NOVINKY V RESUSCITACI

JIŘÍ KARÁSEK

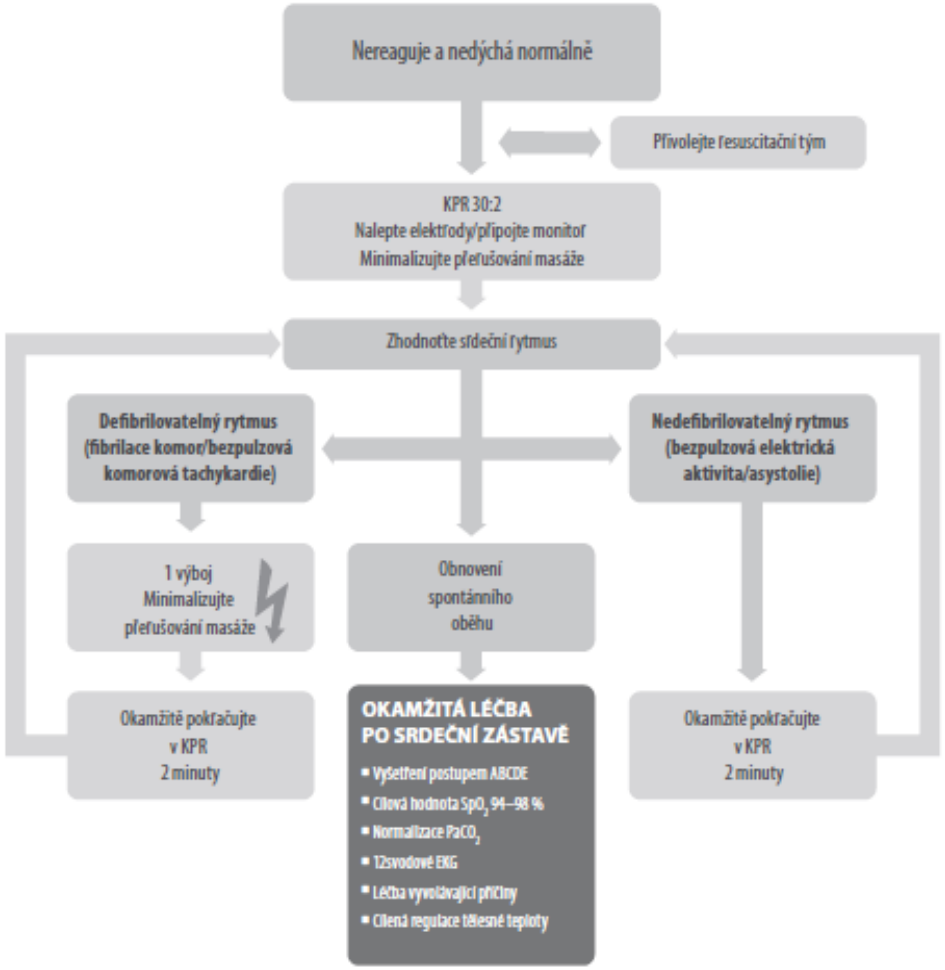
OUPD FN MOTOL A 2.LF UK

EPIDEMIOLOGIE

FN MOTOL

- Incidence 67-170 /100 tis.
- Resuscitace zahájena či pokračováno u 50-60%
- KPR svědky 58%, AED 28%
- 80% TANR
- Propuštění 8%

Rozšířená neodkladná resuscitace



BĚHEM KPR

- Zajistěte vysokou kvalitu srdeční masáže
- Minimalizujte přerušování srdeční masáže
- Podejte kyslík
- Použijte kapnografii
- Po zajištění dýchacích cest pomůckami nepřerušujte srdeční masáž
- Vstup do cévního řečiště (intravenózní nebo intraosální)
- Podejte adrenalin každých 3–5 min
- Podejte amiodaron po 3. výboji

ZAJISTĚTE LÉČBU REVERZIBILNÍCH PŘÍČIN

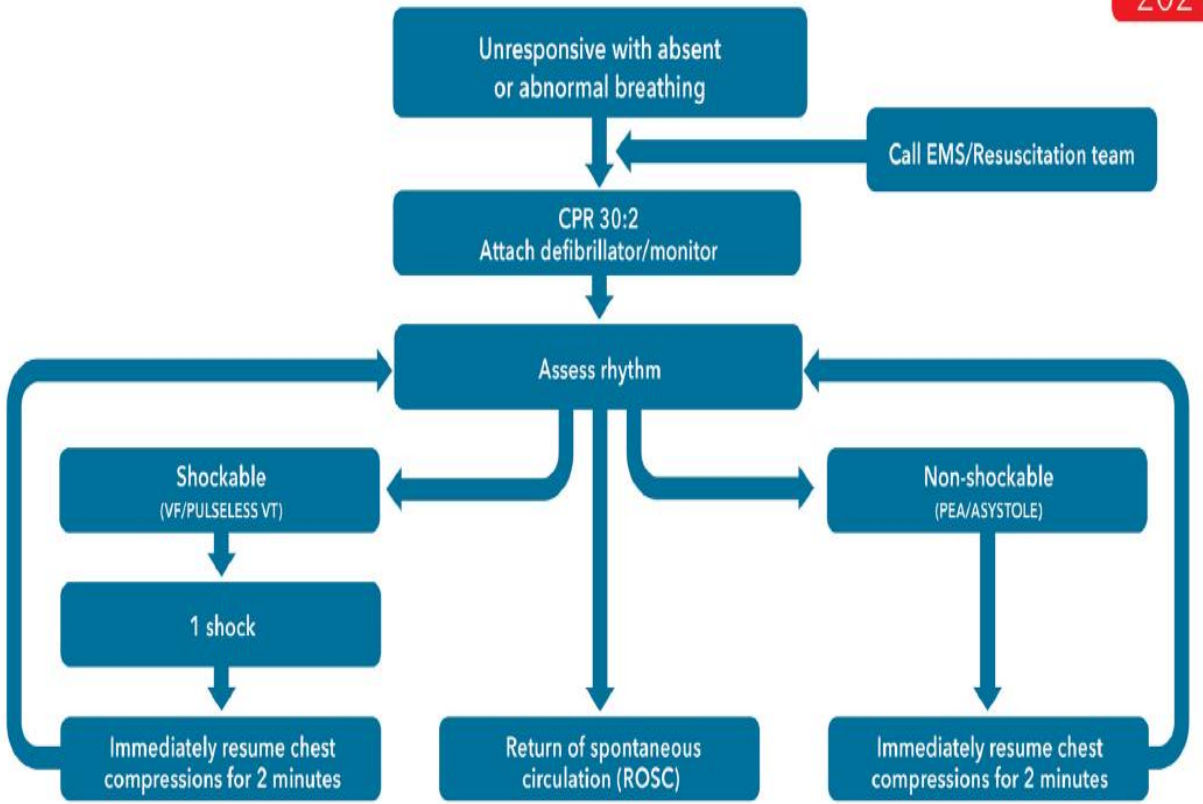
Hypoxie	Trombóza (koronární tepny/plicní embolie)
Hypovolémie	Tenzní pneumotorax
Hypokalémie/hyperkalémie/metabolické příčiny	Tamponáda srdeční
Hypotermie/hypertermie	Toxické látky (intoxikace)

ZVAŽTE

- Ultrasonografické vyšetření
- Mechanickou srdeční masáž k usnadnění transportu a další léčby
- Koronární angiografii a perkutánní koronární intervenci
- Mimotělní KPR

ADVANCED LIFE SUPPORT

EUROPEAN RESUSCITATION COUNCIL
GUIDELINES 2021



Give high-quality chest compressions and

- Give oxygen
- Use waveform capnography
- Continuous compressions if advanced airway
- Minimise interruptions to compressions
- Intravenous or intraosseous access
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks
- Identify and treat reversible causes

Identify and treat reversible causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalemia/metabolic
- Hypo-/hyperthermia
- Thrombosis - coronary or pulmonary
- Tension pneumothorax
- Tamponade- cardiac
- Toxins

Consider ultrasound imaging to identify reversible causes

Consider

- Coronary angiography/percutaneous coronary intervention
- Mechanical chest compressions to facilitate transfer/treatment
- Extracorporeal CPR

After ROSC

- Use an ABCDE approach
- Aim for SpO_2 of 94-98% and normal $PaCO_2$
- 12 Lead ECG
- Identify and treat cause
- Targeted temperature management

ALS 2021

5 TOP MESSAGES

EUROPEAN RESUSCITATION COUNCIL

1. High-quality chest compression with minimal interruption, early defibrillation, and treatment of reversible causes remain the priority

2. Premonitory signs and symptoms often occur before cardiac arrest in- or out-of-hospital - cardiac arrest is preventable in many patients

3. Use a basic or advanced airway technique - only rescuers with a high success rate should use tracheal intubation

4. Use adrenaline early for non-shockable cardiac arrest

5. In select patients, if feasible, consider extracorporeal CPR (eCPR) as a rescue therapy when conventional ALS is failing

ALS

FN MOTOL

High quality chest compressions

- Start chest compressions as soon as possible.
- Deliver compressions on the lower half of the sternum ('in the centre of the chest').
- Compress to a depth of at least 5 cm but not more than 6 cm.
- Compress the chest at a rate of 100–120 min^{-1} with as few interruptions as possible.
- Allow the chest to recoil completely after each compression; do not lean on the chest.
- Perform chest compressions on a firm surface whenever feasible.

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 AUGUST 23, 2018 VOL. 379 NO. 8

A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest

G.D. Perkins, C. Ji, C.D. Deakin, T. Quinn, J.P. Nolan, C. Scomparin, S. Regan, J. Long, A. Slowther, H. Pocock, J.J.M. Black, F. Moore, R.T. Fothergill, N. Rees, L. O'Shea, M. Docherty, I. Gunson, K. Han, K. Charlton, J. Finn, S. Petrou, N. Stallard, S. Gates, and R. Lall, for the PARAMEDIC2 Collaborators*

Table 3. Primary and Secondary Outcomes.*

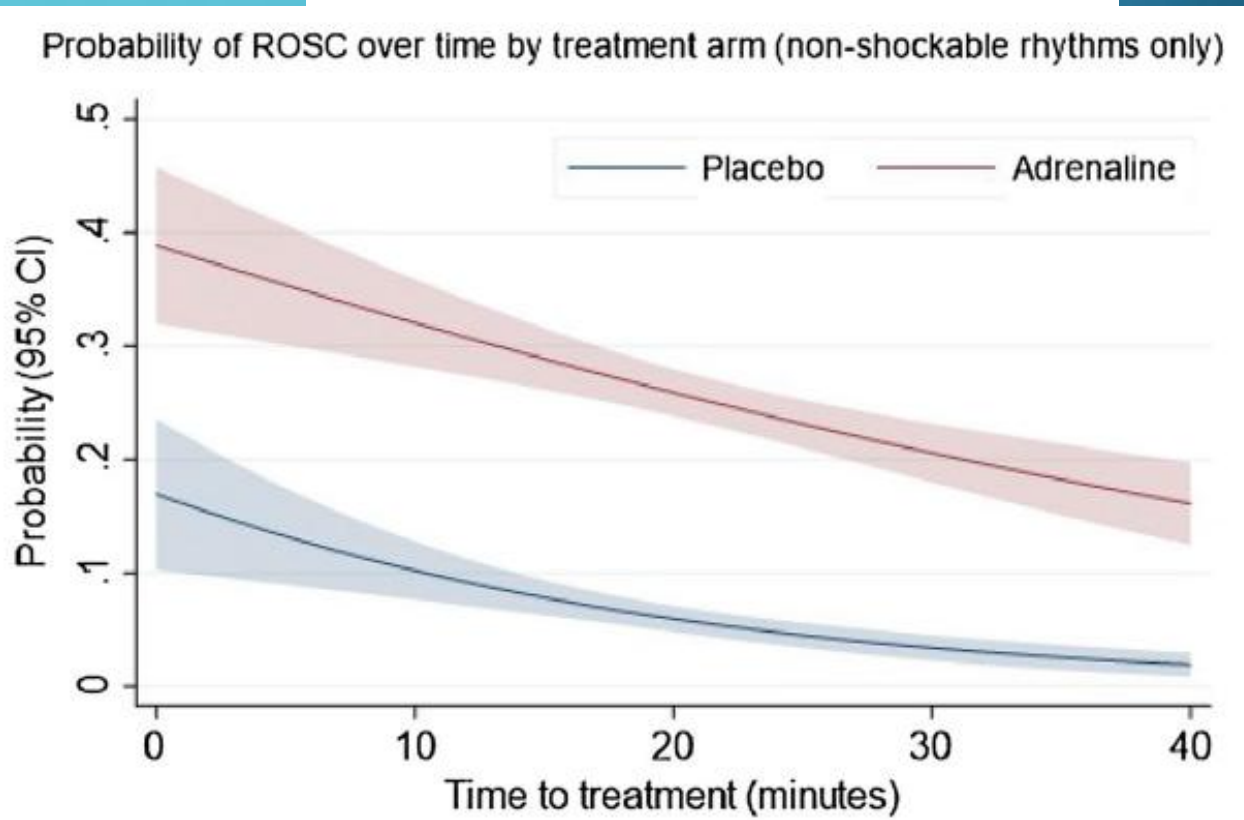
Outcome	Epinephrine	Placebo	Odds Ratio (95% CI)†	
			Unadjusted	Adjusted
Primary outcome				
Survival at 30 days — no./total no. (%)‡	130/4012 (3.2)	94/3995 (2.4)	1.39 (1.06–1.82)	1.47 (1.09–1.97)
Secondary outcomes				
Survival until hospital admission — no./total no. (%)§	947/3973 (23.8)	319/3982 (8.0)	3.59 (3.14–4.12)	3.83 (3.30–4.43)
Median length of stay in ICU (IQR) — days				
Patients who survived	7.5 (3.0–15.0)	7.0 (3.5–12.5)	NA	NA
Patients who died¶	2.0 (1.0–5.0)	3.0 (1.0–5.0)	NA	NA
Median length of hospital stay (IQR)				
Patients who survived	21.0 (10.0–41.0)	20.0 (9.0–38.0)	NA	NA
Patients who died‖	0	0	NA	NA
Survival until hospital discharge — no./total no. (%)	128/4009 (3.2)	91/3995 (2.3)	1.41 (1.08–1.86)	1.48 (1.10–2.00)
Favorable neurologic outcome at hospital discharge — no./total no. (%)	87/4007 (2.2)	74/3994 (1.9)	1.18 (0.86–1.61)	1.19 (0.85–1.68)
Survival at 3 mo — no./total no. (%)	121/4009 (3.0)	86/3991 (2.2)	1.41 (1.07–1.87)	1.47 (1.08–2.00)
Favorable neurologic outcome at 3 mo — no./total no. (%)	82/3986 (2.1)	63/3979 (1.6)	1.31 (0.94–1.82)	1.39 (0.97–2.01)

FN MOTOL

ORIGINAL

The influence of time to adrenaline administration in the Paramedic 2 randomised controlled trial

Gavin D. Perkins[1,2*], Claire Kenna[1], Chen Ji[1], Charles D. Deakin[3,4], Jerry P. Nolan[1,5], Tom Quinn[6], Charlotte Scomparin[1], Rachael Fothergill[1,7], Imogen Gunson[8], Helen Pocock[3], Nigel Rees[9], Lyndsey O'Shea[9], Judith Finn[10], Simon Gates[11] and Ranjit Lall[1]



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Defibrillation Strategies for Refractory Ventricular Fibrillation

Sheldon Cheskes, M.D., P. Richard Verbeek, M.D., Ian R. Drennan, A.C.P., Ph.D., Shelley L. McLeod, Ph.D., Linda Turner, Ph.D., Ruxandra Pinto, Ph.D., Michael Feldman, M.D., Ph.D., Matthew Davis, M.D., Christian Vaillancourt, M.D., Laurie J. Morrison, M.D., Paul Dorian, M.D., and Damon C. Scales, M.D., Ph.D.

