

# **Impact of Optimal Medical Therapy on Long-Term Outcomes after Myocardial Revascularization for Multivessel Coronary Disease**

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# Disclosure

- No potential conflicts of interest

# BACKGROUND

- The importance of **optimal medical therapy (OMT)** has been emphasized for treatment of patients with coronary artery disease (CAD).
- However, the **definition of OMT was varied** among studies.
- Antiplatelet and statin therapies have been considered as mandatory secondary prevention after coronary revascularization, but the **evidence of long-term use of  $\beta$ -blockers or ACE inhibitors/ARBs without heart failure or previous myocardial infarction (MI) are still lacking.**

# OBJECTIVES

- This study sought to determine the prognostic impact of OMT on long-term outcome in patients with multivessel CAD after myocardial revascularization.

# METHODS

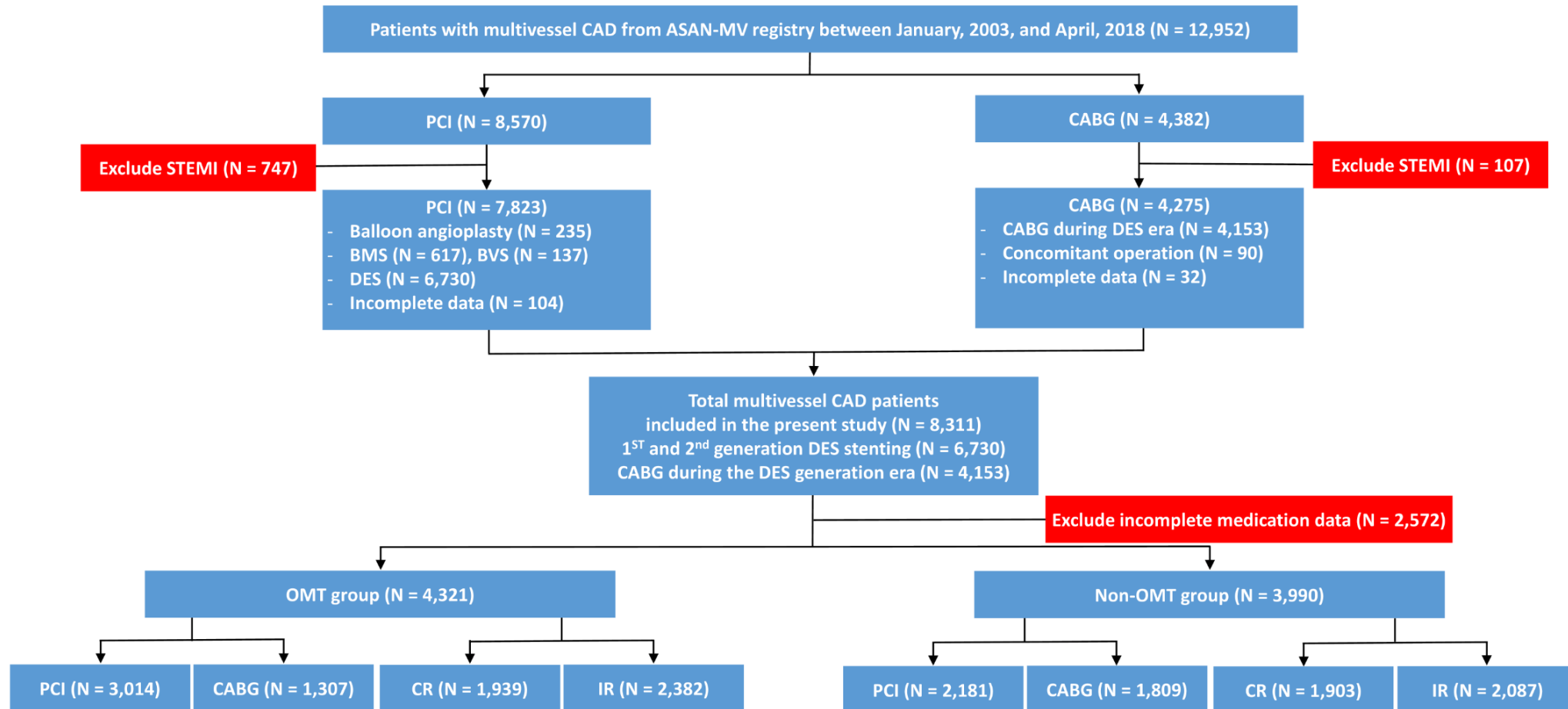
- Using the data from the Asan-Multivessel Registry
- Form January 2003 to April 2018
- We identified the patients who underwent revascularization either isolated coronary-artery bypass grafting (CABG) or percutaneous coronary intervention (PCI)

