

# 20 ans d'avancées qui ont changé nos pratiques : Arrêt cardiaque

**Pr Martin COUR**

Médecine Intensive - Réanimation

Hôpital Edouard Herriot - Hospices Civils de Lyon

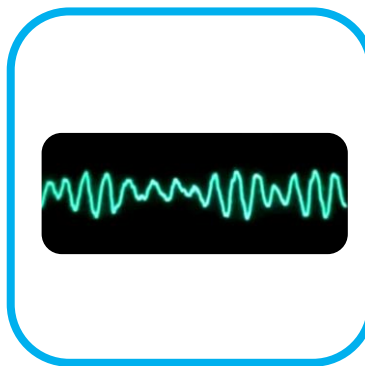
**20<sup>ème</sup> Journée de Réanimation et Urgences Respiratoires**  
11 Avril 2024 - Marseille

**Conflits d'intérêts**

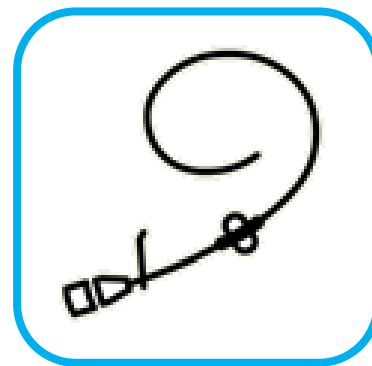
**Aucun à déclarer**



hypothermie



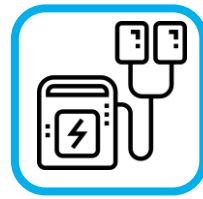
Arrêt réfractaire



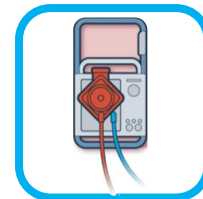
Coronarographie



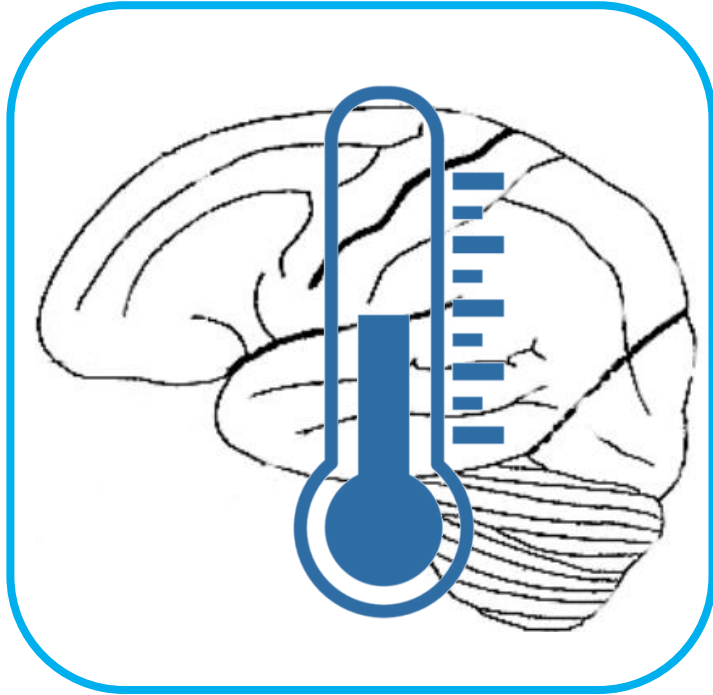
Cordarone



CEE



ECMO



**Stress oxydant**

**Surcharge calcique**

**Excito-toxicité glutamate**

**Lésions mitochondriales**

**Inflammation**



**1 - hypothermie thérapeutique**



## Hyperthermia After Cardiac Arrest Is Associated With an Unfavorable Neurologic Outcome

Association significative mortalité / hyperthermie  
**OR 2.3 par °C > 37°C**

Zeiner A et al. *Arch Int Med* 2001;161:2007-12

HACA Study Group. *New Engl J Med* 2002



Bernard SA et al. *New Engl J Med* 2002



1850 patients  
14 pays



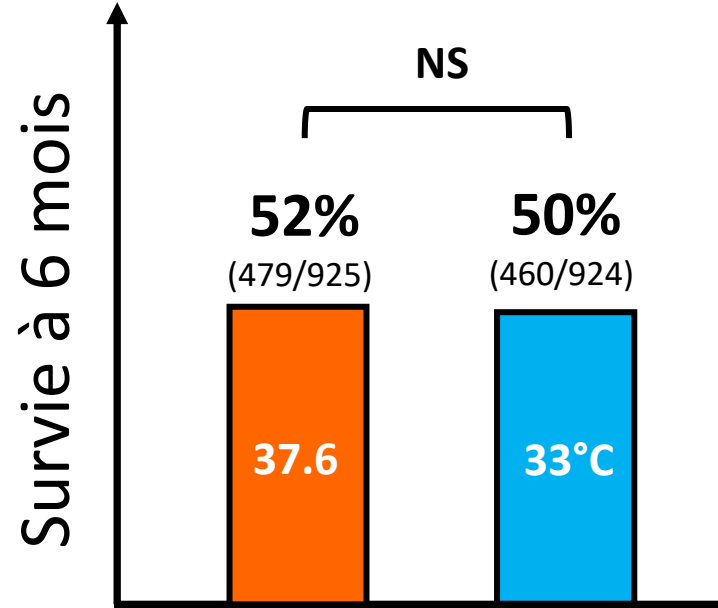
**33°C versus < 37,9°C**

Dankiewicz et al. *New Engl J Med* 2021;384:2283-94



## 33°C versus < 37,9°C

- 1850 patients
- 14 pays
- 80% homme
- ¾ rythme choquable

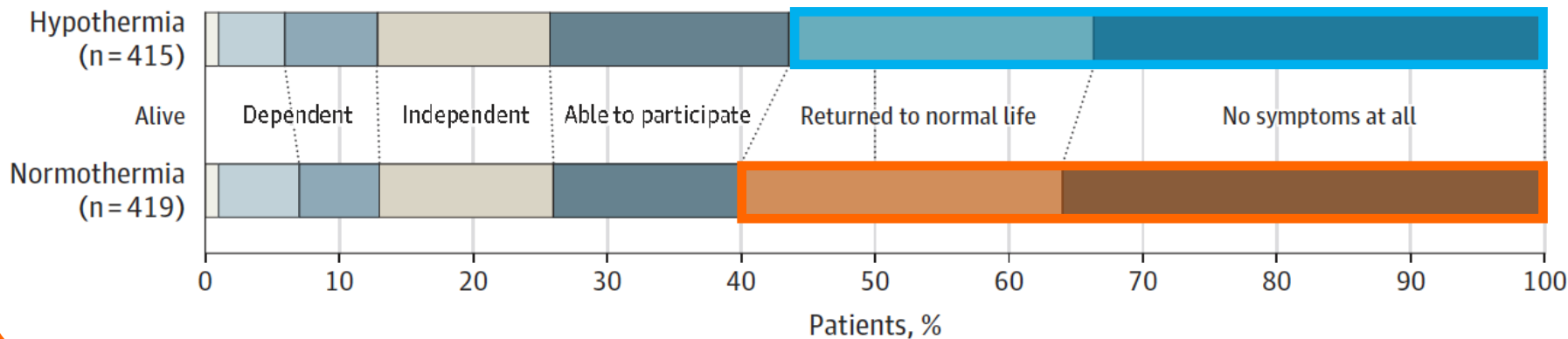


JAMA Neurology | **Original Investigation**

## Effects of Hypothermia vs Normothermia on Societal Participation and Cognitive Function at 6 Months in Survivors After Out-of-Hospital Cardiac Arrest A Predefined Analysis of the TTM2 Randomized Clinical Trial



Devenir des survivants de TTM-2 ?



RESUSCITATION



Resuscitation (2005) 67, 213–247

## Part 4: Advanced life support

International Liaison Committee on Resuscitation

2005



HT 32-34°C, 12-24h, si coma après FV

Autres rythmes : considérer HT

Part 8: Advanced life support

2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations<sup>☆,☆☆</sup>

Resuscitation 81S (2010) e93–e174

**2010**



**HT 32-34°C, 12-24h, si coma après FV**

**Autres rythmes et ACIH : considérer HT**

**Solutés froids : efficaces et sûrs**

## Part 8: Post-Cardiac Arrest Care

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

2015



**TTM 32-36°C, ≥24h, tous les AC**

Solutés froids / SAMU : NON !



## ICM RAPID PRACTICE GUIDELINE

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



## 2022



LOW

We **recommend** actively preventing fever (defined as a temperature  $> 37.7^{\circ}\text{C}$ ) in post-cardiac arrest patients who remain comatose.



GOOD PRACTICE

We **recommend** actively preventing fever for at least 72 hours in post-cardiac arrest patients who remain comatose.



