Impact of Complete Revascularization for Multi-Vessel Disease

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DES vs. CABG
for Multi-Vessel Disease

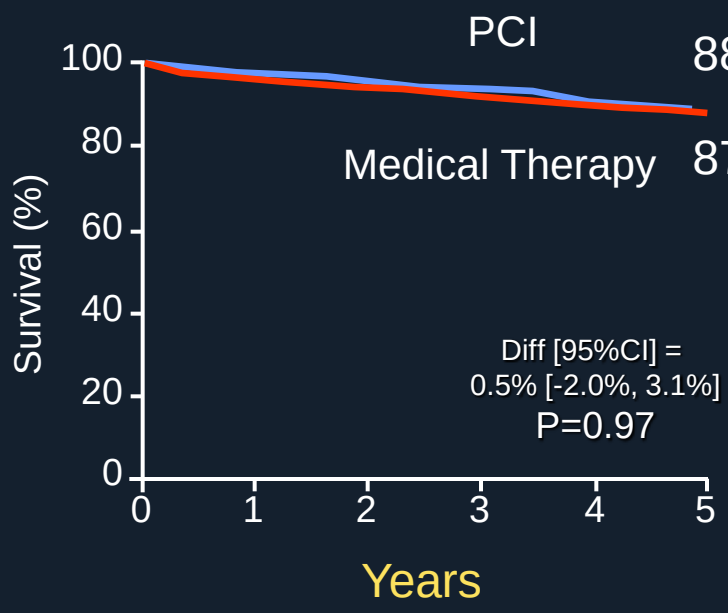
1. BARI 2D
2. FREEDOM
3. SYNTAX
4. BEST
5. Combined Patient Level Meta-Analysis

BARI 2D

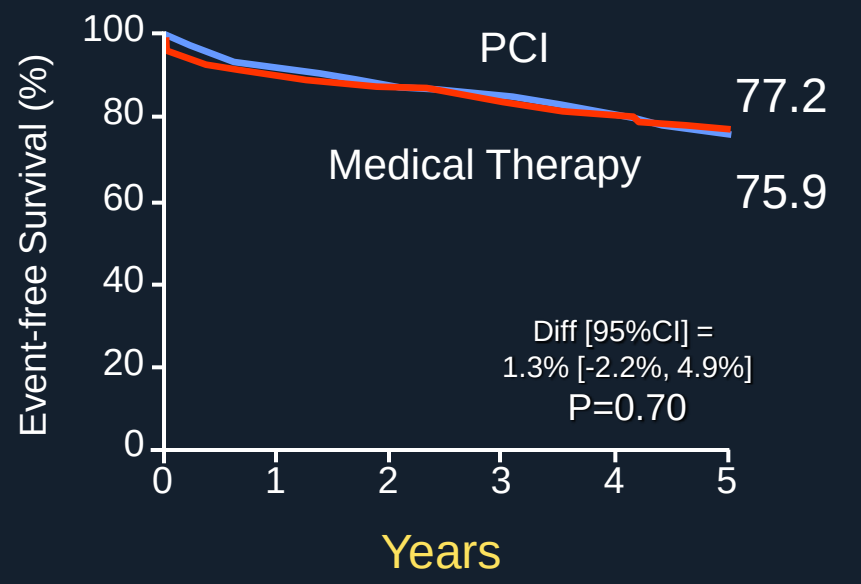
Bypass Angioplasty Revascularization Investigation 2 Diabetes ;
Focused on the Diabetes

BARI 2D: PCI vs. Medical Treatment
(Lower Risk Diabetic Patients)

Survival

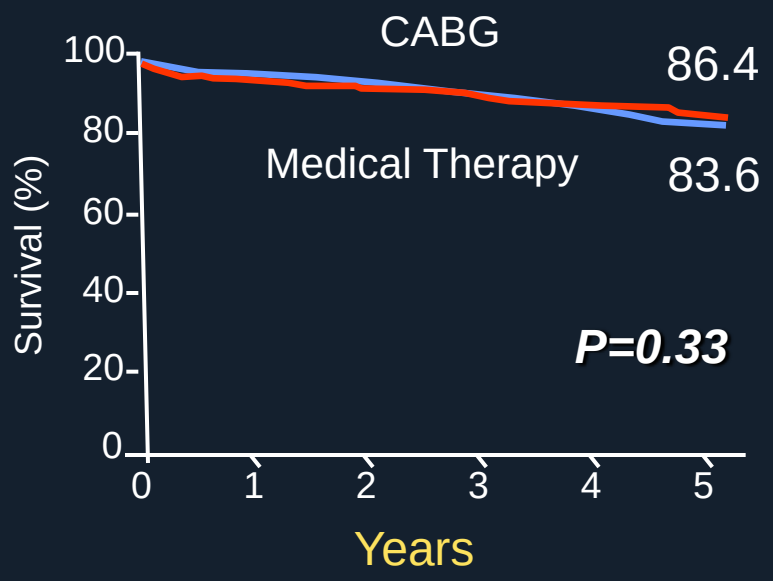


Freedom from MACE (death, MI, or stroke)

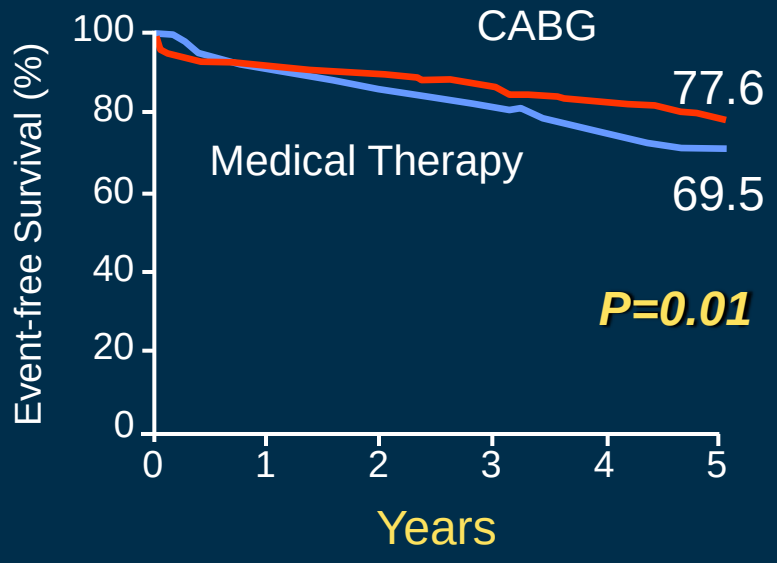


BARI 2D: CABG vs. Medical Treatment
(Higher Risk Diabetic Patients)

Survival



Freedom from MACE (death, MI, or stroke)



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

FREEDOM

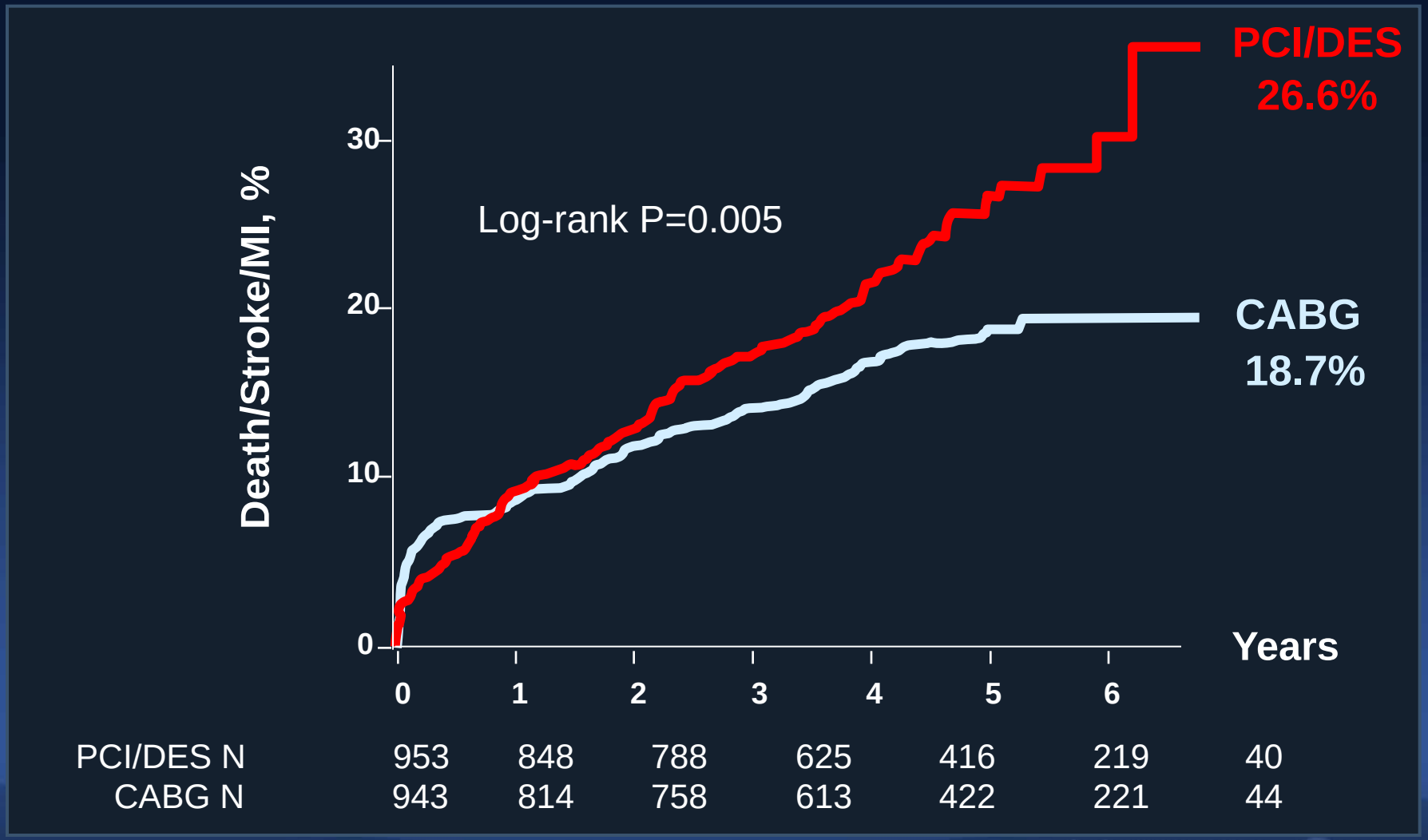
Future ***RE***vascularization ***E***valuation in Patients with ***D***iabetes Mellitus: ***O***ptimal ***M***anagement of Multivessel Disease

