

# The Benefit of Complete Revascularization In Complex Coronary Artery Disease

Patient-Level Pooled Analysis of  
SYNTAX, PRECOMBAT, and BEST Trials

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# Background

- CABG has been considered as a standard revascularization strategy in the treatment of severe coronary artery disease.
- However, previous studies were limited by the high prevalence of incomplete revascularization (IR), particularly in PCI arm, and IR has been known to be a negative impact on the prognosis.
- Recent study demonstrated that patients achieving complete revascularization (CR) showed similar outcomes between PCI and CABG.

# Objectives

- We hypothesized that when severe coronary artery disease was completely revascularized by either revascularization strategy, PCI and CABG showed the similar long-term survival.
- We compared the long-term survival of patients undergoing CABG with those undergoing PCI with CR or IR in severe coronary artery disease.

# Population

- Patient-level pooled database from 3 RCTs enrolling LM and MV disease
  - ***SYNTAX Trial***  
1800 patients with LM or 3VD from EU and USA (PES)
  - ***PRECOMBAT Trial***  
600 patients with LM disease from South Korea (SES)
  - ***BEST Trial***  
880 patients with 2VD or 3VD from Asia (EES)

# Outcomes

- Primary Outcome:  
**Death from any causes**
- Secondary outcomes  
**The composite of death, MI, or stroke**
  - Cardiac death
  - Myocardial infarction
  - Stroke
  - Any repeat revascularization
- ❖ Previously reported definitions from each study were used for individual clinical outcomes

# Data Collection

- The pre-specified outcomes and a common set of baseline variables.
- Individual patient data from each trial was sent to the coordinating board of Asan Medical Center in Seoul, Korea and was merged for analysis.
- The pooled database was checked for completeness and consistency by investigators at the Asan Medical Center.
- A committee blinded to randomization adjudicated all clinical end points of each study.

# The Definition of Complete Revascularization

- The definition of the CR was followed by the definition of the individual studies.
- CR is defined as the treatment of any lesions with more than 50% diameter stenosis in vessels  **$\geq 1.5\text{mm}$**  in SYNTAX trial,  **$\geq 2.0\text{mm}$**  in BEST trial, and  **$\geq 2.5\text{mm}$**  in PRECOMBAT trial as estimated on the diagnostic angiogram.
- Completeness of revascularization was prospectively determined after the revascularization procedure by the operator.
- Post hoc analysis: CR according to SYNTAX criteria