ICM RAPID PRACTICE GUIDELINE

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



2022



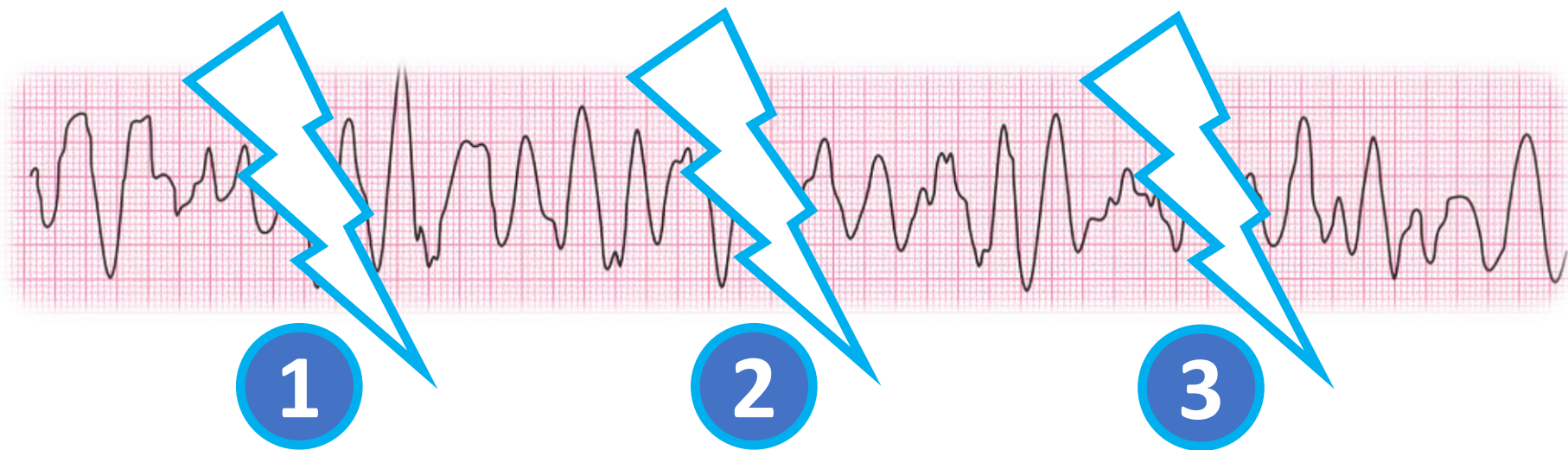
GOOD PRACTICE

There is currently insufficient evidence to recommend for or against temperature control at 32-36°C in sub-populations of cardiac arrest patients

## Pourquoi ça ne marche pas (ou plus) ?



- Amélioration de la prise en charge globale
- Sédation dans les groupes contrôles
- Prévention de la fièvre dans le groupe contrôle

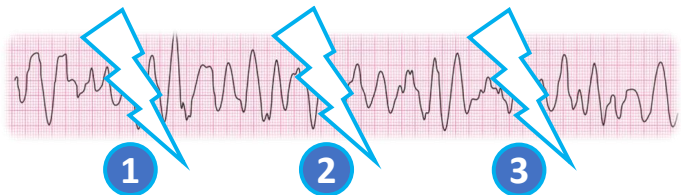


**2 - Arrêt cardiaque réfractaire**



The NEW ENGLAND  
JOURNAL of MEDICINE

## AMIODARONE FOR RESUSCITATION AFTER OUT-OF-HOSPITAL CARDIAC ARREST DUE TO VENTRICULAR FIBRILLATION



FV réfractaire : 3 CEE ou plus

(n=504)

+



ADRE  
1 mg



CORDARONE  
300 mg IVD



PLACEBO

# 20 ans qui ont changé nos pratiques - AC : FV réfractaire

The NEW ENGLAND  
JOURNAL of MEDICINE

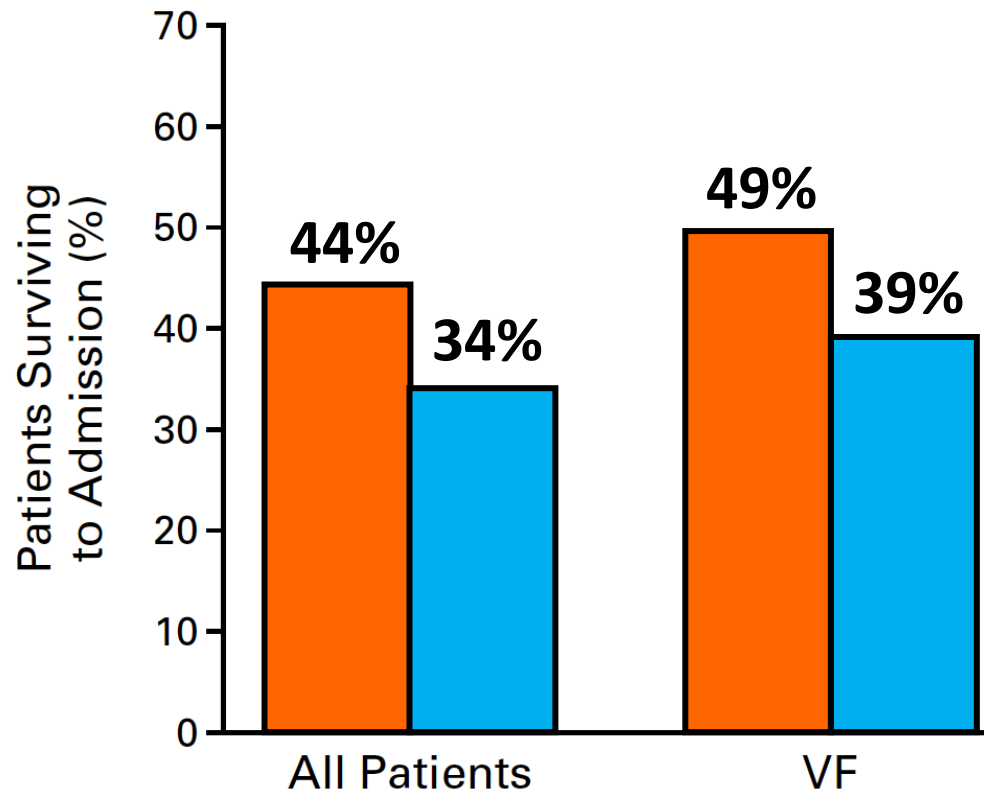
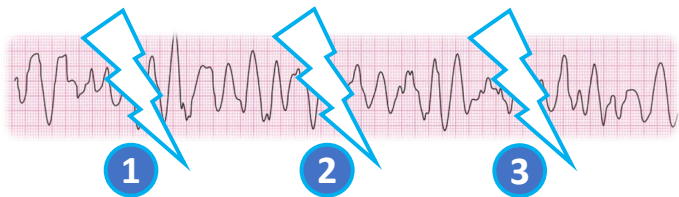
AMIODARONE FOR RESUSCITATION AFTER OUT-OF-HOSPITAL CARDIAC  
ARREST DUE TO VENTRICULAR FIBRILLATION



**CORDARONE**  
300 mg IVD



**PLACEBO**



# 20 ans qui ont changé nos pratique - AC : FV réfractaire

The NEW ENGLAND  
JOURNAL of MEDICINE

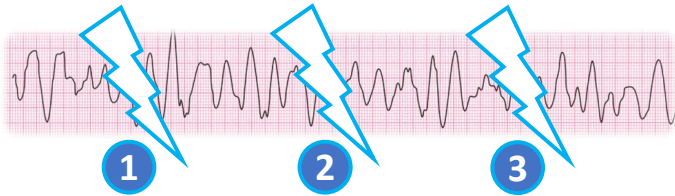
AMIODARONE FOR RESUSCITATION AFTER OUT-OF-HOSPITAL CARDIAC  
ARREST DUE TO VENTRICULAR FIBRILLATION



