# ARRET CARDIAQUE ET HYPOTHERMIE EN 2014
# OU EN EST ON ?

SAVOIE

**Miracle : retrouvé en hypothermie sévère, la victime sauvée après 5 heures de massage cardiaque**

Ce sont des conditions météorologiques similaires qui ont compliqué la tâche des secours pour en faire, au final, un véritable miracle. Photo d'illustration


**Jean-Sébastien MARX**

**SAMU de PARIS**

**(DAR ,Hôpital Necker, Paris, France)**


PARIS DESCARTES FACULTÉ DE MÉDECINE

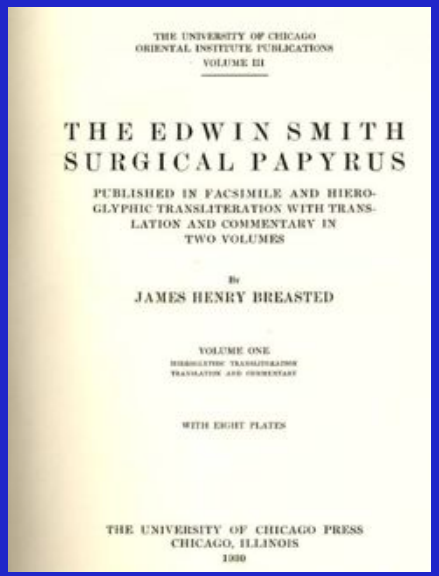
ASSISTANCE PUBLIQUE HÔPITAUX DE PARIS
NECKER-ENFANTS MALADES

CFRC

SAMU DE PARIS

JSEB 2014

# Papyrus découvert par EDWIN SMITH
# Thèbes en 1862


THE UNIVERSITY OF CHICAGO
ORIENTAL INSTITUTE PUBLICATIONS
VOLUME III

THE EDWIN SMITH
SURGICAL PAPYRUS

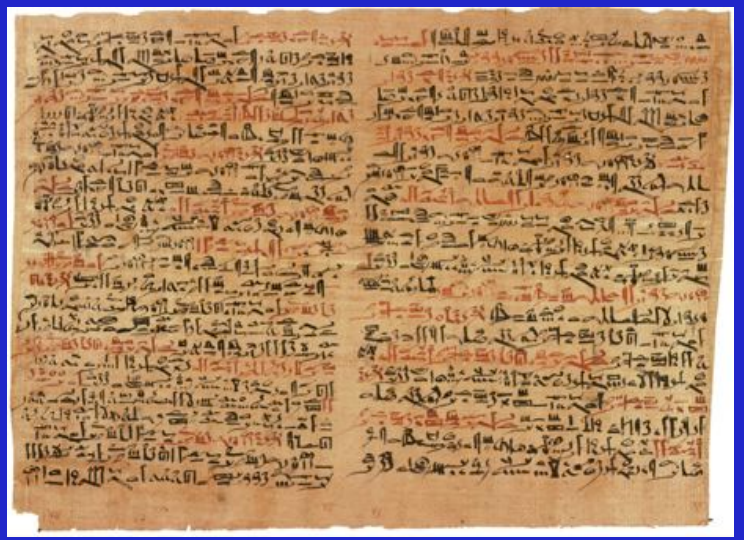
PUBLISHED IN FACSIMILE AND HIERO-
GLYPHIC TRANSLITERATION WITH TRANS-
LATION AND COMMENTARY IN
TWO VOLUMES

By
JAMES HENRY BREASTED

VOLUME ONE
HIEROGLYPHIC TRANSLITERATION
TRANSLATION AND COMMENTARY

WITH EIGHT PLATES

THE UNIVERSITY OF CHICAGO PRESS
CHICAGO, ILLINOIS
1930



**Nouvel empire de l'Egypte antique, vers le XVII ème siècle avant notre ère**


MÉMOIRES
DE
CHIRURGIE MILITAIRE,
ET
CAMPAGNES
DE D. J. LARREY.
TOME I.
PARIS,
Chez J. SMITH, Imprimeur-Libraire, rue de Mont-
1812.