# Study Flow

**SYNTAX (LM+3VD)**  
*N=1800*

**PRECOMBAT (LM)**  
*N=600*

**BEST (MVD)**  
*N=880*

3,280 randomized patients

Medical treatment: 24 patients  
Data not available: 44 patients

**3,212** patients were enrolled in analysis

**CABG**  
N=1520

**PCI-CR**  
N=968

**PCI-IR**  
N=724

1-year follow-up  
N=1492

1-year follow-up  
N=966

1-year follow-up  
N=721

3-year follow-up  
N=1405

3-year follow-up  
N=933

3-year follow-up  
N=670

5-year follow-up  
***N=1208***

5-year follow-up  
***N=837***

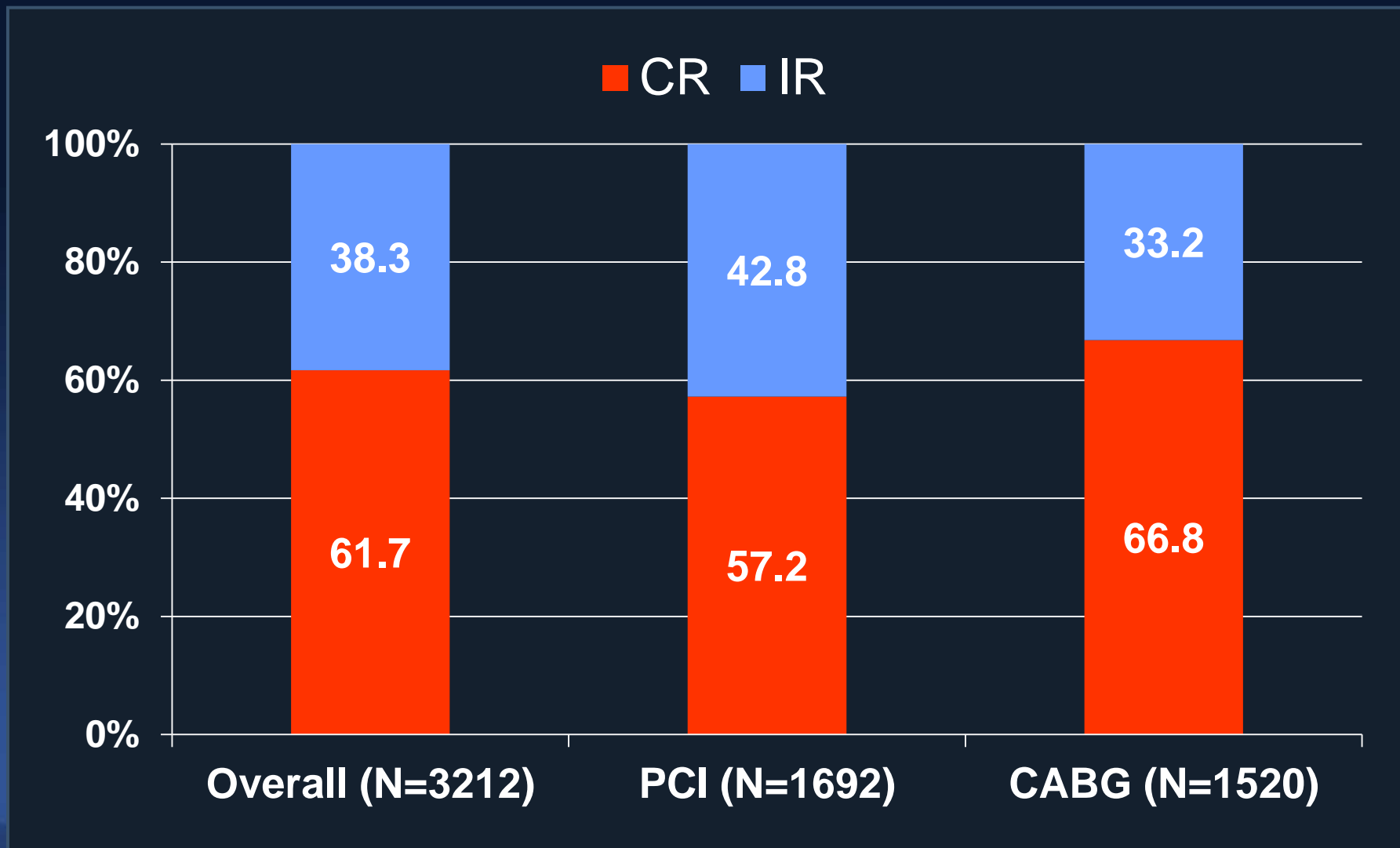
5-year follow-up  
***N=558***



# Statistics

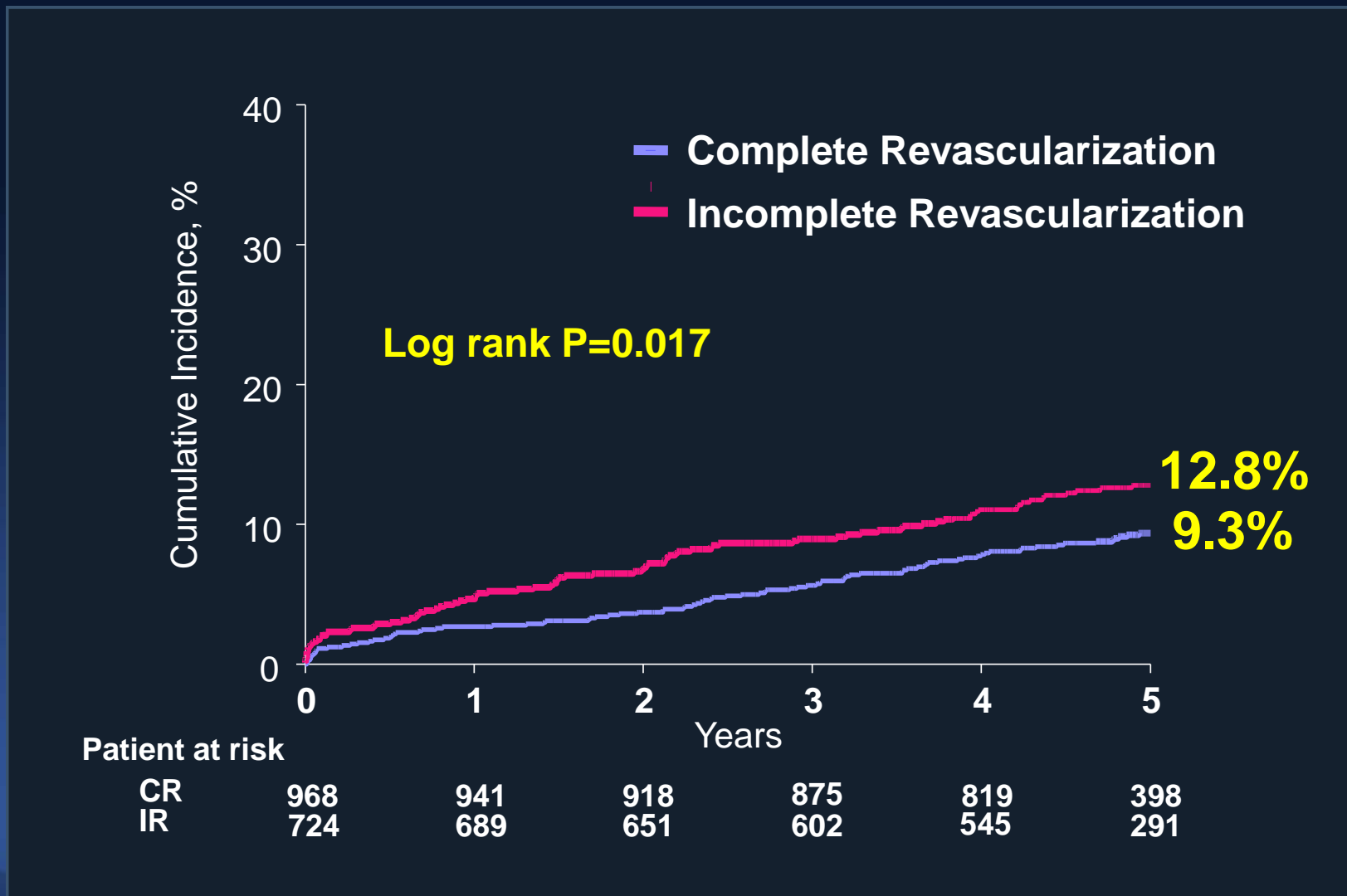
- As-treated principle.
- The time-to-event outcomes were displayed using Kaplan-Meier methodology, compared by the log-rank test.
- The stratified Cox proportional hazards models were used to the merged data analysis.
- The treatment effect was estimated separately for each trial, and the estimates were combined to provide an overall treatment effect.
- A likelihood-ratio test was performed to assess the homogeneity of data
- Analyses were carried out by an independent statistician who was unaware of the treatment assignments.
- All reported P values were 2 sided, and values of  $P < 0.05$  were considered to indicate statistical significance

