VŠEOBECNÁ FAKULTNÍ NEMOCNICE V PRAZE

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HEART RECOVERY IS DETERMINED BY THE RHYTHM DURING CPR

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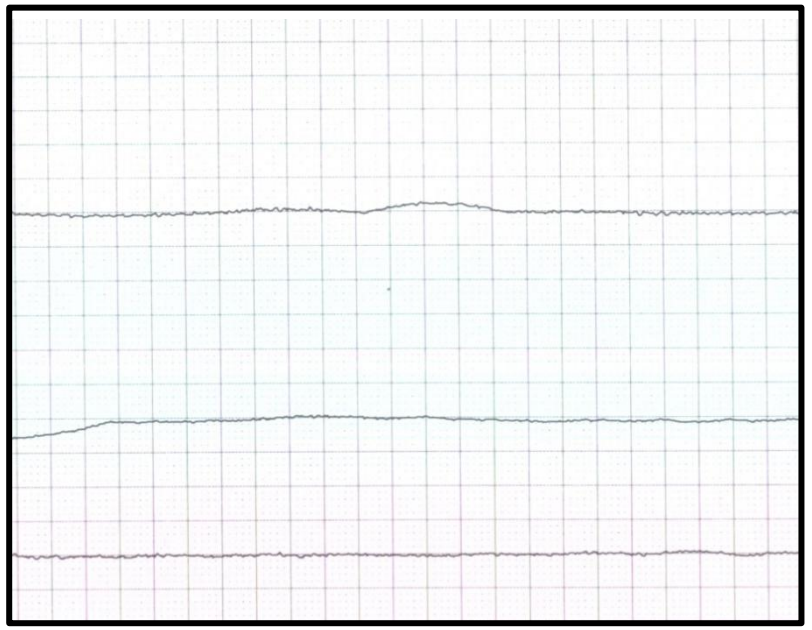
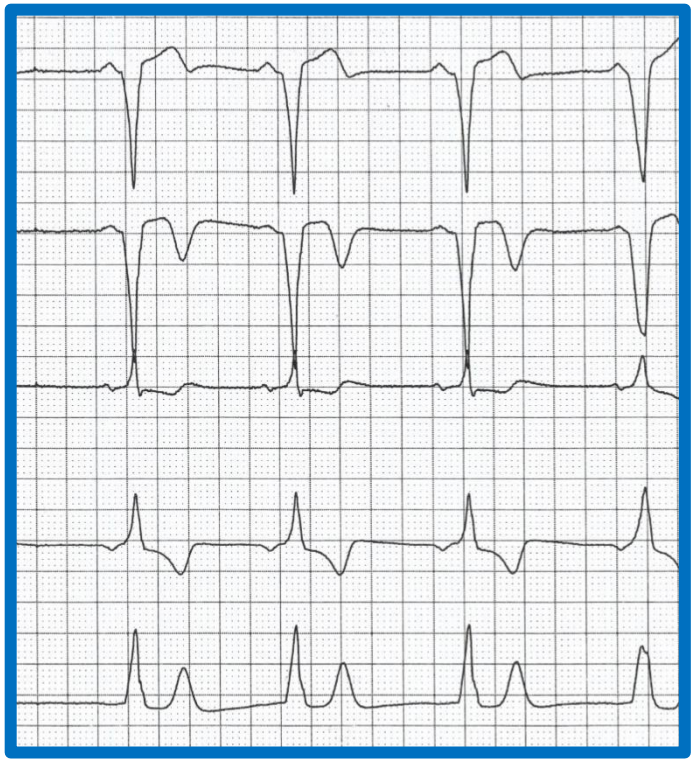
Shockable and Non-shockable rhythms