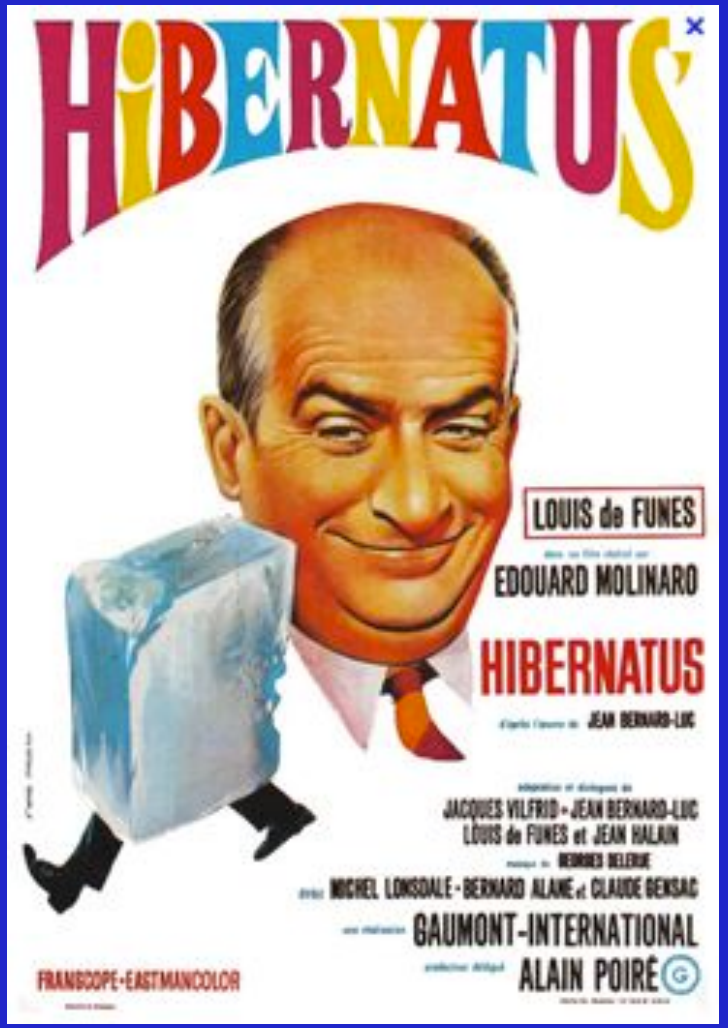
# BENEFICE SUGGERE DEPUIS LONGTEMPS

« Nous remarquons que les blessés qui sont très froids mais que l'on réchauffe prés du feu meurent plus vite que ceux qui demeurent froids »

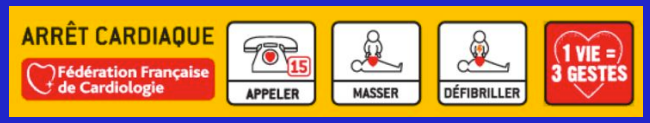
**Baron Dominique-Jean Larrey**
**Mémoires de chirurgie militaire et campagnes (1812-1817)**

