



**VŠEOBECNÁ FAKULTNÍ
NEMOCNICE V PRAZE**

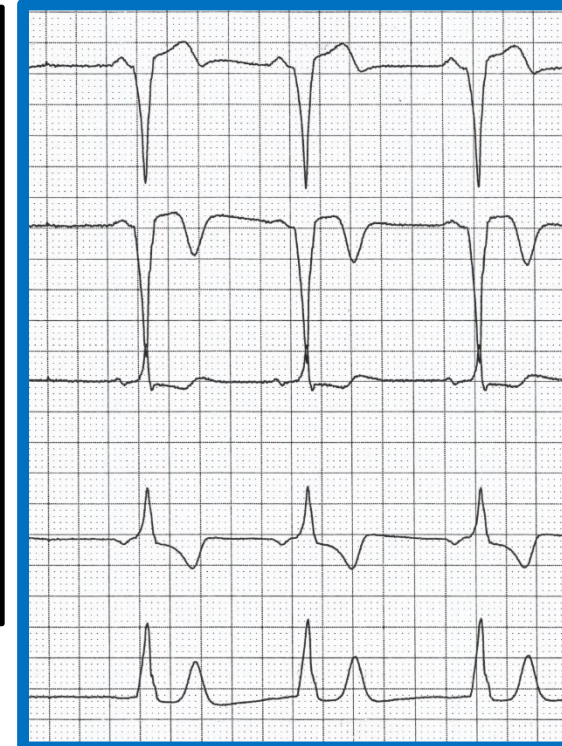
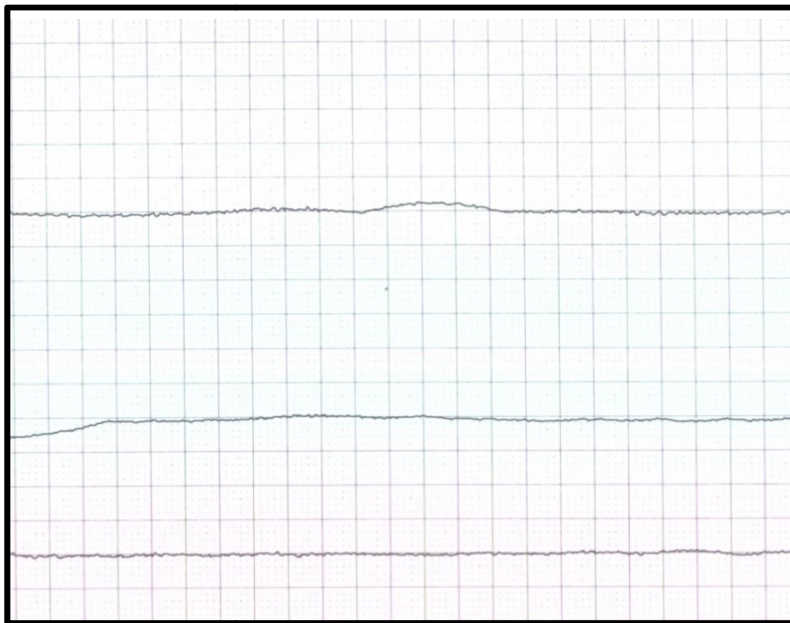
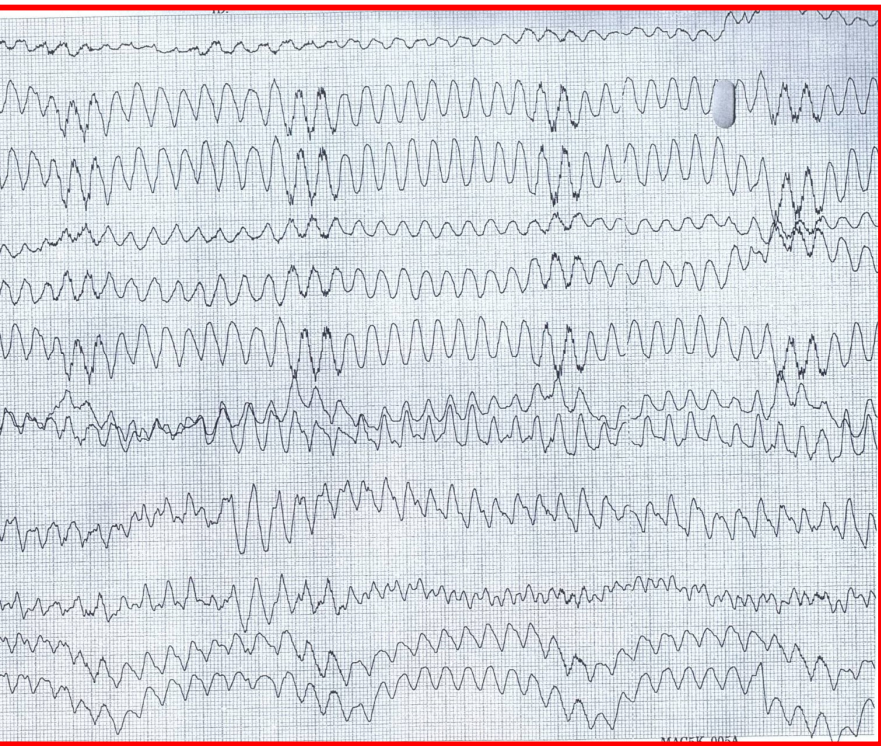