BASELINE CHARACTERISTICS

	PCI	CABG	*P* value
No. of Patients	953	947	
Age, yrs	63.2 ± 8.9	63.1 ± 9.2	0.78
Male, %	73	70	0.08
Body Mass Index (Kg/m2)	29.7 ± 5.4	29.8 ± 5.3	0.08
Hypertension, %	85%	85%	0.75
Hyperlipidemia, %	84%	83%	0.66
Current smoker, %	15%	17%	0.31
Congestive heart failure, %	26%	28%	0.25
Prior Stoke	4%	3%	0.31
LV EF <40%	3%	2%	0.07
EuroScore	2.7 ± 2.4	2.8 ± 2.5	0.52
Syntax Score	26.2 ± 8.4	26.1 ± 8.8	0.77
Three vessel disease	82.3	84.5	0.22
No.of lesion	5.7 ± 2.2	5.7 ± 2.2	0.33
No.of stented lesion or graft vessel	3.5 ± 1.4	2.9 ± 0.8	NA
CTO lesion	6%	6%	0.99
Bifurcation lesion	22%	21%	0.06

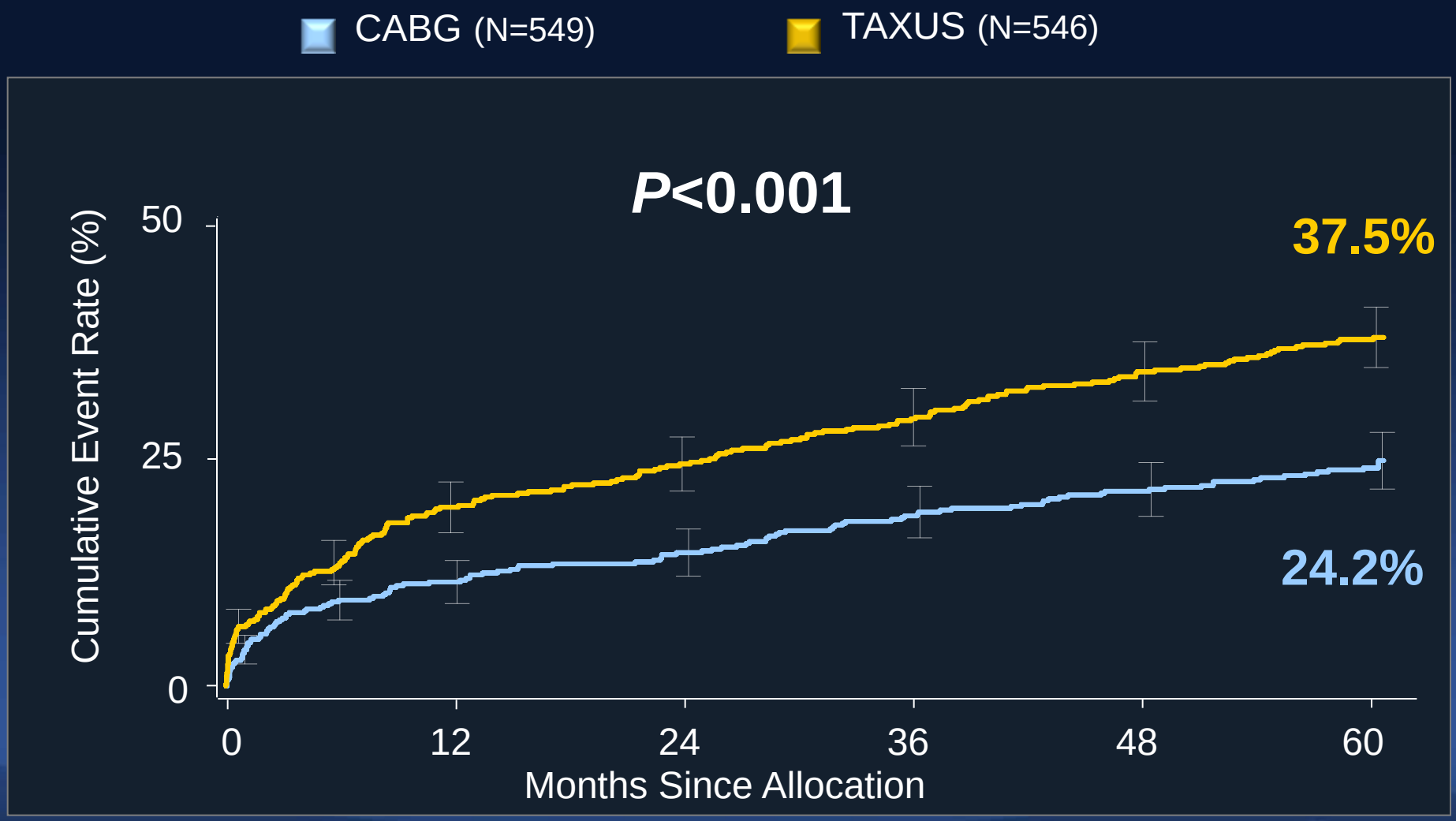
FREEDOM *(Diabetics and MVD)*

Death / MI / Stroke at 5 Year



Farkouh et al, *NEJM* 2012 November 4

SYNTAX *(3VD Subset)*
MACCE to 5 Year



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

ITT population

DES vs. CABG
for Multi-Vessel Disease 2017

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

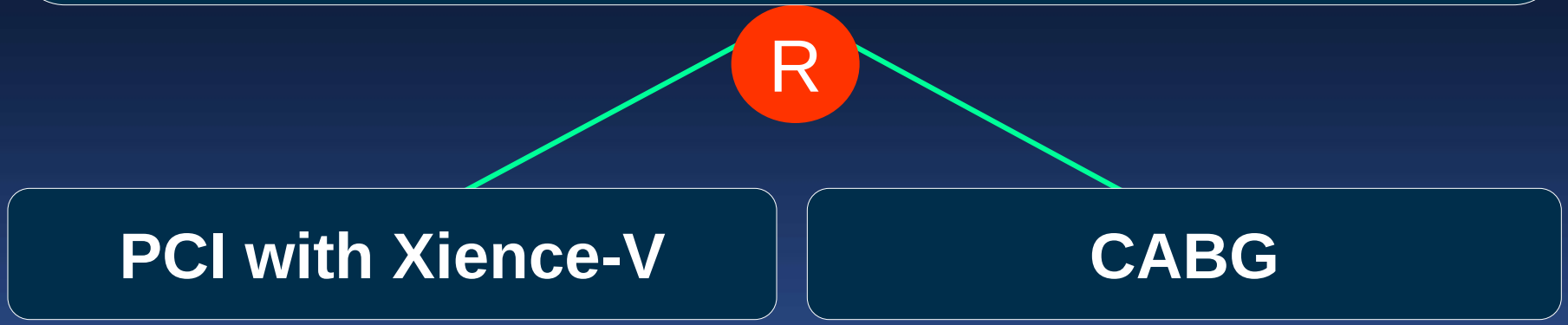
However,
All Studies Used 1st Generation DES

BARI 2D	DES 35%, BMS 56%, Others
FREEDOM	SES 49%, PES 41%, Others
SYNTAX	PES 100%,

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

BEST Study

Patients with
Multi-vessel Disease (Mainly 3VD)



Primary Endpoint at 2 years:
Death + MI + Repeat R

PI : Park Seung-Jung

Baseline Clinical Characteristics

	PCI (N=438)	CABG (N=442)	P value
Age, years	64.0 ± 9.3	64.9 ± 9.4	0.13
Male sex	304 (69.4)	325 (73.5)	0.18
Body mass index	24.7 ± 2.9	25.0 ± 2.9	0.16
Diabetes	177 (40.4)	186 (42.1)	0.62
Hypertension	296 (67.6)	295 (66.7)	0.79
Hyperlipidemia	239 (54.6)	222 (50.2)	0.20
Current smoker	88 (20.1)	89 (20.1)	0.99
Previous PCI	30 (6.8)	38 (8.6)	0.33
Previous myocardial infarction	25 (5.7)	29 (6.6)	0.60
Previous congestive heart failure	16 (3.7)	12 (2.7)	0.43

Procedural Characteristics*

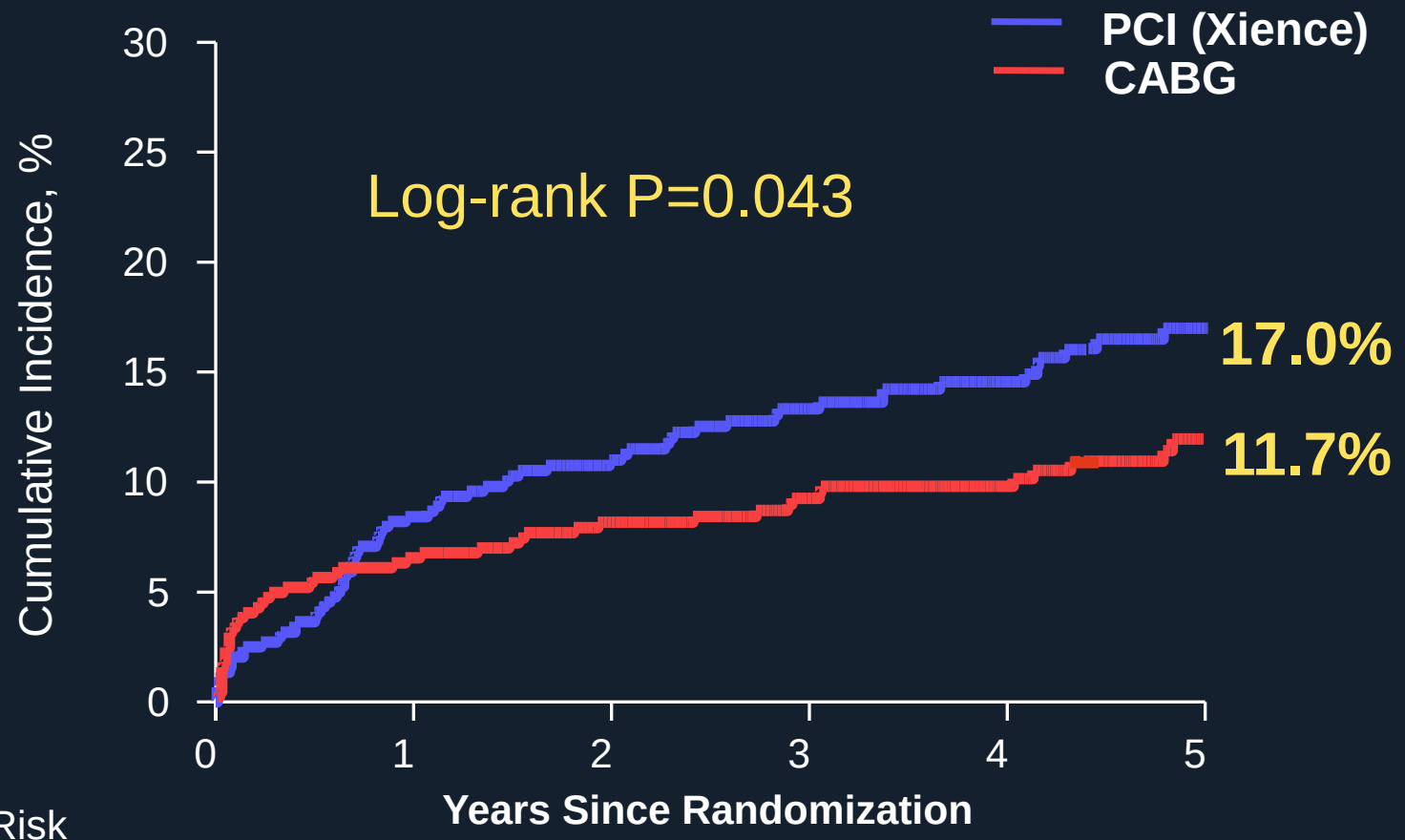
PCI	464
Total stents number	3.4 ± 1.4
Total stent length, mm	85.3 ± 38.2
Mean stent diameter, mm	3.1 ± 0.3
IVUS guidance	333 (71.8)
Complete revascularization	236 (50.9)†
CABG	401
Total no. of grafted vessels	3.1 ± 0.9
Total no. of arterial grafts	2.1 ± 1.1
Total no. of vein grafts	1.0 ± 0.8
Left internal mammary artery graft	398 (99.3)
Off-pump surgery	258 (64.3)
Complete revascularization	274/383 (71.5)†

