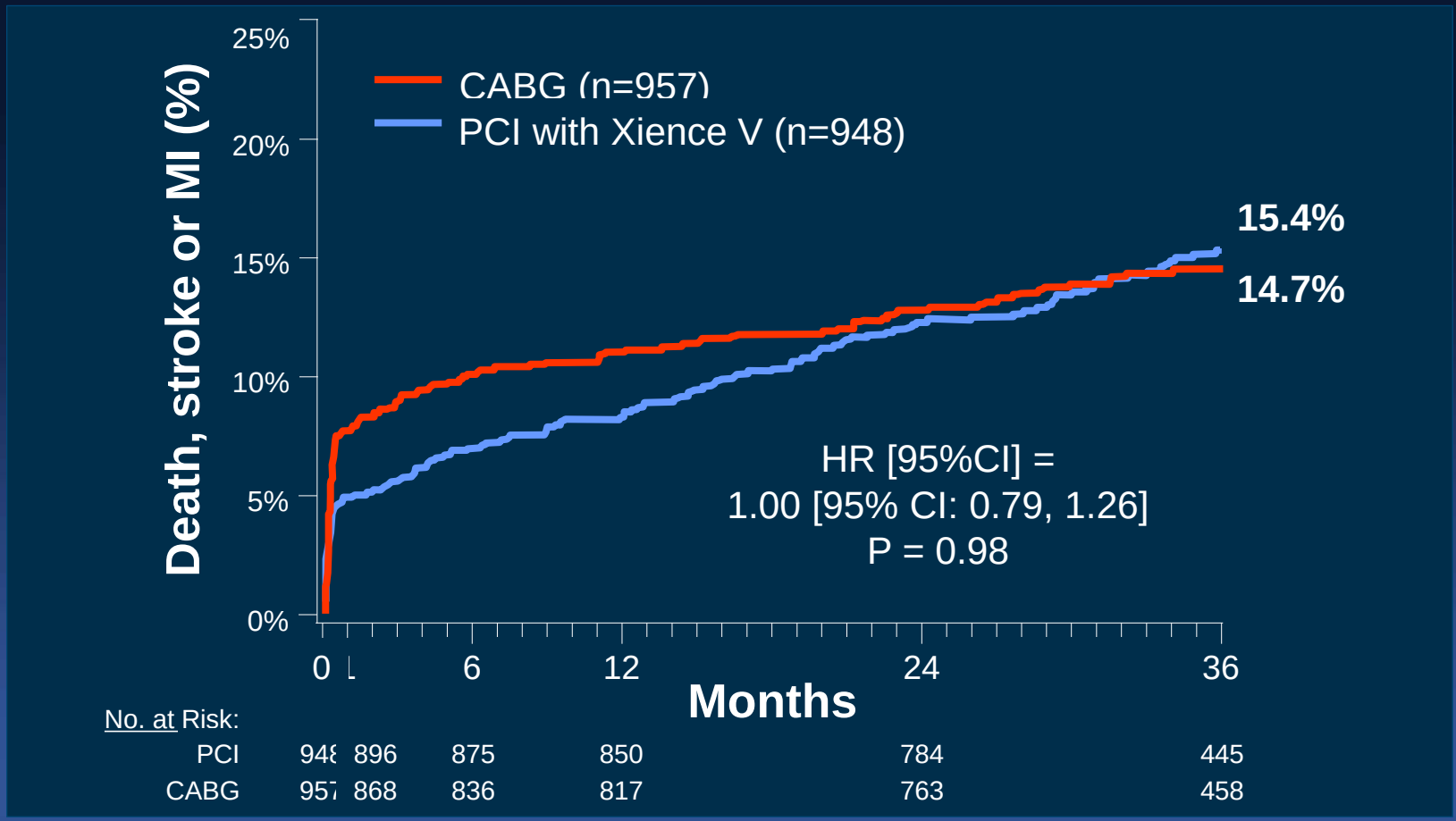


LM with 2-VD or 3-VD



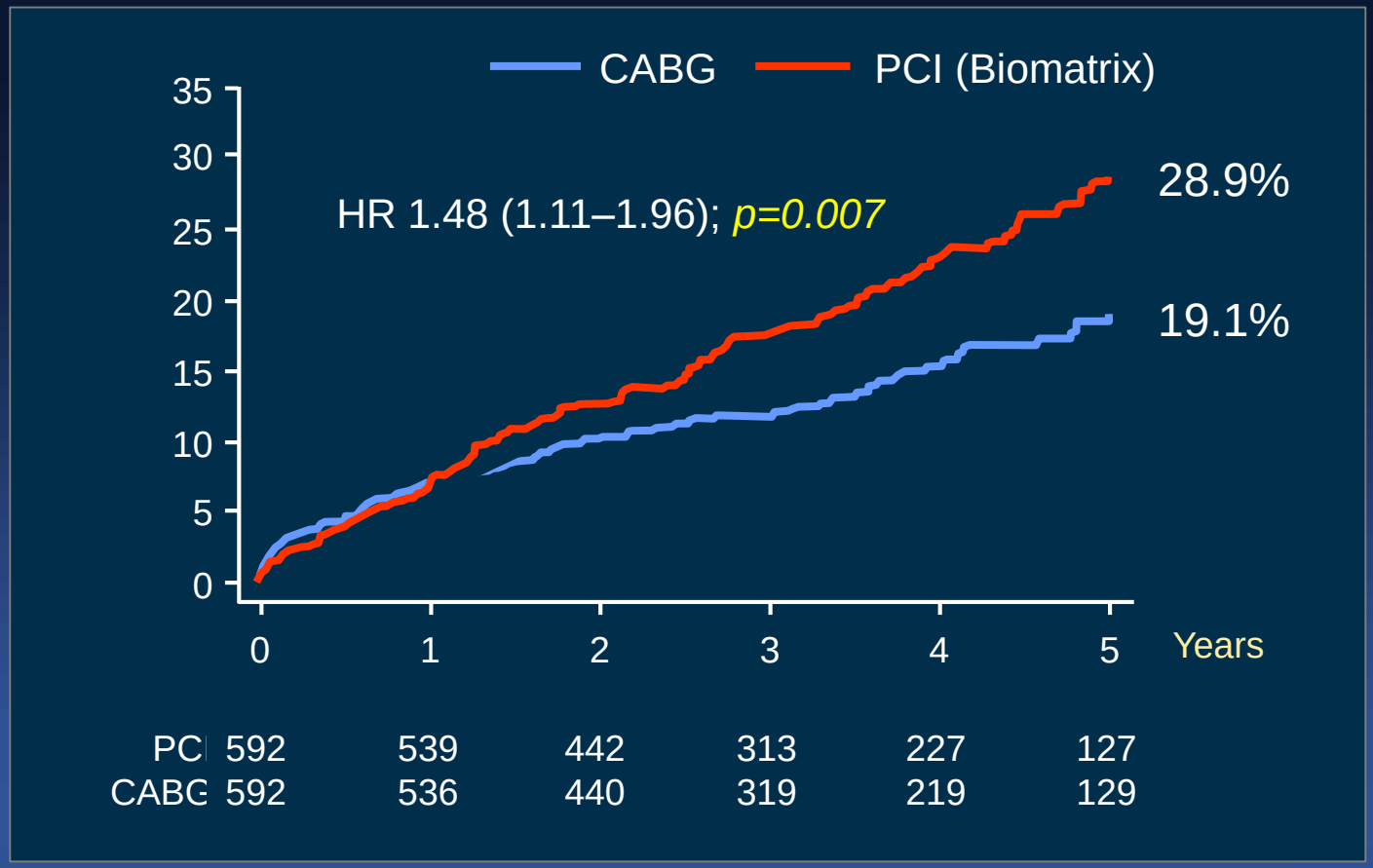
EXCEL

Primary Endpoint
Death, Stroke or MI at 3 Years



NOBLE

Primary Endpoint
Death, non-procedural MI, repeat Revascularization and Stroke at 3 Years



Makikallio T et al. Lancet 2016;388:2743–52

Updated Meta-analysis
PCI vs. CABG at 5 year

PCI vs. CABG	HR (95% CI)	*P*
Revascularization	1.74 (1.47-2.07)	<0.0001

Only Difference Is Only Revascularization at 5 year !

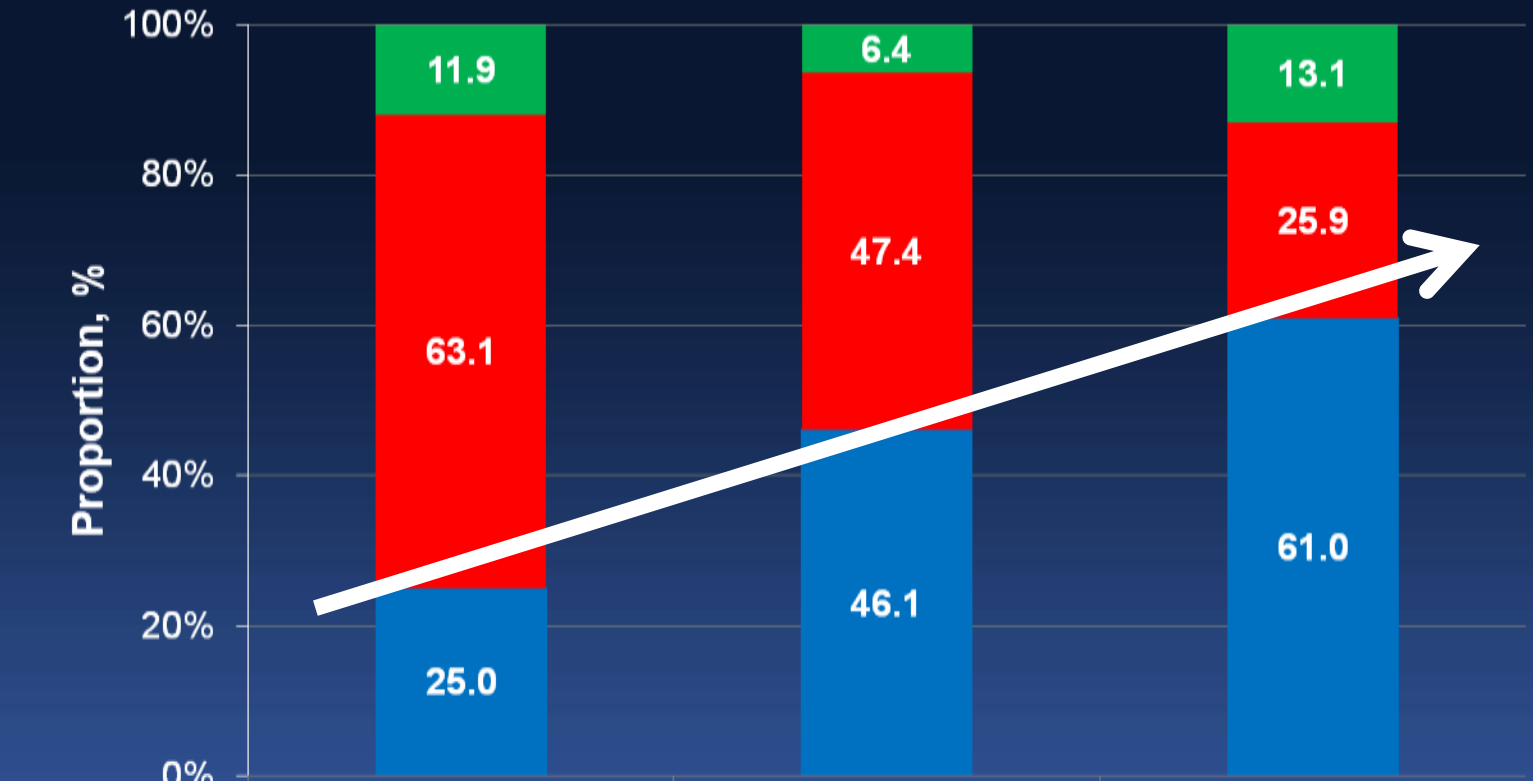
6 RCTs, n=4,686 pts, Boudriot, LE MANS, PRECOMBAT, SYNTAX, NOBLE, EXCEL