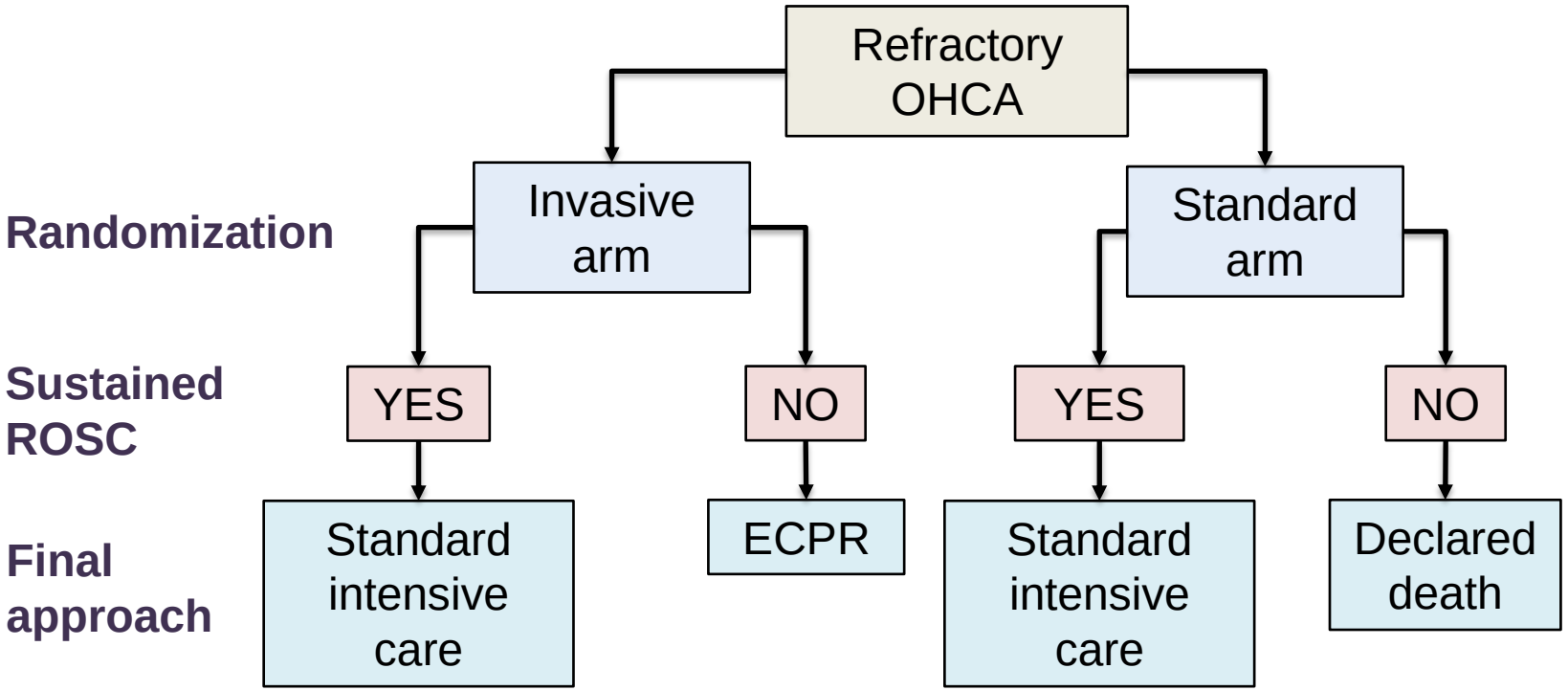


Source: Archives 2nd Internal Dpt. 1st Faculty of Medicine, Charles University and General University Hospital in Prague.

Outcomes and Initial Heart Rhythm

Post-hoc analysis of Prague OHCA trial

Prague OHCA trial



	No. (%)			
	Invasive strategy (n = 124)	Standard strategy (n = 132)	Absolute difference, % (95% CI)	*P* value
Primary outcome				
Survival with minimal or no neurologic impairment at 180 d[a]	39 (31.5)	29 (22.0)	9.5 (−1.3 to 20.1)	.09
Secondary outcomes				
Survival with minimal or no neurologic impairment at 30 d[a]	38 (30.6)	24 (18.2)	12.4 (1.9 to 22.7)	.02
Cardiac recovery at 30 d[b]	54 (43.5)	45 (34.1)	9.4 (−2.5 to 21)	.12

Belohlavek J., et al. JAMA 2022;327:737-47.