# METHODS

- OMT was defined **at least 3 medications** of the following 4 types of drugs at 3 years after index revascularization: **1) antiplatelets; 2) beta-blocker; 3) ACE inhibitors and/or ARBs; and 4) statin.**
- Outcomes:
  - **All-cause death**
  - **Serious composite outcome:** Death from any cause, spontaneous myocardial infarction (MI), stroke at 10 years.
- To reduce bias of this crude cohort study, we applied propensity-score matching and inverse probability of treatment weighting (IPTW).

# RESULTS

# Study Flow Diagram





# Baseline Characteristics

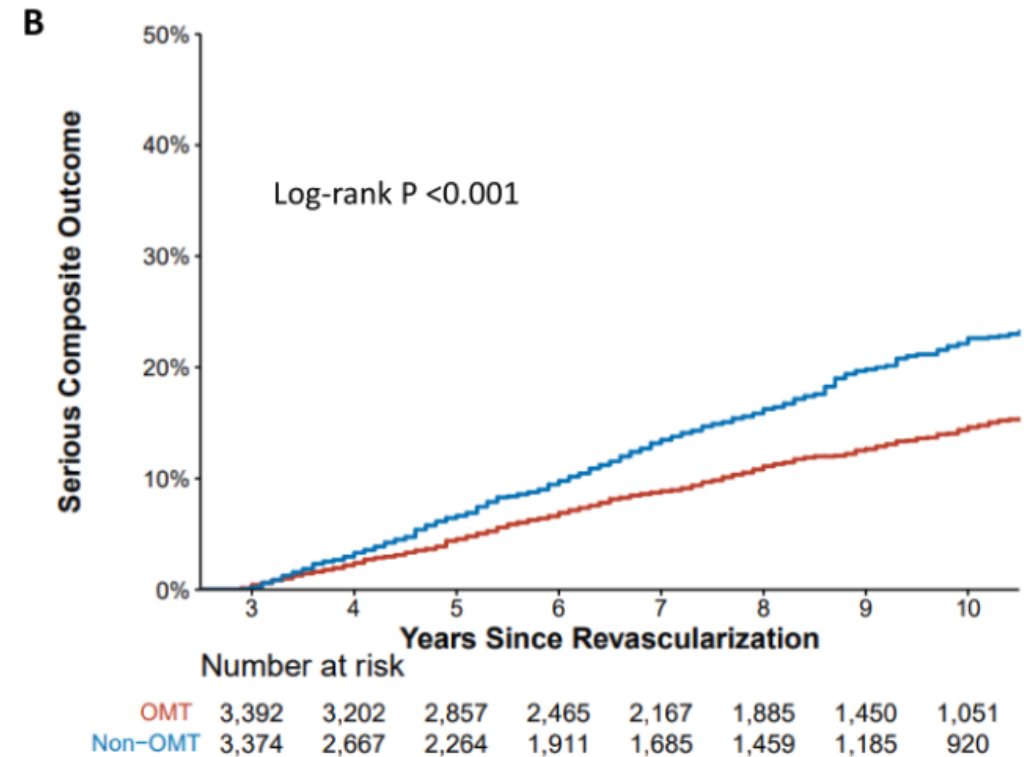
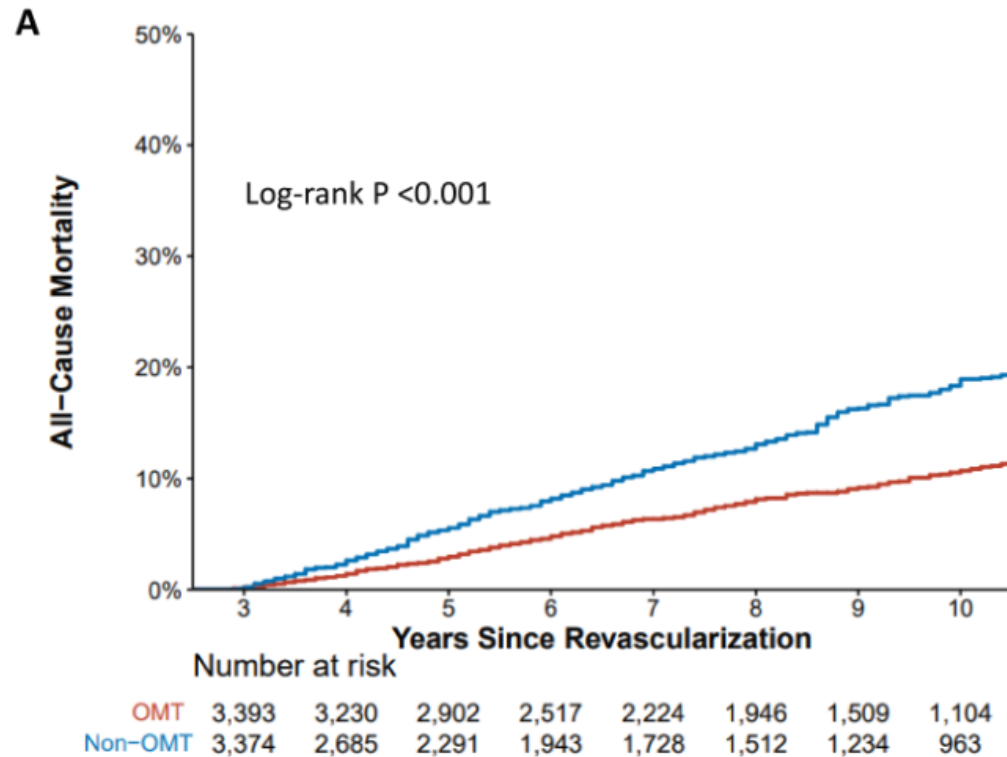
	OMT (n=4321)	Non-OMT (n=3990)	P value
Age, years	63.21 (9.59)	63.41 (9.38)	0.331
Male	3147 (72.8)	2971 (74.5)	0.092
Body mass index, kg/m <sup>2</sup>	25.30 (2.93)	24.71 (3.02)	<b>&lt;0.001</b>
Hypertension	2988 (69.2)	2361 (59.2)	<b>&lt;0.001</b>
Diabetes mellitus	1594 (36.9)	1497 (37.5)	0.553
Dyslipidemia	1314 (30.4)	1112 (27.9)	<b>0.011</b>
Current smoking	1027 (23.8)	1000 (25.1)	0.170
Previous MI	297 ( 6.9)	298 ( 7.5)	0.293
Previous CABG	72 ( 1.7)	50 ( 1.3)	0.118
Previous PCI	695 (16.1)	610 (15.3)	0.319
Previous heart failure	111 ( 2.6)	154 ( 3.9)	<b>0.001</b>
Previous stroke	338 ( 7.8)	315 ( 7.9)	0.902
Chronic kidney disease	103 ( 2.4)	166 ( 4.2)	<b>&lt;0.001</b>