# HYPOTHERMIE THERAPEUTIQUE

## Pourquoi ?

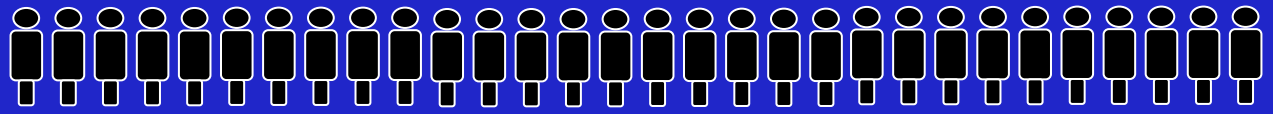


# Pronostic de l'Arrêt Cardiaque Extra-Hospitalier



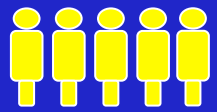



**AC Extra-Hospitaliers**



**34-86 % tentatives de RCP en préhospitalier**

**30% RACS avec survie à l'admission hospitalière**



**Phase Pré-hospitalière**

**20% admis hôpital**

**5% survivants**

**1-3% survie sans séquelle 1 an**

**Mortalité Intra-hospitalière**

- ***SDMV → décès précoces***
- ***Lésions neurologiques → décès secondaires***

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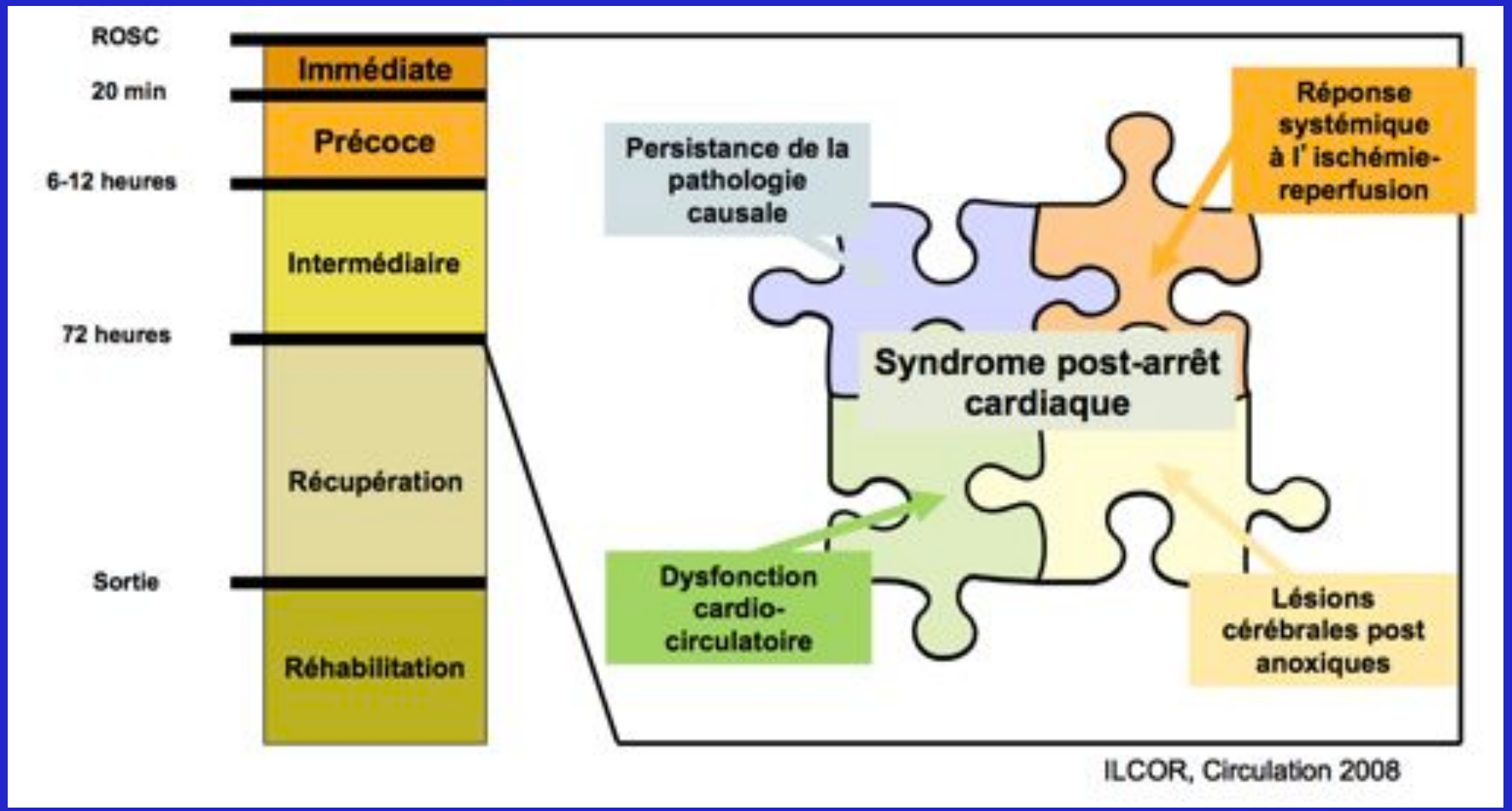
# PHYSIOPATHOLOGIE



# CASE REPORTS


SAVOIE

Miracle : retrouvé en hypothermie sévère, la victime sauvée après 5 heures de massage cardiaque

Ce sont des conditions météorologiques similaires qui ont compliqué la tâche des secours pour faire, au final, un véritable miracle. Photo d'illustration


