The Impact of Cardiogenic Shock and Out-of-Hospital Cardiac Arrest on the Outcome of Acute Myocardial Infarction. National Level Analysis.

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Background

The number of AMIs complicated by CS and OHCA have an upward trend

Both complications increase the mortality of patients with AMI

Background

CS complicates up to 10% of AMIs

RCTs report 30-day mortality rates as high as 40-60%

OHCA prevalence in AMI patients treated by primary PCI varies greatly but can reach 30% in specific settings

30-day mortality rates can exceed 35%

Background

OHCA shifts the most frequent cause of death from primary cardiac reasons to neurological injury

The impact of cardiac arrest on AMI-related CS patients:

increased short-term mortality risk with a diminishing effect over time

Unclear effect of risk for CS development due to CA

Objective

To provide a national level analysis of predictors of CS and OHCA in AMI patients and their effect on mortality based on all-comers national registry

Methods

The analysis is based on data from the National Registry of Cardiovascular Surgery and Interventions (NRCSI) in the Czech Republic combined with data from the National registry of Deaths for mortality analysis

The 2016-2020 period was chosen for standardized registry data, and 23,703 patients with STEMI were analyzed

Results

		Acute STEMI after OHCA [1]			Acute STEMI without OHCA			Statistical significance of difference according to CS and resuscitation			
		1)Cardiogenic shock: no	2)Cardiogenic shock: yes	1 vs. 2 p[2]	3)Cardiogenic shock: no	4)Cardiogenic shock: yes	3 vs 4 p[2]	1 vs 3 p[2]	2 vs 4 p[2]	2 vs 3 p[2]	1 vs 4 p[2]
Total		2 262 (100.0%)	1 138 (100.0%)		19 590 (100.0%)	713 (100.0%)					
Gender	Men	1 676 (74.1%)	870 (76.4%)	0.134	13 991 (71.4%)	486 (68.2%)	0.062	**0.007**	**<0.001**	**<0.001**	**0.002**
	Women	586 (25.9%)	268 (23.6%)		5 599 (28.6%)	227 (31.8%)					
Age	Mean ± SD	62.0 ± 12.6	64.6 ± 12.3	**<0.001**	64.0 ± 12.6	68.8 ± 11.8	**<0.001**	**<0.001**	**<0.001**	0.072	**<0.001**
	< 40	73 (3.2%)	24 (2.1%)	**<0.001**	431 (2.2%)	4 (0.6%)	**<0.001**	**<0.001**	**<0.001**	0.070	**<0.001**
	40–49	317 (14.0%)	114 (10.0%)		2 268 (11.6%)	36 (5.0%)					
	50–59	549 (24.3%)	223 (19.6%)		4 313 (22.0%)	113 (15.8%)					
	60–69	677 (29.9%)	387 (34.0%)		5 930 (30.3%)	212 (29.7%)					
	70–79	446 (19.7%)	258 (22.7%)		4 384 (22.4%)	201 (28.2%)					
	≥ 80	200 (8.8%)	132 (11.6%)		2 264 (11.6%)	147 (20.6%)					

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Total		2 262 (100.0%)	1 138 (100.0%)		19 590 (100.0%)	713 (100.0%)					
Diabetes mellitus		396 (17.5%)	202 (17.8%)	0.86	3 246 (16.6%)	178 (25.0%)	**<0.001**	0.260	**<0.001**	0.302	**<0.001**
Previous PCI		295 (13.0%)	167 (14.7%)	0.192	2 716 (13.9%)	134 (18.8%)	<0.001	0.279	**0.020**	0.446	**<0.001**
Previous CABG		65 (2.9%)	44 (3.9%)	0.126	524 (2.7%)	38 (5.3%)	**<0.001**	0.584	0.140	**0.024**	**0.003**
Chronic kidney disease		49 (2.2%)	59 (5.2%)	**<0.001**	536 (2.7%)	43 (6.0%)	**<0.001**	0.102	0.440	**<0.001**	**<0.001**
Mechanical ventilation		1 631 (72.1%)	1 059 (93.1%)	**<0.001**	432 (2.2%)	194 (27.2%)	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Infarct related artery	LMS	54 (2.4%)	156 (13.7%)	**<0.001**	291 (1.5%)	104 (14.6%)	**<0.001**	**0.002**	0.597	**<0.001**	**<0.001**
	LAD	1 100 (48.6%)	611 (53.7%)	**0.005**	8 571 (43.8%)	366 (51.3%)	**<0.001**	**<0.001**	0.323	**<0.001**	0.208
	LCX	486 (21.5%)	279 (24.5%)	**0.047**	3 442 (17.6%)	163 (22.9%)	**<0.001**	**<0.001**	0.415	**<0.001**	0.440
	RCA	780 (34.5%)	309 (27.2%)	**<0.001**	8 178 (41.7%)	229 (32.1%)	**<0.001**	**<0.001**	**0.023**	**<0.001**	0.243

