Stav po CPR

- máme skutečně pacienty přestat chladit?

OA Dr. Stibor B.

ICU, Landesklinikum Baden bei Wien, Austria

no conflict of interest

OA Dr. Stibor B.

ICU, Landesklinikum Baden bei Wien, Austria

přehled

1. hypotermie - jak to začalo
2. studie TTM1 a TTM2
3. co se stalo poté?
4. interpretace studií
5. máme přestat chladit?
6. klinické zkušenosti
7. guidelines

jak to začalo

HACA trial

The New England Journal of Medicine

VOLUME 346 FEBRUARY 21, 2002 NUMBER 8

MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST

THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

Conclusions In patients who have been successfully resuscitated after cardiac arrest due to ventricular fibrillation, therapeutic mild hypothermia increased the rate of a favorable neurologic outcome and reduced mortality. (N Engl J Med 2002;346:549-56.)

Bernard trial

The New England Journal of Medicine

VOLUME 346 FEBRUARY 21, 2002 NUMBER 8

TREATMENT OF COMATOSE SURVIVORS OF OUT-OF-HOSPITAL CARDIAC ARREST WITH INDUCED HYPOTHERMIA

STEPHEN A. BERNARD, M.B., B.S., TIMOTHY W. GRAY, M.B., B.S., MICHAEL D. BUIST, M.B., B.S., BRUCE M. JONES, M.B., B.S., WILLIAM SILVESTER, M.B., B.S., GEOFF GUTTERIDGE, M.B., B.S., AND KAREN SMITH, B.SC.

Conclusions Our preliminary observations suggest that treatment with moderate hypothermia appears to improve outcomes in patients with coma after resuscitation from out-of-hospital cardiac arrest. (N Engl J Med 2002;346:557-63.)

- in **2002**, two landmark **RCTs** were published simultaneously in **NEJM**
- they have found that **therapeutic hypothermia** (TH) is effective in **reducing the risk** of neurological disability in patients with **OHCA** due to an initial **shockable rhythm** who were comatose post-arrest
- a rapid adoption of TH into clinical practice in post-arrest patients (**revolution in therapy** after cardiac arrest)
- TH received a **class I recommendation** in resuscitation **guidelines**
- TH has since **expanded** to include patients with non-shockable rhythms and patients with IHCA
- **standard procedure** in the postresuscitation care

všichni chladili……


17 10:32 AM

… až do studie TTM

TTM1 trial

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

Niklas Nielsen, M.D., Ph.D., Jørn Wetterslev, M.D., Ph.D., Tobias Cronberg, M.D., Ph.D., David Erlinge, M.D., Ph.D., Yvan Gasche, M.D., Christian Hassager, M.D., D.M.Sci., Janneke Horn, M.D., Ph.D., Jan Hovdenes, M.D., Ph.D., Jesper Kjaergaard, M.D., D.M.Sci., Michael Kuiper, M.D., Ph.D., Tommaso Pellis, M.D., Pascal Stammet, M.D., Michael Wanscher, M.D., Ph.D., Matt P. Wise, M.D., D.Phil., Anders Åneman, M.D., Ph.D., Nawaf Al-Subaie, M.D., Søren Boesgaard, M.D., D.M.Sci., John Bro-Jeppesen, M.D., Iole Brunetti, M.D., Jan Frederik Bugge, M.D., Ph.D., Christopher D. Hingston, M.D., Nicole P. Juffermans, M.D., Ph.D., Matty Koopmans, R.N., M.Sc., Lars Køber, M.D., D.M.Sci., Jørund Langørgen, M.D., Gisela Lilja, O.T., Jacob Eifer Møller, M.D., D.M.Sci., Malin Rundgren, M.D., Ph.D.,

N Engl J Med. 2013 Dec 5;369(23):2197-2206.

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

RESULTS

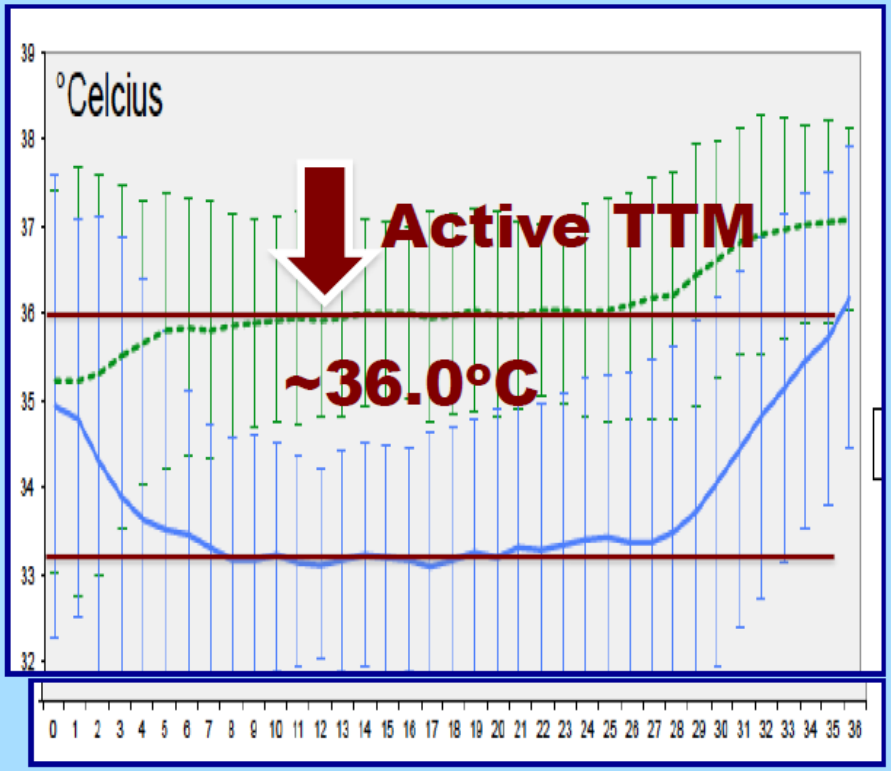
In total, 939 patients were included in the primary analysis. At the end of the trial, 50% of the patients in the 33°C group (235 of 473 patients) had died, as compared with 48% of the patients in the 36°C group (225 of 466 patients) (hazard ratio with a temperature of 33°C, 1.06; 95% confidence interval [CI], 0.89 to 1.28; P=0.51). At the 180-day follow-up, 54% of the patients in the 33°C group had died or had poor neurologic function according to the CPC, as compared with 52% of patients in the 36°C group (risk ratio, 1.02; 95% CI, 0.88 to 1.16; P=0.78). In the analysis using the modified Rankin scale, the comparable rate was 52% in both groups (risk ratio, 1.01; 95% CI, 0.89 to 1.14; P=0.87). The results of analyses adjusted for known prognostic factors were similar.

