



ECPR: Existe-t-il encore un avenir ?

Le Pour



C'est Sûr

Hospices Civils de Lyon



SAMU de LYON

E. Cesareo, P-Y. Dubien, D. Pinero,
C. di Filippo, O Peguet,
J.C Richard, M Pozzi



Hospices Civils de Lyon

■
votre santé,
notre engagement

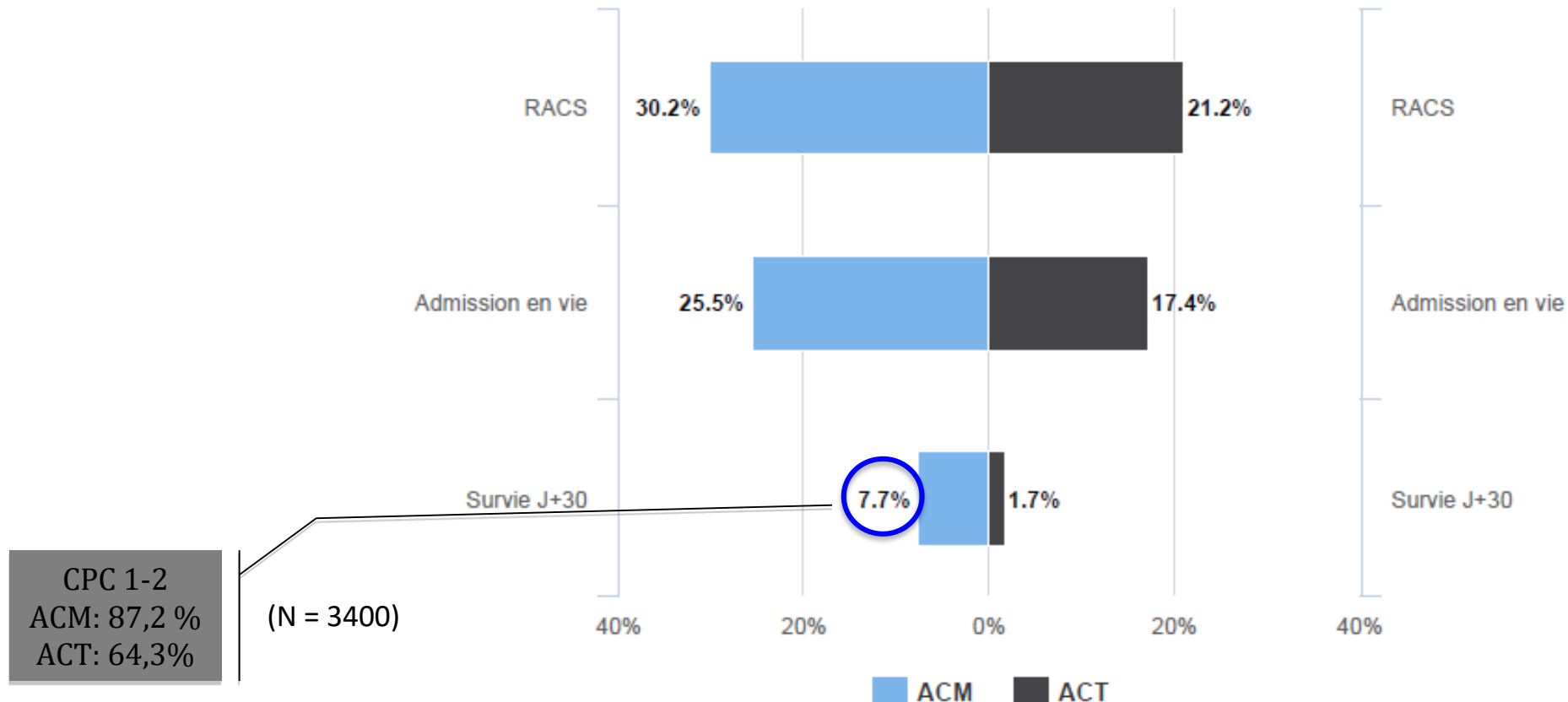
La prise en charge des AC extra hospitaliers en France



RéAC = Données françaises 2013-2023



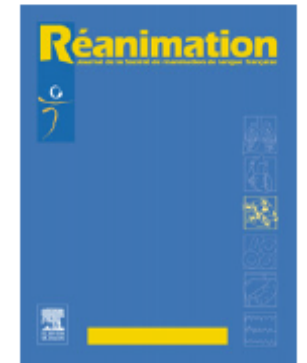
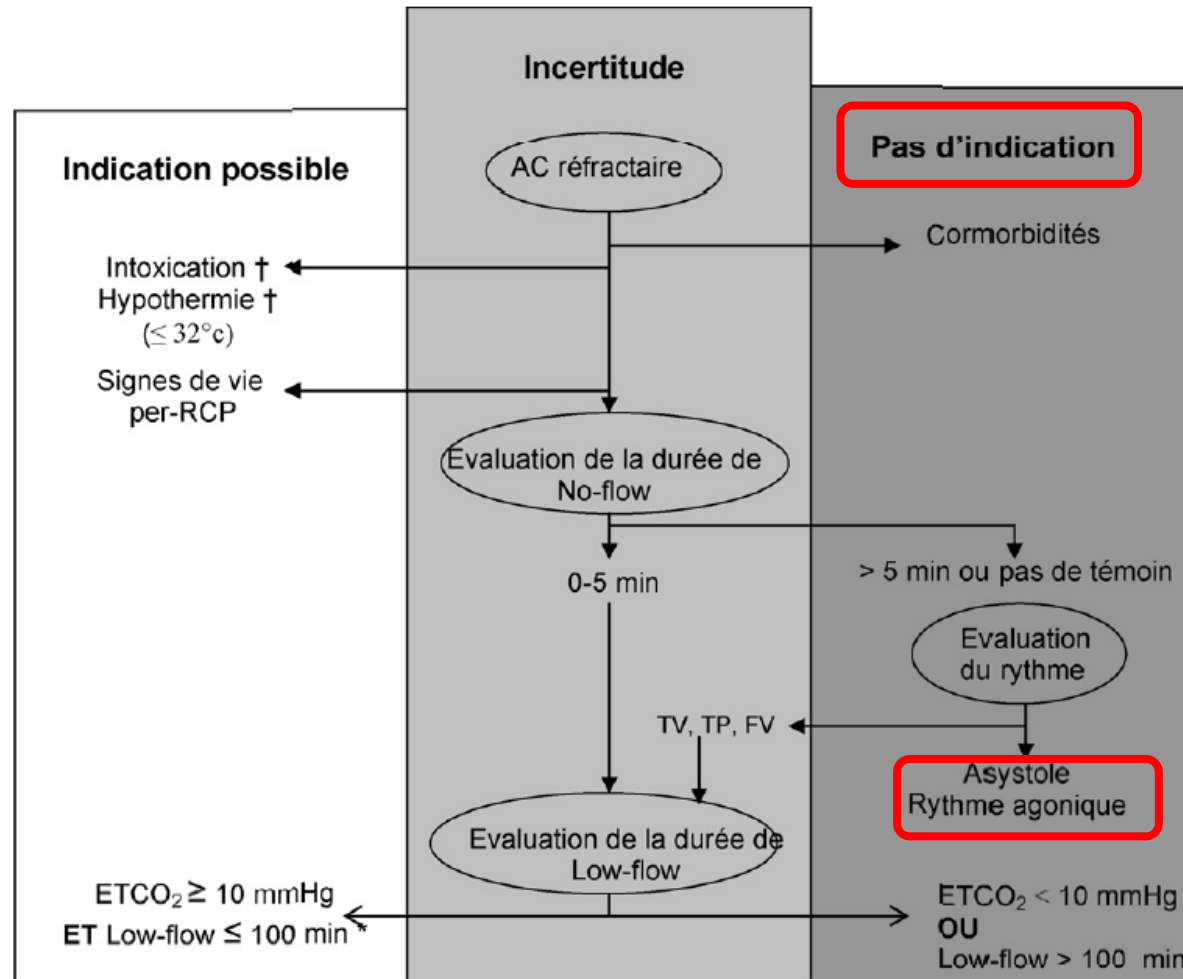
Survie / Population



