OUTCOMES OF PATIENTS WITH MYOCARDIAL INFARCTION AND CARDIOGENIC SHOCK TREATED WITH CULPRIT VESSEL-ONLY VERSUS MULTIVESSEL PRIMARY PCI.

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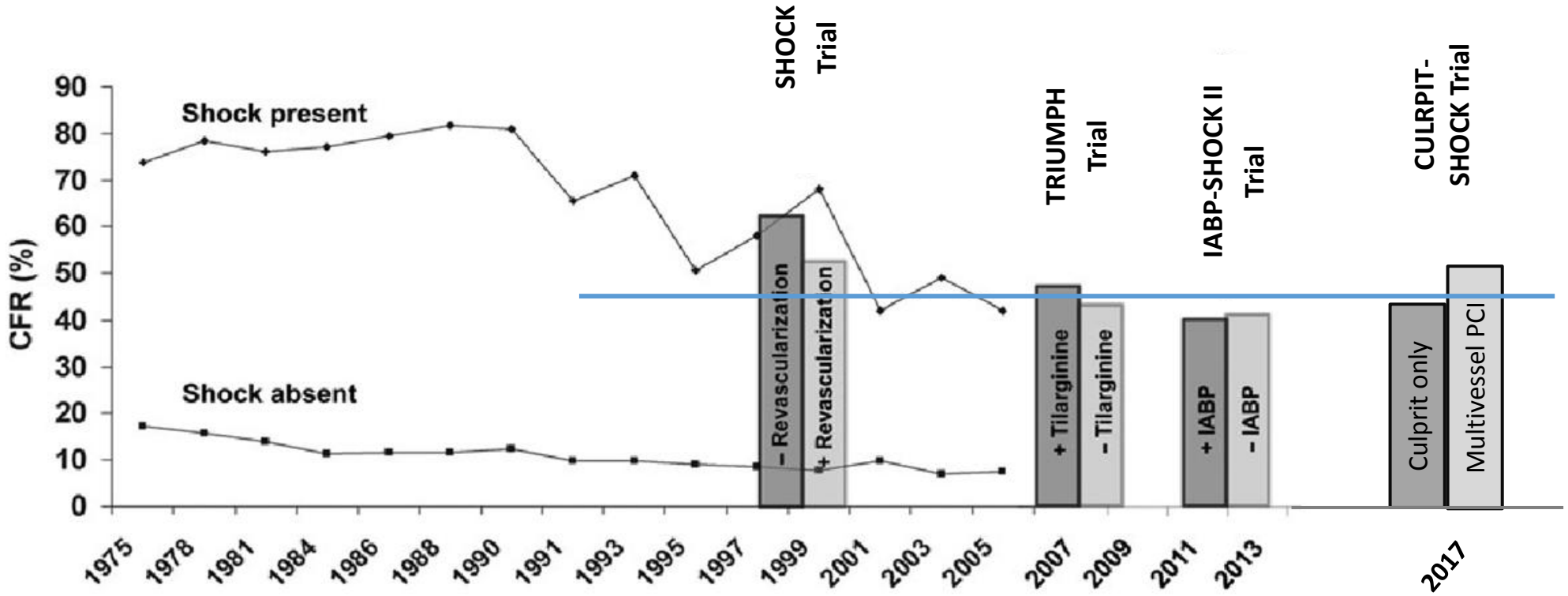
Introduction

Patients with ST elevation **myocardial infarction (STEMI) and cardiogenic shock (CS)** treated with primary percutaneous coronary intervention (pPCI) have high mortality.

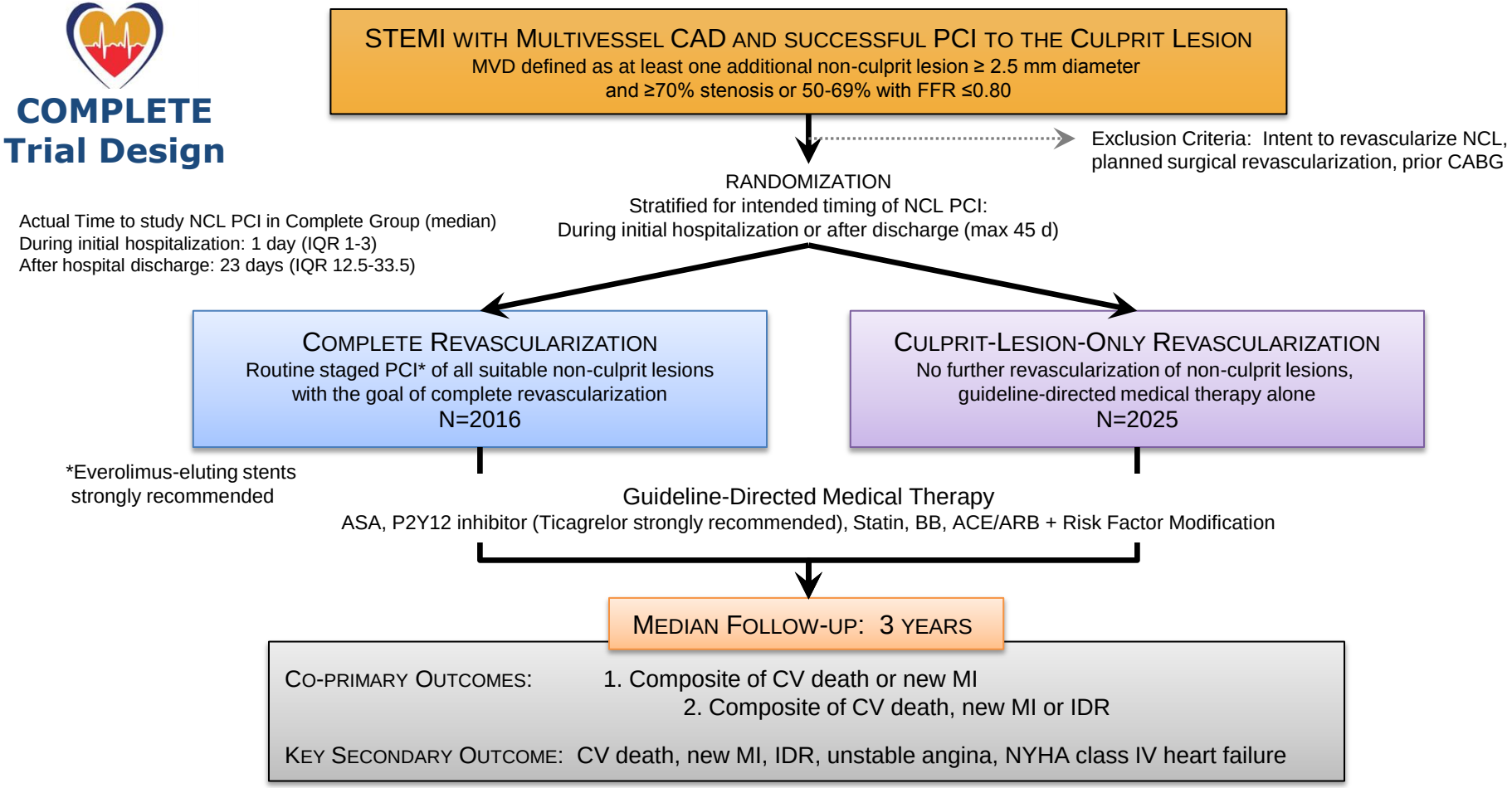
Evidence shows contradictory results in the superiority of culprit **vessel-only strategy (CV-pPCI)** compared to immediate **multivessel PCI (MV-pPCI)** for patients with STEMI and multivessel coronary artery disease (MVD) (CS vs non-CS patients).