* Data were summarized according to the as-treated analysis

† P<0.05 between PCI and CABG group

BEST ;
5 Years Outcomes

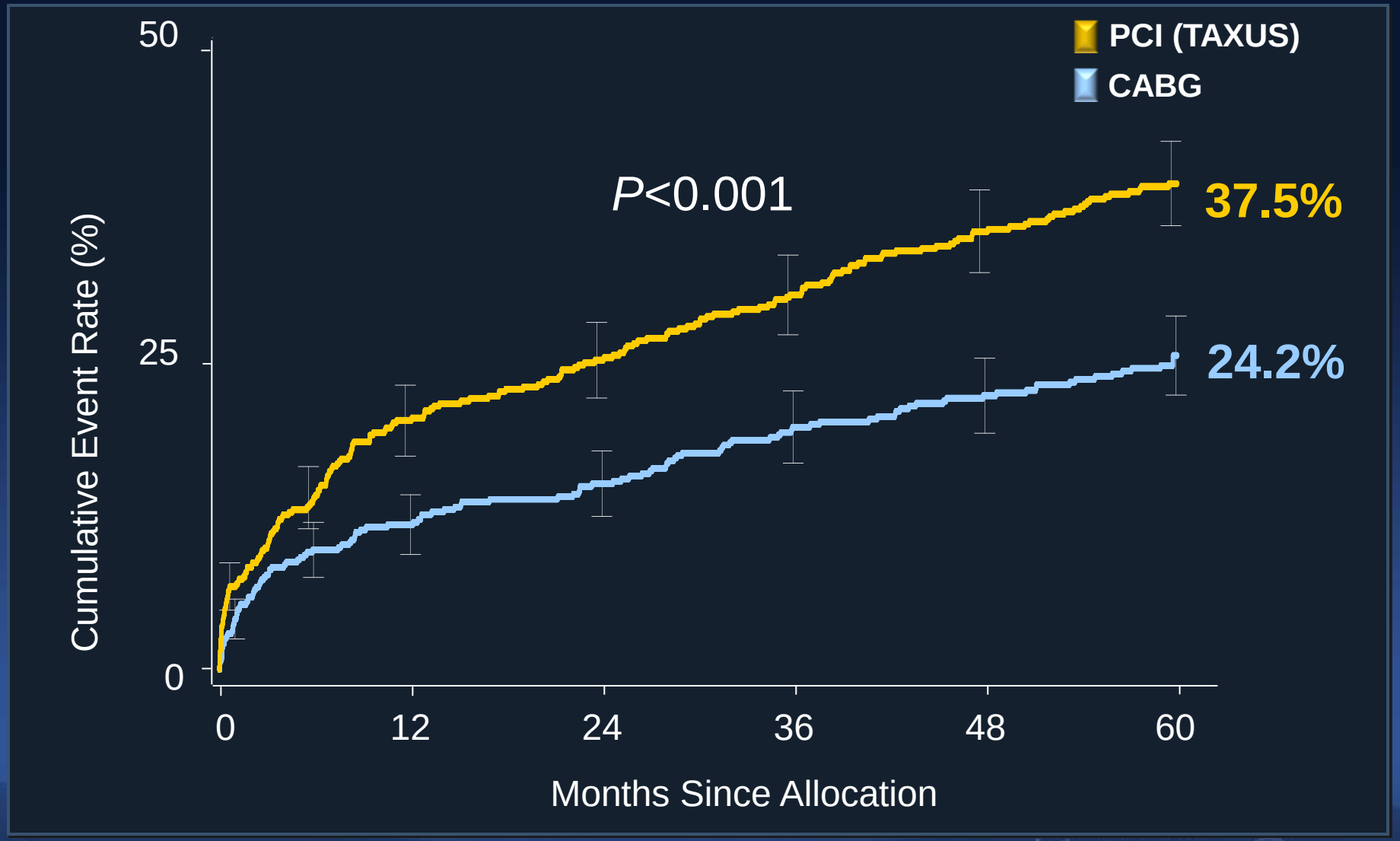
Primary End Point
Death, MI or TVR



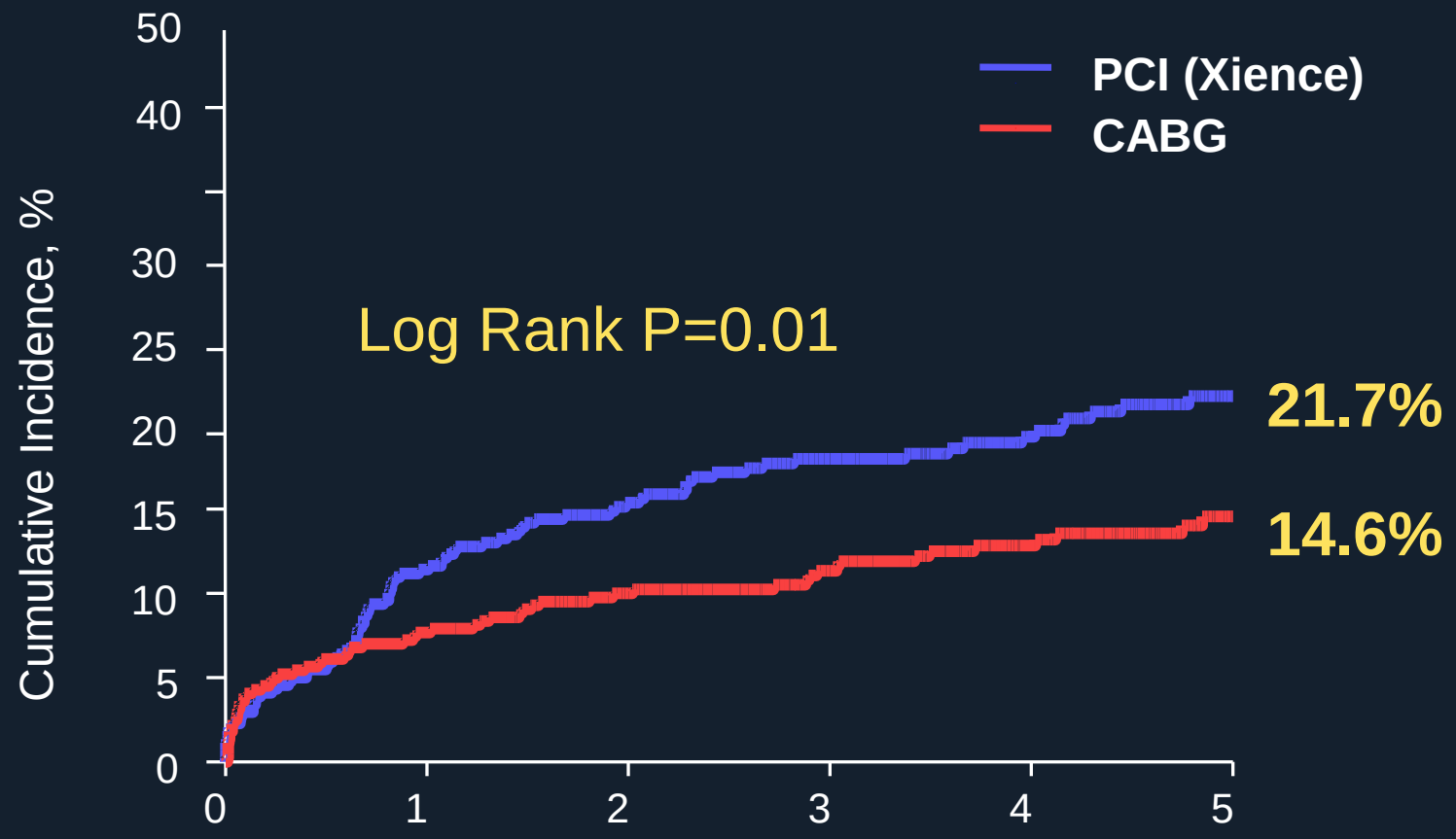
No. at Risk						
PCI	438	402	362	305	242	126
CABG	442	415	377	326	262	145

Primary End Point of SYNTAX, (Death, MI, Stoke or Any Repeat Revascularization)

Death, MI, Stroke or Any RR
SYNTAX (3VD Subset)



