Reste-t-il encore une place pour l'ECMO VA en 2024? Dans l'arrêt cardiaque réfractaire

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Aucun conflit d’intérêt en rapport avec cette présentation

INTRODUCTION

Check for updates

Circulation

AHA STATISTICAL UPDATE

2024 Heart Disease and Stroke Statistics: A Report of US and Global Data From the American Heart Association

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BACKGROUND: The American Heart Association (AHA), in conjunction with the National Institutes of Health, annually reports the most up-to-date statistics related to heart disease, stroke, and cardiovascular risk factors, including core health behaviors (smoking, physical activity, nutrition, sleep, and obesity) and health factors (cholesterol, blood pressure, glucose control, and metabolic syndrome) that contribute to cardiovascular health. The AHA Heart Disease and Stroke Statistical Update presents the latest data on a range of major clinical heart and circulatory disease conditions (including stroke, brain health, complications of pregnancy, kidney disease, congenital heart disease, rhythm disorders, sudden cardiac arrest, subclinical atherosclerosis, coronary heart disease, cardiomyopathy, heart failure, valvular disease, venous thromboembolism, and peripheral artery disease) and the associated outcomes (including quality of care, procedures, and economic costs).

METHODS: The AHA, through its Epidemiology and Prevention Statistics Committee, continuously monitors and evaluates sources of data on heart disease and stroke in the United States and globally to provide the most current information available in the annual Statistical Update with review of published literature through the year before writing. The 2024 AHA Statistical Update is the product of a full year's worth of effort in 2023 by dedicated volunteer clinicians and scientists, committed government professionals, and AHA staff members. The AHA strives to further understand and help heal health problems inflicted by structural racism, a public health crisis that can significantly damage physical and mental health and perpetuate disparities in access to health care, education, income, housing, and several other factors vital to healthy lives. This year's edition includes additional global data, as well as data on the monitoring and benefits of cardiovascular health in the population, with an enhanced focus on health equity across several key domains.

The 2024 AHA Statistical Update uses language that conveys respect and specificity when referencing race and ethnicity. Instead of referring to groups very broadly with collective nouns (eg, Blacks, Whites), we use descriptions of race and ethnicity as adjectives (eg, Asian people, Black adults, Hispanic youths, Native American patients, White females).

As the AHA continues its focus on health equity to address structural racism, we are working to reconcile language used in previously published data sources and studies when this information is compiled in the annual Statistical Update. We strive to use terms from the original data sources or published studies (mostly from the past 5 years) that may not be as inclusive as the terms used in 2024. As style guidelines for scientific writing evolve, they will serve as guidance for data sources and publications and how they are cited in future Statistical Updates.

Supplemental Material is available at https://www.ahajournals.org/doi/suppl/10.1161/CIR.0000000000001209

Circulation is available at www.ahajournals.org/journal/circ

Circulation. 2024;149:e347–e913. DOI: 10.1161/CIR.0000000000001209 February 20, 2024 e347

AC INTRAHOSPITALIER

290000 patients hospitalisés chaque année aux USA

Survie CPC 1-2 = 15-20%

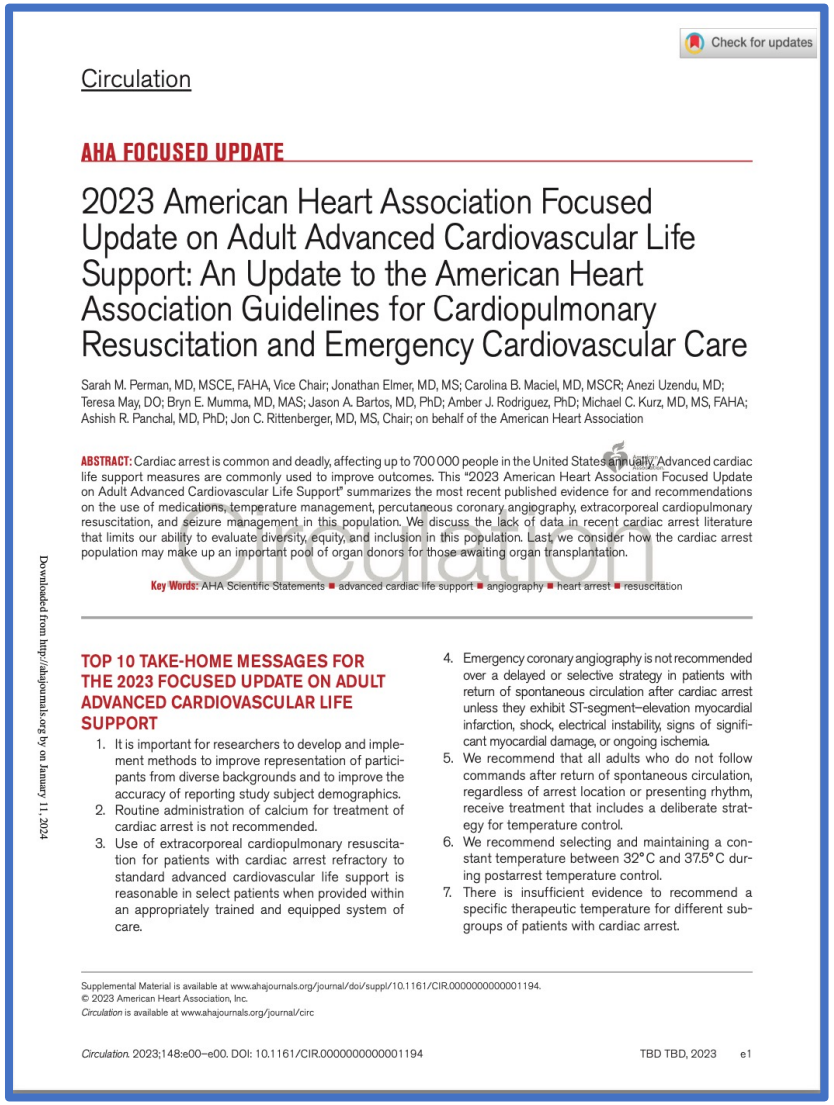
AC EXTRAHOSPITALIER

90 sujets/100000 habitants chaque année aux USA

Survie CPC 1-2 = 5-10%

Circulation 2024;149:e347-e913

EXTRACORPOREAL CARDIOPULMONARY RESUSCITATION (ECPR)



Check for updates

Circulation

AHA FOCUSED UPDATE

2023 American Heart Association Focused Update on Adult Advanced Cardiovascular Life Support: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Sarah M. Perman, MD, MSCE, FAHA, Vice Chair; Jonathan Elmer, MD, MS; Carolina B. Maciel, MD, MSCR; Anezi Uzendu, MD; Teresa May, DO; Bryn E. Mumma, MD, MAS; Jason A. Bartos, MD, PhD; Amber J. Rodriguez, PhD; Michael C. Kurz, MD, MS, FAHA; Ashish R. Panchal, MD, PhD; Jon C. Rittenberger, MD, MS, Chair; on behalf of the American Heart Association

ABSTRACT: Cardiac arrest is common and deadly, affecting up to 700 000 people in the United States annually. Advanced cardiac life support measures are commonly used to improve outcomes. This "2023 American Heart Association Focused Update on Adult Advanced Cardiovascular Life Support" summarizes the most recent published evidence for and recommendations on the use of medications, temperature management, percutaneous coronary angiography, extracorporeal cardiopulmonary resuscitation, and seizure management in this population. We discuss the lack of data in recent cardiac arrest literature that limits our ability to evaluate diversity, equity, and inclusion in this population. Last, we consider how the cardiac arrest population may make up an important pool of organ donors for those awaiting organ transplantation.

Key Words: AHA Scientific Statements ■ advanced cardiac life support ■ angiography ■ heart arrest ■ resuscitation

TOP 10 TAKE-HOME MESSAGES FOR THE 2023 FOCUSED UPDATE ON ADULT ADVANCED CARDIOVASCULAR LIFE SUPPORT

1. It is important for researchers to develop and implement methods to improve representation of participants from diverse backgrounds and to improve the accuracy of reporting study subject demographics.
2. Routine administration of calcium for treatment of cardiac arrest is not recommended.
3. Use of extracorporeal cardiopulmonary resuscitation for patients with cardiac arrest refractory to standard advanced cardiovascular life support is reasonable in select patients when provided within an appropriately trained and equipped system of care.
4. Emergency coronary angiography is not recommended over a delayed or selective strategy in patients with return of spontaneous circulation after cardiac arrest unless they exhibit ST-segment–elevation myocardial infarction, shock, electrical instability, signs of significant myocardial damage, or ongoing ischemia.
5. We recommend that all adults who do not follow commands after return of spontaneous circulation, regardless of arrest location or presenting rhythm, receive treatment that includes a deliberate strategy for temperature control.
6. We recommend selecting and maintaining a constant temperature between 32°C and 37.5°C during postarrest temperature control.
7. There is insufficient evidence to recommend a specific therapeutic temperature for different subgroups of patients with cardiac arrest.

Supplemental Material is available at www.ahajournals.org/journal/doi/suppl/10.1161/CIR.0000000000001194.

Circulation is available at www.ahajournals.org/journal/circ

Circulation. 2023;148:e00–e00. DOI: 10.1161/CIR.0000000000001194 TBD TBD, 2023 e1

American Heart Association®

EXTRACORPOREAL CPR

ECPR		
COR	**LOE**	**Recommendation**
2a	**B-R**	1. Use of ECPR for patients with cardiac arrest refractory to standard ACLS is reasonable in select patients when provided within an appropriately trained and equipped system of care.

Circulation 2024;149:e254-e273

EXTRACORPOREAL CARDIOPULMONARY RESUSCITATION (ECPR)

Extracorporeal Cardiopulmonary Resuscitation in Adults. Interim Guideline Consensus Statement From the Extracorporeal Life Support Organization

Age < 70 years[14]
Witnessed arrest
Arrest to first CPR ("no-flow interval") < 5 minutes (*i.e.,* bystander CPR)
Initial cardiac rhythm of VF/pVT/PEA
Arrest to ECMO flow < 60 minutes "low flow interval"*
ETCO2 > 10 mm Hg (1.3 kPa) during CCPR before cannulation for ECMO
Intermittent ROSC or recurrent VF
"Signs of life" during conventional CPR may be a positive predictive factor for survival
The absence of previously known life limiting comorbidities (*e.g.* end stage heart failure/chronic obstructive pulmonary disease/end-stage renal failure/liver failure/terminal illness) and consistent with patient's goals of care
No known aortic valve incompetence (>mild aortic valve incompetence should be excluded)

ASAIO J 2021;67:221-228

ACR INTRAHOSPITALIER (IHCA)

vs.