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**CARDIAC RHYTHM CONVERSIONS AND THE OUTCOME
IN REFRACTORY OUT-OF-HOSPITAL CARDIAC ARREST.
COMPARISON OF EXTRACORPOREAL VS.
CONVENTIONAL CARDIOPULMONARY RESUSCITATION.**

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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

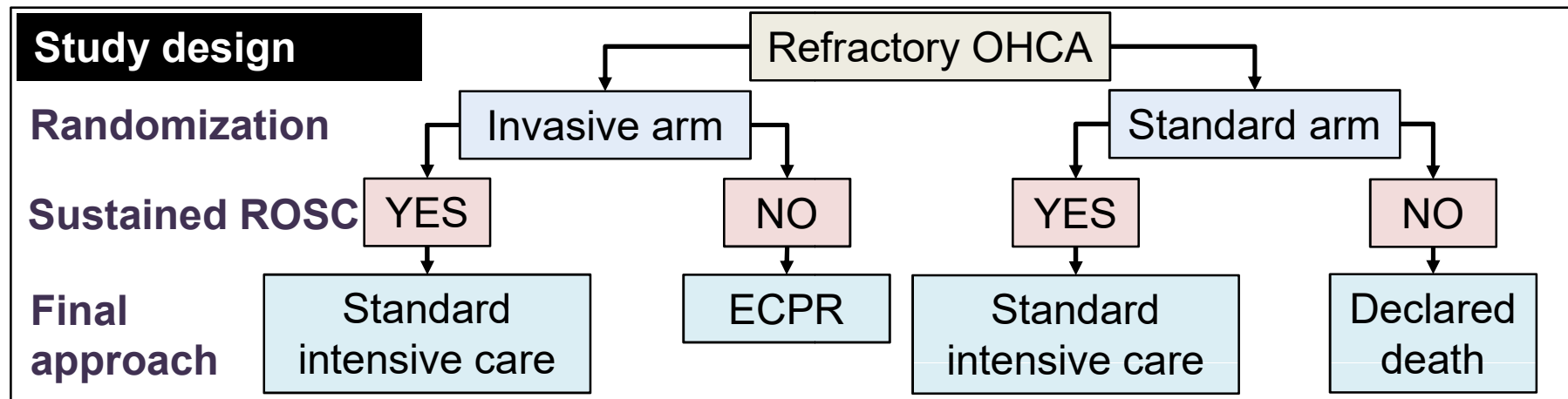
Outcomes and Initial Heart Rhythm

Post-hoc analysis of Prague OHCA trial

Prague OHCA trial

Refractory Out-of-hospital Cardiac Arrest

Primary endpoint: CPC 1,2 at 180D



	No. (%)		Absolute difference, % (95% CI)	P value
	Invasive strategy (n = 124)	Standard strategy (n = 132)		
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