Death, MI, Stroke or Any RR
BEST



No. at Risk

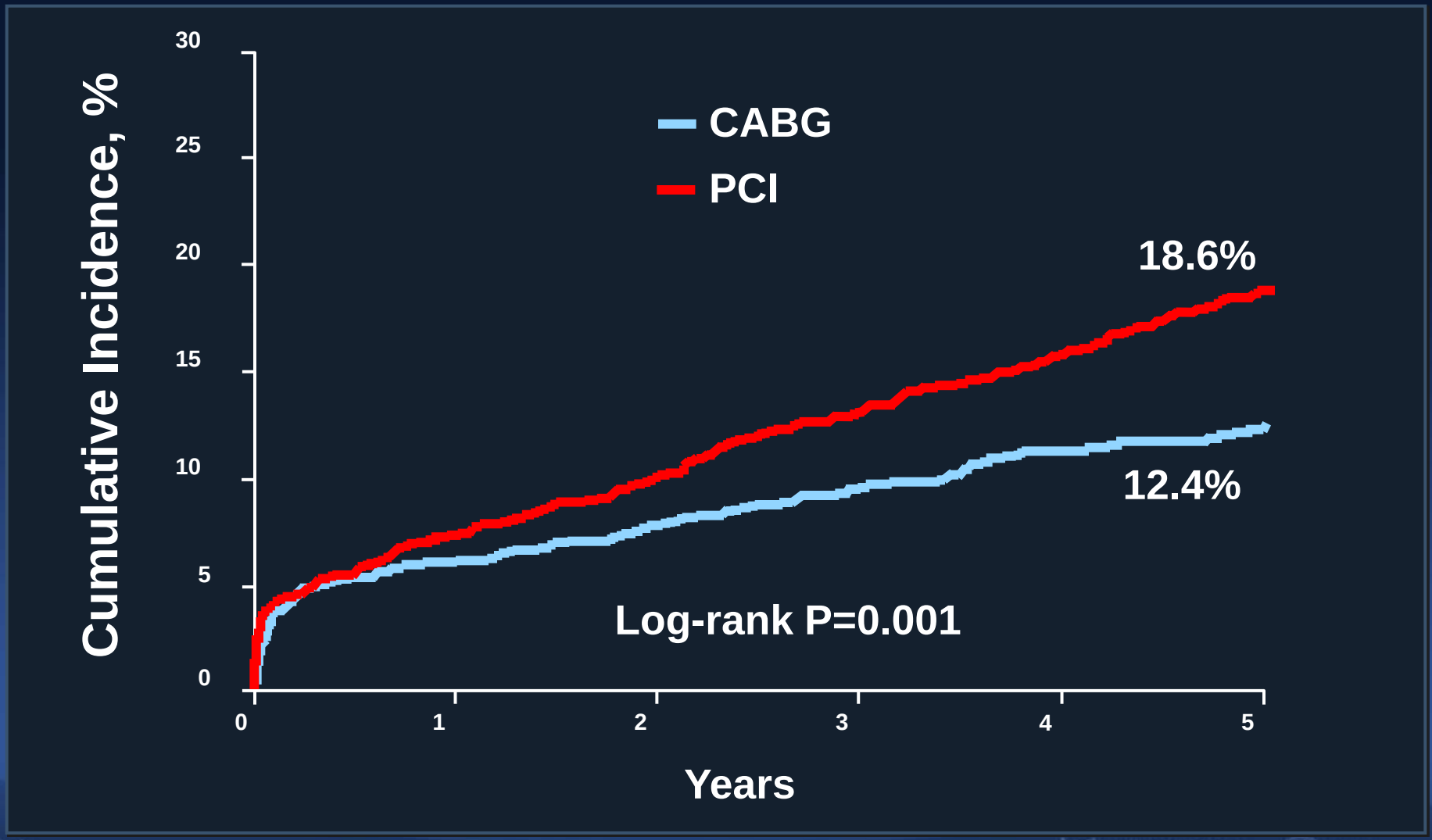
PCI	438	389	341	288	229	117
CABG	442	409	368	317	250	137

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.

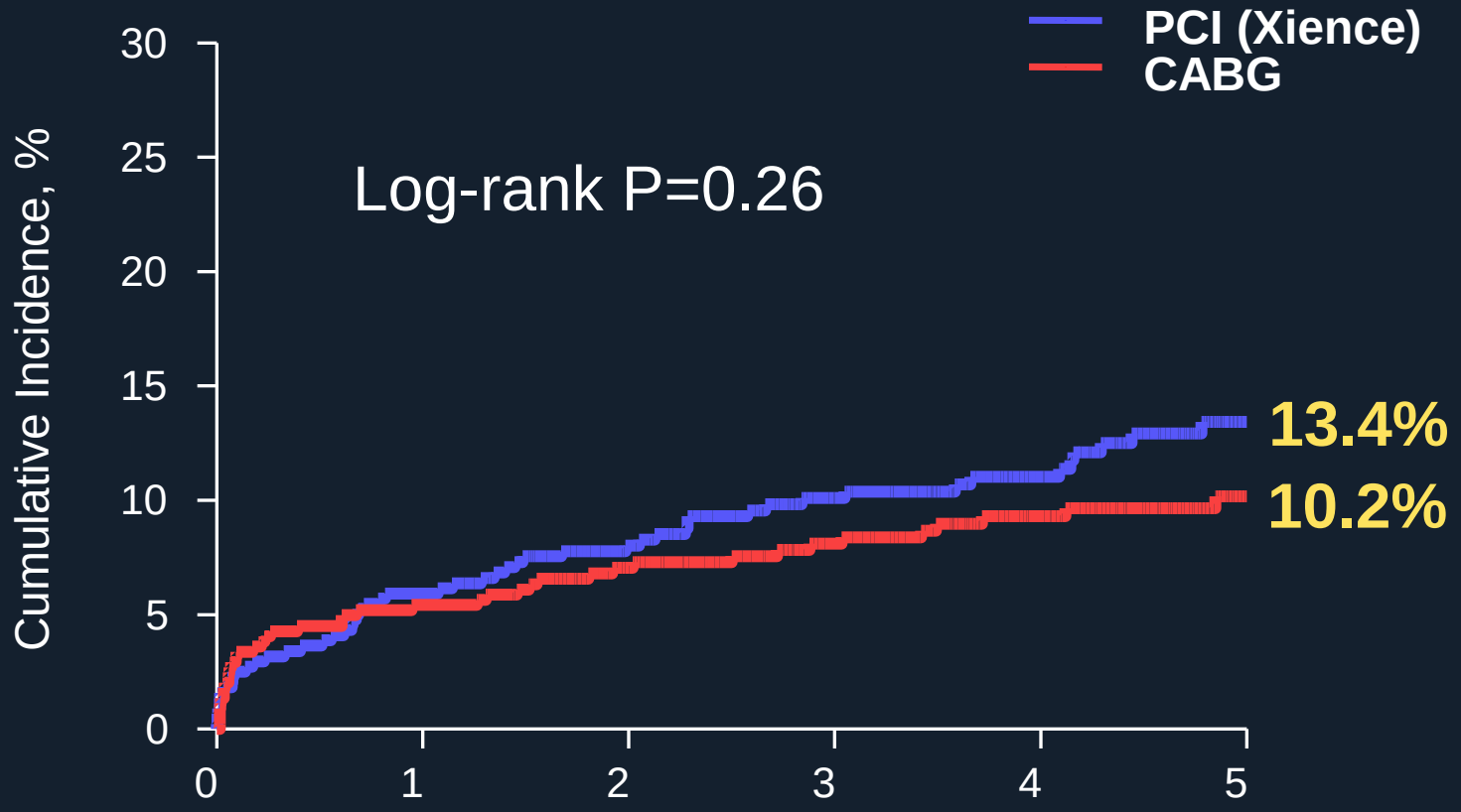
Patient-Level Meta-Analysis(n=3.280)
MVD Subset / **Death, MI or Stroke**