Recommandations sur les indications de l'assistance circulatoire dans le traitement des arrêts cardiaques réfractaires

Bruno Riou, Frédéric Adnet, Frédéric Baud, Alain Cariou, Pierre Carli, Alain Combes, Denis Devictor, Jean Luc Dubois-Randé, Jean-Louis Gérard, Pierre-Yves Gueugniaud, Agnès Hibon-Ricard, Olivier Langeron, Pascal Leprince, Dan Longrois, Alain Pavie, Philippe Pouard, Jean-Christophe Rozé, Jean-Noël Trochu, André Vincentelli.

Retour sur les fondamentaux !!



Réanimation (2009) 18, 371–375

Literature analysis (2008-2014) <i>ECPR for out of hospital cardiac arrest</i>

Auteurs (année)	Patients (n)	Survivants (CPC 1-2)	
Tanno (2008)	66	10.6%	
Kagawa (2010)	39	10.2%	
Le Guen (2011)	51	4,0%	Équipes Françaises
Megarbane (2011)	47	2.1%	
Avalli (2012)	18	5.0%	
Wang (2013)	31	25.8 %	
Maekawa (2013)	53	15.1%	
Johnson (2014)	15	6.6%	
Sakamoto (2014)	260	12.3%	

Survivants sans séquelle neurologique (CPC 1-2)= 2-25%

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 Frascone, Keith Wesley, Marc Conterato, Michelle Biros, Jakub Tolar, Tom P Aufderheide



Lancet 2020;
396: 1807-16

Entre 08/2019 et 06/2020

Prospective, contrôlée

Randomisation ECPR vs traditionnel

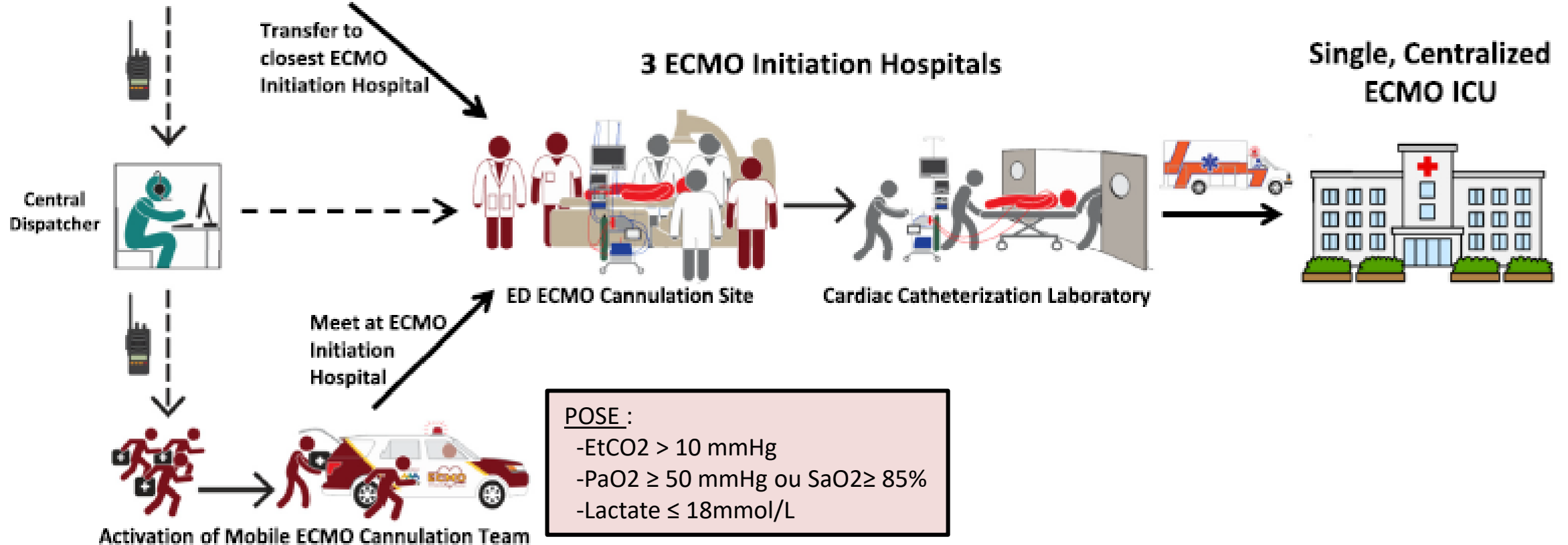


Out-of-Hospital Care

- FV/TV persistante après 3 CEE
- Adultes (18-75 ans)
- MCE avec LUCAS®
- Délais effondrement-Hôpital < 30 minutes !