20 Years of Temporal Changes In PCI vs. CABG For LM Disease

Data from ASAN and IRIS MAIN Registry

Temporal Trends of LM Revascularization,

(IRIS LM Registry n=5,883), 2017

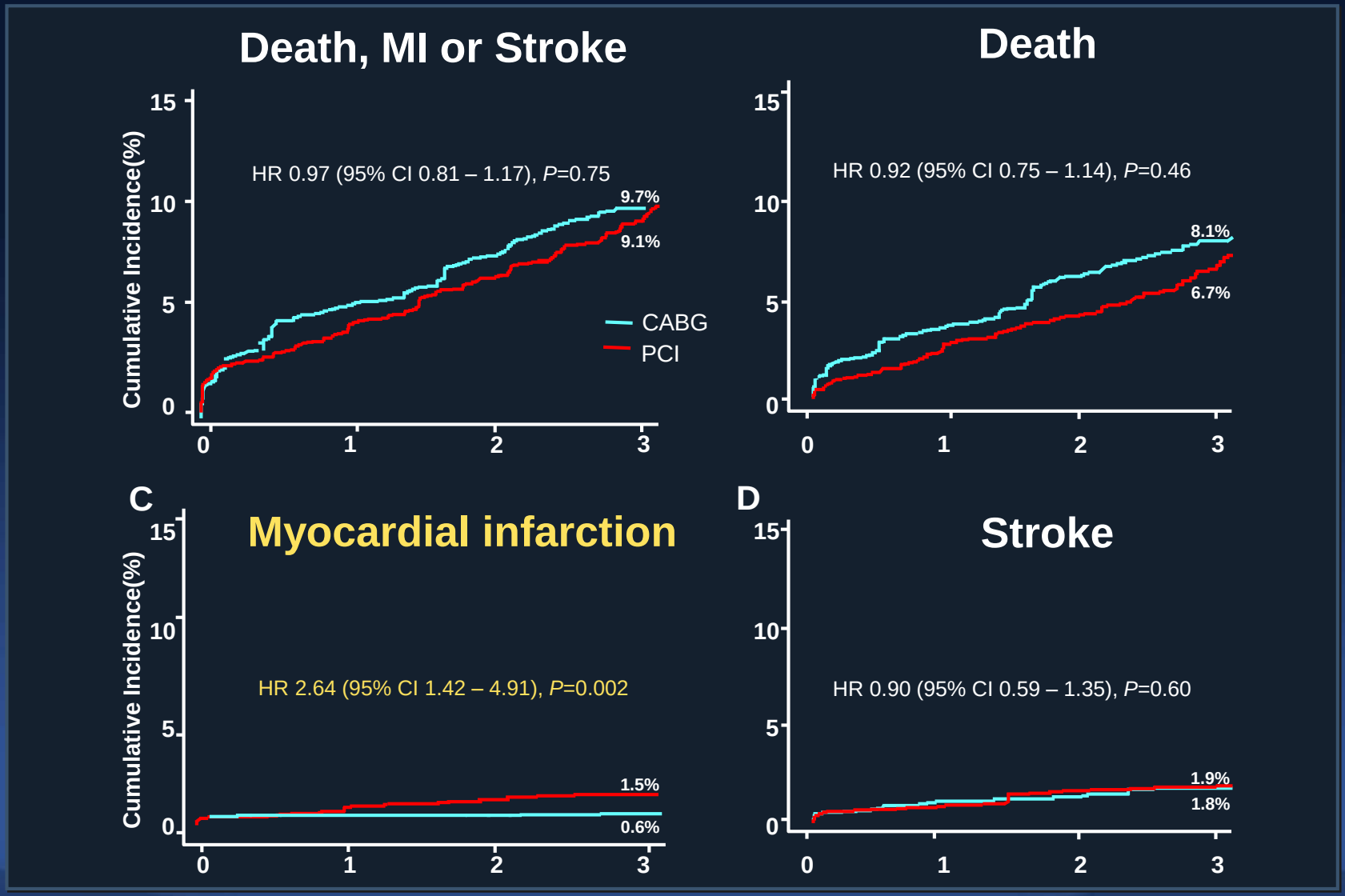


	1995-2002	2003-2006	2007-2013
Medical Tx	129	131	356
CABG	683	964	704
PCI	271	937	1658

PH Lee et al, JACC. 2016 Sep 13;68(11):1233-46.

Clinical Outcomes at 3 year

(IRIS LM Registry n=5,883)

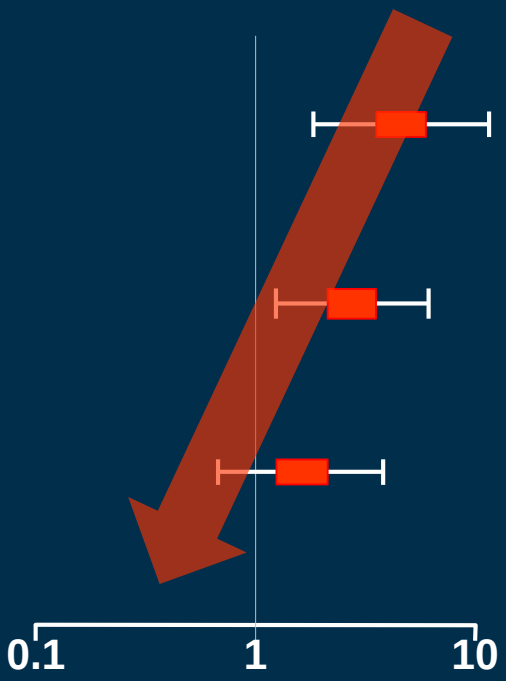


PH Lee et al, JACC. 2016 Sep 13;68(11):1233-46.

MACCE

(AMC LM Registry n=2,360)

P for Interaction = 0.002



	HR (95% CI)	P value
BMS (1995-2002)	0.33 (0.23-0.47)	<0.001
Early DES (2003-2006)	0.53 (0.35-0.80)	0.005
Late DES (2007-2010)	1.01 (0.68-1.49)	0.32

Park SJ, Ahn JM et al, Circ Cardiovasc Interv. 2015;8:e001846.

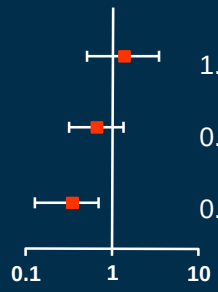
MACCE

(AMC LM Registry n=2,360)

Death

P for Interaction = 0.011

	HR (95% CI)	P value
BMS	1.36 (0.52-3.52)	0.53
Early DES	0.66 (0.32-1.37)	0.27
Late DES	0.31 (0.13-0.71)	**0.015**

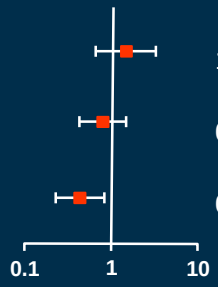


PCI better | CABG better

Death/ MI/ Stroke

P for Interaction = 0.017

	HR (95% CI)	P value
	1.49 (0.67-3.31)	0.33
	0.80 (0.43-1.50)	0.49
	0.44 (0.23-0.85)	**0.015**

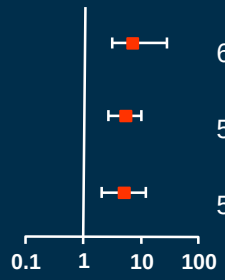


PCI better

Repeat Revascularization

P for Interaction = 0.20

	HR (95% CI)	P value
	6.88 (3.21-14.7)	<0.001
	5.26 (2.73-10.1)	<0.001
	5.07 (2.12-12.1)	**<0.001**

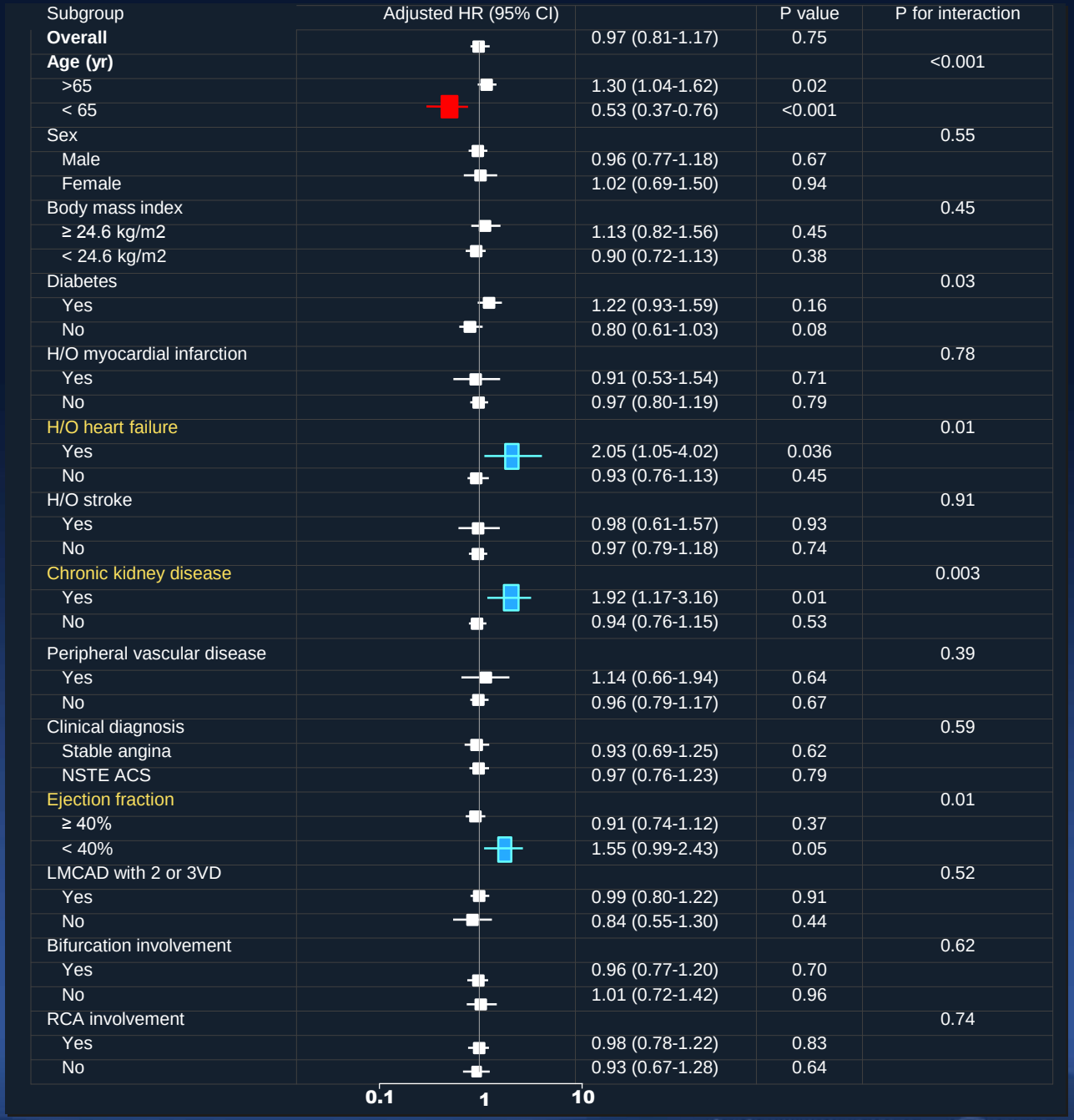


CABG better

Park SJ, Ahn JM et al, Circ Cardiovasc Interv. 2015;8:e001846.

Subgroup Analysis

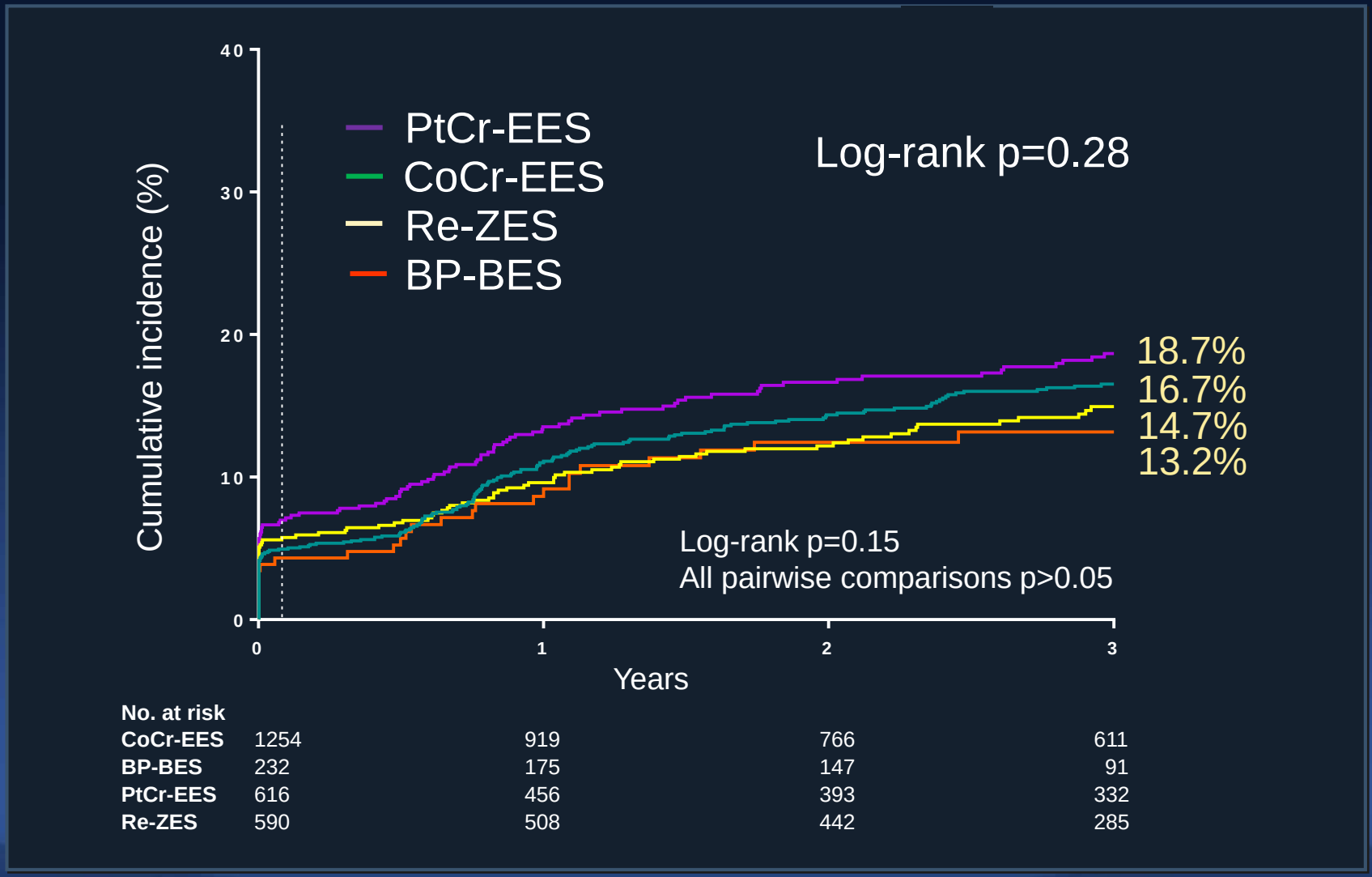
(IRIS LM Registry n=5,883)



Can Any 2nd Generation DES Make A Different Outcomes ?