ACR EXTRAHOSPITALIER (OHCA)

EPIDEMIOLOGIE

1.8 / 1000 admissions hospitalières *(registre danois DANARREST)*

Resuscitation 2019;140:31-36

5.1 / 1000 admissions hospitalières *(Japon)*

J Intensive Care 2022;10:10

9.7 / 1000 admissions hospitalières *(USA)*

Circ Cardiovasc Qual Outcomes 2019;12:e005580

1-10 / 1000 admissions hospitalières

SURVIE

The Swedish cardiopulmonary resuscitation registry

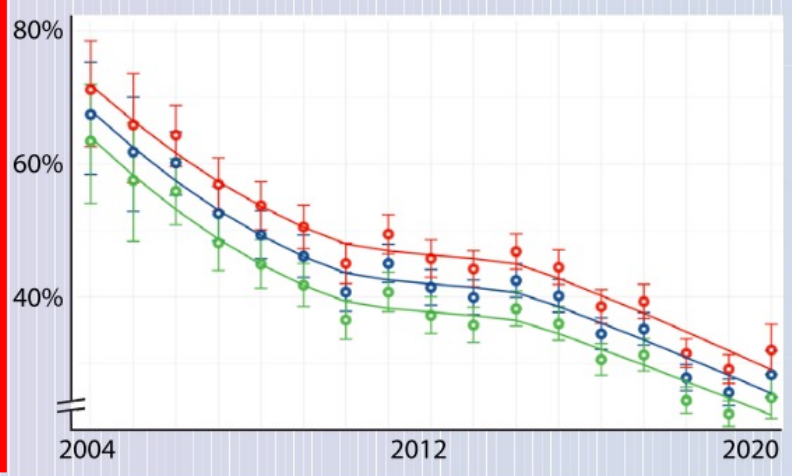
IHCA | 2004-2020 | 30,032

47% — **Overall 30-day survival**

Probability increased 47% overall from 2011 to 2020; 52% increase in men and 37% increase in women

70% — **IHCA due to ischaemia/infarction**

Probability of cardiac arrest due to ischaemia/ infarction declined by 70% between 2004 and 2020



90% — **Cerebral performance category 1–2**

No improvement in neurological function among survivors between 2004 and 2020

43% — **Initial shockable rhythm**

Probability of having an initial shockable rhythm declined by 43%

>90% — **CPR within 60 seconds**

Rates of CPR within 60 seconds increased.
No change in time to defibrillation

Eur Heart J 2022;43:4817-4829

ANALYSE de la LITTERATURE

1) ECPR - ACR intrahospitalier

2) ECPR - ACR intrahospitalier après chirurgie cardiaque

3) ECPR vs. CCPR pour l'ACR intrahospitalier

4) ECPR pour l'ACR intrahospitalier vs. extrahospitalier

1

ANALYSE de la LITTERATURE

Quels sont les résultats de l'ECPR dans le cadre de l'ACR intrahospitalier?

1

ANALYSE de la LITTERATURE

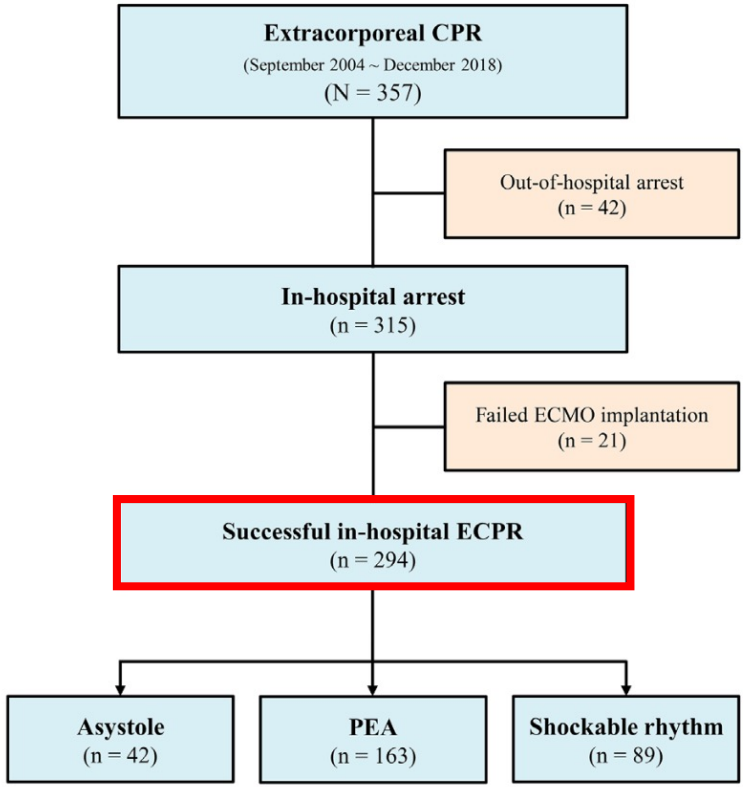
Auteur	[Reference]	Patients (n.)	Survie CPC 1-2
Wang	Resuscitation 2014;85:1219-1224	199	25.1%
Ko	Resuscitation 2020;148:121-127	294	35.4%
Higashi	J Intensive Care 2020;8:39-46	117	31.9%
Park	J Clin Med 2020;9:3588-3599	183	31.1%
Halenarova	Resuscitation 2022;170:71-78	163	34.4%
Bourcier	Int J Cardiol 2022;350:48-54	137	19.0%
Shin	Sci Rep 2022;12:1653-1660	247	31.6%
Diehl	SJTREM 2023;31:89-99	104	41.4%

Survie CPC 1-2 = 19-41%

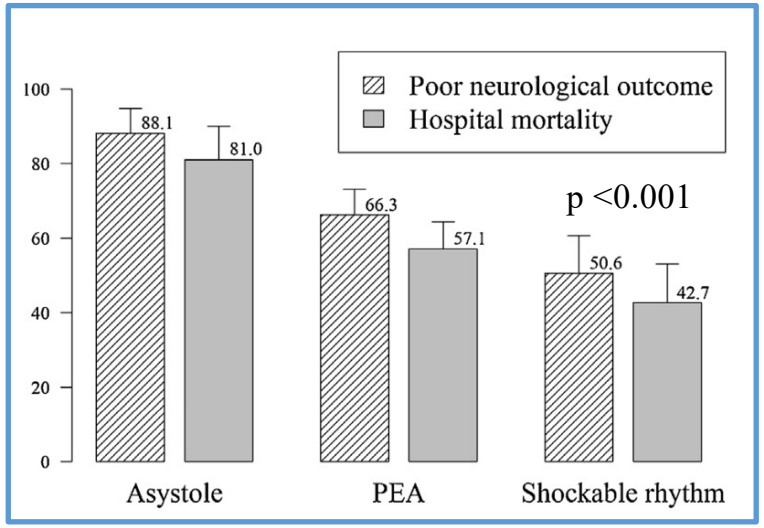
The differential neurologic prognosis of low-flow time according to the initial rhythm in patients who undergo extracorporeal cardiopulmonary resuscitation

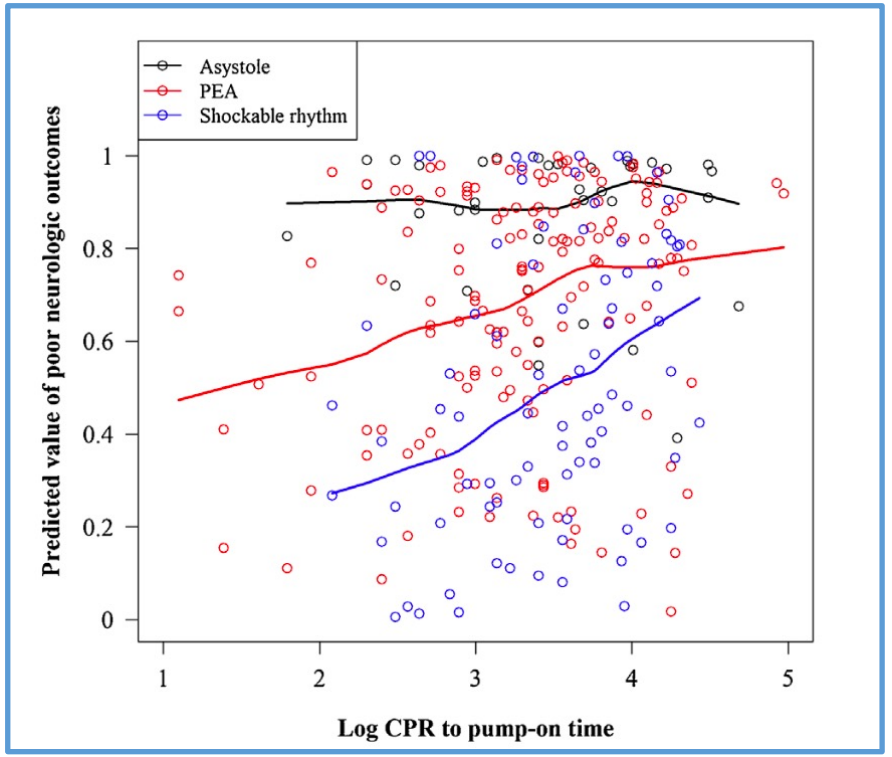
Ko et al.