Meta-Analysis from SYNTAX, BEST and PRECOMBAT, 2016

BEST;
Secondary Clinical Outcomes

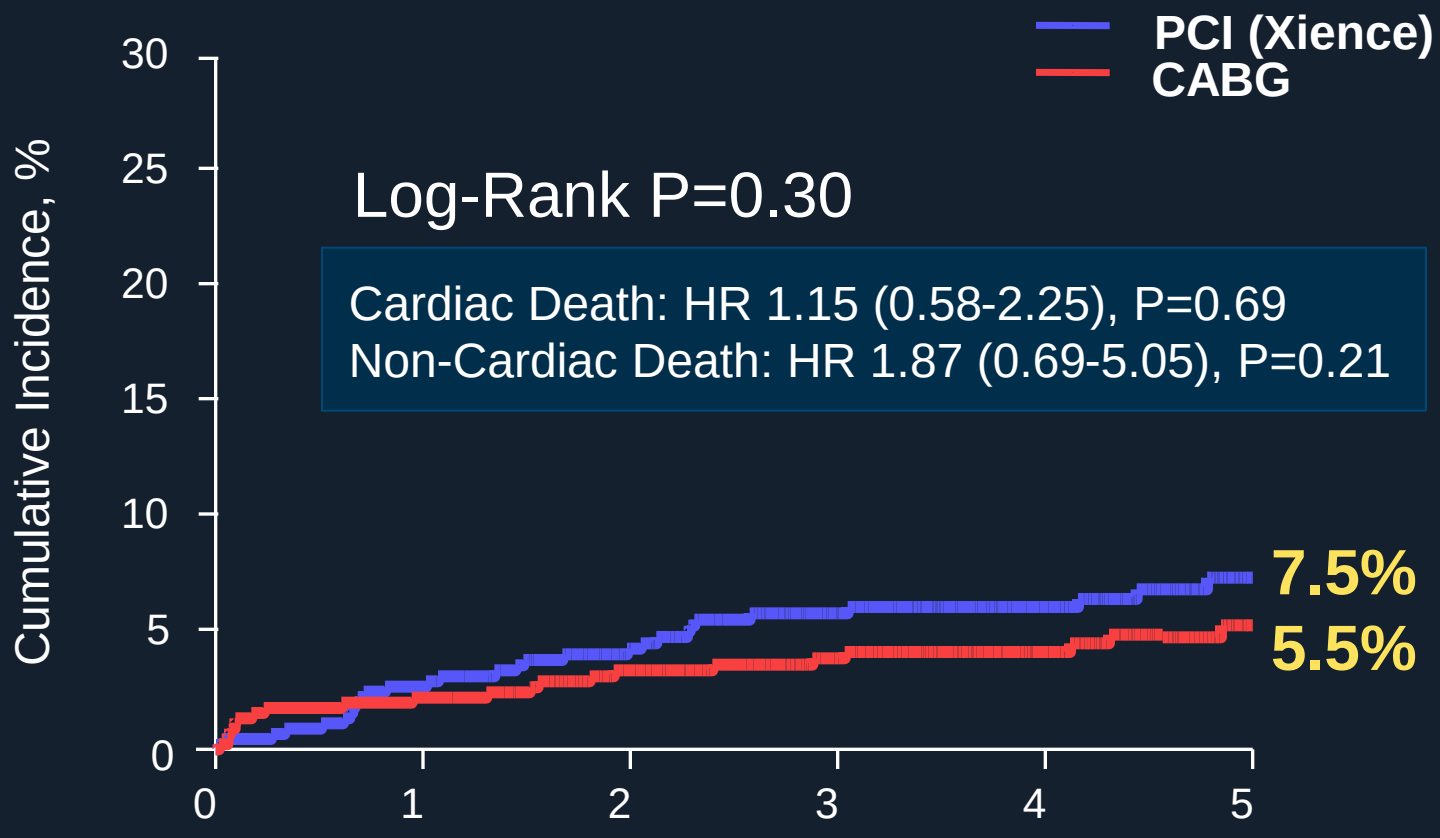
Death, MI or Stroke



No. at Risk						
PCI	438	413	373	318	255	133
CABG	442	419	381	329	263	144

Event rates were derived from Kaplan-Meier estimates

Death

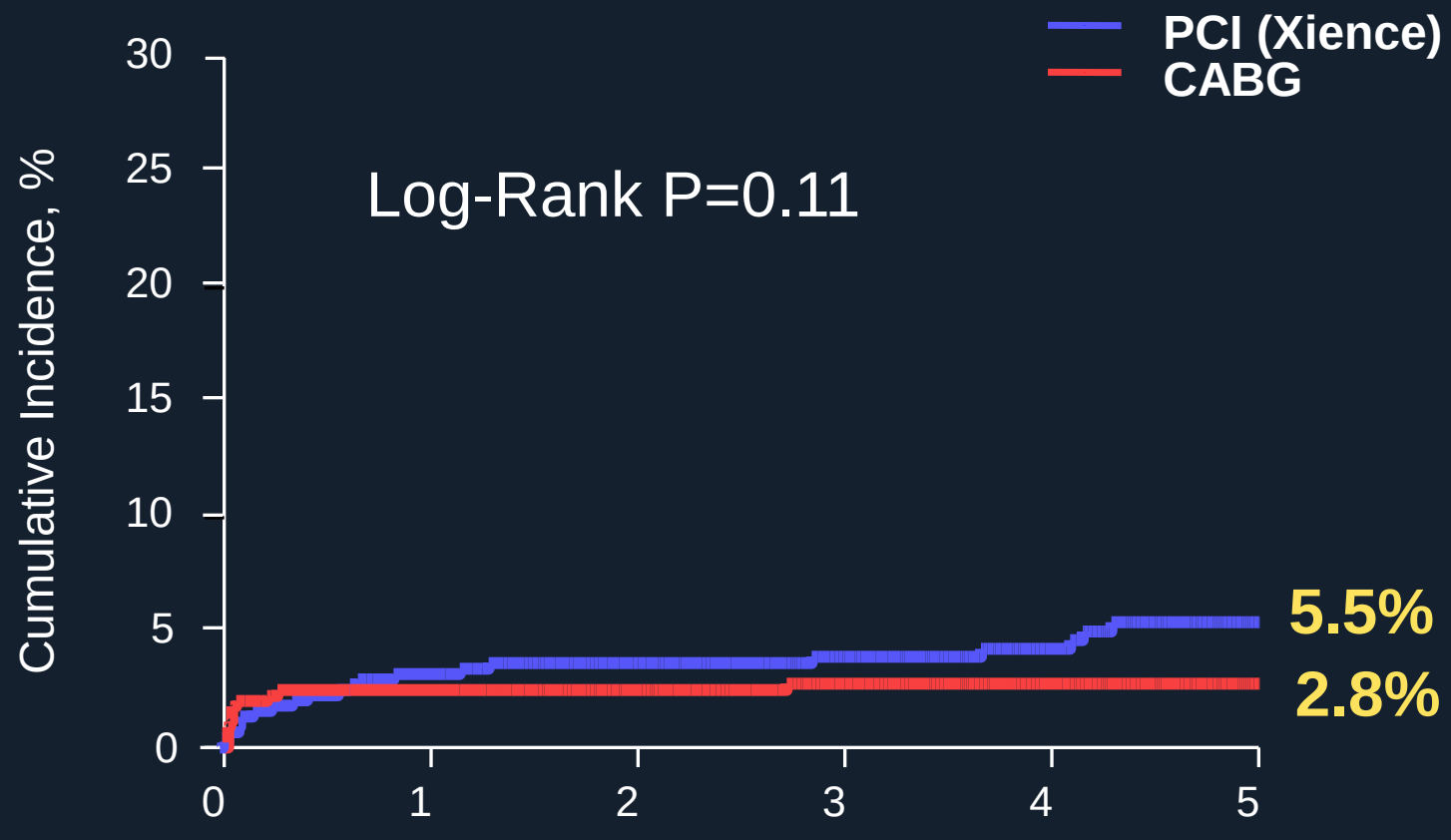


No. at Risk

PCI	438	426	387	333	268	146
CABG	442	433	397	346	278	154

Event rates were derived from Kaplan-Meier estimates

Myocardial Infarction

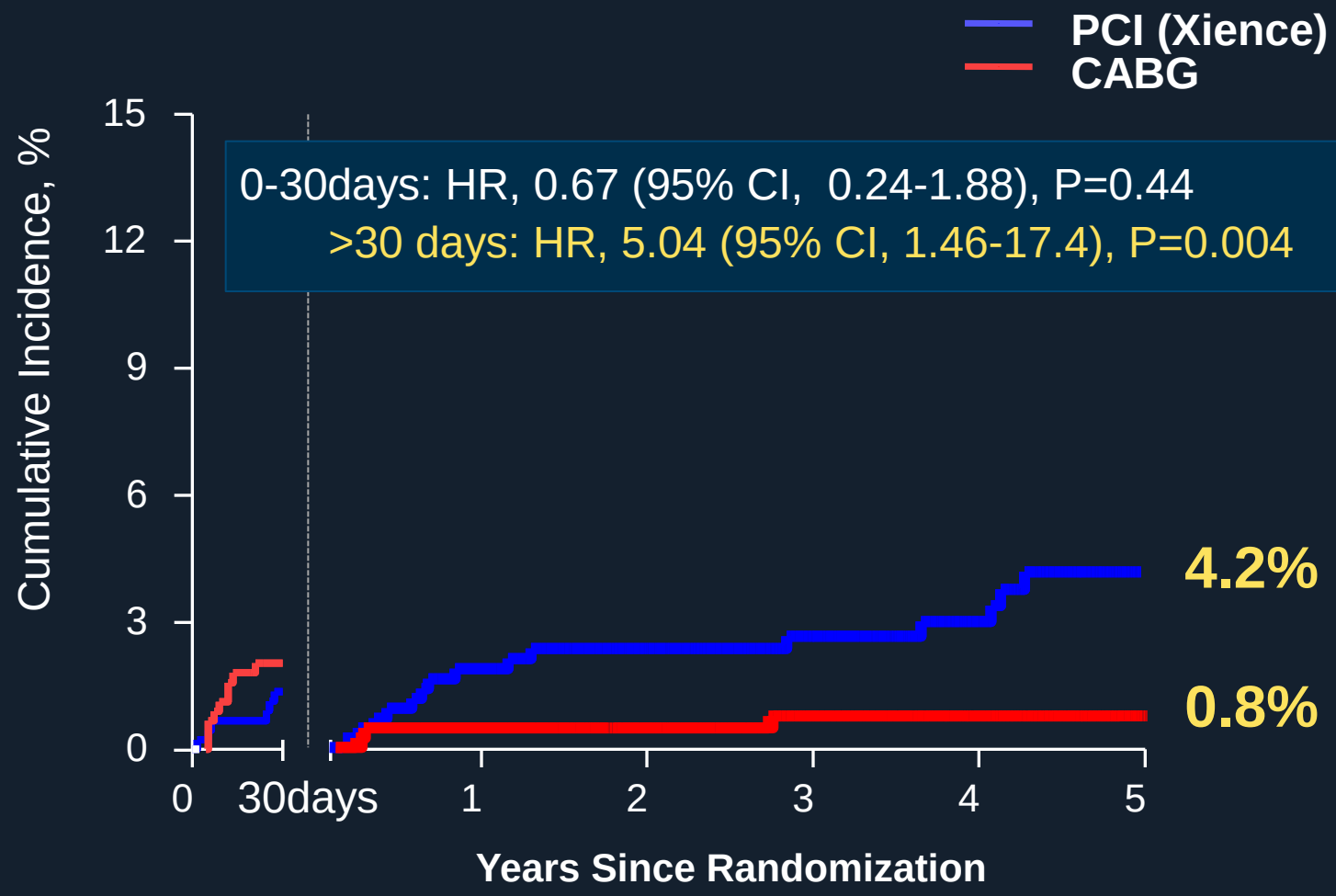


No. at Risk

PCI	438	419	382	325	261	140
CABG	442	422	386	335	271	151

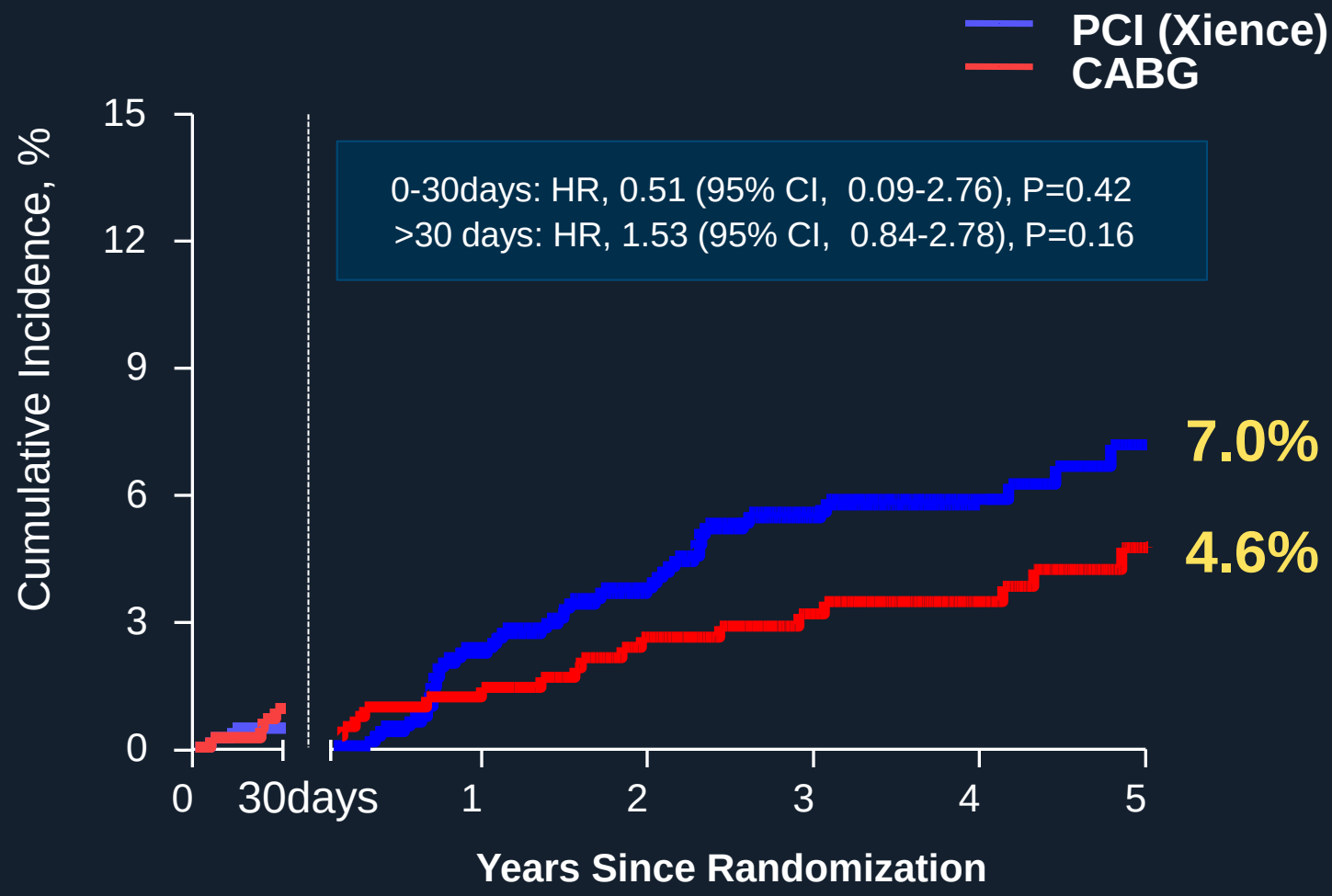
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of MI