FN MOTOL

OHCA s refrakterní VF susp. kardiální etiologie (3 výboje)

CRT s 3 clustery v 6 EMS (rotace po 6 měsících)

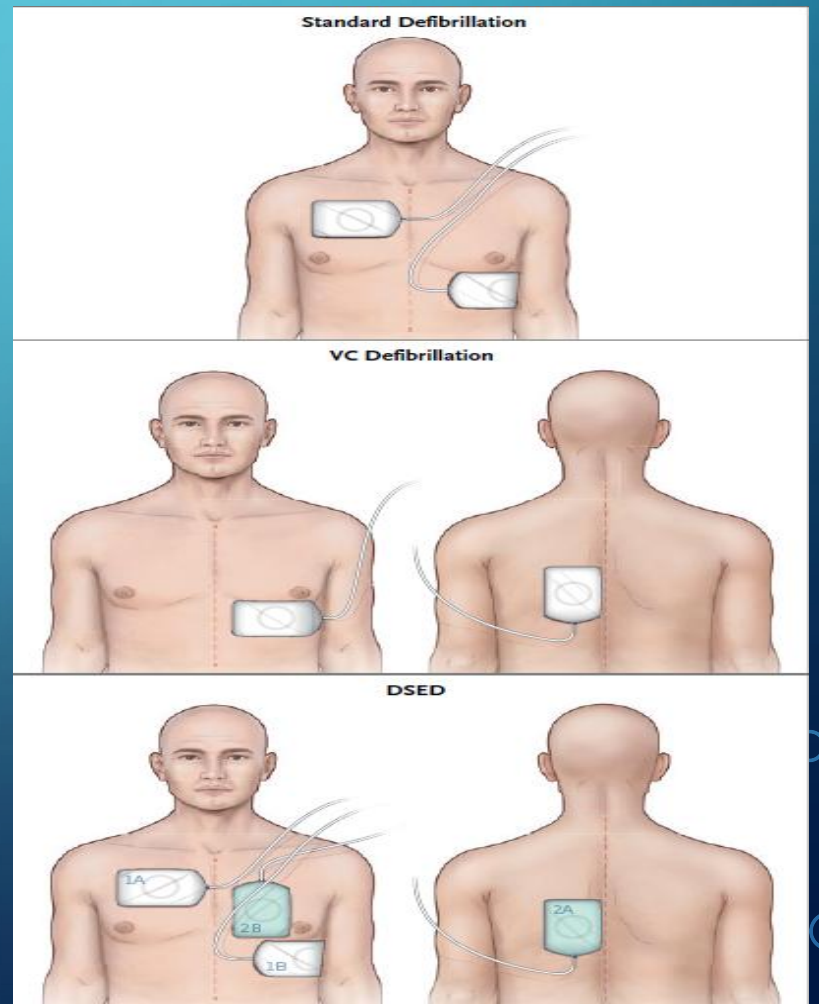
Ukončeno pro COVID

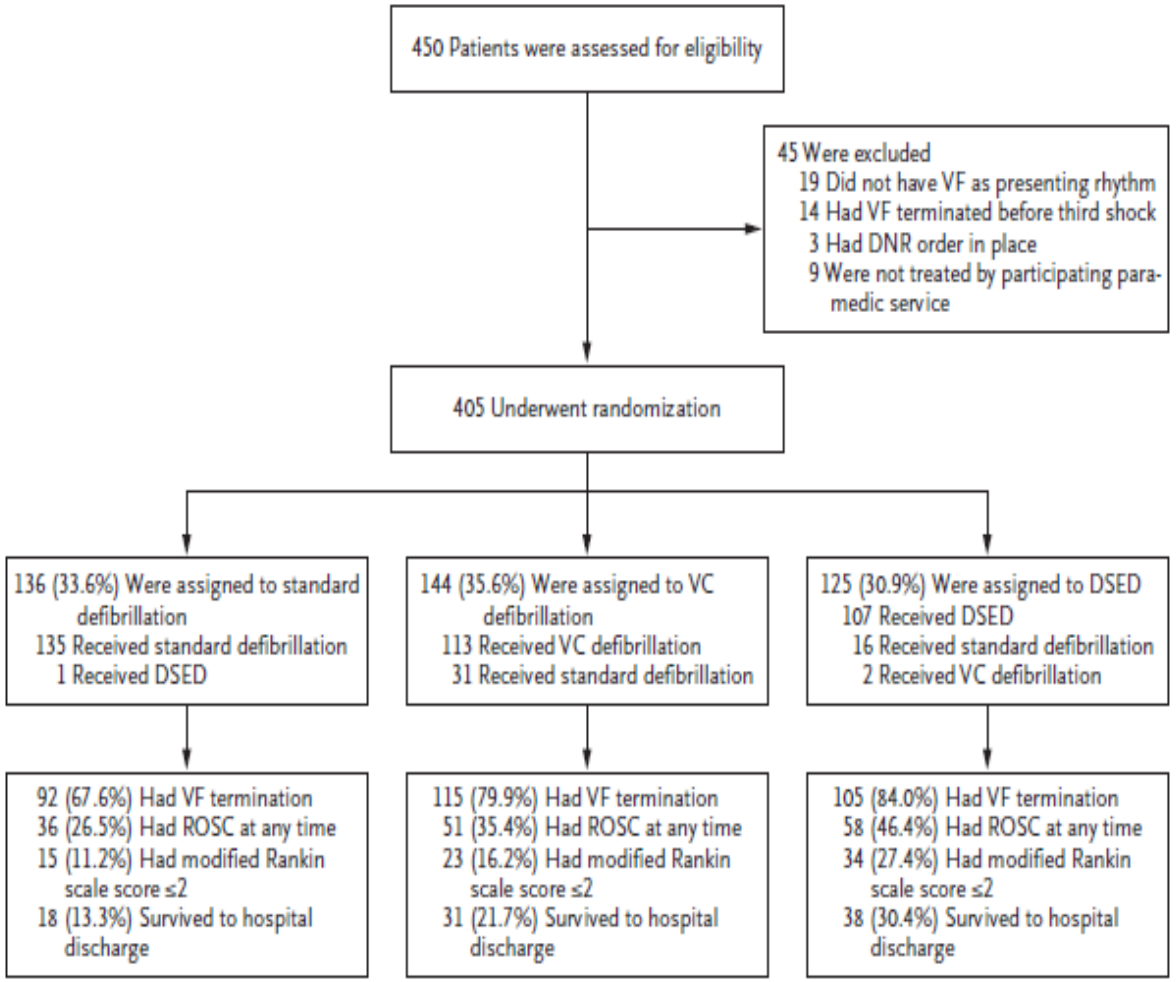
Konvenční defibrilace vs. VC (vector change) vs. DSED (double sequentional extrenal defibrilation

405 pts. (136/244/125 pts.)

Primární outcome: survival to discharge

Sekundární: terminace VF, ROSC, dobrý neurolog. outcome mRs 2 a méně





Outcome	Standard Defibrillation (N=136)	VC Defibrillation (N=144)	DSED (N=125)	Adjusted Relative Risk (95% CI)*	
				DSED vs. Standard	VC vs. Standard
	number of patients/total number (percent)				
Survival to hospital discharge†	18/135 (13.3)	31/143 (21.7)	38/125 (30.4)	2.21 (1.33–3.67)	1.71 (1.01–2.88)
Termination of ventricular fibrillation	92/136 (67.6)	115/144 (79.9)	105/125 (84.0)	1.25 (1.09–1.44)	1.18 (1.03–1.36)
ROSC	36/136 (26.5)	51/144 (35.4)	58/125 (46.4)	1.72 (1.22–2.42)	1.39 (0.97–1.99)
Modified Rankin scale score ≤2†‡	15/134 (11.2)	23/142 (16.2)	34/124 (27.4)	2.21 (1.26–3.88)	1.48 (0.81–2.71)

Characteristic	Standard Defibrillation (N=136)	VC Defibrillation (N=144)	DSED (N=125)
Age — yr	64.0±14.4	63.8±13.2	63.0±16.8
Male sex — no. (%)	109 (80.1)	127 (88.2)	106 (84.8)
Bystander-witnessed cardiac arrest — no. (%)	82 (60.3)	110 (76.4)	83 (66.4)
Bystander CPR performed — no. (%)	74 (54.4)	90 (62.5)	71 (56.8)
Public location of cardiac arrest — no. (%)	41 (30.1)	51 (35.4)	36 (28.8)
Median response time (IQR) — min†	7.4 (5.7–9.9)	7.4 (6.9–9.0)	7.8 (6.0–9.4)

Characteristic	Standard Defibrillation (N=136)	VC Defibrillation (N=144)	DSED (N=125)
Median time from initial call to first shock (IQR) — min†	10.2 (8.2–13.2)	10.4 (8.8–12.6)	10.2 (8.8–11.8)
Prehospital intubation — no. (%)	52 (38.2)	72 (50.0)	53 (42.4)
Preshock pause — sec‡	6.5±7.0	6.1±6.0	6.4±7.6
Postshock pause — sec§	4.8±3.9	5.2±5.8	4.5±2.2
Compression rate per minute¶	109.8±8.0	111.1±8.4	111.7±8.7
Compression depth — cm‖	6.0±1.0	5.9±1.0	5.7±0.9
Chest compression fraction — %**	83.1±8.1	80.8±8.7	79.1±9.5
No. of standard shocks	7.4±3.0	4.2±2.1	3.9±1.4
No. of shocks to first ROSC††	5.5±1.6	5.3±1.7	5.7±1.9
Antiarrhythmic drug administered — no. (%)	110 (80.9)	106 (73.6)	92 (73.6)
Amiodarone dose — mg	403.4±75.8	392.9±76.5	378.5±75.4
Lidocaine dose — mg	185.7±73.9	175.7±60.6	162.5±83.3
Median time from arrival of EMS to first antiarrhythmic drug administration (IQR) — min‡‡	11.0 (8.0–14.0)	11.6 (9.0–16.0)	11.0 (8.0–15.5)
Epinephrine administered — no. (%)	129 (94.9)	133 (92.4)	107 (85.6)
Epinephrine dose — mg	4.2±2.2	4.2±2.0	4.0±2.1
Median time from arrival of EMS to first epinephrine dose (IQR) — min‡‡	8.7 (6.0–11.5)	9.0 (6.0–14.0)	8.8 (5.4–13.4)
Median time from arrival of EMS to first ROSC (IQR) — min‡‡	14.8 (10.6–20.0)	15.8 (12.5–19.4)	14.0 (11.0–22.0)
Median time from arrival of EMS to departure from scene (IQR) — min§§	25.0 (21.3–32.2)	27.5 (23.3–33.6)	26.5 (21.0–33.8)

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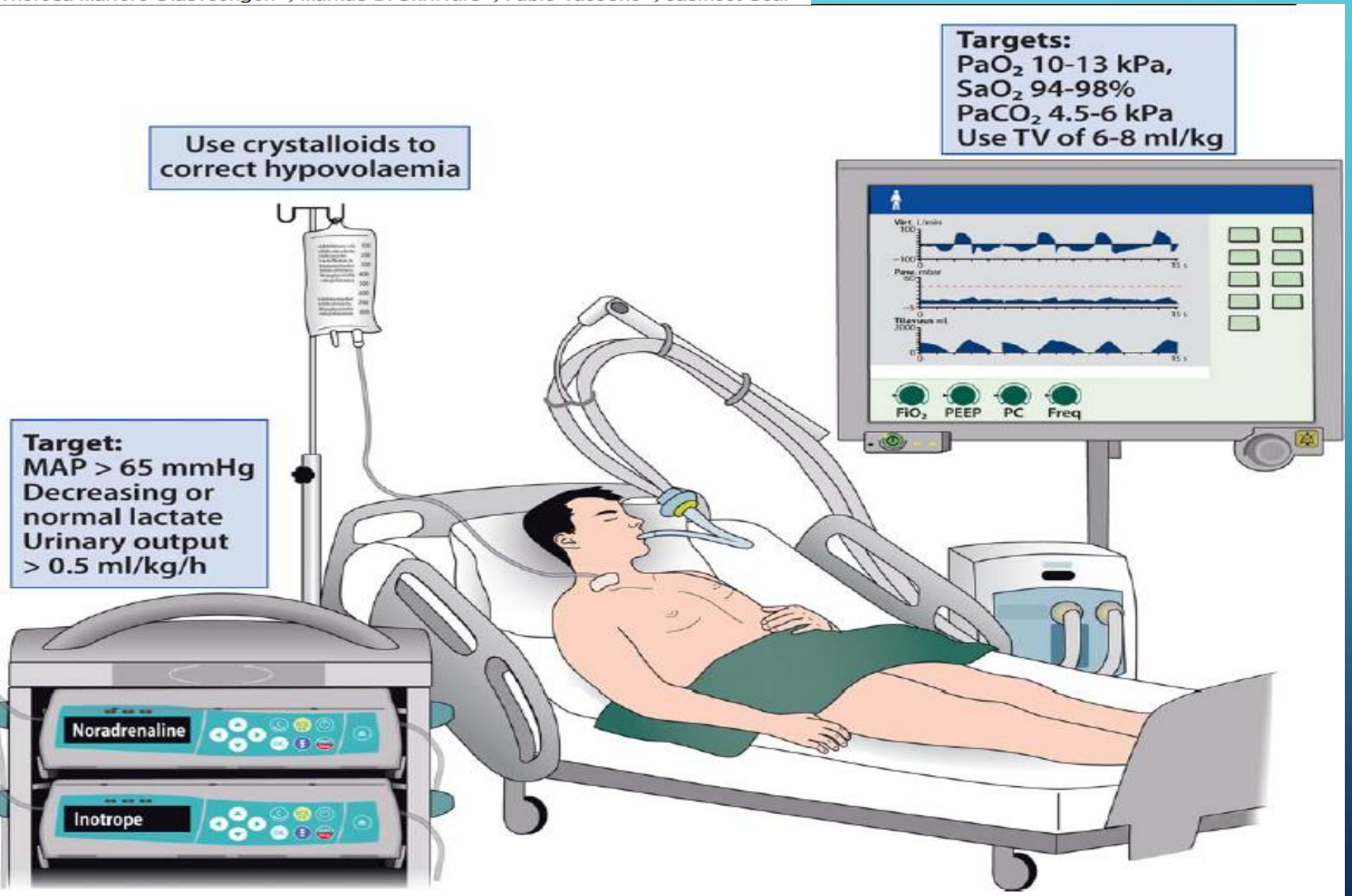
Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

EUROPEAN RESUSCITATION COUNCIL

European Resuscitation Council and European Society of Intensive Care Medicine Guidelines 2021: Post-resuscitation care☆

Jerry P. Nolan[a,b,1,*], Claudio Sandroni[c,d,1], Bernd W. Böttiger[e], Alain Cariou[f], Tobias Cronberg[g], Hans Friberg[h], Cornelia Genbrugge[i,j], Kirstie Haywood[k], Gisela Lilja[l], Véronique R.M. Moulaert[m], Nikolaos Nikolaou[n], Theresa Mariero Olasveengen[o], Markus B. Skrifvars[p], Fabio Taccone[q], Jasmeet Soar[r]



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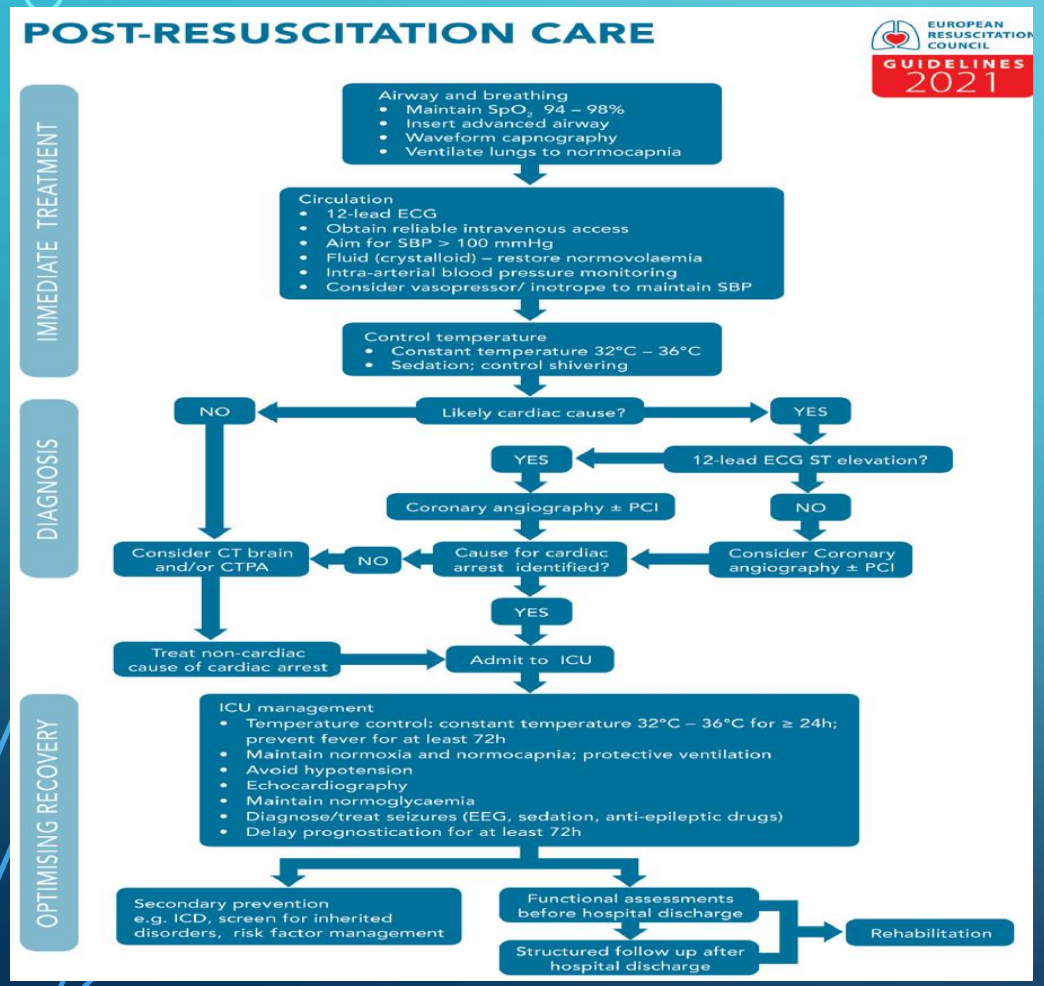

- oxygenace/ventilace
- oběhová podpora
- kontrola tělesné teploty
- diagnostický algoritmus
- neuroprognostifikace/konvulze

FN MOTOL

OXYGENACE A VENTILACE

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Resuscitation
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European Resuscitation Council and European Society of Intensive Care Medicine Guidelines 2021: Post-resuscitation care☆

Jerry P. Nolan[a,b,1,*], Claudio Sandroni[c,d,1], Bernd W. Böttiger[e], Alain Cariou[f], Tobias Cronberg[g], Hans Friberg[h], Cornelia Genbrugge[i,j], Kirstie Haywood[k], Gisela Lilja[l], Véronique R.M. Moulaert[m], Nikolaos Nikolaou[n], Theresa Mariero Olasveengen[o], Markus B. Skrifvars[p], Fabio Taccone[q], Jasmeet Soar[r]

Control of oxygenation

- After ROSC, use 100% (or maximum available) inspired oxygen until the arterial oxygen saturation or the partial pressure of arterial oxygen can be measured reliably.
- After ROSC, once SpO_2 can be measured reliably or arterial blood gas values are obtained, titrate the inspired oxygen to achieve an arterial oxygen saturation of 94—98% or arterial partial pressure of oxygen (PaO_2) of 10—13 kPa or 75—100 mmHg (Fig. 3).
- Avoid hypoxaemia ($PaO_2 < 8$ kPa or 60 mmHg) following ROSC.
- Avoid hyperoxaemia following ROSC.