Denver Father Dug Out of Avalanche By Fellow Skiers

KID CHRONIC FEBRUARY 22, 2013 0

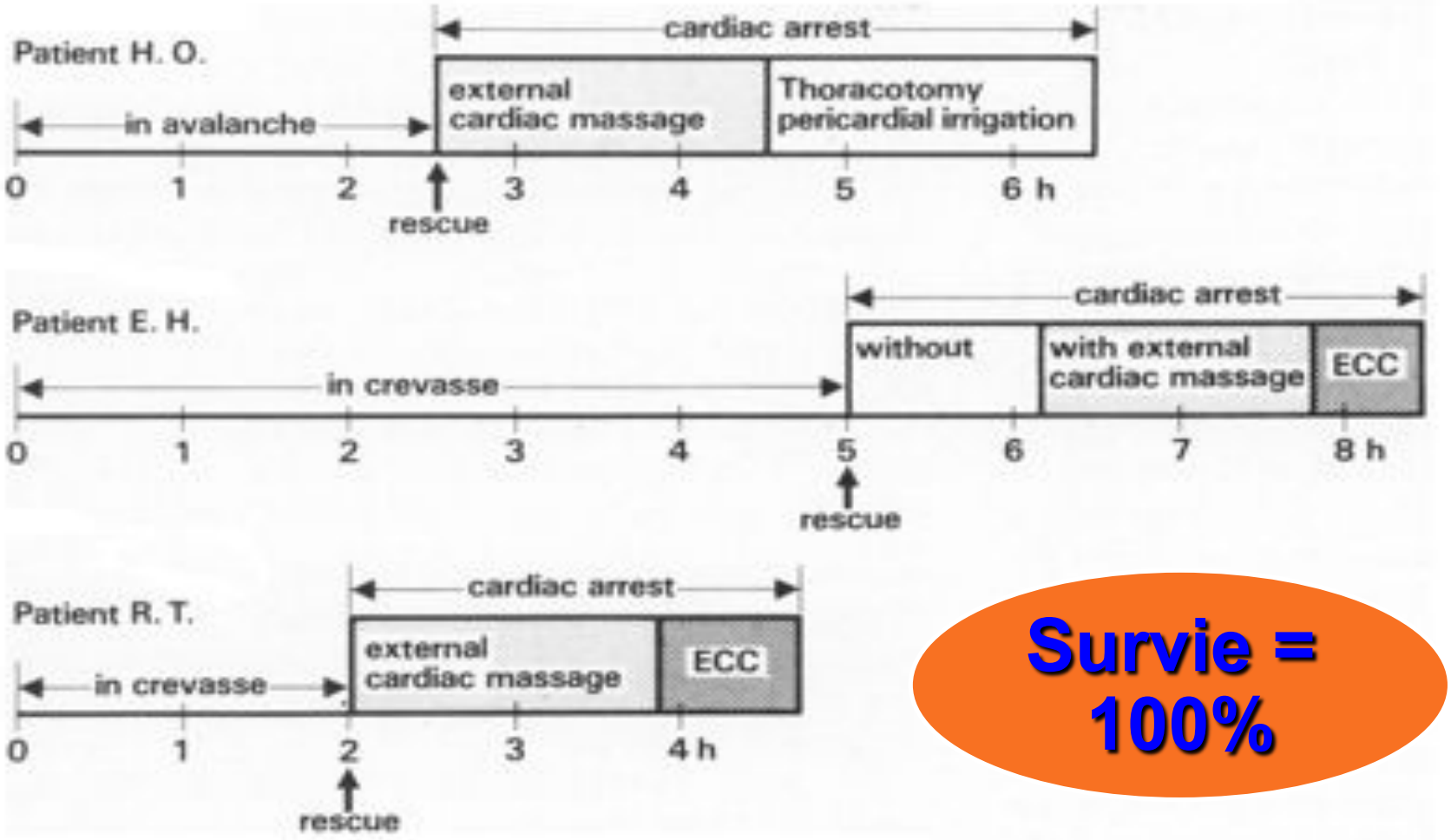
Avalanche Survivor

Anthony Robinson was all smiles as fellow skiers dug him out of what certainly could have been a life taking avalanche.

# *Management of Profound Accidental Hypothermia with Cardiorespiratory Arrest*

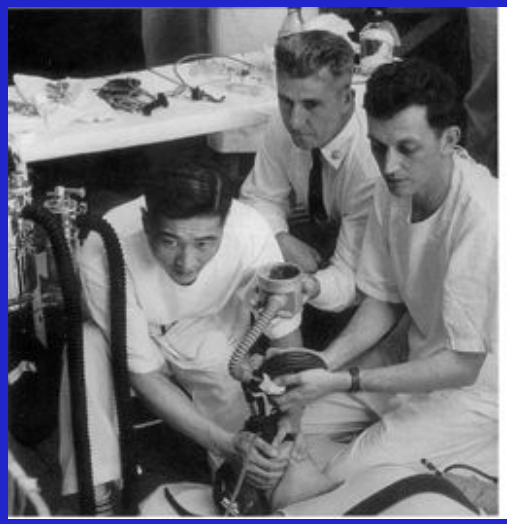
ULRICH ALTHAUS, M.D.,* PETER AEBERHARD, M.D.,† PETER SCHÜPBACH, M.D.,* BERNHARD H. NACHBUR, M.D.,* WILFRIED MÜHLEMANN, M.D.‡

Ann Surg. 1982 April; 195(4): 492–495.


**Survie = 100%**

**P. Safar, Univ. of Pittsburgh 1961**



This photograph, taken in the 1950's, depicts Dr. C. Park, Anesthesia Resident, Baltimore City Hospital; Capt. Martin McMahon, Chief, Baltimore Fire Department Ambulance Service and Dr. Peter Safar, Chief, Department of Anesthesia, Baltimore City Hospital, performing one of the earliest resusucitation studies using CPR. Dr. Safar's research in the 1950's and 1960's was supported by the US Army.