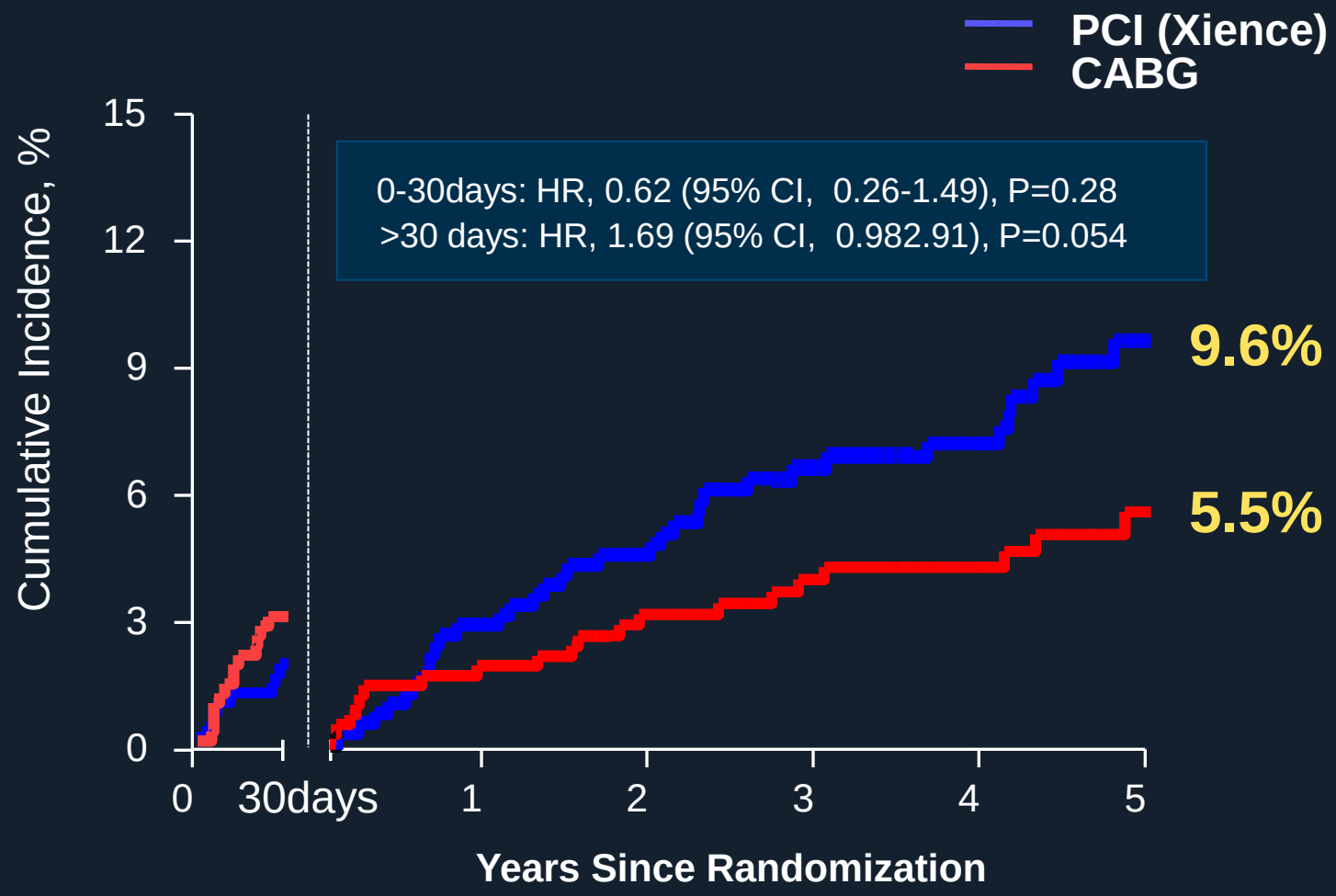
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of Death



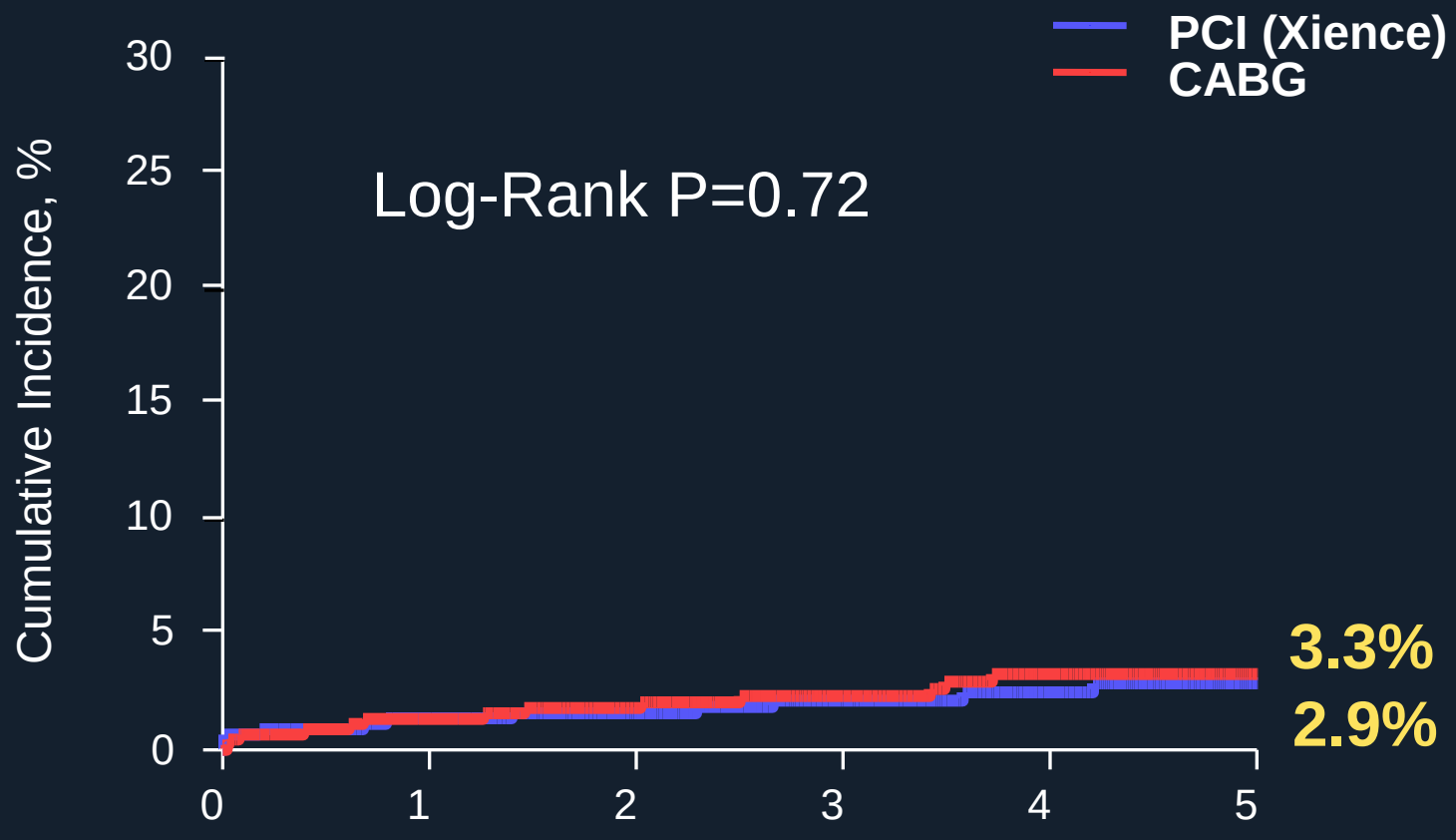
Event rates were derived from Kaplan-Meier estimates