Resuscitation 2020;148:121-127

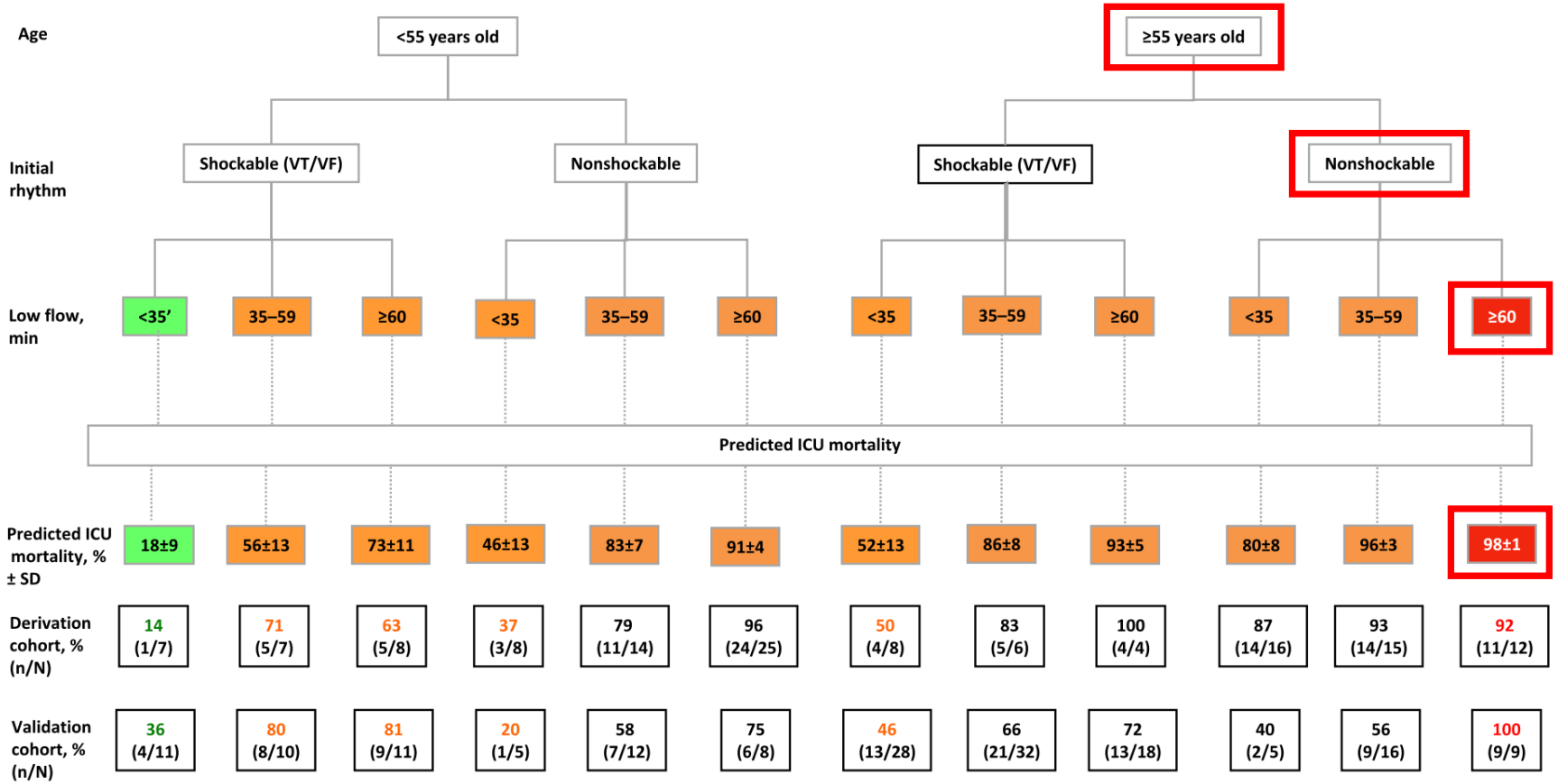


Survie CPC 1-2 = 35.4%





Extracorporeal cardiopulmonary resuscitation for refractory in-hospital cardiac arrest: A retrospective cohort study



Bourcier et al.

Int J Cardiol 2022;350:48-54

2

ANALYSE de la LITTERATURE

Quels sont les résultats de l'ECPR dans le cadre de l'ACR intrahospitalier <u>après chirurgie cardiaque</u>?

2

ANALYSE de la LITTERATURE

Auteur	[Reference]	Patients (n.)	Survie
Zhao	Eur J Med Res 2015;20:83-89	24	33.3%
Distelmaier	Resuscitation 2016;104:24-27	30	36.6%
Mazzeffi	JTCS 2016;152:1133-1139	23	26.1% (**CPC 1-2**)
Levy	Perfusion 2022;37:745-751	44	25.0% (**CPC 1-2**)

Survie = 25-37%

ECPR - ACR INTRAHOSPITALIER APRES CHIRURGIE CARDIAQUE

STS EXPERT CONSENSUS STATEMENT

The Society of Thoracic Surgeons Expert Consensus for the Resuscitation of Patients Who Arrest After Cardiac Surgery

The Society of Thoracic Surgeons Task Force on Resuscitation After Cardiac Surgery*

Executive Summary

The Society of Thoracic Surgeons Task Force on Resuscitation After Cardiac Surgery provides this professional society perspective on resuscitation in patients who arrest after cardiac surgery. This document was created using a multimodal methodology for evidence generation and includes information from existing guidelines, from the International Liaison Committee on Resuscitation, from our own structured literature reviews on issues particular to cardiac surgery, and from an international survey on resuscitation hosted by CTSNet.

In gathering evidence for this consensus paper, searches were conducted using the MEDLINE keywords "cardiac surgery," "resuscitation," "guideline," "thoracic surgery," "cardiac arrest," and "cardiac massage." Weight was given to clinical studies in humans, although some case studies, mannequin simulations of potential protocols, and animal models were also considered.

Consensus was reached using a modified Delphi method consisting of two rounds of voting until 75% agreement on appropriate wording and strength of the opinions was reached. The Society of Thoracic Surgeons Workforce on Critical Care was enlisted in this process to provide a wider variety of experiences and backgrounds in an effort to reinforce the opinions provided.

We start with the premise that external massage is ineffective for an arrest due to tamponade or hypovolemia (bleeding), and therefore these subsets of patients will receive inadequate cerebral perfusion during cardiac arrest in the absence of resternotomy. Because these two situations are common causes for an arrest after cardiac surgery, the inability to provide effective external cardiopulmonary resuscitation highlights the importance of early emergency resternotomy within 5 minutes. In addition, because internal massage is more effective than external massage, it should be used preferentially if other quickly reversible causes are not found.

We present a protocol for the cardiac arrest situation that includes the following recommendations: (1) successful treatment of a patient who arrests after cardiac surgery is a multidisciplinary activity with at least six key roles that should be allocated and rehearsed as a team on a regular basis; (2) patients who arrest with ventricular fibrillation should immediately receive three sequential attempts at defibrillation before external cardiac massage, and if this fails, emergency resternotomy should be performed; (3) patients with asystole or extreme bradycardia should undergo an attempt to pace if wires are available before external cardiac massage, then optionally external pacing followed by emergency resternotomy; and (4) pulseless electrical activity should receive prompt resternotomy after quickly reversible causes are excluded. Finally, we recommend that full doses of epinephrine should not be routinely given owing to the danger of extreme hypertension if a reversible cause is rapidly resolved.

Protocols are given for excluding reversible airway and breathing complications, for left ventricular assist device emergencies, for the nonsternotomy patient, and for safe emergency resternotomy. We believe that all cardiac units should have accredited policies and protocols in place to specifically address the resuscitation of patients who arrest after cardiac surgery.

(Ann Thorac Surg 2017;103:1005–20)

REPORT

The American Heart Association (AHA) issued its latest edition of guidelines for resuscitation in October 2015 [1]. These guidelines do not provide specialist guidance for patients who arrest after cardiac surgery. The European Resuscitation Council (ERC) guidelines were published simultaneously and, in contrast, included a detailed section on the resuscitation of patients who arrest after cardiac surgery [2]. The ERC guidelines recommend resternotomy within 5 minutes of a cardiac arrest, allowing any trained practitioner to

*A complete list of the authors for The Society of Thoracic Surgeons Task Force on Resuscitation After Cardiac Surgery appears at the end of this article.

The STS Executive Committee approved this document.

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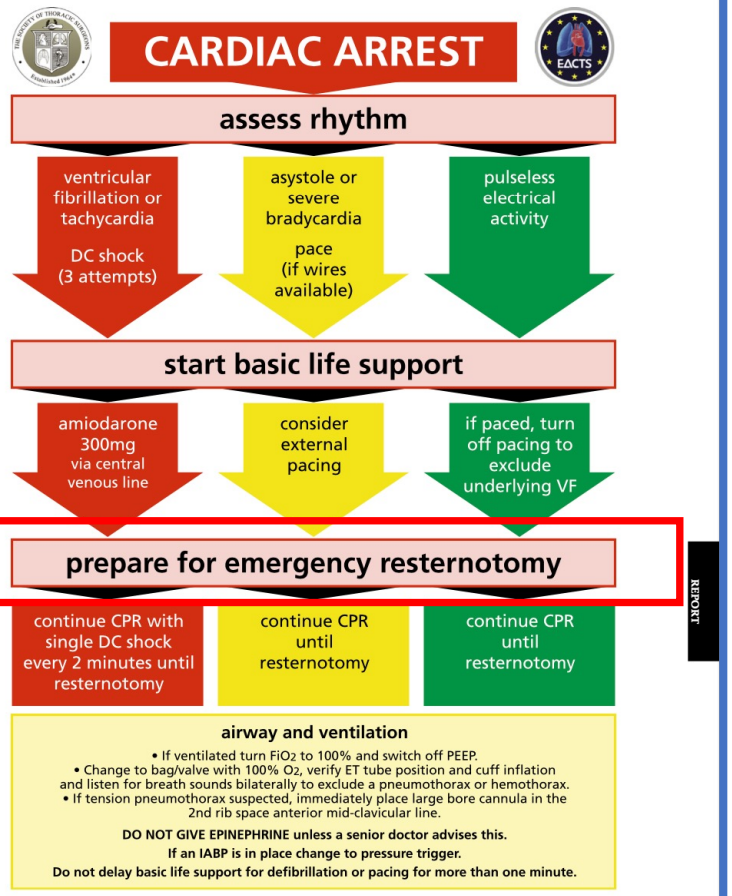
Drs Dunning and Levine disclose a relationship with CALS-S UK Ltd. Dr Arora discloses a financial relationship with Pfizer and Mallinckrodt Pharmaceuticals.

0003-4975/$36.00
http://dx.doi.org/10.1016/j.athoracsur.2016.10.033



REPORT

…Cannulas may be inserted into the aorta and right atrium without pursestring sutures and held by assistants until purse-strings are applied on bypass…

…In units expert in the use of peripheral ECMO, that may be instituted in preference to central cannulation…

Ann Thorac Surg 2017;103:1005-1020

3

ANALYSE de la LITTERATURE

Y a-t-il une supériorité de l'ECPR par rapport à la CCPR dans le cadre de l'ACR intrahospitalier?

3

ANALYSE de la LITTERATURE

Auteur	[Reference]	ECPR/CCPR	Survie (CPC 1-2)
Chen	Lancet 2008;372:554-561	**59**/113 (*46/46 PSM*)	ECPR=CCPR
Lin	Resuscitation 2010;81:796-803	**55**/63 (*27/27 PSM*)	ECPR=CCPR
Shin	Crit Care Med 2011;39:1-7	**85**/321 (*60/60 PSM*)	↑ ECPR
Blumenstein	EHJ Acute Cardiovasc Care 2016;5:13-22	**52**/272 (*52/52 PSM*)	ECPR=CCPR
Bian	Crit Care Med 2024;52:e268-e278	**34**/4819 (33/132 PSM)	ECPR=CCPR

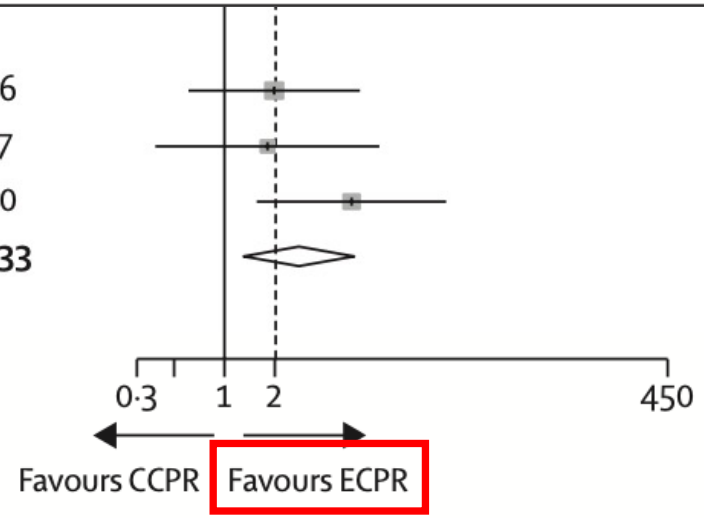
ECPR vs. CCPR - ACR INTRAHOSPITALIER

Extracorporeal cardiopulmonary resuscitation versus conventional cardiopulmonary resuscitation in adults with cardiac arrest: a comparative meta-analysis and trial sequential analysis

Low et al.