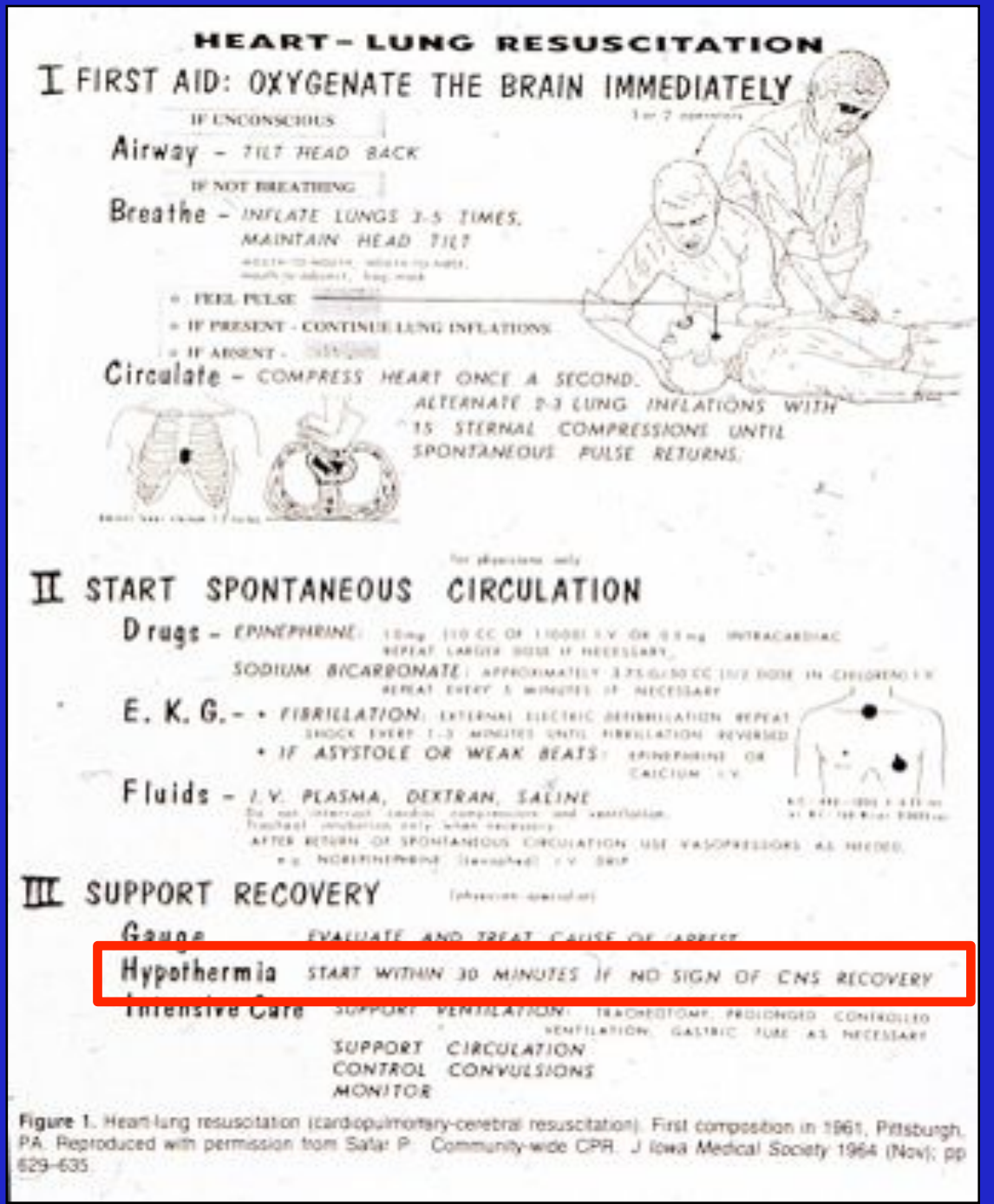
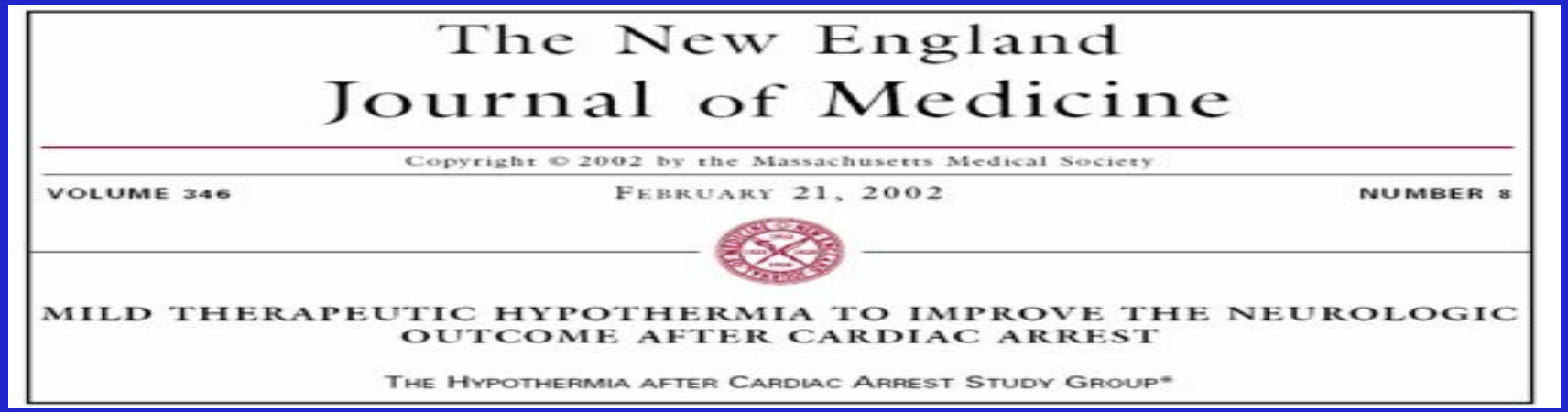



**Figure 1.** Heart-lung resuscitation (cardiopulmonary-cerebral resuscitation). First composition in 1961, Pittsburgh, PA. Reproduced with permission from Safar P. Community-wide CPR. J Iowa Medical Society 1964 (Nov); pp 629–635.



The New England Journal of Medicine

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VOLUME 346 FEBRUARY 21, 2002 NUMBER 8