Control of ventilation

- Obtain an arterial blood gas and use end tidal CO_2 in mechanically ventilated patients.
- In patients requiring mechanical ventilation after ROSC, adjust ventilation to target a normal arterial partial pressure of carbon dioxide ($PaCO_2$) i.e. 4.5—6.0 kPa or 35—45 mmHg.
- In patients treated with targeted temperature management (TTM) monitor $PaCO_2$ frequently as hypocapnia may occur.
- During TTM and lower temperatures use consistently either a temperature or non-temperature corrected approach for measuring blood gas values.
- Use a lung protective ventilation strategy aiming for a tidal volume of 6—8 mL kg^{-1} ideal body weight.

BOX

CRT 2x2 factorial design

Comatose OHCA patients 1:1, TTM 36, MV 24 h at least

Restrictive oxygen target (PaO2 9-10kPa)-FiO2 0,3 vs. liberal oxygen target (PaO2 13-14kPa)-FiO2 0,6.

789 patients (394 vs. 395)

Primary outcome: composite of death from any cause or hospital discharge CPC 3,4 to D90

Secondary outcomes: NSE at H48, death from any cause, cognitive ability scores and CPC at day 90

Table 2. Primary and Secondary Outcomes and Adverse Events.*

Variable	Restrictive Oxygen Target (N=394)	Liberal Oxygen Target (N=395)	Treatment Effect (95% CI)†	P Value
Primary outcome				
Death from any cause or CPC 3 or 4 at discharge — no. (%)‡	126 (32.0)	134 (33.9)	0.95 (0.75–1.21)	0.69
Secondary outcomes				
Death from any cause at 90 days — no. (%)	113 (28.7)	123 (31.1)	0.93 (0.72–1.20)	
Acute kidney injury with renal-replacement therapy — no. (%)	34 (8.6)	47 (11.9)	0.85 (0.69–1.03)	
Median CPC at 90 days (IQR)‡	1 (1–5)	1 (1–5)		
Median score on modified Rankin scale at 90 days (IQR)§	2 (0–6)	1 (0–6)		
Median score on Montreal Cognitive Assessment at 90 days (IQR)¶	27 (24–29)	27 (24–28)		
Median neuron-specific enolase at 48 hr (IQR) — μg/liter‖	17 (11–36)	18 (11–34)		
Adverse events — no. (%)				
Infection**	103 (26.1)	109 (27.6)	0.96 (0.82–1.13)	0.65
Arrhythmia††	57 (14.5)	52 (13.2)	1.06 (0.86–1.30)	0.60
Bleeding				
Any	82 (20.8)	92 (23.3)	0.93 (0.79–1.10)	0.40
Uncontrolled bleeding‡‡	17 (4.3)	21 (5.3)	0.90 (0.67–1.21)	0.62
Acute kidney injury with renal-replacement therapy	34 (8.6)	47 (11.9)	0.85 (0.69–1.03)	0.13
Electrolyte disorder§§	32 (8.1)	25 (6.3)	1.15 (0.85–1.56)	0.33
Metabolic disorder¶¶	34 (8.6)	28 (7.1)	1.12 (0.84–1.48)	0.42
Seizure‖‖	81 (20.6)	83 (21.0)	0.99 (0.83–1.17)	0.14

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Mild Hypercapnia or Normocapnia after Out-of-Hospital Cardiac Arrest

TAME

Comatose OHCA patients 1:1

Mild hypercapnia PaCO2 50-55 mm Hg 24 h

Normocapnia PaCO 35-45 mm Hg 24 h

Primary endpoint: GOS-E 5-8 at 6 month

Secodary endpoint: death at 6 month

Table 2. Primary and Secondary Outcomes.*

Outcome	Mild Hypercapnia	Normocapnia	Unadjusted Risk Difference or Mean Difference (95% CI)†	Adjusted Relative Risk or Mean Difference (95% CI)‡	P Value
Primary outcome: favorable neurologic outcome at 6 mo — no./total no. (%)§	332/764 (43.5)	350/784 (44.6)	−1.2 (−6.1 to 3.8)	0.98 (0.87 to 1.11)	0.76
Secondary outcomes					
Dichotomized favorable neurologic outcome at 6 mo — no./total no. (%)¶	348/788 (44.2)	365/806 (45.3)	−1.1 (−6.0 to 3.8)	0.98 (0.87 to 1.11)	
Poor functional outcome at 6 mo — no./total no. (%)‖	407/762 (53.4)	400/779 (51.3)	2.1 (−2.9 to 7.1)	1.05 (0.95 to 1.15)	
Death at ICU discharge — no./total no. (%)	313/823 (38.0)	299/840 (35.6)	2.4 (−2.2 to 7.1)	1.07 (0.97 to 1.18)	
Death at hospital discharge — no./total no. (%)	367/823 (44.6)	349/840 (41.5)	3.0 (−1.7 to 7.8)	1.07 (0.97 to 1.19)	
Death within 6 mo — no./total no. (%)	393/816 (48.2)	382/832 (45.9)	2.2 (−2.6 to 7.1)	1.05 (0.94 to 1.16)	
Mean EQ Visual Analogue Scale score (95% CI)**					
All available patients	35.8 (32.6 to 39.0)	36.8 (33.6 to 40.0)	−1.0 (−5.0 to 3.0)	0.2 (−3.7 to 4.0)	
Surviving patients	76.4 (74.1 to 78.6)	74.5 (72.3 to 76.7)	1.9 (−0.9 to 4.7)	2.9 (−0.3 to 6.1)	

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Mild Hypercapnia (N=829)	Normocapnia (N=839)
Demographic characteristics		
Age — yr	61.2±14.3	61.6±13.3
Male sex — no. (%)	635 (76.6)	681 (81.2)
Medical history		
Hypertension — no./total no. (%)	270/798 (33.8)	297/795 (37.4)
Diabetes — no. (%)	148 (17.9)	161 (19.2)
Percutaneous coronary intervention — no./total no. (%)	112/798 (14.0)	118/795 (14.8)
Myocardial infarction — no. (%)	96 (11.6)	128 (15.3)
Chronic obstructive pulmonary disease — no. (%)	82 (9.9)	87 (10.4)
Heart failure — no. (%)	59 (7.1)	74 (8.8)
Coronary-artery bypass grafting — no. (%)	48/798 (6.0)	58/795 (7.3)
NYHA class III or IV heart failure — no./total no. (%)	10/804 (1.2)	18/811 (2.2)
Median Charlson comorbidity index (IQR)†	2 (1–4)	2 (1–4)
Characteristics of the cardiac arrest		
Location of the cardiac arrest — no. (%)		
Place of residence	471 (56.8)	461 (54.9)
Public place	266 (32.1)	277 (33.0)
Workplace	59 (7.1)	67 (8.0)
Other	33 (4.0)	34 (4.1)
Bystander-witnessed cardiac arrest — no. (%)	730 (88.1)	744 (88.7)
Bystander-performed CPR — no. (%)	667 (80.5)	681 (81.2)
First monitored rhythm — no. (%)		
Shockable rhythm	581 (70.1)	608 (72.5)
Ventricular fibrillation	554 (66.8)	578 (68.9)
Nonperfusing ventricular tachycardia	27 (3.3)	30 (3.6)
ROSC after bystander-initiated defibrillation	28 (3.4)	27 (3.2)
Unknown rhythm, shock administered	24 (2.9)	19 (2.3)
Nonshockable rhythm	181 (21.8)	176 (21.0)
Pulseless electrical activity	110 (13.3)	98 (11.7)
Asystole	71 (8.6)	78 (9.3)
Unknown rhythm, no shock administered	15 (1.8)	9 (1.1)
Median time from cardiac arrest to sustained ROSC (IQR) — min‡	26 (17–40)	25 (16–39)
Median time from cardiac arrest to randomization (IQR) — min	154 (121–183)	151 (117–180)
Clinical characteristics on hospital admission		
Tympanic temperature — °C	35.4±1.1	35.4±1.1
Median FOUR motor score (IQR)§	0 (0–0)	0 (0–0)
Corneal reflexes present in both eyes — no./total no. (%)	121/277 (43.7)	112/280 (40.0)
Pupillary reflexes present in both eyes — no./total no. (%)	517/664 (77.9)	526/665 (79.1)
Median arterial pH (IQR)	7.20 (7.10–7.28)	7.22 (7.10–7.29)
Arterial lactate level — mmol/liter	6.79±3.58	7.00±3.93
First measured $Paco_2$ — mm Hg	52.8±17.3	52.5±20.3

PODPORA OBĚHU

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European Resuscitation Council and European Society of Intensive Care Medicine Guidelines 2021: Post-resuscitation care☆

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Haemodynamic monitoring and management

- All patients should be monitored with an arterial line for continuous blood pressure measurements, and it is reasonable to monitor cardiac output in haemodynamically unstable patients.
- Perform early (as soon as possible) echocardiography in all patients to detect any underlying cardiac pathology and quantify the degree of myocardial dysfunction.
- Avoid hypotension (<65 mmHg). Target mean arterial pressure (MAP) to achieve adequate urine output (>0.5 mL kg^{-1} h^{-1}) and normal or decreasing lactate (Fig. 3).
- During TTM at 33 °C, bradycardia may be left untreated if blood pressure, lactate, $ScvO_2$ or SvO_2 is adequate. If not, consider increasing the target temperature, but to no higher than 36 °C.
- Maintain perfusion with fluids, noradrenaline and/or dobutamine, depending on individual patient need for intravascular volume, vasoconstriction or inotropy.
- Do not give steroids routinely after cardiac arrest.
- Avoid hypokalaemia, which is associated with ventricular arrhythmias.

BOX

- CRT 2x2 factorial design
- Comatose OHCA patients 1:1, TTM 36
- key exclusions: unwitnessed asystole or IC bleeding or stroke
- MAP: 63 mm Hg vs. MAP 77 mm Hg
- 789 patients (393 vs. 396)
- Blinded calibration of MAP devices (70 mm Hg for all, but real +/- 10%)
- MAP maintained with fluidws to CVP 10 mm Hg, norepinephrine and the addition dopamine if needed
- Primary outcome: composite of death from any cause or hospital discharge CPC 3,4 to D90
- Secondary outcomes: NSE at H48, death from any cause, cognitive ability scores and CPC at day 90

Table 2. Outcomes and Adverse Events.*

Outcome or Event	High Blood-Pressure Target (N=393)	Low Blood-Pressure Target (N=396)	Hazard Ratio (95% CI)	P Value
Primary outcome				
Death from any cause or CPC of 3 or 4 at discharge within 90 days — no. (%)†	133 (34)	127 (32)	1.08 (0.84–1.37)	0.56
Secondary outcomes				
Death from any cause within 90 days — no. (%)	122 (31)	114 (29)	1.13 (0.88–1.46)	
Acute kidney injury with renal-replacement therapy — no. (%)	41 (10)	40 (10)	1.03 (0.66–1.59)	
Median CPC at 3 months (IQR)†	1 (1–5)	1 (1–5)		
Median modified Rankin scale score at 3 months (IQR)‡	1 (0–6)	1 (0–6)		
Median Montreal Cognitive Assessment score, per protocol (IQR)§	20 (15–27)	21 (15–27)		
Median Montreal Cognitive Assessment score at 3 months, post hoc (IQR)§	27 (24–29)	26 (24–29)		
Median neuron-specific enolase level at 48 hours (IQR) — μg/liter¶	18 (11–37)	18 (11–34)		
			Relative Risk (95% CI)	
Serious adverse events — no. (%)				
Infection‖	102 (26)	110 (28)	0.96 (0.82–1.11)	0.56
Arrhythmia**	59 (15)	50 (13)	1.10 (0.79–1.38)	0.33
Any bleeding††	82 (21)	92 (23)	0.93 (0.79–1.10)	0.43
Uncontrolled bleeding††	22 (6)	16 (4)	0.85 (0.64–1.13)	0.31
Electrolyte disorder‡‡	23 (6)	34 (9)	0.82 (0.66–1.04)	0.13
Metabolic disorder§§	31 (8)	31 (8)	1.00 (0.77–1.30)	0.98
Seizure¶¶	76 (19)	88 (22)	0.92 (0.78–1.08)	0.32

KONTROLA TĚLESNÉ TEPLOTY

FN MOTOL

Temperature control

- Maintain a constant, target temperature between 32 °C and 36 °C for those patients in whom temperature control is used (strong recommendation, moderate-quality evidence).
- Whether certain subpopulations of cardiac arrest patients may benefit from lower (32–34 °C) or higher (36 °C) temperatures remains unknown, and further research may help elucidate this.
- TTM is recommended for adults after OHCA with an initial shockable rhythm who remain unresponsive after ROSC (strong recommendation, low-quality evidence).
- TTM is suggested for adults after OHCA with an initial non-shockable rhythm who remain unresponsive after ROSC (weak recommendation, very low-quality evidence).
- TTM is suggested for adults after IHCA with any initial rhythm who remain unresponsive after ROSC (weak recommendation, very low-quality evidence).
- If targeted temperature management is used, it is suggested that the duration is at least 24 h (weak recommendation, very low-quality evidence).

- We recommend TTM for adults after either OHCA or IHCA (with any initial rhythm) who remain unresponsive after ROSC.
- Maintain a target temperature at a constant value between 32 °C and 36 °C for at least 24 h.
- Avoid fever (>37.7 °C) for at least 72 h after ROSC in patients who remain in coma.

A recent randomised controlled trial of both IHCA and OHCA patients with initial non-shockable rhythms showed a higher percentage of patients survived with a favourable neurological outcome when treated with TTM at 33 °C versus 37 °C.[13] This has enabled the recommendation to be extended to all rhythms and locations.

The definition of fever (>37.7 °C) is consistent with that used in the TTM2 trial.[14]

KONTROLA TĚLESNÉ TEPLOTY

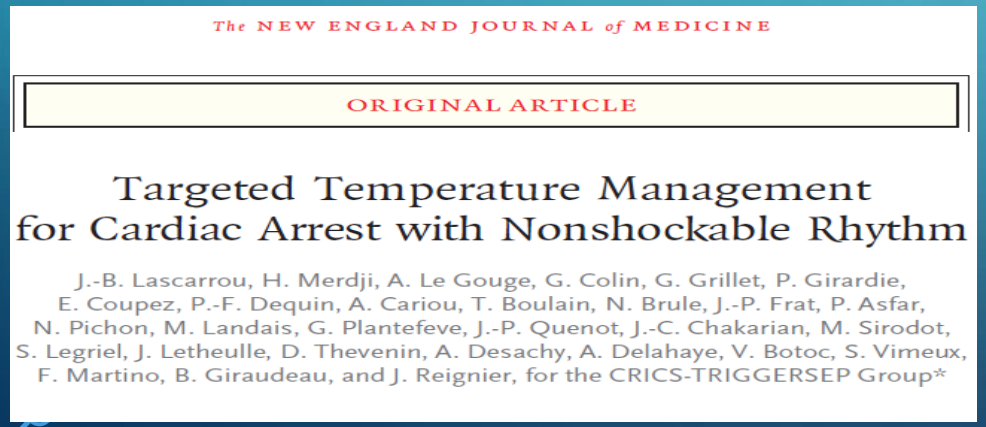
FN MOTOL

Temperature control

- We recommend targeted temperature management (TTM) for adults after either OHCA or in-hospital cardiac arrest (IHCA) (with any initial rhythm) who remain unresponsive after ROSC.
- Maintain a target temperature at a constant value between 32 °C and 36 °C for at least 24 h.
- Avoid fever (>37.7 °C) for at least 72 h after ROSC in patients who remain in coma.
- Do not use pre-hospital intravenous cold fluids to initiate hypothermia.