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Lancet 2020;
396: 1807-16

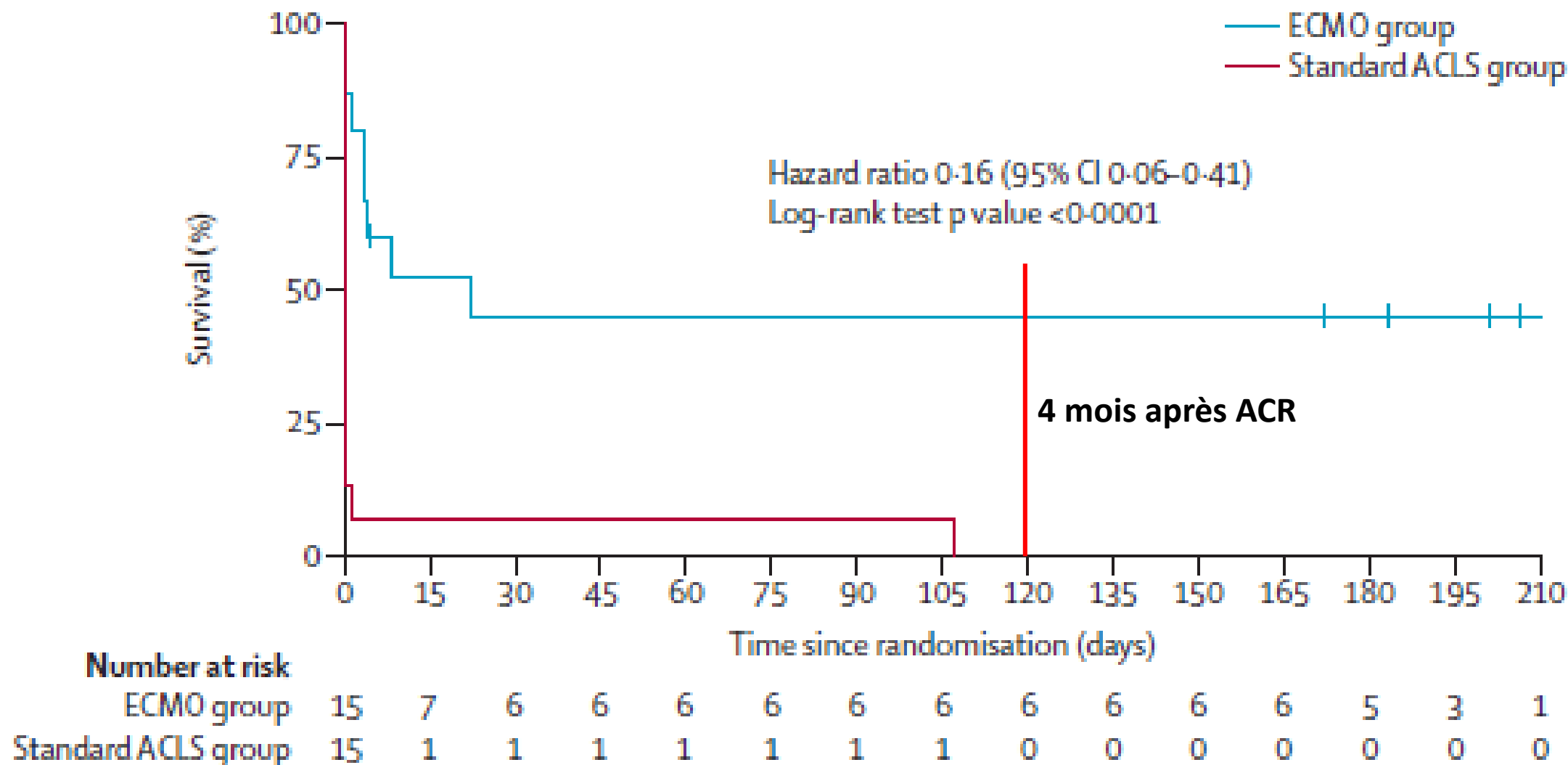
Entre 08/2019 et 06/2020

Randomisation ECMO vs traditionnel

1ère Etude intermédiaire
30 patients inclus (15/15)

	ECMO-facilitated resuscitation (n=15)		Standard ACLS treatment (n=15)	
	Number of patients with data	Patients	Number of patients with data	Patients
Primary outcome (95% CrI)				
Survival to hospital discharge	14	6 (43%, 21.3-67.7)	15	1 (7%, 1.6-30.2)
	(1 retrait consentement J+3)			

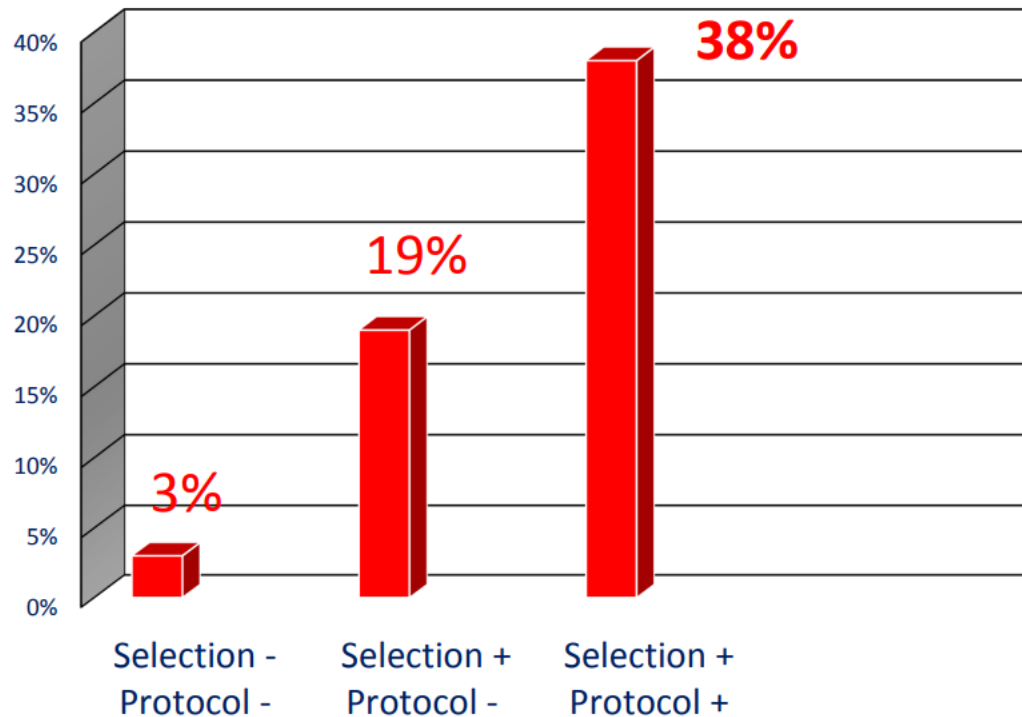
Haut niveau de preuves en faveur ECPR dans FV réfractaire



En France ?