# The Proportion Of The Completeness of Revascularization

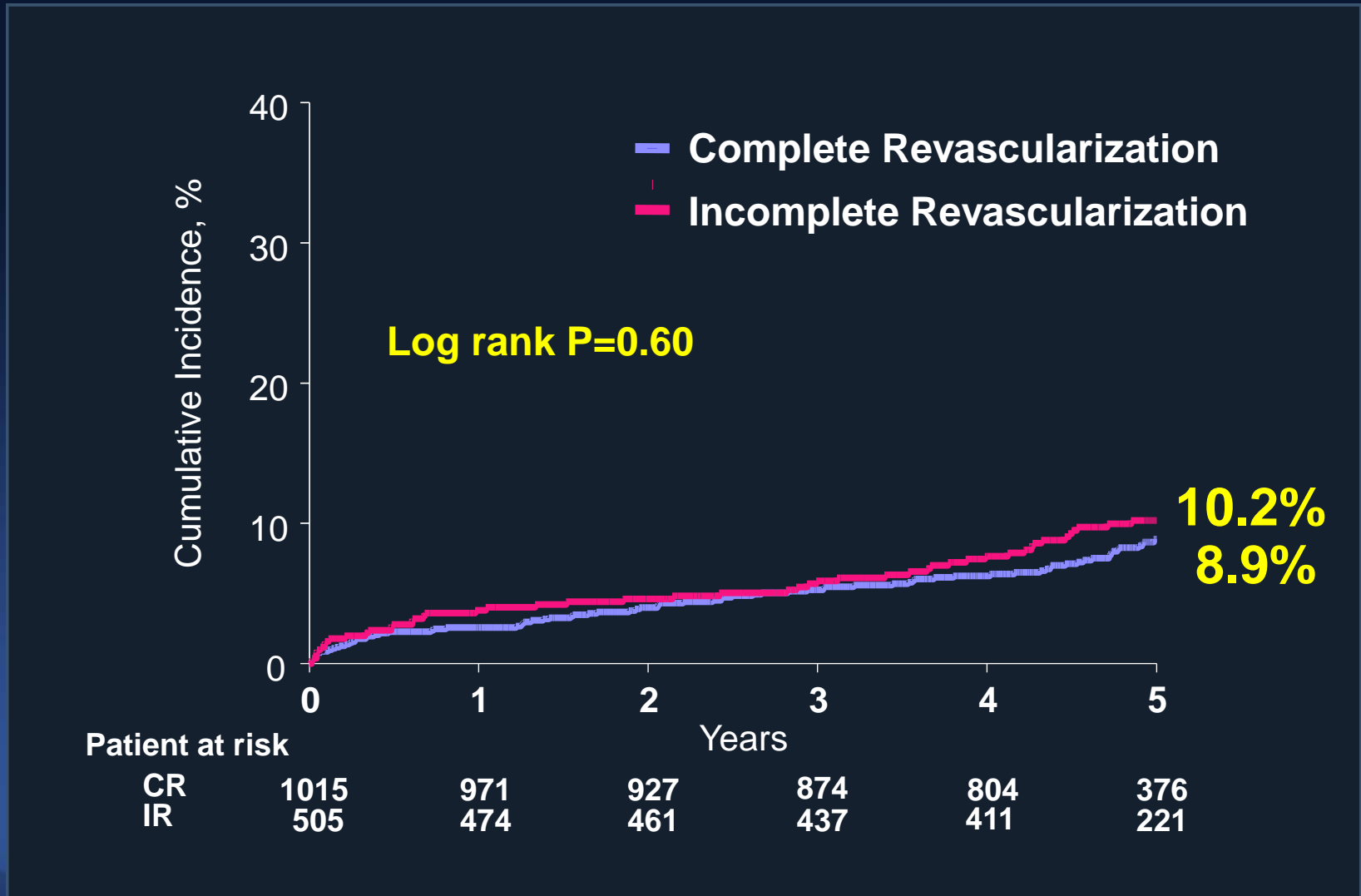


# Primary Outcome: Death From Any Cause

## PCI Group



# Primary Outcome: Death From Any Cause CABG Group



# Baseline Characteristics

	<b>CABG (N=1520)</b>	<b>PCI-CR (N=968)</b>	<b>PCI-IR (N=724)</b>	<b>P value</b>
Age (years)	64.4±9.7	63.9±9.70	65.1±9.70	0.044
Male sex	1182 (77.8%)	714 (73.8%)	541 (74.7%)	0.054
Body mass index (kg/m <sup>2</sup> )	26.6±4.1	26.5±4.4	26.5±4.4	0.81
Current smoker	339 (22.4%)	210 (21.7%)	146 (20.2%)	0.49
Diabetes	478 (31.4%)	298 (30.8%)	259 (35.8%)	0.063
Hypercholesterolemia	975 (64.5%)	589 (60.9%)	493 (68.6%)	0.005
Hypertension	947 (62.3%)	620 (64.0%)	489 (67.5%)	0.054
Acute coronary syndrome	923 (60.7%)	596 (61.6%)	451 (62.3%)	0.76
Previous MI	327 (21.7%)	178 (18.6%)	149 (20.6%)	0.18
Peripheral vascular disease	109 (7.2%)	58 (6.0%)	54 (7.5%)	0.41
Chronic renal failure	22 (1.4%)	11 (1.1%)	8 (1.1%)	0.72
LVEF, %	59.3±11.5	59.5±12.5	58.5±11.3	0.32