	OMT (n=4321)	Non-OMT (n=3990)	P value
LV ejection fraction, %	58.31 (9.59)	58.24 (9.44)	0.385
Clinical presentation			
Stable	1945 (45.0)	1612 (40.4)	<0.001
Unstable	1505 (34.8)	1508 (37.8)	
NSTEMI	333 ( 7.7)	281 ( 7.0)	
Disease type			
LM disease	872 (20.2)	930 (23.3)	0.001
3-vessel disease	1708 (39.5)	1622 (40.7)	0.296
Revascularization			
CABG	1306 (30.2)	1809 (45.3)	<0.001
PCI	3015 (69.8)	2181 (54.7)	
Complete Revascularization	1939 (44.9)	1903 (47.7)	0.010

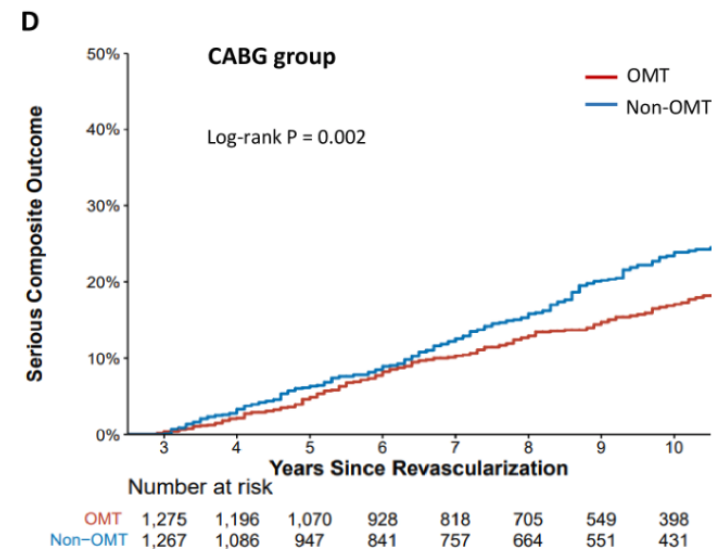
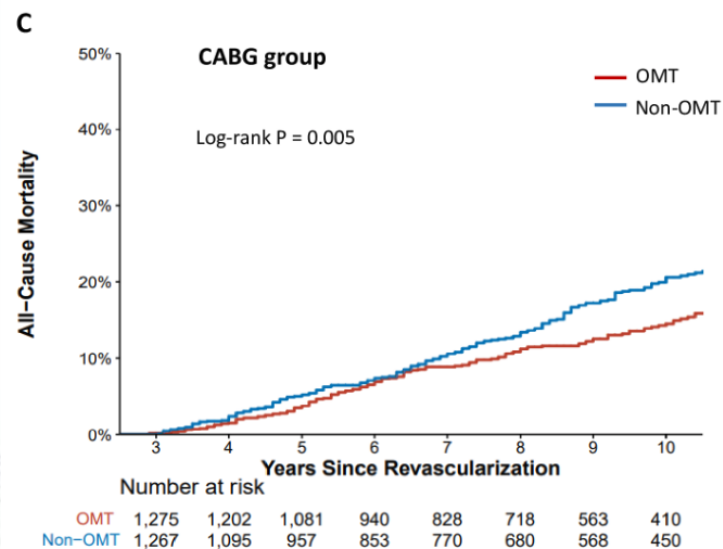
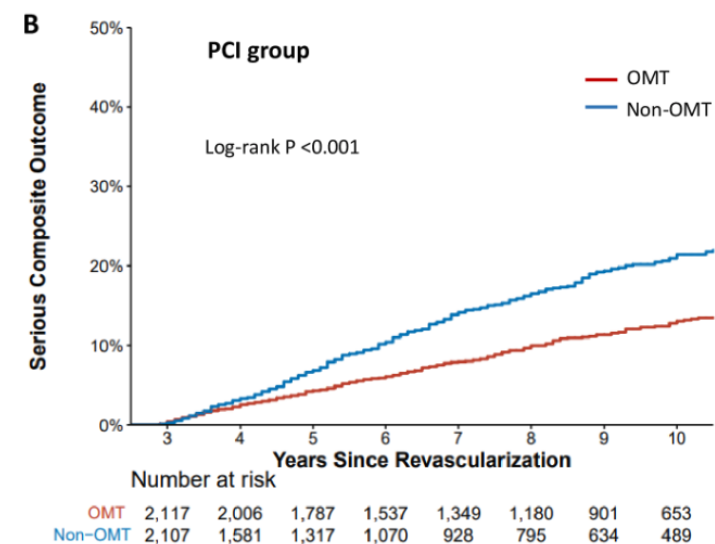
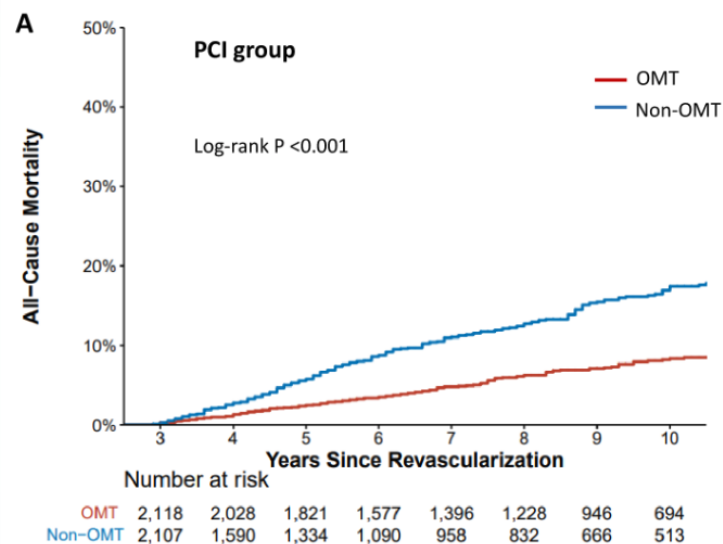
# Clinical outcomes at 10-years according to OMT status