Analysis from 2,692 LM PCI with 2nd Generation DESs, AMC data

Primary End Point
Target-Vessel Failure

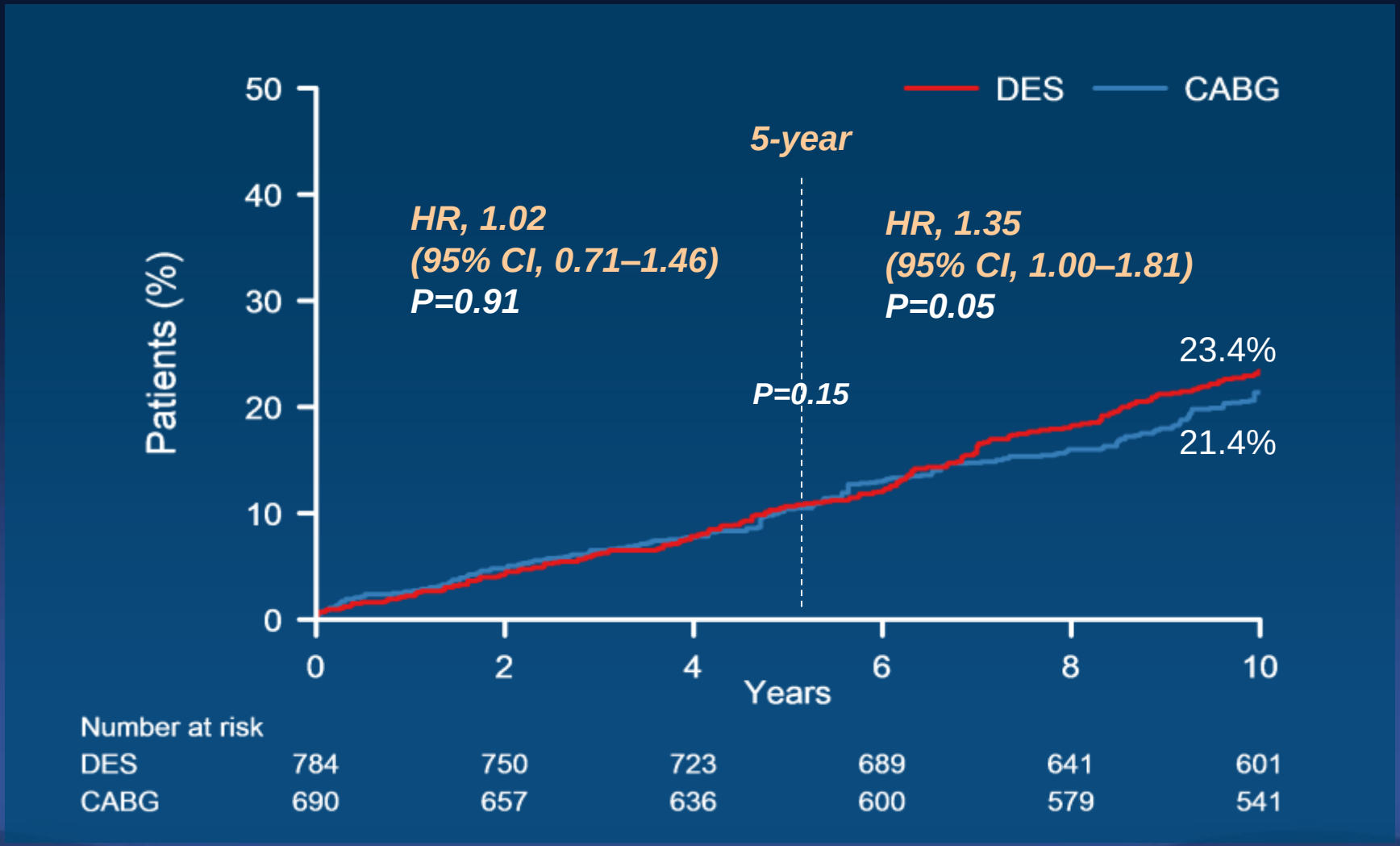


Lee PH et al, JACC 2018 Feb 27;71(8):832-841.

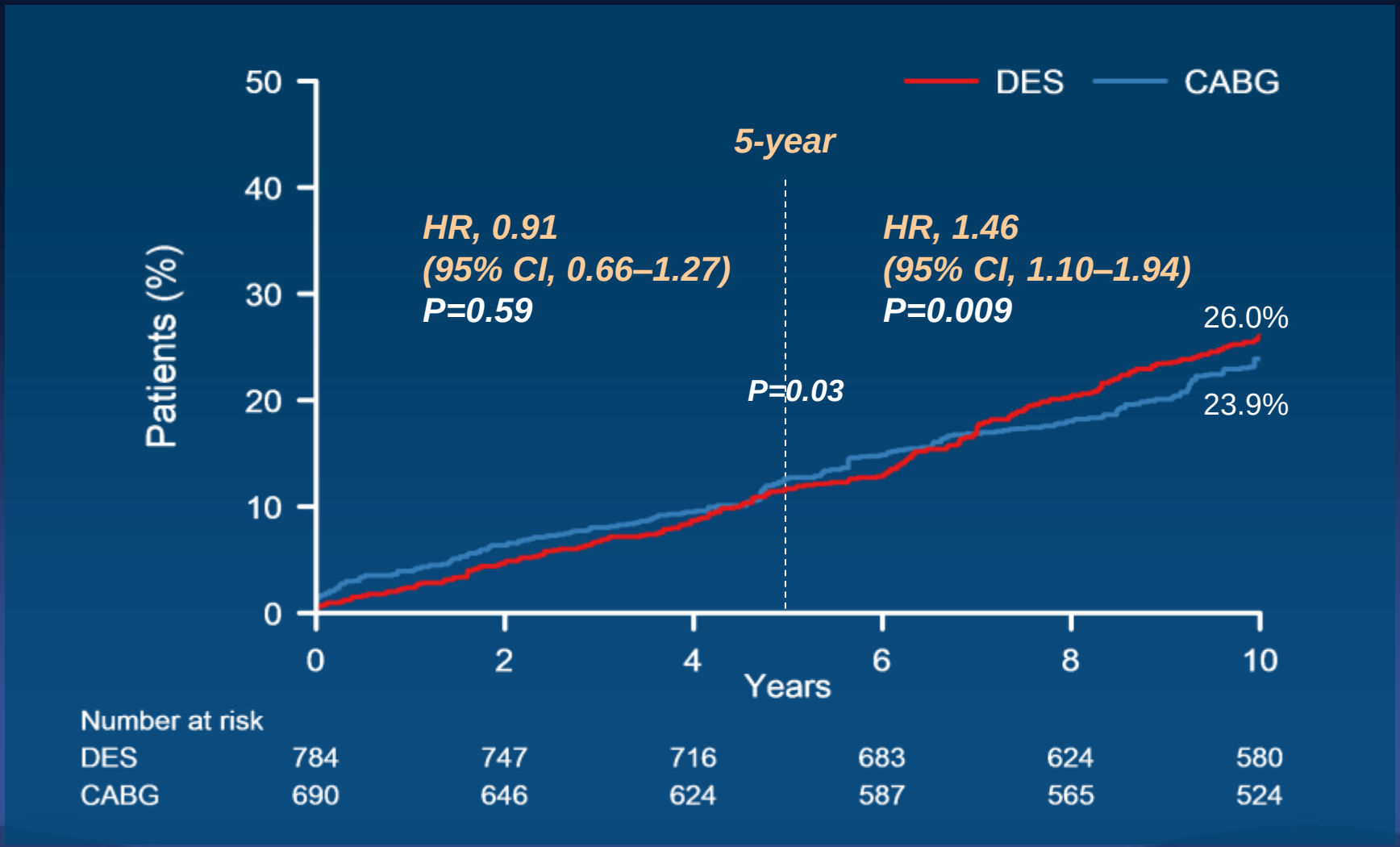
10 Year All Cause Mortality in PCI vs. CABG For LM Disease

Data from MAINCOMPARE Registry and SYNTAX

MAINCOMPARE
10 Year All-Cause Mortality



MAINCOMPARE
Death, Q-MI, or Stroke



DES vs. CABG
for LM Disease 2018

1. Outcomes of PCI with DES is Comparable with CABG, *Even Better Survival in Selected Patients !*
2. Higher Stroke in CABG
3. Higher Revascularization in PCI
4. CABG Is Still better In Patients with History of Hear failure, Chronic Kidney Disease and Low EF (<40%).
5. We Need A Longterm Follow-up Data More than 10 years.

ESC Guidelines 2018
Elective PCI for LM Stenosis

LM Disease is
Not Surgical Disease Anymore !

Reference; SYNTAX Study, PRECOMBAT study, MAINCOMPARE registry study and Meta-Analysis. *Patrick, SW et al, NEJM. 2009 March 5;360(10), Park SJ et al, NEJM. 2011 May 5;364(18):1718-27, Levin GN et al. ACC/AHA guidelines. JACC 2011;58:44-122, Capodanno et al, JACC 2011;58:1426-32*

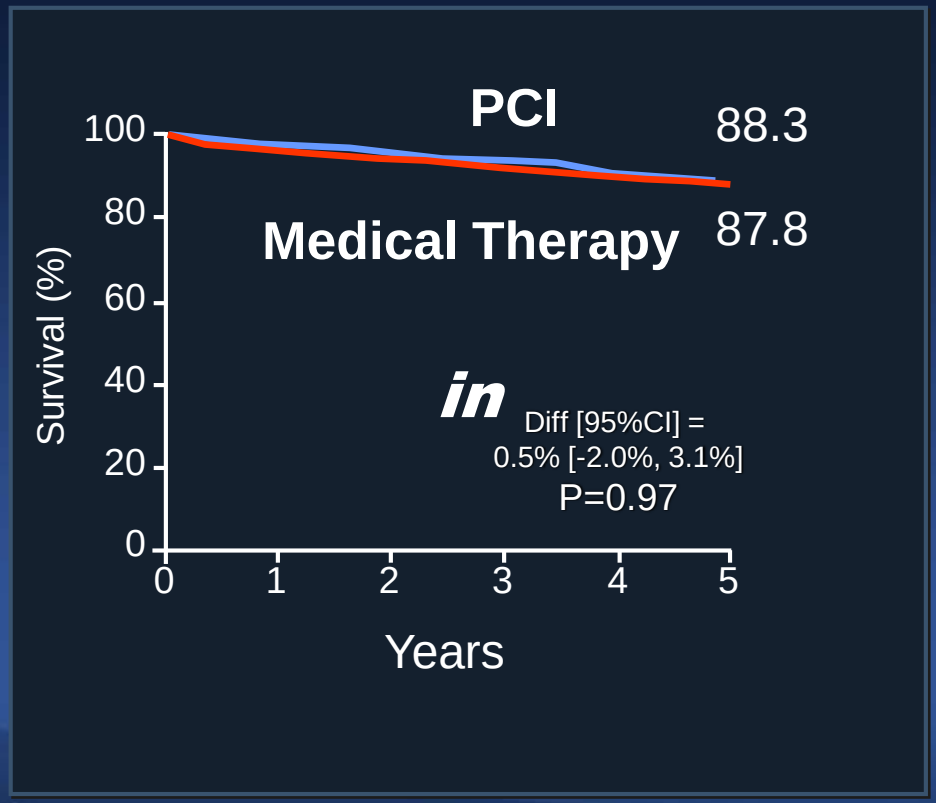
PCI vs. CABG
for Multi-vessel Disease

1. BARI 2D
2. FREEDOM
3. SYNTAX
4. BEST
5. Combined Patient Level Meta-Analysis

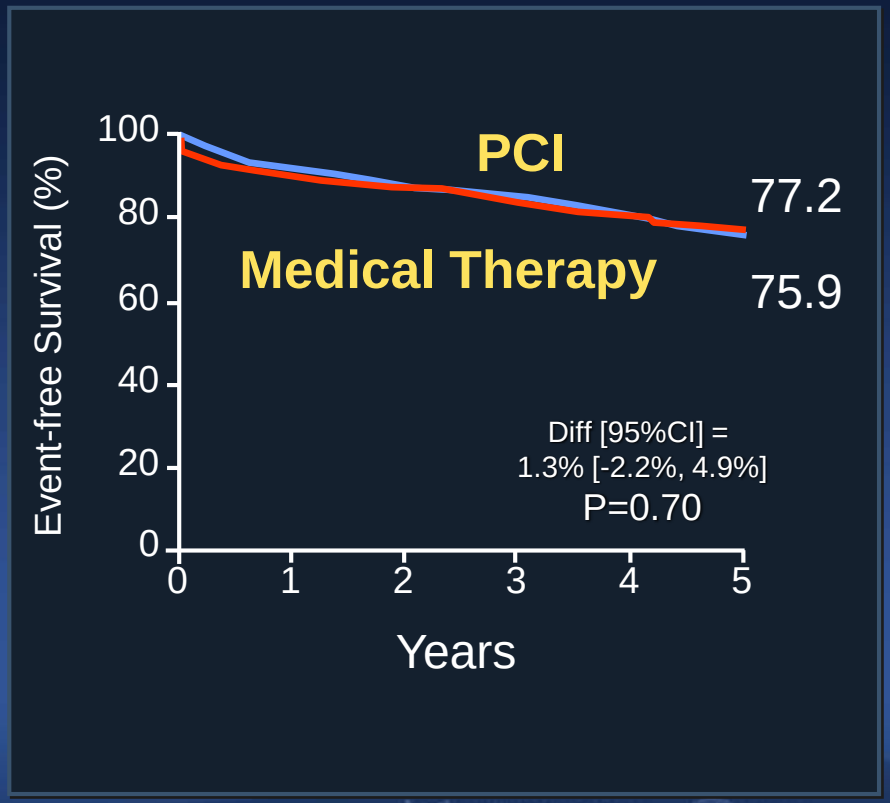
BARI 2D

PCI Is Not Better than Medical Treatment in Lower Risk Diabetic Patients at 5 year

Survival



Freedom from MACE (Death, MI, or Stroke)