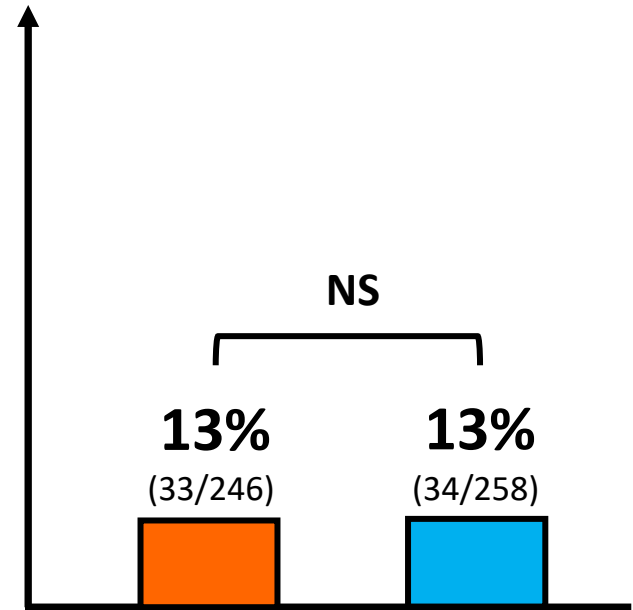
**CORDARONE**  
300 mg IVD



**PLACEBO**

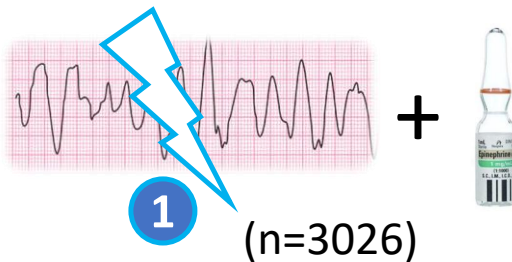


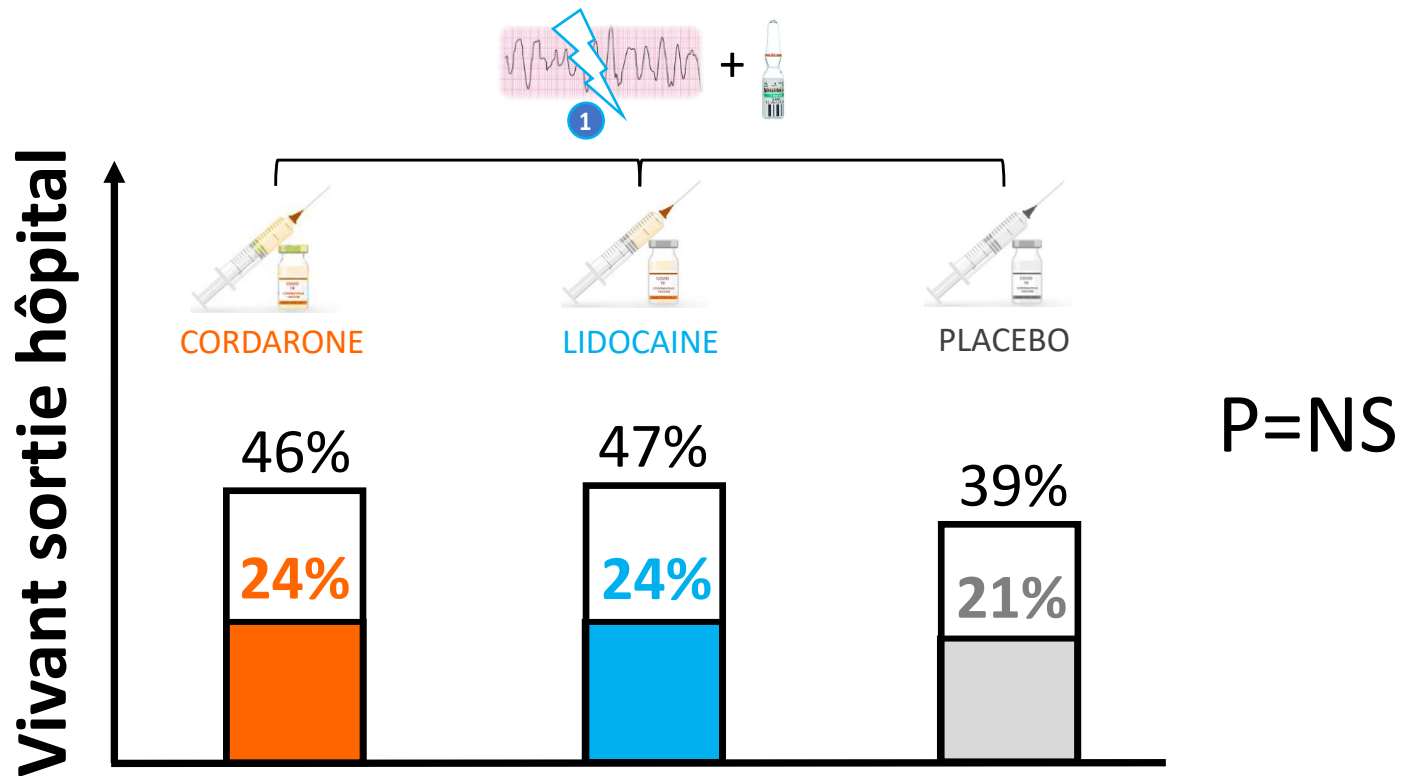
Survie Hôpital

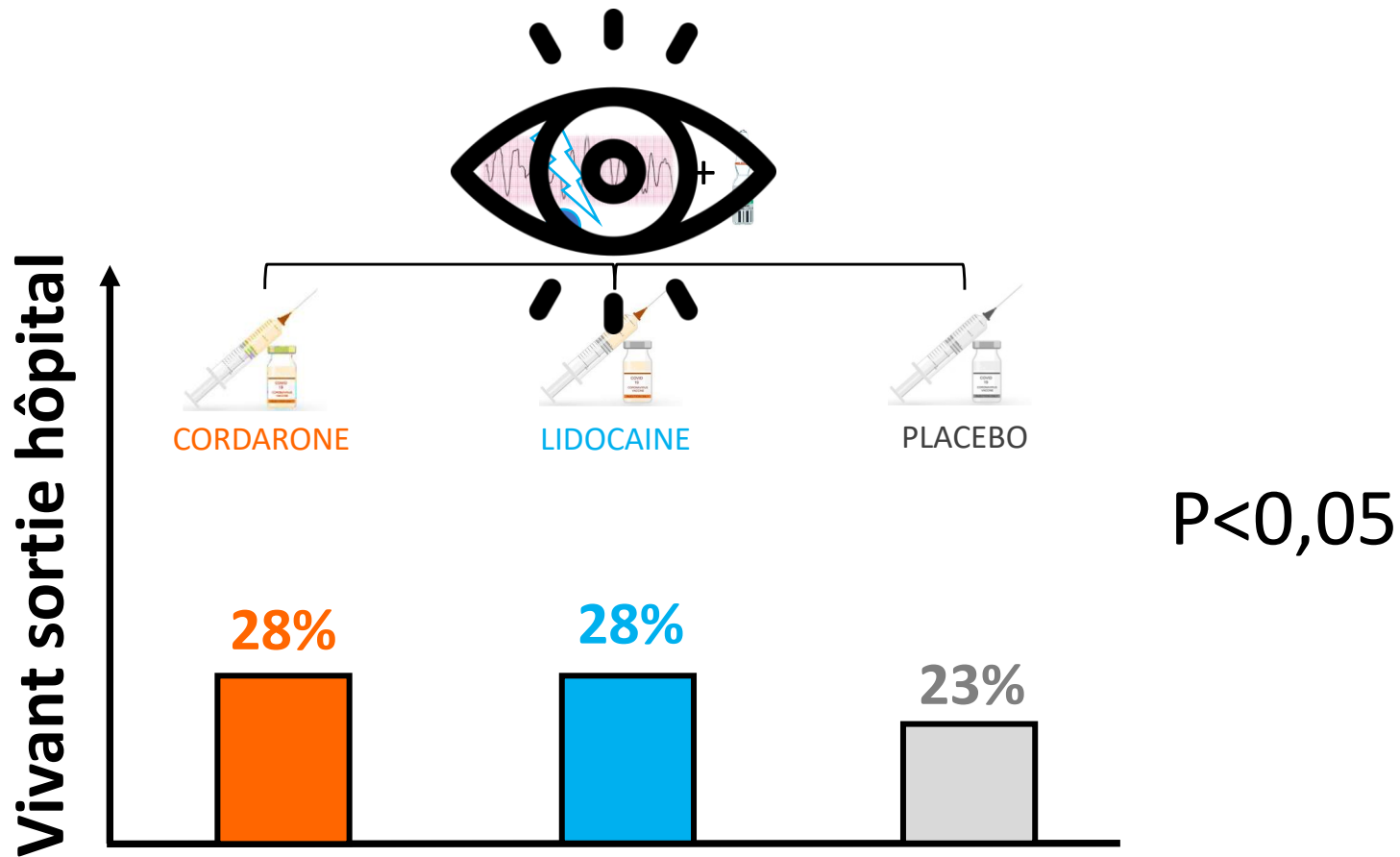




# Amiodarone, Lidocaine, or Placebo in Out-of-Hospital Cardiac Arrest

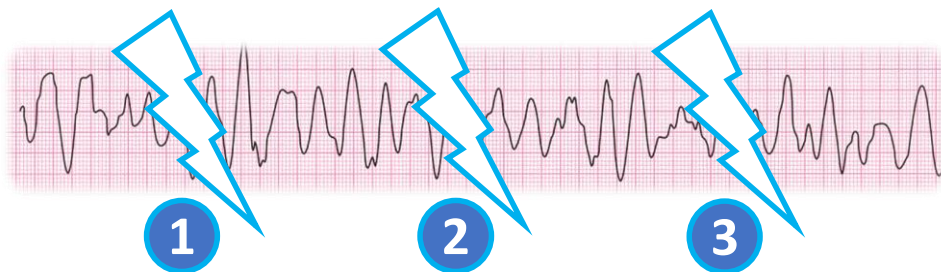






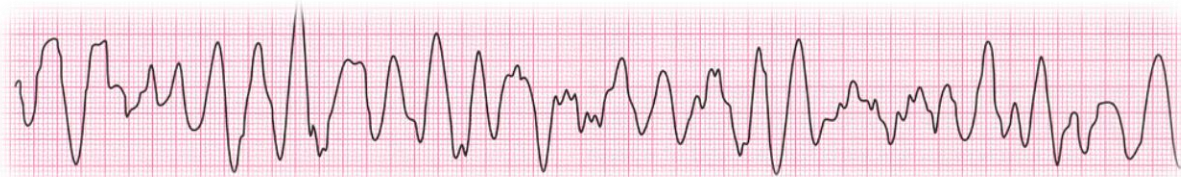


## European Resuscitation Council Guidelines 2021: Executive summary



**Adrénaline 1 mg**

**Cordarone 300 mg  
(ou Xylocaine 100 mg)**



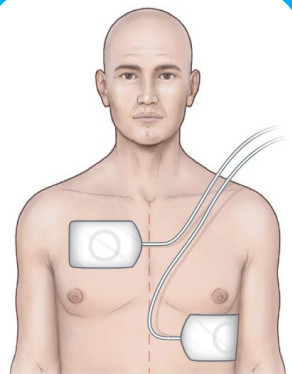
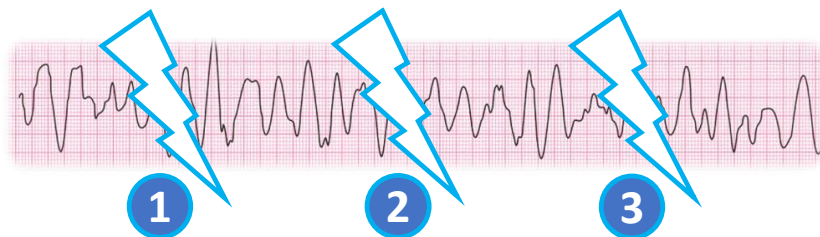
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

# Defibrillation Strategies for Refractory Ventricular Fibrillation

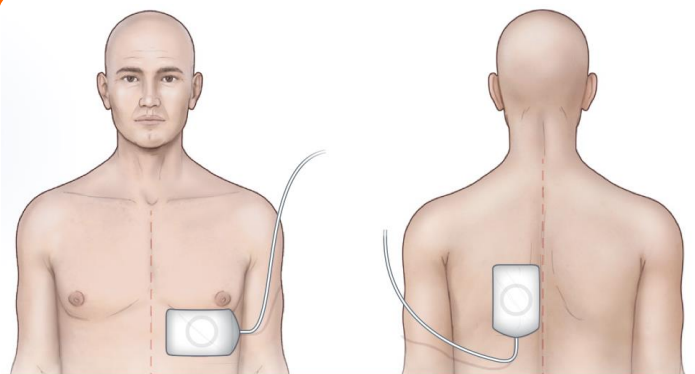