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Total		2 262 (100.0%)	1 138 (100.0%)		19 590 (100.0%)	713 (100.0%)					
TIMI flow before treatment *(the lowest value of all treated lesions)*	0	1 167 (51.6%)	714 (62.7%)	**<0.001**	10 279 (52.5%)	486 (68.2%)	**<0.001**	**0.015**	0.096	**<0.001**	**<0.001**
	1	186 (8.2%)	120 (10.5%)		1 663 (8.5%)	71 (10.0%)					
	2	453 (20.0%)	159 (14.0%)		3 403 (17.4%)	80 (11.2%)					
	3	456 (20.2%)	145 (12.7%)		4 245 (21.7%)	76 (10.7%)					
TIMI flow after treatment *(the lowest value of all treated lesions)*	0	84 (3.7%)	82 (7.2%)	**<0.001**	383 (2.0%)	61 (8.6%)	**<0.001**	**<0.001**	**0.021**	**<0.001**	**<0.001**
	1	29 (1.3%)	41 (3.6%)		158 (0.8%)	41 (5.8%)					
	2	120 (5.3%)	116 (10.2%)		866 (4.4%)	90 (12.6%)					
	3	2 029 (89.7%)	899 (79.0%)		18 183 (92.8%)	521 (73.1%)					

Procedures

Results

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Total	2 262 (100.0%)	1 138 (100.0%)		19 590 (100.0%)	713 (100.0%)					
Mechanical ventilation	1 631 (72.1%)	1 059 (93.1%)	**<0.001**	432 (2.2%)	194 (27.2%)	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Procedures										
IABP the same day as PCI	12 (0.5%)	78 (6.9%)	**<0.001**	33 (0.2%)	45 (6.3%)	**<0.001**	**0.002**	0.647	**<0.001**	**<0.001**
ECMO the same day as PCI	14 (0.6%)	87 (7.6%)	**<0.001**	19 (0.1%)	21 (2.9%)	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
MCS - short/medium term the same day as PCI	0 (0.0%)	10 (0.9%)	**<0.001**	7 (0.0%)	5 (0.7%)	**<0.001**	0.216	0.676	**<0.001**	**<0.001**
MCS - long term the same day as PCI	0 (0.0%)	0 (0.0%)	-	0 (0.0%)	0 (0.0%)	-	-	-	-	-
IABP from 1-30 days after PCI	8 (0.4%)	7 (0.6%)	0.290	34 (0.2%)	8 (1.1%)	**<0.001**	0.093	0.244	**0.008**	**0.024**
ECMO from 1-30 days after PCI	11 (0.5%)	21 (1.8%)	**<0.001**	22 (0.1%)	6 (0.8%)	**<0.001**	**<0.001**	0.068	**<0.001**	0.294
MCS - short/medium term from 1-30 days after PCI	2 (0.1%)	5 (0.4%)	**0.040**	11 (0.1%)	2 (0.3%)	0.082	0.575	0.580	**0.001**	0.260
MCS - long term from 1-30 days after PCI	1 (0.0%)	3 (0.3%)	0.089	6 (0.0%)	2 (0.3%)	**0.028**	0.745	0.946	**0.010**	0.118

Results

CS+ OHCA- patients were the oldest and had more comorbidities

CS- OHCA+ patients were the youngest and had fewer comorbidities

Infarct related artery supplying a large myocardial mass was more common in CS+ patients

Results

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Total	2 262 (100.0%)	1 138 (100.0%)		19 590 (100.0%)	713 (100.0%)					
Mortality at 30 days	239 (10.6%)	549 (48.2%)	**<0.001**	776 (4.0%)	305 (42.8%)	**<0.001**	**<0.001**	**0.008**	**<0.001**	**<0.001**
Mortality at 1 year	387 (17.1%)	660 (58.0%)	<0.001	1 645 (8.4%)	387 (54.3%)	<0.001	<0.001	0.116	<0.001	<0.001