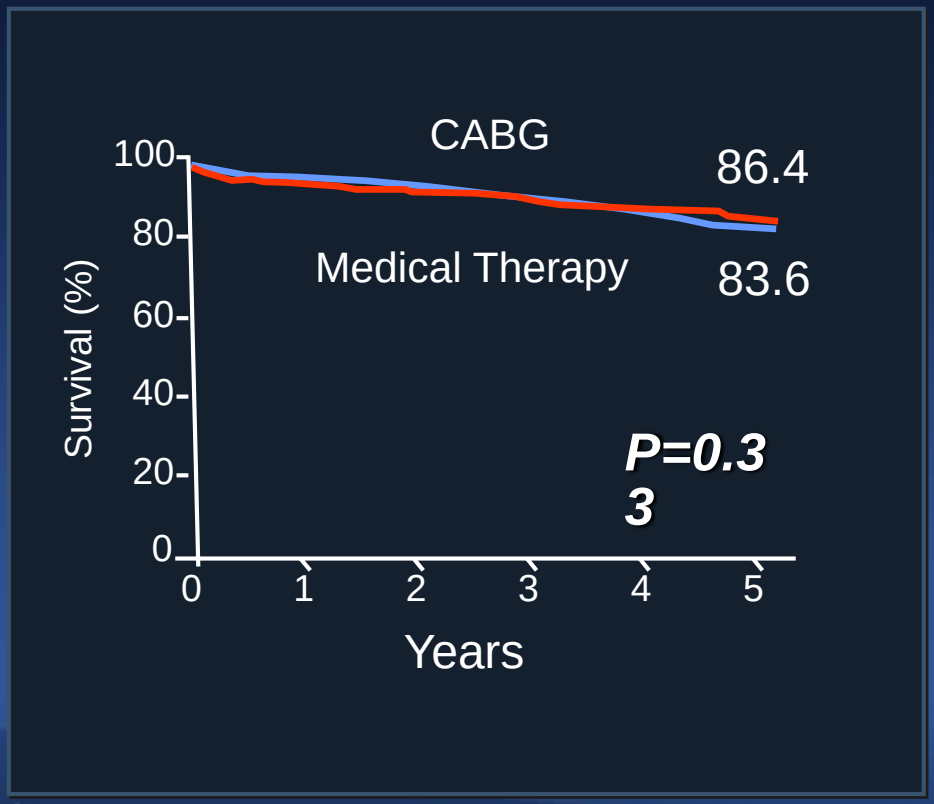
The BARI 2D Study Group. *NEJM* 2009;360:2503-15

BARI 2D

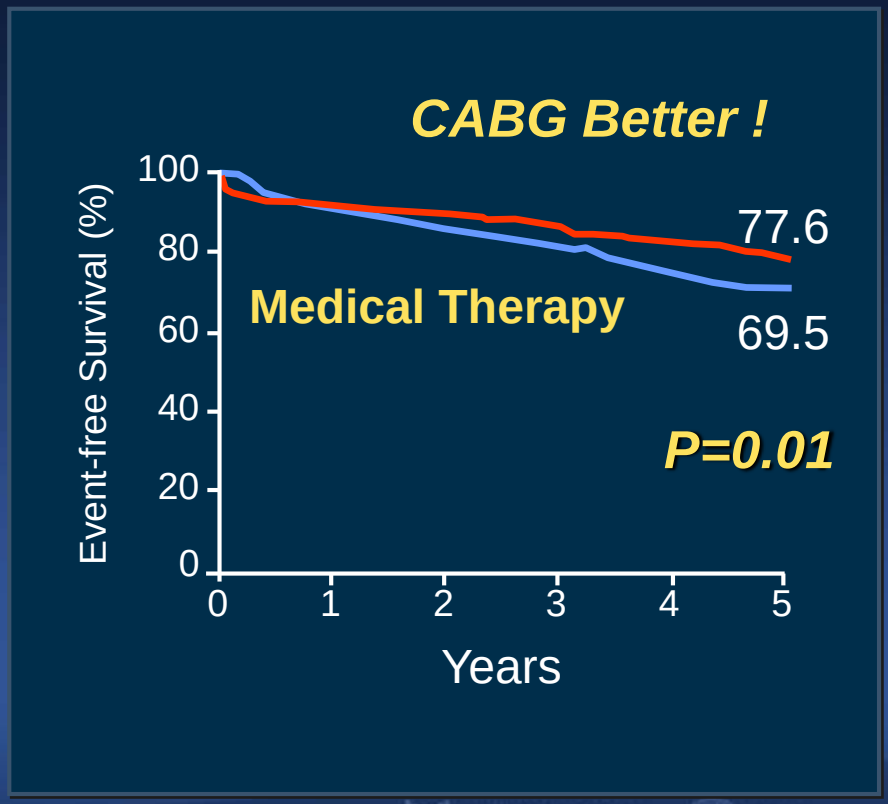
CABG Is Better than Medical Treatment

in High Risk Diabetic Patients at 5 year

Survival

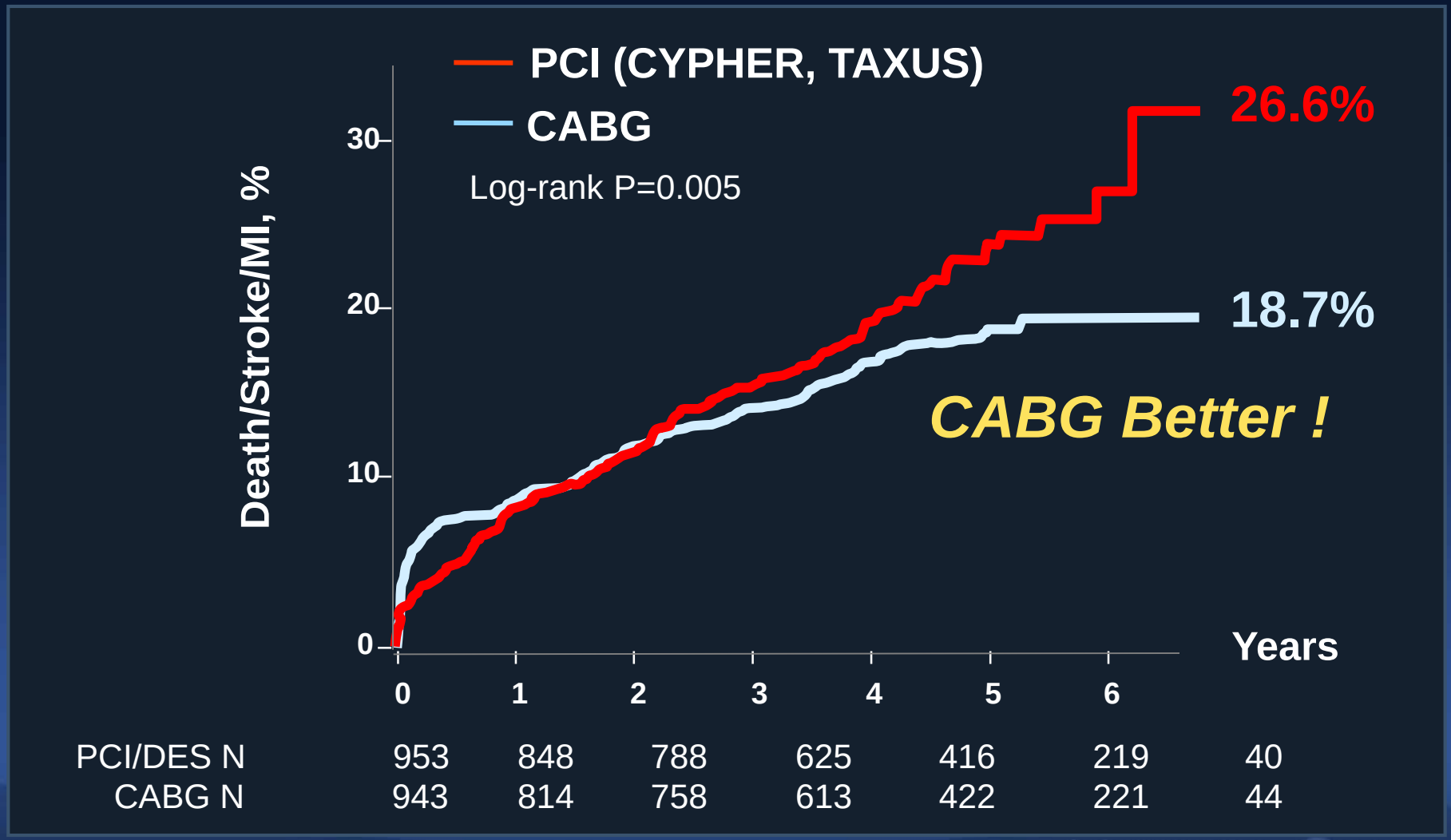


Freedom from MACE (Death, MI, or Stroke)



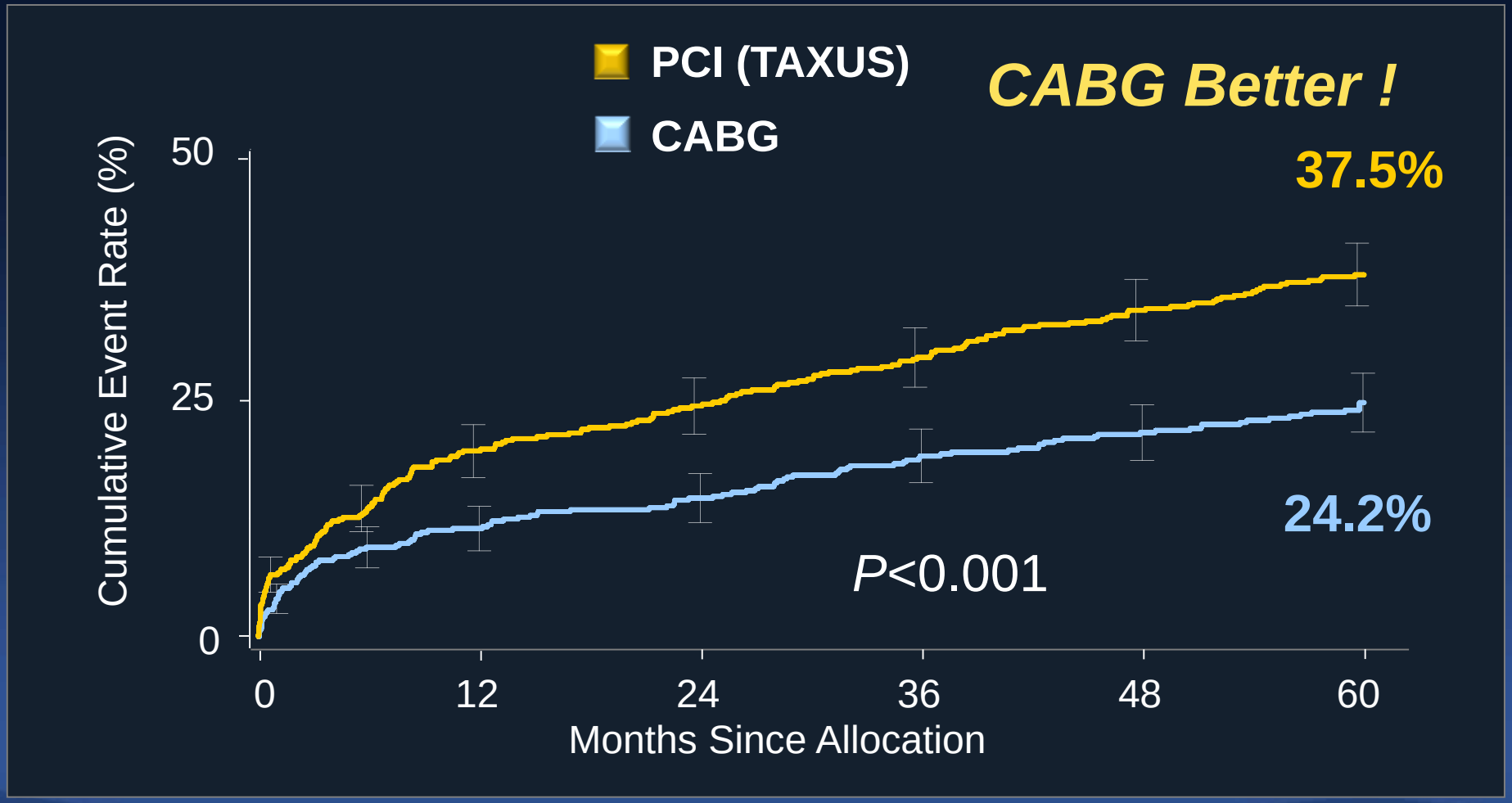
The BARI 2D Study Group.*NEJM* 2009;360:2503-15