MILD THERAPEUTIC HYPOTHERMIA TO IMPROVE THE NEUROLOGIC OUTCOME AFTER CARDIAC ARREST

THE HYPOTHERMIA AFTER CARDIAC ARREST STUDY GROUP*

**Etude européenne, multicentrique, 5 pays**

**275 patients**

**Mars 1996 – juillet 2000**

**Randomisés en 2 groupes: normothermie vs hypothermie**

**ACR devant témoin**

**Premier rythme: FV ou TV**

**Délai PEC5-15 mn et RCS<60 mn**

**Hypothermie modérée 32-34 C, pdt 24 h, monitorage vésical**

**Hypothermie induite par matelas air pulsé+/- packs de glace**

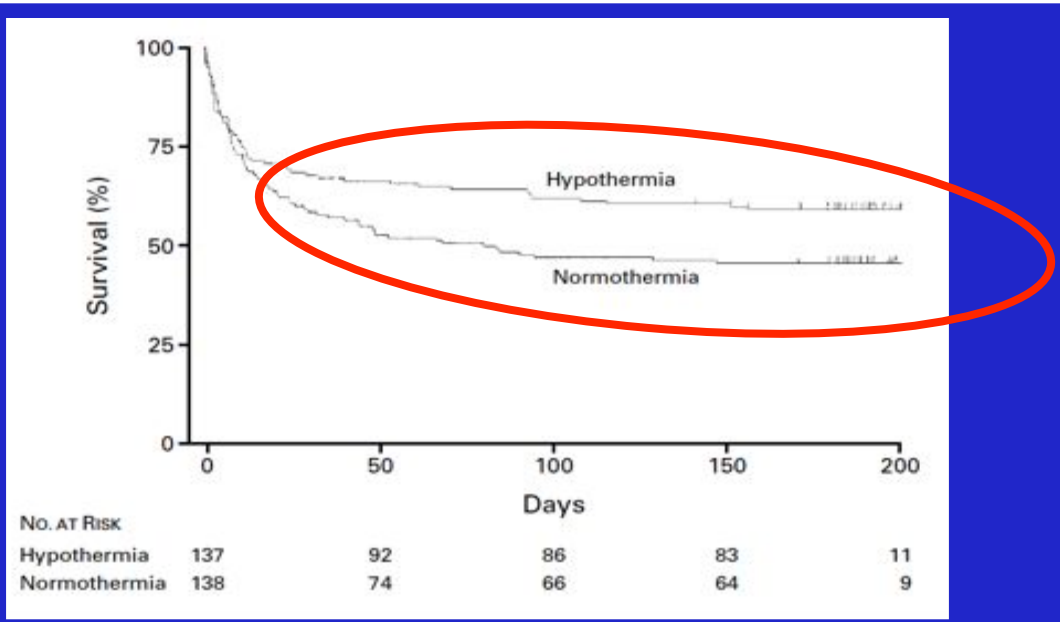
**Objectif principal: devenir neurologique à 6 mois**

**Objectifs secondaires: mortalité à 6 mois, complications 1 ère semaine**

# Pronostic neurologique et survie meilleurs dans le groupe hypothermie

**TABLE 2.** NEUROLOGIC OUTCOME AND MORTALITY AT SIX MONTHS.

| OUTCOME | NORMOTHERMIA | HYPOTHERMIA | RISK RATIO (95% CI)* | P VALUE† |
|---|---|---|---|---|
| | no./total no. (%) | | | |
| Favorable neurologic outcome | 54/137 (39) | 75/136 (55) | 1.40 (1.08–1.81) | 0.009 |
| Death | 76/138 (55) | 56/137 (41) | 0.74 (0.58–0.95) | 0.02 |



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

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

*NEJM, 2002; vol 346, No 8: 557-563*

**Etude australienne monocentrique**

**77 patients**

**Sept 1996 - juin 1999**

**Randomoisés en 2 groupes: normo vs hypothermie**

**Premeir rythme: FV**

**Hypothermie à 33 c pendant 12 h débutée en préhospitalier**

**Hypothermie induite par pack de glace**

**Monitorage tympanique et vésicale**

# Meilleur pronostic neurologique dans le groupe Hypothermie mais pas de différence en terme de mortalité

**TABLE 5.** OUTCOME OF PATIENTS AT DISCHARGE FROM THE HOSPITAL.

| OUTCOME* | HYPOTHERMIA (N=43) | NORMOTHERMIA (N=34) | |
|---|---|---|---|
| | number of patients | | |
| Normal or minimal disability (able to care for self, discharged directly to home) | 15 | 7 | p |
| Moderate disability (discharged to a rehabilitation facility) | 6 | 2 | |
| Severe disability, awake but completely dependent (discharged to a long-term nursing facility) | 0 | 1 | |
| Severe disability, unconscious (discharged to a long-term nursing facility) | 0 | 1 | |
| Death | 22 | 23 | |
| | 51% | 68% | |