Sheldon Cheskes, M.D., P. Richard Verbeek, M.D., Ian R. Drennan, A.C.P., Ph.D.,  
Shelley L. McLeod, Ph.D., Linda Turner, Ph.D., Ruxandra Pinto, Ph.D.,  
Michael Feldman, M.D., Ph.D., Matthew Davis, M.D.,  
Christian Vaillancourt, M.D., Laurie J. Morrison, M.D., Paul Dorian, M.D.,  
and Damon C. Scales,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

# 20 ans qui ont changé nos pratiques - AC : FV réfractaire



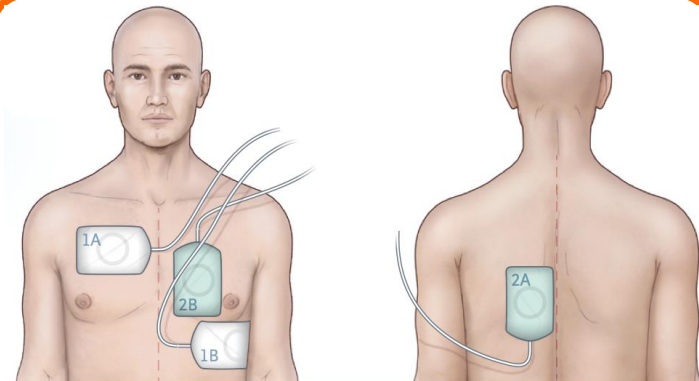
Contrôle

n=136/405



Défibrillation antéro-postérieure (DAP)

n=143/405



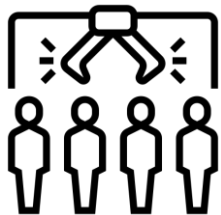
Défibrillation double séquence (DDS)

n=125/405

## Defibrillation Strategies for Refractory Ventricular Fibrillation



RCP / paramedics



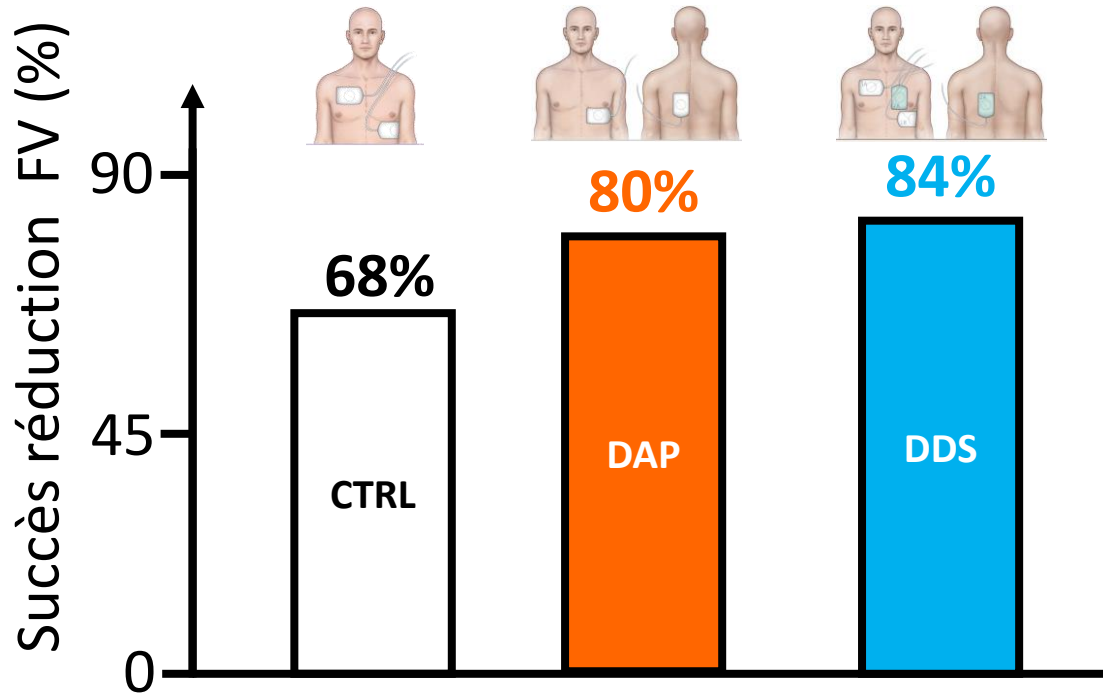
Age : 64 ans

Homme : 84%

Témoin : 68%

911-Paramedics: 7'

911-1<sup>er</sup> CEE : 10'