Land Mark Analysis of Death and MI



Event rates were derived from Kaplan-Meier estimates

Stroke

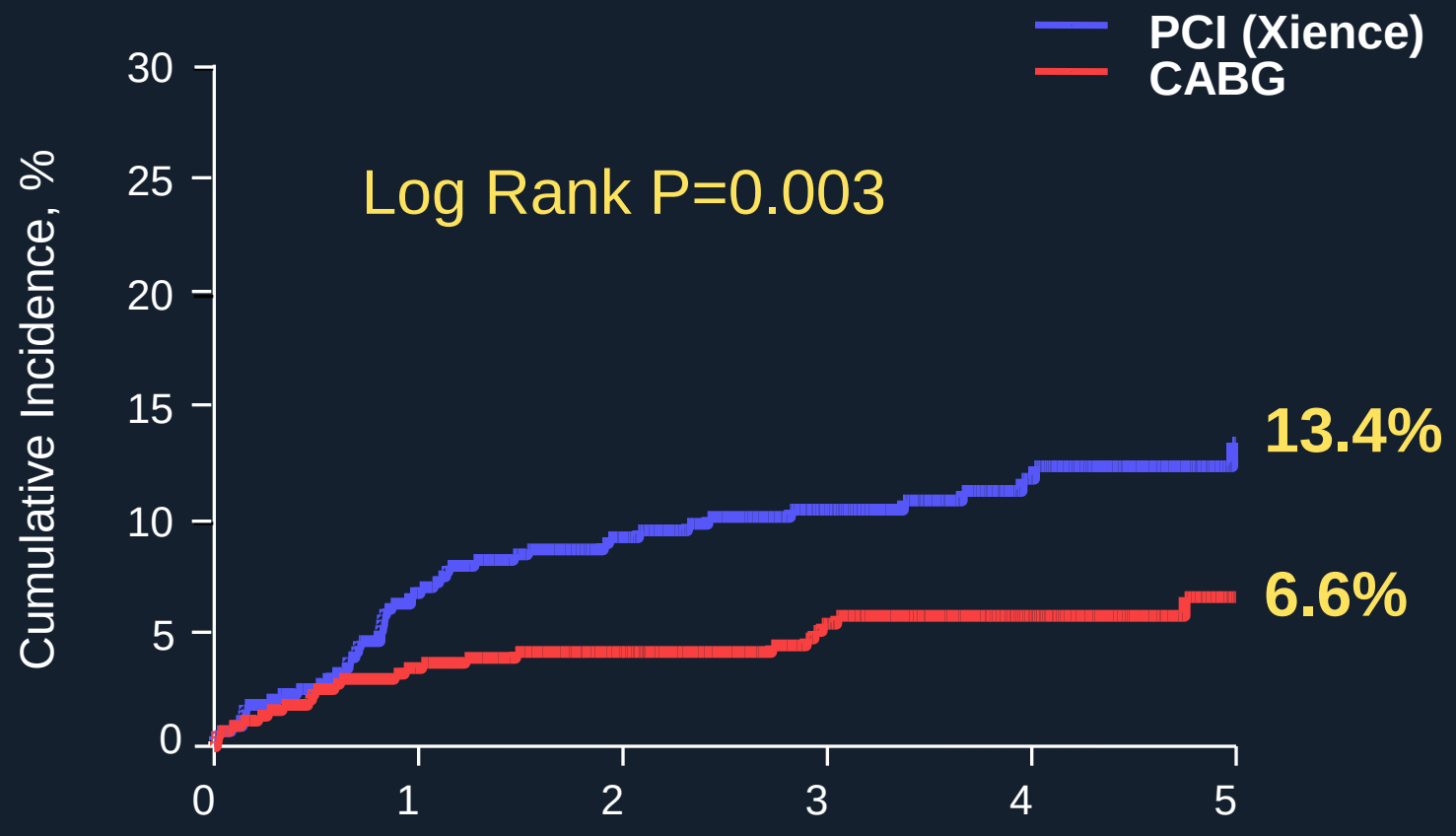


No. at Risk

PCI	438	421	383	326	262	140
CABG	442	427	389	338	271	152

Event rates were derived from Kaplan-Meier estimates

Any Repeat Revascularization

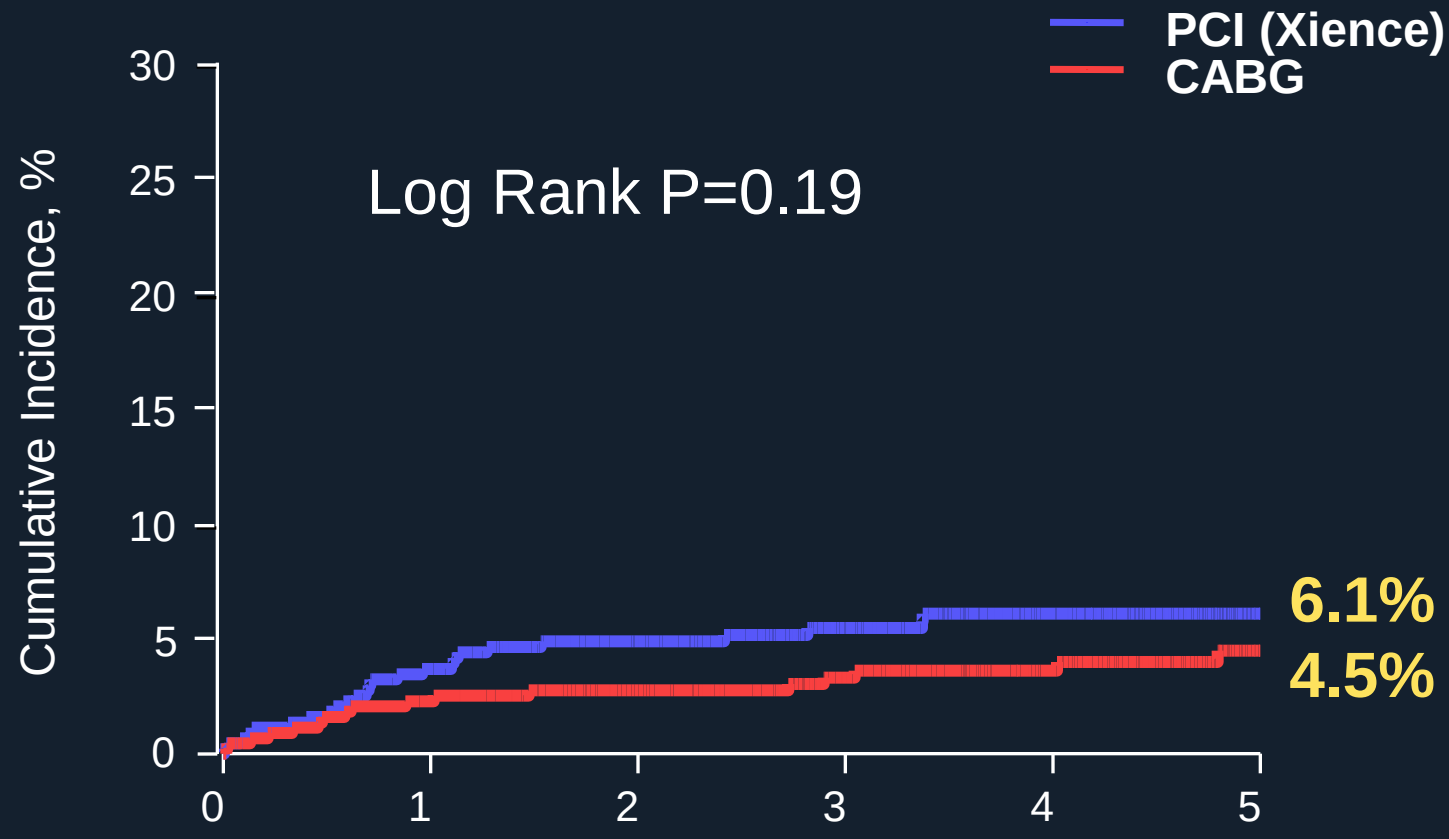


No. at Risk

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

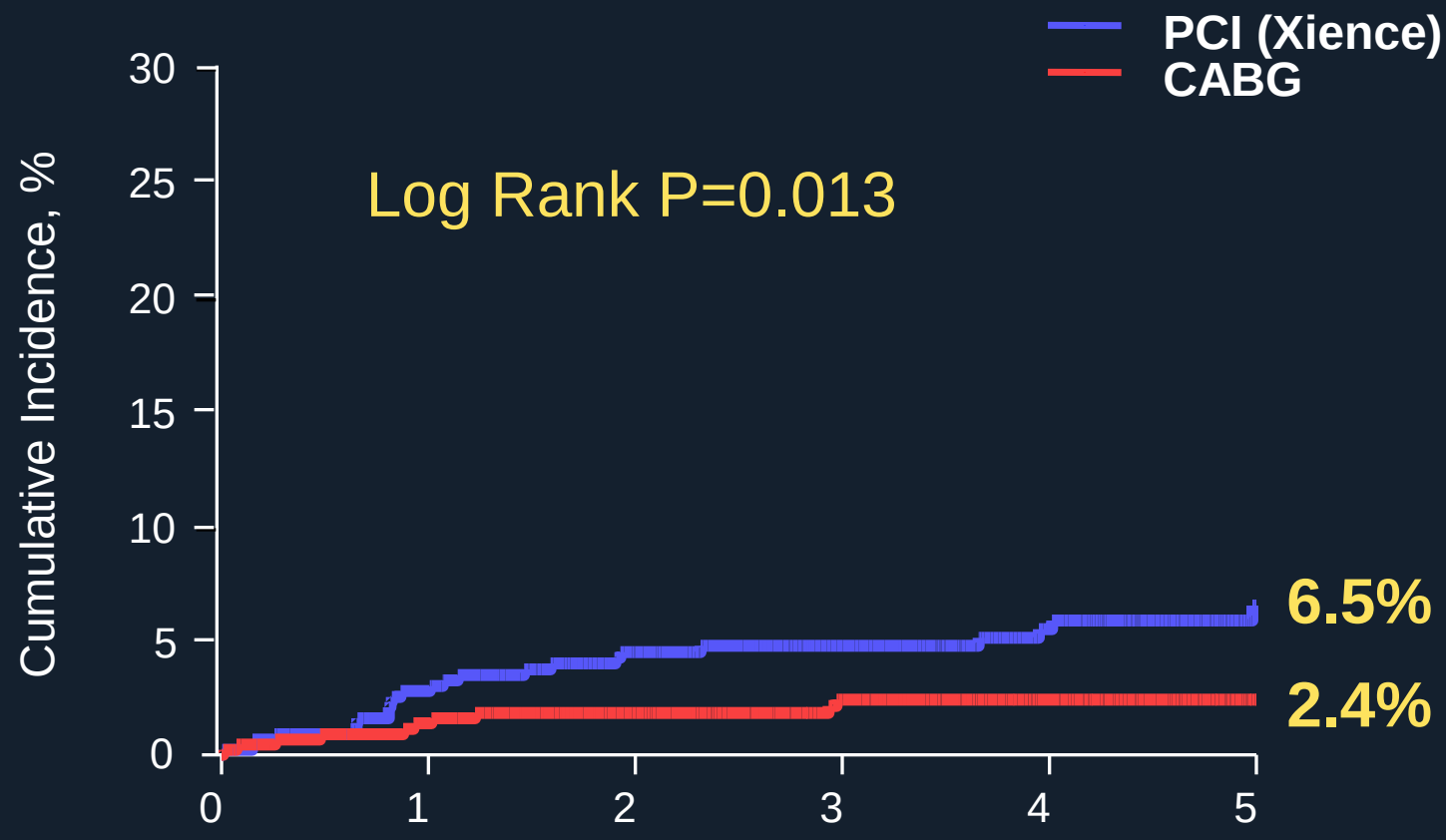


No. at Risk

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

Same Messages from New York State Registry

	PCI	CABG	HR (95% CI)	P value
	N=9223	N=9223		
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

Total 34,819 eligible patients, 9223 patients had similar propensity scores

What We've Learned *from Current Data*

Is the Game Over ?