Results

CS predicted 30-day mortality

OR (95% CI) 5.515 (4.506; 6.751) for OHCA+

OR (95% CI) 9.275 (7.562; 11.376) for OHCA-

CS predicted 1-year mortality

OR (95% CI) 4.659 (3.870; 5.609) for OHCA+

OR (95% CI) 7.329 (6.040; 8.892) for for OHCA-

Figure 1a Mortality of patients according to cardiogenic shock and OHCA (30 days)

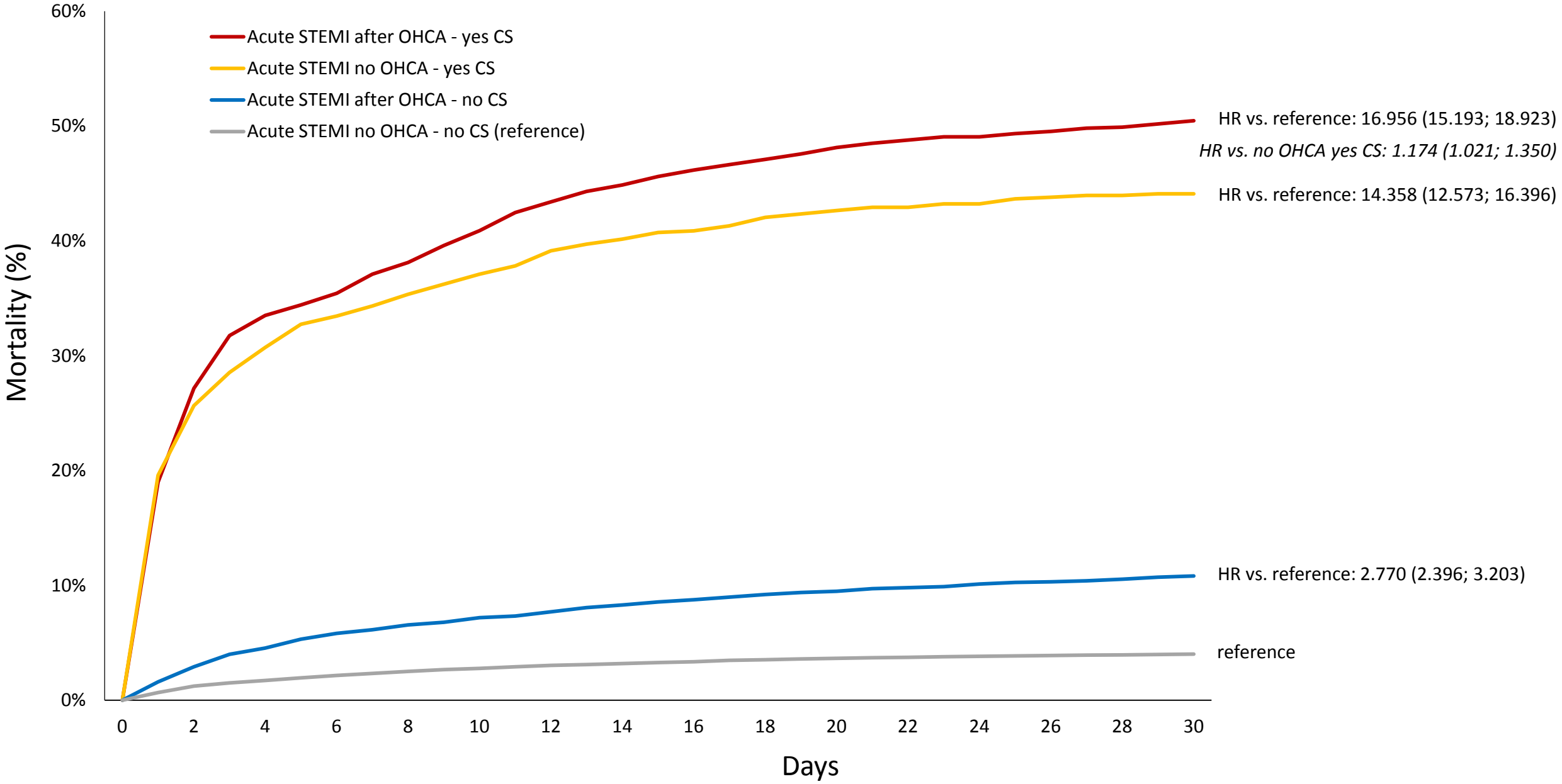


Figure 1b Mortality of patients according to cardiogenic shock and OHCA (1 year)