FREEDOM *(DM and MVD)*
Death / MI / Stroke at 5 Year



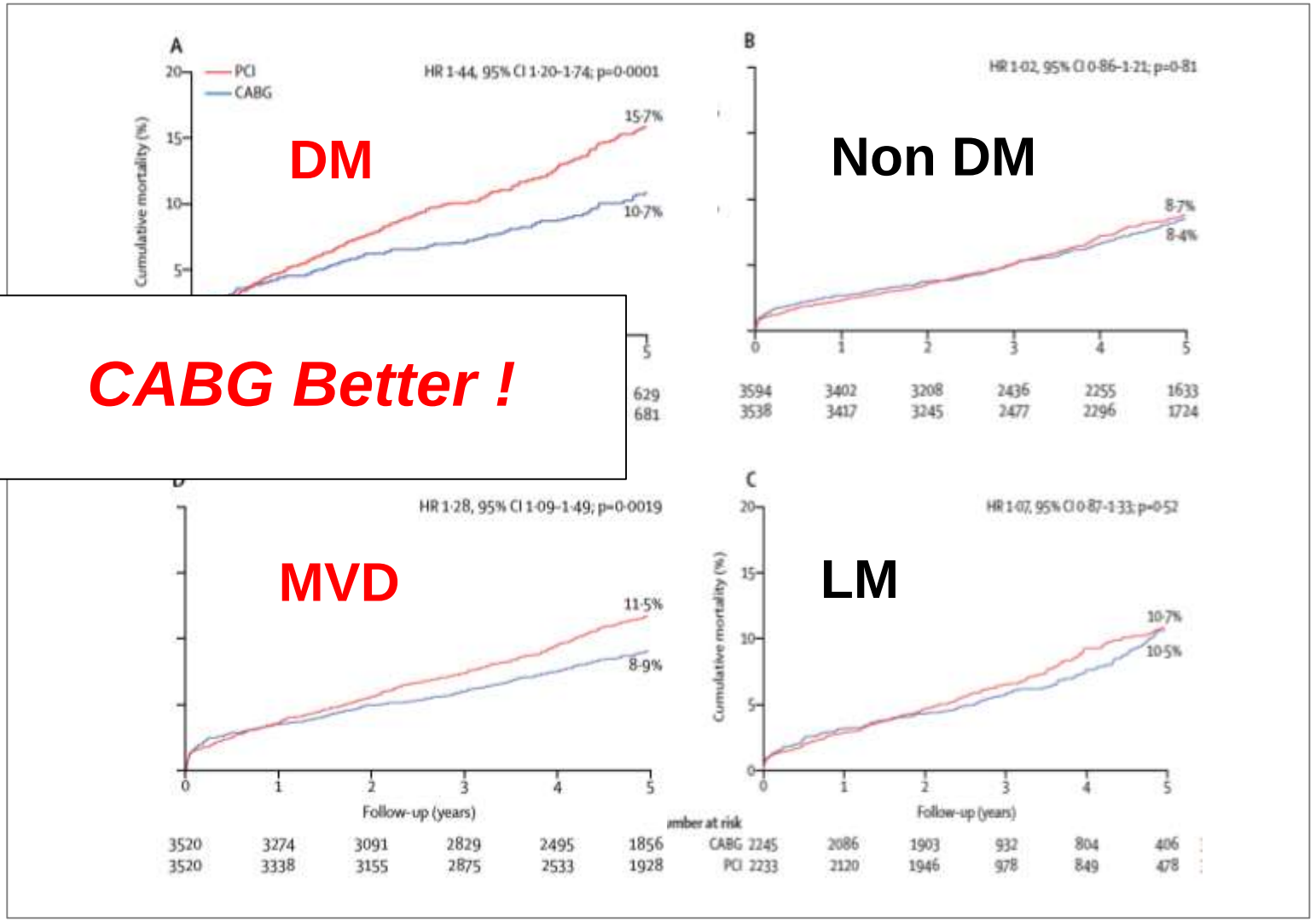
Farkouh et al, *NEJM* 2012 November 4

SYNTAX *(3VD Subset)*
Death, MI, Stroke or Any RR at 5 Year



Friedrich W Mohr et al. LANCET 2013, 381; 629-638

Cumulative Mortality



CABG Better !

Head SJ et al. Lancet February 22, 2018 ; *Patient-level Meta-Analysis of 11,518 Patients with 11 RCTs (ERACI II, ARTS, MASS-II, SoS, SYNTAX, PRECOMBAT, FREEDOM, VA CARDS, BEST, NOBLE, and EXCEL)*

DES vs. CABG
for Multi-Vessel Disease 2018

CABG was superior to PCI with DESs in patients with diabetes and advanced CAD (predominantly, 3 VD).

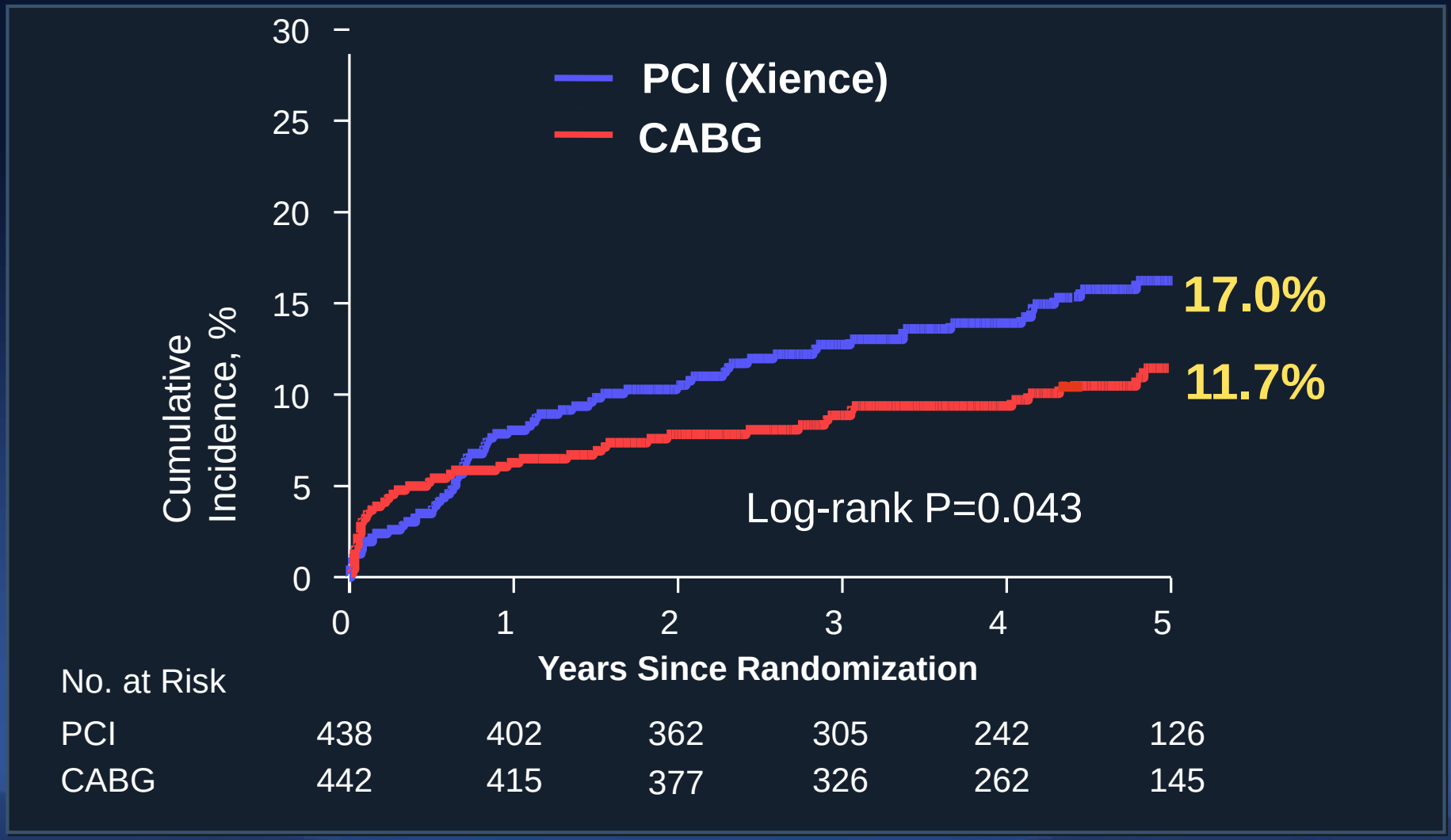
What Is Changing Now ?

2018

1. **New DES**
2. **Better Concept of PCI**

Can We Make A Better Clinical Outcomes *Using New DES ?*

BEST
Death, MI or TVR at 5 Year

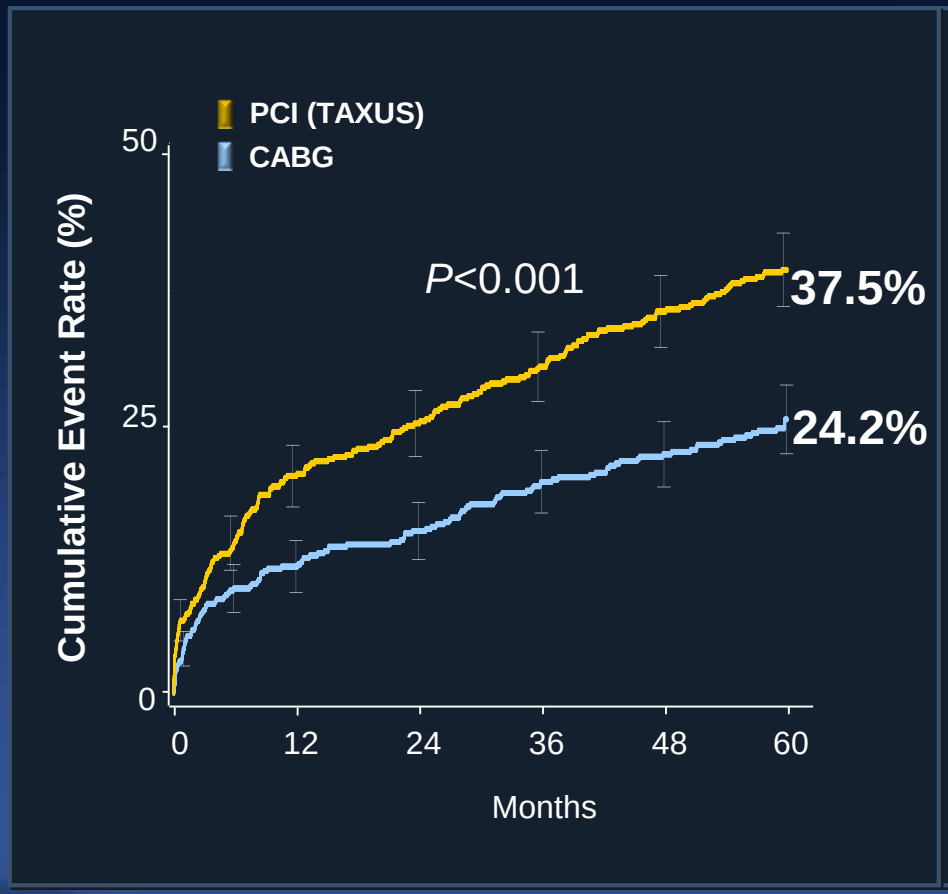


Park SJ et al, NEJM. 2015; 372: 1204-1212

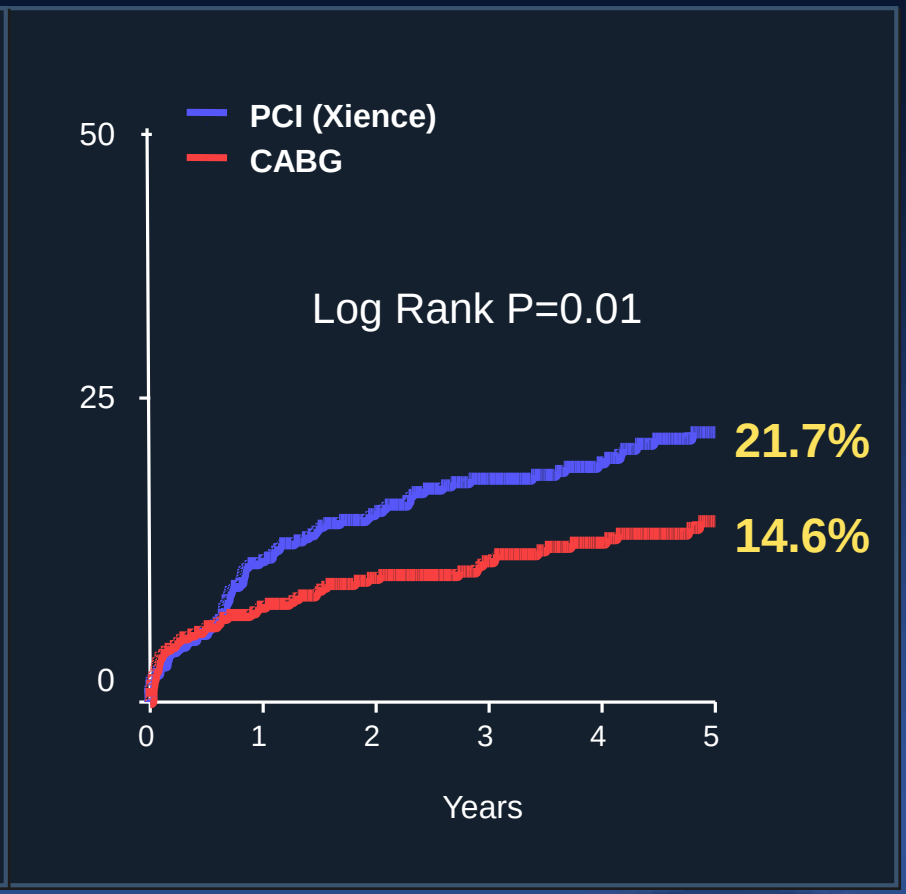
Same Primary Endpoint

Death, MI, Stroke or Any RR

SYNTAX (3VD Subset)