HYPERION

- 33°C vs. 37°C u nedefibr. rytmu
- prim. outcome: 90. den CPC 1,2
- sekund. outcome: 90. denní mortalita
- IHCA i OHCA



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management for Cardiac Arrest with Nonshockable Rhythm

J.-B. Lascarrou, H. Merdji, A. Le Gouge, G. Colin, G. Grillet, P. Girardie, E. Coupez, P.-F. Dequin, A. Cariou, T. Boulain, N. Brule, J.-P. Frat, P. Asfar, N. Pichon, M. Landais, G. Plantefeve, J.-P. Quenot, J.-C. Chakarian, M. Sirodot, S. Legriel, J. Letheulle, D. Thevenin, A. Desachy, A. Delahaye, V. Botoc, S. Vimeux, F. Martino, B. Giraudeau, and J. Reignier, for the CRICS-TRIGGERSEP Group*

Table 2. Neurologic Outcomes and Hospitalization Characteristics.*

Outcome	Hypothermia (N=284)	Normothermia (N=297)	Difference or Hazard Ratio (95% CI)
CPC score of 1 or 2 on day 90 — no. (%)	29 (10.2)	17 (5.7)	4.5 (0.1 to 8.9)†
CPC score distribution on day 90 — no. (%)			
CPC score of 1	16 (5.6)	11 (3.7)	
CPC score of 2	13 (4.6)	6 (2.0)	
CPC score of 3	22 (7.7)	31 (10.4)	
CPC score of 4	1 (0.4)	0	
CPC score of 5	231 (81.3)	247 (83.2)	
Loss to follow-up	1 (0.4)	2 (0.7)	
Death by day 90 — no. (%)	231 (81.3)	247 (83.2)	−1.9 (−8.0 to 4.4)†
Death in the ICU — no. (%)	222 (78.2)	236 (79.5)	0.93 (0.78 to 1.10)‡
Duration of mechanical ventilation — days			
Median	4.5	4.0	
Interquartile range	2.0 to 7.0	2.0 to 7.0	
Length of stay in ICU — days			
Median	4.0	4.0	
Interquartile range	2.0 to 7.0	2.0 to 6.0	
Survival to ICU discharge — no. (%)	62 (21.8)	61 (20.5)	1.07 (0.75 to 1.52)‡
Duration of mechanical ventilation — days			
Median	11.0	10.0	
Interquartile range	6.0 to 24.0	4.0 to 27.0	
Length of stay in ICU — days			
Median	6.0	6.0	
Interquartile range	4.0 to 18.0	2.0 to 21.0	
Survival to hospital discharge — no. (%)	56 (19.7)	50 (16.8)	1.19 (0.81 to 1.74)‡

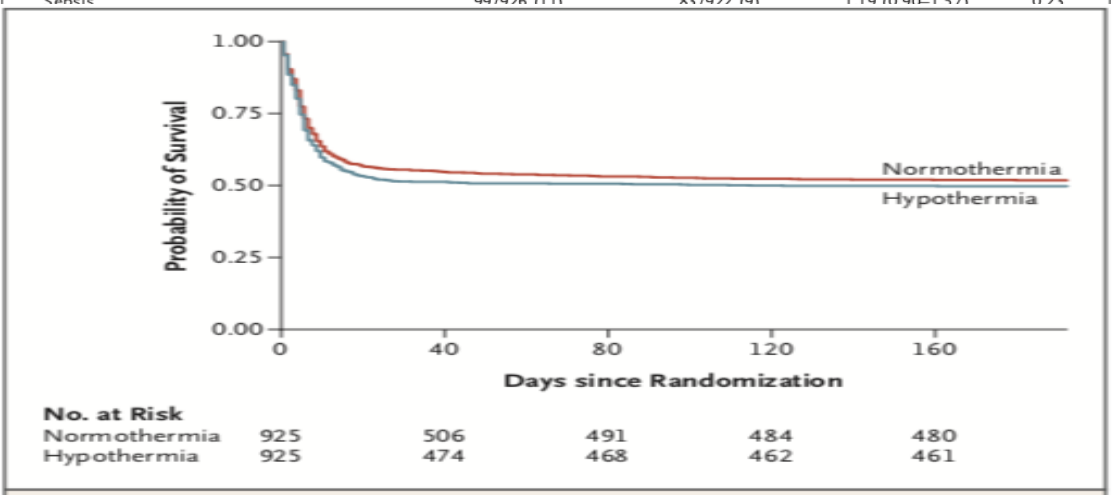
ORIGINAL ARTICLE

Hypothermia versus Normothermia after Out-of-Hospital Cardiac Arrest

J. Dankiewicz, T. Cronberg, G. Lilja, J.C. Jakobsen, H. Levin, S. Ullén, C. Rylander, M.P. Wise, M. Oddo, A. Cariou, J. Bělohlávek, J. Hovdenes, M. Saxena, H. Kirkegaard, P.J. Young, P. Pelosi, C. Storm, F.S. Taccone, M. Joannidis, C. Callaway, G.M. Eastwood, M.P.G. Morgan, P. Nordberg, D. Erlinge, A.D. Nichol, M.S. Chew, J. Hollenberg, M. Thomas, J. Bewley, K. Sweet, A.M. Grejs, S. Christensen, M. Haenggi, A. Levis, A. Lundin, J. Düring, S. Schmidbauer, T.R. Keeble, G.V. Karamasis, C. Schrag, E. Faessler, O. Smid, M. Otáhal, M. Maggiorini, P.D. Wendel Garcia, P. Jaubert, J.M. Cole, M. Solar, O. Borgquist, C. Leithner, S. Abed-Maillard, L. Navarra, M. Annborn, J. Undén, I. Brunetti, A. Awad, P. McGuigan, R. Bjørkholt Olsen, T. Cassina, P. Vignon, H. Langeland, T. Lange, H. Friberg, and N. Nielsen, for the TTM2 Trial Investigators*

Table 2. Outcomes and Adverse Events.

Outcome or Event	Hypothermia (N=930)	Normothermia (N=931)	Relative Risk (95% CI)*	P Value
Primary outcome: death from any cause at 6 mo — no./total no. (%)	465/925 (50)	446/925 (48)	1.04 (0.94–1.14)	0.37
Main secondary outcome — no./total no. (%)				
Score of 4–6 on modified Rankin scale at 6-mo follow-up†	488/881 (55)	479/866 (55)	1.00 (0.92–1.09)	
Poor functional outcome at 6 mo‡	495/918 (54)	493/911 (54)	1.00 (0.91–1.08)	
Score on modified Rankin scale at 6-mo follow-up — no./total no. (%)†				
0	140/881 (16)	148/866 (17)		
1	87/881 (10)	80/866 (9)		
2	132/881 (15)	127/866 (15)		
3	34/881 (4)	32/866 (4)		
4	16/881 (2)	20/866 (2)		
5	7/881 (1)	13/866 (2)		
6	465/881 (53)	446/866 (52)		
Serious adverse events — no./total no. (%)				
Arrhythmia resulting in hemodynamic compromise	222/927 (24)	152/921 (16)	1.45 (1.21–1.75)	<0.001
Bleeding	44/927 (5)	46/922 (5)	0.95 (0.63–1.42)	0.81
Skin complication related to device used for targeted temperature management	10/927 (1)	5/922 (<1)	1.99 (0.71–6.37)	0.21
Pneumonia	330/927 (36)	322/921 (35)	1.02 (0.90–1.15)	0.75
Sepsis	99/926 (11)	83/922 (9)	1.19 (0.90–1.57)	0.23



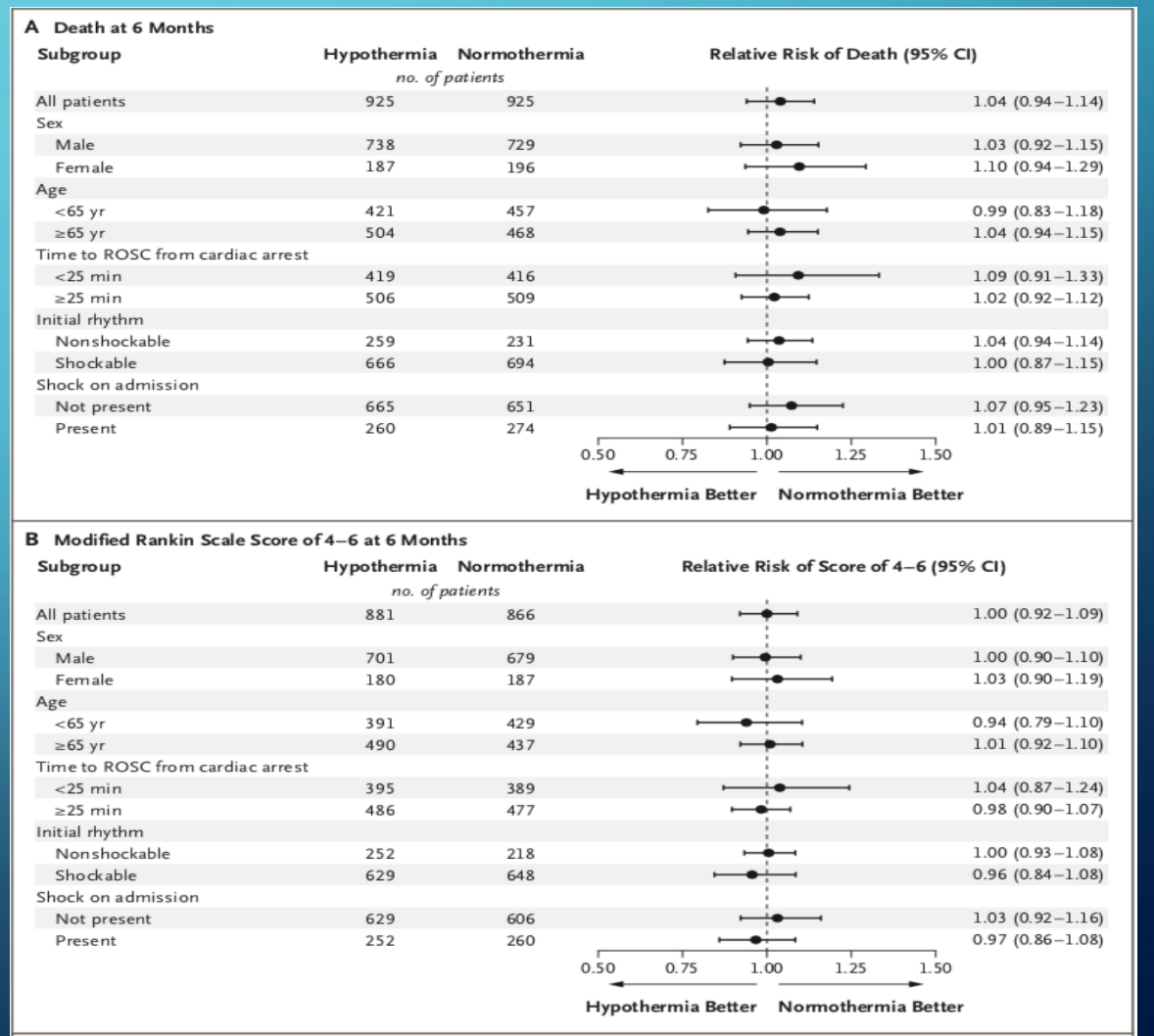
TTM 2

33^{0}C vs. normotermie do 37.8 ^{0}C

primární outocome: 6-měs. mortalita

sekundární outcome: 6-měs. mRS ≥4

OHCA bez ohledu na inic. rytmus



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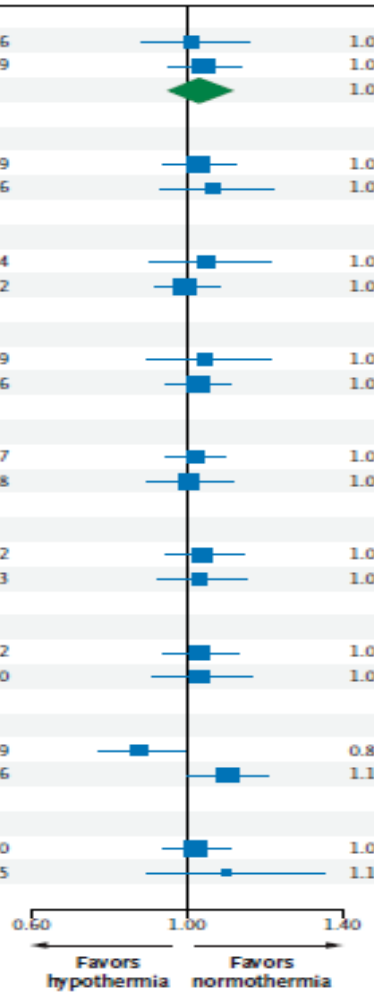
ORIGINAL ARTICLE

Hypothermic versus Normothermic Temperature Control after Cardiac Arrest

FN MOTOL

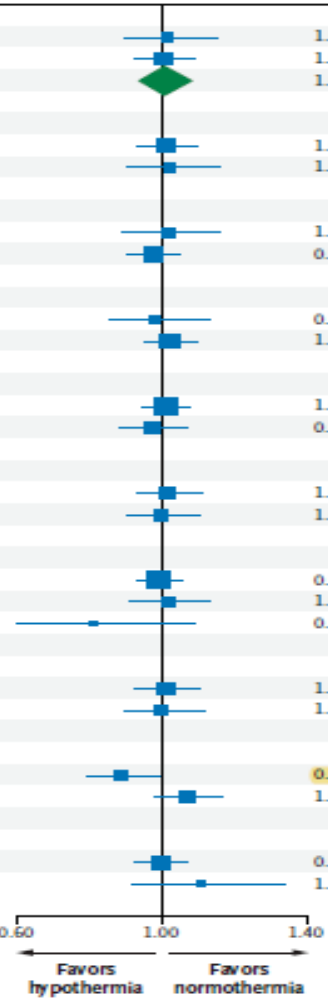
Meta-analysis of all-cause mortality (including subgroups)

Outcome →	Hypothermia Died	Hypothermia Survived	Normothermia Died	Normothermia Survived	Risk Ratio with 95% CI
TTM1	226	247	220	246	1.01 0.88 to 1.16
TTM2	465	460	446	479	1.04 0.95 to 1.14
					1.03 0.96 to 1.11
					P = 0.41
Sex					
Male	528	603	498	599	1.03 0.94 to 1.13
Female	163	104	168	126	1.07 0.93 to 1.23
Age					
<65 years	230	414	234	454	1.05 0.91 to 1.22
≥65 years	461	293	431	272	1.00 0.92 to 1.08
Time to ROSC from arrest					
<25 min	221	414	209	419	1.05 0.90 to 1.22
≥25 min	470	293	456	306	1.03 0.95 to 1.12
Initial rhythm					
Nonshockable	288	69	252	67	1.02 0.95 to 1.10
Shockable	403	638	413	658	1.00 0.90 to 1.12
Shock on admission					
Not present	473	594	447	602	1.04 0.94 to 1.15
Present	218	112	218	123	1.03 0.92 to 1.15
Time to ALS					
≥10 min	405	325	373	322	1.03 0.94 to 1.14
<10 min	285	375	287	400	1.03 0.91 to 1.17
Bystander CPR					
No bystander CPR	171	128	209	119	0.88 0.77 to 1.02
Bystander CPR	520	579	455	606	1.10 1.01 to 1.21
Witnessed arrest					
Witnessed arrest	609	656	595	670	1.02 0.94 to 1.11
Unwitnessed arrest	82	51	70	55	1.10 0.90 to 1.35



Meta-analyses of functional outcome (including subgroups)

Functional outcome →	Hypothermia Poor	Hypothermia Good	Normothermia Poor	Normothermia Good	Risk Ratio with 95% CI
TTM1	245	224	239	225	1.01 0.90 to 1.15
TTM2	488	393	479	387	1.00 0.92 to 1.09
					1.01 0.94 to 1.08
					P = 0.88
Sex					
Male	563	527	536	510	1.01 0.93 to 1.09
Female	170	90	182	102	1.02 0.90 to 1.16
Age					
<65 years	250	361	261	387	1.02 0.89 to 1.16
≥65 years	483	256	457	225	0.98 0.91 to 1.05
Time to ROSC from arrest					
<25 min	236	373	237	362	0.98 0.85 to 1.13
≥25 min	497	244	480	250	1.02 0.95 to 1.10
Initial rhythm					
Nonshockable	298	51	259	47	1.01 0.95 to 1.08
Shockable	435	566	458	565	0.97 0.88 to 1.07
Shock on admission					
Not present	508	521	487	515	1.02 0.93 to 1.11
Present	225	96	230	97	1.00 0.90 to 1.10
MIRACLE2 risk group					
High risk	281	43	259	37	0.99 0.93 to 1.05
Intermediate risk	282	215	268	211	1.01 0.91 to 1.13
Low risk	60	283	87	315	0.81 0.60 to 1.09
Time to ALS					
≥10 min	427	286	395	271	1.01 0.93 to 1.10
<10 min	305	326	317	338	1.00 0.89 to 1.12
Bystander CPR					
No bystander CPR	183	108	224	91	0.88 0.79 to 0.99
Bystander CPR	550	509	492	520	1.07 0.98 to 1.16
Witnessed arrest					
Witnessed arrest	647	572	644	562	0.99 0.92 to 1.07
Unwitnessed arrest	86	45	73	50	1.11 0.91 to 1.34