Lancet Respir Med 2023;11:883-893

	ECPR (n/N)	CCPR (n/N)	Odds ratio (95% CI)	Weight	p value
IHCA					
Chen et al (2008)[10]	9/46	5/46	1·99 (0·61–6·49)	9·4%	
Lin et al (2010)[12]	5/27	3/27	1·82 (0·39–8·51)	5·5%	
Shin et al (2011),[41] Shin et al (2013)[42]	14/60	3/60	5·78 (1·57–21·35)	7·7%	
Random-effects model	**28/133**	**11/133**	**2·80 (1·31–6·00)**	**22·6%**	**0·0080**
Heterogeneity: I^2=0%, τ^2=0, p=0·40					



…Mortality reductions and improvements in survival CPC 1-2 were significant in patients with IHCA…

4

ANALYSE de la LITTERATURE

Y a-t-il une différence des résultats de l'ECPR entre ACR intrahospitalier et extrahospitalier?

4

ANALYSE de la LITTERATURE

Auteur	[Reference]	Intra/Extra	Survie (CPC 1-2)
Kagawa	Resuscitation 2010;81:968-973	**38**/39	INTRA=EXTRA
Avalli	Resuscitation 2012;83:579-583	**24**/18	↑ INTRA
Wang	Resuscitation 2014;85:1219-1224	**199**/31	INTRA=EXTRA
Ellouze	Artif Organs 2018;42:15-21	**43**/22	INTRA=EXTRA
Daou	J Thorac Dis 2020;12:849-857	**60**/53	INTRA=EXTRA
Lunz	Intensive Care Med 2020;46:973-982	**165**/258	↑ INTRA

ECPR - ACR INTRAHOSPITALIER vs. EXTRAHOSPITALIER

Extracorporeal Life Support for Refractory Cardiac Arrest: A 10-Year Comparative Analysis

Matteo Pozzi, MD, Xavier Armoiry, PharmD, PhD, Felix Achana, PhD, Catherine Koffel, MD, Isabelle Pavlakovic, MD, Flavie Lavigne, MD, Jean Luc Fellahi, MD, PhD, and Jean Francois Obadia, MD, PhD

Ann Thorac Surg 2019;107:809-816

01/01/2007 – 31/12/2016

131 ECMO VA
Arrêt cardiaque réfractaire

45 ACR INTRAHOSPITALIER

Survie hospitalière CPC 1-2
n = 3 (7.0%)

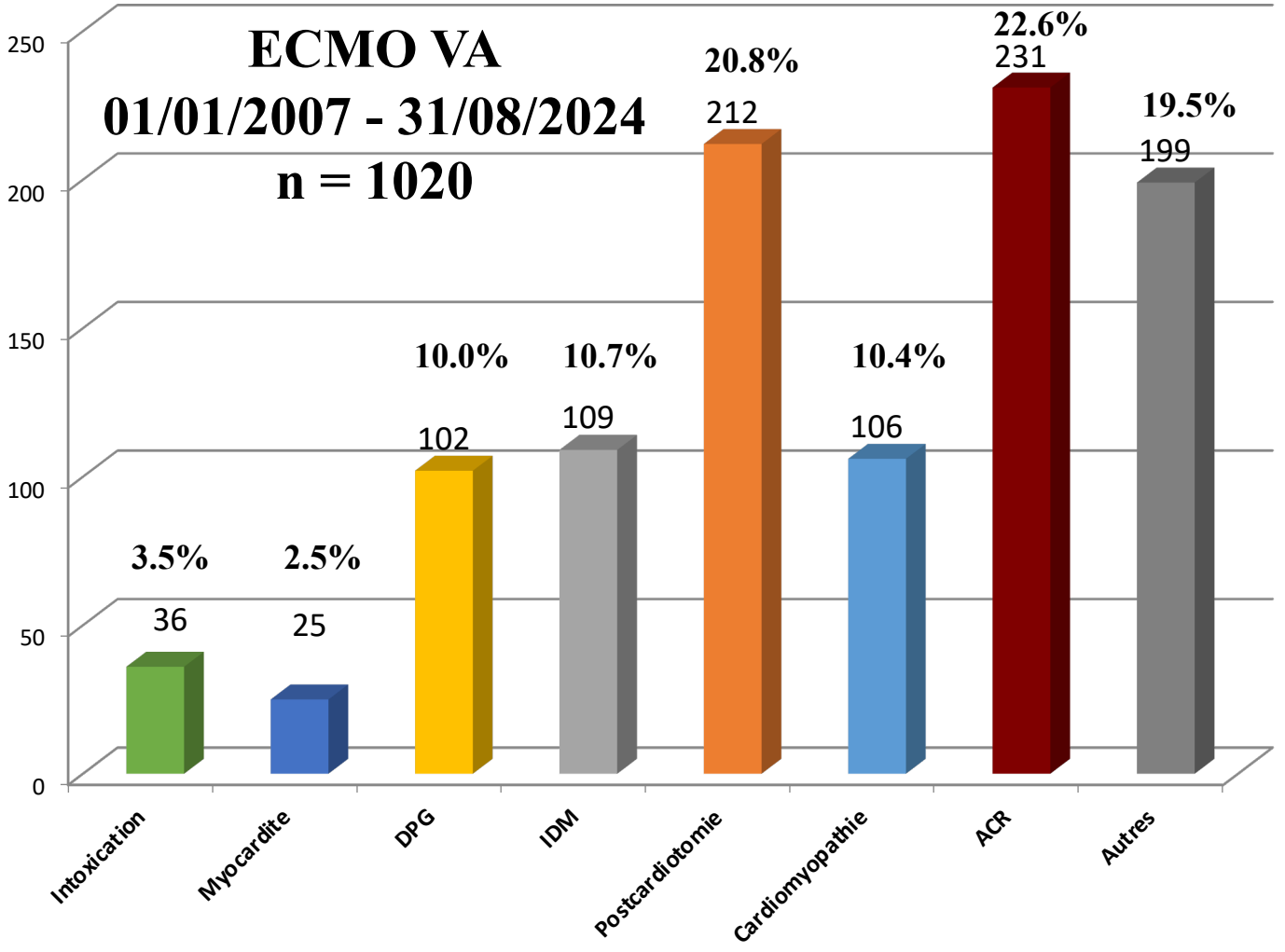
p=1.00

86 ACR EXTRAHOSPITALIER

Survie hospitalière CPC 1-2
n = 5 (6.1%)

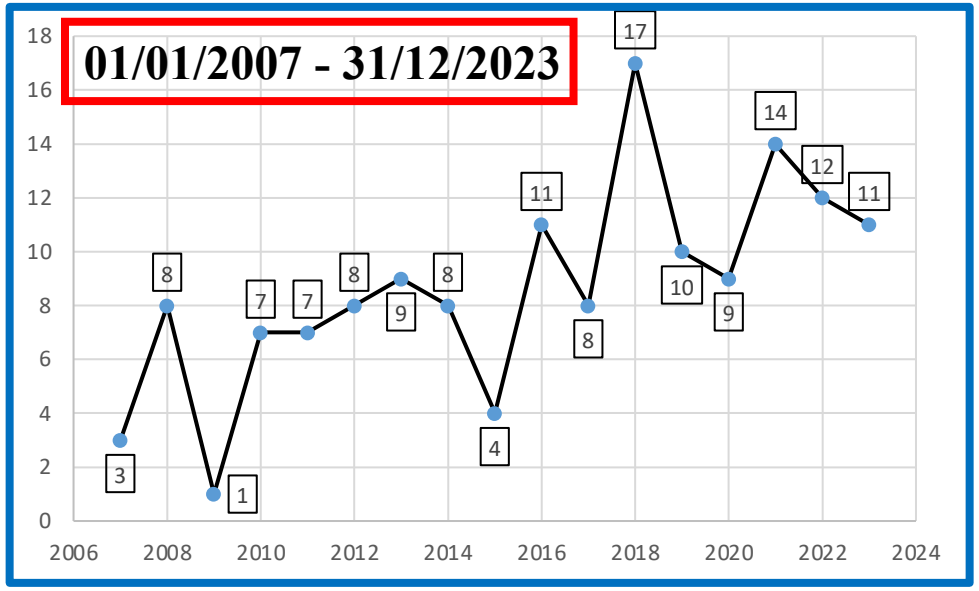
ECMO VA

HOPITAL LOUIS PRADEL - LYON



ECPR - ACR INTRAHOSPITALIER

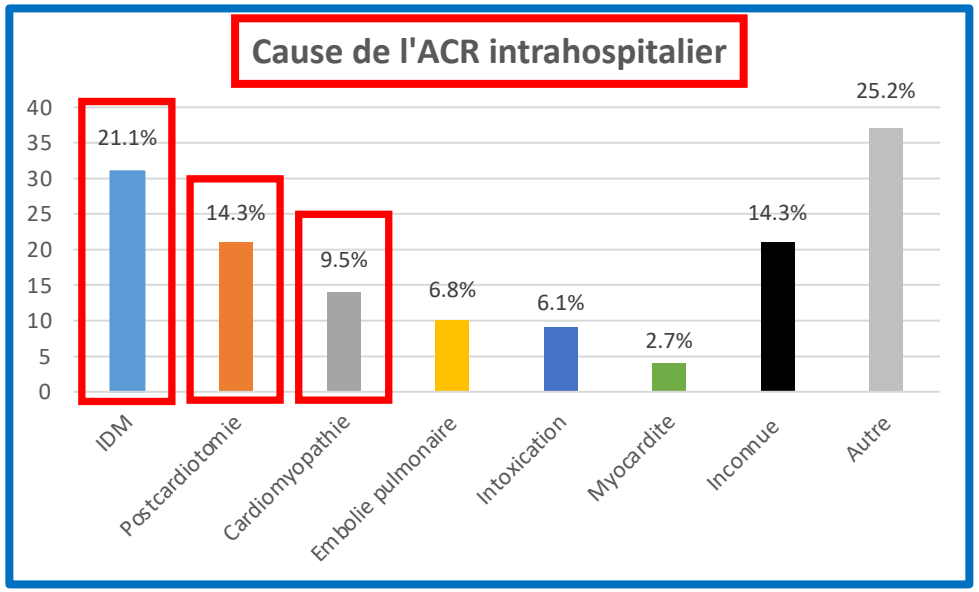
HOPITAL LOUIS PRADEL - LYON



147 patients

51.0 ± 13.9 ans

H 64.6% / F 35.4%



ECPR - ACR INTRAHOSPITALIER

HOPITAL LOUIS PRADEL - LYON

147 patients

Age ≥70 ans (4.8%)

No-flow 0.7 ± 2.5 minutes

Low-flow 39.7 ± 26.3 minutes

Rythme choquable 22.5%

↓

Survie CPC 1-2 = 20.4%

21 patients (postcardiotomie)

Chirurgie valvulaire (47.5%)

No-flow 0.3 ± 2.5 minutes

Low-flow 40.9 ± 15.6 minutes

Rythme choquable 6.3%

↓

Survie CPC 1-2 = 14.3%

ECPR - ACR INTRAHOSPITALIER

Protocole v1: M. Pozzi, P. Portran, R. Schweizer, A. Schwab, L. Didier, D. Chesnel, E. Bonnefoy, N. Genot - 01/02/2024