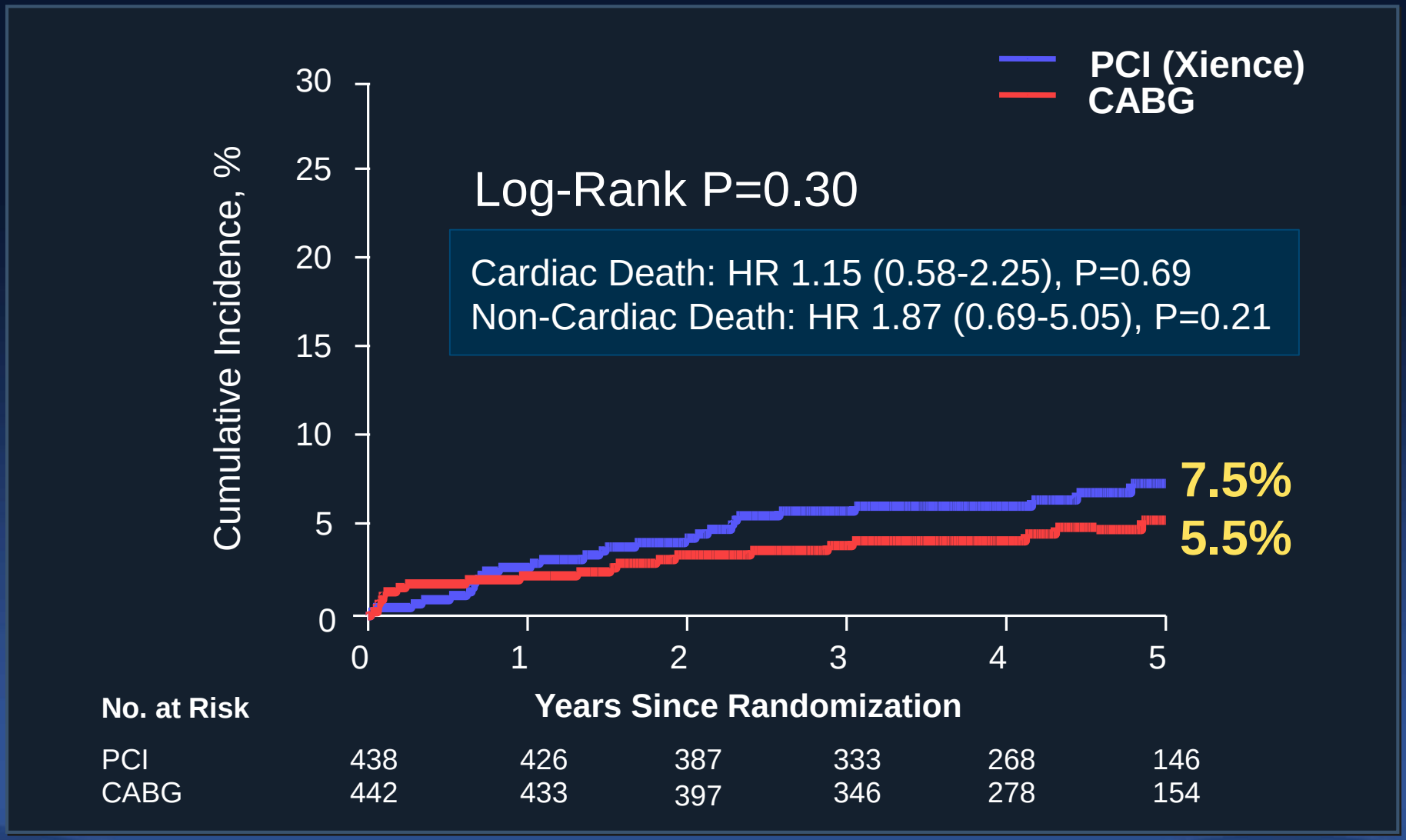


BEST



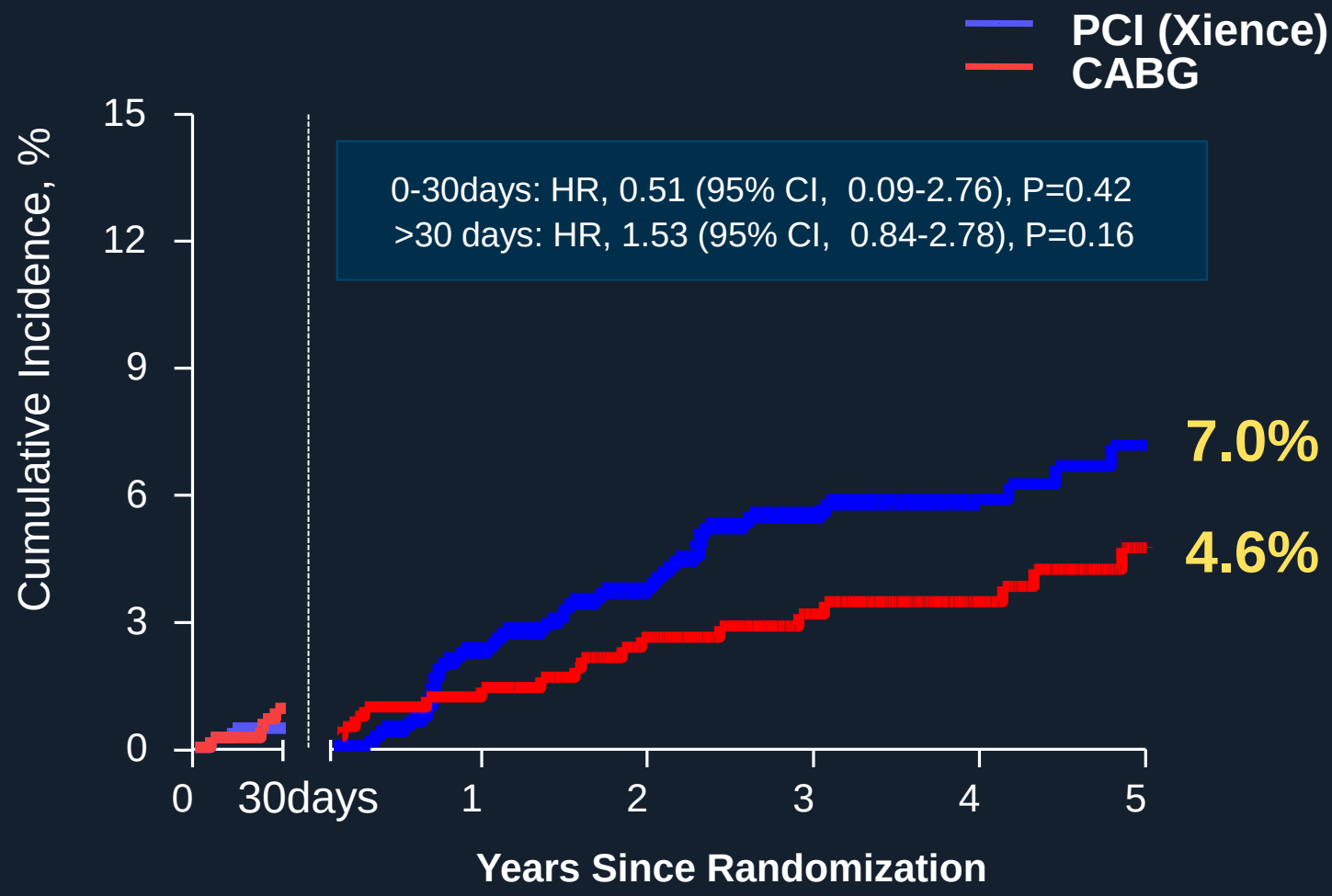
Park SJ et al, NEJM. 2015; 372: 1204-1212
Mohr FW et al. Lancet 2013 Feb 23; 381:629

Death



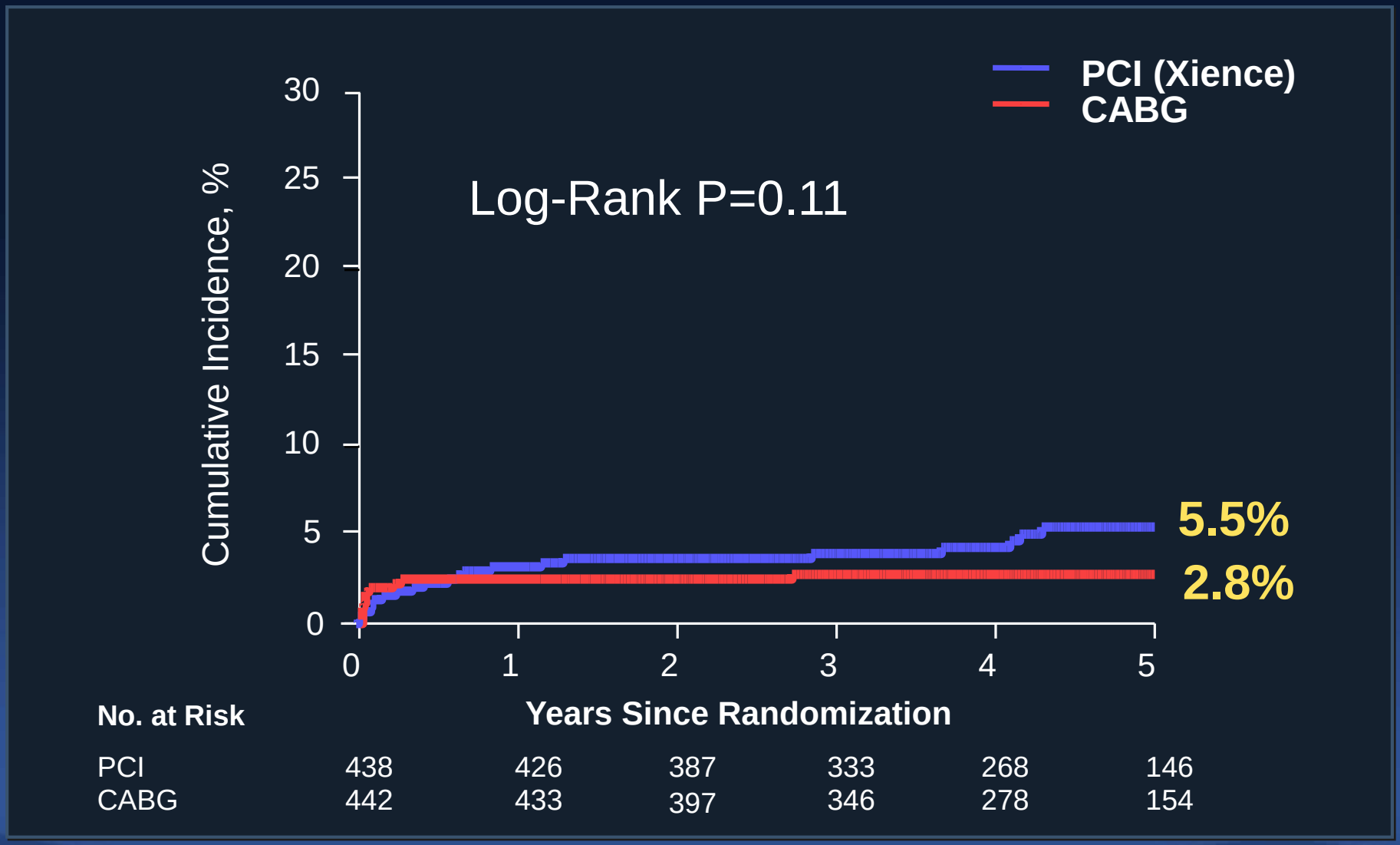
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of Death



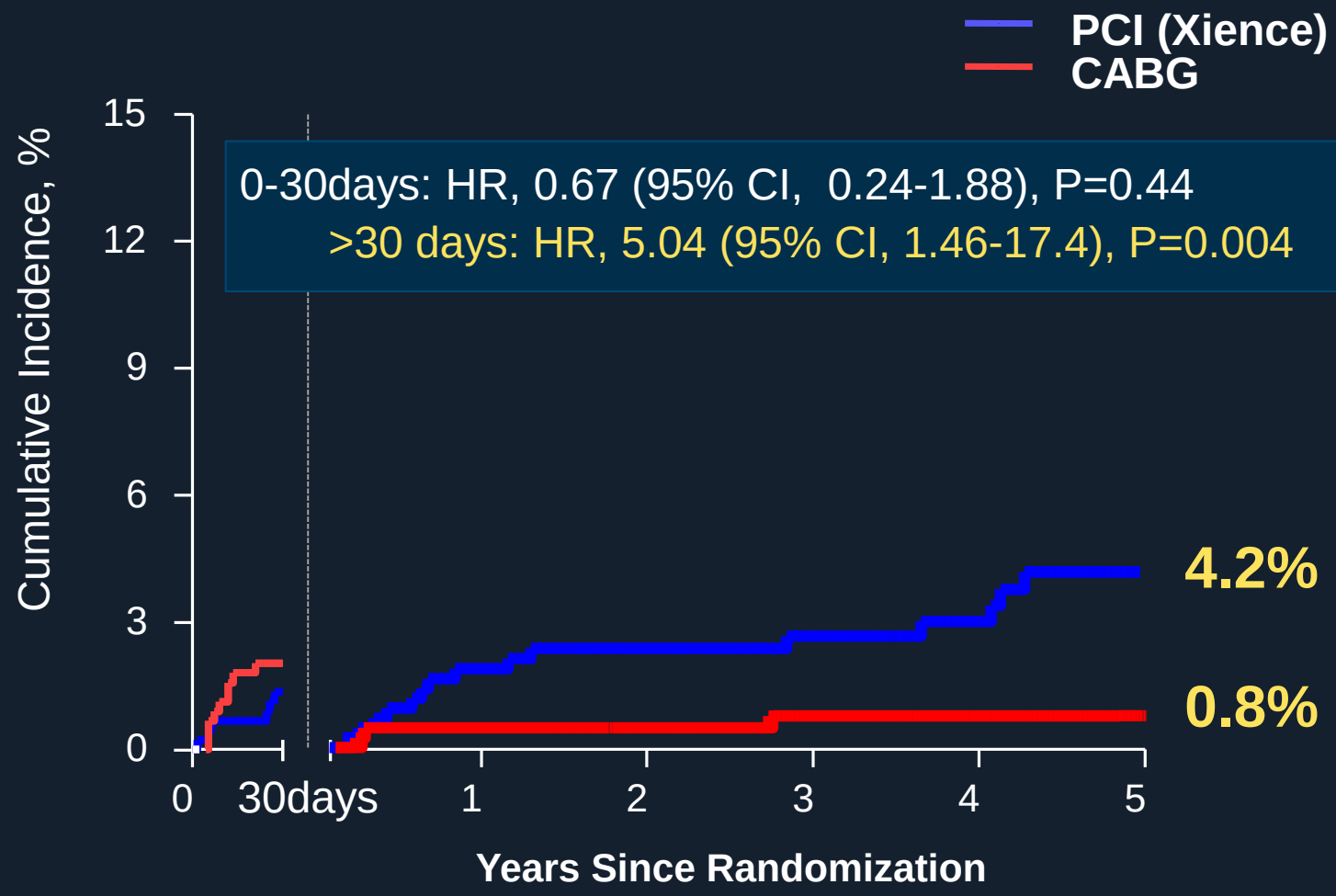
Event rates were derived from Kaplan-Meier estimates