Diagnosis of cause of cardiac arrest

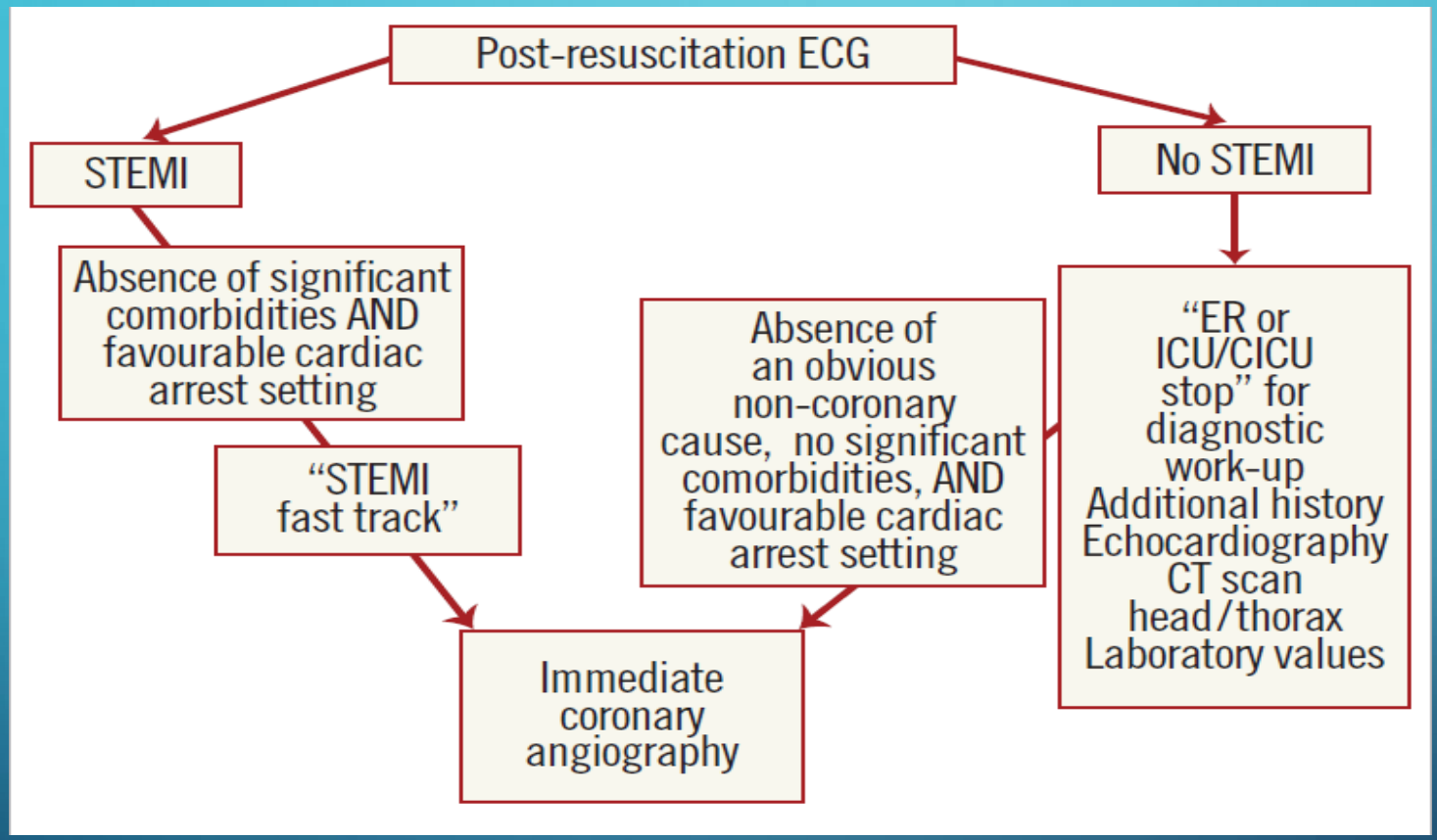
- Early identification of a respiratory or neurological cause can be achieved by performing a brain and chest CT-scan at hospital admission, before or after coronary angiography (see coronary reperfusion).
- In the absence of signs or symptoms suggesting a neurological or respiratory cause (e.g. headache, seizures or neurological deficits, shortness of breath or documented hypoxaemia in patients with known respiratory disease) or if there is clinical or ECG evidence of myocardial ischaemia, undertake coronary angiography first. This is followed by CT scan if coronary angiography fails to identify causative lesions.

Coronary reperfusion

- Emergent cardiac catheterisation laboratory evaluation (and immediate PCI if required) should be performed in adult patients with ROSC after cardiac arrest of suspected cardiac origin with ST-elevation on the ECG.
- In patients with ROSC after out-of-hospital cardiac arrest (OHCA) without ST-elevation on the ECG, emergent cardiac catheterisation laboratory evaluation should be considered if there is an estimated high probability of acute coronary occlusion (e.g. patients with haemodynamic and/or electrical instability).

2015 Guidelines	2021 Guidelines	Rationale for change
Coronary angiography It is reasonable to discuss and consider emergent cardiac catheterisation laboratory evaluation after ROSC in patients with the highest risk of a coronary cause for their cardiac arrest	In patients with ROSC after OHCA without ST-elevation on the ECG, emergent cardiac catheterisation laboratory evaluation should be considered if there is an estimated high probability of acute coronary occlusion (e.g. patients with haemodynamic and/or electrical instability).	A randomised controlled trial showed no difference in 90-day survival following out of hospital VF cardiac arrest among patients without ST-elevation on the ECG allocated to immediate coronary angiography versus delayed angiography.[10] Recent ESC guidelines state that 'Delayed as opposed to immediate angiography should be considered in haemodynamically stable patients without ST-segment elevation successfully resuscitated after an out-of-hospital cardiac arrest'.[11]

DIAGNOSTIKA



Invasive coronary treatment strategies for out-of-hospital cardiac arrest: a consensus statement from the European Association for Percutaneous Cardiovascular Interventions (EAPCI)/Stent for Life (SFL) groups

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(Summary of the 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Prepared by the Czech Society of Cardiology)

Tabulka 13 – Riziková kritéria vyžadující invazivní strategii u non-STE AKS

Kritéria velmi vysokého rizika
• Hemodynamická nestabilita nebo kardiogenní šok
• Recidivující nebo pokračující bolest na hrudi refrakterní k medikamentózní léčbě
• Život ohrožující arytmie nebo srdeční zástava
• Mechanické komplikace infarktu myokardu
• Akutní srdeční selhání
• Recidivující dynamické změny ST nebo vlny T zejména s intermitentními elevacemi úseku ST

5.6.3 Načasování invazivní strategie

■ ***Okamžitá invazivní strategie (< 2 h)***

Pacienti s non-STE AKS a velmi vysokým rizikem (tabulka 13) mají bez léčby špatnou prognózu. Doporučuje se okamžitá (tj. < 2 h od přijetí k hospitalizaci, analogická léčbě STEMI) invazivní strategie bez ohledu na EKG nebo výsledky biomarkerů. Centra bez STEMI programu by měla tyto pacienty okamžite prelozit (obr. 6). Lecba pacientu se srdeční zástavou mimo nemocnici a bez STE na EKG musí být individualizována a vyžaduje multidisciplinární konzultaci. Ti, kteří jsou při vědomí, by měli okamžitě podstoupit SKG

Doporučené postupy ESC pro léčbu akutního infarktu myokardu u pacientů s elevacemi úseku ST, 2017: souhrn dokumentu vypracovaný Českou kardiologickou společností

(2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: Summary of the document prepared by the Czech Society of Cardiology)

ČESKÁ KARDIOLOGICKÁ SPOLEČNOST
THE CZECH SOCIETY OF CARDIOLOGY

Petr Kala[a], Martin Mates[b], Michael Želízko[c], Richard Rokyta[d], Petr Ošťádal[b]

Srdeční zástava

Doporučení	Třída[a]	Úroveň[b]
U pacientů po resuscitaci pro srdeční zástavu s EKG záznamem odpovídajícím STEMI je doporučena strategie primární PCI.	I	B
U pacientů, kteří v časném období po resuscitaci pro srdeční zástavu dále nereagují, je indikována cílená regulace tělesné teploty.[c]	I	B
Je indikováno, aby zdravotní systémy uplatňovaly strategie pro usnadnění převozu (jednou specializovanou záchrannou službou) všech pacientů s podezřením na IM přímo do nemocnic s nonstop (24/7) možností reperfuzní léčby formou PCI.	I	C
Je doporučeno, aby všichni lékaři a zdravotničtí pracovníci pečující o osoby s podezřením na IM měli přístup k defibrilátorům a byli vyškoleni v poskytování základní podpory srdeční a životních funkcí.	I	C
U pacientů po resuscitaci pro srdeční zástavu bez diagnostických elevací úseku ST, ale s vysokým podezřením na probíhající ischemii myokardu by měla být zvážena urgentní koronarografie (a PCI, pokud je indikována).	IIa	C
Přednemocniční chlazení rychlou i.v. aplikací velkých objemů chladné tekutiny okamžitě po obnovení spontánního oběhu není doporučeno	III	B

3.3 Srdeční zástava (tabulka 7)

K mnoha úmrtím dochází během prvních několika hodin od začátku STEMI z důvodu fibrilace komor. U resuscitovaných pacientů s elevacemi úseku ST na EKG je indikována okamžitá koronarografie. Detaily viz doporučené postupy European Resuscitation Council (ERC).

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EUROPEAN RESUSCITATION COUNCIL

European Resuscitation Council Guidelines for Resuscitation 2015
Section 8. Initial management of acute coronary syndromes

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- We recommend emergency cardiac catheterisation lab evaluation (and immediate PCI if required), in a manner similar to patients with STEMI without cardiac arrest, in selected adult patients with ROSC after out-of-hospital cardiac arrest (OHCA) of suspected cardiac origin with ST-elevation on ECG.
- In patients who are comatose and with ROSC after OHCA of suspected cardiac origin without ST-elevation on ECG It is reasonable to consider an emergency cardiac catheterisation lab evaluation in patients with the highest risk of coronary cause cardiac arrest.

The invasive management (i.e. early coronary angiography (CAG) followed by immediate PCI if deemed necessary) of this patient group, particularly patients after prolonged resuscitation and having nonspecific ECG changes, has been controversial due to the lack of specific evidence and significant implications on resource utilization (including transfer of patients to PCI centres).

COACT

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ORIGINAL ARTICLE

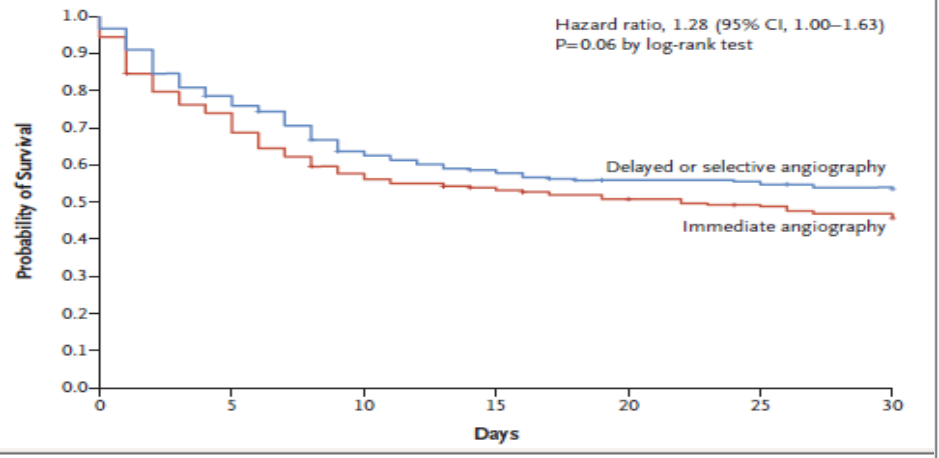
Table 3. Clinical Outcomes.*

Outcome	Immediate Angiography Group (N=273)	Delayed Angiography Group (N=265)	Effect Size (95% CI)†
Primary end point			
Survival at 90 days — no. of patients (%)‡	176 (64.5)	178 (67.2)	OR, 0.89 (0.62 to 1.27)
Secondary end points			
Survival with good cerebral performance or mild or moderate disability — no. of patients/total no. (%)	171/272 (62.9)	170/264 (64.4)	OR, 0.94 (0.66 to 1.31)
CPC score at 90 days — no./total no. (%)§			
1	157/272 (57.7)	159/264 (60.2)	Reference
2	14/272 (5.1)	11/264 (4.2)	OR, 1.29 (0.56 to 2.92)
3	4/272 (1.5)	5/264 (1.9)	OR, 0.81 (0.21 to 3.07)
4	0/272	2/264 (0.8)	NA
5	97/272 (35.7)	87/264 (33.0)	OR, 1.13 (0.78 to 1.63)
Survival until hospital discharge — no. of patients (%)	178 (65.2)	182 (68.7)	OR, 0.85 (0.60 to 1.22)
Neurologic status at ICU discharge			
GCS score			
Median (IQR)	15 (14 to 15)	15 (14 to 15)	
Geometric mean (95% CI)	13.7 (13.2 to 14.2)	13.5 (12.9 to 13.7)	1.02 (0.96 to 1.04)
CPC score — no./total no. (%)§			
1	74/258 (28.7)	86/249 (34.5)	Reference
2	59/258 (22.9)	56/249 (22.5)	OR, 1.22 (0.76 to 1.98)
3	36/258 (14.0)	30/249 (12.0)	OR, 1.39 (0.78 to 2.48)
4	4/258 (1.6)	9/249 (3.6)	OR, 0.52 (0.15 to 1.75)
5	85/258 (32.9)	68/249 (27.3)	OR, 1.45 (0.93 to 2.27)
TIMI major bleeding, any grade — no. (%)	7 (2.6)	13 (4.9)	OR, 0.51 (0.20 to 1.30)
Recurrence of ventricular tachycardia resulting in defibrillation or electrical cardioversion — no. (%)	21 (7.7)	16 (6.0)	OR, 1.30 (0.66 to 2.54)
Creatinine kinase			
Median AUC (IQR)	30,099 (9983 to 67,096)	28,006 (11,044 to 74,043)	
Geometric mean (95% CI)	25,694 (21,764 to 30,333)	25,306 (21,140 to 30,291)	1.02 (0.80 to 1.30)
Creatinine kinase MB			
Median AUC (IQR)	930 (402 to 2456)	851 (302 to 2868)	
Geometric mean (95% CI)	975 (793 to 1198)	949 (739 to 1219)	1.03 (0.74 to 1.42)
Troponin T			
Median AUC (IQR)	11.3 (4.4 to 33.5)	10.6 (4.5 to 36.2)	
Geometric mean (95% CI)	11.2 (9.2 to 13.6)	12.8 (10.3 to 16.0)	0.87 (0.64 to 1.16)
Troponin I			
Median AUC (IQR)	154.7 (33.1 to 1762)	183.2 (21.4 to 7278)	
Geometric mean (95% CI)	226.7 (100.1 to 513.2)	315.9 (116.7 to 837.5)	0.72 (0.21 to 2.54)
AKIN classification stage — no./total no. (%)¶			
0	218/244 (89.3)	214/243 (88.1)	Reference
1	12/244 (4.9)	8/243 (3.3)	OR, 1.47 (0.59 to 3.67)
2	4/244 (1.6)	5/243 (2.1)	OR, 0.79 (0.21 to 2.96)
3	10/244 (4.1)	16/243 (6.6)	OR, 0.61 (0.27 to 1.38)