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

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

Issue of
Complete vs. Incomplete

Complete vs Incomplete
from New York Registry

	PCI	CABG	HR (95% CI)	P value
Complete Revascularization	N=1911	N=1911		
Death at 3 year	2.54 %	2.50 %	1.08 (0.82-1.42)	0.58
Myocardial infarction	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
Incomplete Revascularization	N=7312	N=7312		
Death	3.25%	2.96%	1.03 (0.91-1.17)	0.63
Myocardial infarction	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

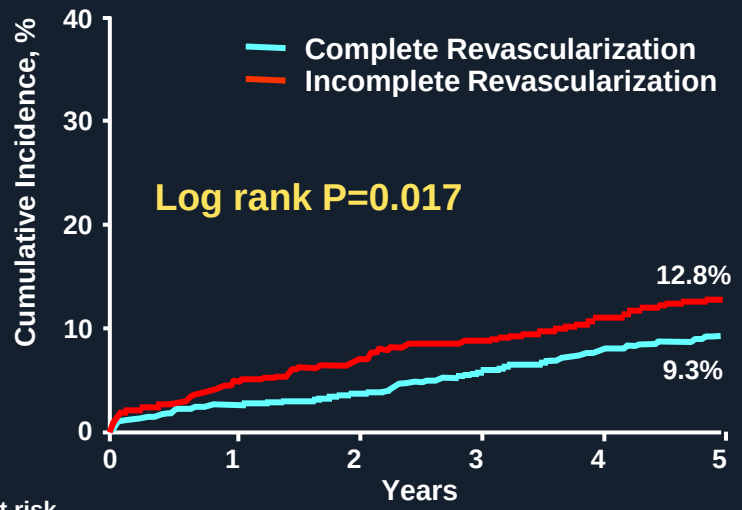
Complete vs Incomplete
from BEST Study

	PCI	CABG	HR (95% CI)	P value
Complete Revascularization	N=215	N=295		
Death at 5 year	7.0%	4.4%	1.50 (0.71-3.15)	0.29
Myocardial infarction	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
Incomplete Revascularization	N=215	N=122		
Death	6.5%	5.7%	1.22 (0.49-3.02)	0.68
Myocardial infarction	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 vs Incomplete

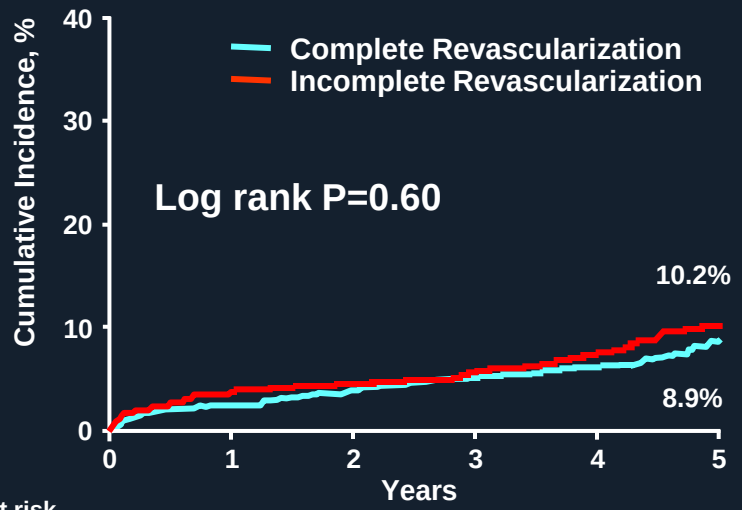
from Meta-Analysis from SYNTAX, BEST and PRECOMBAT

PCI



Patient at risk						
CR	968	911	918	875	819	398
IR	724	689	651	602	545	291

CABG

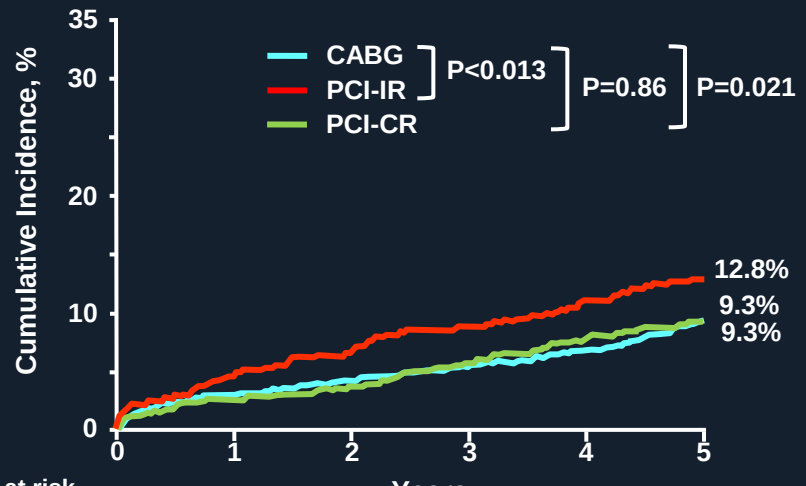


Patient at risk						
CR	1015	971	927	874	804	376
IR	505	474	461	437	411	221

Complete vs Incomplete

from Meta-Analysis from SYNTAX, BEST and PRECOMBAT

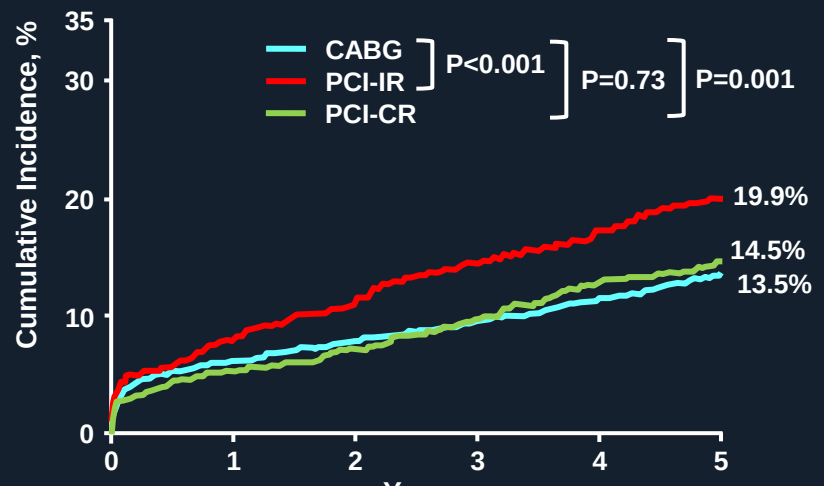
Death From Any Cause



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

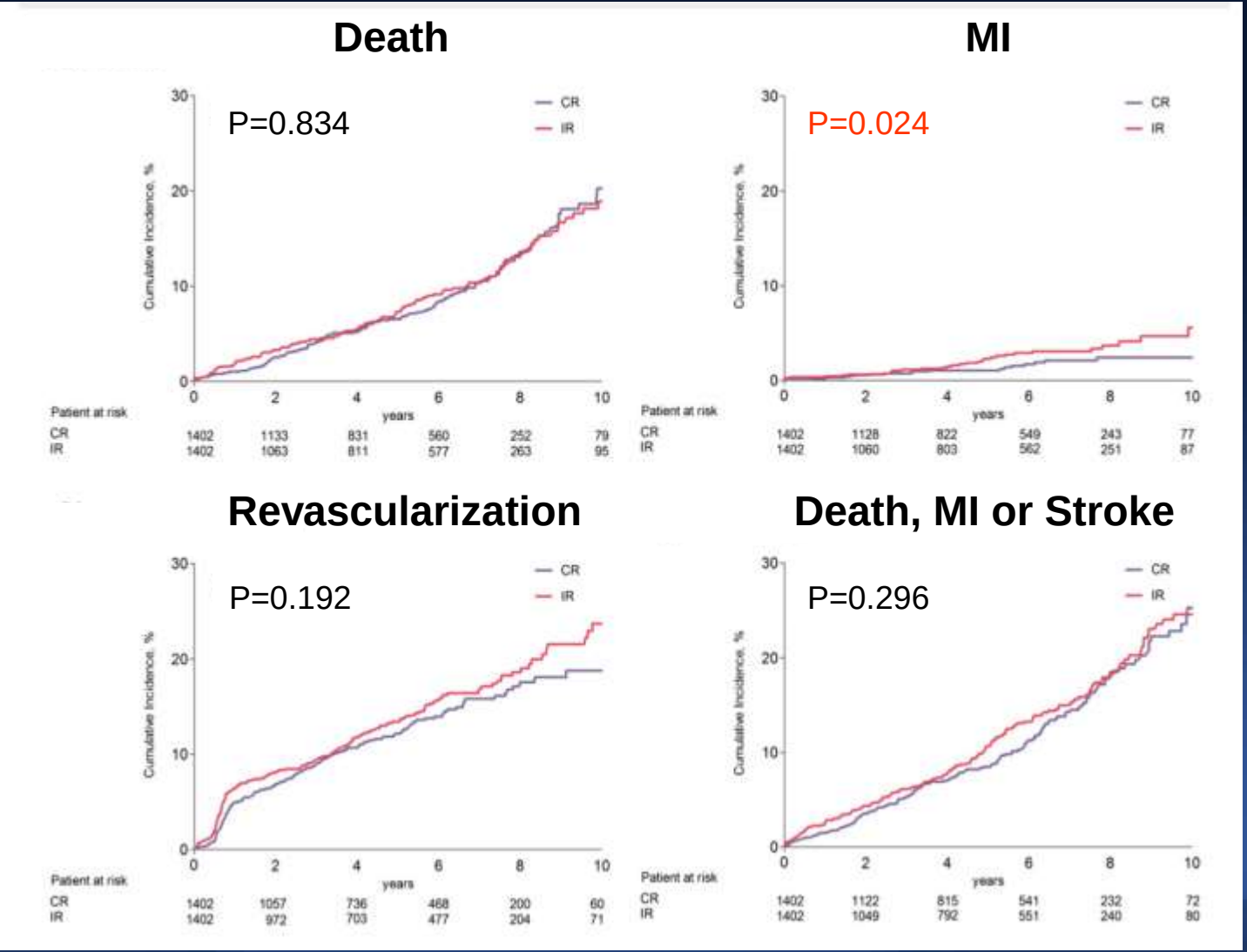
Death, MI, or Stroke



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

Complete vs Incomplete
from AMC MV Registry



Chang MO, et al. AHJ 2016 Sep;179:157-65.

What We've Learned *from Current 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

Current Status of PCI

ESC Guidelines 2014
Elective PCI for 3 Vessel Disease

	CABG		PCI	
Recommendation according to extent of CAD	**Class**	**Level**	**Class**	**Level**
3 VD with a SYNTAX score ≤ 22	I	A	I	B
3 VD with a SYNTAX score 23 -32	I	A	III	B
3 VD with a SYNTAX score > 32	I	A	III	B

Reference; SYNTAX Study, .
Patrick, SW et al, NEJM. 2009 March 5;360(10)

Does SYNTAX Score (Angiographic Complexity) Really Matter in Current PCI ?

Impact of FFR for 3 Vessel Disease

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Totally Different World !
Different Concept !
We Need Different Data !

Tonino et al, JACC 2010;55:2816-2821

Practical Guidelines, 2017
Elective PCI for 3 Vessel Disease

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

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

PCI vs. CABG in Multi-Vessel Disease, *2017*

The Game Is Just Begun !

Thank You !!

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