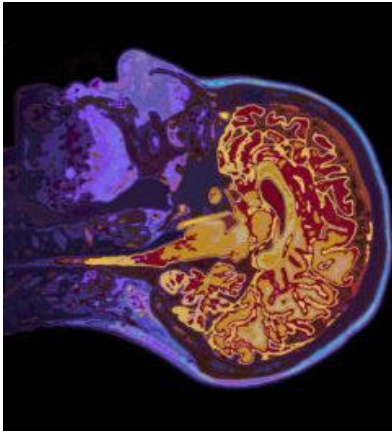


Arrêt cardiaque – Update année 2021



Pr Guillaume Debaty
CHU Grenoble Alpes
gdebaty@chu-grenoble.fr



Journée RESURCOR - AC - AVC

9 décembre 2021

Liens d'intérêt



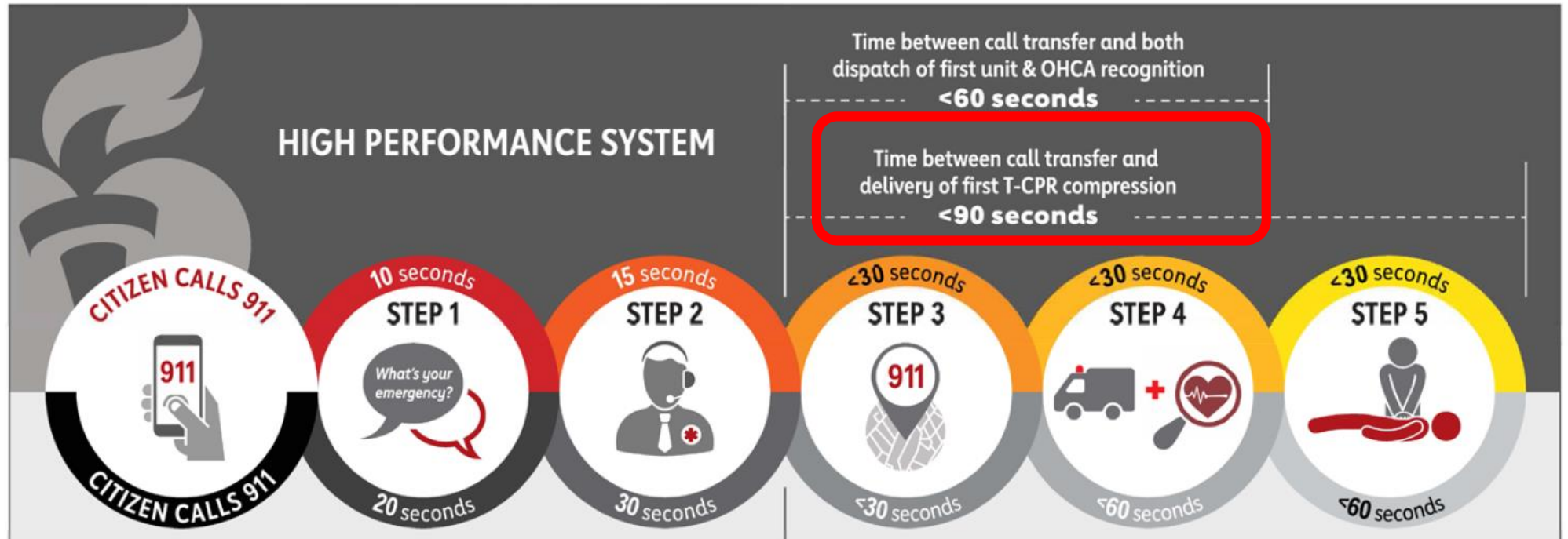
Support projet de recherche :
Stryker, Zoll, Nonin, Massimo, Zoll



Comment aller plus vite pour guider la réanimation ?



Objectif = < 90 secondes



1. Décroché
2. Prise des renseignements administratifs
3. Reconnaissance de l'AC

1. Début T-RCP
2. Poursuite jusqu'à arrivée des secours

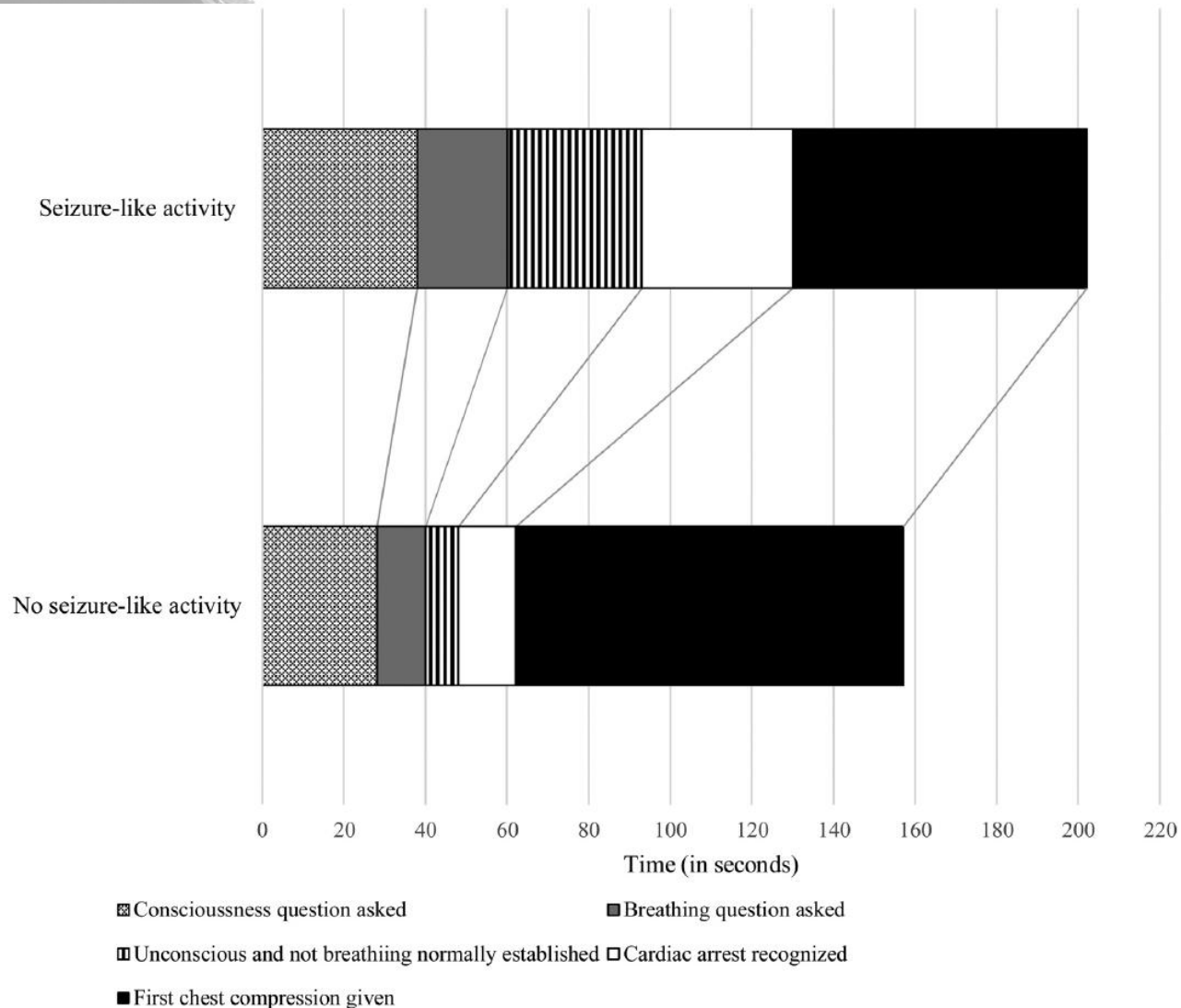


Early Access and Cardiac Arrest Prevention, Including Emergency Medical Dispatch and DACPR

- Avoir un protocole de régulation (forte recommandation, faible niveau de preuve)
- Suggérer de monitorer ses capacités de surveillance (réécoute, taux d'AC non reconnu...)
- Suggérer d'optimiser sa sensibilité (faux négatifs)

Seizure-like presentation in OHCA creates barriers to dispatch recognition of cardiac arrest

RESUSCITATION 156 (2020) 230–236



**5% des appels
pour arrêts cardiaques**

Quel protocole de reconnaissance de l'AC ?

Recommendations for T-CPR Instructions for Adults in Suspected Cardiac Arrest		
COR	LOE	Recommendations
1	C-LD	1. We recommend that emergency dispatch centers offer CPR instructions and empower dispatchers to provide such instructions for adult patients in cardiac arrest. ⁷
1	C-LD	2. Telecommunicators should instruct callers to initiate CPR for adults with suspected OHCA. ⁷
1	C-LD	3. We recommend that dispatchers should provide chest compression-only CPR instructions to callers for adults with suspected OHCA. ⁷

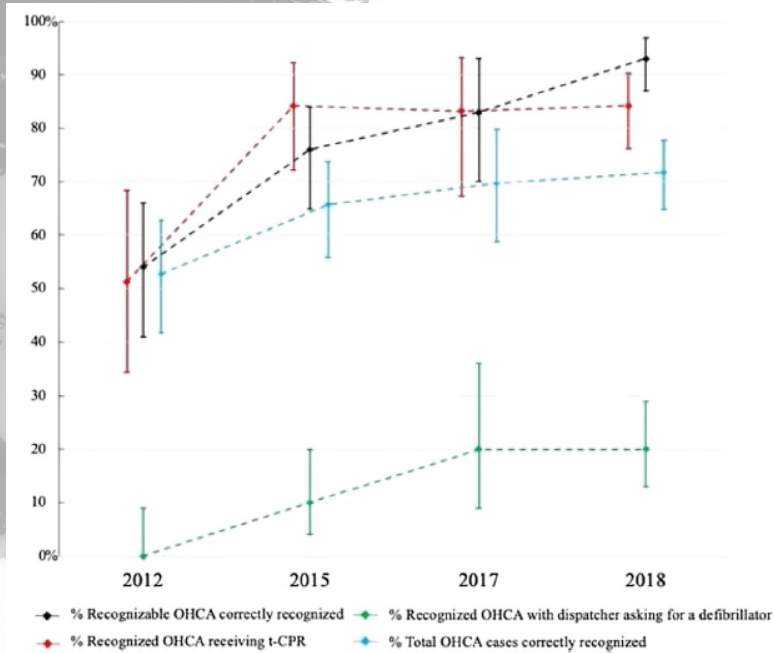


Vs.