HOPITAL LOUIS PRADEL - LYON

ARRET CARDIAQUE INTRAHOSPITALIER DEVANT TEMOIN

Appeler le 31 89 39 dans les 15 minutes de RCP

CRITERES D'INCLUSION

- Pas de contre-indications absolues

- Age 18-70 ans
- Temps de *no-flow* ≤5 minutes
- Rythme = FV / TV / DEM
- Temps de *low-flow* (estimé) ≤60 minutes
- E_TCO_2 pendant la RCP ≥10 mmHg

- Lésions cérébrales connues et irréversibles
- Néoplasie terminale avec espérance de vie <1 an
- Choc hémorragique intraitable
- Directives anticipées

ECMO VA

Cas particuliers:

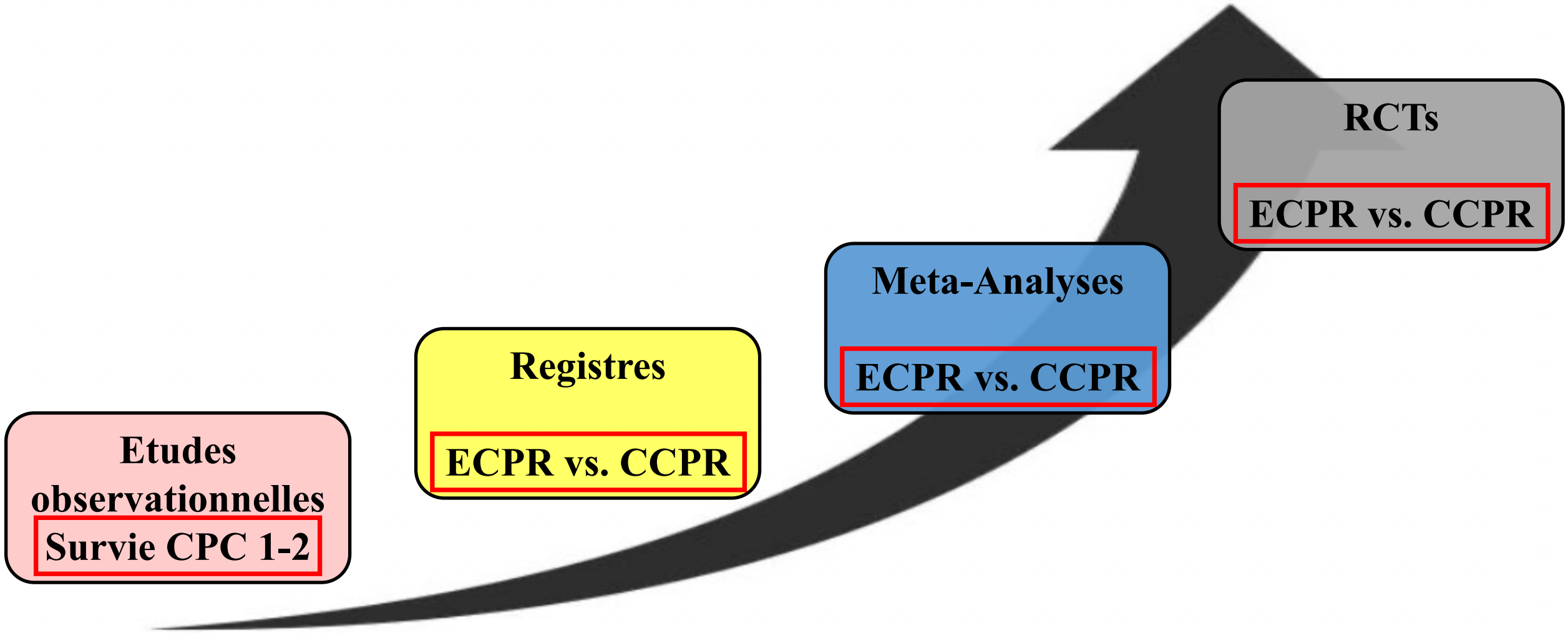
1) ACR en postopératoire de chirurgie cardiaque: *discussion systématique* avec le chirurgien responsable / chirurgien d'astreinte (*discuter la réouverture sternale au lit du patient en cas de tamponnade cardiaque*);

2) Asystolie sur embolie pulmonaire confirmée ou hautement probable

Indication d'ECMO VA à discuter cas par cas

Adapté de: **Extracorporeal Cardiopulmonary Resuscitation in Adults. Interim Guideline Consensus Statement From the Extracorporeal Life Support Organization.** Richardson et al. ASAIO J 2021;67(3):221-228.

ECPR - ACR EXTRAHOSPITALIER



1

Quels sont les résultats de l'ECPR dans le cadre de l'ACR extrahospitalier?

ECPR - ACR EXTRAHOSPITALIER

ETUDES OBSERVATIONNELLES

Auteur	[Reference]	Patients (n.)	Survie CPC 1-2
SAVE-J	Resuscitation 2014;85:762-768	234	13.7%
Lunz	Intensive Care Med 2020;46:973-982	268	9.0%
Nakajima	Resusc Plus 2020;25:4:100048	5612	12.4%
CRITICAL	Circulation 2020;141:1031-1033	256	16.0%
Mork	Crit Care 2021;25:174	225	19.1%
SAVE-J II	Crit Care 2022;26:129	1644	14.1%
Mistraletti	Resuscitation 2023;182:109659	108	7.5%
Choi	Crit Care 2023;27:87	484	9.9%
Springer	Front Cardiovasc Med 2024;10:1265978	330	13.3%
Su	SJTREM 2024;32:23	152	21.7%

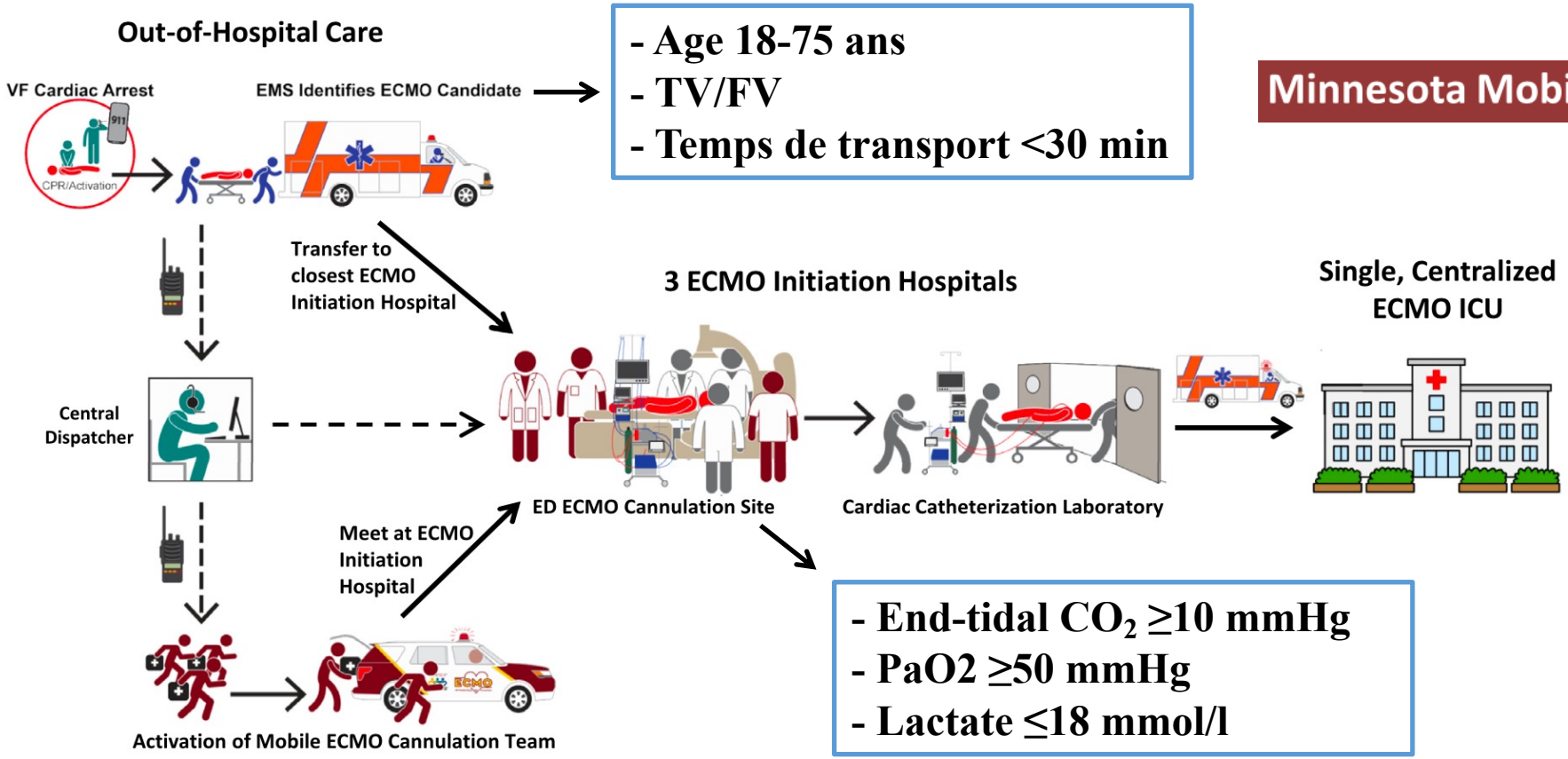
Survie CPC 1-2 = 8-22%

ECPR - ACR EXTRAHOSPITALIER

Impact of age on survival for patients receiving ECPR for refractory out-of-hospital VT/VF cardiac arrest

Chahine et al.