## Defibrillation Strategies for Refractory Ventricular Fibrillation

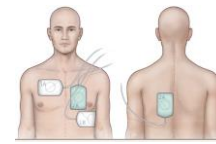
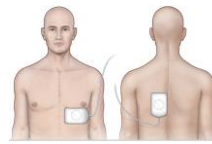
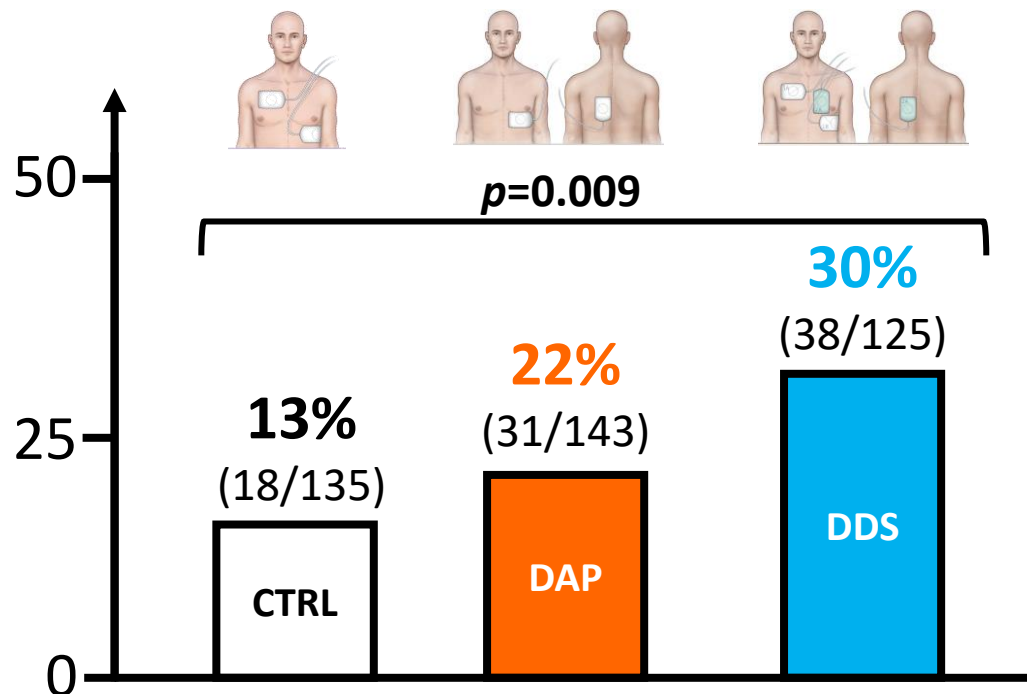


RCP / paramedics

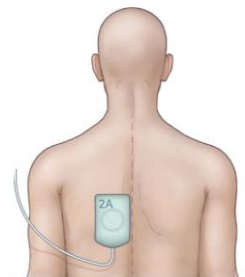
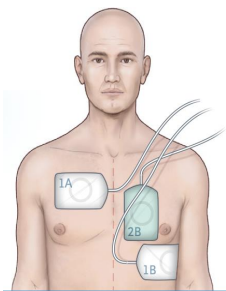


Age : 64 ans  
Homme : 84%  
Témoin : 68%  
911-Paramedics: 7'  
911-1<sup>er</sup> CEE : 10'

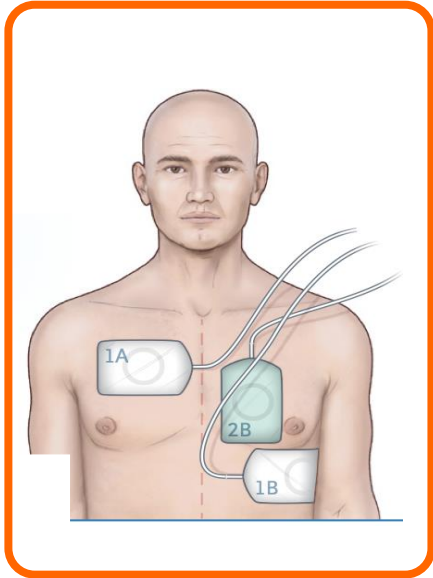
Survie hôpital CPC 1-2 (%)



## Double défibrillation



# DOUBLE SEQUENTIAL EXTERNAL DEFIBRILLATION



Intubation ?

Adrénaline ?

Cordarone ?

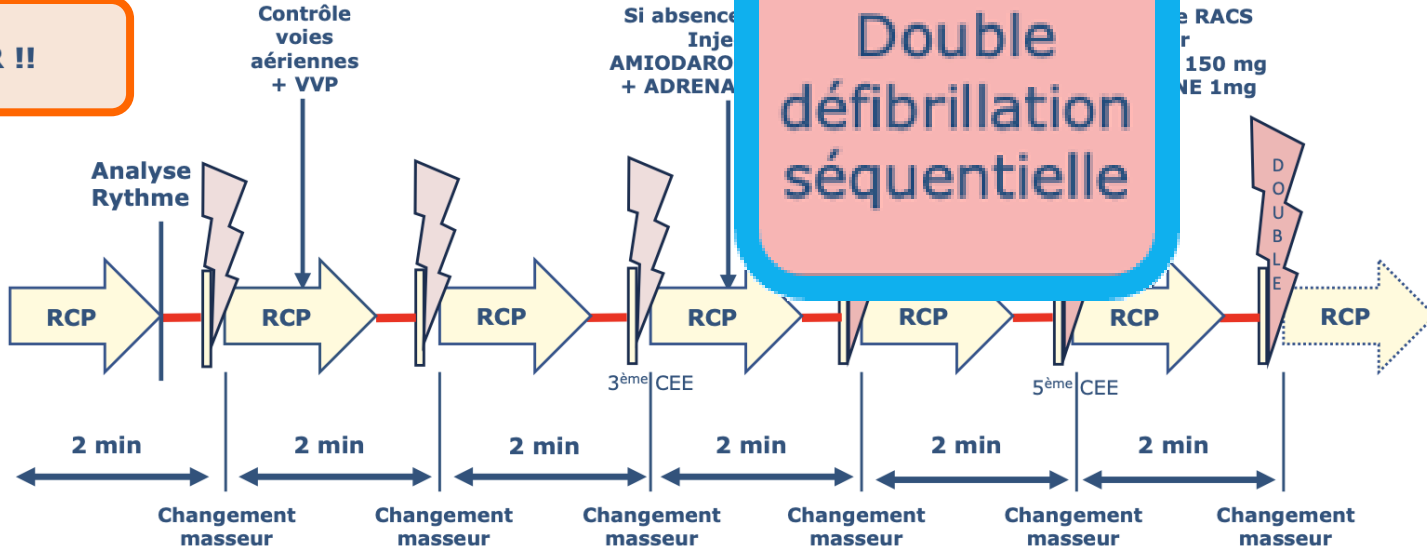
2 défibrillateurs ?

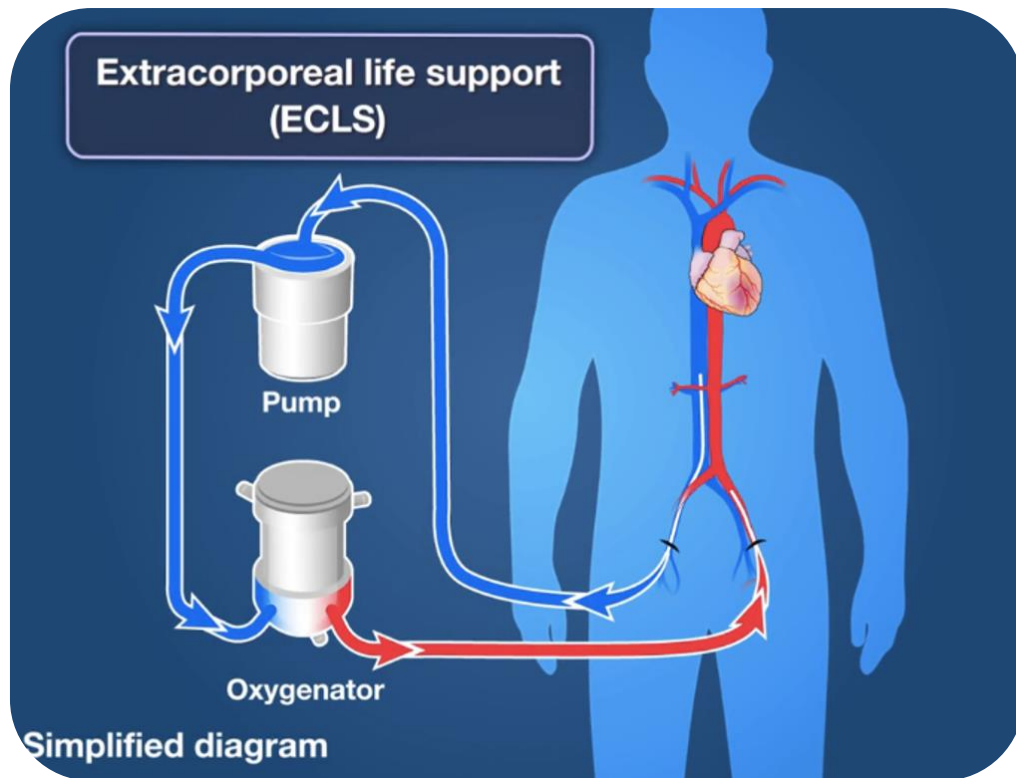
Formation ?



## 2. AC avec rythme choqué

Penser à l'ECPR !!