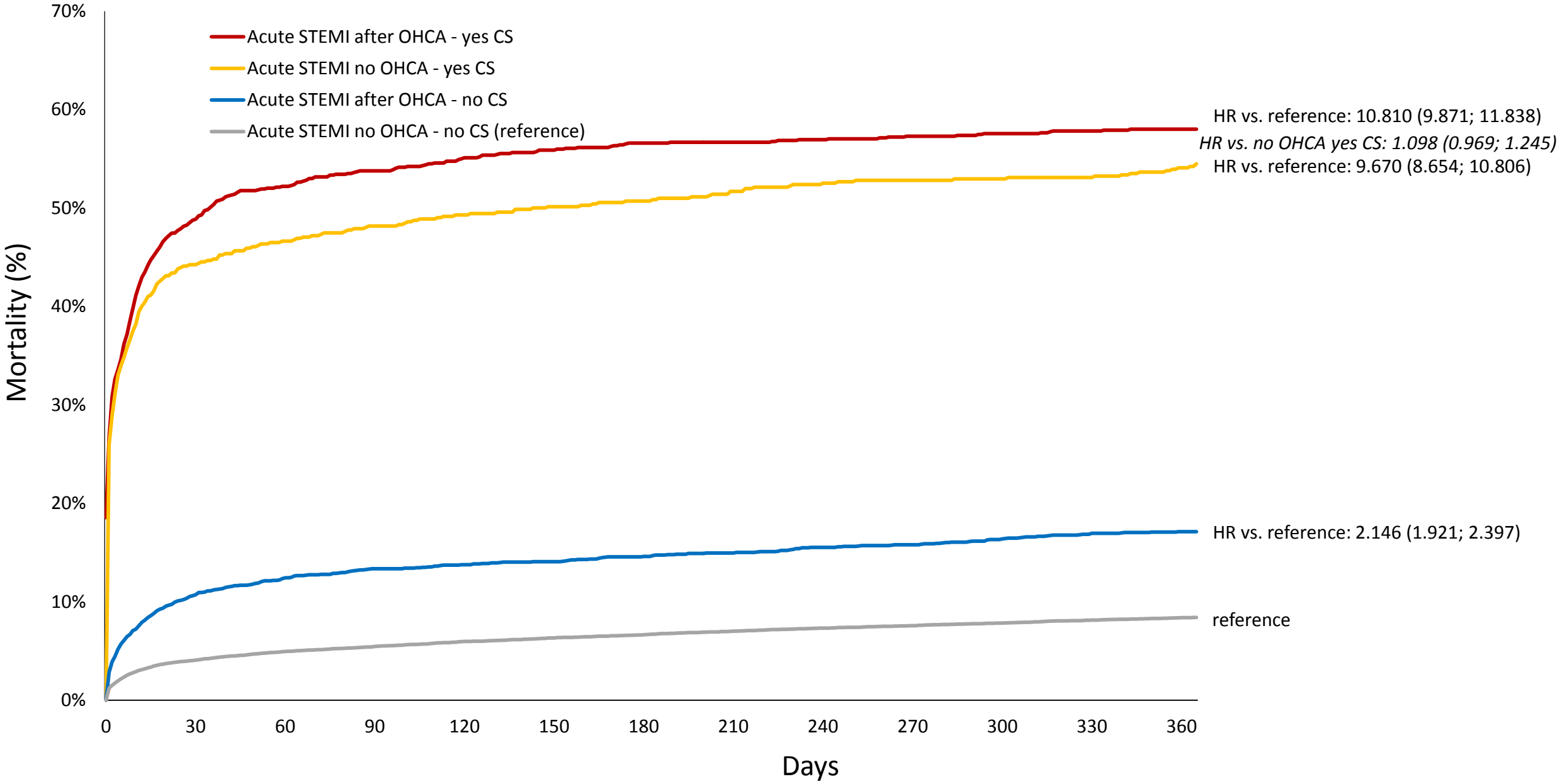
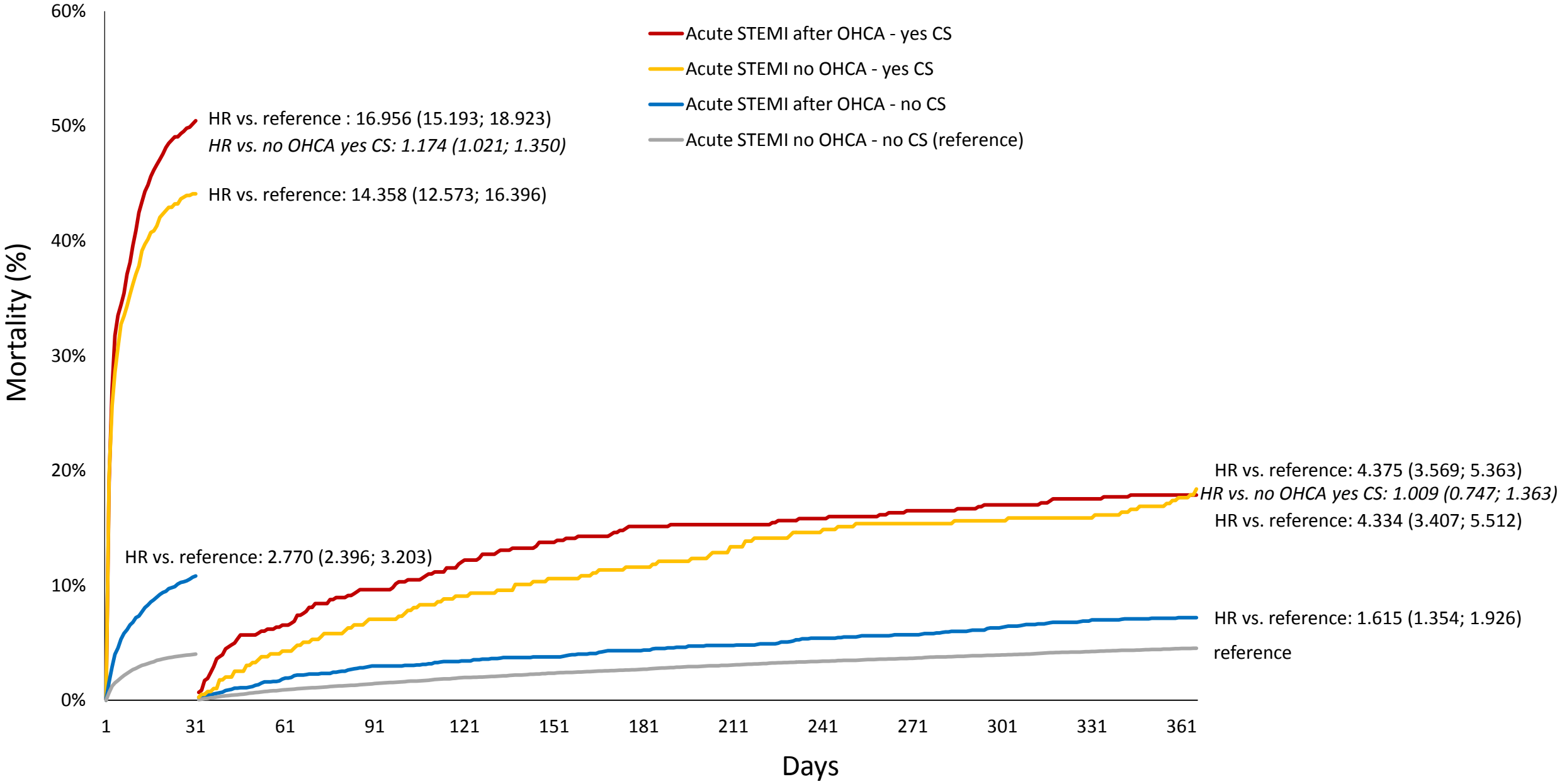


Figure 1c Mortality of patients according to cardiogenic shock and OHCA (landmark analysis 30 days and 31days-1 year)



Conclusion

OHCA significantly altered the 30-day mortality risk for both patients with and without CS with a diminishing impact at 1-year

CS is a strong predictor of both 30-day and 1-year mortality in STEMI, irrespective of OHCA

STEMI patients after OHCA and CS at admission are at the highest risk of death

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