Myocardial Infarction



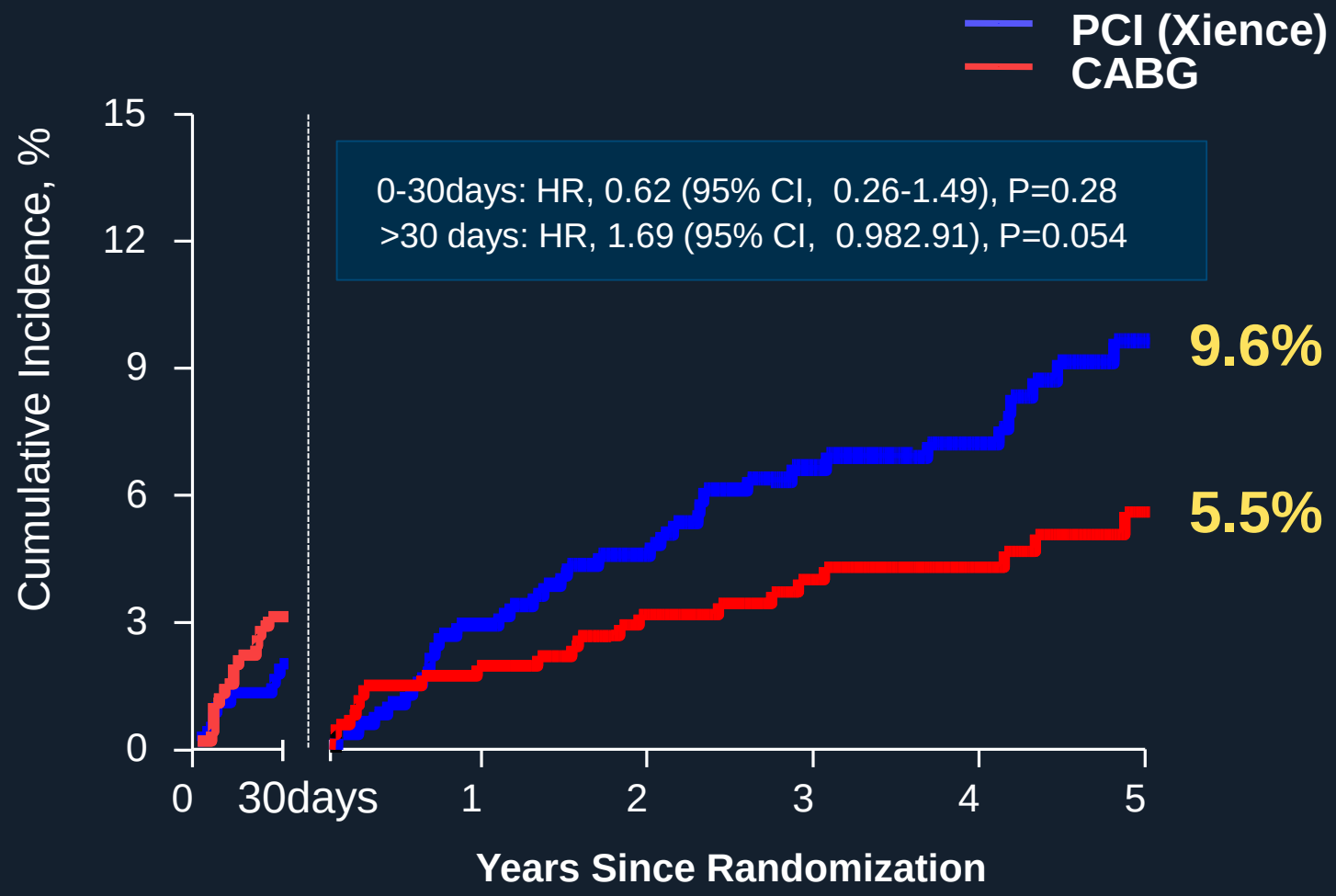
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of MI



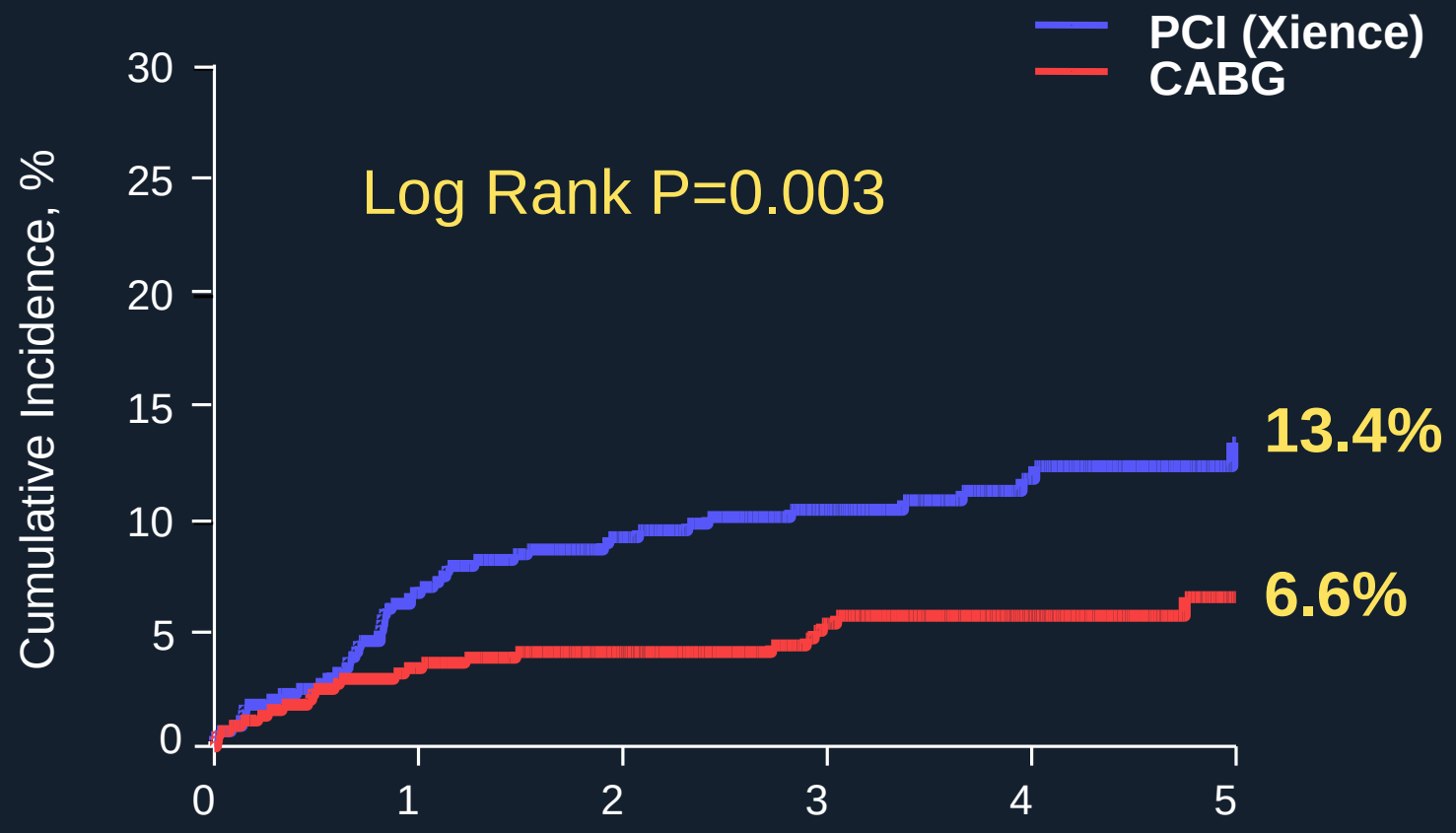
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of Death and MI