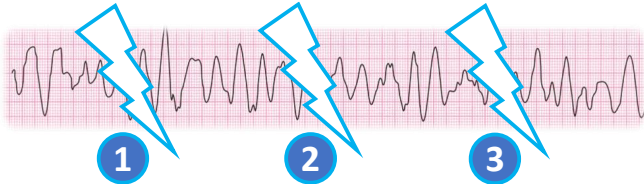
THE LANCET

"The NHS in 2023 is very different from even the recent past, in some ways better, in many ways worse. Health care can be a deeply rewarding vocation, but, there are limits to how far vocation can be exploited."

## 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



18-75 ans



< 30 min



# 20 ans qui ont changé nos pratique - AC : AC réfractaire

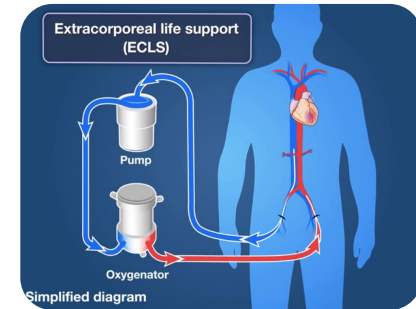
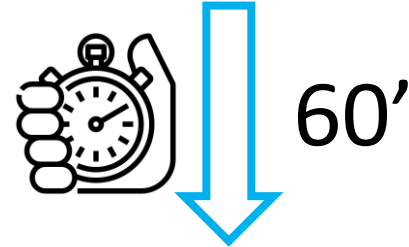
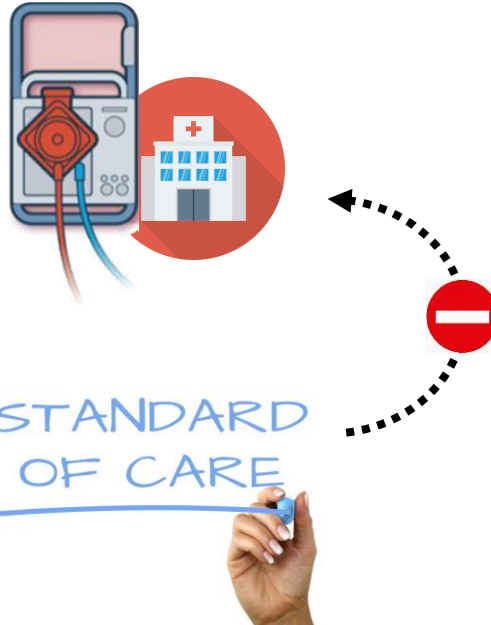
THE LANCET

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

The ARREST 2020 trial was different from other trials in several ways. Health care workers were not aware of the study objectives. The trial was open-label. The trial was randomised. The trial was controlled. The trial was randomised. The trial was controlled.



(n=29)



# 20 ans qui ont changé nos pratique - AC : AC réfractaire

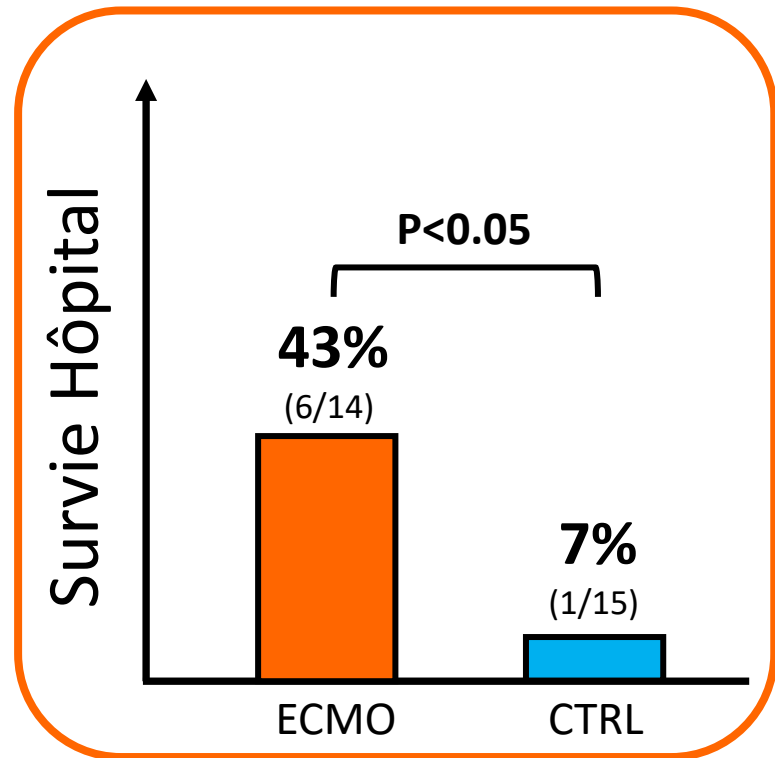
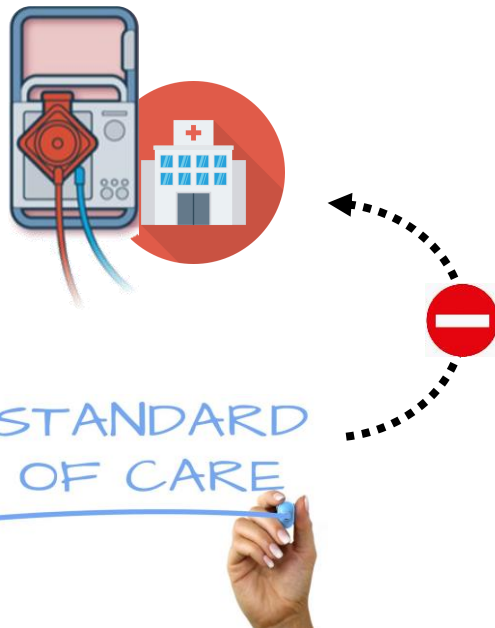
THE LANCET

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

The LANCET is not responsible for any differences that arise from the use of any of the information in this article. Health care providers should always consult the relevant literature to know for certain what to do.



(n=29)

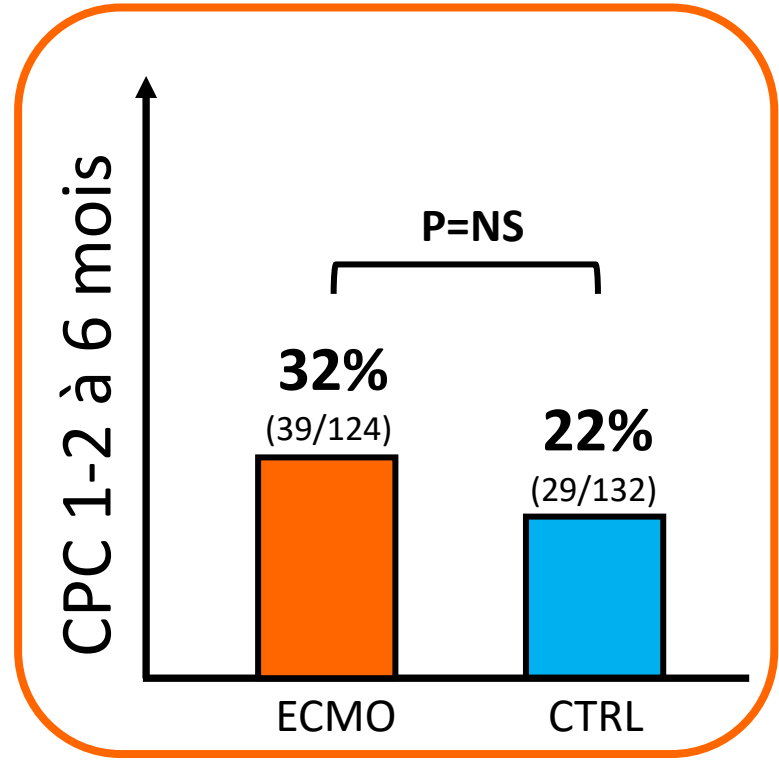
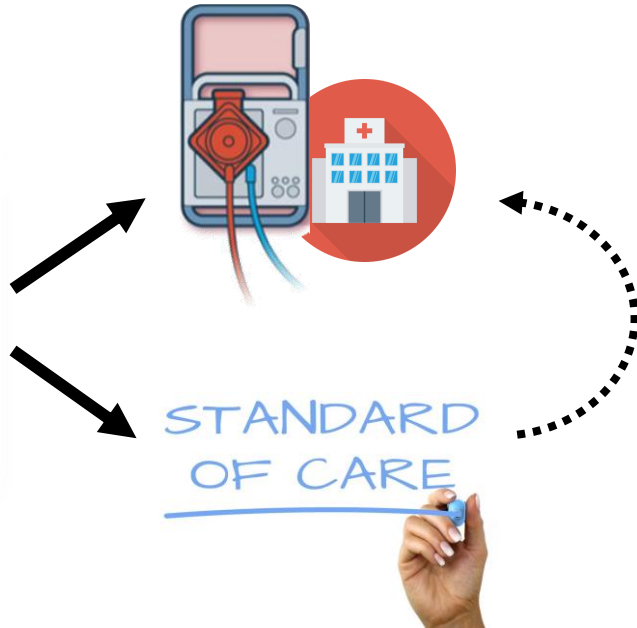