CONCLUSIONS

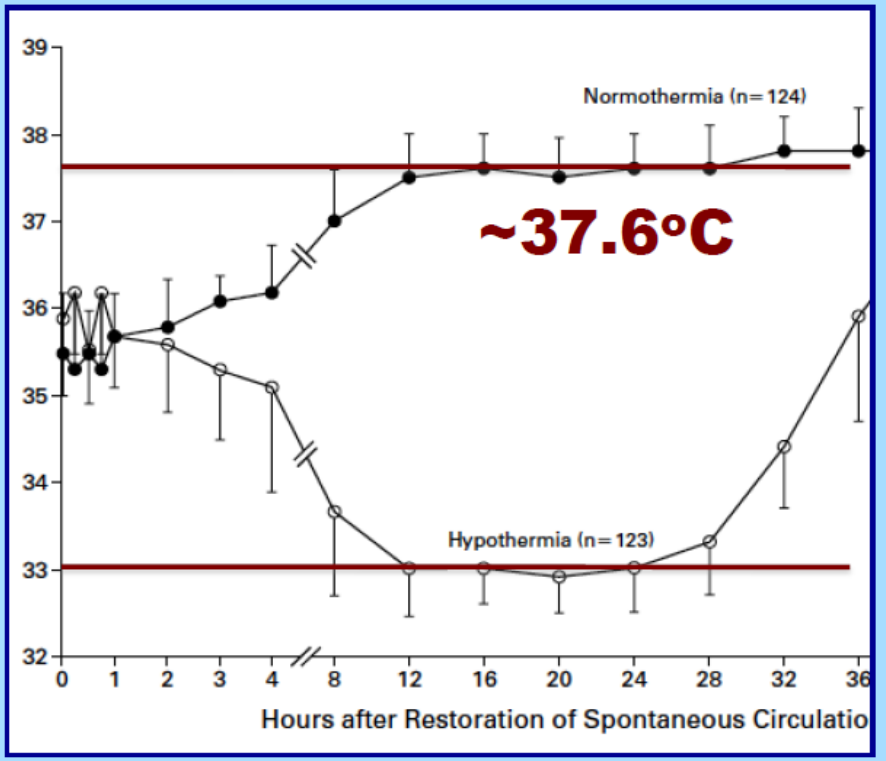
In unconscious survivors of out-of-hospital cardiac arrest of presumed cardiac cause, hypothermia at a targeted temperature of 33°C did not confer a benefit as compared with a targeted temperature of 36°C. (Funded by the Swedish Heart–Lung Foundation and others; TTM ClinicalTrials.gov number, NCT01020916.)

Marked differences in “control” group

Nielsen et al



HACA study



Bernard et al: ~37.3°C

Large difference in maintenance temperatures

TTM2 trial

The NEW ENGLAND JOURNAL of MEDICINE

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*

N Engl J Med. 2021 Jun 17;384(24):2283-2294.

TTM2 trial

Hypothermia versus Normothermia after Out-of-Hospital Cardiac Arrest

RESULTS

A total of 1850 patients were evaluated for the primary outcome. At 6 months, 465 of 925 patients (50%) in the hypothermia group had died, as compared with 446 of 925 (48%) in the normothermia group (relative risk with hypothermia, 1.04; 95% confidence interval [CI], 0.94 to 1.14; P=0.37). Of the 1747 patients in whom the functional outcome was assessed, 488 of 881 (55%) in the hypothermia group had moderately severe disability or worse (modified Rankin scale score ≥4), as compared with 479 of 866 (55%) in the normothermia group (relative risk with hypothermia, 1.00; 95% CI, 0.92 to 1.09). Outcomes were consistent in the prespecified subgroups. Arrhythmia resulting in hemodynamic compromise was more common in the hypothermia group than in the normothermia group (24% vs. 17%, P<0.001). The incidence of other adverse events did not differ significantly between the two groups.

CONCLUSIONS

In patients with coma after out-of-hospital cardiac arrest, targeted hypothermia did not lead to a lower incidence of death by 6 months than targeted normothermia.

máme

přestat

chladit?

- výsledky **studií**

- **experimentální** modely

- klinické **zkušenosti**

- změna ***outcome*** po zavedení protokolu TTM1

- detaily studií **TTM1** a **TTM2**

experimentální práce

hypotermie

- v patofyziologických modelech:

- ↓ buněčného poškození, ↓ mitochondriální dysfunkce, ↓ oxidativního stresu, ↓ neuroinflamatorní reakce, ↓ aktivity apoptózy

  (Talma N; Biochim Biophys Acta 2016; 1860:2521)
  (Busto R; J Cereb Blood Flow Metab 1987; 7:729)

- v experimentálních modelech:

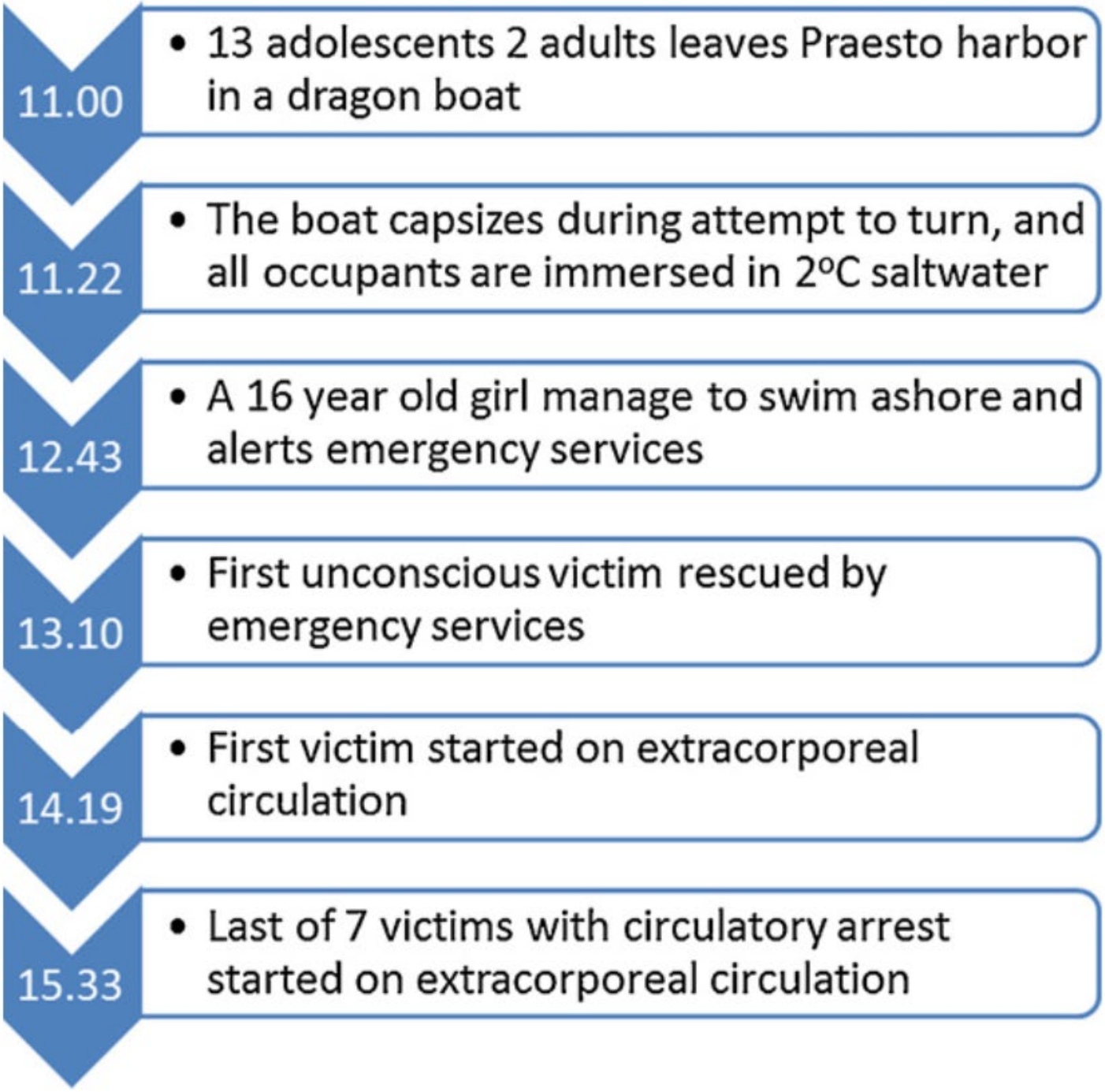
- ↓mortality ↑outcome (metanalýza exper. modelů)

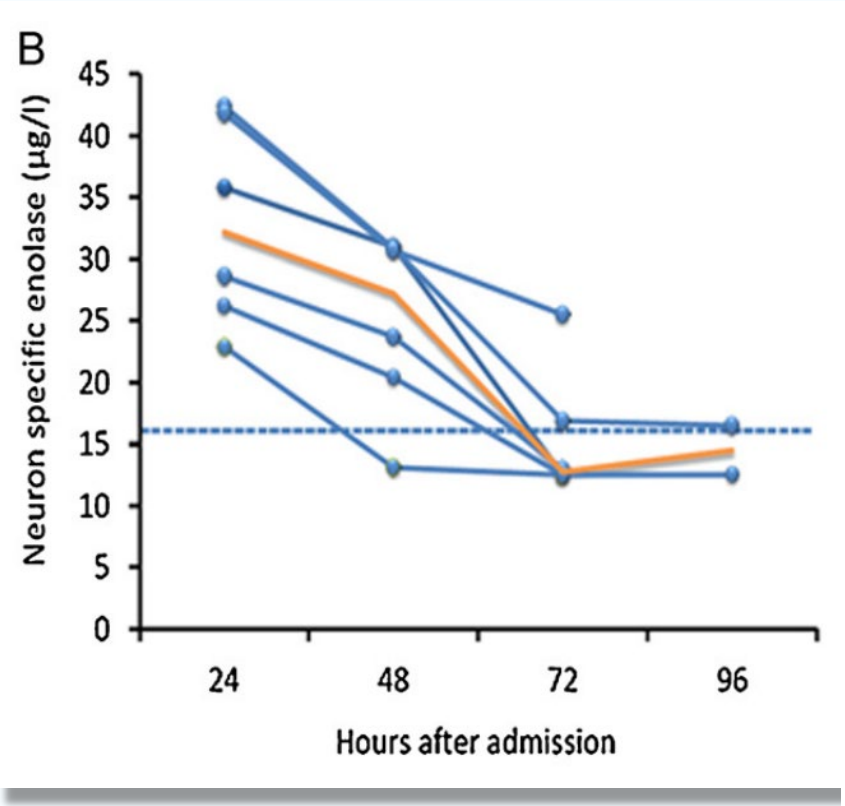
  (Arrich J; Resuscitation 2021; 162:47)