2 équipes ont rapporté leur expérience de la pose ECPR sur les lieux de l'effondrement

ECPR / Survival CPC 1-2 / Paris Experience



Lamhaut L, Hutin A, Puymirat E et al
Resuscitation. 2017 Aug;117:109-117

ECPR / Survival CPC 1-2 / Lyon Experience

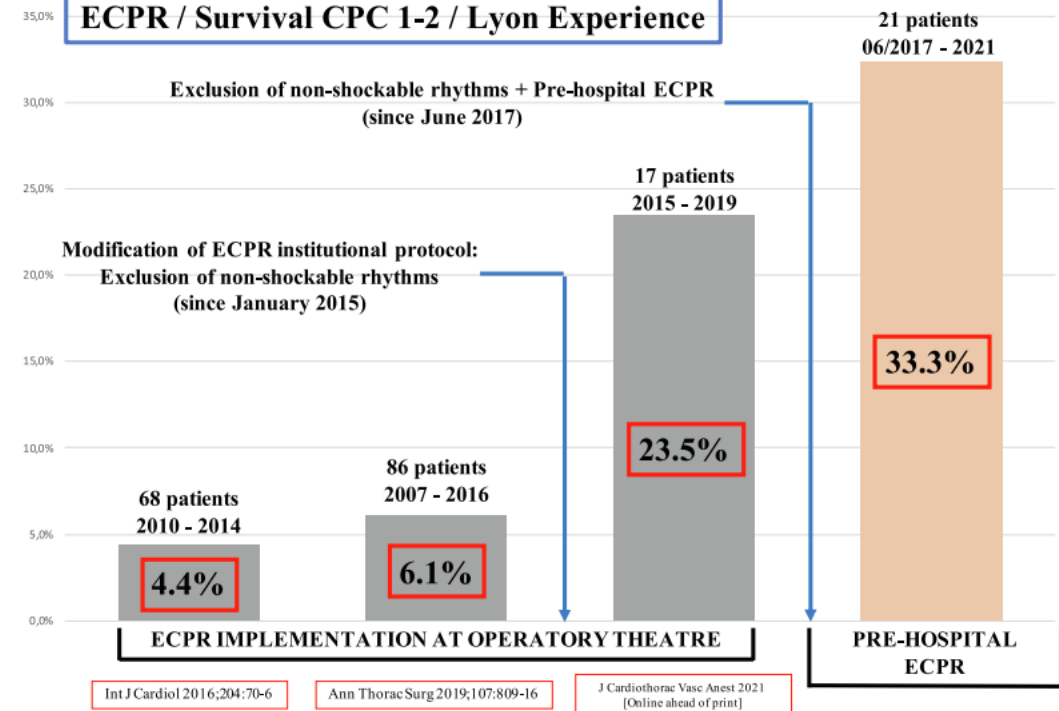


Fig. 1 – Evolution of our institutional management as well as the survival with a favourable neurological outcome of refractory OHCA. CPC = Cerebral Performance Category, ECPR = extracorporeal cardiopulmonary resuscitation, OHCA = out-of-hospital cardiac arrest.

Pozzi M, Cesareo E, Pinero D et al
Resuscitation. 2022 Jul;176:19-20

Pourquoi pas en Tchéquie ou aux pays bas ??

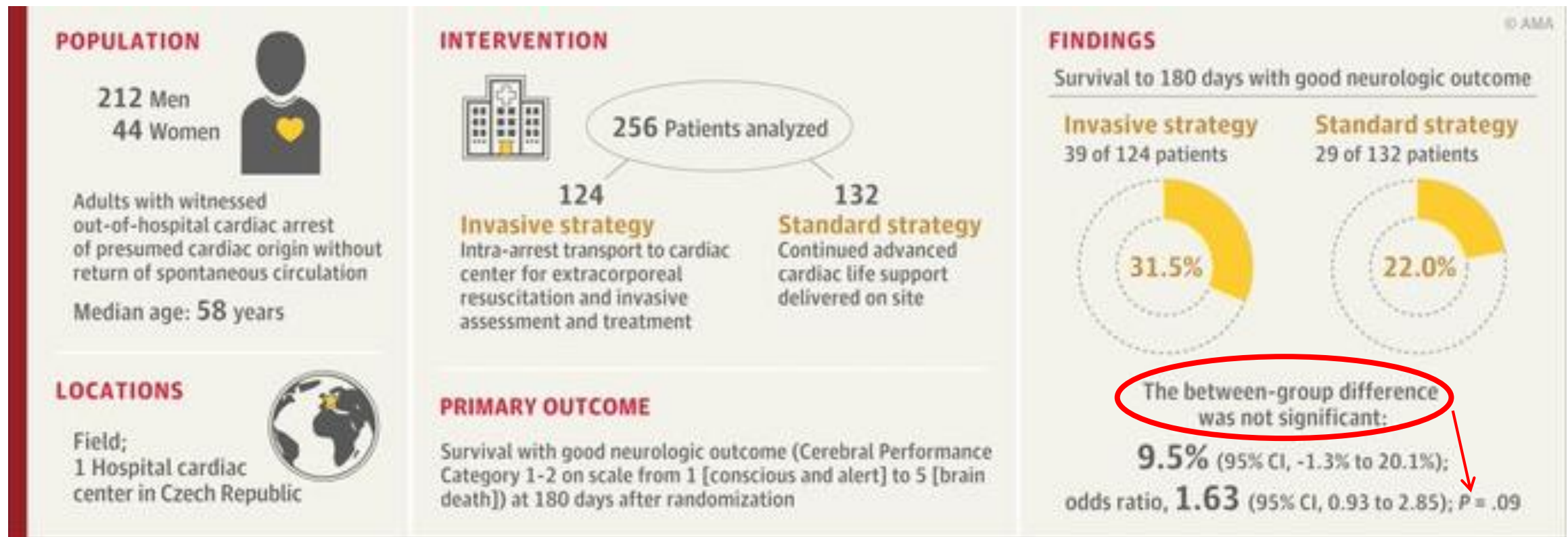
(plus exactement de quoi parlons-nous ?)