Main sur l'abdomen pour recherche de mouvements respiratoires

Quel protocole de reconnaissance de l'AC ?



Derkenne, Resuscitation 2020

Reconnaissance AC : 54% à 93%

Mais délai de 1^{ère} RCP : 168s à 210s

Mao Resuscitation 2020

Reconnaissance AC : 67,5% à 84,4%

- Mais délai de 1^{ère} RCP : 167s à 199s (p=0,07)

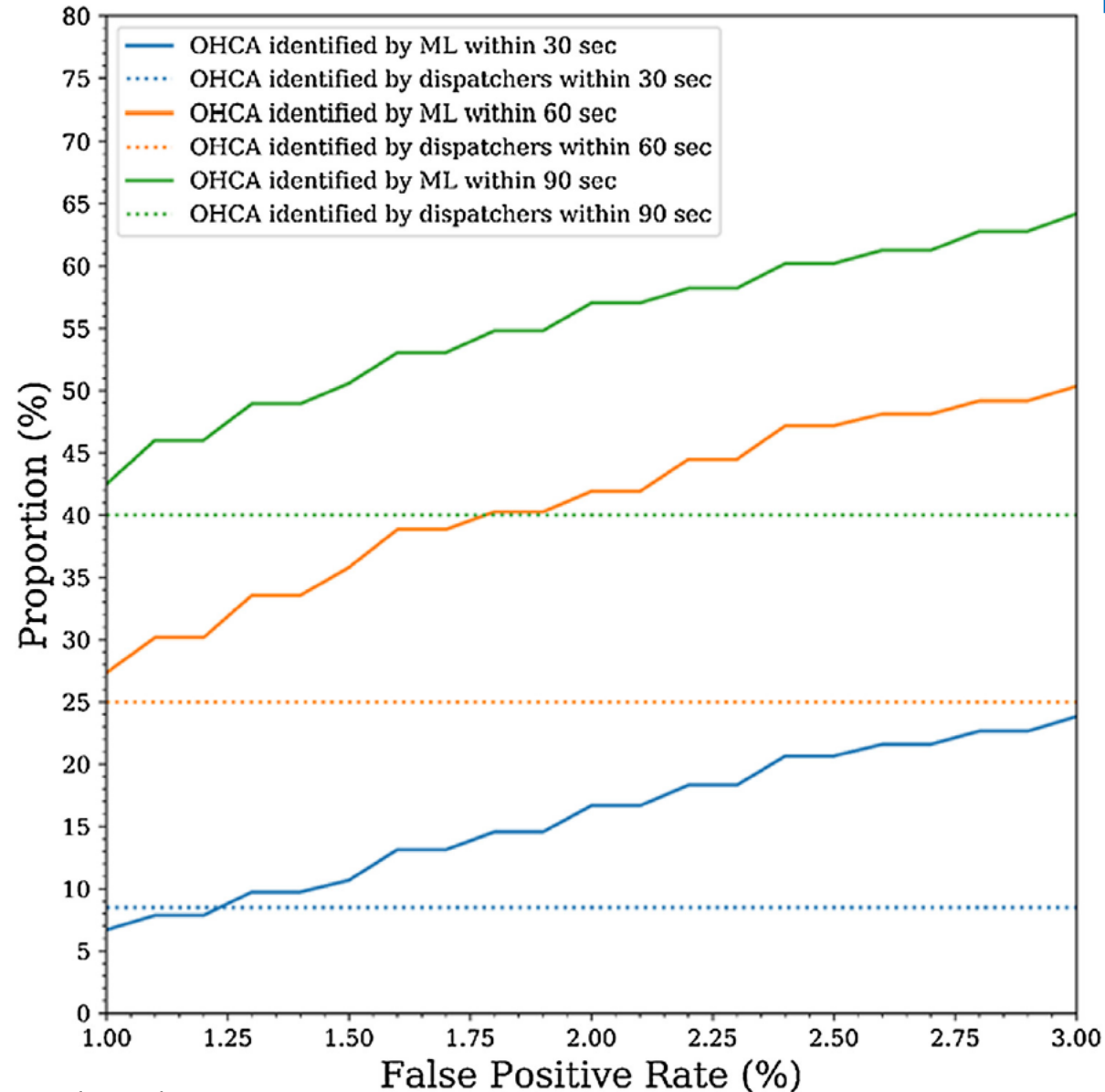
Intelligence artificielle et dispatch

C

Introduction à Triage

Performance de l'IA dans l'arrêt cardiaque

- 851 appels
- rétrospectif



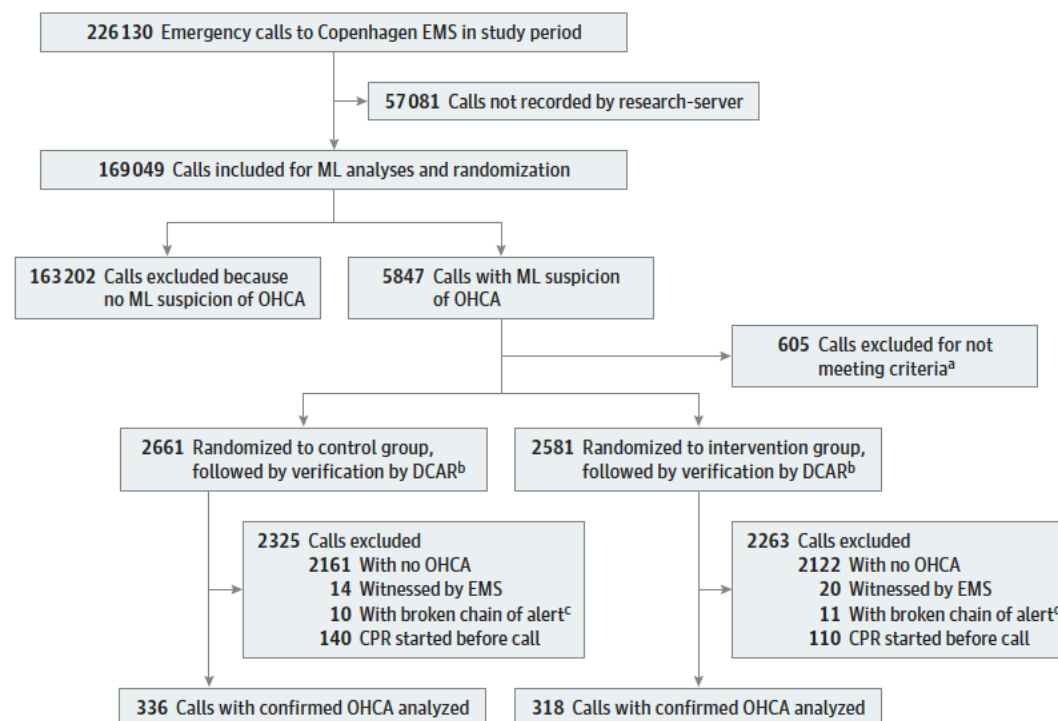
Performance de l'IA dans l'arrêt cardiaque

JAMA
Network | Open™

Original Investigation | Emergency Medicine

Effect of Machine Learning on Dispatcher Recognition of Out-of-Hospital Cardiac Arrest During Calls to Emergency Medical Services A Randomized Clinical Trial

Stig Nikolaj Blomberg, MsC; Helle Collatz Christensen, MD, PhD; Freddy Lippert, MD; Annette Kjær Ersbøll, MsC, PhD; Christian Torp-Petersen, MD, PhD; Michael R. Sayre, MD; Peter J. Kudenchuk, MD; Fredrik Folke, MD, PhD



Performance de l'IA dans l'arrêt cardiaque

Outcome	Group, mean (SD)		P value
	Control	Intervention	
Eligible for analysis, No. (%)	336 (51.5)	318 (48.5)	.48
Call length, min	6.68 (3.39)	6.94 (3.36)	.35
Alert generated from machine learning model, min ^a	1.33 (1.51)	1.39 (1.32)	.60
Recognition of cardiac arrest, No (%)	304 (90.5)	296 (93.7)	.15
Secondary outcomes			
Time to dispatcher recognition, min	1.70 (1.57)	1.71 (1.63)	.90
DA-CPR instructions started, No. (%)	208 (61.9)	206 (64.8)	.47
Time to DA-CPR, min	2.48 (1.89)	2.52 (1.76)	.82