p 0,046

P 0,0145



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# ILCOR Advisory Statement

## Therapeutic Hypothermia After Cardiac Arrest


**An Advisory Statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation**

**Writing Group**

**J.P. Nolan, FRCA; P.T. Morley, MD; T.L. Vanden Hoek, MD; R.W. Hickey, MD**

**Members of the Advanced Life Support Task Force**

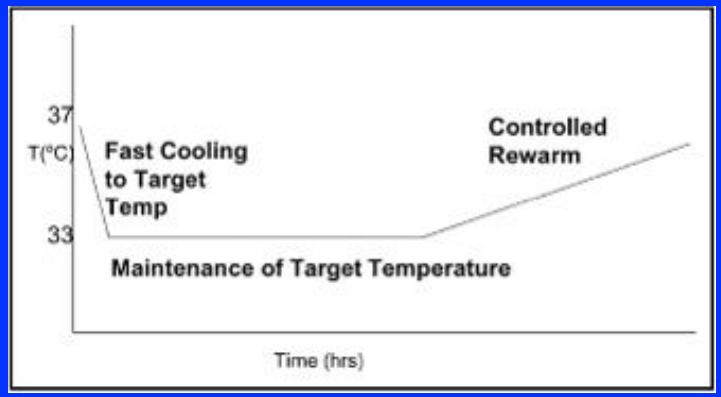
**W.G.J. Kloeck, MBBCh, DipPEC(SA), Chair; J. Billi, MD; B.W. Böttiger, MD; P.T. Morley, MD; J.P. Nolan, FRCA; K. Okada, MD; C. Reyes, MD; M. Shuster, MD, FRCPC; P.A. Steen, MD; M.H. Weil, MD, PhD; V. Wenzel, MD**

**Member of the Pediatric Life Support Task Force**

**R.W. Hickey, MD**

**Additional Contributors**

**P. Carli, MD; T.L. Vanden Hoek, MD; D. Atkins, MD**


**« On the basis of the published evidence to date, the Advanced Life Support (ALS) Task Force of the International Liaison Committee on Resuscitation (ILCOR) made the following recommendations in October 2002 :**

- **Unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest should be cooled to 32°C to 34°C for 12 to 24 hours when the initial rhythm was ventricular fibrillation (VF)**
- **Such cooling may also be beneficial for other rhythms or in-hospital cardiac arrest »**


**JSEB 2014**

**Circulation 2003;108:118-121**

# HYPOTHERMIE THERAPEUTIQUE

**2002 -> 2014**

**Quels AC ?**

Review

# The role of hypothermia in post-cardiac arrest patients with return of spontaneous circulation: A systematic review☆

James H. Walters[a,*], Peter T. Morley[b], Jerry P. Nolan[c]

Resuscitation 82 (2011) 508–516


## 3. Results

The search identified 2991 papers. Seventy-seven studies met with the criteria for further review. Of these, four were LOE 1 (meta-analyses)[14–17]; seven were LOE 1 (Randomized Controlled Trials),[18–24] but six of these were from the same group of patients[18]; nine LOE 2 (non-randomized, concurrent controls)[16,25–32]; 15 LOE 3 (retrospective controls)[7,8,33–45]; 40 LOE 4 (no controls); and one LOE 5 (extrapolated from non-cardiac arrest group).

The level of evidence and quality of the papers are summarized in Tables 3–6.

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Review

# The role of hypothermia in post-cardiac arrest patients with return of spontaneous circulation: A systematic review☆

James H. Walters[a,*], Peter T. Morley[b], Jerry P. Nolan[c]

Resuscitation 82 (2011) 508–516


**Table 3**
Evidence supporting therapeutic hypothermia following OHCA.

| | | | | |
|---|---|---|---|---|
| Good | Arrich, CD[16]<br>HACA study group, CD[18]<br>Tiainen, E[19]<br>Nielsen, D[17] | | | |
| Fair | Holzer, CD[14] | Bernard, [illegible]<br>Holzer, CD[26]<br>Kagawa,[32] D | Busch, C[34]<br>Belliard, CD[35]<br>Oddo, D[36]<br>Sunde, CD[37]<br>Storm, CDE[38]<br>Don, CD[39]<br>Bro-Jeppesen, D[40] | Sagalyn, [illegible] |
| Poor | Hachimi-Idrissi, E[20]<br>Cheung, CD[15] | Arrich, CD[67] | Castrejon, D[41] | Williams, D[86] |
| Level of evidence | 1 | 2 | 3 | 4 5 |

A = return of spontaneous circulation; B = survival of event; C = survival to hospital discharge; D = intact neurological survival; E = other endpoint.
[a] Meta-analysis.
[b] Overlapping patients