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

Belohlavek J. JAMA. 2022; 327:737-47





Extracorporeal versus conventional cardiopulmonary resuscitation for refractory out-of-hospital cardiac arrest: a secondary analysis of the Prague OHCA trial



Daniel Rob¹, Jana Smalcova¹, Ondrej Smid¹, Ales Kral¹, Tomas Kovarnik¹, David Zemanek¹, Petra Kavalkova¹, Michal Huptych², Arnost Komarek³, Ondrej Franek⁴, Stepan Havranek¹, Ales Linhart¹ and Jan Belohlavek^{1*}

Rob et al. *Critical Care* (2022) 26:330
<https://doi.org/10.1186/s13054-022-04199-3>

256 patients

Age médian 58 ans

83% sexe masculin

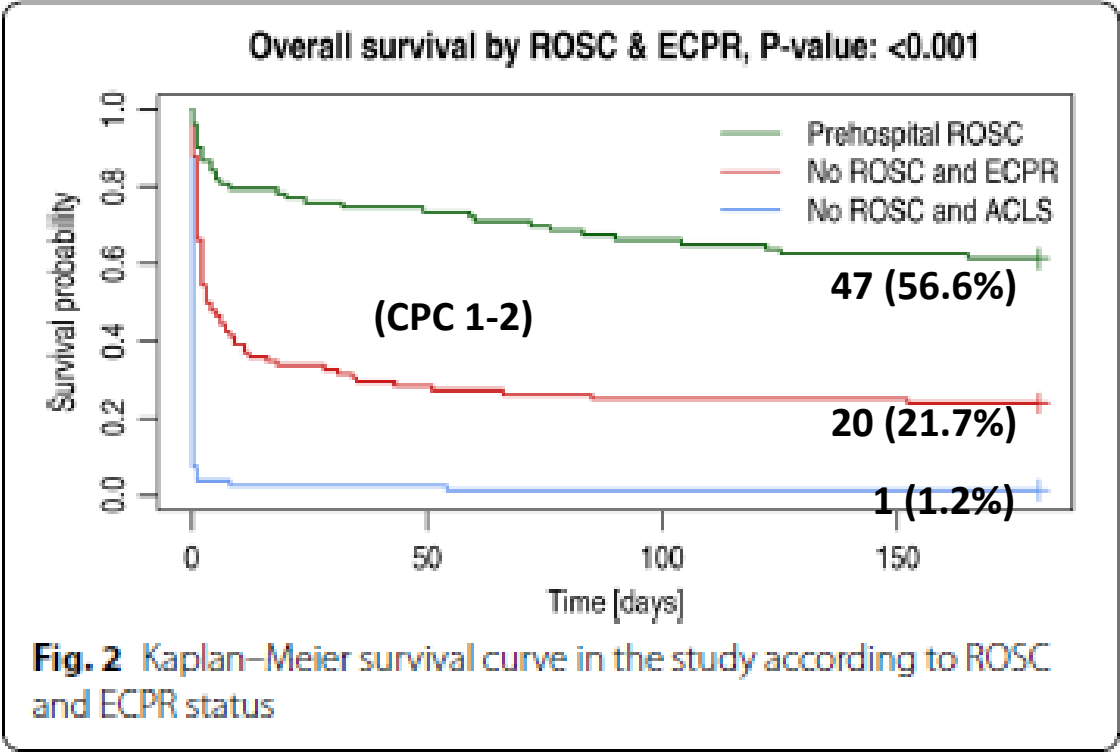
RACS = 83 (32%)

Pas de RACS = 173

ECPR = 92 (36%)

ACLS = 81 (32%)

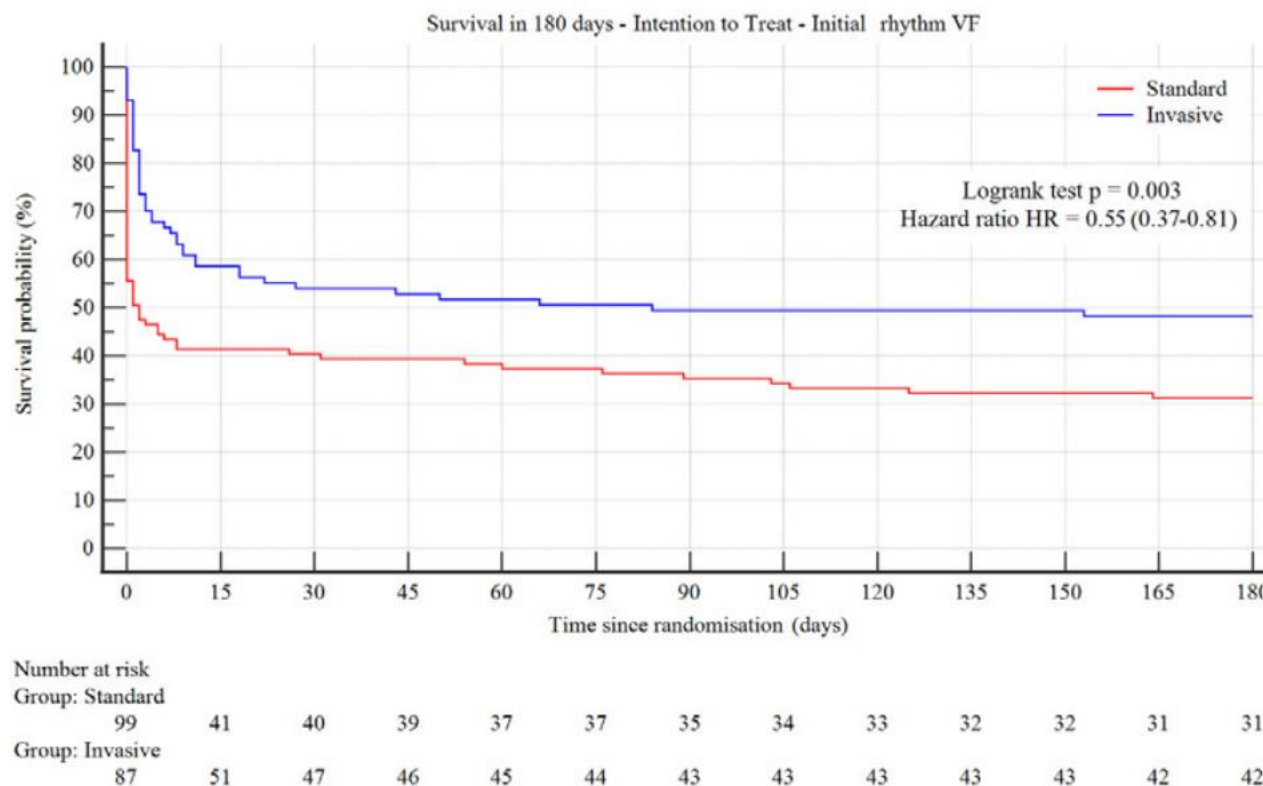
	RACS	ACLS	ECPR	
FV	63(75.9%)	36 (44.4%)	57 (62%)	< 0.001
Asystole	14 (16.9%)	23 (28.4%)	18 (19.6%)	
PEA	6 (7.2%)	22 (27.2%)	17 (18.5%)	