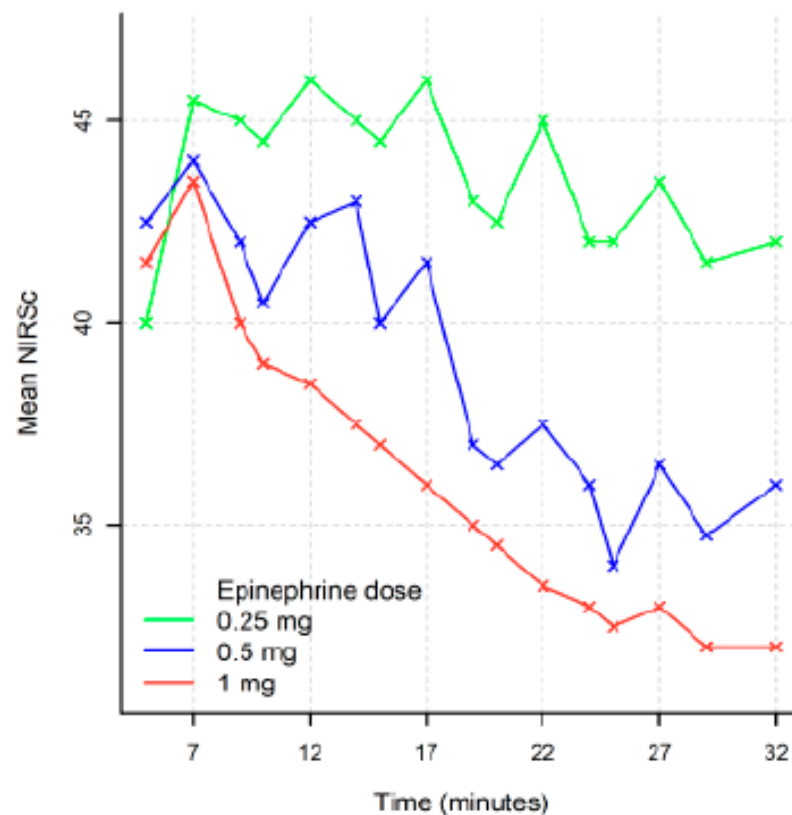
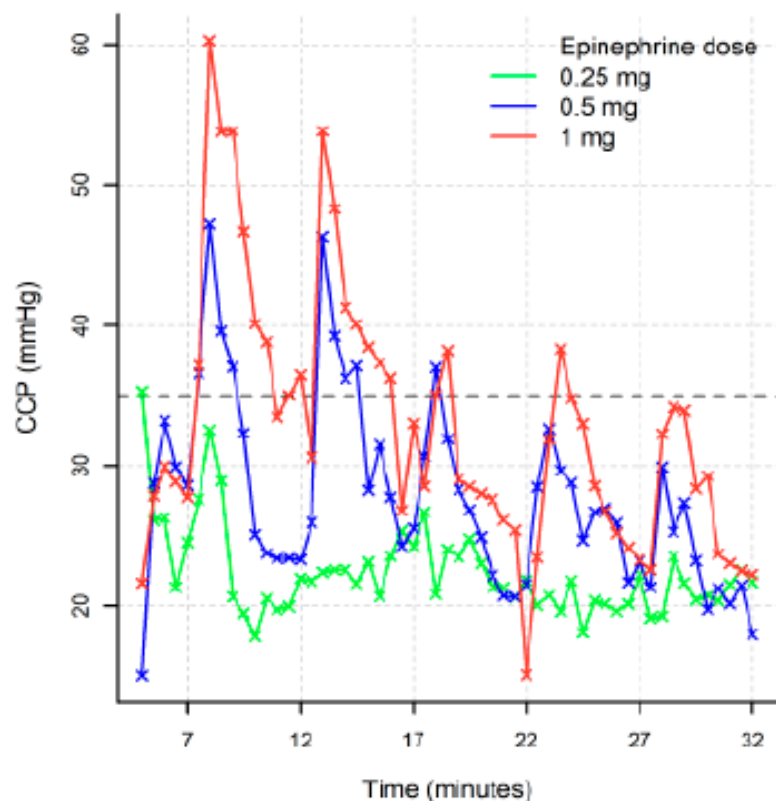


Article

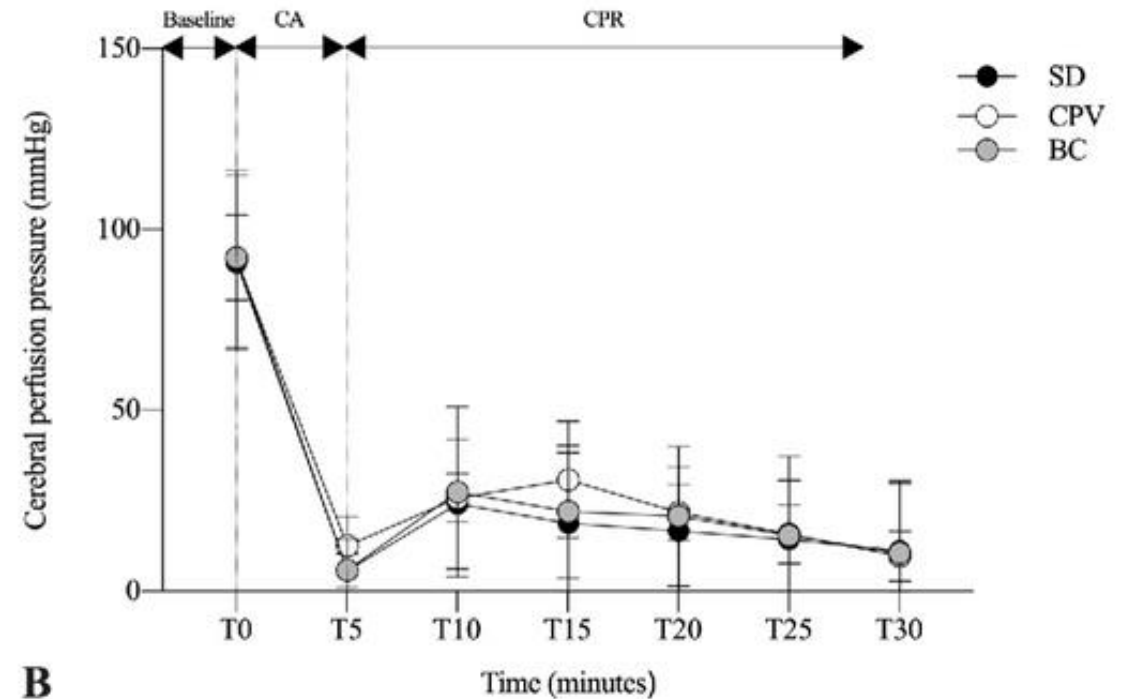
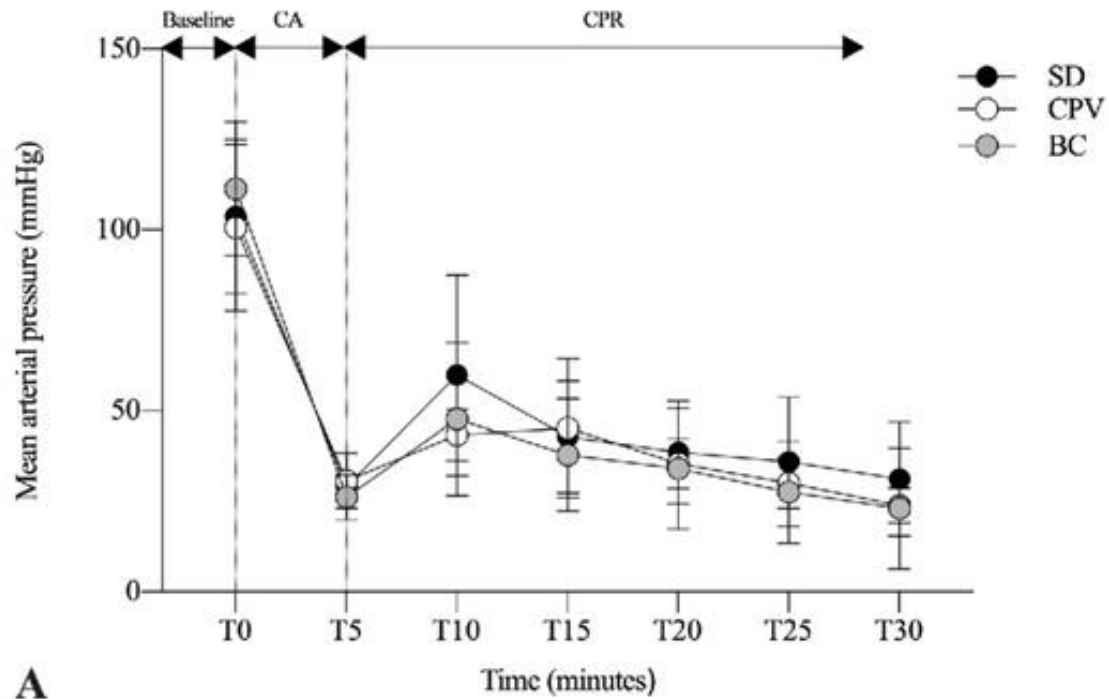
Mildly Reduced Doses of Adrenaline Do Not Affect Key Hemodynamic Parameters during Cardio-Pulmonary Resuscitation in a Pig Model of Cardiac Arrest

Deborah Jaeger ^{1,2}, Jonathan Koger ^{1,2}, Helene Duhem ³, Caroline Fritz ^{2,4}, Victor Jeangeorges ¹, Kevin Duarte ⁵, Bruno Levy ^{2,6}, Guillaume Debaty ³ and Tahar Chouihed ^{1,2,5,*}