## PRAGUE OHCA TRIAL

Essai monocentrique en République Tchèque



(n=256)



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RESEARCH SUMMARY

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

160 ACEH sur FV réfractaire



**Extracorporeal  
CPR**

(N=70)



**Conventional  
CPR**

(N=64)

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## RESEARCH SUMMARY

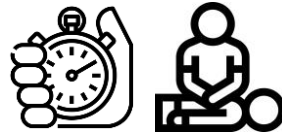
### Early Extracorporeal CPR for Refractory Out-of-Hospital Cardiac Arrest



## Principaux critères d'inclusion (10 centres)



18-70 ans



RCP spécialisée > 15 min



FV / choc DSA



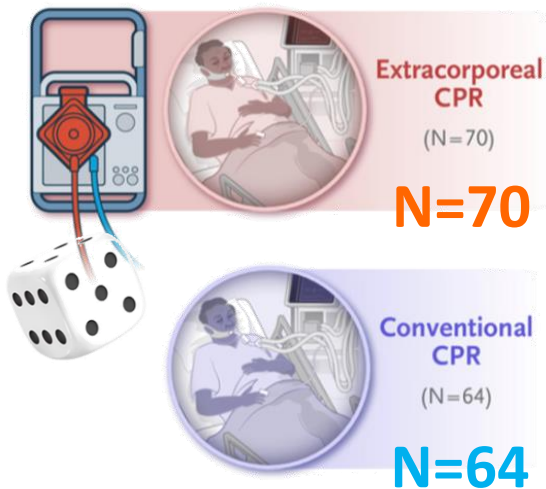
ACR - bloc ECMO < 60 min

10 Centres - 12 EMS en Allemagne

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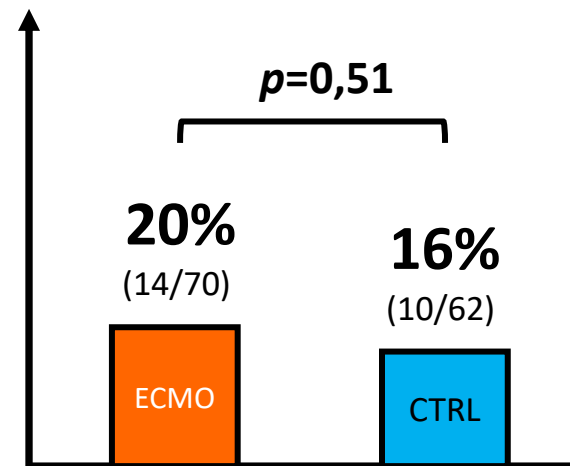
## RESEARCH SUMMARY

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






AC-ECMO : 74'

CPC 1-2 à J30





		Réa standard	ECMO	P
<b>ARREST</b> ( <i>Lancet</i> 2020)		n=15	n=14	
Survie 6 mois CPC1-2		<b>0%</b>	<b>43%</b>	<b>&lt;0.001</b>
<b>PRAGUE OHCA</b> ( <i>JAMA</i> 2022)		n=132	n=124	
Survie 6 mois CPC1-2		<b>22%</b>	<b>32%</b>	<b>NS</b>
<b>INCEPTION</b> ( <i>NEJM</i> 2023)		n=64	n=70	
Survie 6 mois CPC1-2		<b>16%</b>	<b>20%</b>	<b>NS</b>

**ARREST**

Yannopoulos D et al. *Lancet* 2020; 396:1807-16

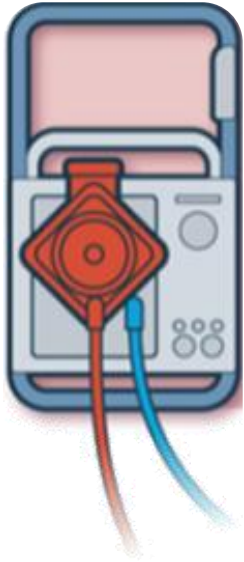
**PRAGUE OHCA**





Belohlavek J et al. *JAMA* 2022; 327:737-47

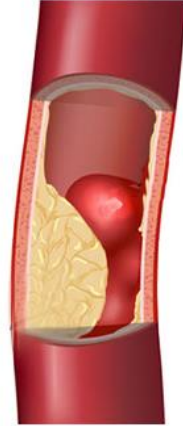
**INCEPTION TRIAL**

Suverein MM et al. *New Engl J Med* 2023; 388:299-309

# 20 ans qui ont changé nos pratique - AC : AC réfractaire



		Réa standard	ECMO	P
<b>ARREST (<i>Lancet</i> 2020)</b>		n=15	n=14	
Survie 6 mois CPC1-2		<b>0%</b>	<b>43%</b>	<b>&lt;0.001</b>
<b>PRAGUE OHCA (<i>JAMA</i> 2022)</b>		n=132	n=124	
Survie 6 mois CPC1-2		<b>22%</b>	<b>32%</b>	<b>NS</b>
<b>INCEPTION (<i>NEJM</i> 2023)</b>		n=64	n=70	
Survie 6 mois CPC1-2		<b>16%</b>	<b>20%</b>	<b>NS</b>
<b>DOSE VF-STUDY (<i>NEJM</i> 2022)</b>		Réa standard	DDS	P
RANKIN modifié $\leq 2$		<b>11%</b>	<b>27%</b>	<b>0.009</b>



## 3 - Place de la coronarographie

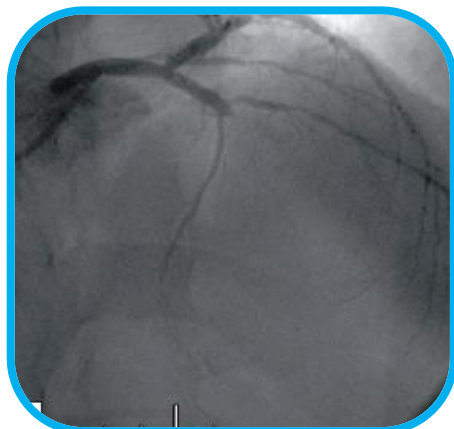
The NEW ENGLAND  
JOURNAL of MEDICINE

ESTABLISHED IN 1812

APRIL 11, 2019

VOL. 380 NO. 15

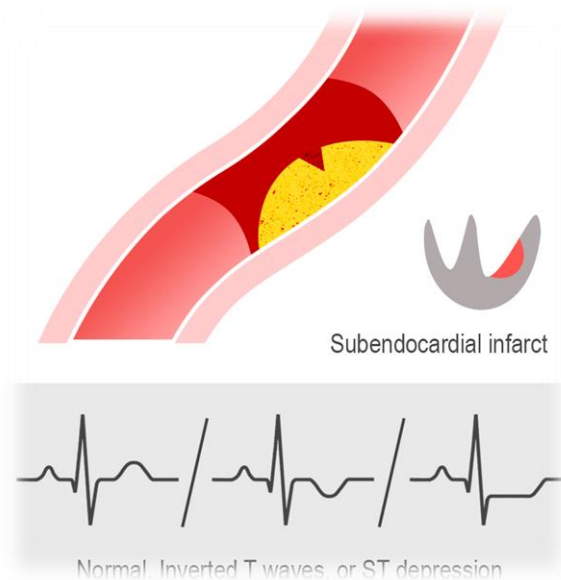
## Immediate Coronary Angiography in Survivors of Out-of-Hospital Cardiac Arrest