Cardiogenic Shock - Mortality over Time



Thiele H et al. ESC 2023 Adapted from Werdan et al. Eur Heart J 2014;35:156-167

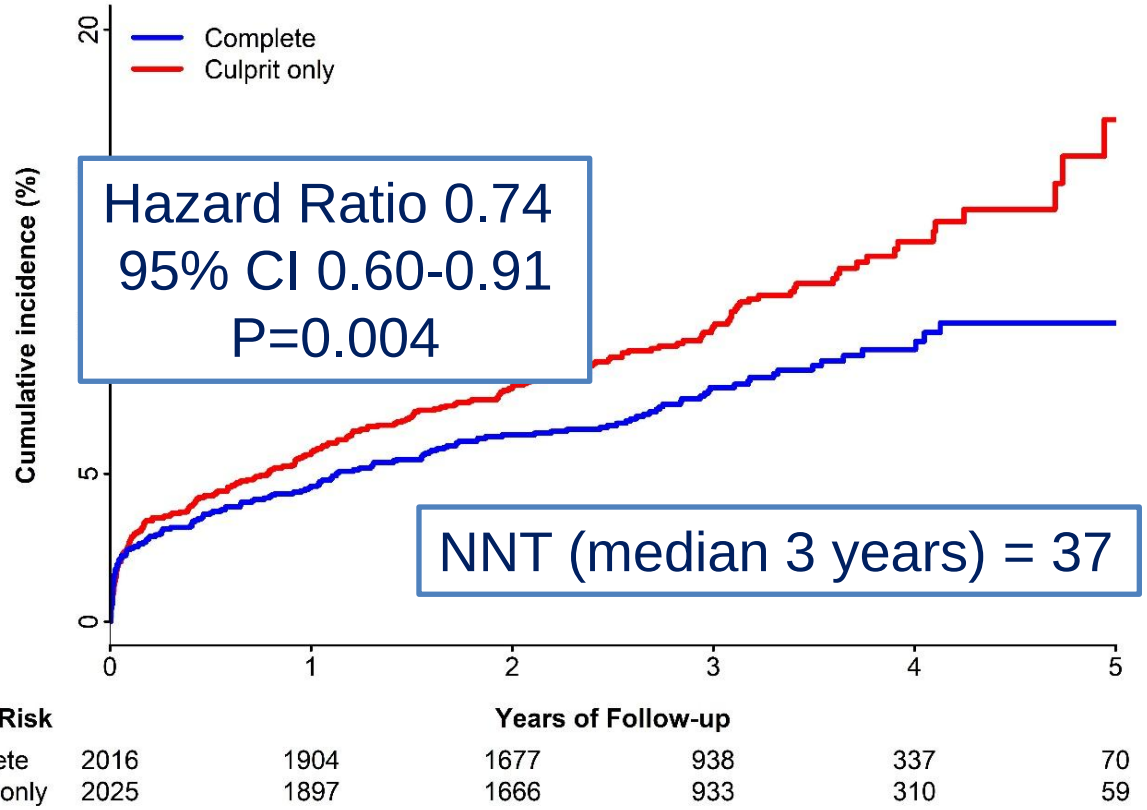
COMPLETE Trial Design



Mehta SR et al. *Am Heart J* 2019; 215:157-166.