ECPR was associated with a lower risk of 180-day death (HR 0.21, 95% CI 0.14–0.31; P < 0.001)

Intraarrest transport, extracorporeal cardiopulmonary resuscitation, and early invasive management in refractory out-of-hospital cardiac arrest: an individual patient data pooled analysis of two randomised trials

Jan Belohlavek,^{a,g,*} Demetris Yannopoulos,^{b,g} Jana Smalcova,^a Daniel Rob,^a Jason Bartos,^b Michal Huptych,^c Petra Kavalkova,^a Rajat Kalra,^b Brian Grunau,^d Fabio Silvio Taccone,^e and Tom P. Aufderheide^f



Interpretation In patients with refractory OHCA, the invasive approach significantly improved 30- and 180-day neurologically favourable survival.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JANUARY 26, 2023

VOL. 388 NO. 4

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

M.M. Suverein, T.S.R. Delnoij, R. Lorusso, G.J. Brandon Bravo Bruinsma, L. Otterspoor, C.V. Elzo Kraemer, A.P.J. Vlaar, J.J. van der Heijden, E. Scholten, C. den Uil, T. Jansen, B. van den Bogaard, M. Kuijpers, K.Y. Lam, J.M. Montero Cabezas, A.H.G. Driessen, S.Z.H. Rittersma, B.G. Heijnen, D. Dos Reis Miranda, G. Bleeker, J. de Metz, R.S. Hermanides, J. Lopez Matta, S. Eberl, D.W. Donker, R.J. van Thiel, S. Akin, O. van Meer, J. Henriques, K.C. Bokhoven, L. Mandigers, J.J.H. Bunge, M.E. Bol, B. Winkens, B. Essers, P.W. Weerwind, J.G. Maessen, and M.C.G. van de Poll

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	Extracorporeal CPR (N = 70)	Conventional CPR (N = 64)
Age — yr	54±12	57±10
Male sex — no. (%)	63 (90)	57 (89)
Primary shockable rhythm — no. (%)	69 (99)	63 (98)
Arrest occurred at home — no. (%)	31 (44)	24 (38)
Witnessed arrest — no. (%)	68 (97)	63 (98)
CPR started ≤5 min after arrest — no. (%)	69 (99)	61 (95)

Table 4. Survival with Favorable Neurologic Outcome.*

Randomisation après 15 mn ACLS

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)		

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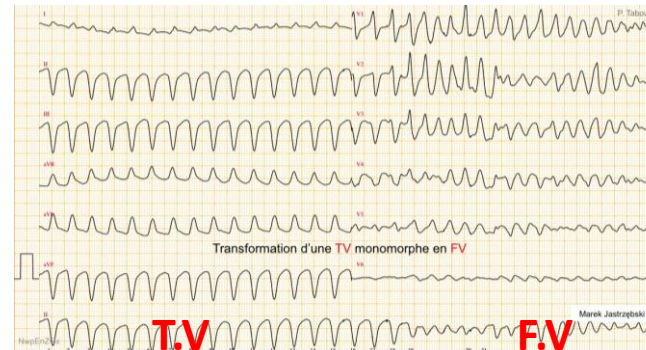
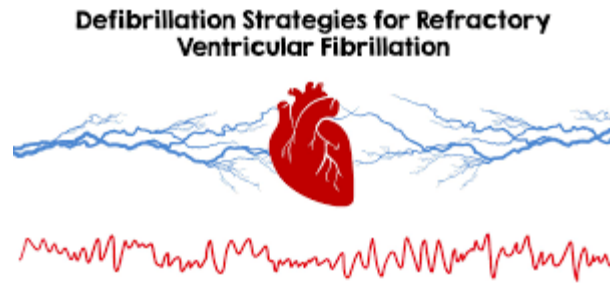
Table 3. Clinical Outcomes.*

Randomisation après 15 mn ACLS !!

Outcome	Extracorporeal CPR (N=70)	Conventional CPR (N=64)	Odds Ratio (95% CI)†
Initiation of extracorporeal CPR — no. (%)	52 (74)	3 (5)	0.02 (0.0 to 0.6)
Cannulation and circulation successful	46 (66)	3 (5)	
Cannulation or circulation failed	6 (9)	0	
Patient died before ICU admission	2 (3)	0	
No initiation of extracorporeal CPR — no. (%)	18 (26)	61 (95)	58.7 (16.4 to 210.7)

Avoir un esprit critique !

- Quel rythme au moment de la pose ECPR ??



Rythme choquable !



Ce qui pourrait changer le devenir des FV dites réfractaires

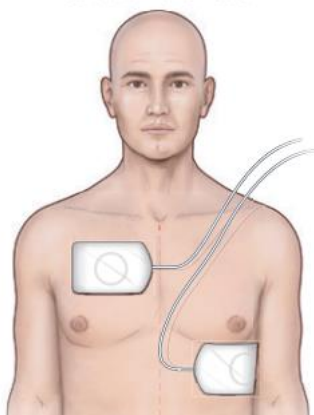
- les bêtabloquants ??
- La double défibrillation séquentielle?