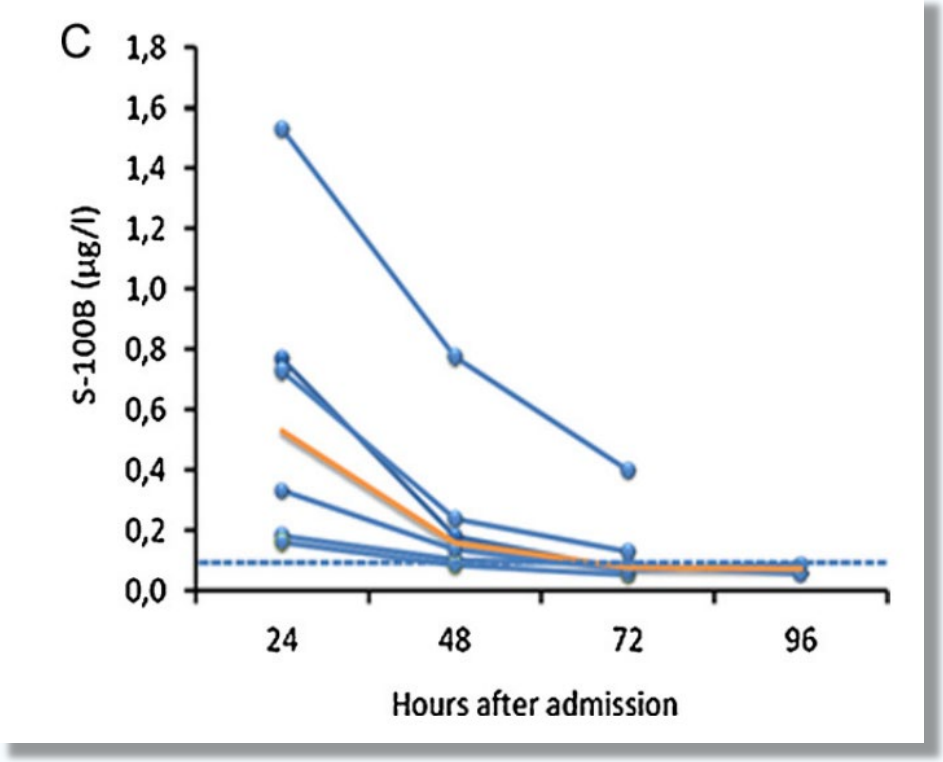
- reduction in **cerebral metabolic rate**
  (for every 1^{o}C a 6-10% drop in $CMRO_2$)
- interruption of **apoptotic** pathways
- reduction of **neuroinflammation**
- reduction of **free radical** production
- reduction of **areas of hyperthermia**
  within injured brain tissue
- improve brain **glucose metabolism**
- **down-regulation** of the release of and imbalance of local vasoactive mediators such as endothelin, thromboxane A2 and prostaglandin I2
- reduce **ischaemic-reperfusion** injury
- decreasing harmful intracellular **calcium accumulation**

klinické zkušenosti

11.02.2012


11.00
• 13 adolescents 2 adults leaves Praesto harbor in a dragon boat
11.22
• The boat capsizes during attempt to turn, and all occupants are immersed in 2°C saltwater
12.43
• A 16 year old girl manage to swim ashore and alerts emergency services
13.10
• First unconscious victim rescued by emergency services
14.19
• First victim started on extracorporeal circulation
15.33
• Last of 7 victims with circulatory arrest started on extracorporeal circulation


B
Neuron specific enolase (µg/l)
45
40
35
30
25
20
15
10
5
0
24
48
72
96
Hours after admission


C
S-100B (µg/l)
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
24
48
72
96
Hours after admission

- seven ECMO
- warming (one degree per 10 minutes)
- six hours after the accident ROSC
- everybody awoke at the same day
- 100% survival
- good neurological outcome in six of seven

Resuscitation

Volume 83, Issue 9, September 2012, Pages 1078-1084

Clinical paper

Outcome of accidental hypothermia with or without circulatory arrest: Experience from the Danish Præstø Fjord boating accident ☆

Michael Wanscher [a], Lisbeth Agersnap [f], Jesper Ravn [a], Stig Yndgaard [a], Jørgen Feldbæk Nielsen [f], Else R. Danielsen [b], Christian Hassager [a], Bertil Romner [c], Carsten Thomsen [b], Steen Barnung [d], Anne Grethe Lorentzen [g], Hans Høgenhaven [e], Matthew Davis [a], Jacob Eifer Møller [a]

Accidental Hypothermia: 'You're Not Dead Until You're Warm and Dead'

JOHN L. FOGGLE, MD, MBA, FACEP

what happened after TTM1?

after TTM1

- ↑mortality ↓neurol. outcome
  (Bray JE; Resuscitation 2017; 113:39)

- ↑mortality ↑tělesné teploty
  (Salter R; Crit Care Med 2018; 46:1722)

- ↑mortality ↓adherence k hypotermii
  (Garfield B; Ther Hypothermia Temp Manag 2020; e-pub; Nolan JP; Resuscitation 2021; 162:304)

- ↑mortality
  (Nishikimi M; Crit Care Med 2021; 49:e741)

- ↓mortality 25% vs 44% (HACORE dle TTM1)
  (Akin M; JACC Cardiovasc Interv 2018; 11:1811)

problémy studií

TTM2 trial

- study **protocol**: **90 min** from ROSC to 33°C

TTM2 trial

- study **protocol**: **90 min** from ROSC to 33°C

- time from **ROSC** to **randomisation**: **135 min**

- time from **randomisation** to **33°C**: **5 hours** (median)

- more than **50% of pts** needed **7 hours** from **ROSC** to **33°C**!