Baseline clinical and demographical data

Parameter	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
Under CPR	154 (99 %)	44 (98 %)	54 (98 %)	0.89
Resuscitation assisted CPR	133 (85 %)	24 (53 %)	46 (84 %)	<0.000
Randomized to				
Standard	84 (54 %)	24 (53 %)	24 (44 %)	0.41
Intensive	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
Out-of-hospital death	33 (21 %)	20 (44 %)	22 (40 %)	0.0015
Admission to hospital	20/33 (61 %)	12/20 (60 %)	14/22 (64 %)	0.009
Death within 1 hour of admission	13/33 (39 %)	8/20 (40 %)	8/22 (36 %)	0.15
ICD implanted	57 (37 %)	17 (38 %)	18 (33 %)	0.85
Laboratory values on admission				
Glucose (mmol/L)	7.00 (6.87-7.17)	6.85 (6.75; 6.97)	6.85 (6.77; 6.99)	<0.000
Urea (mmol/L)	10.7 (7.8-13.8)	13.1 (11.1; 17.0)	13.9 (8.9; 18.0)	0.001
Causes of cardiac arrest (including autopsy findings)				
Acute coronary syndrome	89 (57 %)	15 (33 %)	23 (42 %)	<0.000
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 %)	<0.000
Primary endpoint	63 (40 %)	3 (7 %)	2 (4 %)	

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 %)	

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 (71 %)	48 (100 %)	

Cox regression analysis

Prediction of inauspicious neurological outcomes

Variable	Model A (Admitted to hospital) (<i>n</i> = 210)			Model B (After the initial in-hospital evaluation) (<i>n</i> = 181)		
	HR	95% CI	<i>P</i>	HR	95% CI	<i>P</i>
Age ≥ 65 years	0.92	0.63–1.34	0.67	0.87	0.57–1.34	0.53
Female sex	0.96	0.62–1.49	0.86	1.17	0.73–1.85	0.52
Received ROSC on admission = yes	0.35	0.24–0.51	<0.001	0.69	0.41–1.15	0.15
On CPR > 45 min = yes	–	–	–	1.97	1.16–3.32	0.01
Received assisted bystander CPR = yes	1.19	0.8–1.77	0.39	1.31	0.82–2.1	0.26
Coronary syndrome = yes	–	–	–	1.29	0.86–1.94	0.22
Shocking rhythm = yes	0.32	0.22–0.46	<0.001	0.27	0.18–0.41	<0.001