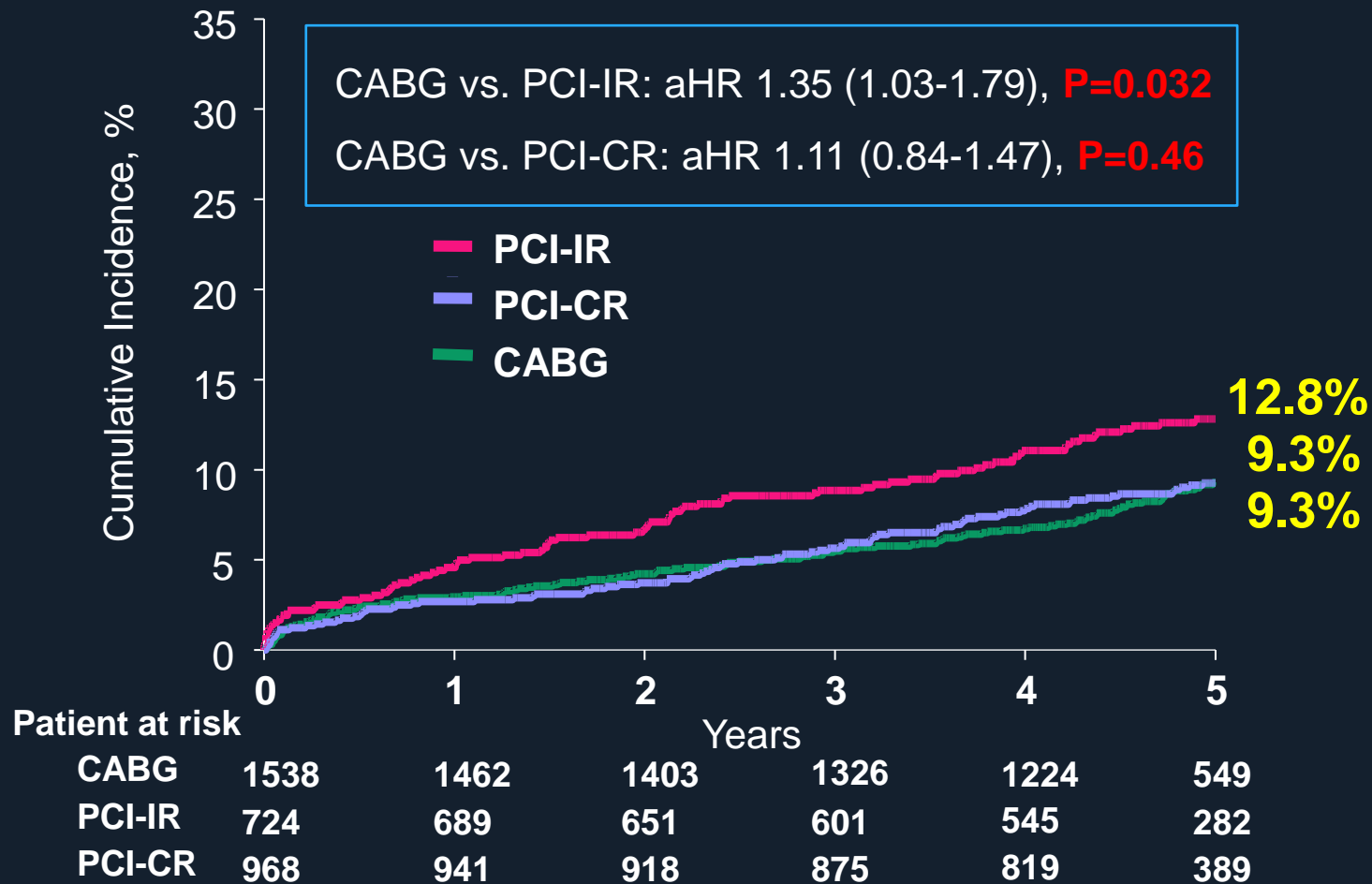
# Lesion Characteristics

	<b>CABG (N=1520)</b>	<b>PCI-CR (N=968)</b>	<b>PCI-IR (N=724)</b>	<b>P value</b>
Diseased vessels				<0.001
Two vessel	88 (5.8%)	105 (10.8%)	32 (4.4%)	
Three vessel	818 (53.8%)	407 (42.0%)	469 (64.8%)	
Left main				
isolated	89 (5.9%)	88 (9.1%)	4 (0.6%)	
plus one vessel	192 (12.6%)	129 (13.3%)	41 (5.7%)	
plus two vessel	114 (7.5%)	147 (15.2%)	78 (10.8%)	
plus three vessel	219 (14.4%)	92 (9.5%)	100 (13.8%)	
EuroSCORE	3.4±2.4	3.3±2.4	3.4±2.4	0.29
SYNTAX score				
Mean	27.7±10.6	24.5±9.8	28.9±10.5	<0.001
High (≥33)	443 (29.8%)	182 (18.9%)	232 (32.3%)	
Intermediate (23-32)	542 (36.4%)	336 (35.0%)	270 (37.6%)	
Low (≤22)	502 (33.8%)	443 (46.1%)	217 (30.2%)	