Mehta et al.: NEJM 2019;381:1411-1421

First Co-Primary Outcome: CV Death or New MI



No. at Risk						
Complete	2016	1904	1677	938	337	70
Culprit only	2025	1897	1666	933	310	59

Mehta et al.: NEJM 2019;381:1411-1421

COMPLETE TRIAL

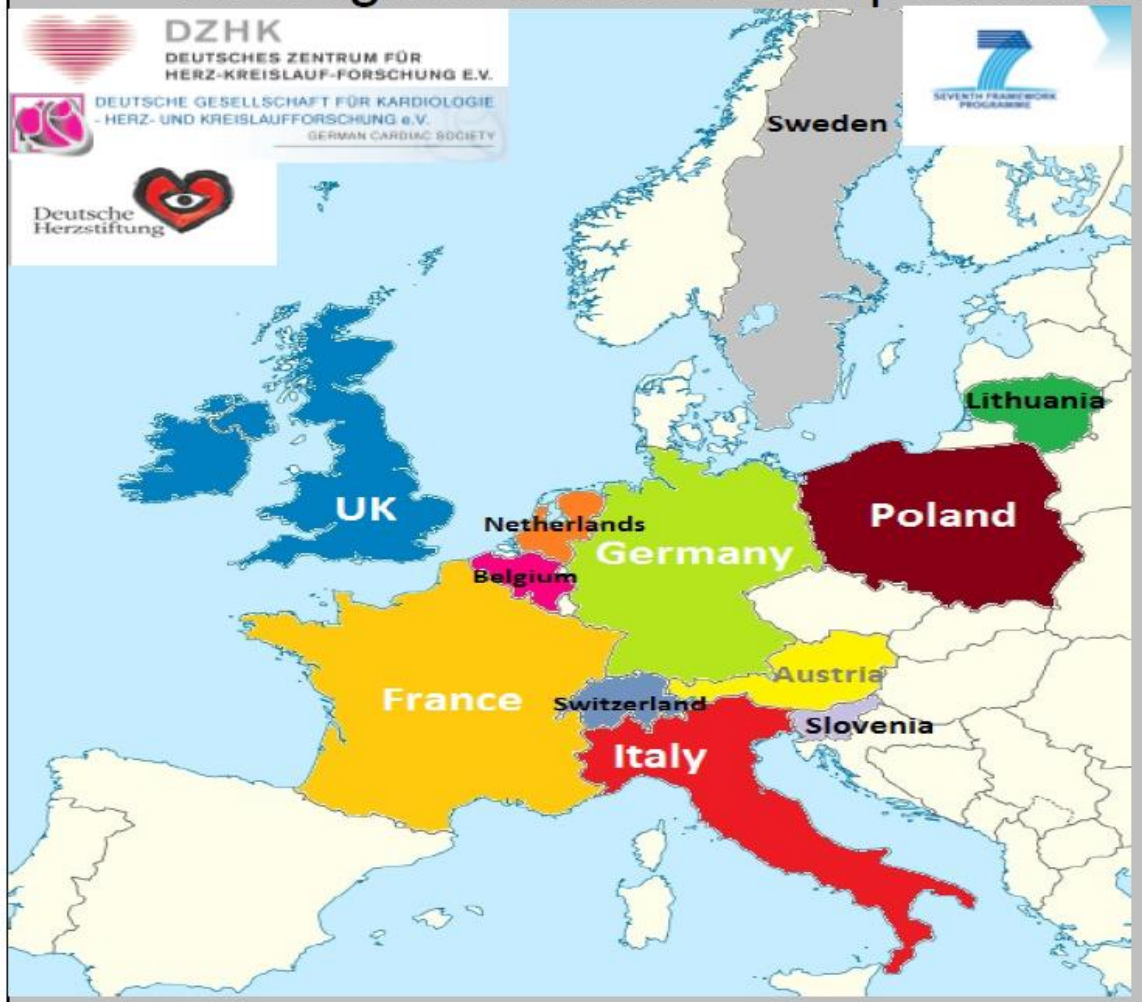
Efficacy Outcomes

	Complete Revasc. N=2016		Culprit Lesion Only N=2025		HR (95% CI)	P value
	N (%)	%/year	N (%)	%/year		
Co-Primary Outcomes						
CV death or MI	**158 (7.8)**	**2.7**	**213 (10.5)**	**3.7**	**0.74 (0.60-0.91)**	**0.004**
CV death, MI or IDR	**179 (8.9)**	**3.1**	**339 (16.7)**	**6.2**	**0.51 (0.43-0.61)**	**<0.001**
Key Secondary Outcome						
CV death, MI, IDR, unstable angina or class IV HF	272 (13.5)	4.9	426 (21.0)	8.1	0.62 (0.53-0.72)	<0.001
Other Secondary Outcomes						
MI	109 (5.4)	1.9	160 (7.9)	2.8	0.68 (0.53-0.86)	0.002
IDR	29 (1.4)	0.5	160 (7.9)	2.8	0.18 (0.12-0.26)	<0.001
Unstable Angina	70 (3.5)	1.2	130 (6.4)	2.2	0.53 (0.40-0.71)	<0.001
CV death	59 (2.9)	1.0	64 (3.2)	1.0	0.93 (0.65-1.32)	0.68
All-cause Death	96 (4.8)	1.6	106 (5.2)	1.7	0.91 (0.69-1.20)	0.51