TOMAHAWK

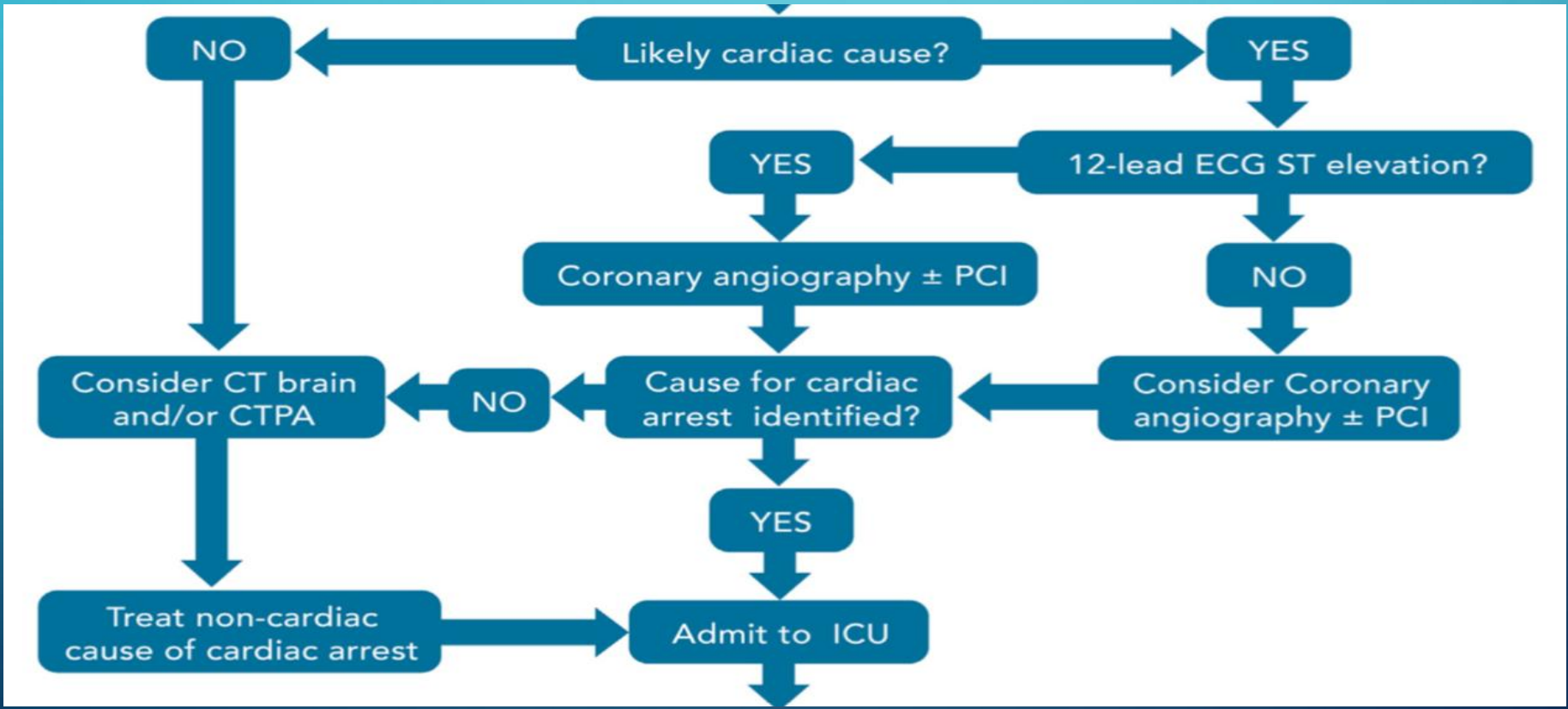
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

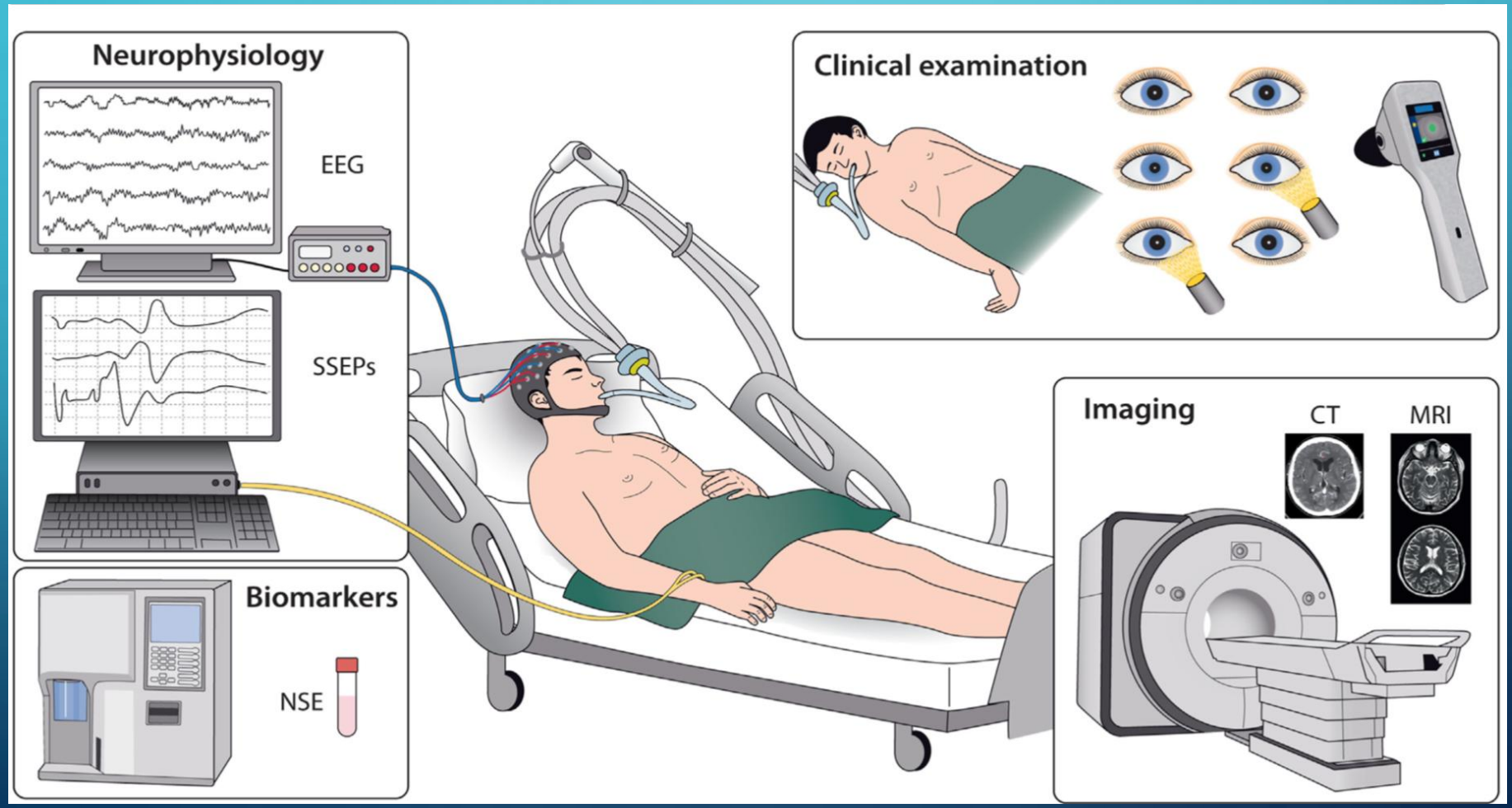


End Point	Immediate Angiography (N=265)	Delayed or Selective Angiography (N=265)	Effect Size (95% CI)†
Primary end point			
Death from any cause — no. (%)	143 (54.0)	122 (46.0)	Hazard ratio, 1.28 (1.00 to 1.63)
Secondary efficacy end points‡			
Myocardial infarction — no./total no. (%)	0/248	2/250 (0.8)	Relative risk, 0 (0 to 1.93)
Severe neurologic deficit — no./total no. (%)§	21/112 (18.8)	16/126 (12.7)	Relative risk, 1.48 (0.82 to 2.67)
Death from any cause or severe neurologic deficit — no./total no. (%)	164/255 (64.3)	138/248 (55.6)	Relative risk, 1.16 (1.00 to 1.34)
Median length of ICU stay (IQR) — days	7 (3–11)	8 (4–13)	HLE, –1 (–2 to 0)

DIAGNOSTICKÝ ALGORYTMUS

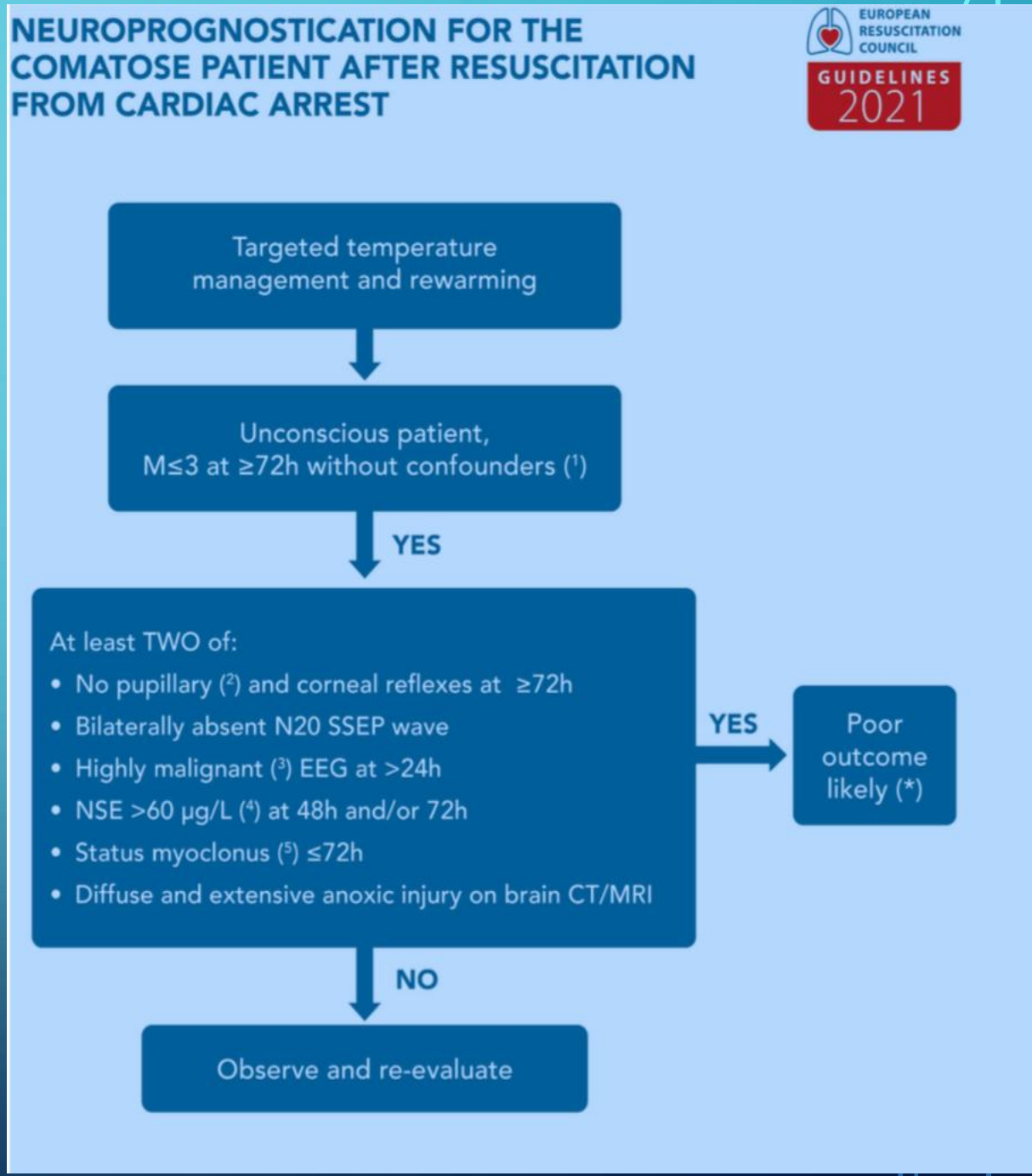


NEUROPROGNOSTIFIKACE



FN MOTOL

- Klinická : GMS, pupilární rf., korneální rf., myokolonus
- Elektrofyziologie: EEG, SSEP
- Biomarkery: NSE 24, 48 a 72 hod.
- Zobrazovací metody: CT/MRA



The NEW ENGLAND JOURNAL of MEDICINE

Trial of Three Anticonvulsant Medications for Status Epilepticus

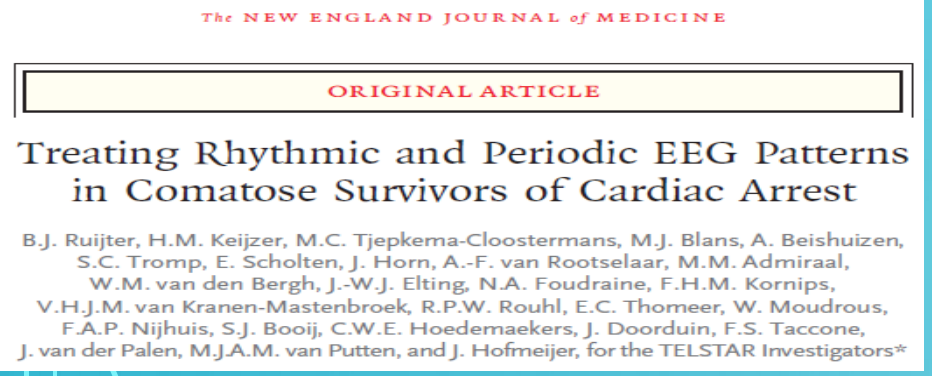
MULTICENTER, RANDOMIZED, DOUBLE-BLIND TRIAL

384
Children and adults with benzodiazepine-refractory status epilepticus

	Levetiracetam	Fosphenytoin	Valproate
	60 mg/kg	20 mg/kg (phenytoin equivalents)	40 mg/kg
Absence of clinically evident seizures and improved responsiveness at 60 min	47% (68/145)	45% (53/118)	46% (56/121)

No significant difference in rates of seizure cessation or in safety

Outcome	Levetiracetam (N=150)	Fosphenytoin (N=125)	Valproate (N=125)
	number of patients (percent)		
Life-threatening hypotension within 60 min after start of trial-drug infusion	1 (0.7)	4 (3.2)	2 (1.6)



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Treating Rhythmic and Periodic EEG Patterns in Comatose Survivors of Cardiac Arrest

B.J. Ruijter, H.M. Keijzer, M.C. Tjepkema-Cloostermans, M.J. Blans, A. Beishuizen, S.C. Tromp, E. Scholten, J. Horn, A.-F. van Rootselaar, M.M. Admiraal, W.M. van den Bergh, J.-W.J. Elting, N.A. Foudraine, F.H.M. Kornips, V.H.J.M. van Kranen-Mastenbroek, R.P.W. Rouhl, E.C. Thomeer, W. Moudrous, F.A.P. Nijhuis, S.J. Booij, C.W.E. Hoedemaekers, J. Doorduin, F.S. Taccone, J. van der Palen, M.J.A.M. van Putten, and J. Hofmeijer, for the TELSTAR Investigators*

TELSTAR

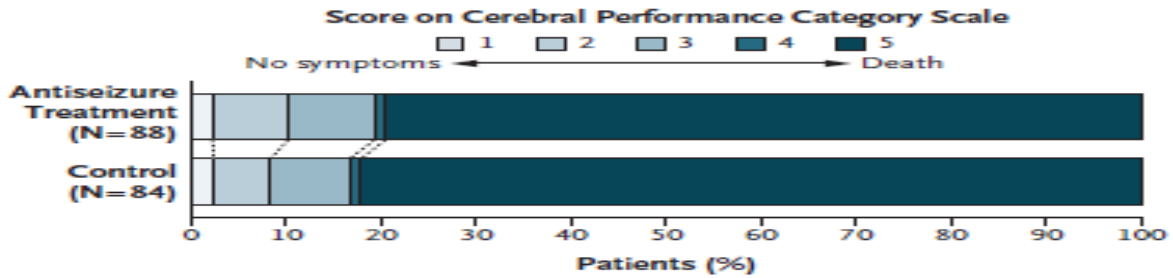
- 172 pt. comatose after OHCA/IHCA
- rhytmic and periodic EEG patterns on continous EEG (start at least H24)
- CRT 1:1, 88 pts. antiseiuzere med. vs. 84 pts. standard care
- Therapy et least 48 hours
- Primary outcome : CPC at 3 months
- Secondary endpoints: mortality, ICU stay, MV days
- Interventions:
- STEP 1- first antiseizure drug (phenytoin/valproate/levetiracetam)+ sedative (propofol or midazolame)
- STEP 2 – second antiseizure drug+second sedative
- STEP 3 – high dose barbiturate

Table 2. Antiseizure Treatment and EEG Response.*

Variable	Antiseizure Treatment (N=88)	Control (N=84)†
	no./total no. (%)	
Treatment details		
Intensive antiseizure treatment started	88/88 (100)	0/83
Intensive antiseizure treatment continued after 24 hr‡	54/88 (61)	0/83
No. of antiseizure drugs used		
0	0/88	75/83 (90)
1	24/88 (27)	5/83 (6)
2	57/88 (65)	3/83 (4)
≥3	7/88 (8)	0/83
No. of sedative drugs used		
0	1/88 (1)	20/83 (24)
1	27/88 (31)	47/83 (57)
2	54/88 (61)	15/83 (18)
≥3	6/88 (7)	1/83 (1)
≥1 Antiseizure drug continued during entire period of ICU admission	85/88 (97)	8/83 (10)
Effect on EEG recordings		
Complete suppression of EEG index activity for ≥48 consecutive hr§	49/88 (56)	2/83 (2)
Complete suppression of EEG index activity for ≥24 consecutive hr	75/88 (85)	10/83 (12)
Suppression of RPPs 0–24 hr after randomization		
Complete	64/88 (73)	3/83 (4)
Partial	20/88 (23)	11/83 (13)
None	4/88 (5)	69/83 (83)
Suppression of RPPs 24–48 hr after randomization‡		
Complete	60/88 (68)	39/83 (47)
Partial	12/88 (14)	14/83 (17)
None	6/88 (7)	9/83 (11)
No EEG recordings available	2/88 (2)	1/83 (1)
Treatment restrictions during ICU admission		
Do not resuscitate	32/88 (36)	36/83 (43)
Withdrawal of life-sustaining treatment	68/88 (77)	65/83 (78)

Table 3. Primary, Secondary, and Safety Outcomes (Intention-to-Treat Population).*

Outcome	Antiseizure Treatment (N=88)	Control (N=84)	Measure of Effect†		P Value
			Calculation	Value (95% CI)	
Primary outcome					
CPC score of 3, 4, or 5 at 3 mo — no. (%)	79 (90)	77 (92)	Risk difference	2 (–7 to 11)	0.68
Secondary outcomes‡					
CPC score at 3 mo§			Common odds ratio	1.19 (0.56 to 2.53)	
CPC score of 2 to 5 at 3 mo — no. (%)	86 (98)	82 (98)	Risk difference	0 (–5 to 4)	
CPC score of 4 or 5 at 3 mo — no. (%)	71 (81)	70 (83)	Risk difference	3 (–9 to 14)	
Death at 3 months — no. (%)	70 (80)	69 (82)	Risk difference	3 (–9 to 14)	
Mean length of stay in the ICU (95% CI) — days	8.7 (6.7 to 10.7)	7.5 (5.5 to 9.4)			
Mean duration of mechanical ventilation (95% CI) — days	7.8 (6.1 to 9.5)	6.6 (4.9 to 8.4)			
Serious adverse events until 3 mo					
Any serious adverse event — no. (%)	73 (83)	72 (86)	Chi-square test		0.62
Death after withdrawal of life-sustaining treatment — no./total no. (%)	68/88 (77)	65/83 (78)	Chi-square test		0.87
Death, other cause — no. (%)	2 (2)¶	4 (5)‖	Fisher's exact test		0.44
Patients with other serious adverse events — no. (%)	8 (9)	9 (11)	Chi-square test		0.72
No. of other serious adverse events	10	11			



FN MOTOL

CAC

Adult patients with non-traumatic OHCA should be considered for transport to a cardiac arrest centre according to local protocol.