# Procedural Characteristics

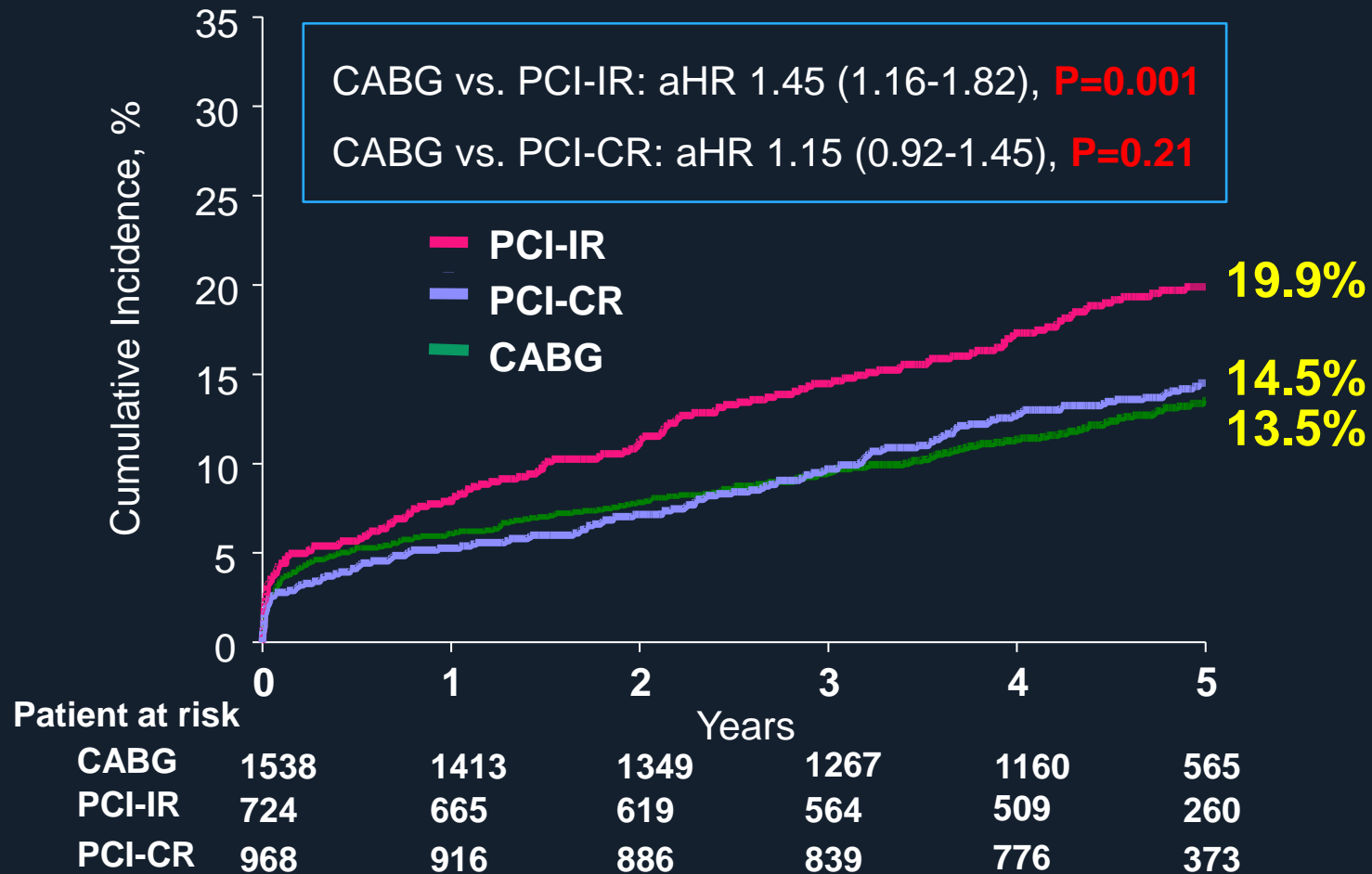
	CR	IR	P value
<b>PCI</b>			
SYNTAX Score	24.5±9.8	28.9±10.5	<0.001
Stent Number	4.0±2.2	3.7±1.9	0.015
Stent Length	84.0±48.6	77.4±38.8	0.002
<b>CABG</b>			
SYNTAX Score	26.6±10.4	29.8±10.7	<0.001
Off-Pump Surgery	36.2%	34.0%	0.43
Total graft number	2.9±0.8	2.6±0.7	<0.001
Arterial graft	1.7±0.9	1.6±0.7	0.01
Vein graft	1.2±0.9	1.0±0.9	<0.001
Use of IMA	98.8%	98.2%	0.36

# Primary Outcome: Death From Any Cause





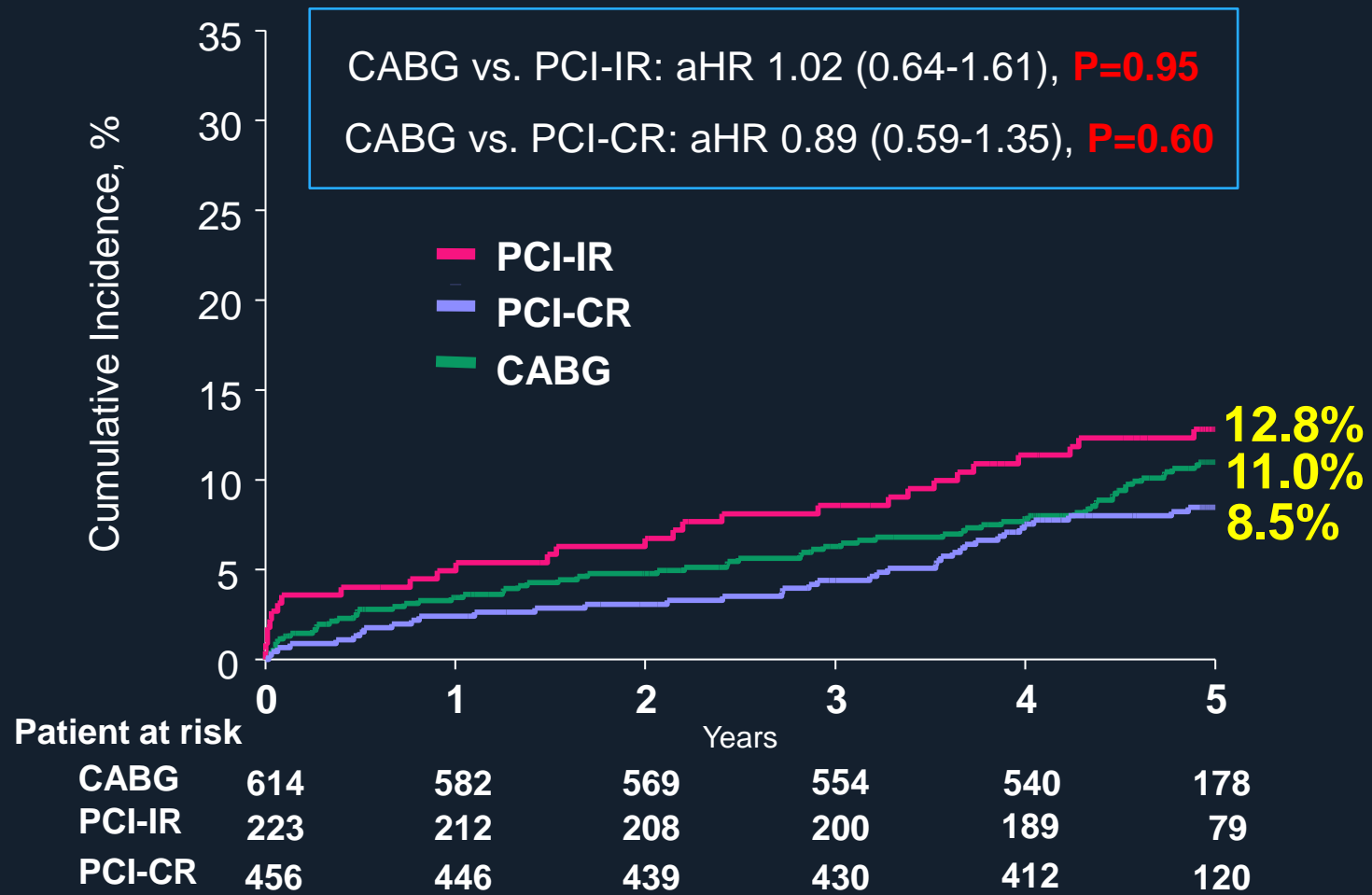
# Major Secondary Outcome: Death, MI or Stroke