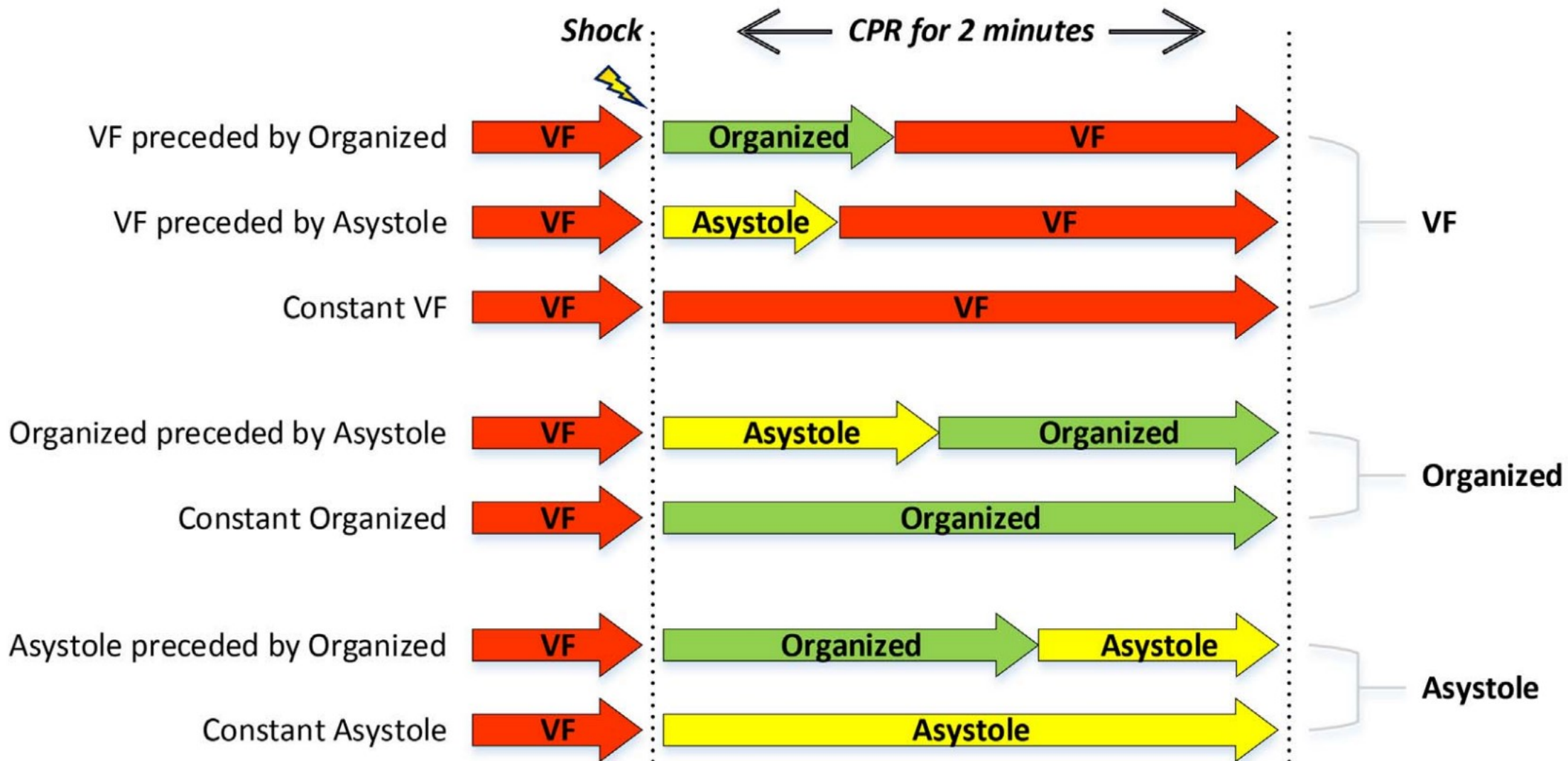
Heart rhythms could change

Longer CPR – higher rate of rhythm change

Rhythm conversions

Rhythm Profile

Rhythm at 2-minute



Prognostic Impact of Heart Rhythm Conversions

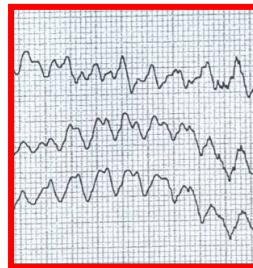
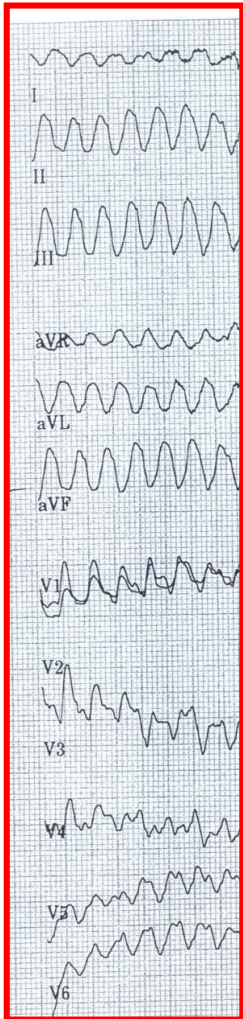
Shockable → Non-shockable

Non-shockable → Shockable

Shockable → Non-shockable Rhythm

Prague OHCA trial data

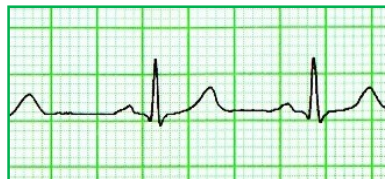
Ventricular fibrillation
(n = 156)



Last rhythm VF

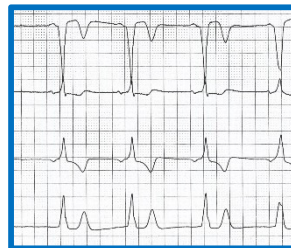
Outcome
CPC 1,2

13/41 (32 %)



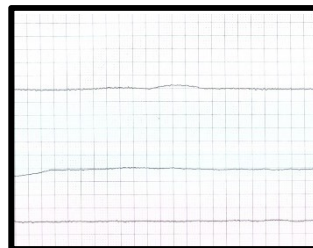
ROSC on
admission

45/69 (65 %)