Resuscitation 2023;193:109998



- Age 18-75 ans
- TV/FV
- Temps de transport <30 min

Minnesota Mobile Resuscitation Consortium

- End-tidal CO_2 ≥10 mmHg
- PaO2 ≥50 mmHg
- Lactate ≤18 mmol/l

391 patients
Survie CPC 1-2
34%

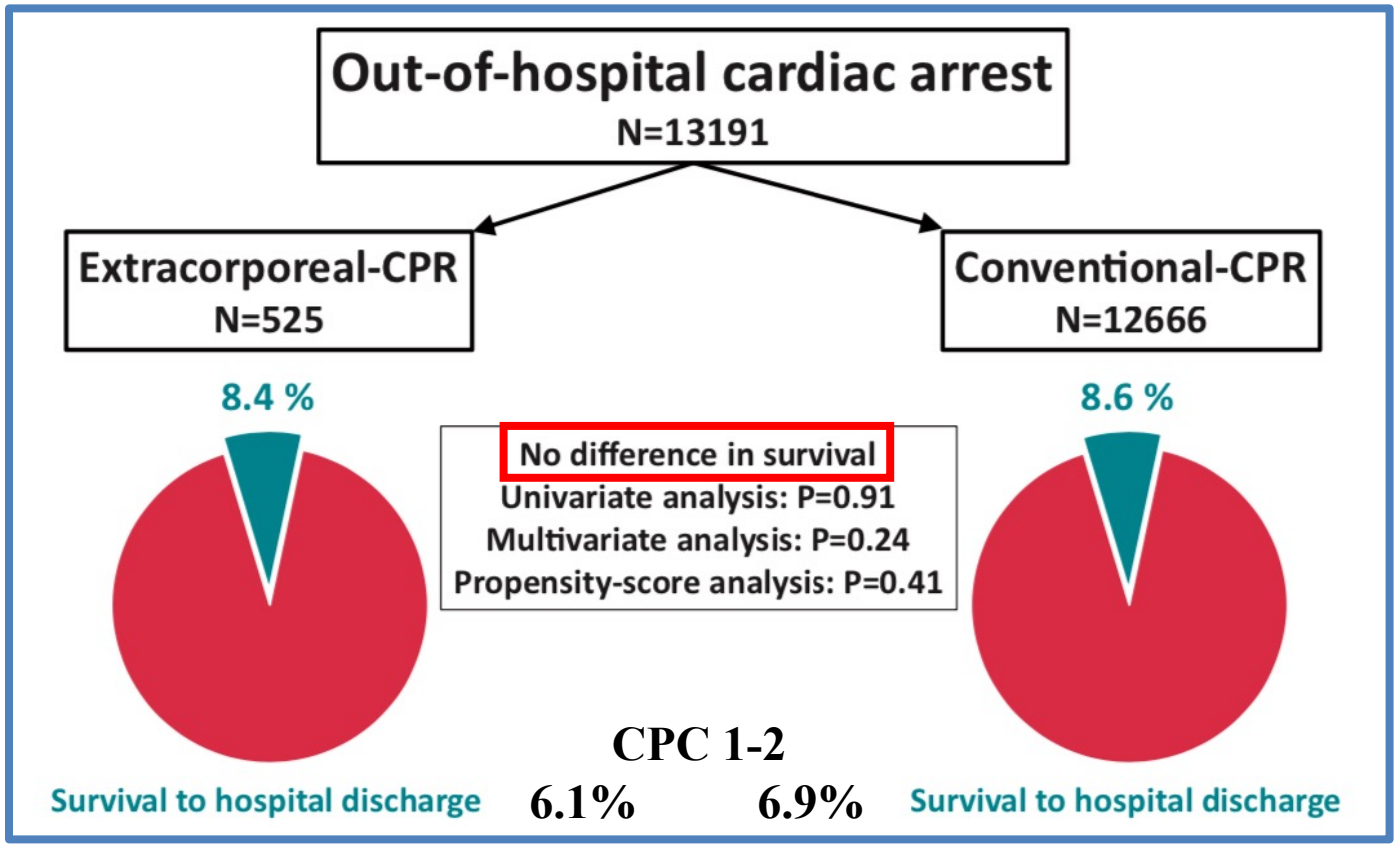
2

Y a-t-il une supériorité de l'ECPR par rapport à la CCPR dans le cadre de l'ACR extrahospitalier?

Extracorporeal cardiopulmonary resuscitation in out-of-hospital cardiac arrest: a registry study

Bougouin et al.

Eur Heart J 2020;41:1961-1971

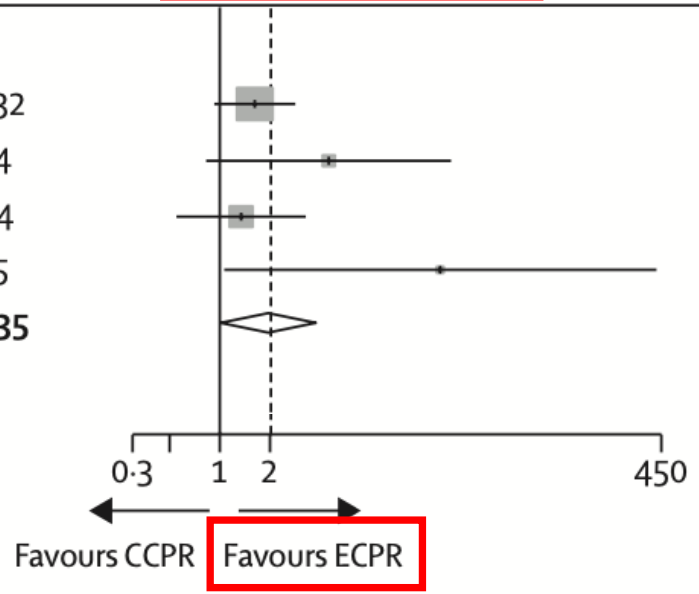


Extracorporeal cardiopulmonary resuscitation versus conventional cardiopulmonary resuscitation in adults with cardiac arrest: a comparative meta-analysis and trial sequential analysis

Low et al.

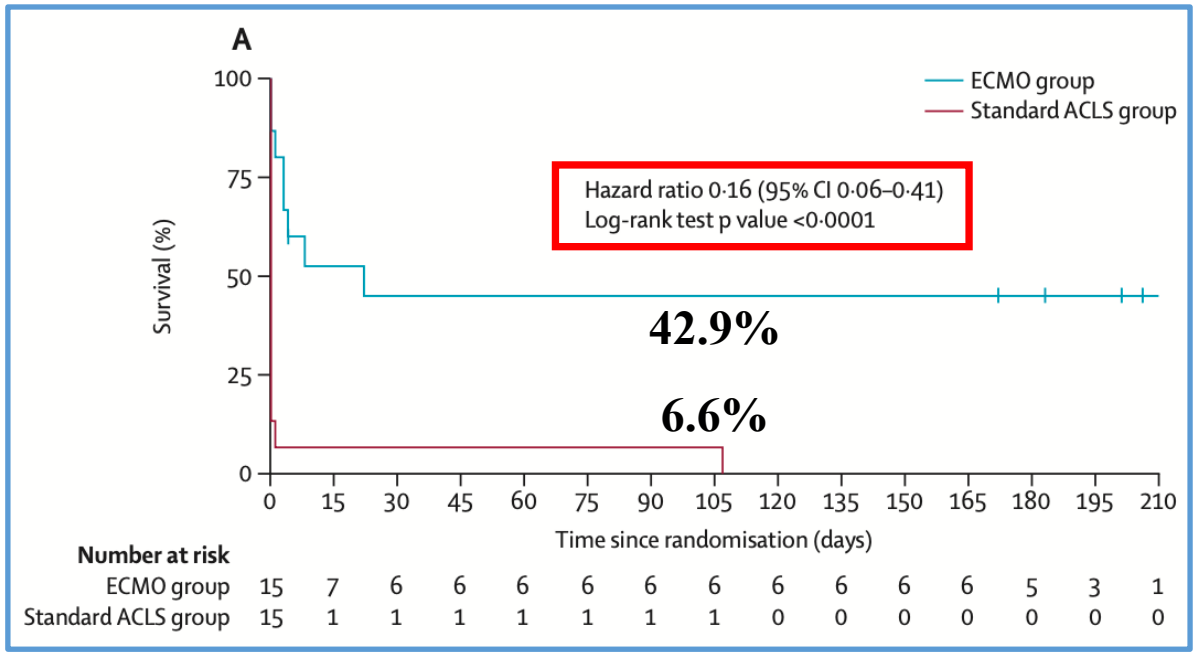
Lancet Respir Med 2023;11:883-893

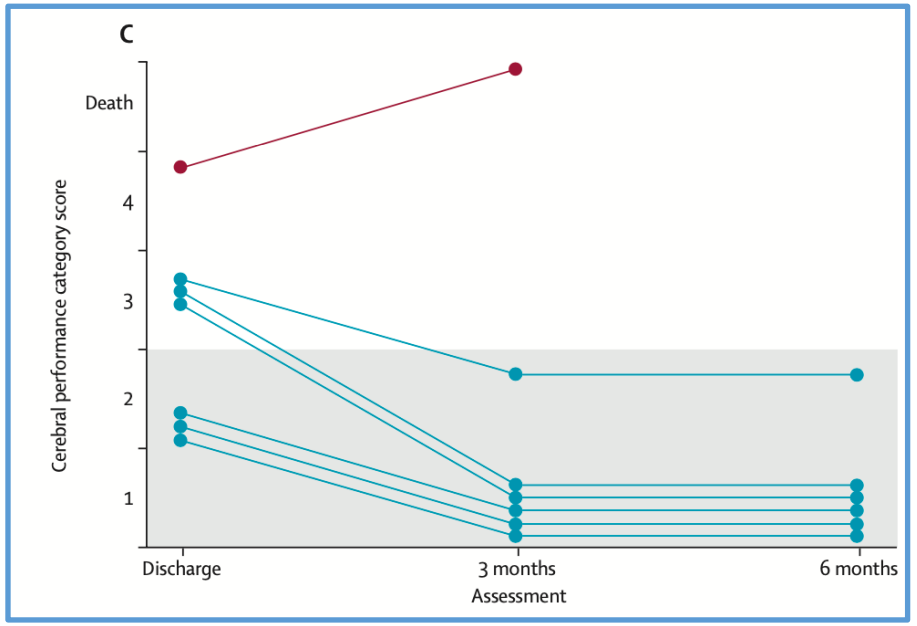
	ECPR (n/N)	CCPR (n/N)	Odds ratio (95% CI)	Weight	p value
OHCA					
Belohlavek et al (2022)[23]	39/124	29/132	1·63 (0·93–2·85)	38·5%	
Maekawa et al (2013)[46]	7/24	2/24	4·53 (0·83–24·65)	4·6%	
Suverein et al (2023)[21]	14/70	10/64	1·35 (0·55–3·30)	16·1%	
Yannopoulos et al (2020)[22]	6/15	0/15	21·21 (1·07–420·80)	1·5%	
Random-effects model	**66/233**	**41/235**	**1·96 (1·02–3·79)**	**60·7%**	**0·045**
Heterogeneity: I^2=31%, τ^2=0·14, p=0·23					



…ECPR had variable effects on neurological outcomes in patients with OHCA (short-term p=0.51; long-term p=0.045)…

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





Yannopoulos et al.

Lancet 2020;396:1807-1816

ECPR - ACR EXTRAHOSPITALIER

Effect of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment on Functional Neurologic Outcome in Refractory Out-of-Hospital Cardiac Arrest

A Randomized Clinical Trial

PRAGUE OHCA STUDY

	No. (%)			
	Invasive strategy (n = 124)	Standard strategy (n = 132)	Absolute difference, % (95% CI)	*P* value
Primary outcome				
Survival with minimal or no neurologic impairment at 180 d[a]	39 (31.5)	29 (22.0)	9.5 (−1.3 to 20.1)	.09
Secondary outcomes				
Survival with minimal or no neurologic impairment at 30 d[a]	38 (30.6)	24 (18.2)	12.4 (1.9 to 22.7)	.02
Cardiac recovery at 30 d[b]	54 (43.5)	45 (34.1)	9.4 (−2.5 to 21)	.12
ECLS implanted	82 (66)	10 (8)		

Belohlavek et al.