- only **few pts** with **intravascular** cooling (TTM1 24%, TTM 29%)

- **other studies** with more intravascular cooling had lower mortality (**25-35 %**)

- **80%** of pts had bystander CPR (short no-flow time)
- Germany (middle Europe), USA: ≈ **40%**

- approximately **50%** (!) of pts in both groups had **insufficient** control of **fever** at day 3

- **85%** (**88%**) pts had propofol (0% in HACA, Bernard study)

- protocol for determination of the **neurologic prognosis** and withdrawal of **life-supporting therapies**

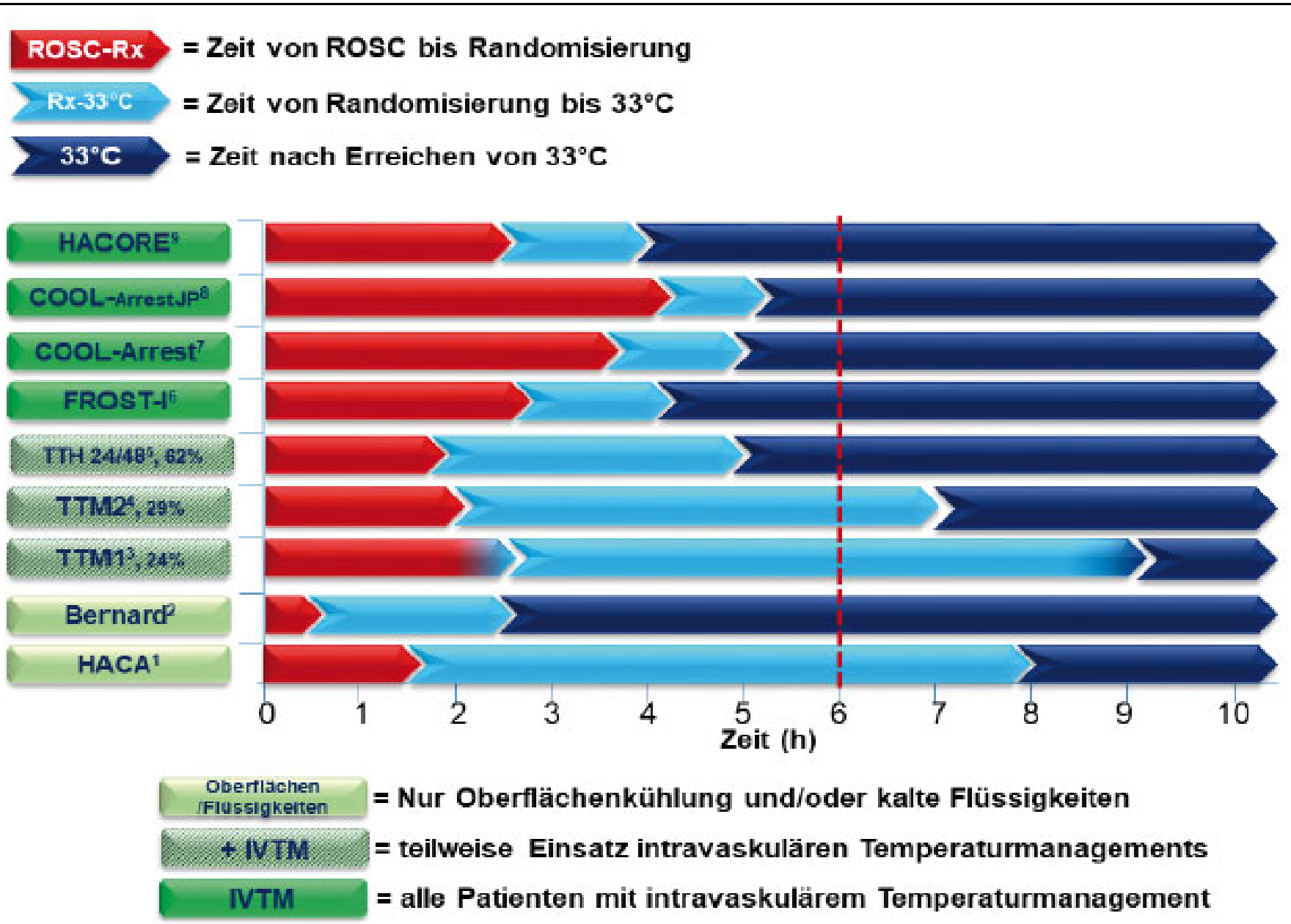

ROSC-Rx = Zeit von ROSC bis Randomisierung
Rx-33°C = Zeit von Randomisierung bis 33°C
33°C = Zeit nach Erreichen von 33°C
HACORE[9]
COOL-ArrestJP[8]
COOL-Arrest[7]
FROST-I[6]
TTH 24/48[5], 62%
TTM2[4], 29%
TTM1[3], 24%
Bernard[2]
HACA[1]
0 1 2 3 4 5 6 7 8 9 10
Zeit (h)
Oberflächen /Flüssigkeiten = Nur Oberflächenkühlung und/oder kalte Flüssigkeiten
+ IVTM = teilweise Einsatz intravaskulären Temperaturmanagements
IVTM = alle Patienten mit intravaskulärem Temperaturmanagement

Tabelle: Vergleich der Charakteristika der wichtigsten Studien – Hypothermie versus Normothermie (bzw. 36°C)

Studie	Studiendesign	Population	Hypothermie	Primary Endpoint	Outcome	Limitationen
Bernard-Studie (2002)	Single-center	77 Patienten mit OHCA mit Kammerflimmern	H: 33°C vs. N über 12 h	Krankenhausüberleben mit gutem neurologischen Outcome	Überleben mit gutem neurolog. Outcome: 49% (H) vs. 26% (N), p=0.046	- Fallzahl - Fieber in N-Gruppe - Verblindung
HACA-Studie (2002)	Multicenter	275 Patienten mit OHCA mit Kammerflimmern	H: 32°C-34°C vs. N über 24 h	neurologisches Outcome (6 Monate)	Mortalität (6 Monate): 41% (H) vs. 55% (N), p=0.02	- Fallzahl - Fieber in N-Gruppe - Verblindung
TTM-Studie (2013)	Multicenter	950 Patienten mit OHCA mit vermuteter kardialer Genese	H: 33°C vs. N: 36°C über 36 h	Mortalität	Mortalität: 50% (H) vs. 48% (N), p=0.51	- Hohe „Bystander"-CPR Rate - Verblindung
Hyperion-Studie (2019)	Multicenter	584 Patienten mit CA mit nicht-schockbarem Rhythmus	H:33°C vs. N: 37°C über 24 h	Gutes neurologisches Outcome	Überleben mit gutem neurolog. Outcome: 10,2% (H) vs. 5.7% (N), p=0.047	- Fragility index = 1 - Outcome basiert auf neurologischem Score
TTM2-Studie (2021)	Multicenter	1850 Patienten mit OHCA	H: 33°C vs. N: 37°C über 40 h	Mortalität nach 6 Monaten	Mortalität (6 Monate): 50% (H) vs. 48% (N), p=0.37	- Hohe „Bystander" CPR Rate