		Unadjusted Data			After Propensity-Score Matching			Data Adjusted with the Use of IPTW		
Outcomes		OMT (n=4321)	Non-OMT (n=3990)	P value	OMT (n=3397)	Non-OMT (n=3397)	P value	OMT (n=4319)	Non-OMT (n=3993)	P value
All-cause death	10 years	312 (9.9%)	464 (18.6%)	<0.001	265 (10.7%)	387 (18.7%)	<0.001	336 (10.6%)	454 (18.6%)	<0.001
	HR (95% CI)	0.52 (0.45–0.60)		<0.001	0.55 (0.47–0.65)		<0.001	0.56 (0.48–0.64)		<0.001
Serious composite outcome	10 years	453 (14.3%)	562 (22.5%)	<0.001	366 (14.5%)	469 (22.5%)	<0.001	468 (14.7%)	550 (22.5%)	<0.001
	HR (95% CI)	0.62 (0.55–0.70)		<0.001	0.63 (0.55–0.73)		<0.001	0.64 (0.56–0.73)		<0.001

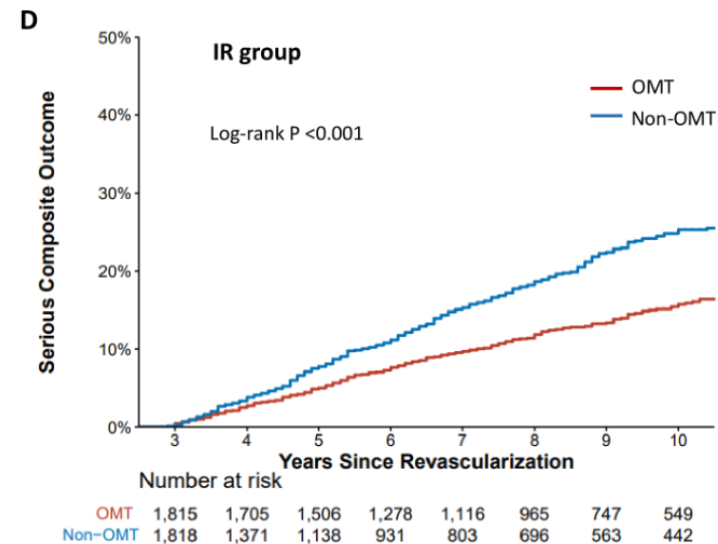
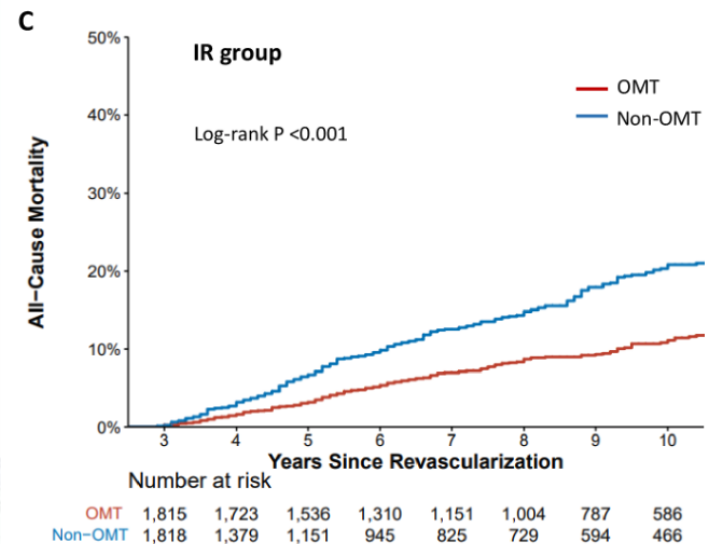
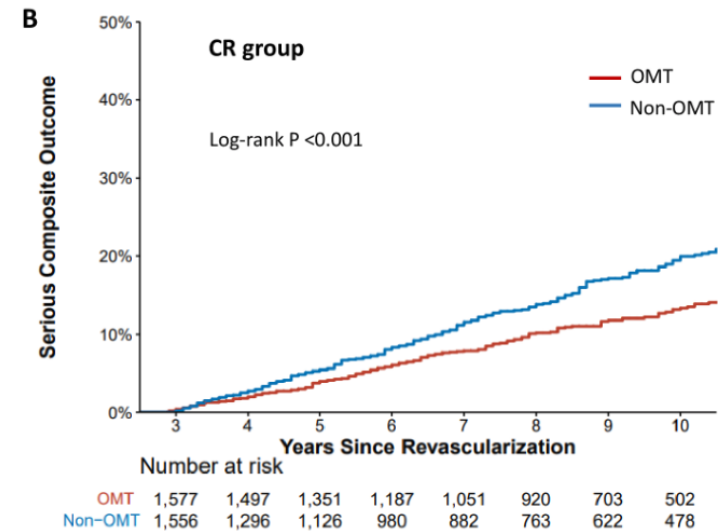
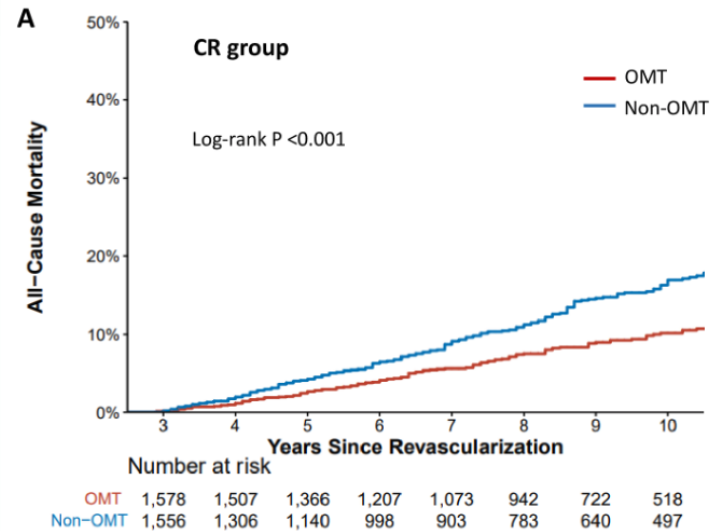
# Outcomes in the Matched Cohort