An expert consensus paper published by several European organisations including the Association of Acute Cardiovascular Care (ACVA) of the European Society of Cardiology (ESC), the ERC and the ESICM, states that the minimum requirements for a cardiac arrest centre are 24/7 availability of an on-site coronary angiography laboratory, an emergency department, an ICU, imaging facilities, such as echocardiography, CT, and MRI.[16] Based on evidence from a systematic review, ILCOR suggests that wherever possible, adult patients with non-traumatic OHCA cardiac arrest should be cared for in cardiac arrest centres.[17]

ESC European Society of Cardiology European Heart Journal: Acute Cardiovascular Care doi:10.1093/ehjacc/zuaa024 CLINICAL PRACTICE/EDUCATION

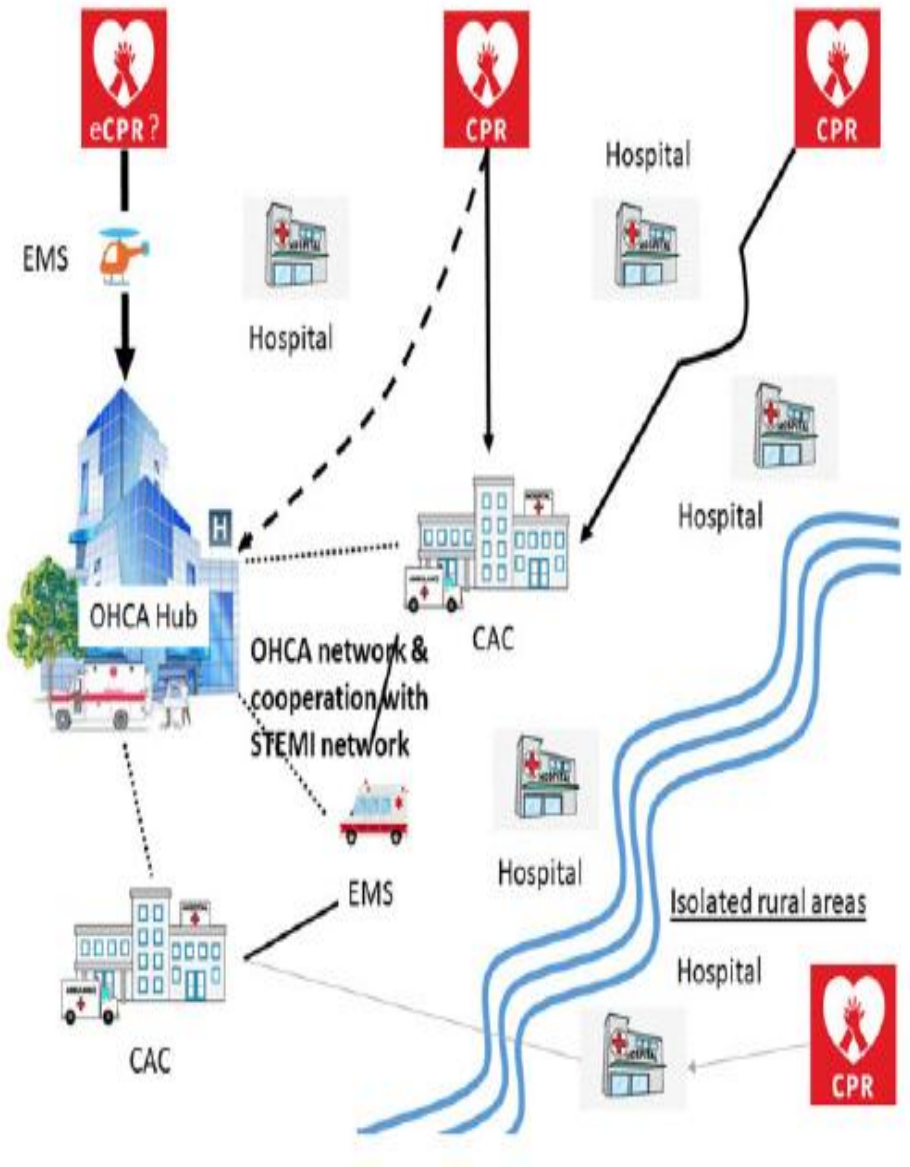
The cardiac arrest centre for the treatment of sudden cardiac arrest due to presumed cardiac cause: aims, function, and structure: position paper of the ACVC association of the ESC, EAPCI, EHRA, ERC, EUSEM, and ESICM

CAC (Cardiac Arrest Centre)

- Emergency department for assessment of patient without STEMI criteria for non-cardiac causes
- Coronary angiography 24/7
- ICU with the option of TTM
- Imaging facilities (TTE, TEE, CT and MRI)
- Rehabilitation service
- Education and teaching
- Data acquisition and quality control

OHCA hub hospital

- All features of the CAC AND
- Mechanical assist device program – eCPR
- Arrhythmia management with EPS
- Device management
- Research facilities and fund raising



FN MOTOL

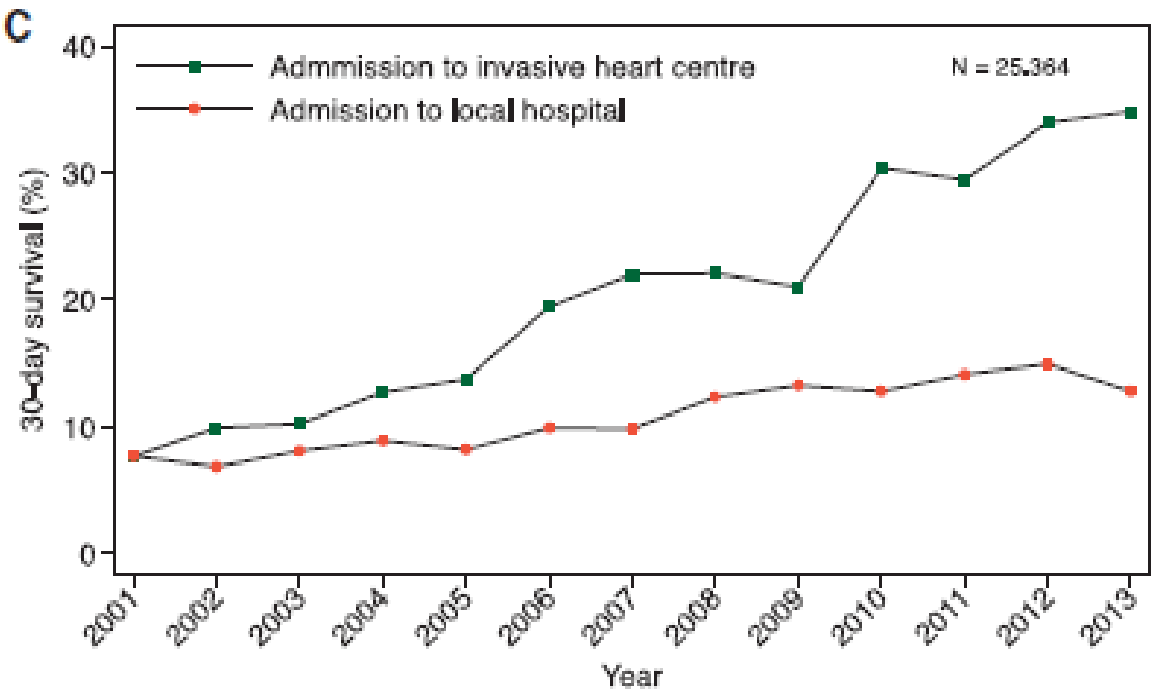
- 1. přijetí do PCI centra zlepšuje 30-denní přežívání
- 2. vzdálenost do centra nemá na přežívání vliv
- 3. přežívání je závislé na hustotě populace, laické KPR, zástavě přede svědky a defibrilovatelném rytmu

European Heart Journal (2017) 38, 1645–1652
doi:10.1093/eurheartj/ehx104

CLINICAL RESEARCH
Acute coronary syndromes

Distance to invasive heart centre, performance of acute coronary angiography, and angioplasty and associated outcome in out-of-hospital cardiac arrest: a nationwide study

Tinne Tranberg[1]*, Freddy K. Lippert[2], Erika F. Christensen[3,4], Carsten Stengaard[1], Jakob Hjort[1], Jens Flensted Lassen[1], Frants Petersen[5], Jan Skov Jensen[6], Caroline Bäck[7], Lisette Okkels Jensen[8], Jan Ravkilde[9], Hans Erik Bøtker[1], and Christian Juhl Terkelsen[1]



HR = 0.91 (95% CI: 0.89–0.93, $P < 0.001$)

JAMA Network | Open

Original Investigation | Emergency Medicine

Association of High-Volume Centers With Survival Outcomes Among Patients With Nontraumatic Out-of-Hospital Cardiac Arrest
A Systematic Review and Meta-Analysis

Amelia Xin Chun Goh; Jie Cong Seow; Melvin Yong Hao Lai; Nan Liu, PhD; Yi Man Goh; Marcus Eng Hock Ong, MBBS, MPH; Shir Lynn Lim, MBBS, MMed (Int Med); Jamie Sin Ying Ho, MBBChir (Cantab); Jun Wei Yeo; Andrew Fu Wah Ho, MBBS, MMed, MPH

Figure 2. Adjusted Odds of Survival to Charge and to 30 Days

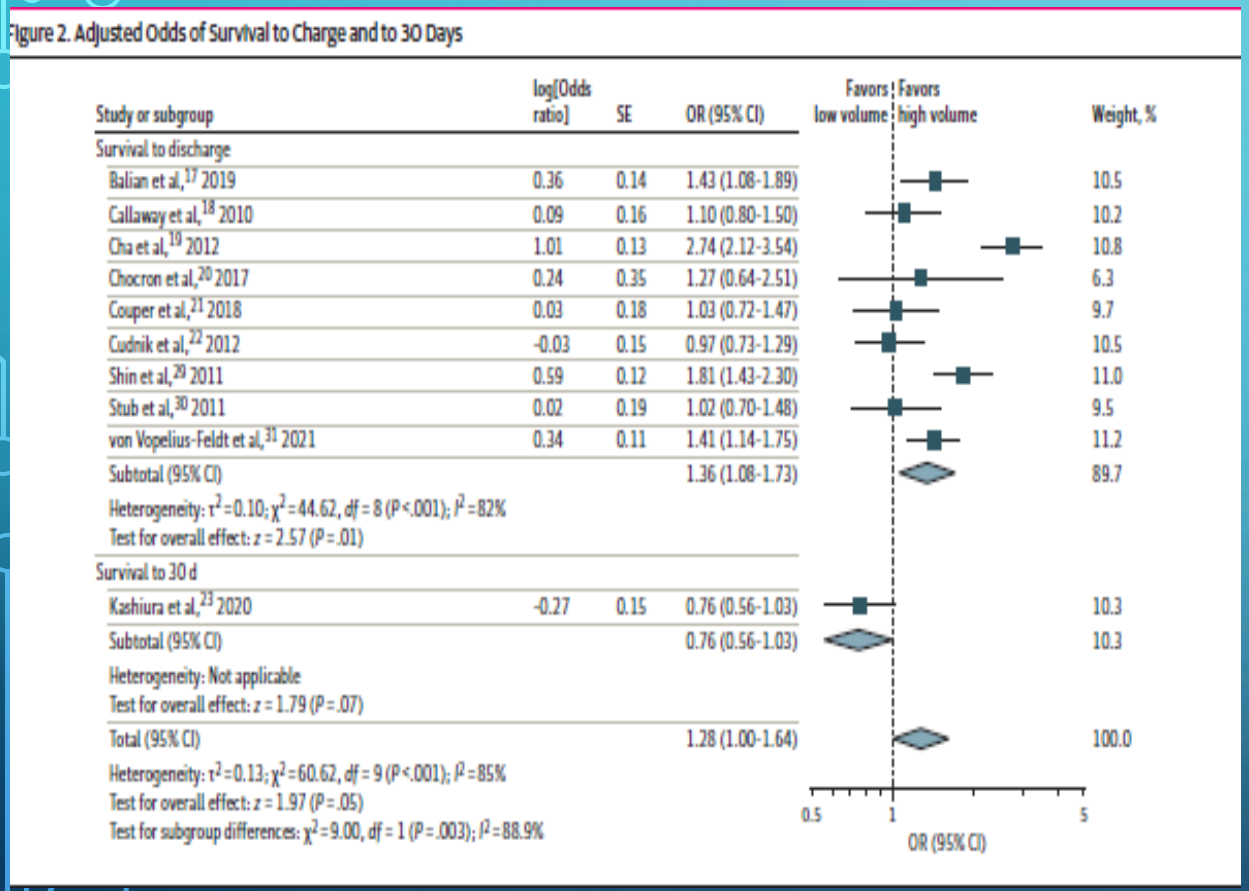
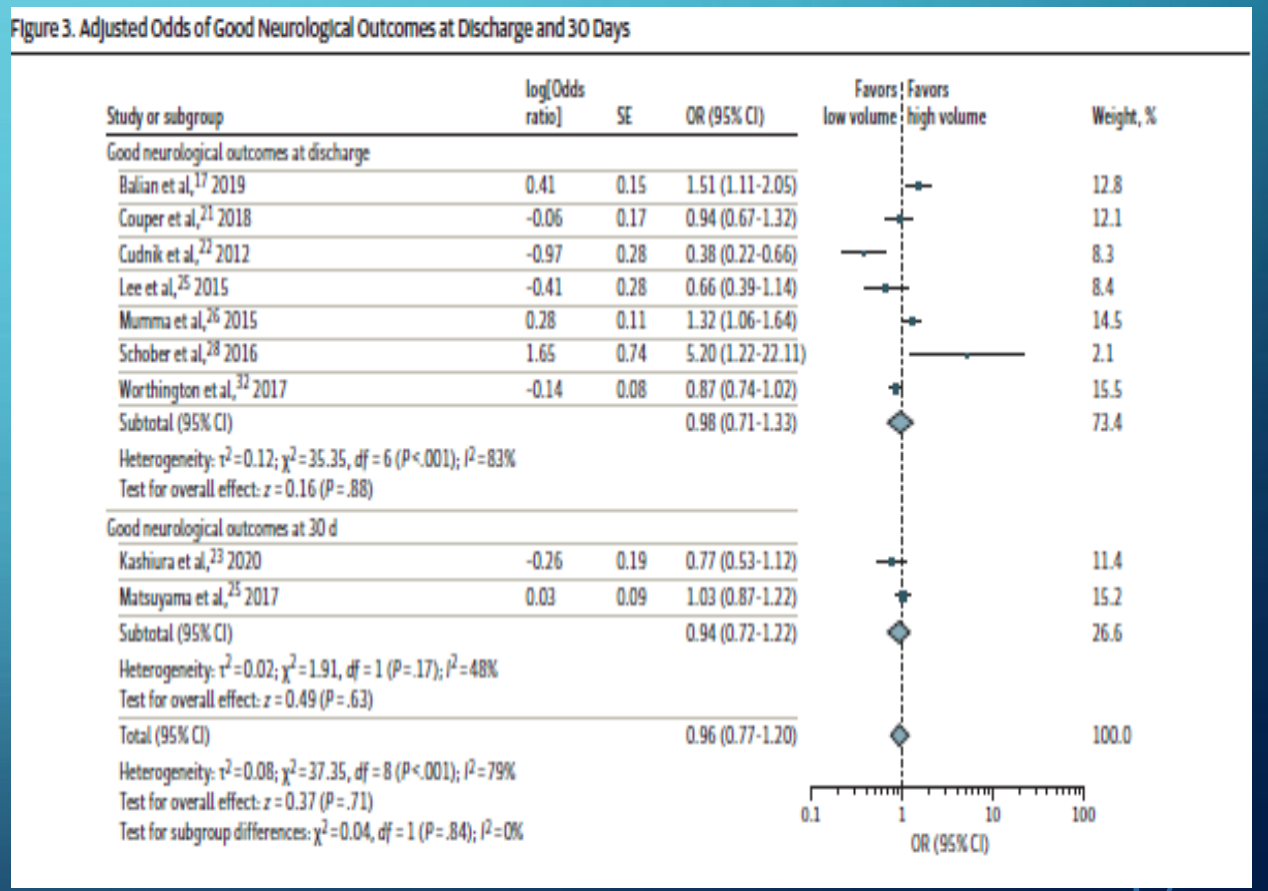
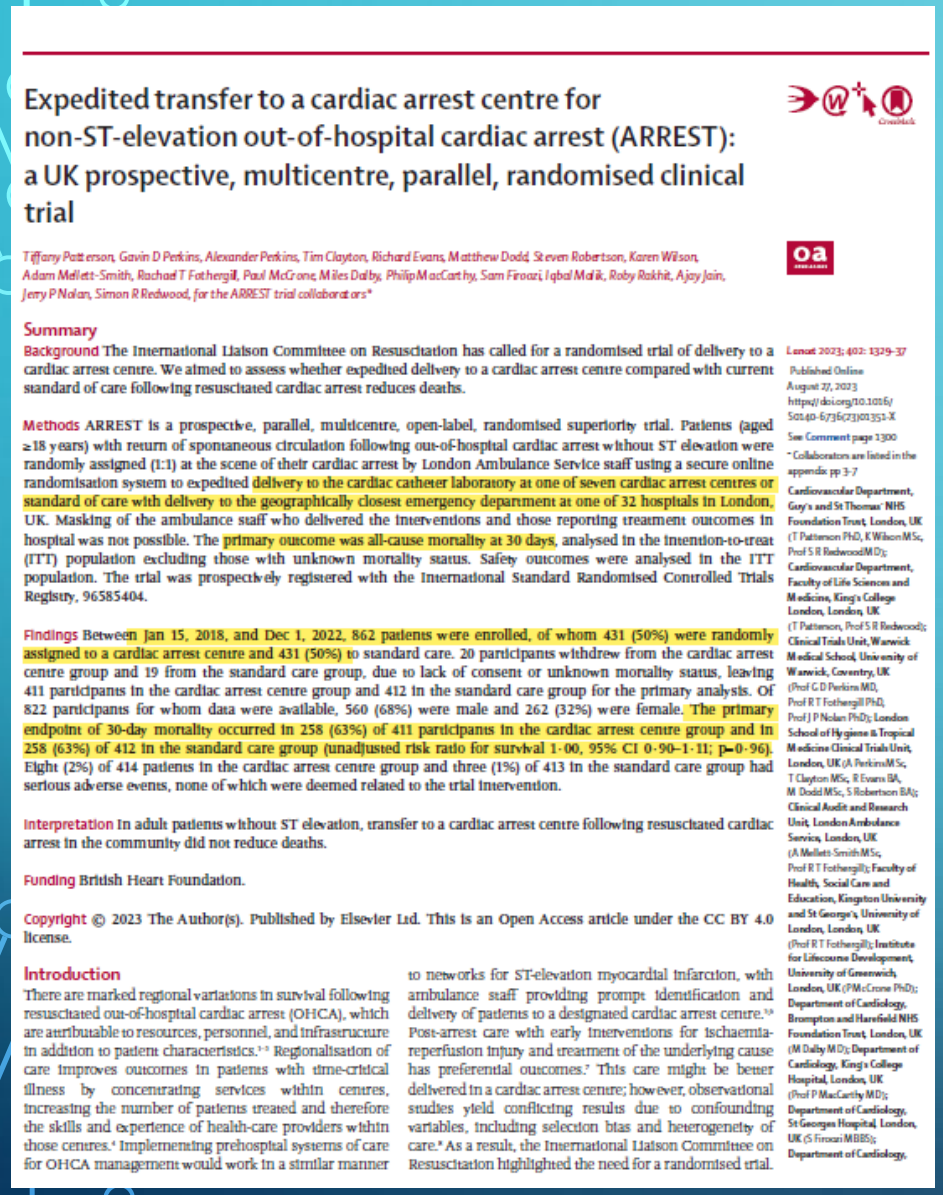