Baseline clinical and demographical data

Initial rhythm	VF (n = 156)	PEA (n = 45)	Asystole (n = 55)	P
Age (years)	56 (45-64)	62 (54; 66)	58 (47; 69)	0.07
Gender (Male)	141 (90 %)	31 (69 %)	40 (73 %)	0.0003
Bystander CPR	154 (99 %)	44 (98 %)	54 (98 %)	0.89
Dispatcher assisted CPR	133 (85 %)	24 (53 %)	46 (84 %)	<0.0001
Randomized to				
Standard	84 (54 %)	24 (53 %)	24 (44 %)	0.41
Invasive	72 (46 %)	21 (47 %)	31 (56 %)	
Time of CPR (time to ROSC or ECLS) (min)	54 (33; 69)	50 (42; 68)	56 (37; 67)	0.62
Declared death	33 (21 %)	20 (44 %)	22 (40 %)	0.0015
Prehospital	20/33 (61 %)	12/20 (60 %)	14/22 (64 %)	0.009
Within 1 hour of admission	13/33 (39 %)	8/20 (40 %)	8/22 (36 %)	0.15
ECLS implanted	57 (37 %)	17 (38 %)	18 (33 %)	0.85
Laboratory values on admission				
pH	7.00 (6.87-7.17)	6.85 (6.75; 6.97)	6.85 (6.77; 6.99)	<0.0001
Lactate (mmol/L)	10.7 (7.8-13.8)	13.1 (11.1; 17.0)	13.9 (8.9; 18.0)	0.001
Cause of cardiac arrest (including autopsy findings)				
Acute coronary syndrome	89 (57 %)	15 (33 %)	23 (42 %)	<0.0001
Chronic coronary artery disease	29 (19 %)	1 (2 %)	2 (4 %)	
Pulmonary embolism	1 (1 %)	15 (33 %)	8 (15 %)	
Chronic heart failure	8 (5 %)	2 (4 %)	4 (7 %)	
Cardiomyopathy	7 (5 %)	1 (2 %)	1 (2 %)	
Unknown	6 (4 %)	3 (7 %)	6 (11 %)	
Primary endpoint	63 (40 %)	3 (7 %)	2 (4 %)	<0.0001

Havranek S., et al. Resuscitation 2022;181:289-96.

Primary and secondary endpoints

Parameter	Shockable rhythm (N = 156)	Non-shockable rhythm (N = 100)	P value
Primary outcome			
Survival with CPC at 180 days			
1 or 2	63 (40.4 %)	5 (5 %)	<0.001
≥3	93 (59.6 %)	95 (95 %)	
Secondary outcomes			
Cardiac recovery at 30 days			
Yes	84 (53.8 %)	15 (15 %)	<0.001
No	72 (46.2 %)	85 (85 %)	
Neuro recovery at 30 days			
Yes	58 (37.2 %)	4 (4 %)	<0.001
No	98 (62.8 %)	96 (96 %)	

Havranek S., et al. Resuscitation 2022;181:289-96.

Primary and secondary endpoints

	INVASIVE			STANDARD / CONVENTIONAL		
Initial rhythm	**Shockable (N = 72)**	**Non-shockable (N = 52)**	**P**	**Shockable (N = 84)**	**Non-shockable (N = 48)**	**P**
Primary outcome						
Survival with CPC at 180 days						
1 or 2	35 (49 %)	4 (8 %)	<0.001	28 (33 %)	1 (2 %)	<0.001
≥3	37 (51 %)	48 (92 %)		56 (67 %)	47 (98 %)	
Secondary outcomes						
Cardiac recovery at 30 days						
Yes	43 (60 %)	11 (21 %)	<0.001	41 (49 %)	4 (8 %)	<0.001
No	29 (40 %)	41 (79 %)		43 (51 %)	44 (92 %)	
Neuro recovery at 30d days						
Yes	34 (47 %)	4 (8 %)	<0.001	24 (29 %)	0 (0 %)	<0.001
No	38 (53 %)	48 (92 %)		60 (17 %)	48 (100 %)	