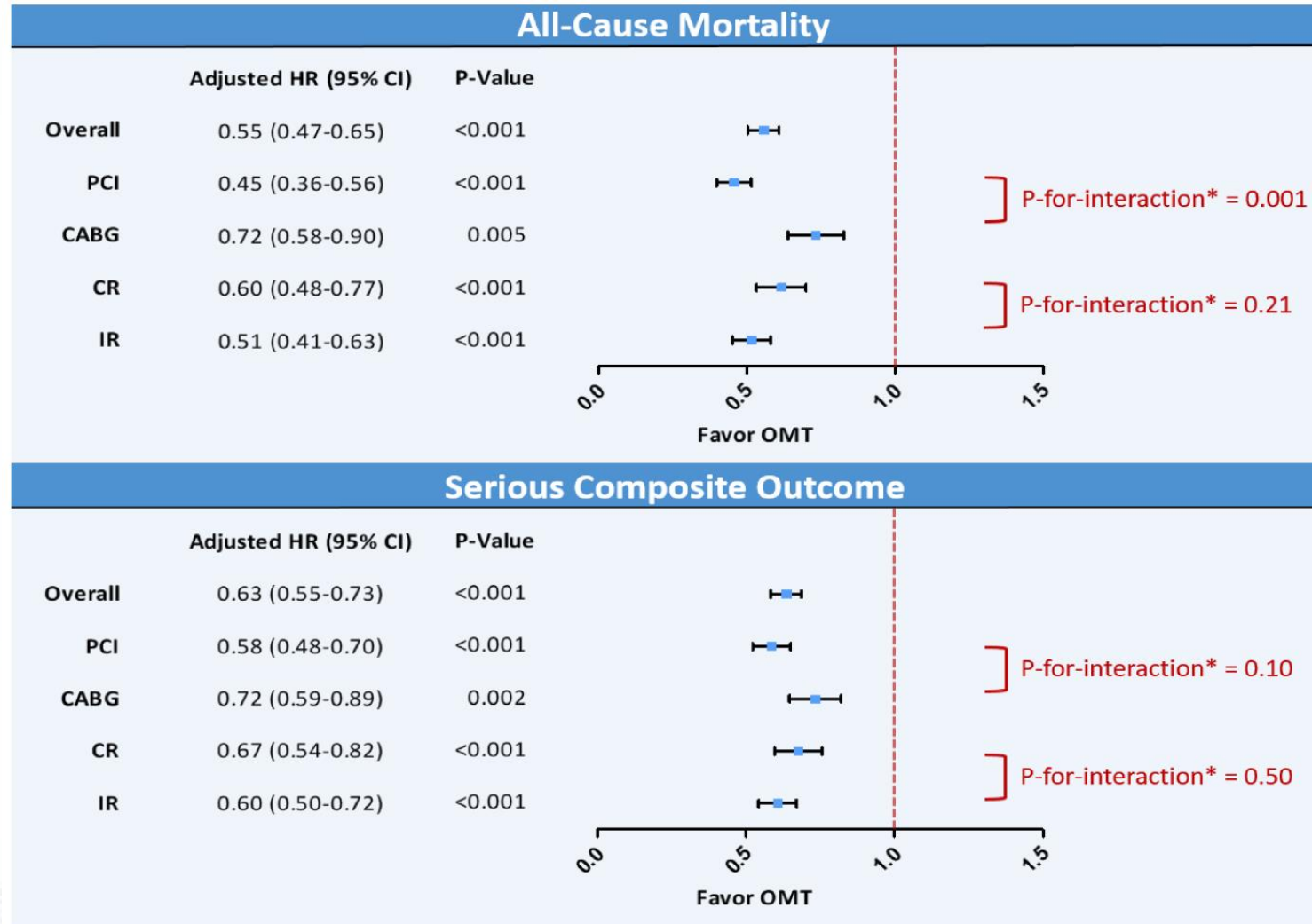
# Outcomes According to the OMT Status in the Matched Cohort of Each Stratum