Event rates were derived from Kaplan-Meier estimates

Any Repeat Revascularization

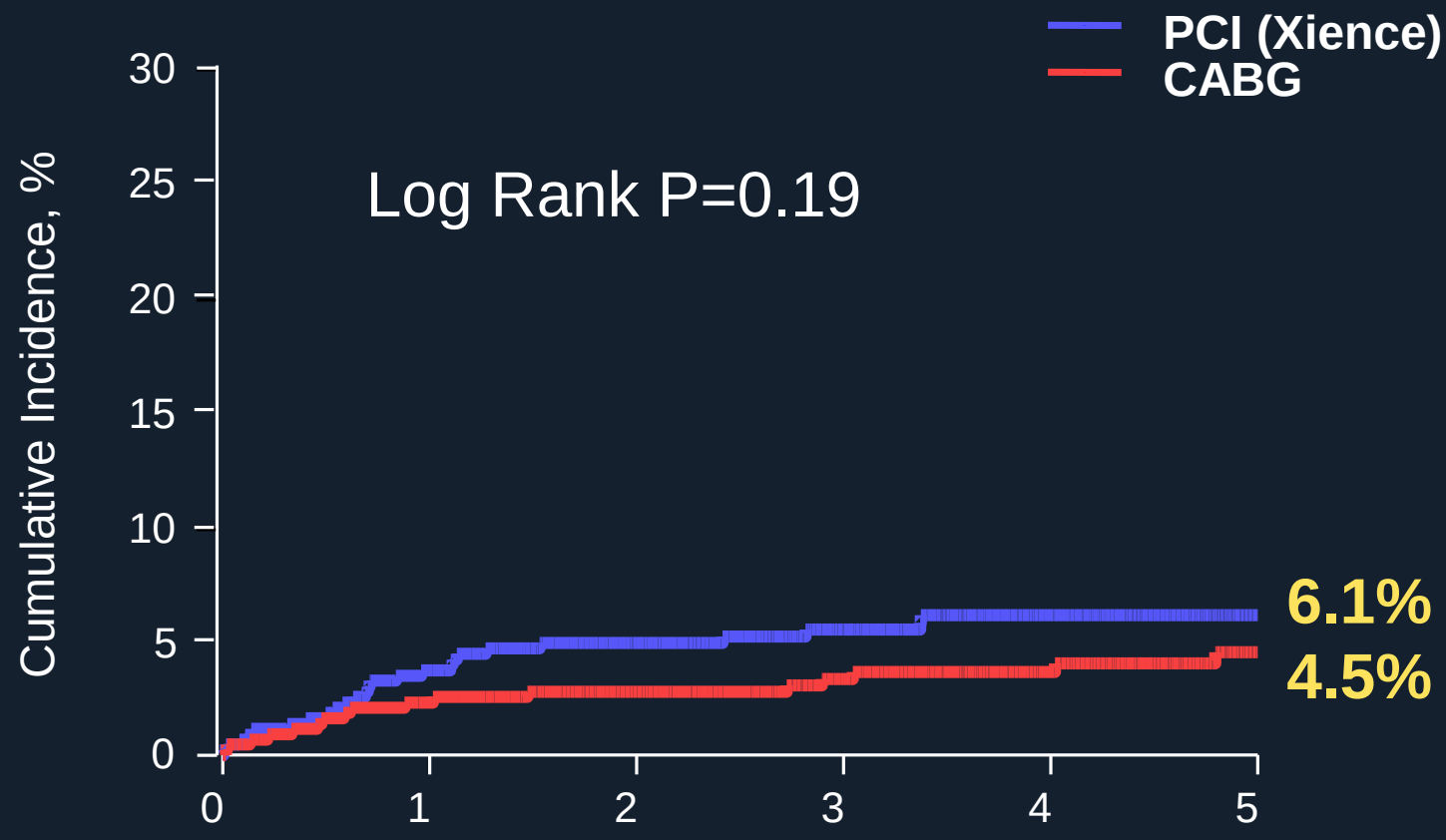


No. at Risk

PCI	438	393	335	257	164	80
CABG	442	414	365	286	189	87

Event rates were derived from Kaplan-Meier estimates

Target Lesion Revascularization

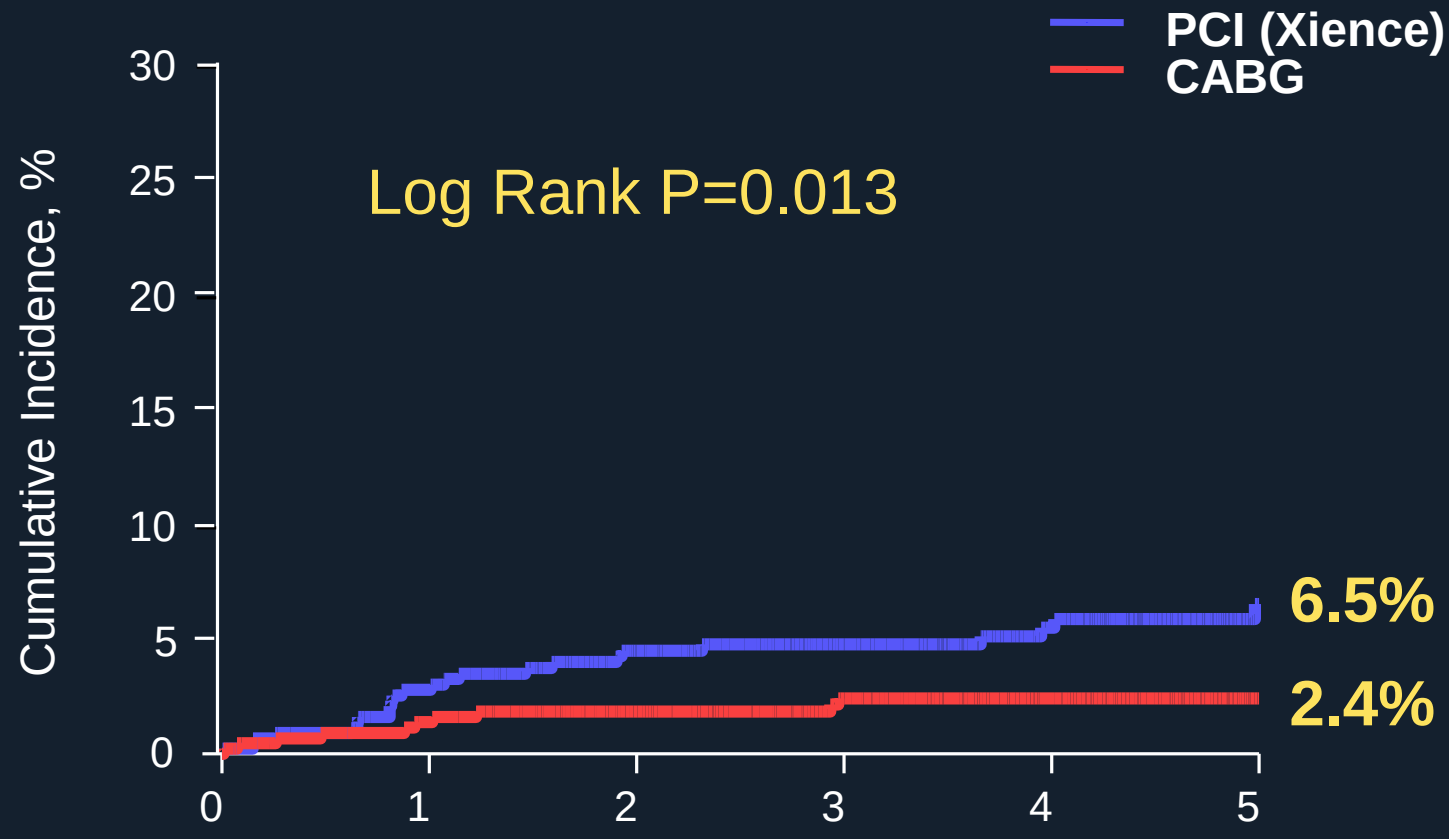


No. at Risk

PCI	438	408	365	310	247	130
CABG	442	424	386	334	267	147

Event rates were derived from Kaplan-Meier estimates

New Lesion Revascularization



No. at Risk

PCI	438	416	370	317	254	138
CABG	442	427	389	337	270	149

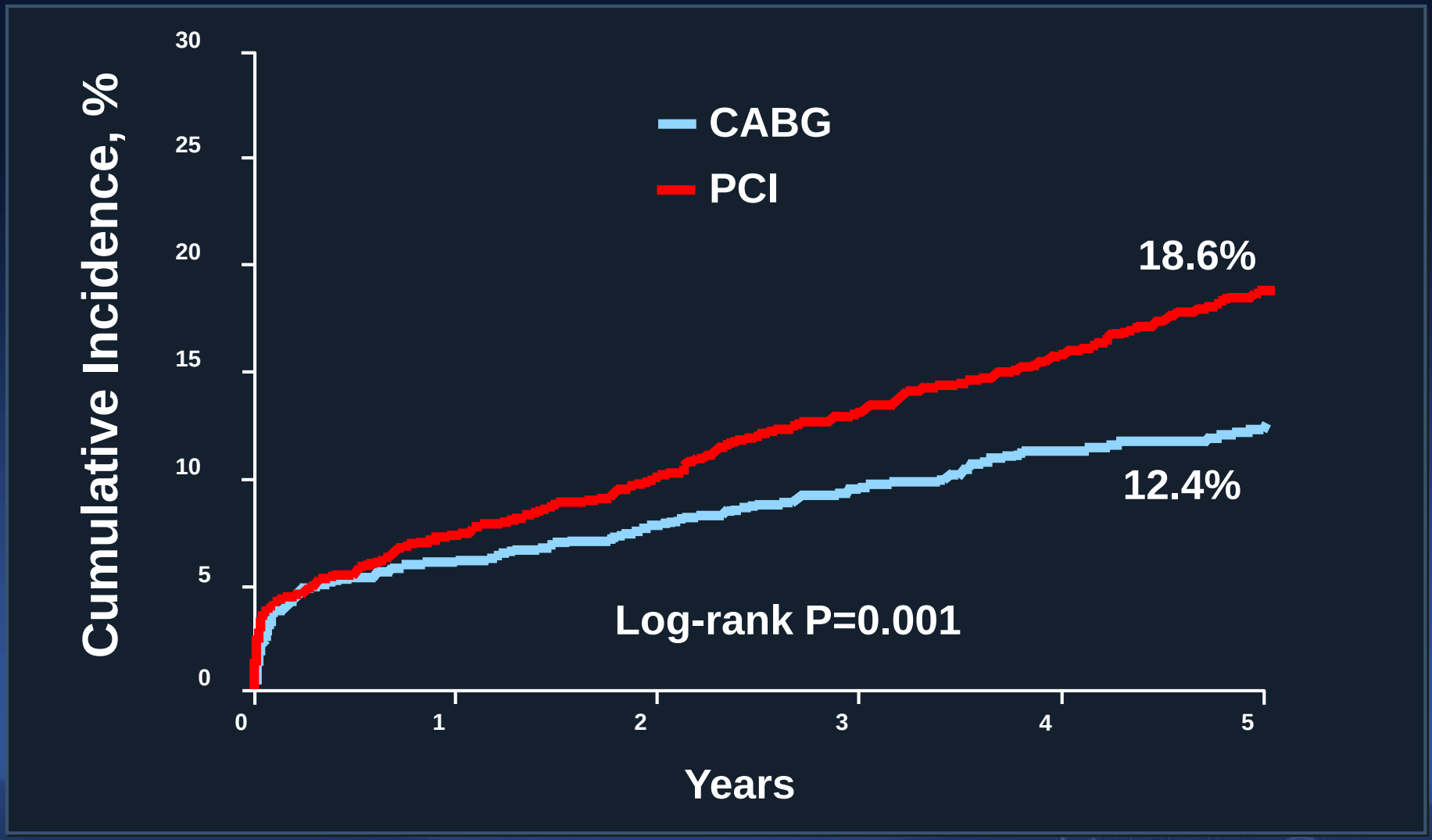
Event rates were derived from Kaplan-Meier estimates

Patient-Level Meta-Analysis (n=3,280)

Database Pooling of
SYNTAX (n=1800, PES),
BEST (n=880, EES), and
PRECOMBAT (n=600, SES) trials.

Patient-Level Meta-Analysis(n=3.280)

MVD Subset / **Death, MI or Stroke at 5 year**



PCI vs. CABG
In Multi-Vessel Disease

New York State Registry Data, Propensity Matched Pairs (n=9223)

	PCI with (XIENCE) (N=9,223)	CABG (n=9,223)	HR (95% CI)	P value
Death at 3 year	3.1 %	2.86%	1.04 (0.93-1.17)	0.50
Myocardial infarction	1.87%	1.13%	1.51 (1.29-1.77)	<0.001
Stoke	0.72%	0.97%	0.62 (0.50-0.76)	<0.001
Revascularization	7.25%	3.10%	2.35 (2.14-2.58)	<0.001

Bangalore S et al. N Engl J Med 2015; 372:1213-1222

What We've Learned *from Current Data*

CABG Is Still Better for MVD !

Even After New DES (Xience) Use, Mainly Due to Increased Spontaneous MI and New Lesion Revascularization in PCI group.

Park SJ et al, NEJM. 2015; 372: 1204-1212

Bangalore S et al. N Engl J Med 2015; 372:1213-1222

Why Surgery Is Still Better
Even using 2nd Generation of DES ?

Complete vs Incomplete
from New York Registry

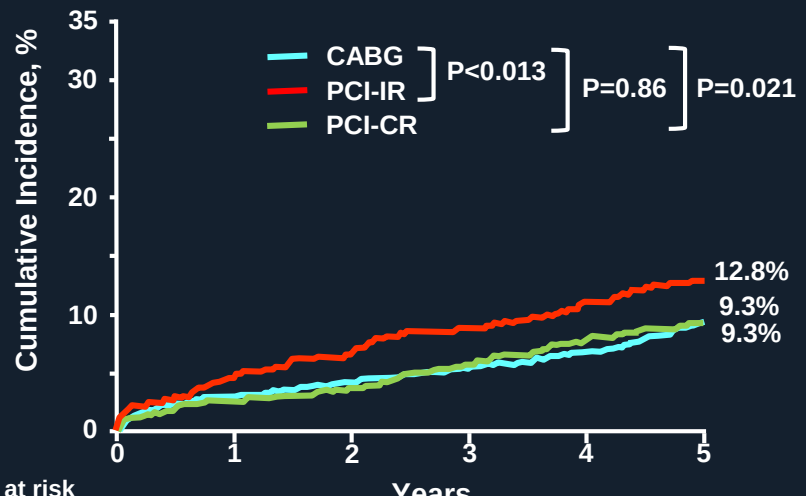
	PCI (Xience)		CABG	HR (95% CI)	P value
Incomplete Revascularization					
Death	3.25%		2.96%	1.03 (0.91-1.17)	0.63
MI	1.98%	>	1.07%	1.66 (1.39-1.98)	<0.001
Stoke	0.80%	<	1.01%	0.66 (0.52-0.83)	0.0004
Revascularization	7.70%	>	3.03%	2.59 (2.34-2.88)	<0.001
Complete Revascularization					
Death	2.54 %		2.50 %	1.08 (0.82-1.42)	0.58
MI	1.43%		1.37%	1.02 (0.71-1.47)	0.93
Stoke	0.42%	<	0.84%	0.43 (0.24-0.75)	0.003
Revascularization	5.46%	>	3.40%	1.55 (1.26-1.90)	<0.001

Complete vs Incomplete
from BEST Study

	PCI (Xience)	CABG	HR (95% CI)	P value
Incomplete Revascularization				
Death	6.5%	5.7%	1.22 (0.49-3.02)	0.68
MI	**7.4%** >	1.6%	4.85 (1.11-21.1)	0.036
Death, MI, or Stroke	12.6%	9.0%	1.52 (0.75-3.07)	0.24
Any Repeat Revascularization	15.8%	10.7%	1.58 (0.83-3.00)	0.16
MACC	23.7%	16.4%	1.59 (0.94-2.66)	0.08
Complete Revascularization				
Death	7.0%	4.4%	1.50 (0.71-3.15)	0.29
MI	2.3%	3.1%	0.75 (0.25-2.24)	0.60
Death, MI, or Stroke	11.6%	9.5%	1.18 (0.69-2.02)	0.55
Any repeat revascularization	6.5%	3.4%	1.89 (0.84-4.25)	0.13
MACCE	16.7%	12.2%	1.34 (0.84-2.13)	0.22

Complete vs Incomplete
Patient-Level Meta-Analysis

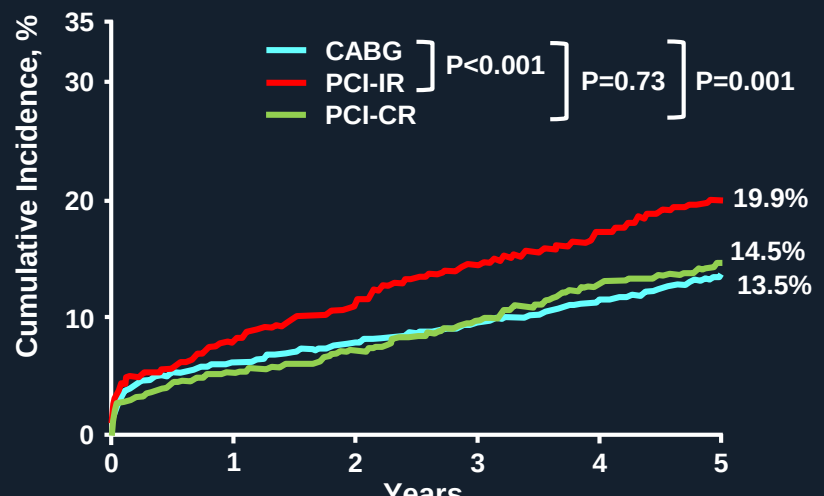
Death From Any Cause



Patient at risk

CABG	1538	1462	1403	1326	1224	549
PCI-IR	724	689	651	601	545	282
PCI-CR	968	941	918	875	819	389

Death, MI, or Stroke



Patient at risk

CABG	1538	1413	1349	1267	1160	565
PCI-IR	724	665	619	564	509	260
PCI-CR	968	916	886	839	776	373

Meta-Analysis from SYNTAX, BEST and PRECOMBAT, 2016

What We've Learned *from These Data*

Complete Revascularization
Is Important Practical Issue !

Park SJ et al, NEJM. 2015; 372: 1204-1212
Bangalore S et al. N Engl J Med 2015; 372:1213-1222

ESC Guidelines 2018
Elective PCI for 3 Vessel Disease

	CABG		PCI	
3-VD without Diabetes Mellitus	**Class**	**Level**	**Class**	**Level**
3 VD with low SYNTAX score (0-22)	I	A	I	A
3 VD with intermediate of high SYNTAX score (>22)	I	A	III	A
3-VD with Diabetes Mellitus				
3 VD with low SYNTAX score (0-22)	I	A	IIb	A
3 VD with intermediate of high SYNTAX score (>22)	I	A	III	A

SYNTAX Score Showed
"Poor Discrimination Power"

Original Investigation | August 2014

Prognostic Value of *Site* SYNTAX Score and Rationale for Combining Anatomic and Clinical Factors in Decision Making

Insights From the SYNTAX Trial

Yao-Jun Zhang, PhD*; Javaid Iqbal, MRCP, PhD*; Carlos M. Campos, MD*; David V. Klaveren, MSc‡; Christos V. Bourantas, MD*; Keith D. Dawkins, MD§; Adrian P. Banning, MD‖; Javier Escaned, MD, PhD¶; Ton de Vries, MSc#; Marie-Angèle Morel, BSc#; Vasim Farooq, MD*; Yoshinobu Onuma, MD*; Hector M. Garcia-Garcia, MD, PhD*; Gregg W. Stone, MD**; Ewout W. Steyerberg, PhD‡; Friedrich W. Mohr, MD††; Patrick W. Serruys, MD, PhD*

Conclusion ; SyntaxScore (SS) and tertiles based on SS *showed poor discrimination* among low, intermediate, and high-risk group. However, combining clinical factors with SS retained the predictive performance of SS II.

Zhang YJ, Patrick SW et al. JACC 2014;64(5):423-432

Practical Guidelines for Multi-Vessel PCI, *2018*

1. ***If*** *the Lesion is Functionally Significant and Favorable Anatomy for PCI, Complete Revascularization Should be Considered.*

2. ***If*** *the Lesion is Unfavorable Anatomy for PCI, Send the Patients to Surgery !*

What Is the Definition of Favorable Anatomy for PCI ?

2.5, 5, 50

Can Make A Good Clinical Outcomes.

TLR rate would be <2%, Almost Perfect in Real World !

Hong MK, Eur Heart J, 2006:27:1305
Song HG et al, Catheterization and Cardiovascular Interventions. 2014 :1;83(6):873-8

PCI vs. CABG
In Multi-Vessel Disease, *2018*

We need absolutely new data for the future role of PCI and CABG in functionally significant multi-vessel disease under the integrated concept of FFR and IVUS.

Thank You !!

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