Lésions : 50%

Survie : 38%

## AC sans élévation du segment ST ? Rythme choquable

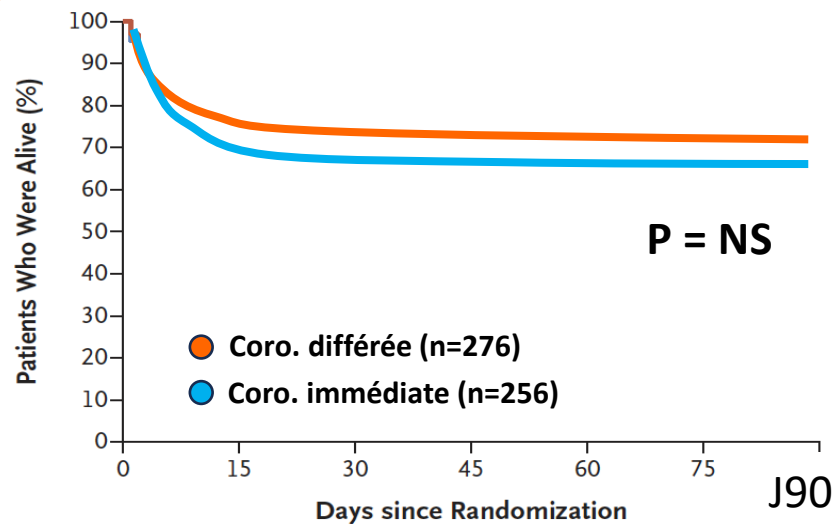


N=542

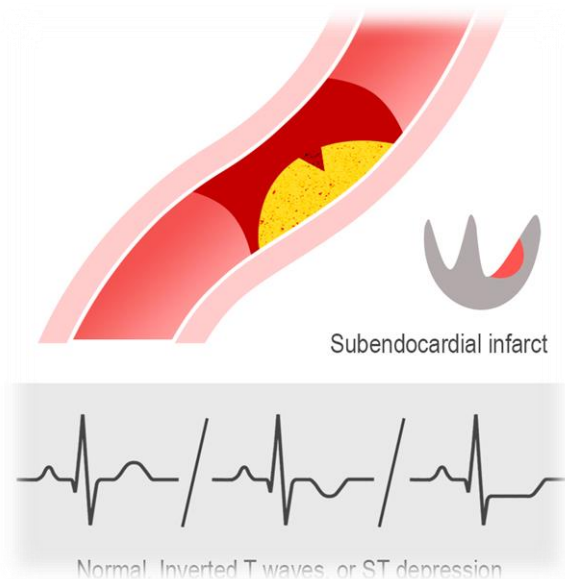
The NEW ENGLAND  
JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 11, 2019 VOL. 380 NO. 15

Coronary Angiography after Cardiac Arrest  
without ST-Segment Elevation



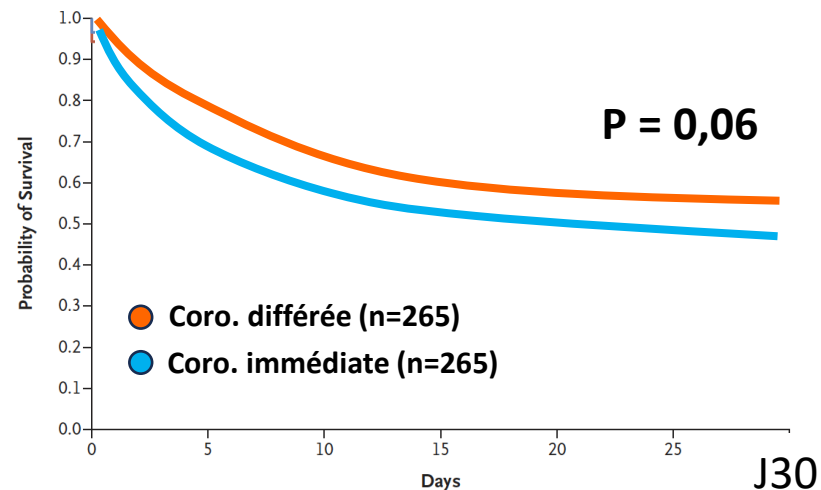
## AC sans élévation du segment ST ? Choquable ET non choquable



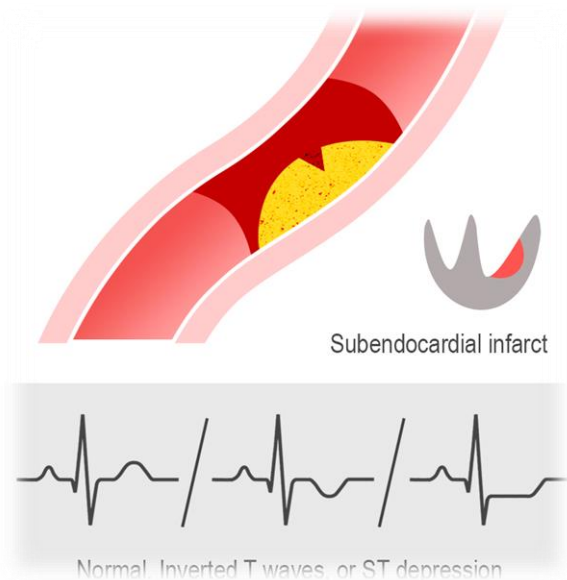
N=530

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JOURNAL of MEDICINE

Angiography after Out-of-Hospital Cardiac  
Arrest without ST-Segment Elevation



## AC sans élévation du segment ST ? Choquable ET non choquable

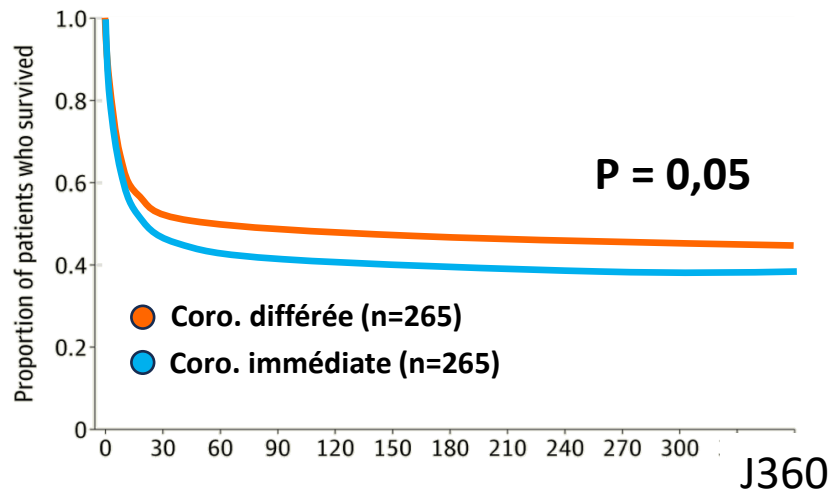


N=530



**JAMA Cardiology**

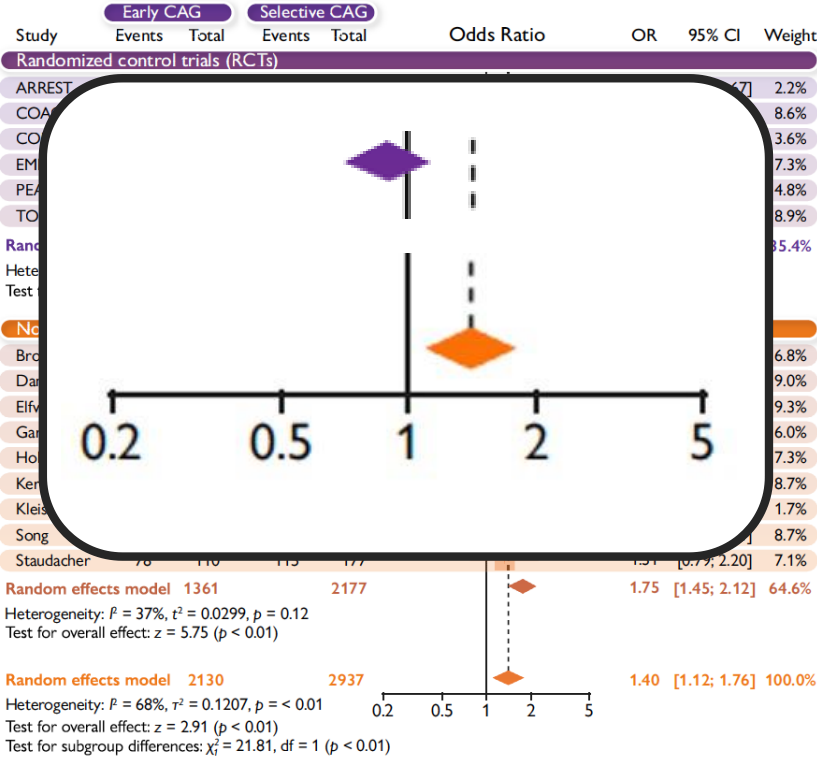
**Coronary Angiography After Out-of-Hospital Cardiac Arrest Without ST-Segment Elevation**  
One-Year Outcomes of a Randomized Clinical Trial



# 20 ans qui ont changé nos pratiques - AC : Coronarographie

Does early compared to selective CAG after NSTEMI-OHCA improve survival?

## Meta-analysis of early vs. selective CAG



Essais randomisés

Etudes observationnelles

## Network meta-analysis of early vs. late vs. no CAG in NRS

Comparator	Treatment		
	no CAG	early CAG	late CAG
no CAG		**4.61** (1.14, 21.70)	**19.51** (5.06, 128.95)
early CAG	**0.22** (0.05, 0.87)		**4.20** (1.22, 20.91)
late CAG	**0.05** (0.01, 0.20)	**0.24** (0.05, 0.82)	



Selection/Survivorship bias



EUROPEAN  
RESUSCITATION  
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**1** Hypothermie -> Contrôle fièvre

**2** AC réfractaire : Cordarone, DDS, ECMO

**3** Place de la coronarographie NSTEMI