Mehta et al.: NEJM 2019;381:1411-1421

CULPRIT-SHOCK Trial

Investigator-initiated European multicenter trial; 1:1 randomization



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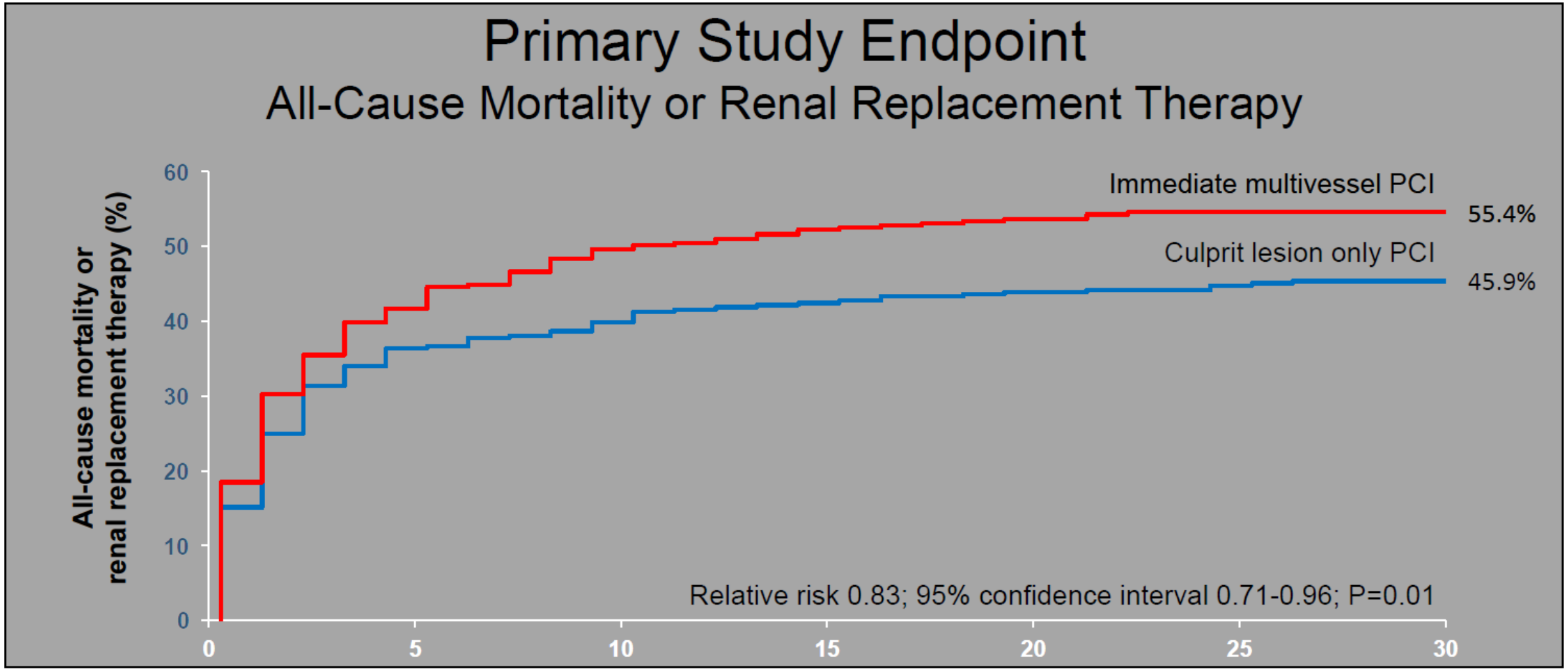
Thiele, Desch et al. Am Heart J. 2016;172:160-169, NEJM 2017, NEJM 2018.

Primary Study Endpoint

All-Cause Mortality or Renal Replacement Therapy



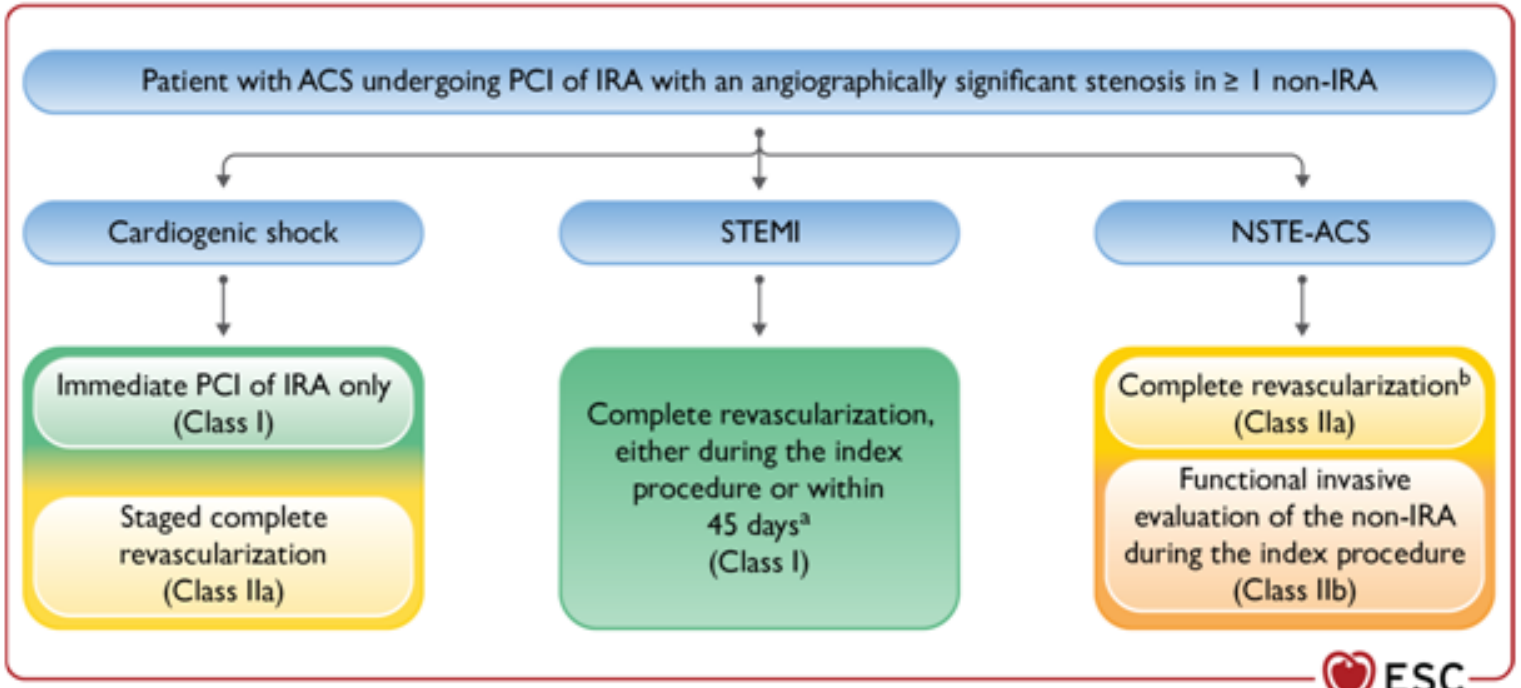
Number at risk:

Culprit lesion only PCI	344	219	207	198	192	189	184
Immediate multivessel PCI	341	199	172	162	156	153	152

New Engl J Med 2017;377:2419-2432.