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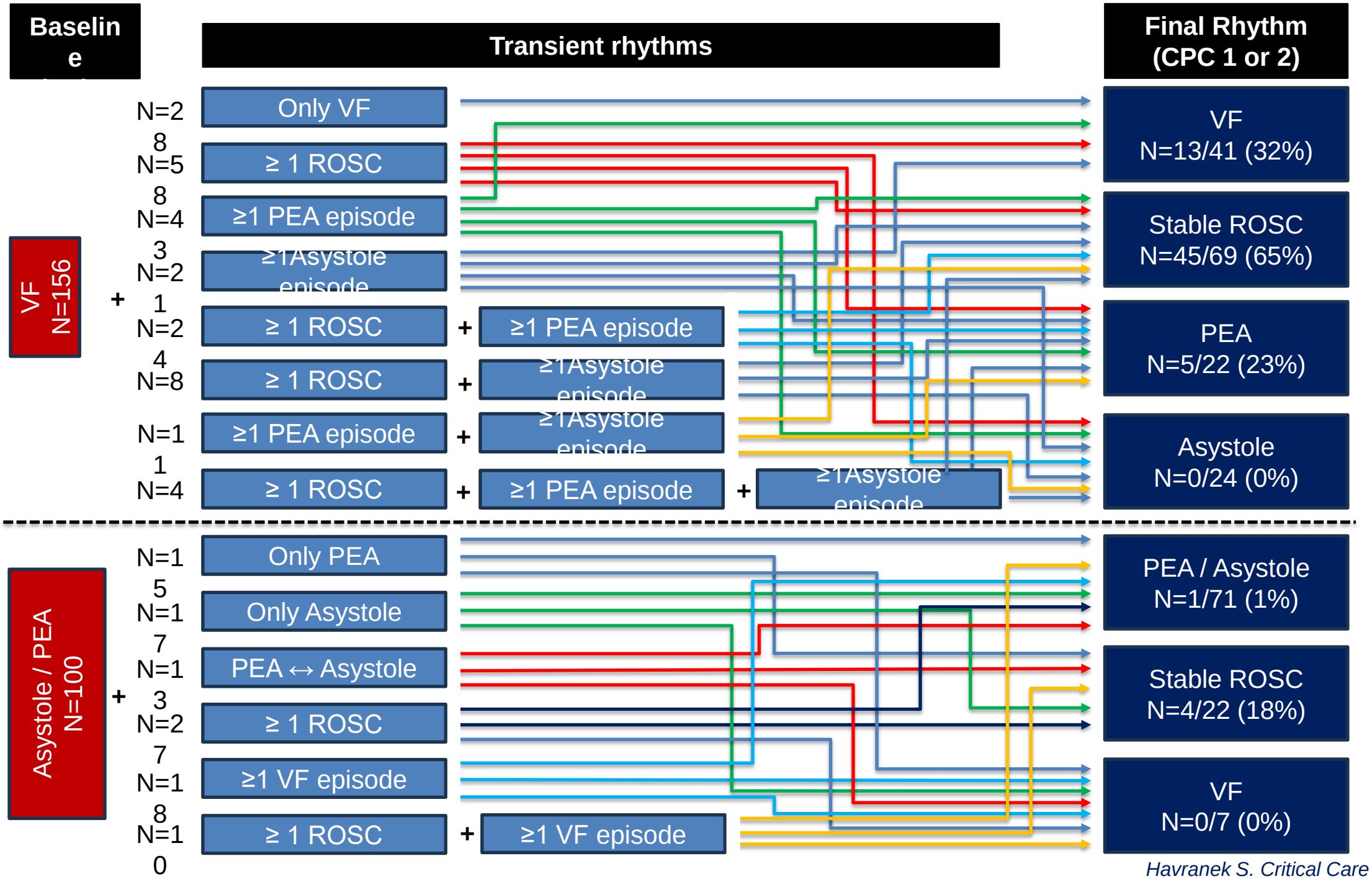
Heart rhythms could change

Longer CPR – higher rate of rhythm change



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Shockable → Non-shockable Rhythm

The role of treatment strategy Invasive / ECPR vs. Standard / Conventional

	Intention to treat			As treated		
Treatment arm	**Invasive (N = 72)**	**Standard (N = 84)**	**P**	**Invasive (N = 80)**	**Standard (N = 76)**	**P**
Ongoing VF (all other rhythms excluded)	7/20 (35 %)	1/8 (13 %)	0.48	8/22 (36 %)	**0/6 (0 %)**	0.2
VF + ROSC anytime (non-shockable intermittent rhythms included)	**26/34 (76 %)**	24/50 (48 %)	0.02	**27/36 (75 %)**	23/48 (48 %)	0.02
VF + ROSC anytime (non-shockable intermittent rhythms excluded)	**18/20 (86 %)**	17/29 (59 %)	0.03	**19/21 (91 %)**	16/28 (57 %)	0.02
VF → last rhythm ROSC (non-shockable intermittent rhythms excluded)	**15/16 (94 %)**	17/28 (61 %)	0.04	**16/17 (94 %)**	16/27 (59 %)	0.02
VF + PEA anytime (asystole excluded)	7/16 (44 %)	8/24 (33 %)	0.74	9/19 (47 %)	6/21 (29 %)	0.37
VF + last rhythm PEA (asystole excluded)	3/6 (50 %)	1/11 (9 %)	0.2	4/8 (50 %)	0/9 (0 %)	0.06
VF + asystole anytime (PEA included)	3/16 (19 %)	2/23 (9 %)	0.65	4/18 (22 %)	1/21 (5 %)	0.25
VF + last rhythm asystole (PEA included)	0/7 (0 %)	0/17 (0 %)	x	0/7 (0 %)	0/17 (0 %)	x