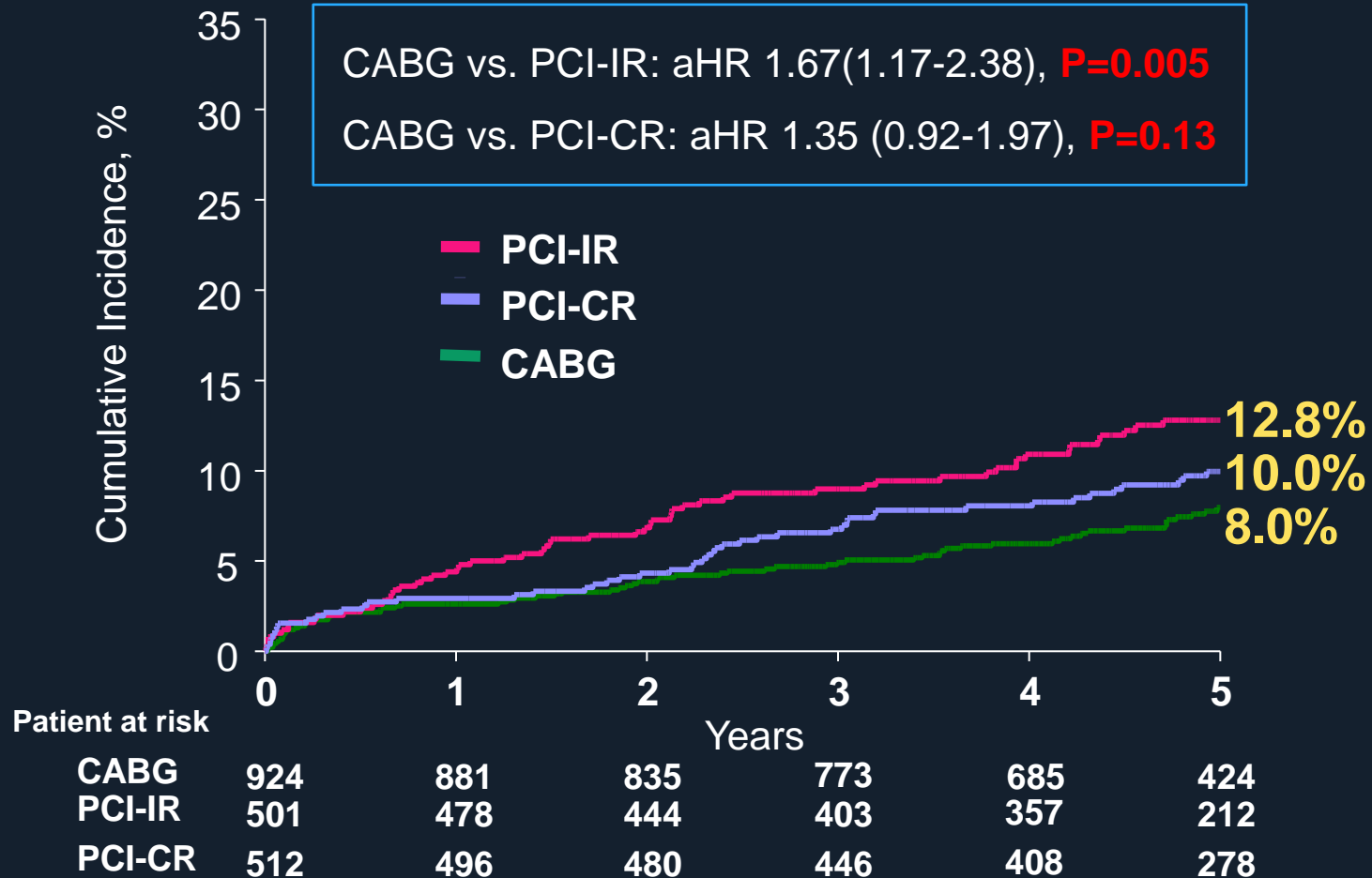
# Adjusted Clinical Outcomes

	Crude Incidence			Adjusted HR (95% CI)			P value	
	CABG (N=1520)	PCI-CR (N=968)	PCI-IR (N=724)	CABG (N=1520)	PCI-CR (N=968)	PCI-IR (N=724)	CABG vs PCI-CR	CABG vs. PCI-IR
<b>Primary Outcome: Death From Any Cause</b>	<b>8.8%</b>	<b>8.9%</b>	<b>12.0%</b>	<b>1 (Ref)</b>	<b>1.11 (0.84-1.47)</b>	<b>1.35 (1.03-1.79)</b>	<b>0.46</b>	<b>0.032</b>
<b>Death/MI/Stroke</b>	13.0%	13.9%	18.8%	1 (Ref)	1.15 (0.92-1.45)	1.45 (1.16-1.82)	0.21	0.001
<b>Cardiac Death</b>	4.7%	5.7%	7.7%	1 (Ref)	1.32 (0.91-1.90)	1.61 (1.12-2.31)	0.14	0.01
<b>MI</b>	3.1%	5.3%	8.3%	1 (Ref)	1.91 (1.27-2.86)	2.75 (1.86-4.05)	0.002	<0.001
<b>Death/MI</b>	11.1%	12.3%	17.4%	1 (Ref)	1.21 (0.97-1.54)	1.60 (1.26-2.03)	0.13	<0.001
<b>Stroke</b>	2.6%	2.0%	2.5%	1 (Ref)	0.75 (0.43-1.31)	0.88 (0.50-1.54)	0.31	0.66
<b>Any RR</b>	9.1%	15.9%	23.3%	1 (Ref)	1.71 (1.35-2.16)	2.66 (2.12-3.33)	<0.001	<0.001
<b>Death/MI/Stroke/RR</b>	20.1%	25.6%	34.1%	1 (Ref)	1.32 (1.11-1.57)	1.80 (1.52-2.13)	0.002	<0.001