Dose optimale d'adrénaline pendant la RCP

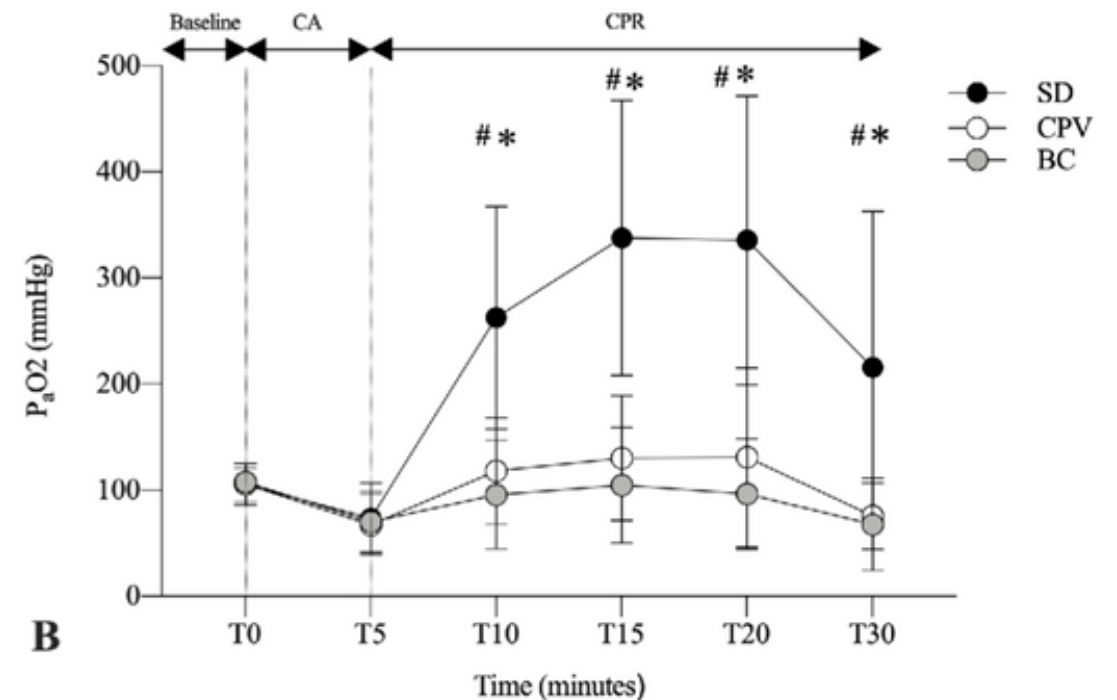
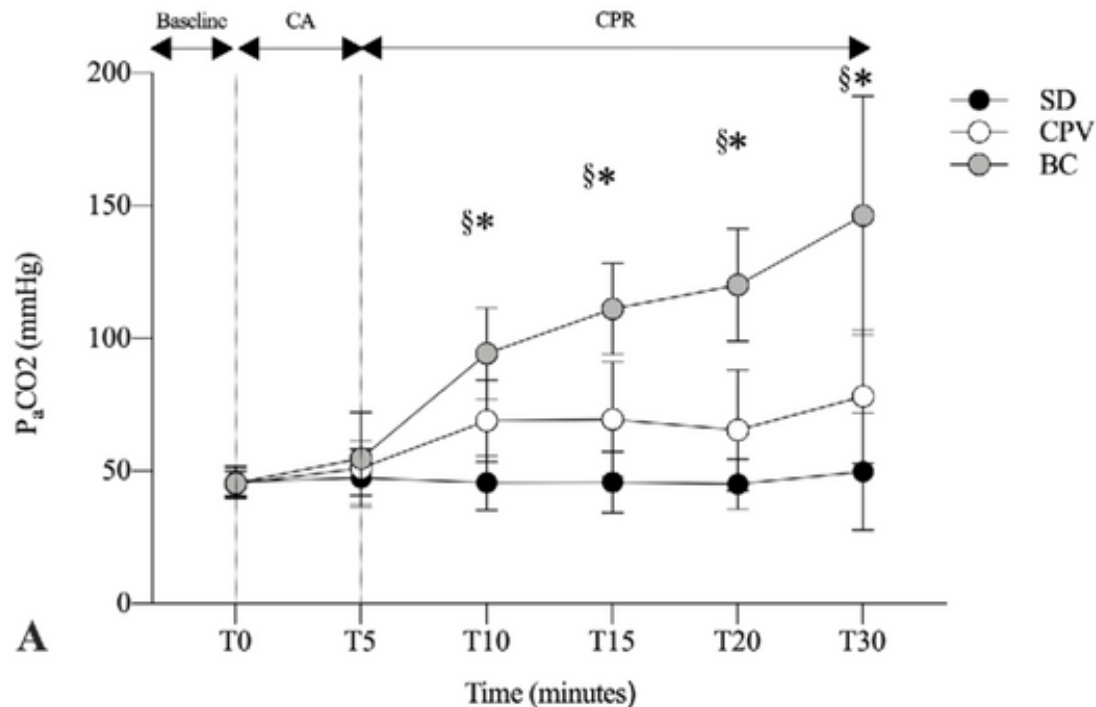


Stratégies de ventilation pendant la RCP



Fritz C et al. Impact of Different Ventilation Strategies on Gas Exchanges and Circulation During Prolonged Mechanical Cardio-Pulmonary Resuscitation In A Porcine Model. Shock. 2021 Oct 27.

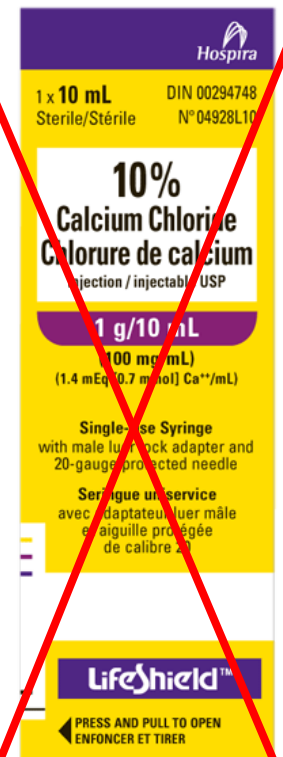
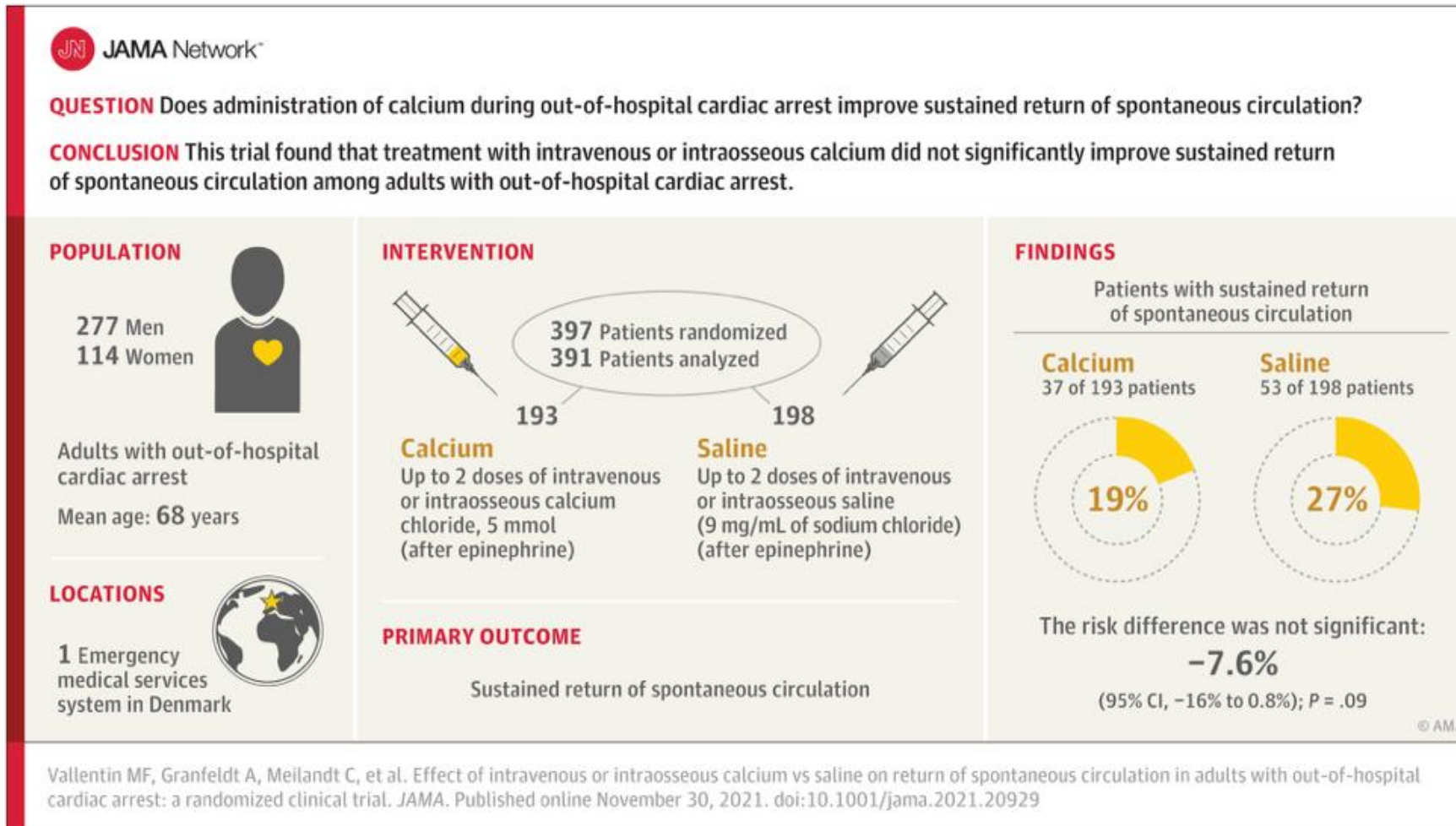
Stratégies de ventilation pendant la RCP



Fritz C et al. Impact of Different Ventilation Strategies on Gas Exchanges and Circulation During Prolonged Mechanical Cardio-Pulmonary Resuscitation In A Porcine Model. Shock. 2021 Oct 27.

Effect of Intravenous or Intraosseous Calcium vs Saline on Return of Spontaneous Circulation in Adults With Out-of-Hospital Cardiac Arrest A Randomized Clinical Trial

Mikael Fink Vallentin, MD; Asger Granfeldt, MD, PhD, DMSc; Carsten Meilandt, BSc; Amalie Ling Povlsen, BSc; Birthe Sindberg, RN; Mathias J. Holmberg, MD, MPH, PhD; Bo Nees Iversen, MD; Rikke Mærkedahl, MD; Lone Riis Mortensen, MD; Rasmus Nyboe, MD; Mads Partridge Vandborg, MD; Maren Tarpgaard, MD; Charlotte Runge, MD, PhD; Christian Fynbo Christiansen, MD, PhD; Thomas H. Dissing, MD, PhD; Christian Juhl Terkelsen, MD, PhD, DMSc; Steffen Christensen, MD, PhD; Hans Kirkegaard, MD, PhD, DMSc; Lars W. Andersen, MD, MPH, PhD, DMSc



5 MESSAGES PRINCIPAUX

1. RCP de haute qualité avec des interruptions minimales, une défibrillation précoce, et le traitement causes réversibles restent la priorité

2. Des signes et symptômes ont souvent lieu avant un arrêt cardiaque intra ou extra-hospitalier et sont évitables chez de

siques ou
oies aériennes.
un taux de
ale élevé devraient

4. Utilisez de l'adrénaline tôt pour les rythmes non choquables d'arrêt cardiaque

5. Chez des patients sélectionnés, si c'est réalisable, considérer l'extracorporel CPR (eCPR) comme un thérapeutique de secours quand la RCP conventionnelle est un échec

Chez des patients sélectionnés, si c'est réalisable, considérer l'extracorporel CPR (eCPR) comme un thérapeutique de secours quand la RCP conventionnelle est un



Lancet. 2020;396:1807-1816

Advanced reperfusion strategies for patients with out-of-hospital cardiac arrest and refractory ventricular fibrillation (ARREST): a phase 2, single centre, open-label, randomised controlled trial

Demetris Yannopoulos, Jason Bartos, Ganesh Raveendran, Emily Walser, John Connett, Thomas A Murray, Gary Collins, Lin Zhang, Rajat Kalra, Marinos Kosmopoulos, Ranjit John, Andrew Shaffer, R J Frascione, Keith Wesley, Marc Conterato, Michelle Biros, Jakub Tolar, Tom P Aufderheide



Out-of-Hospital

- AC d'origine cardiaque présumée
- FV ou TV comme rythme initial
- 18-75 ans
- 3 CEE et 300 mg d'amiodarone sans RACS
- RCP mécanique + valve d'impédance
- Temps estimé de transport < 30 min
- RCP en cours pendant transport avec 3 mg d'adrénaline max

Fibrillation Arrest

Medical Center

Treatment 1: Early VA-ECMO facilitation resuscitation.