OHCA - Herzstillstand außerhalb der Klinik, CA - Herzstillstand, H - Hypothermie, N - Normothermie, CPR - Herz-Lungen-Wiederbelebung

A Commentary on the Effect of Targeted Temperature Management in Patients Resuscitated from Cardiac Arrest

Michael Holzer, Jeanne E. Poole, Jean-Baptiste Lascarrou, Ken Fujise, and Graham Nichol

Published Online: 15 Nov 2022 | https://doi.org/10.1089/ther.2022.0041

Abstract

The members of the International Liaison Committee on Resuscitation (ILCOR) Advanced Life Support Task Force have written a comprehensive summary of trials of the effectiveness of induced hypothermia (IH) or targeted temperature management (TTM) in comatose patients after cardiac arrest (CA). However, in-depth analysis of these studies is incomplete, especially since there was no significant difference in primary outcome between hypothermia versus normothermia in the recently reported TTM2 trial. We critically appraise trials of IH/TTM versus normothermia to characterize reasons for the lack of treatment effect, based on a previously published framework for what to consider when the primary outcome fails. We found a strong biologic rationale and external clinical evidence that IH treatment is beneficial. Recent TTM trials mainly included unselected patients with a high rate of bystander cardiopulmonary resuscitation. The treatment was not applied as intended, which led to a large delay in achievement of target temperature. While receiving intensive care, sedative drugs were likely used that might have led to increased neurologic damage as were antiplatelet drugs that could be associated with increased acute stent thrombosis in hypothermic patients. It is reasonable to still use or evaluate IH treatment in patients who are comatose after CA as there are multiple plausible reasons why IH compared to normothermia did not significantly improve neurologic outcome in the TTM trials.

rychlost chlazení?

Resuscitation Science

Intra-Arrest Transnasal Evaporative Cooling

A Randomized, Prehospital, Multicenter Study (PRINCE: Pre-ROSC IntraNasal Cooling Effectiveness)

Maaret Castrén, MD, PhD*; Per Nordberg, MD*; Leif Svensson, MD, PhD; Fabio Taccone, MD; Jean-Louise Vincent, MD, PhD; Didier Desruelles, MD; Frank Eichwede, MD; Pierre Mols, MD, PhD; Tilmann Schwab, MD; Michel Vergnion, MD; Christian Storm, MD; Antonio Pesenti, MD, PhD; Jan Pachl, MD, PhD; Fabien Guérisse, MD; Thomas Elste, MD; Markus Roessler, MD, DEAA; Harald Fritz, MD; Pieterjan Durnez, MD; Hans-Jörg Busch, MD; Becky Inderbitzen, MSE; Denise Barbut, MD

Coclusions:

Prehospital intra-arrest transnasal cooling is safe and feasible and is associated with a significant improvement in the time intervals required to cool patients.

Circulation.2010;122:729-736.

Research

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Trans-Nasal Evaporative Intra-arrest Cooling on Functional Neurologic Outcome in Out-of-Hospital Cardiac Arrest

The PRINCESS Randomized Clinical Trial

INTERVENTIONS Patients were randomly assigned to receive trans-nasal evaporative intra-arrest cooling (n = 343) or standard care (n = 334). Patients admitted to the hospital in both groups received systemic therapeutic hypothermia at 32°C to 34°C for 24 hours.

CONCLUSIONS AND RELEVANCE Among patients with out-of-hospital cardiac arrest, trans-nasal evaporative intra-arrest cooling compared with usual care did not result in a statistically significant improvement in survival with good neurologic outcome at 90 days.

JAMA.2019;321(17):1677-1685.

Taccone *et al. Crit Care* (2021) 25:198
https://doi.org/10.1186/s13054-021-03583-9

Critical Care

RESEARCH Open Access

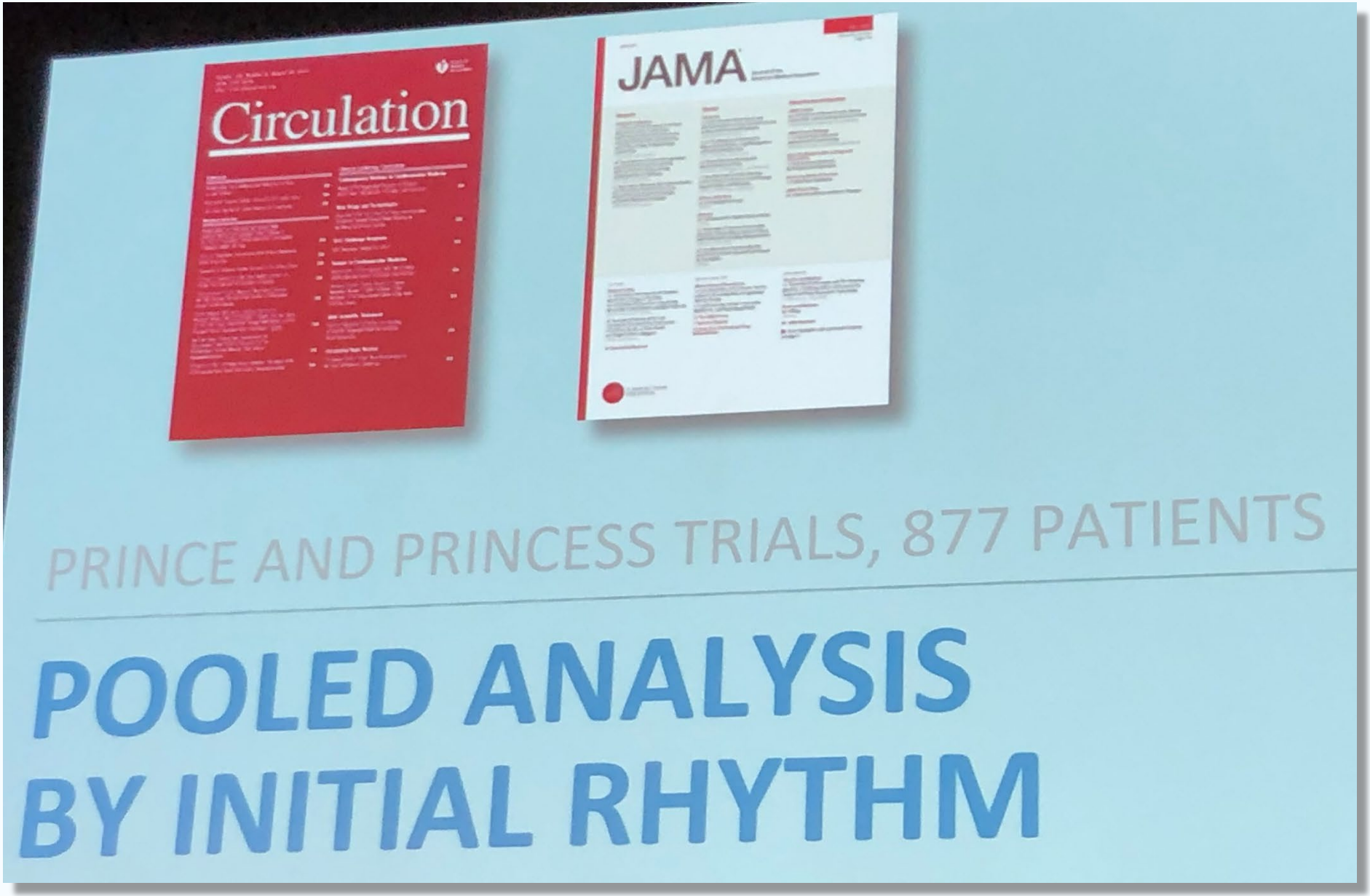
Effect of intra-arrest trans-nasal evaporative cooling in out-of-hospital cardiac arrest: a pooled individual participant data analysis