Pulseless
electrical
activity on
admission

5/22 (23 %)



Asystole on
admission

0/24 (0 %)

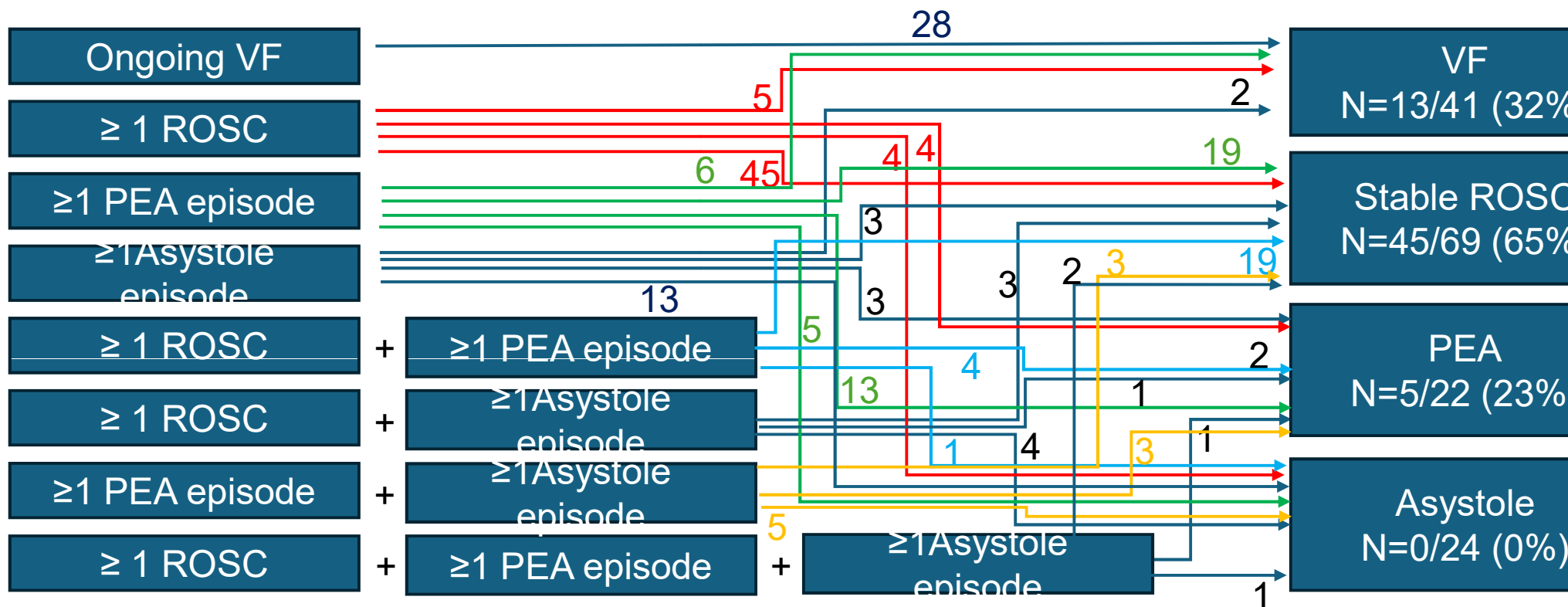
Initial rhythm

Intermittent rhythm scenario

Final Rhythm

VF
156

+



Shockable → Non-shockable Rhythm

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

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

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 %)	NS
Rhythm change	30 (67 %)	38 (69 %)	
→ Intermittent Rhythm			
ROSC	11 (24 %)	4 (7 %)	0.008
Asystole*	2 (4 %)	38 (100 %)	
VF	8 (18 %)	13 (24 %)	
PEA*	30 (100 %)	2 (4 %)	
→ Last Rhythm			
ROSC	6 (13 %)	16 (29 %)	0.0002
Asystole	12 (27 %)	29 (53 %)	
VF	5 (11 %)	2 (4 %)	
PEA	23 (51 %)	8 (15 %)	

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

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
Under CPR	Yes	No	No	Yes	Yes
Time from collapse to EMS (min)	4	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
Obtained ROSC on admission	Yes	Yes	No	Yes	Yes
Time to hospital admission (min)	45	34	39	63	61
ICD 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