A l'admission :

- Pas de RACS
- Critères d'arrêt de réanimation :
 - $\text{ETCO}_2 < 10 \text{ mmHg}$
 - $\text{PaCO}_2 < 50 \text{ mmHg}$
 - Lactate artériel $> 18 \text{ mmol/l}$

Outcomes are reported in the ITT primary endpoint.

DEATH

Survival to hospital discharge

Treatment 2: Standard ACLS.

ACLS in the ED for at least 15 minutes from arrival and for 60 minutes from 911 call.

Patient with no ROSC after 15 minutes of CPR from ED arrival or a total of 60 minutes from 911 call (whichever comes first) and ED MD deems ACLS futile.

Pronounce DEATH

VA-ECMO or other circulatory support device initiation. Suggested common clinical indications once in the CCL with ROSC:

- Profound cardiogenic shock with SBP < 90 mmHg or MAP < 60 mmHg despite inotropic support and an intra-aortic balloon pump,
- Persistent hypoxia with arterial oxygen saturation < 90% despite maximum ventilatory support,
- Fluid pulmonary edema despite iv diuretics,
- Recurrent episodes of VF or VT in the CCL.

Patient achieved ROSC or arrived with ROSC.

Patient enters CCL for angiogram/PCI

Is patient clinically stable?

No. Consider circulatory support devices.

Yes. Proceed with Angiogram/PCI.

Hospital Admission

DEATH

Survival to hospital discharge

Outcomes are reported in the ITT primary endpoint.

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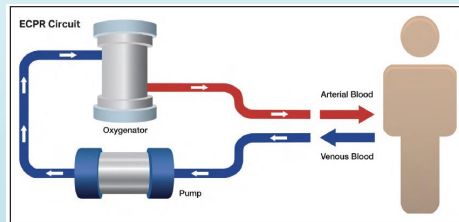
Time from 911 call to VA-ECMO initiation, min	12	59 (28)
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Survie à la sortie de l'hôpital

Primary outcome



ECPR



43%
(6 sur 15 patients)

risk difference 36%,
3·7–59·2; 0·9861
posterior
probability of
ECMO superiority



RCP standard



7%
(1 sur 15 patients)

ECPR pour l'AC réfractaire

Load&go Mothership

Emergency physician-initiated extracorporeal cardiopulmonary resuscitation[☆]

Joseph M. Bellezzo^{a,*}, Zack Shinar^{a,b}, Daniel P. Davis^c, Brian E. Jaski^b, Suzanne Chillcott^b, Marcia Stahovich^b, Christopher Walker^b, Sam Baradarian^b, Walter Dembitsky^b

[Resuscitation 83 \(2012\) 966–970](#)

The incidence of “load&go” out-of-hospital cardiac arrest candidates for emergency department utilization of emergency extracorporeal life support: A one-year review[☆]

Michael Poppe^a, Christoph Weiser^a, Michael Holzer^a, Patrick Sulzgruber^a, Philip Datler^a, Markus Keferböck^a, Sebastian Zeiner^a, Elisabeth Lobmeyr^a, Raphael van Tulder^a, Andreas Ziegler^b, Harald Glück^b, Manfred Meixner^b, Georg Schrattenbacher^b, Henrik Maszar^b, Andreas Zajicek^b, Fritz Sterz^{a,*}, Andreas Schober^a

[Resuscitation 91 \(2015\) 131–136](#)

Stay and Stabilize

Extracorporeal Cardiopulmonary Resuscitation (ECPR) in the Prehospital Setting: An Illustrative Case of ECPR Performed in the Louvre Museum

Lionel Lamhaut, Alice Hutin, Juliette Deutsch, Jean-Herlé Raphalen, Romain Jouffroy, Jean-Pierre Orsini, Frédéric Baud & Pierre Carli

[Prehospital Emergency Care, 21:3, 386-389,](#)

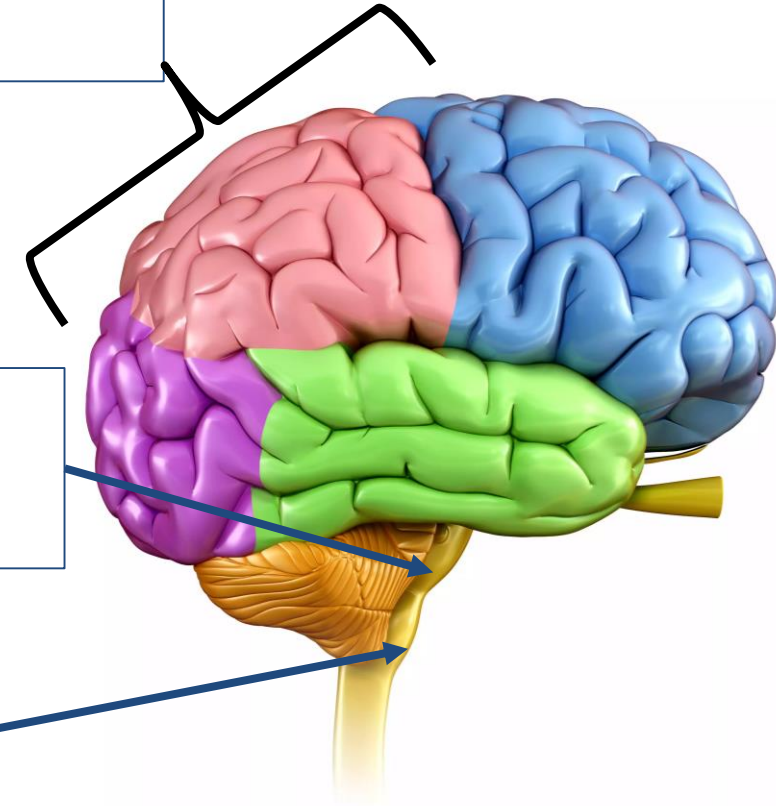
Meilleurs signes de perfusion cérébrale per CPR

- Étude multicentrique dans 3 villes (Paris, Nancy, Grenoble).
- AC réfractaires traités par ECPR
- CPJ = CPC \leq 2 at 30 days