Fabio Silvio Taccone[1], Jacob Hollenberg[2], Sune Forsberg[2], Anatolij Truhlar[3], Martin Jonsson[2], Filippo Annoni[1*], Dan Gryth[2], Mattias Ringh[2], Jerome Cuny[4], Hans-Jörg Busch[5], Jean-Louis Vincent[1], Leif Svensson[2] Per Nordberg[2]

Results: Among the 325 patients with initial shockable rhythms, favourable neurological outcome was observed in 54/158 (34.2%) patients in the intervention and 40/167 (24.0%) in the control group (RR 1.43 [confidence intervals, CIs 1.01–2.02]). Complete neurological recovery was observed in 40/158 (25.3%) in the intervention and 27/167 (16.2%) in the control group (RR 1.57 [CIs 1.01–2.42]). Among the 526 patients with initial non-shockable rhythms, favourable neurological outcome was in 10/259 (3.8%) in the intervention and 13/267 (4.9%) in the control group (RR 0.88 [CIs 0.52–1.29]; $p = 0.67$); survival and complete neurological recovery were also similar between groups. No significant benefit was observed for the intervention in the entire population.

Conclusions: In this pooled analysis of individual data, intra-arrest cooling was associated with a significant increase in favourable neurological outcome in out-of-hospital cardiac arrest patients with initial shockable rhythms. Future studies are needed to confirm the potential benefits of this intervention in this subgroup of patients.

Keywords: Cardiac arrest, Intra-arrest, Hypothermia, Outcome, Randomized clinical trial