Figure 14

Algorithm for the management of acute coronary syndrome patients with multivessel coronary artery disease



2023 ESC Guidelines for the management of acute coronary syndromes
(European Heart Journal; 2023 – doi: 10.1093/eurheartj/ehad191)

Aims

- To compare the characteristics and prognosis of patients with CS-STEMI and MVD treated with culprit **vessel-only pPCI vs. multivessel PCI** during the initial procedure, using data from:
  - the National Registry of Cardiovascular Interventions (NRCI),
  - National Registry of Paid Health Services,
  - and Registry of Death Records.

Methods

The National Registry of Cardiovascular Interventions (NRCI)

Prospective multicentre registry on all PCIs performed from all 24 PCI centres in the Czech Republic since 2005

Data Linked with the **Registry of Deceased Persons**

From January 1st, 2016, to December 31st, 2020, **23,703 primary PCI patients with STEMI**

1,213 had Cardiogenic shock and multivessel coronary disease (MVD)

- 921 (75.9%) **treated with CV-pPCI**
- 292 (24.1%) **treated with MV-pPCI**

Baseline Characteristics

		All patients N (total %)	CV-pPCI N (%)	MV-pPCI N (%)	p
Total		1213 (100)	921 (75.9)	292 (24.1)	-
Male		896 (73.9)	668 (74.6)	228 (25.4)	< 0.001
Age years (mean ± SD)		68±11.4	68.1±11.2	66.2±11.4	0.780
	< 40	10 (0.8)	7 (70.0)	3 (30.0)	0.125
	40–49	62 (5.1)	39 (62.9)	23 (37.1)	
	50–59	196 (16.2)	144 (73.5)	52 (26.5)	
	60–69	405 (33.4)	313 (77.3)	92 (22.7)	
	70–79	342 (28.2)	260 (76.0)	82 (24.0)	
	≥ 80	198 (16.3)	158 (79.8)	40 (20.2)	
Previous PCI		183 (15.1)	148 (80.9)	35 (19.1)	0.890
Previous CABG		71 (5.9)	57 (80.3)	14 (19.7)	0.376
Chronic kidney disease/failure		87 (7.2)	63 (72.4)	24 (27.6)	0.426
After CPR		728 (60.0)	556 (76.4)	172 (23.6)	0.657
Artificial lung ventilation		821 (67.7)	615 (74.9)	206 (25.1)	0.227

PCI - percutaneous coronary intervention; CV -pPCI – culprit vessel only primary PCI, MV-pPCI – multivessel primary PCI; N- number; SD - standard deviation; CABG – coronary artery bypass grafting; CPR – cardiopulmonary resuscitation