Mouvements

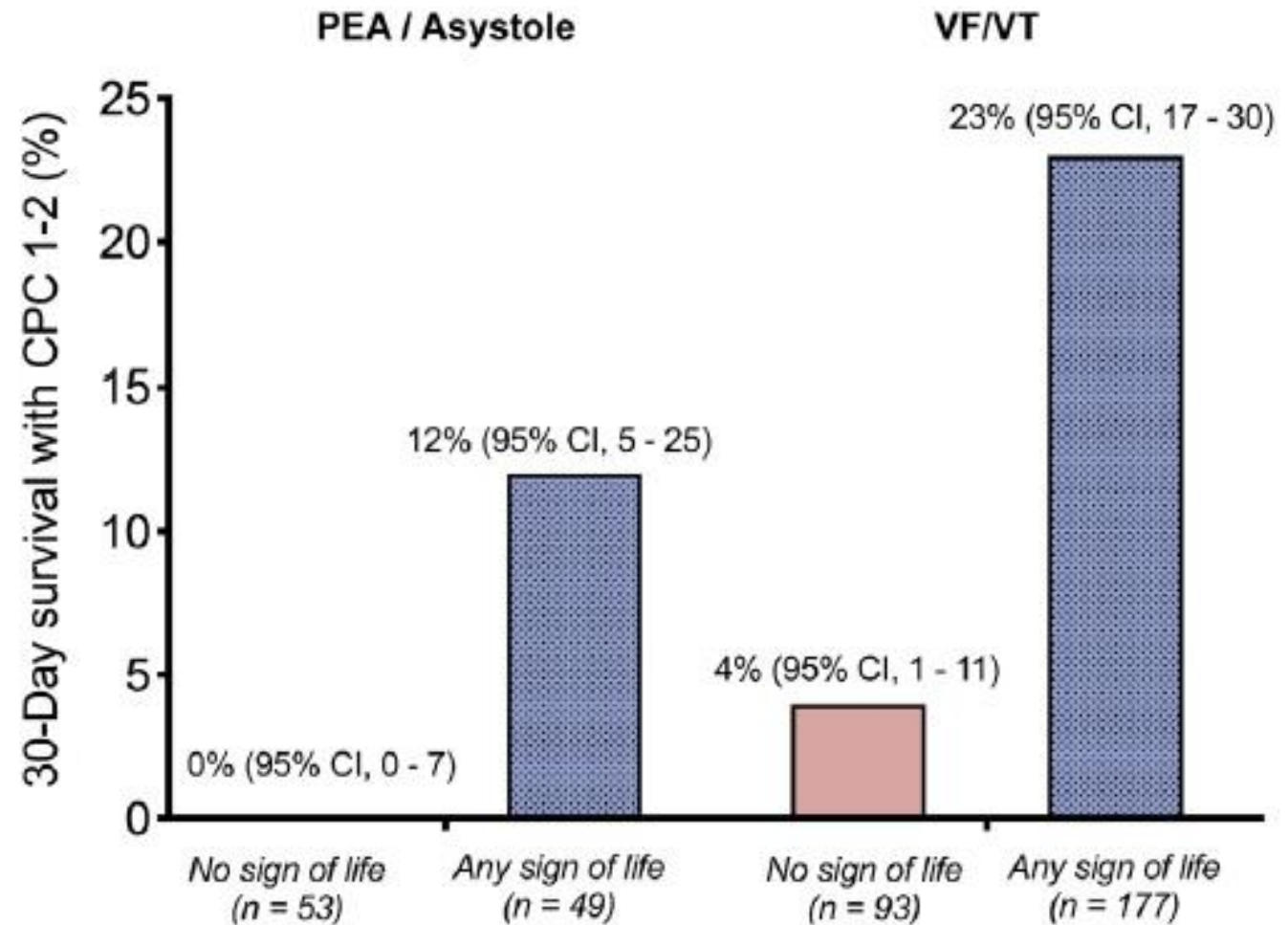
Réponse pupillaire

Gasps



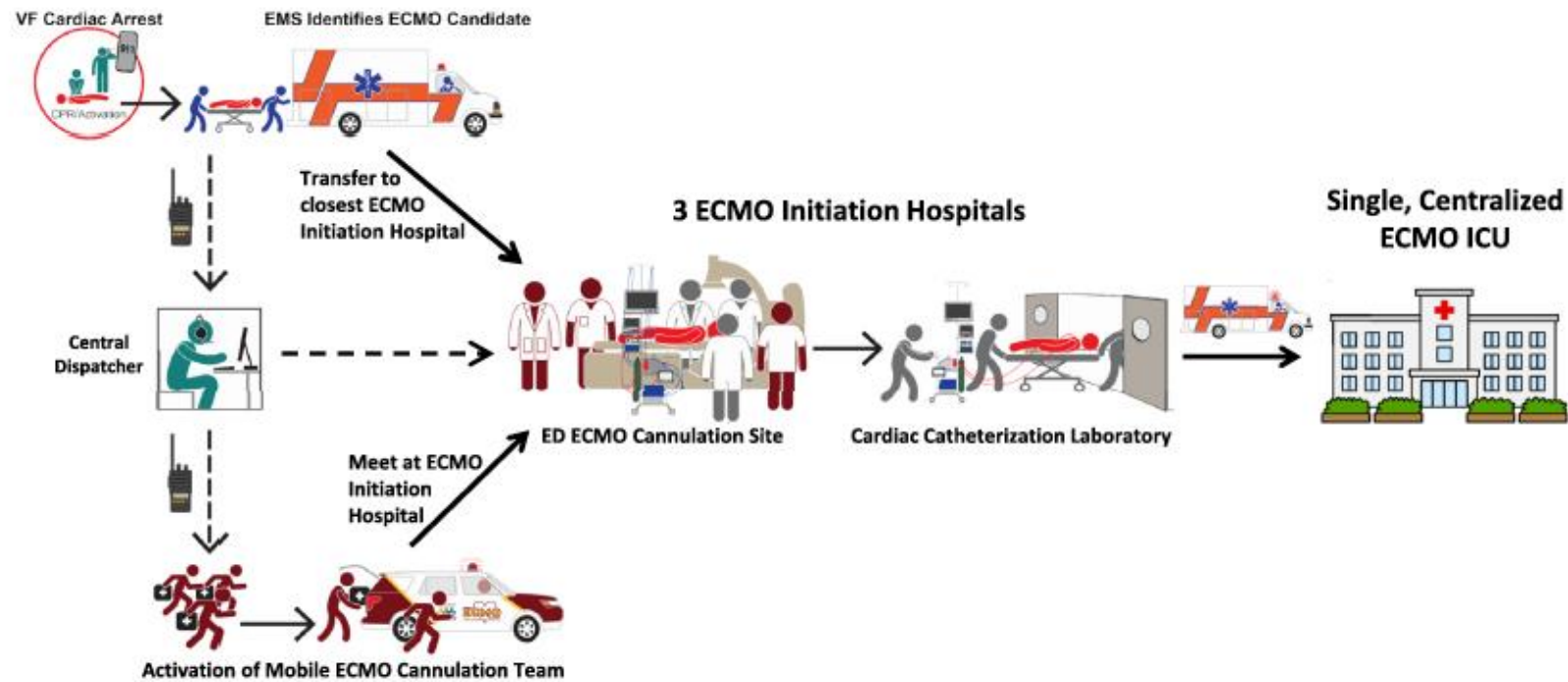
Signes de vie pendant la RCP

434 patients inclus
Signes de vie : 260 patients (60%)



Debaty G et al. Prognostic value of signs of life throughout cardiopulmonary resuscitation for refractory out-of-hospital cardiac arrest. *Resuscitation*. 2021;162:163-170.

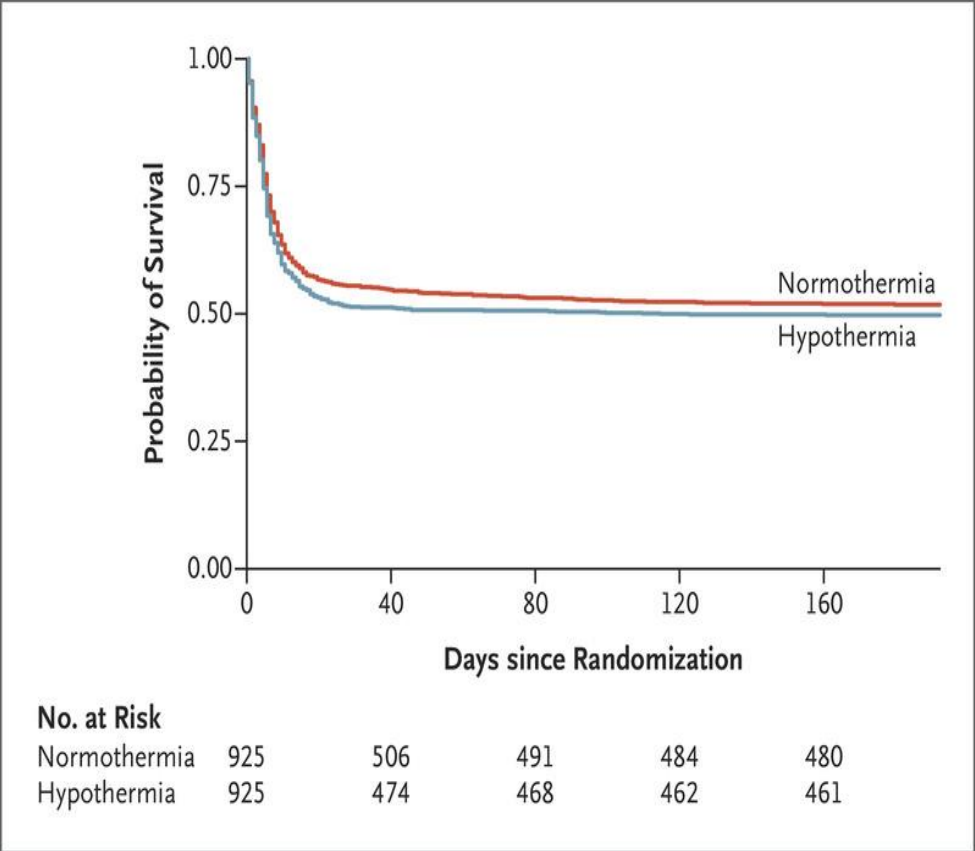
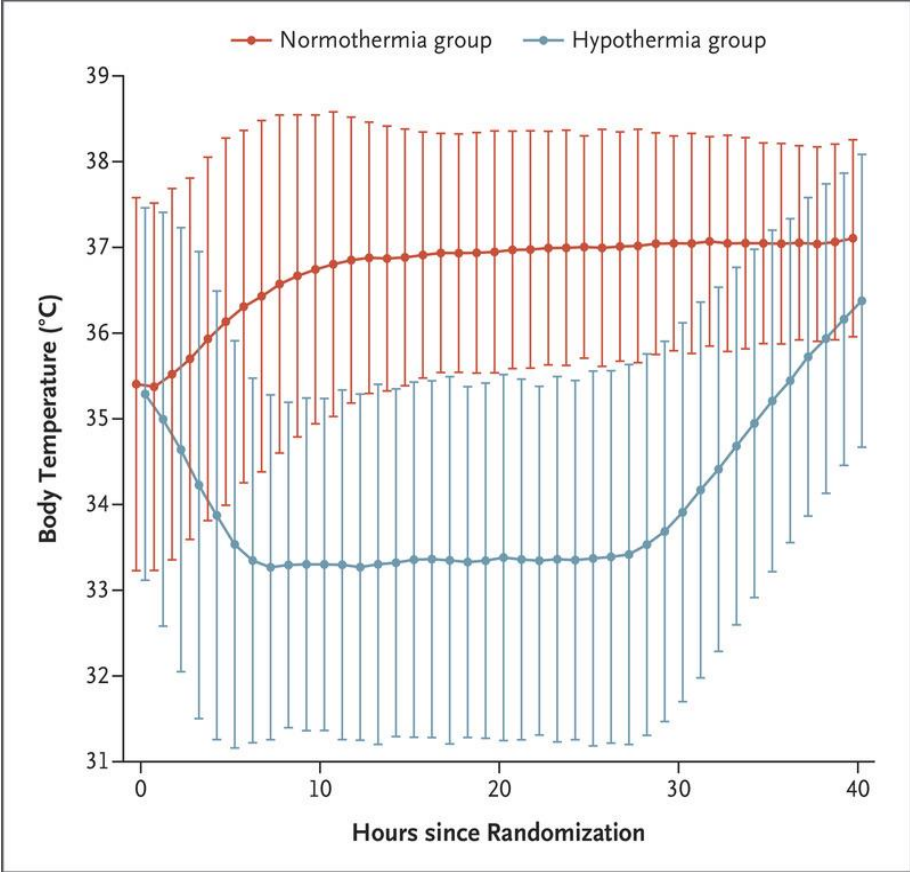
Réduire le low flow par ECPR préhospitalier



Bartos JA et al. The Minnesota mobile extracorporeal cardiopulmonary resuscitation consortium for treatment of out-of-hospital refractory ventricular fibrillation: Program description, performance, and outcomes. *EClinicalMedicine*. 2020;29-30:100632.