Circulation
JAMA
PRINCE AND PRINCESS TRIALS, 877 PATIENTS
POOLED ANALYSIS
BY INITIAL RHYTHM

Pooled analysis

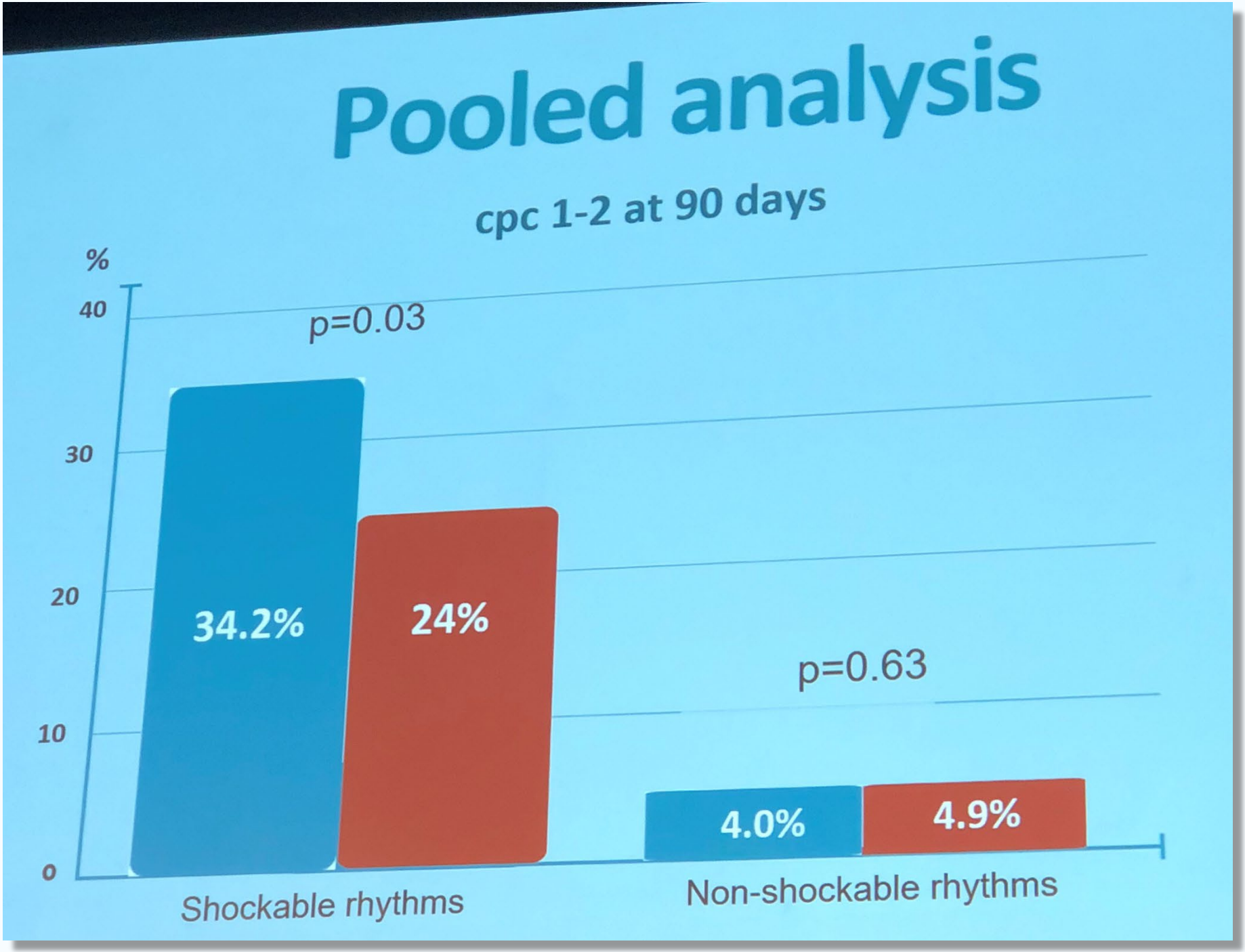


Table 1 Baseline characteristics of included patients with regard to the initial cardiac rhythm

	Shockable rhythms		Non-shockable rhythms	
	Intervention ($n=158$)	**Control ($n=167$)**	**Intervention ($n=259$)**	**Control ($n=267$)**
Age, years	64 [56–70]	62 [53–70]	67 [57–74]	67 [57–74]
Male gender, *n* (%)	143 (86)	130 (83)	174 (70)	187 (70)
Suspected cardiac origin of arrest, *n* (%)	147 (94)	136 (94)	189 (82)	189 (81)
Bystander CPR, *n* (%)	119 (74)	113 (75)	122 (46)	122 (50)
Estimated time from arrest to CPR (min)	8 [6–11]	9 [6–12]	8 [5–11]	8 [6–12]
Estimated time from call to CPR (min)	7 [5–10]	7 [5–10]	7 [5–10]	8 [5–12]
Estimated time from arrest to ALS (min)	13 [9–17]	12 [9–17]	13 [9–16]	12 [9–17]
Estimated time from arrest to airway protection (min)	15 [11–20]	14 [10–18]	14 [10–18]	14 [11–18]
Estimated time from arrest to randomization (min)	18 [13–23]	17 [13–21]	18 [13–23]	16 [12–21]
Estimated time from arrest to ROSC (min)	30 [19–40]	25 [20–33]	30 [26–37]	30 [20–41]
Estimated time from arrest to hospital admission (min)	52 [44–62]	52 [38–62]	53 [44–65]	55 [42–70]
Estimated time from arrest to hospital cooling (min)	102 [80–151]	93 [64–151]	97 [71–137]	103 [82–129]
Number	98	99	80	84
Temperature at ER—tympanic, mean (SD)	34.87 (1.15)[a]	35.76 (0.80)	34.42 (1.40)[a]	35.60 (0.72)
Temperature at ICU—tympanic, mean (SD)	34.82 (1.16)[a]	35.38 (0.96)	34.45 (1.32)[a]	35.55 (0.92)
Temperature at ICU—core, mean (SD)	34.87 (0.96)[a]	35.33 (0.90)	34.47 (1.38)[a]	35.35 (1.06)

guidelines?

RESUSCITATION 161 (2021) 220 –269

Available online at www.sciencedirect.com

Resuscitation

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

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]

POST RESUSCITATION CARE 2021
5 TOP MESSAGES

EUROPEAN RESUSCITATION COUNCIL

1. After ROSC use ABC approach

- Insert an advanced airway (tracheal intubation when skills available)
- Titrate inspired oxygen to an SpO_2 of 94-98% and ventilate lungs to achieve normocapnia
- Obtain reliable intravenous access, restore normovolaemia, avoid hypotension (aim for systolic BP > 100mmHg)

2. Emergent cardiac catheterisation +/- immediate PCI after cardiac arrest of suspected cardiac origin and ST-elevation on the ECG

3. Use targeted temperature management (TTM) for adults after either OHCA or IHCA (with any initial rhythm) who remain unresponsive after ROSC

4. Use multimodal neurological prognostication using clinical examination, electrophysiology, biomarkers, and imaging

5. Assess physical and non-physical impairments before and after discharge from the hospital and refer for rehabilitation if necessary

Table 1 – Summary of changes since the 2015 Guidelines on Post-resuscitation care.

2015 Guidelines	2021 Guidelines	Rationale for change
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]

- 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.

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ERC-ESICM guidelines on temperature control after cardiac arrest in adults ☆

Table 2 – ERC-ESICM Recommendations for temperature control after cardiac arrest in adults.

We recommend continuous monitoring of core temperature in patients who remain comatose after ROSC from cardiac arrest (good practice statement).
We recommend actively preventing fever (defined as a temperature > 37.7 °C) in post-cardiac arrest patients who remain comatose (weak recommendation, low-certainty evidence).
We recommend actively preventing fever for at least 72 hours in post-cardiac arrest patients who remain comatose (good practice statement).
Temperature control can be achieved by exposing the patient, using anti-pyretic drugs, or if this is insufficient, by using a cooling device with a target temperature of 37.5 °C (good practice statement).
There is currently insufficient evidence to recommend for or against temperature control at 32–36 °C in sub-populations of cardiac arrest patients or using early cooling, and future research may help elucidate this. We recommend not actively rewarming comatose patients with mild hypothermia after ROSC to achieve normothermia (good practice statement).
We recommend not using prehospital cooling with rapid infusion of large volumes of cold IV fluid immediately after ROSC (strong recommendation; moderate certainty evidence).

the story

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go on….


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