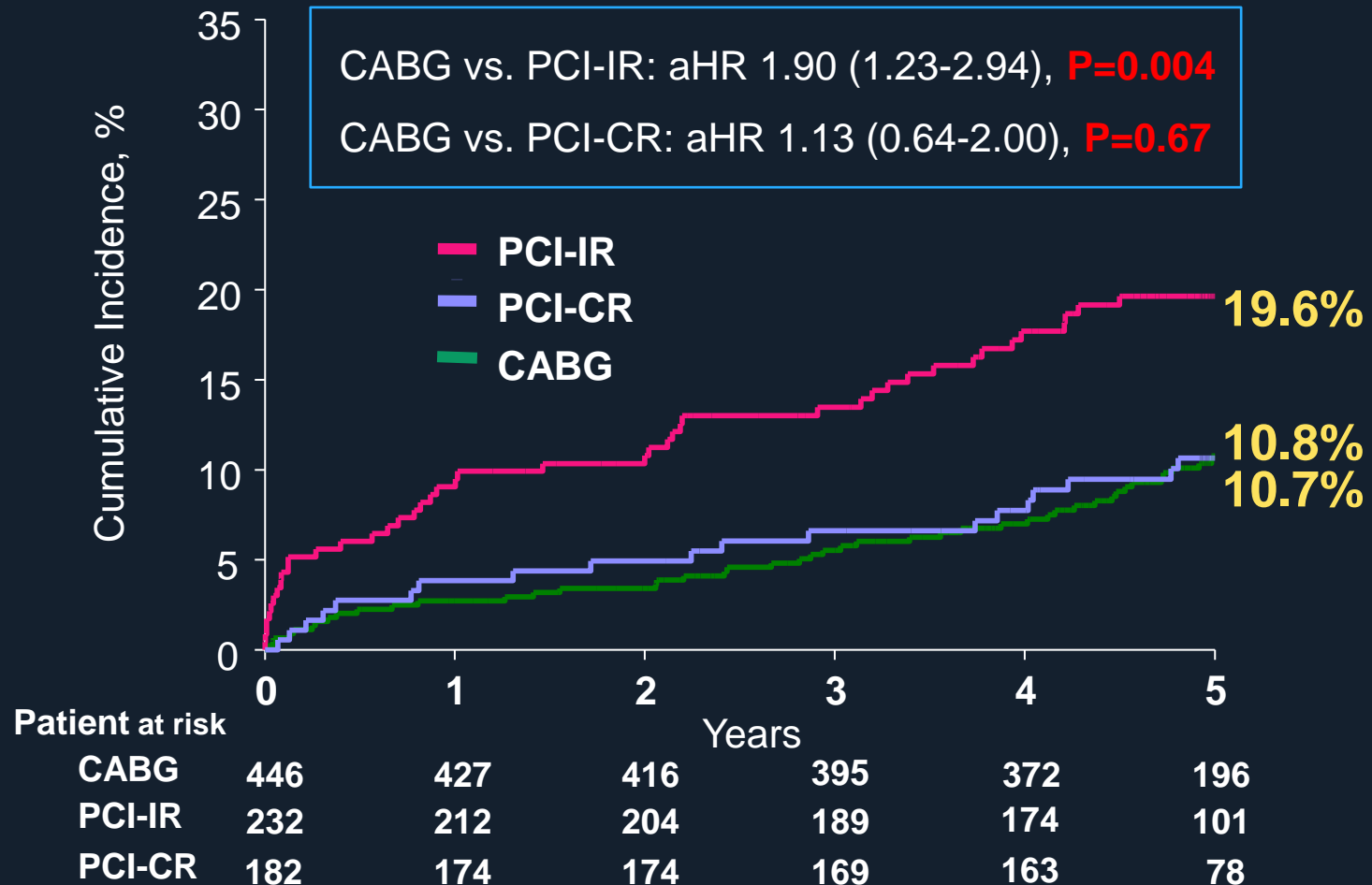
# LM Disease: Primary Outcome



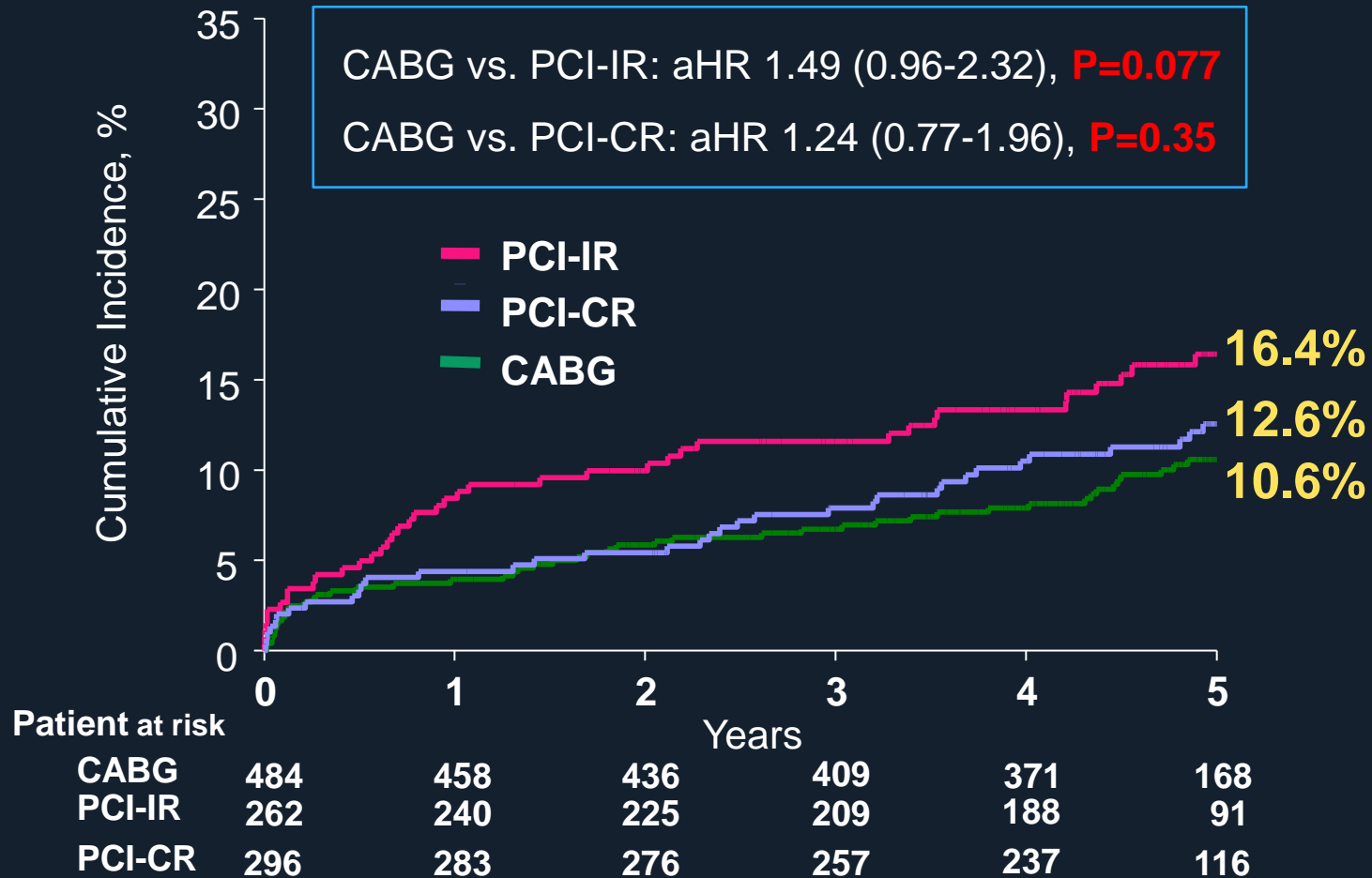
# Multivessel Disease: Primary Outcome



# High SYNTAX ( $\geq 32$ ): Primary Outcome

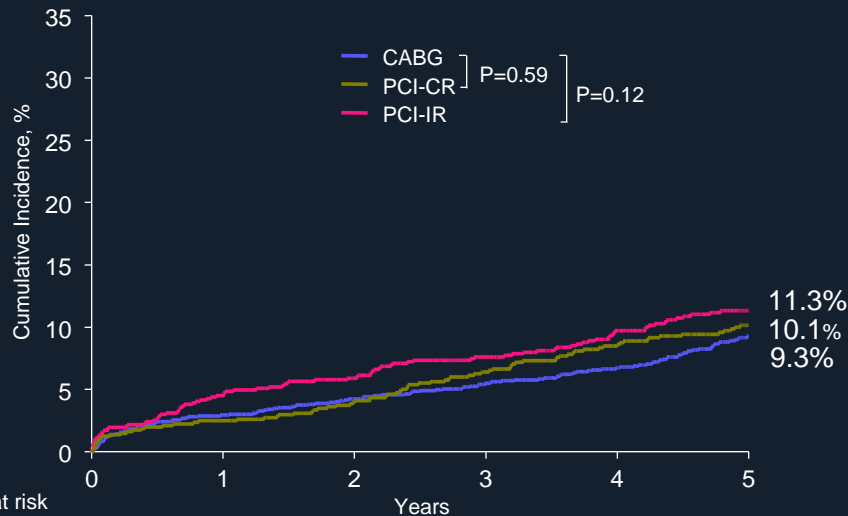


# Diabetic Patients: Primary Outcome

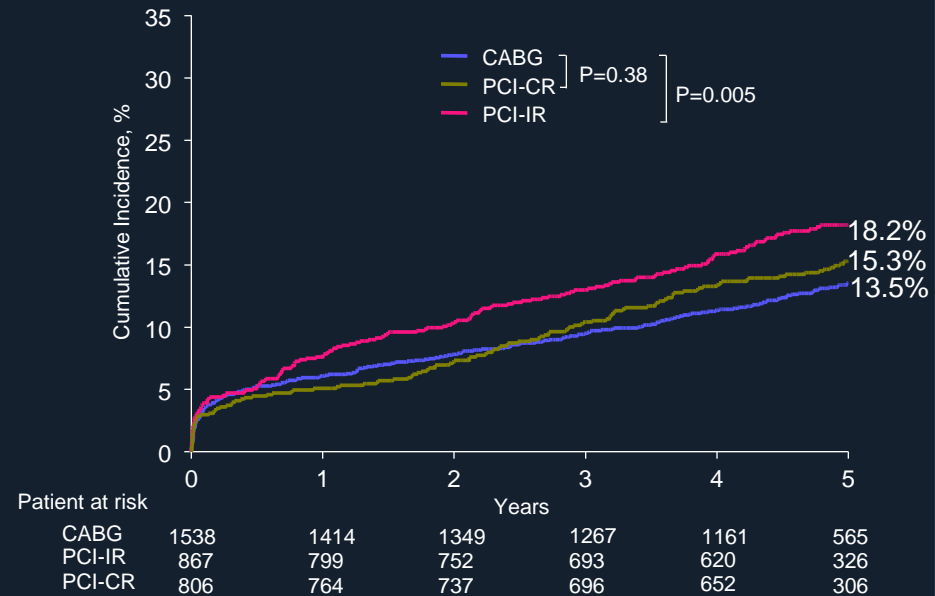


# Post Hoc Analysis: SYNTAX Criteria ( $\geq 1.5\text{mm}$ )

## Death From Any Cause



## Death, MI, or Stroke



# Conclusions

- For the treatment of left main or multivessel coronary artery disease, patients undergoing PCI achieving CR showed similar long-term survival rate to those undergoing CABG.
- The ability to achieve CR should enter into the decision algorithm for choice of revascularization strategy, and PCI with CR appeared to be a reasonable alternative to CABG in severe coronary artery disease.
- Our findings should be confirmed in future clinical trials.