Hypothermia versus Normothermia after Out-of-Hospital Cardiac Arrest

Josef Dankiewicz, M.D., Ph.D., Tobias Cronberg, M.D., Ph.D., Gisela Lilja, O.T., Ph.D., Janus C. Jakobsen, M.D., Ph.D., Helena Levin, M.Sc., Susann Ullén, Ph.D., Christian Rylander, M.D., Ph.D., Matt P. Wise, M.B., B.Ch., D.Phil., Mauro Oddo, M.D., Alain Cariou, M.D., Ph.D., Jan Bělohávek, M.D., Ph.D., Jan Hovdenes, M.D., Ph.D., et al., for the TTM2 Trial Investigators*

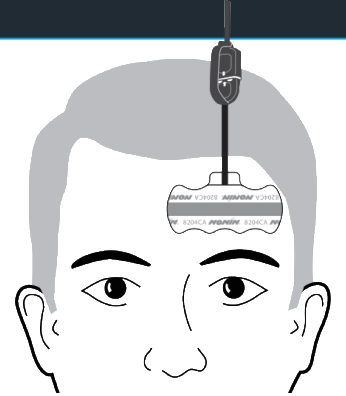


Recommendations for Performance of TTM		
COR	LOE	Recommendations
1	B-R	1. We recommend selecting and maintaining a constant temperature between 32°C and 36°C during TTM.
2a	B-NR	2. It is reasonable that TTM be maintained for at least 24 h after achieving target temperature.
2b	C-LD	3. It may be reasonable to actively prevent fever in comatose patients after TTM.
3: No Benefit	A	4. We do not recommend the routine use of rapid infusion of cold IV fluids for prehospital cooling of patients after ROSC.

Utilisation préhospitalière de l'oxymétrie cérébrale per RCP

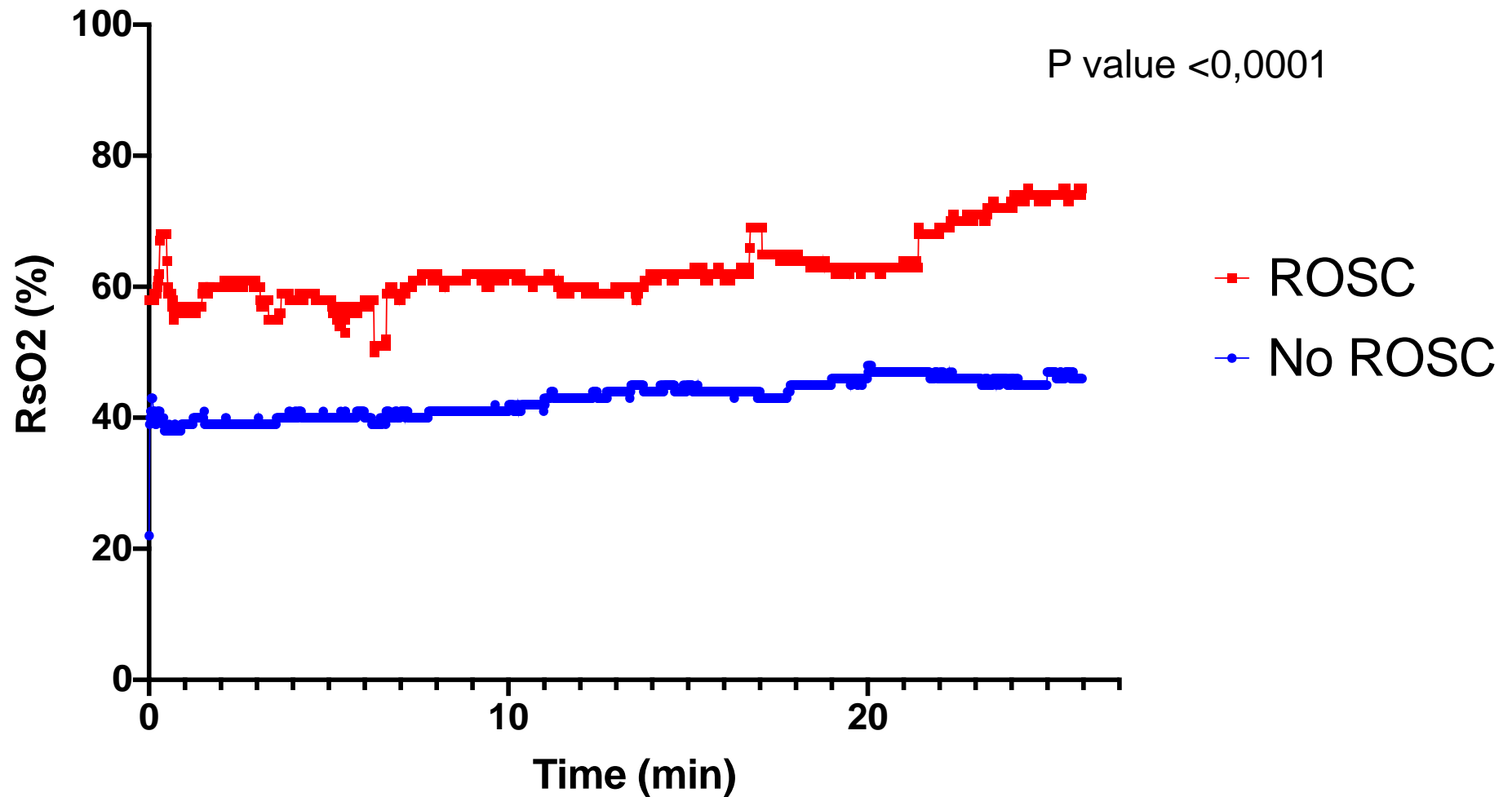


1^{ère} étude préhospitalière
Grenoble/Annecy/Chambery (2014)
5 Kg
20 min de batterie



Étude Gravity
330 g
Autonomie: plusieurs heures

RSO2 and ROSC – Gravity Study (preliminary data)



Étude de survie : RCP standard vs élévation contrôlée avec ACD+ITD

10 minutes de FV

Animaux randomisés :