Defibrillation Strategies for Refractory Ventricular Fibrillation

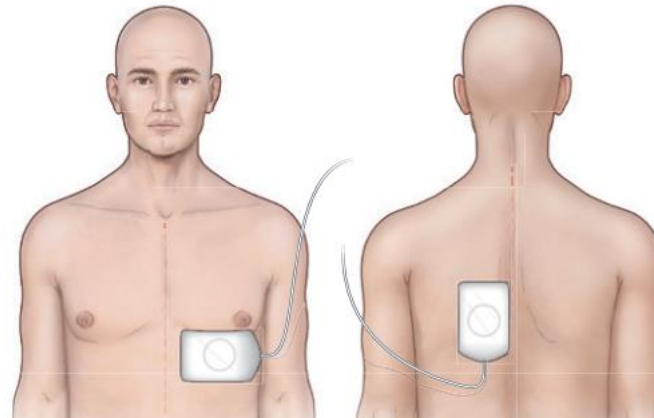
Sheldon Cheskes, M.D., P. Richard Verbeek, M.D., Ian R. Drennan, A.C.P., Ph.D., Shelley L. McLeod, Ph.D., Linda Turner, Ph.D., Ruxandra Pinto, Ph.D., Michael Feldman, M.D., Ph.D., Matthew Davis, M.D., Christian Vaillancourt, M.D., Laurie J. Morrison, M.D., Paul Dorian, M.D., and Damon C. Scales, M.D.,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

N Engl J Med 2022; 387:1947-1956

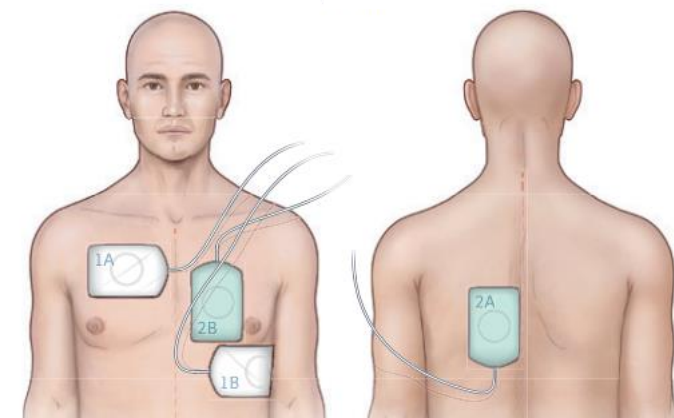
Standard



Antéro-postérieur



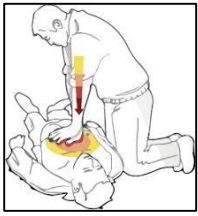
DDS



Outcome	Standard Defibrillation (N = 136)	VC Defibrillation (N = 144)	DSED (N = 125)	Adjusted Relative Risk (95% CI)*	
405 patients- Rythme choquable				DSED vs. Standard	VC vs. Standard
				<i>number of patients/total number (percent)</i>	
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)



Pour conclure



ARRÊT CARDIAQUE REFRACTAIRE (y compris double défibrillation séquentielle)

< 65 ans *
Pas de comorbidité majeure
NF < 5mn

Rythme non choquable

Signes de vie* per RCP ?

non

Pas d'Indication ECPR

**Poursuite
RCP-S**

oui

IMV avec Cardiotoxiques
AC au bloc opératoire
Hypothermie accidentelle

INDICATION ECPR +

Equipe ECMO



Rythme choquable

Signes de vie* per RCP ?

oui

non

EtCO₂ > 10mmHg
LF envisageable < 90mn
Adrénaline cible ≤ 3mg
Lactate < 15 * *

* Signes de vie per RCP :
| mouvements de lutte
| ouverture des yeux
| franche réactivité pupillaire

* * Critère à discuter selon histoire clinique

**Merci pour votre
attention**

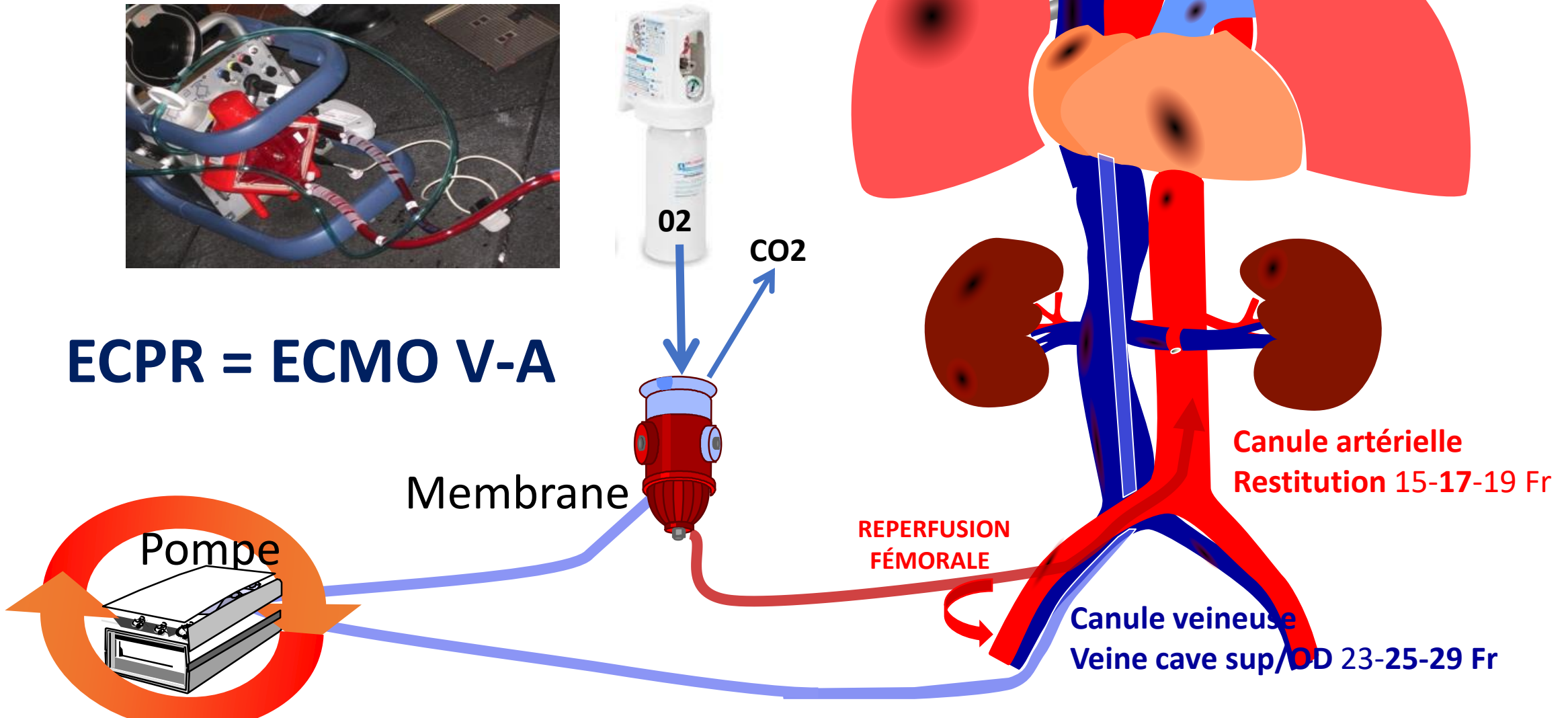


Des questions ?