JAMA 2022;327:737-747

Early Extracorporeal CPR for Refractory Out-of-Hospital Cardiac Arrest

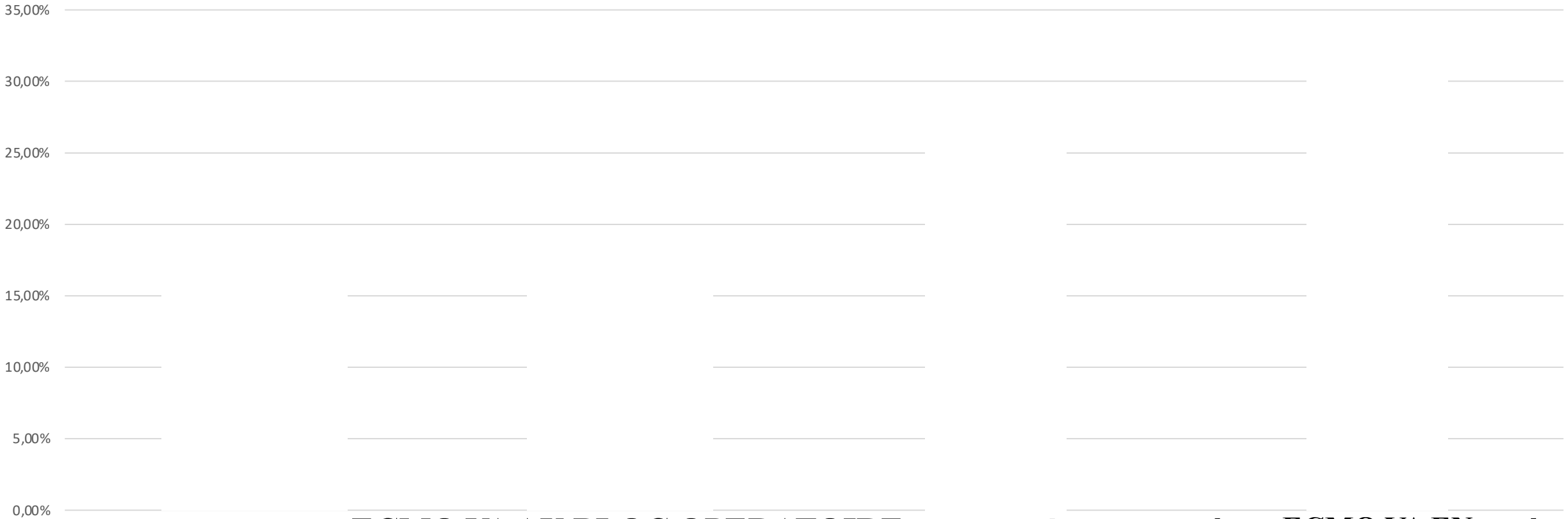
INCEPTION Trial

Outcome	Extracorporeal CPR (N=70)	Conventional CPR (N=63)†	Odds Ratio (95% CI)	P Value	Risk Ratio (95% CI)
Primary outcome: 30-day survival with favorable neurologic outcome — no./total no. (%)	14/70 (20)	10/62 (16)‡	1.4 (0.5–3.5)	0.52	1.05 (0.97–1.13)
Secondary outcomes — no./total no. (%)					
3-month survival with favorable neurologic outcome	12/68 (18)	9/63 (14)	1.5 (0.6–3.8)		
6-month survival with favorable neurologic outcome	14/70 (20)	10/63 (16)	1.3 (0.5–3.3)		

Suverein et al.

N Engl J Med 2023;388:299-309

EXPERIENCE LYONNAISE // SURVIE CPC 1-2



ECMO VA AU BLOC OPERATOIRE

ECMO VA EN PRE-HOSPITALIER

Int J Cardiol 2016;204:70-6

Ann Thorac Surg 2019;107:809-16

J Cardiothorac Vasc Anest 2022;36:1670-7

EXPERIENCE LYONNAISE

Extracorporeal life support for refractory out-of-hospital cardiac arrest: Should we still fight for? A single-centre, 5-year experience☆

Matteo Pozzi [a,*,1], Catherine Koffel [b,1], Xavier Armoiry [c,1], Isabelle Pavlakovic [b,1], Jean Neidecker [b,1], Cyril Prieur [d,1], Eric Bonnefoy [d,1], Jacques Robin [a,1], Jean-François Obadia [a,1]

01/01/2010 – 31/12/2014

68 patients

RYTHME CHOQUABLE

19 patients (27.9%)

Taux de survie CPC 1-2 = 15.8% (3 pts)

p = 0.001

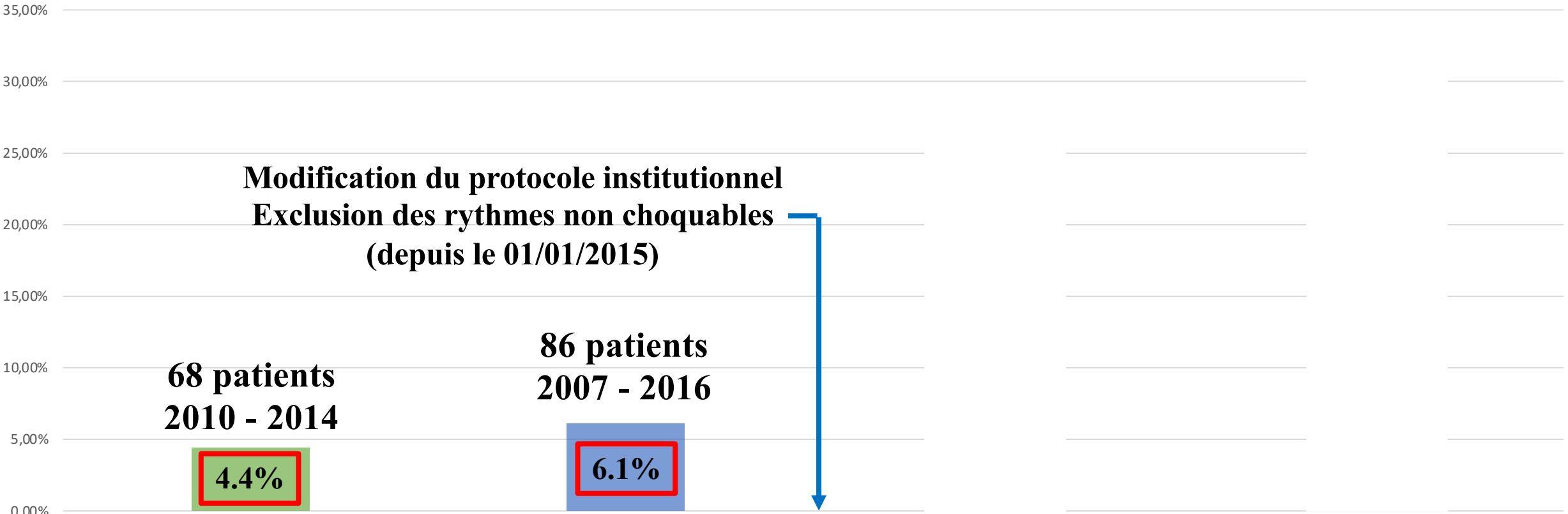
RYTHME NON CHOQUABLE

49 patients (72.1%)

Taux de survie CPC 1-2 = 0% (0 pts)

Int J Cardiol 2016;204:70-76

EXPERIENCE LYONNAISE // SURVIE CPC 1-2



Int J Cardiol 2016;204:70-6

Ann Thorac Surg 2019;107:809-16

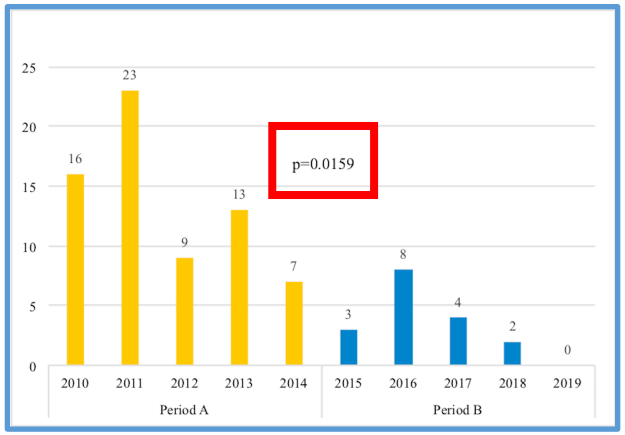
J Cardiothorac Vasc Anest 2022;36:1670-7

EXPERIENCE LYONNAISE

Impact of a Modified Institutional Protocol on Outcomes After Extracorporeal Cardiopulmonary Resuscitation for Refractory Out-Of-Hospital Cardiac Arrest

Janvier 2010-Décembre 2014 vs. Janvier 2015-Décembre 2019

68 pts (1.1 ECLS/mois) vs. 17 (0.3 ECLS/mois)



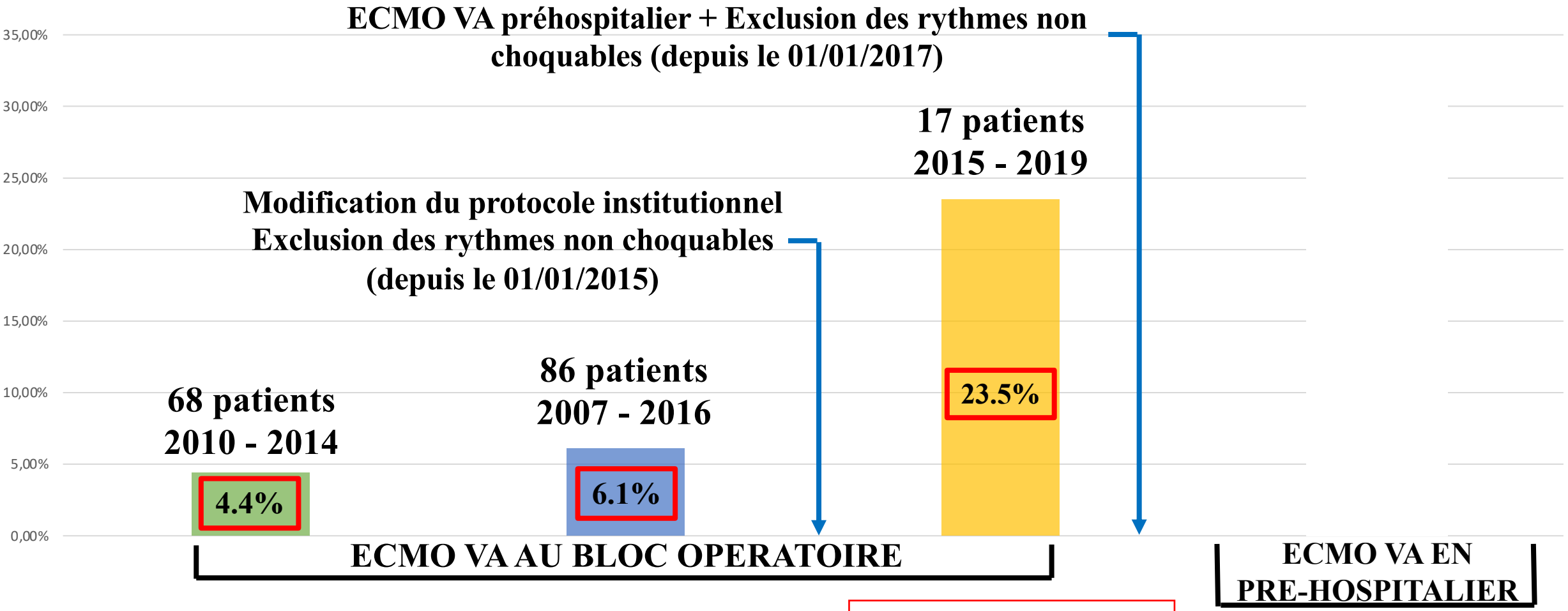
Survie CPC 1-2 → 4.4% vs. 23.5% (p=0.027)

Pozzi et al.