Figure 3. Adjusted Odds of Good Neurological Outcomes at Discharge and 30 Days





Expedited transfer to a cardiac arrest centre for non-ST-elevation out-of-hospital cardiac arrest (ARREST): a UK prospective, multicentre, parallel, randomised clinical trial

Tiffany Patterson, Gavin D Perkins, Alexander Perkins, Tim Clayton, Richard Evans, Matthew Dodd, Steven Robertson, Karen Wilson, Adam Mellett-Smith, Rachael T Fothergill, Paul McCrone, Miles Dalby, Philip MacCarthy, Sam Firoozi, Iqbal Malik, Roby Rakhit, Ajay Jain, Jerry P Nolan, Simon R Redwood, for the ARREST trial collaborators*

Summary

Background The International Liaison Committee on Resuscitation has called for a randomised trial of delivery to a cardiac arrest centre. We aimed to assess whether expedited delivery to a cardiac arrest centre compared with current standard of care following resuscitated cardiac arrest reduces deaths.

Methods ARREST is a prospective, parallel, multicentre, open-label, randomised superiority trial. Patients (aged ≥18 years) with return of spontaneous circulation following out-of-hospital cardiac arrest without ST elevation were randomly assigned (1:1) at the scene of their cardiac arrest by London Ambulance Service staff using a secure online randomisation system to expedited delivery to the cardiac catheter laboratory at one of seven cardiac arrest centres or standard of care with delivery to the geographically closest emergency department at one of 32 hospitals in London, UK. Masking of the ambulance staff who delivered the interventions and those reporting treatment outcomes in hospital was not possible. The primary outcome was all-cause mortality at 30 days, analysed in the intention-to-treat (ITT) population excluding those with unknown mortality status. Safety outcomes were analysed in the ITT population. The trial was prospectively registered with the International Standard Randomised Controlled Trials Registry, 96585404.

Findings Between Jan 15, 2018, and Dec 1, 2022, 862 patients were enrolled, of whom 431 (50%) were randomly assigned to a cardiac arrest centre and 431 (50%) to standard care. 20 participants withdrew from the cardiac arrest centre group and 19 from the standard care group, due to lack of consent or unknown mortality status, leaving 411 participants in the cardiac arrest centre group and 412 in the standard care group for the primary analysis. Of 822 participants for whom data were available, 560 (68%) were male and 262 (32%) were female. The primary endpoint of 30-day mortality occurred in 258 (63%) of 411 participants in the cardiac arrest centre group and in 258 (63%) of 412 in the standard care group (unadjusted risk ratio for survival 1·00, 95% CI 0·90–1·11; p=0·96). Eight (2%) of 414 patients in the cardiac arrest centre group and three (1%) of 413 in the standard care group had serious adverse events, none of which were deemed related to the trial intervention.

Interpretation In adult patients without ST elevation, transfer to a cardiac arrest centre following resuscitated cardiac arrest in the community did not reduce deaths.

Funding British Heart Foundation.

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See Comment page 1300

*Collaborators are listed in the appendix: pp 3–7
Cardiovascular Department, Guy's and St Thomas' NHS Foundation Trust, London, UK (T Patterson PhD, K Wilson MSc, Prof S R Redwood MD); Cardiovascular Department, Faculty of Life Sciences and Medicine, King's College London, London, UK (T Patterson, Prof S R Redwood); Clinical Trials Unit, Warwick Medical School, University of Warwick, Coventry, UK (Prof G D Perkins MD, Prof R T Fothergill PhD, Prof J P Nolan PhD); London School of Hygiene & Tropical Medicine Clinical Trials Unit, London, UK (A Perkins MSc, T Clayton MSc, R Evans BA, M Dodd MSc, S Robertson BA); Clinical Audit and Research Unit, London Ambulance Service, London, UK (A Mellett-Smith MSc, Prof R T Fothergill); Faculty of Health, Social Care and Education, Kingston University and St George's, University of London, London, UK (Prof R T Fothergill); Institute for Lifecourse Development, University of Greenwich, London, UK (P McCrone PhD); Department of Cardiology, Brompton and Harefield NHS Foundation Trust, London, UK (M Dalby MD); Department of Cardiology, King's College Hospital, London, UK (Prof P MacCarthy MD); Department of Cardiology, St Georges Hospital, London, UK (S Firoozi MBBS); Department of Cardiology,

Introduction

There are marked regional variations in survival following resuscitated out-of-hospital cardiac arrest (OHCA), which are attributable to resources, personnel, and infrastructure in addition to patient characteristics.[1–3] Regionalisation of care improves outcomes in patients with time-critical illness by concentrating services within centres, increasing the number of patients treated and therefore the skills and experience of health-care providers within those centres.[4] Implementing prehospital systems of care for OHCA management would work in a similar manner to networks for ST-elevation myocardial infarction, with ambulance staff providing prompt identification and delivery of patients to a designated cardiac arrest centre.[5,6] Post-arrest care with early interventions for ischaemia-reperfusion injury and treatment of the underlying cause has preferential outcomes.[7] This care might be better delivered in a cardiac arrest centre; however, observational studies yield conflicting results due to confounding variables, including selection bias and heterogeneity of care.[8] As a result, the International Liaison Committee on Resuscitation highlighted the need for a randomised trial.

Multicentrická otevřená, randomizovaná studie (2018-2022), přerušená pro COVID

Inclusion: věk nad 18, ROSC, předpokládaná kard. zástava, EKG bez ST elevací

Exclusion: těhotenství, předpokládaná nekard. etiologie, ST elevace na EKG po KPR

Randomizace 1:1 (7x cathlab CAC vs. 32 ED nejbližší nemocnice)

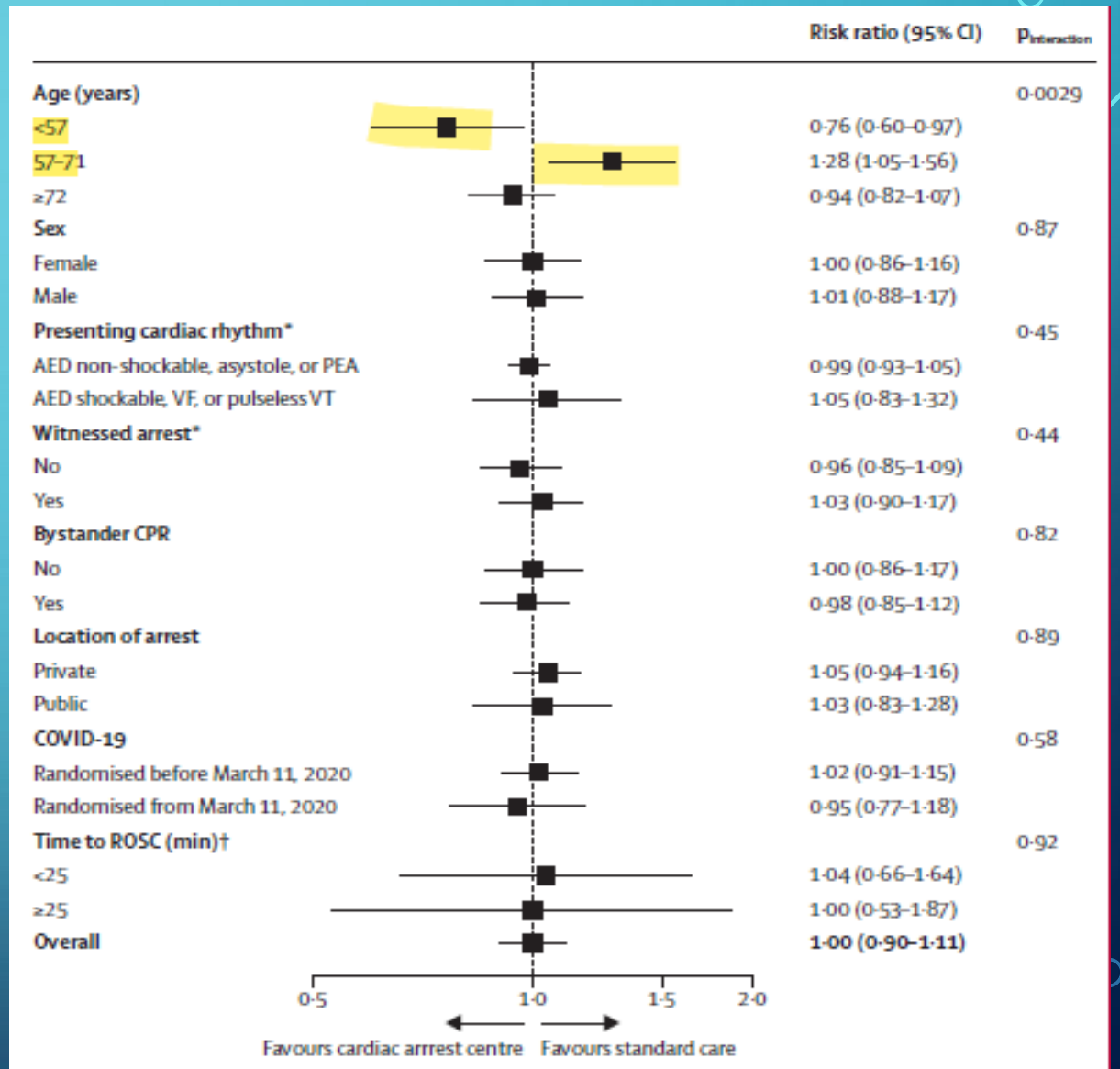
Primární endpoint: 30- denní mortalita

Sekundární endpointy: 3-měsíční mortalita, neurolog. status při dimisi a 3.měsíc

	Cardiac arrest centre group (n=414)	Standard care group (n=413)	RR, OR, or mean difference (95% CI)	Adjusted OR* (95% CI) or p value	Risk difference (95% CI)
Primary endpoint					
30-day mortality	258/411 (63%)	258/412 (63%)	RR 1·00 (0·90 to 1·11)	1·09 (0·73 to 1·63)	0·2% (−6·5 to 6·8)
Secondary endpoints					
3-month mortality	267/411 (65%)	263/411 (64%)	RR 1·02 (0·92 to 1·12)	--	1·0% (−5·6 to 7·5%)
mRS score at discharge			OR 1·00 (0·76 to 1·32)	0·99	--
0	70/413 (17%)	78/402 (19%)	--	--	--
1	23/413 (6%)	31/402 (8%)	--	--	--
2	22/413 (5%)	12/402 (3%)	--	--	--
3	15/413 (4%)	9/402 (2%)	--	--	--
4	10/413 (2%)	2/402 (1%)	--	--	--
5	16/413 (4%)	12/402 (3%)	--	--	--
6	257/413 (62%)	258/402 (64%)	--	--	--
mRS score at 3 months			OR 0·98 (0·73 to 1·31)	0·87	--
0	75/399 (19)	69/390 (18%)	--	--	--
1	22/399 (6%)	32/390 (8%)	--	--	--
2	17/399 (4%)	9/390 (2%)	--	--	--
3	5/399 (1%)	9/390 (2%)	--	--	--
4	9/399 (2%)	3/390 (1%)	--	--	--
5	4/399 (1%)	5/390 (1%)	--	--	--
6	267/399 (67%)	263/390 (67%)	--	--	--
mRS score at discharge					
Favourable	130/413 (32%)	130/402 (32%)	RR 1·01 (0·92 to 1·11)	0·79	0·9% (−5·5 to 7·3)
Unfavourable	283/413 (69%)	272/402 (68%)	--	--	--
mRS score at 3 months					
Favourable	119/399 (30%)	119/390 (31%)	RR 1·01 (0·92 to 1·11)	0·83	0·7% (−5·7 to 7·1)
Unfavourable	280/399 (70%)	271/390 (70%)	--	--	--
Mean EQ-5D-5L score	0·68 (0·32); n=97†	0·72 (0·25); n=92†	Mean difference −0·04 (−0·12 to 0·05)	--	--

Data are n/N (%) and mean (SD), unless otherwise specified. Mortality refers to all-cause mortality. mRS=modified Rankin Scale. OR=odds ratio. RR=risk ratio. *Adjusted OR calculated due to convergence issues. †The number of participants for whom data were obtained.

Table 3: **Primary and secondary outcomes**

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