Procedural characteristics

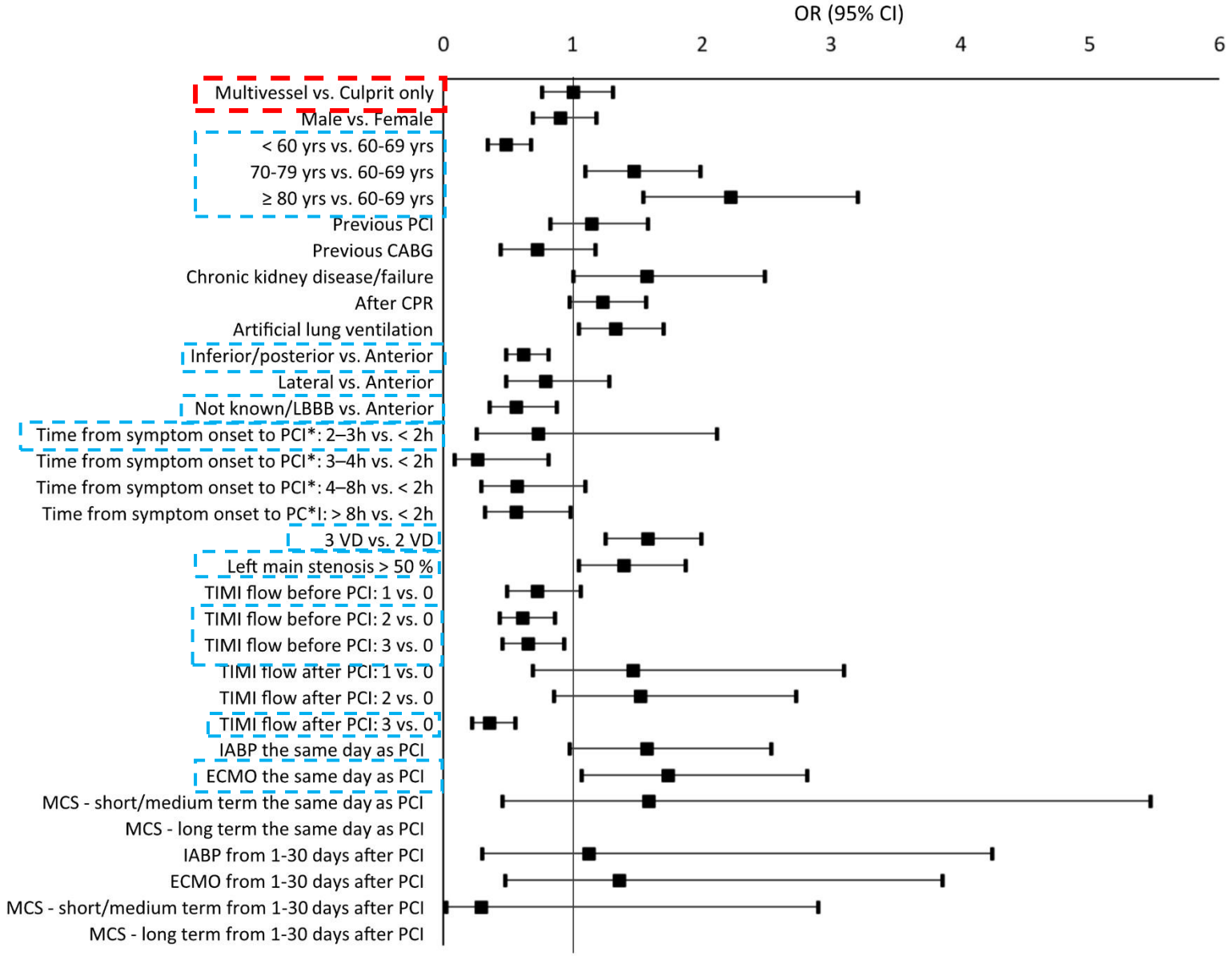
	All patients N (total %)	CV-pPCI N (%)	MV-pPCI N (%)	p
MI location				
Anterior	640 (52.8)	468 (73.1)	172 (26.9)	
Inferior/posterior	401 (33.1)	335 (83.5)	66 (16.5)	0.671
Lateral	95 (7.8)	65 (68.4)	30 (31.6)	
Not known/LBBB	77 (6.3)	53 (68.8)	24 (31.2)	-
No. of diseased vessels *				
1	0 (0.0)	0 (0.0)	0 (0.0)	-
2	547 (45.1)	445 (81.4)	102 (18.6)	< 0.001
3	666 (54.9)	476 (71.5)	190 (28.5)	
Left main stenosis > 50 %	239 (19.7)	149 (62.3)	90 (37.7)	< 0.001
TIMI flow after PCI				
0	110 (9.1)	63 (57.3)	47 (42.7)	
1	56 (4.6)	41 (73.2)	15 (26.8)	< 0.001
2	145 (12.0)	110 (75.9)	35 (24.1)	
3	902 (74.4)	707 (78.4)	195 (21.6)	
Procedures				
IABP the same day as PCI	78 (6.4%)	47 (5.1%)	31 (10.6%)	0.001
ECMO on the same day as PCI	80 (6.6%)	49 (5.3%)	31 (10.6%)	0.003
MCS - short/medium term the same day as PCI	11 (0.9%)	5 (0.5%)	6 (2.1%)	0.028
MCS - long-term the same day as PCI	0 (0.0%)	0 (0.0%)	0 (0.0%)	-
IABP from 1-30 days after PCI	9 (0.7%)	6 (0.7%)	3 (1.0%)	0.456
ECMO from 1-30 days after PCI	15 (1.2%)	8 (0.9%)	7 (2.4%)	0.062
MCS - short/medium term from 1-30 days after PCI	4 (0.3%)	1 (0.1%)	3 (1.0%)	0.045
MCS - long-term from 1-30 days after PCI	3 (0.2%)	1 (0.1%)	2 (0.7%)	0.146
Complications				
Vessel complications requiring surgery	5 (0.4)	2 (0.2)	3 (1.0)	0.094
Severe bleeding	3 (0.2)	2 (0.2)	1 (0.3)	0.563

All-cause mortality

	CV-pPCI	MV-pPCI
30- days mortality	50.5%	51.4%
1-year mortality	59.0%	61.3%

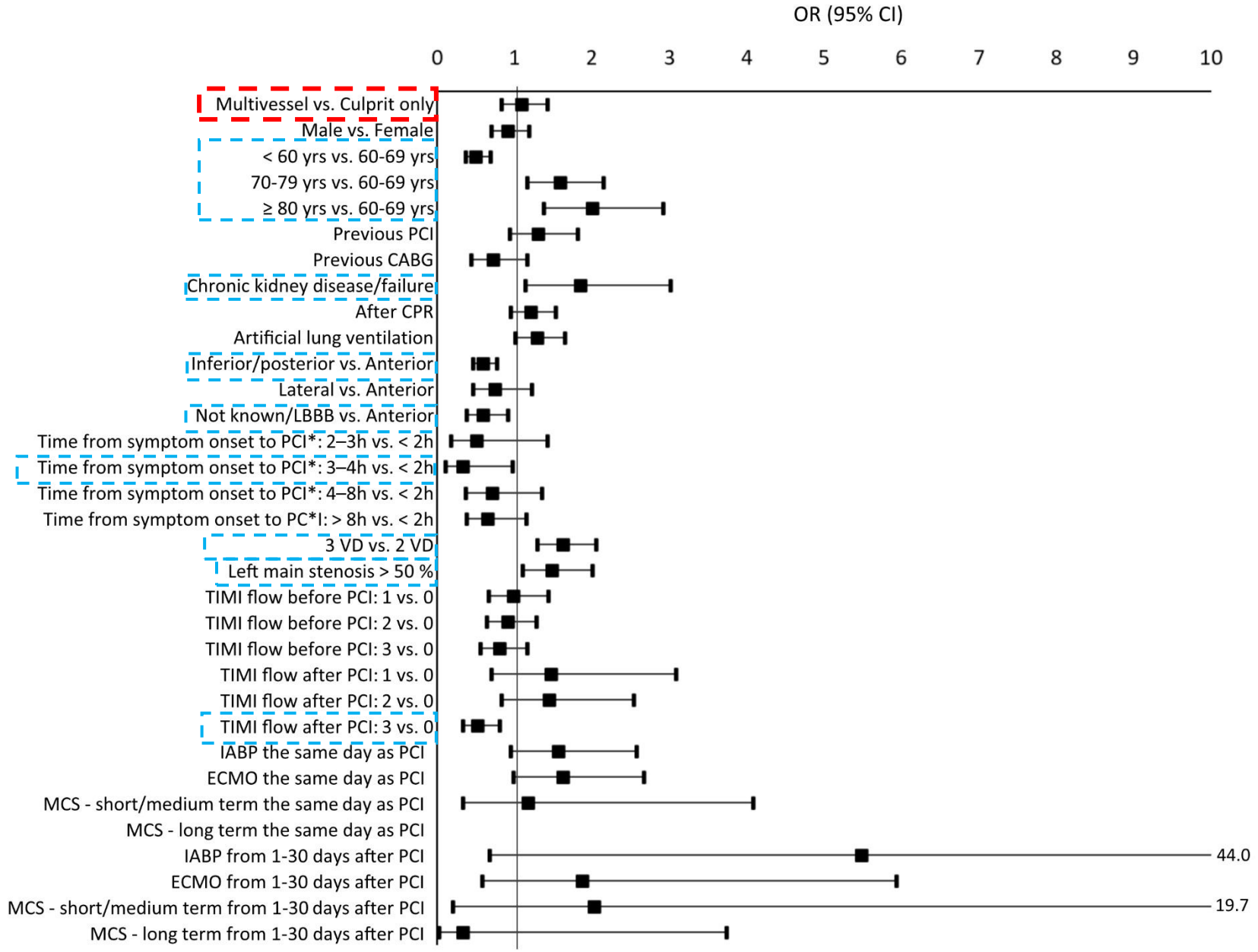
Predictors of 30-day all-cause mortality