Prognostic Role of Rhythms – Cox Regression Analyses

Parameters available during CPR

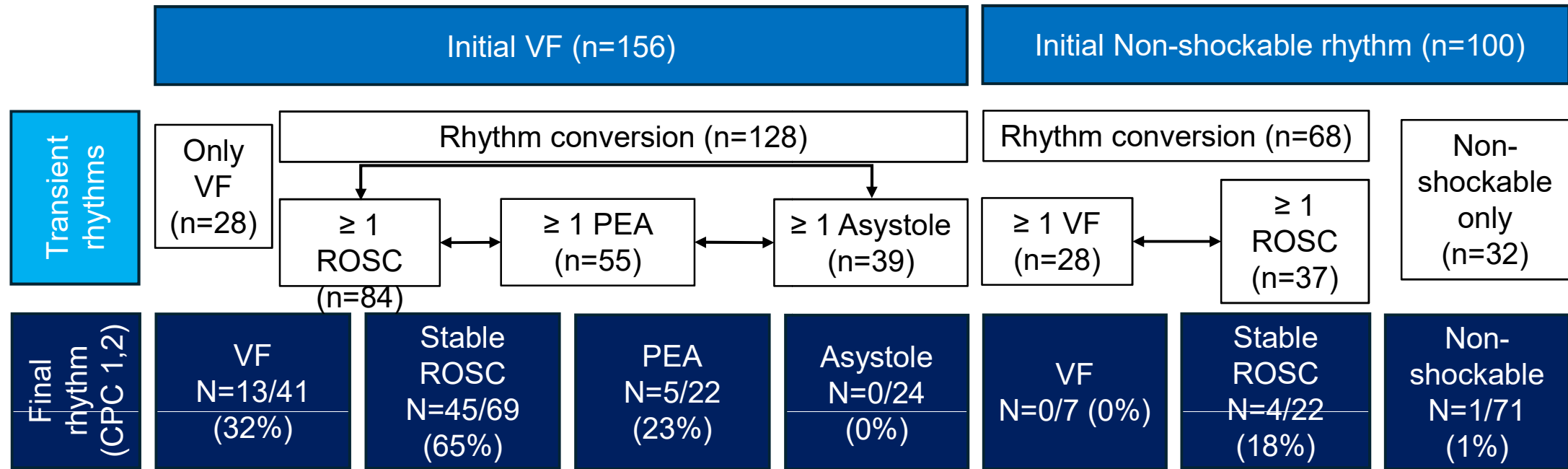
Variable	All patients (n = 256)			Shockable rhythms only (n = 156)		
	HR	95% CI	P	HR	95% CI	P
Age ≥ 65 years	1.09	0.79-1.5	0.61	1.18	0.73-1.9	0.5
Female = woman	0.92	0.64-1.34	0.68	0.38	0.16-0.88	0.02
Prof. assisted bystander CPR = yes	0.91	0.64-1.28	0.58	1.15	0.66-2.0	0.63
IC anytime = yes	0.39	0.28-0.53	<0.0001	0.31	0.2-0.5	<0.0001
Stole anytime = yes	2.43	1.79-3.3	<0.0001	2.38	1.51-3.76	0.0002

Parameters available after initial in-hospital evaluation

Variable	All patients (n = 142)			Shockable rhythms only (n = 68)		
	HR	95% CI	P	HR	95% CI	P
Age ≥ 65 years	0.94	0.64-1.37	0.76	1.09	0.63-1.88	0.76
Female = woman	1.19	0.77-1.86	0.43	0.59	0.23-1.49	0.26
Prof. assisted bystander CPR = yes	0.84	0.57-1.23	0.37	0.91	0.49-1.66	0.75
Length CPR >45 min = yes	1.85	1.11-3.08	0.02	3.9	1.9-8.0	0.0002
Acute coronary syndrome = yes	0.92	0.66-1.3	0.65	1.3	0.79-2.16	0.31
Sustained ROSC on admission = yes	0.55	0.32-0.93	0.02	0.87	0.45-1.69	0.68
Stole on admission = yes	2.37	1.53-3.69	0.0001	3.44	1.76-6.74	0.0003

Conclusions

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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.

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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!