CPC 1, 2 / all patients

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Non-shockable Rhythms

Prague OHCA trial data

Initial Rhythm	PEA ($n = 45$)	Asystole ($n = 55$)	p
No rhythm change	15 (33%)	17 (31%)	Not significant
Rhythm change	30 (67%)	38 (69%)	
Intermittent rhythm			
ROSC	11 (24%)	4 (7%)	0.008
Asystole[a]	2 (4%)	38 (100%)	
VF	8 (18%)	13 (24%)	
PEA[a]	30 (100%)	2 (4%)	
Last rhythm			
ROSC	6 (13%)	16 (29%)	0.0002
Asystole	12 (27%)	29 (53%)	
VF	5 (11%)	2 (4%)	
PEA	22 (49%)	8 (15%)	

Out of all non-shockable patients, CPC 1, 2 was achieved in 5 cases.

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Non-shockable Rhythms

Prague OHCA trial data

Patient No	1	2	3	4	5
Age (years)	35	45	66	58	68
Gender	Male	Female	Male	Male	Male
Bystander CPR	Yes	No	No	Yes	Yes
Time from collapse to EMS (min)	4	Collapse after EMS arrival	Collapse after EMS arrival	10	9
Randomized to	Invasive	Invasive	Invasive	Invasive	Standard
Time of CPR	50	34	49	49	28
Initial rhythm	EMD	EMD	EMD	Asystole	Asystole
Rhythm profile	EMD →VF →EMD →ROSC	EMD →ROSC	EMD →ECLS	Asystole →VF →ROSC	Asystole →ROSC →BRADY →ROSC
Sustained ROSC on admission	Yes	Yes	No	Yes	Yes
Time to hospital admission (min)	45	34	39	63	61
ECLS implanted	No	No	Yes	No	No
Cause of cardiac arrest (including autopsy findings)	Cardiomyopathy	Pulmonary embolism	Most likely myocardial infarction	Chronic heart failure	Aortic valve stenosis

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Prognostic Role of Rhythms – Cox Regression Analyses

Model	Model A (Parameters Available During Ongoing CPR, *n* = 256)		Model B (Parameters After Initial In-Hospital Evaluation, *n* = 156)	
	HR (95% CI)	*p*	HR (95% CI)	*p*
Age ≥ 65 yr	1.09 (0.79–1.5)	0.61	0.94 (0.64–1.37)	0.76
Sex = woman	0.92 (0.64–1.34)	0.68	1.19 (0.77–1.86)	0.43
Telephone assisted bystander CPR = yes	0.91 (0.64–1.28)	0.58	0.84 (0.57–1.23)	0.37
Length CPR > 45 min = yes	–	–	1.85 (1.11–3.08)	0.02
Acute coronary syndrome = yes	–	–	0.92 (0.66–1.3)	0.65
ROSC anytime = yes	0.39 (0.28–0.53)	< 0.0001	–	–
Asystole anytime = yes	2.43 (1.79–3.3)	< 0.0001	–	–
Sustained ROSC at admission = yes	–	–	0.55 (0.32–0.93)	0.02
Asystole at admission = yes	–	–	2.37 (1.53–3.69)	0.0001

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Conclusions

Conclusions

The post-initial rhythm profile could more precisely identify an outcome in refractory OHCA patients.

Deterioration of the initial shockable rhythm to asystole has a poor prognosis, even when ECPR is readily available.

An **ECPR-based approach seems beneficial** in patients with **ongoing VF** and **regular electrical activity**.

An **initial non-shockable rhythm** has an inauspicious prognosis, and a conversion to a shockable rhythm does not seem to improve outcomes.

Thank you!