Univariate logistic regression analysis



Predictors of 1-year all-cause mortality

Univariate logistic regression analysis



Predictors of 30-day and 1-year all-cause mortality

Multivariate logistic regression analysis

Predictor	30-days mortality		1-year mortality	
	OR (95% IS)	p	OR (95% IS)	p
Primary PCI	0.90 (0.68; 1.18)	0.439	0.99 (0.75; 1.30)	0.923
Gender	1.16 (0.89; 1.51)	0.273	1.15 (0.88; 1.51)	0.292
3VD vs. 2VD	1.60 (1.27; 2.03)	<0.001	1.64 (1.30; 2.07)	<0.001
Left main stenosis > 50 %	1.01 (1.00; 1.03)	0.139	1.02 (1.00; 1.04)	0.101
IABP the same day as PCI	1.48 (0.91; 2.40)	0.110	1.45 (0.88; 2.40)	0.147
ECMO on the same day as PCI	1.83 (1.12; 2.98)	0.016	1.70 (1.03; 2.81)	0.037

PCI- percutaneous coronary intervention; 3VD – 3-vessel disease; 2VD – 2-vessel disease; IABP – intra-aortic balloon pump; ECMO – extracorporeal membrane oxygenation.

Conclusions

Our data from a large all-comers registry suggests that selective use of MV-pPCI does not increase the mortality rate in patients with CS-STEMI and MVD compared to CV-pPCI.

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Original Article

Outcomes of patients with myocardial infarction and cardiogenic shock treated with culprit vessel-only versus multivessel primary PCI

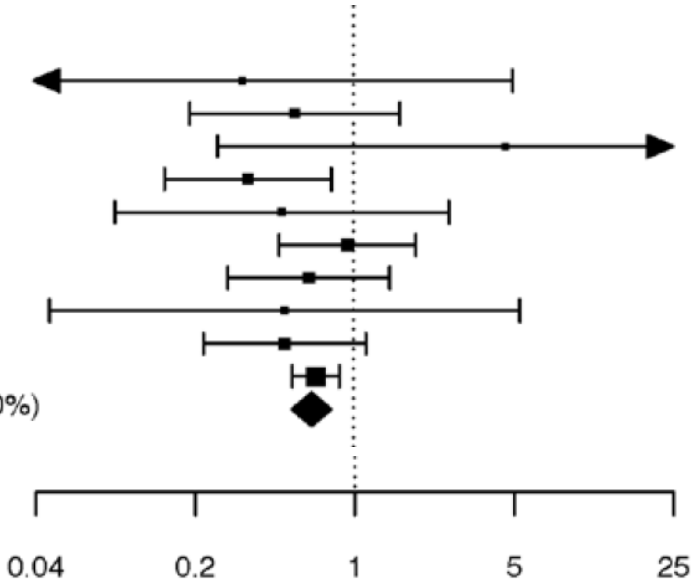
Ota Hlinomaz [1], Zuzana Motovska [2, *], Petr Kala [3], Milan Hromadka [4], Jan Precek [5], Jan Mrozek [6], Pavel Červinka [7], Jiri Kettner [8], Jan Matejka [9], Ahmad Zohoor [10], Josef Bis [11], Jiri Jarkovsky [12, 13]

Hlinomaz O, Motovska Z, Kala P, Hromadka M, Precek J, Mrozek J, Červinka P, Kettner J, Matejka J, Zohoor A, Bis J, Jarkovsky J. Outcomes of patients with myocardial infarction and cardiogenic shock treated with culprit vessel-only versus multivessel primary PCI. Hellenic J Cardiol. 2023 Aug 24: S1109-9666(23)00146-X. doi: 10.1016/j.hjc.2023.08.009. Epub ahead of print. PMID: 37633488.