# Outcomes According to the OMT Status in the Matched Cohort of Complete and Incomplete Revascularization



# Long-Term Impact of OMT



\*P-for-interaction was assessed by the inverse probability weighted Cox proportional hazards regression model



# DISCUSSION

- The main findings can be summarized as follows:
  - (1) Approximately half (52%) of patients were on OMT status during long-term follow-up, which was higher in the PCI group and in the IR group.
  - (2) After adjustment using propensity-score analysis, compared to patients without OMT, those with OMT had significantly lower risks of all-cause mortality and serious composite outcome of death, spontaneous MI, or stroke at 10 years.
  - (3) The long-term benefit of OMT was more prominent in the PCI group than in the CABG group, in which significant interactions were present between OMT status and revascularization type for all-cause mortality.
  - (4) The benefit of OMT was consistent irrespective of CR or IR status.

# CONCLUSION

- In patients with multivessel CAD who underwent coronary revascularization, long-term maintenance of OMT status was significantly associated with a lower risk of all-cause mortality and serious composite outcome of death, spontaneous MI, or stroke at 10 years. The effect of OMT was more remarkable in the PCI group than in the CABG group.



# LIMITATIONS

- First, we could **not identify exact reasons or target** for use of medication, especially  $\beta$ -blockers or ACE inhibitors/ARBs in this study.
- It might be possible that patients receiving long-term  $\beta$ -blockers or ACE inhibitors/ARBs therapy might have **less severe risk profiles or conditions** to tolerate these medications compared with those not prescribing or stopping such drugs during the follow-up.
  - To overcome this potential selection bias, we rigorously adjusted a wide range of baseline covariates using propensity-score matching and IPTW.

# LIMITATIONS

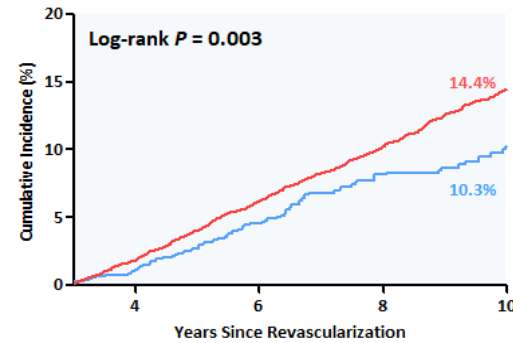
- Second, the single-center design of this study may limit to generalize our findings.
- Third, our analysis lacks status of medication between 3 and 10 years. We were not consider whether the status of medication at 3 year maintained until 10 years later.