J Cardiothorac Vasc Anest 2022;36:1670-1677

ECPR - ACR EXTRAHOSPITALIER

EXPERIENCE LYONNAISE // SURVIE CPC 1-2



Int J Cardiol 2016;204:70-6

Ann Thorac Surg 2019;107:809-16

J Cardiothorac Vasc Anest 2022;36:1670-7

EXPERIENCE LYONNAISE

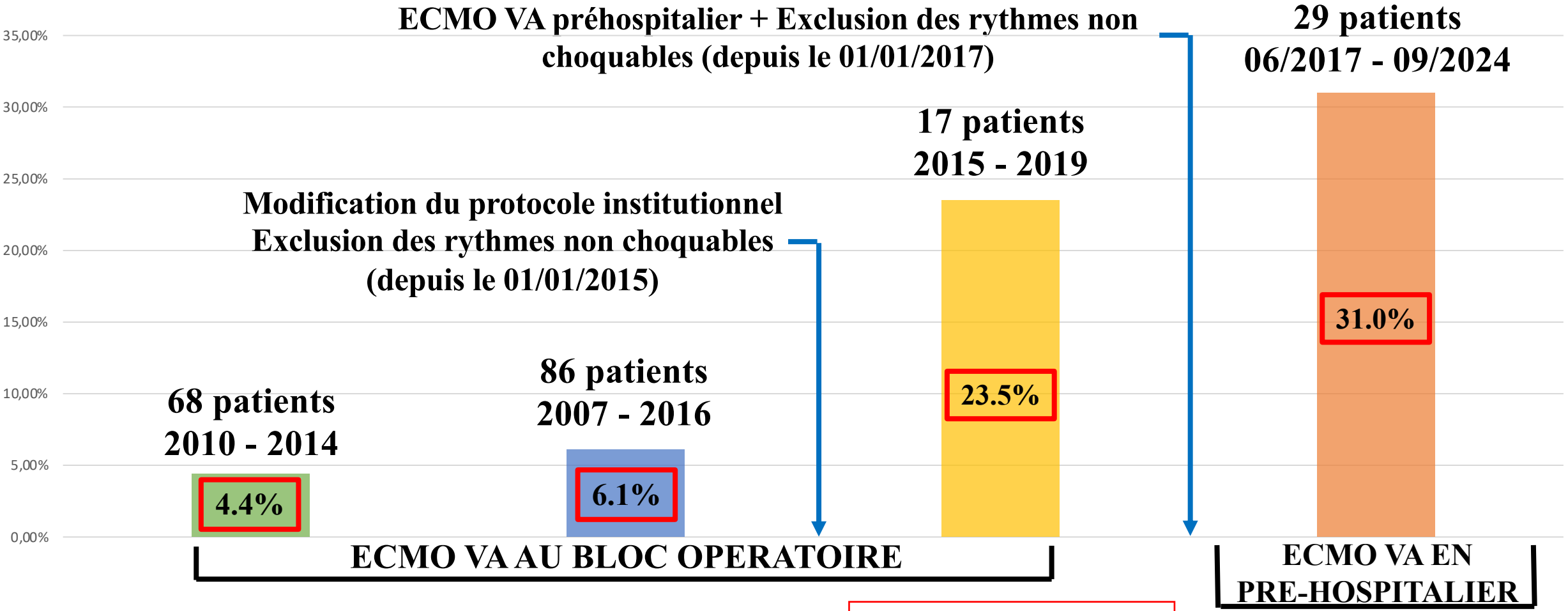
Pre-hospital extracorporeal cardiopulmonary resuscitation for refractory out-of-hospital cardiac arrest: Preliminary results of a multidisciplinary approach

M. Pozzi, E. Cesareo, D. Pinero, P.Y. Dubien, J.C. Richard

Resuscitation 2022;176:19-20

Collaboration étroite avec le SAMU et la Réanimation Médicale

EXPERIENCE LYONNAISE // SURVIE CPC 1-2



Int J Cardiol 2016;204:70-6

Ann Thorac Surg 2019;107:809-16

J Cardiothorac Vasc Anest 2022;36:1670-7

Extracorporeal cardiopulmonary resuscitation in out-of-hospital cardiac arrest: a registry study

Bougouin et al.

Eur Heart J 2020;41:1961-1971

Table 3 Factors associated with hospital survival in the group treated with extracorporeal-cardiopulmonary resuscitation

Baseline characteristics	Survivors (*N* = 44)	Non-survivors (*N* = 479)	*P*-value
Male, *n* (%)	38 (86)	402 (84)	0.67
Age, years, mean (SD)	50 (13)	49 (10)	0.77
Previous coronary artery disease, *n* (%)	4 (9)	51 (11)	0.69
At home, *n* (%)	13 (30)	203 (42)	0.10
Bystander-witnessed, *n* (%)	44 (100)	462 (96)	0.20
Bystander CPR, *n* (%)	35 (80)	387 (81)	0.78
Shockable rhythm, *n* (%)	39 (89)	317 (67)	0.003
No-flow >5 min, *n* (%)	5 (12)	83 (19)	0.26
CPR duration >90 min, *n* (%)	15 (34)	188 (49)	0.06
Un-sustained ROSC, *n* (%)	14 (32)	118 (25)	0.29
Percutaneous coronary intervention, *n* (%)	20 (51)	137 (32)	0.02
Prehospital extracorporeal-CPR, *n* (%)	19 (43)	116 (24)	0.006

ECPR - ACR EXTRAHOSPITALIER

ASAIO Journal 2021

Extracorporeal Cardiopulmonary Resuscitation in Adults. Interim Guideline Consensus Statement From the Extracorporeal Life Support Organization

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REVIEWERS: ROBERT NEUMAR, MD,*** SHINGO ICHIBA, MD,††† THOMAS MUELLER, MD,‡‡‡ ALAIN COMBES, MD, PhD§§§

***Disclaimer*: Veno-arterial extracorporeal membrane oxygenation (ECMO) is increasingly being deployed for selected patients in cardiac arrest who do not attain a native circulation with conventional CPR (ECPR). This ELSO guideline is intended to be a practical guide to implementing ECPR and the early management following establishment of ECMO support. Where a paucity of high-quality evidence exists, a consensus has been reached amongst the authors to provide guidance to the clinician. This guideline will be updated as further evidence in this field becomes available.**

Key Words: extracorporeal cardiopulmonary resuscitation, extracorporeal membrane oxygenation, cardiopulmonary resuscitation, resuscitation.

INTRODUCTION

Extracorporeal cardiopulmonary resuscitation (ECPR) is the application of extracorporeal membrane oxygenation (ECMO) in patients where conventional cardiopulmonary resuscitation (CCPR) measures are unsuccessful in achieving a sustained return of spontaneous circulation (ROSC) (Sustained ROSC is deemed to have occurred when chest compressions are not required for 20 consecutive minutes following cardiac arrest.).[1] The primary purpose of ECPR is to restore the circulation and gas exchange. By providing organ perfusion, it provides time for the delivery of interventions necessary to regain an adequate native circulation. These may include percutaneous coronary intervention (PCI) and recovery from myocardial stunning, pulmonary thrombectomy, rewarming, or toxin clearance.

Extracorporeal cardiopulmonary resuscitation is a time-sensitive, complex intervention that requires teamwork, clearly defined roles, and well trained healthcare providers.[2] Extracorporeal cardiopulmonary resuscitation can be deployed both for patients with in-hospital cardiac arrest and out of hospital cardiac arrest (OHCA). ECPR should be considered after 10–15 minutes of unsuccessful conventional resuscitation efforts,[2] because organization and preparation for ECPR will take some time and it has been clearly shown that time to ECMO correlates with neurologic outcome.[3,4]

Currently, there are no published randomized controlled trials comparing outcomes of ECPR to CCPR. Observational studies comparing ECPR to historical controls and case matched controls have demonstrated favorable results for ECPR.[5–9] However, these studies are heterogeneous and survival ranges from 15% to 50%. Among adult ECPR patients recorded in the international ELSO dataset, survival to hospital discharge is 29%.[10]

At the time being, we do not know whether the number of neurologic injured patients will increase with growing use of ECPR. A major task for the future will be to develop better neuroprognostication tools. In the current observational studies in selected populations,[5,8–10] >85% of survivors of cardiac arrest treated with ECPR had neurologic outcomes fall into favorable neurologic performance categories (cerebral performance categories 1 or 2).[5,8,9] Future trials involving ECPR should endeavor to report neurologic outcomes as well as mortality.

This document contains numerous additional literature references, organized by topic, found in the Supplemental Digital Content 1, http://links.lww.com/ASAIO/A584.

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Supplemental digital content is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML and PDF versions of this article on the journal's Web site (www.asaiojournal.com).

All authors take responsibility for the integrity of the submission from inception to published article. A.C.R., J.E.T., V.N., and L.R. conceived study design, and A.C.R. and J.E.T. drafted the work; all authors revised the article for important intellectual content, had final approval of the work to be published, and agree to be accountable to for all aspects of the work.

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ECMO VA EN PRE-HOSPITALIER

…In the absence of definitive evidence, it is recommended that patients in refractory cardiac arrest who are suitable for ECPR should be transported to the nearest hospital which can provide this support as fast and as safely as possible…

…Before further data become available, at the present time, it is recommended to reserve out of hospital ECPR to highly specialized teams, possibly in the setting of controlled clinical trials.

ASAIO J 2021;67:221-228

CONCLUSIONS

ACR INTRAHOSPITALIER

La survie CPC 1-2 de l'ECPR pour l'ACR intrahospitalier est satisfaisante

La résternotomie devrait être réservée aux ACR intrahospitalier postcardiotomie sur tamponnade cardiaque

La littérature est en faveur, avec un bon niveau de preuve, de la supériorité de l'ECPR par rapport au CCPR dans l'ACR intrahospitalier

ACR EXTRAHOSPITALIER

La survie CPC 1-2 de l'ECPR pour l'ACR extrahospitalier est encourageante

La supériorité de l'ECPR par rapport au CCPR dans l'ACR extrahospitalier n'est pas encore évidente

Chaque protocole institutionnel doit suivre les recommandations internationales et s'adapter au contexte et aux ressources locales

RESPECT DES CRITERES DE SELECTION = AMELIORATION DES RESULTATS

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Chirurgie
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RESHAPE
Research on Healthcare Professionals and Performance

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SFAR

LE CONGRÈS

DU 18 AU 20 SEPTEMBRE 2024

PALAIS DES CONGRÈS DE PARIS