STEMI and MVD – non-shock patients

Infarkt myokardu

Study and Year	Active Events	N	Control Events	N	Relative risk [95% CI]
Unstable CAD – Multivessel disease following STEMI					
Help–AMI, 2009	1	52	1	17	0.33 [0.02, 4.95]
Politi, 2010	6	130	7	84	0.55 [0.19, 1.59]
Dambrink, 2012	4	79	0	40	4.61 [0.25, 83.61]
PRAMI, 2013	7	234	20	231	0.35 [0.15, 0.80]
CvLPRIT, 2015	2	150	4	146	0.49 [0.09, 2.62]
DANAMI 3, 2015	15	313	16	314	0.94 [0.47, 1.87]
Zhang, 2015	9	215	14	213	0.64 [0.28, 1.44]
Hamza, 2016	1	50	2	50	0.50 [0.05, 5.34]
Compare ACUTE, 2017	7	295	28	590	0.50 [0.22, 1.13]
Complete, 2019	109	2016	160	2025	0.68 [0.54, 0.87]
Multivessel disease following STEMI studies (**p < 0.0001**, Q = 6.10, df = 9, p for heterogeneity = 0.73; I^2 = 0.0%)					0.66 [0.54, 0.80]



Celková mortalita 0,84 (0,69-1,04); p=0,11

KV mortalita 0,68 (0,47-0,98); p=0,04

Chacko L et al.: Circ Cardiovasc Qual Outcomes 2020;13

COMPLETE TRIAL

Procedural Characteristics

	Complete N=2016	Culprit-only N=2025
Index PCI for STEMI		
Primary	**91.9%**	**93.1%**
Pharmaco-invasive	**3.2%**	**3.0%**
Rescue	**4.9%**	**3.9%**
Radial access	**80.8%**	**80.7%**
Residual diseased vessels		
1	**76.1%**	**77.1%**
≥2	**23.9%**	**22.9%**
NCL location		
Left main	**0.4%**	**0.1%**
LAD	**38.0%**	**41.2%**
Proximal LAD	**9.8%**	**10.4%**
Mid LAD	**21.7%**	**23.7%**
Circumflex	**36.4%**	**35.6%**
RCA	**25.3%**	**23.2%**

	Complete N=2016	Culprit-only N=2025
NCL diameter	**2.8 mm**	**2.9 mm**
Mean NCL stenosis (visual)	**79.3%**	**78.7%**
NCL stenosis (visual)		
50-69% and FFR<0.80	**0.8%**	**0.6%**
70-79%	**41.3%**	**45.1%**
80-89%	**33.5%**	**32.6%**
90-99%	**22.3%**	**19.7%**
100%	**2.1%**	**2.0%**
SYNTAX score (Core Lab)		
Baseline	**16.3**	**16.0**
Culprit lesion specific	**8.8**	**8.6**
Non-culprit lesion specific	**4.5**	**4.5**
Residual (after index PCI)	**7.2**	**7.0**

Complete revascularization was achieved in 90.1% after NCL PCI

COMPLETE TRIAL

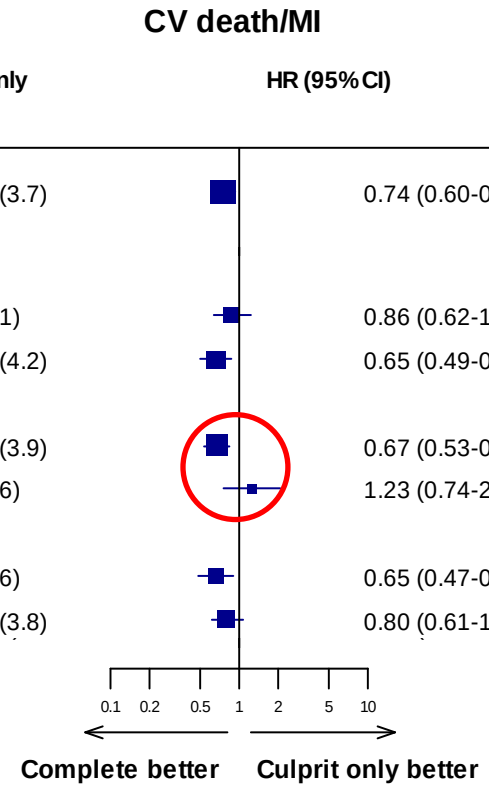
Sub-types of MI

	Complete Revasc. N=2016		Culprit Lesion Only N=2025		HR (95% CI)
	N (%)	%/year	N (%)	%/year	
Subtype of MI					
NSTEMI	66 (3.27)	1.11	105 (5.19)	1.78	0.63 (0.46-0.85)
STEMI	43 (2.13)	0.72	53 (2.62)	0.88	0.81 (0.54-1.22)
Universal MI Definition					
Type 1	63 (3.13)	1.05	128 (6.32)	2.17	0.49 (0.36-0.66)
Type 2	16 (0.79)	0.26	13 (0.64)	0.21	1.24 (0.60-2.58)
Type 3	4 (0.20)	0.07	1 (0.05)	0.02	4.04 (0.45-36.17)
Type 4a	16 (0.79)	0.27	8 (0.40)	0.13	2.01 (0.86-4.70)
Type 4b	8 (0.40)	0.13	13 (0.64)	0.21	0.62 (0.26-1.49)
Type 5	1 (0.05)	0.02	1 (0.05)	0.02	1.00 (0.06-15.92)

Mehta et al.: NEJM 2019;381:1411-1421

Main Pre-Defined Subgroup Analyses

Subgroup	Complete	Culprit only	HR (95% CI)	P value for Interaction
	no. of events/total no. (%/yr)			
Overall	158/2016 (2.7)	213/2025 (3.7)	0.74 (0.60-0.91)	
Main pre-defined:				
Proximal/mid LAD non-culprit stenosis				0.2
Presence	64/820 (2.7)	78/849 (3.1)	0.86 (0.62-1.20)	
Absence	87/1097 (2.7)	129/1085 (4.2)	0.65 (0.49-0.85)	
Non-culprit stenosis severity ≥ 80% visual or ≥ 60% core lab				0.033
Presence	127/1668 (2.6)	183/1631 (3.9)	0.67 (0.53-0.84)	
Absence	31/346 (3.2)	29/392 (2.6)	1.23 (0.74-2.04)	
Residual SYNTAX score				0.32
<6(median)	60/885 (2.3)	90/870 (3.6)	0.65 (0.47-0.90)	
≥ 6(median)	91/1033 (3.0)	117/1070 (3.8)	0.80 (0.61-1.05)	



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