# Breakdown of the Combination of Individual OMT Agents and Outcomes

	Patients (n)	Mortality (%)	Serious Composite Outcome (%)
<b>Overall Patients</b>	8311	13.8	18.0
<b>Patients on no medication</b>	791	34.9	38.5
<b>Patients on one type of medication</b>	1181	31	33.4
APD	1161	31.4	33.6
Statin	12	16.7	27.1
ACEI/ARB	5	18	18
Beta-blocker	3	50	50
<b>Patients on 2 types of medications</b>	1932	10.4	14.7
APD + Statin	1634	8	12
APD + ACEI/ARB	153	29.7	32.6
APD + Beta-blocker	117	17.1	25.2
Statin + ACEI/ARB	17	23.3	32.1
Statin + Beta-blocker	9	0	0
ACEI/ARB + Beta-blocker	2	50	50
<b>Patients on 3 types of medications</b>	3159	9.8	13.9
APD + Statin + ACEI/ARB	1270	12	16
APD + Statin + Beta-blocker	1798	6.5	10.6
APD+ ACEI/ARB + Beta-blocker	82	33.8	40.4
Statin + ACEI/ARB + Beta-blocker	9	50	50
<b>Patients on 4 types of medications (OMT)</b>	1162	10.3	15.4

# Clinical Outcomes at 10 Years According to the Different Criteria of OMT Status Before and After Propensity-Score Adjustment

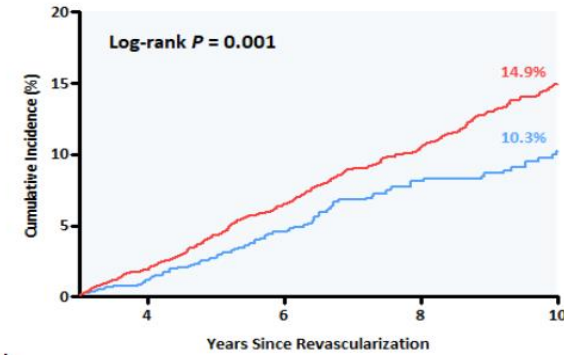
A. All-Cause Death (Crude)



No. at risk

— Non-OMT4	7,149	6,169	4,670	3,623	2,217
— OMT4	1,162	1,099	852	656	350

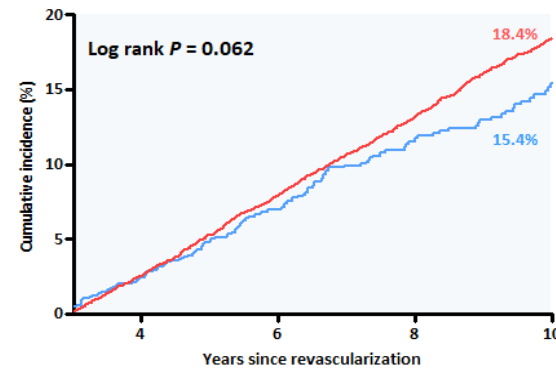
B. All-Cause Death (Matched Cohort)



No. at risk

— Non-OMT4	4,059	3,487	2,548	1,972	1,150
— OMT4	1,161	1,099	852	656	350

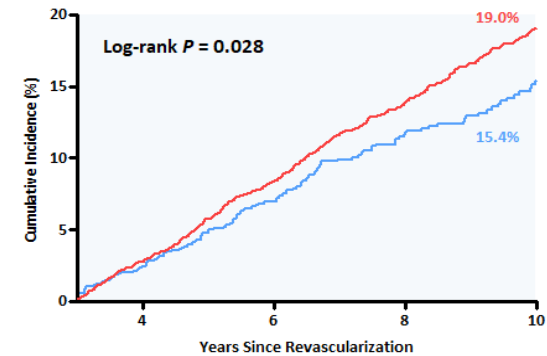
A. Death, Spontaneous MI, or Stroke (Crude)



No. at risk

— Non-OMT4	7,149	6,130	4,583	3,501	2,107
— OMT4	1,162	1,085	833	621	332

B. Death, Spontaneous MI, or Stroke (Matched Cohort)



No. at risk

— Non-OMT4	4,059	3,458	2,493	1,891	1,086
— OMT4	1,161	1,085	833	617	332

# Clinical Outcomes at 10 Years According to the Different Criteria of OMT Status Before and After Propensity-Score Adjustment