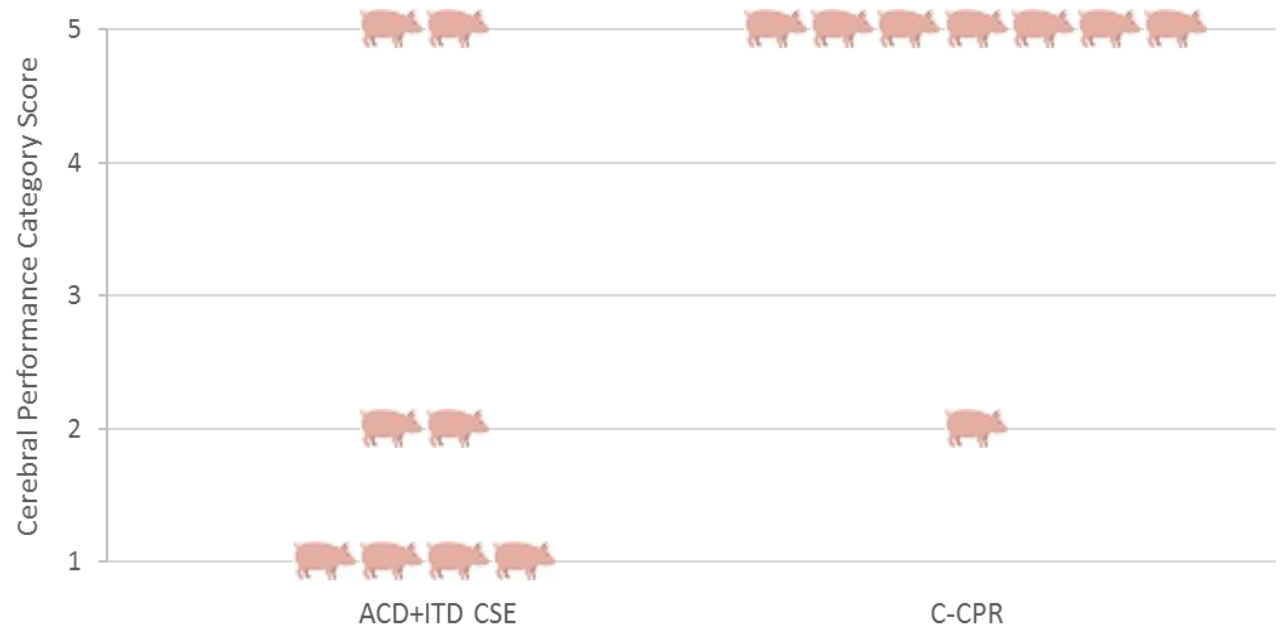
a) RCP standard à plat **OU**

b) Élévation contrôlée avec ACD+ITD

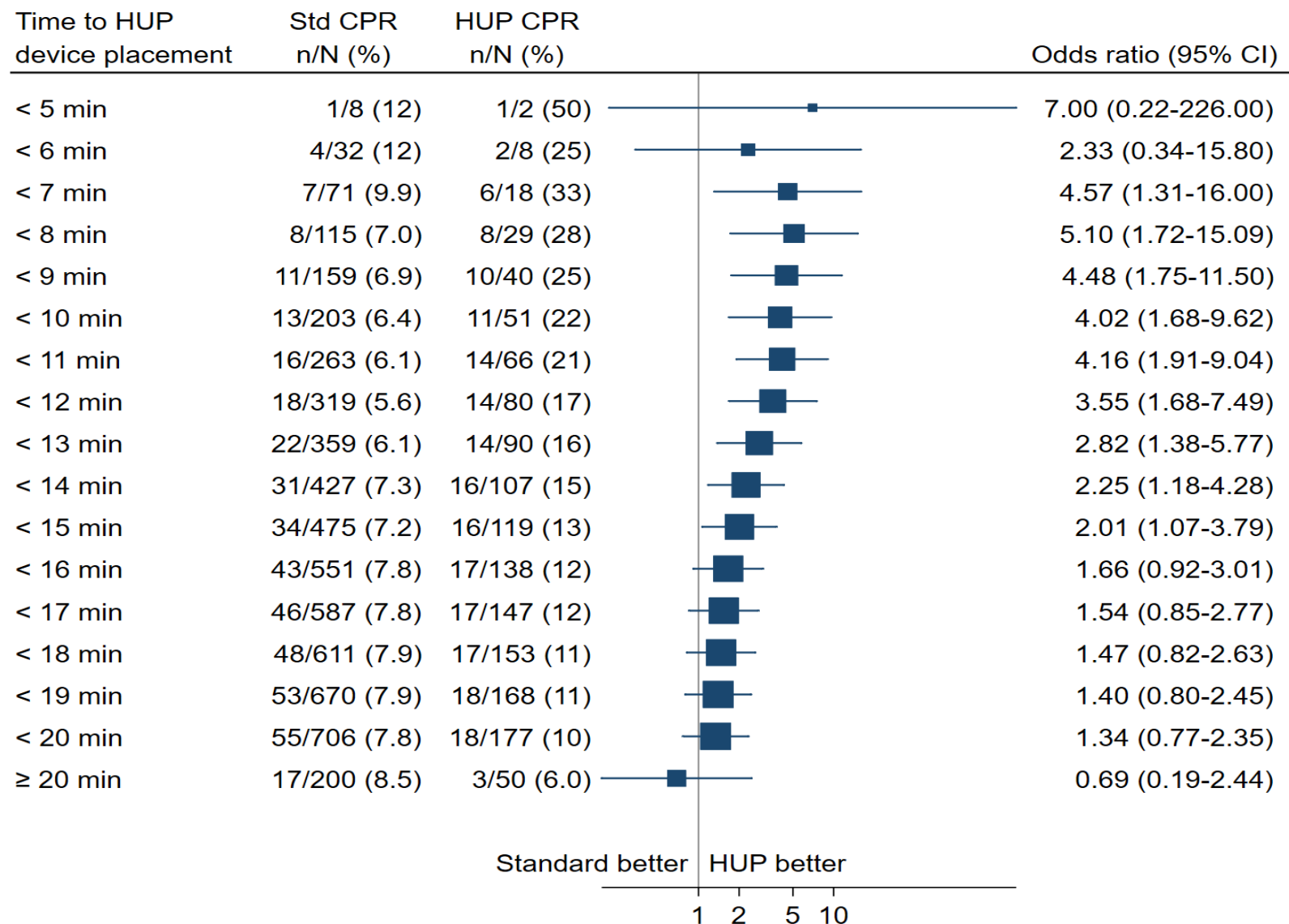
19 min de RCP

Évaluation neurologique l'aveugle à 24h

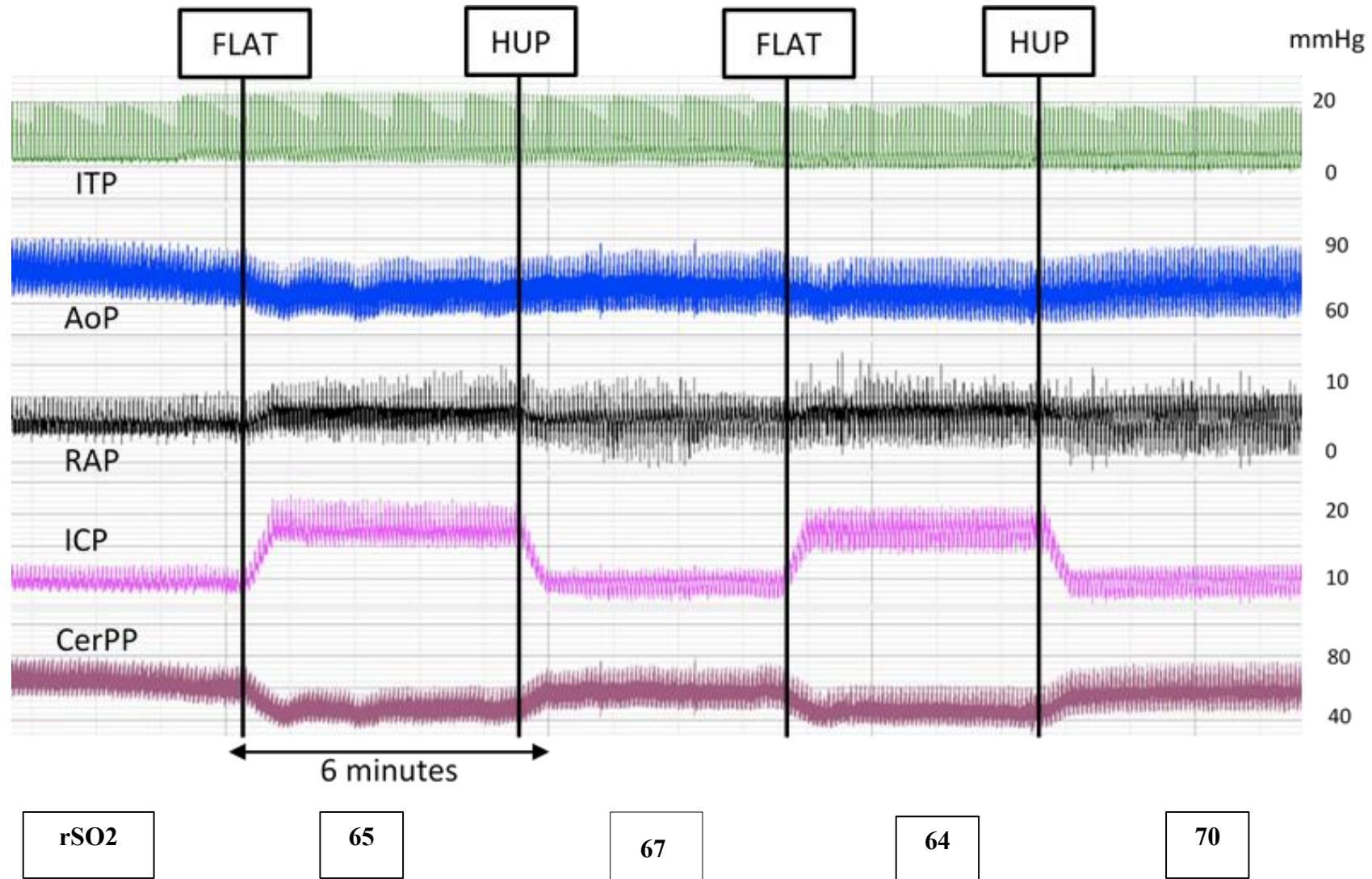
Moore et al , Resuscitation 2021



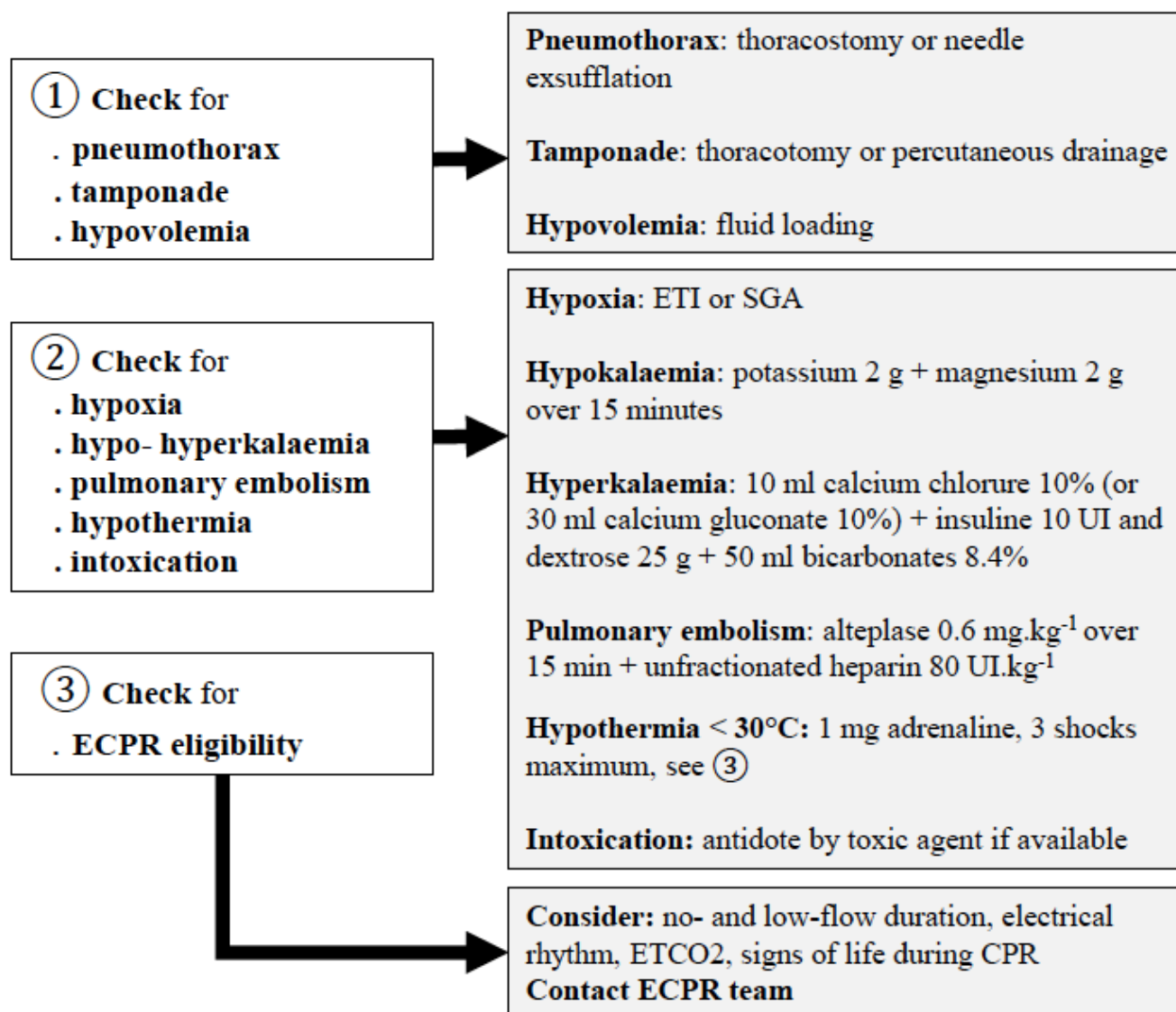
Importance du délai pour devenir neurologique



Élévation de la tête post RACS



Rôle du médecin



Leadership role during all CPR duration

Conclusion

- Le délai d'intervention est primordial (conseil de RCP, thérapeutique, HUP)
- Le cerveau est notre cible thérapeutique
- Place du médecin