De quoi parlons-nous ?



ECPR = ECMO V-A

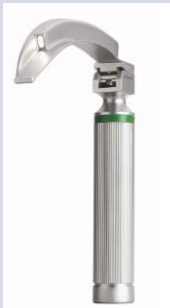




L'objectif: ce n'est pas un show médiatique
ni alimenter les discussions réseaux sociaux



Mais récupérer du cerveau
(organe cible)



F.V RÉFRACTAIRE

(Echec X 3 CEE)

+ amiodarone

IMV avec Cardiotoxiques
Anaphylaxie au Bloc Op
Hypothermie accidentelle

Double Défibrillation Séquentielle

Succès
RACS

Echec

Rythme non choquable

Rythme choquable

Signes de vie* per RCP ?

non

oui

* Signes de vie
mouvements de lutte
ouverture des yeux
Franche réactivité pupillaire

Pas d'Indication ECPR

RCP-S

Et

Pas de comorbidité majeure
NF < 5mn âge < 65 ans

EtCO₂ > 10mmHg
LF envisageable < 90mn
Adrénaline (cible < 3mg)
Lactate < 15**

** Critère à discuter selon histoire clinique

INDICATION ECPR +

Equipe ECMO

Equipe ECMO



Thirteen Survivors of Prehospital Thoracotomy for Penetrating Trauma: A Prehospital Physician-Performed Resuscitation Procedure That Can Yield Good Results

Gareth E. Davies, FRCP, FFAEM, and David J. Lockey, FRCA, FIMC, RCS(Ed)



J Trauma Acute Care Surg
2015; 79: 523-32

Results: Overall, 71 patients met inclusion criteria. Thirteen patients (18%) survived to hospital discharge. Neurologic outcome was good in 11 patients

TABLE 1. Data on Survivors

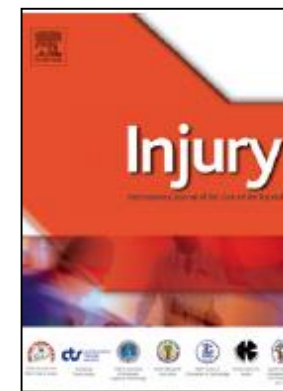
14% CPC 1-2

Survivor	Gender	Age (yr)	Injury (Site of Stab Wound)	Time From Cardiac Arrest to Team Attending (min)	Cardiac Rhythm Before Intervention	Neurological Outcome	Hospital Length of Stay (d)
1	M	34	RV and tamponade	In attendance	A	Good	25
2	M	48	Entry and exit wound; RV and tamponade	5-6	NA	Poor	130
3	M	23	RV and tamponade	3	PEA	Good	11
4	M	22	RV and tamponade	In attendance	PEA	Good	6
5	M	16	RV and tamponade	In attendance	PEA	Good	4
6	M	17	RV and tamponade	3	PEA	Good	7
7	M	34	RV and tamponade	In attendance	A	Good	NA
8	M	18	RV and tamponade	NA	PEA	Impaired	13
9	M	48	BV and tamponade	5-10	A	Poor	29
10	M	41	RV and tamponade	In attendance	A	Good	6
11	M	40	RV and tamponade	In attendance	A	Good	12
12	M	19	RV and tamponade	3	NA	Good	25
13	M	15	Thoracic aorta and tamponade	In attendance	PEA	Good	7

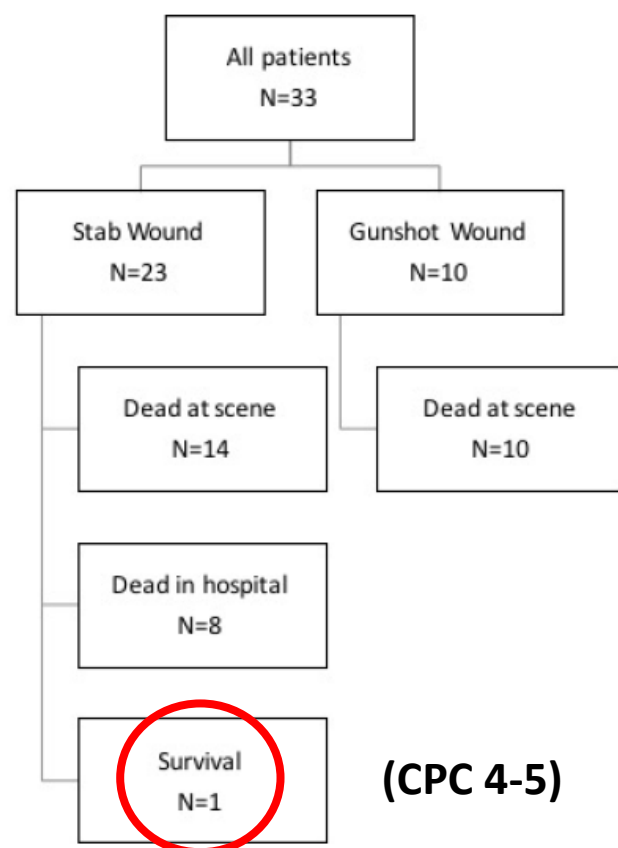
RV, right ventricle; BV, biventricular; A, asystole; PEA, pulseless electrical activity; NA, data not available.

Out of Hospital Thoracotomy for Cardiac Arrest after Penetrating Thoracic Trauma

Implementation and outcomes in a physician staffed HEMS operation



Van Vledder MG. Injury. 2017; 48:1865-9



(CPC 4-5)

	Stab wound N=23	Gunshot wound N=10
Cardiac Tamponade		
Yes	14 (61%)	1 (10%)
No	9 (39%)	7 (70%)
Unknown	0	2 (30%)
Outcome		
Dead at the Delay between arrest and thoracotomy	14 (61%)	10 (100%)
Witnessed	5 (22%)	2 (20%)
< 10 minutes	11 (48%)	3 (30%)
> 10 minutes	5 (22%)	2 (20%)
Unknown	2 (8%)	3 (30%)