**Etudes de niveau 1 en faveur de l'Hypothermie Thérapeutique**

**5 Etudes de niveau 1 neutres vis-à-vis de l'Hypothermie Thérapeutique**

**Absence d'étude de niveau 1 contre l'Hypothermie Thérapeutique**

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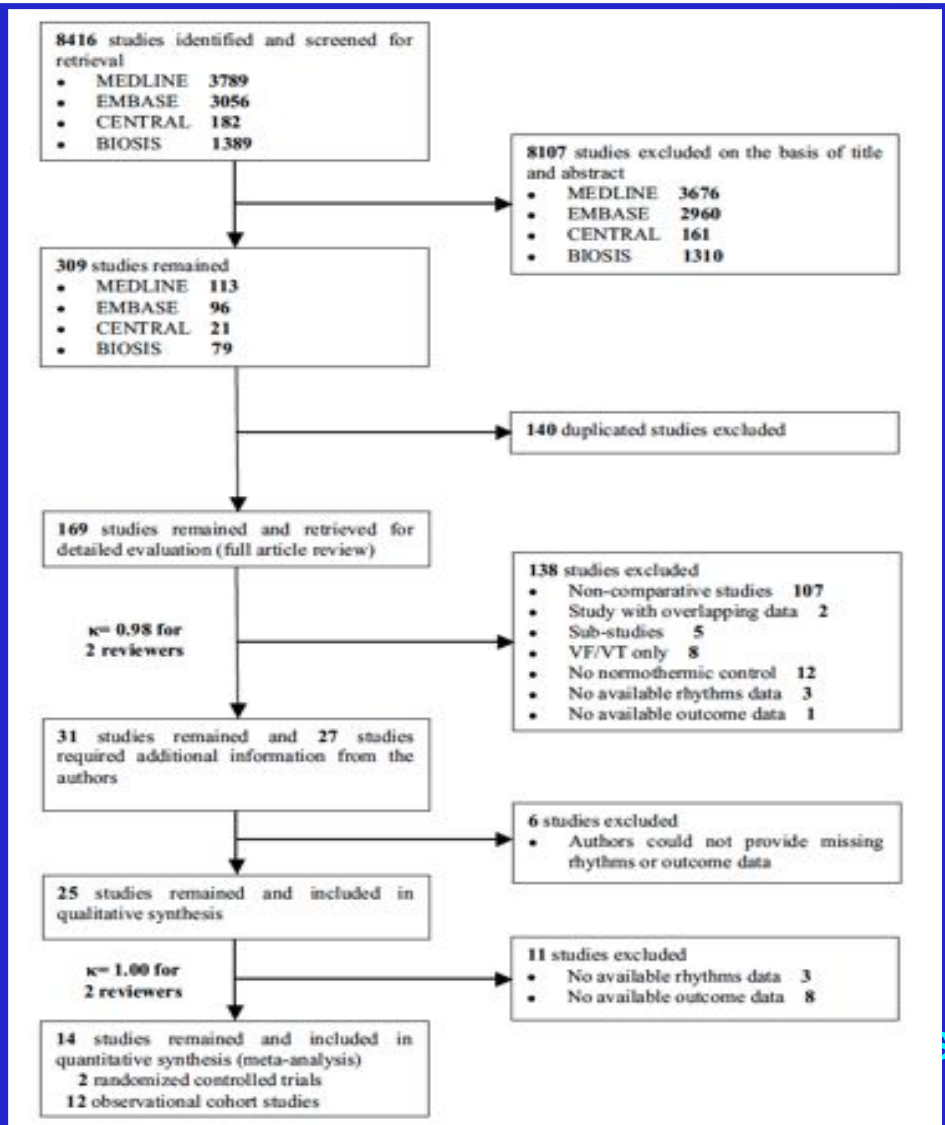
Does therapeutic hypothermia benefit adult cardiac arrest patients presenting with non-shockable initial rhythms?: A systematic review and meta-analysis of randomized and non-randomized studies☆

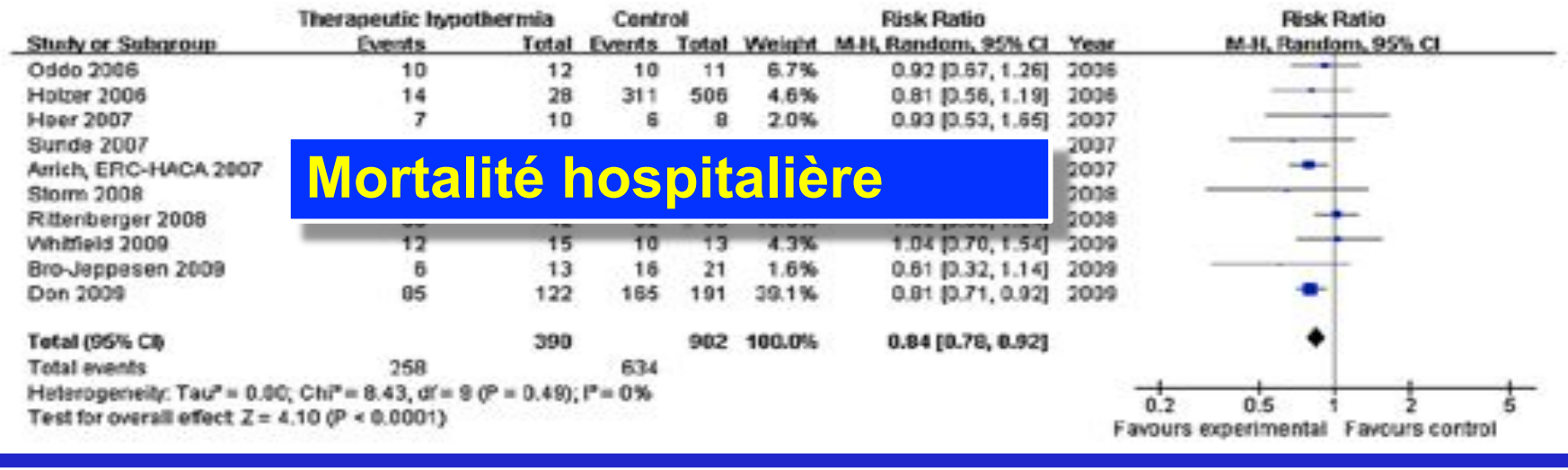
Resuscitation 83 (2012) 188–196

Young-Min Kim[a], Hyeon-Woo Yim[b,c], Seung-Hee Jeong[c], Mary Lou Klem[d], Clifton W. Callaway[e,*]

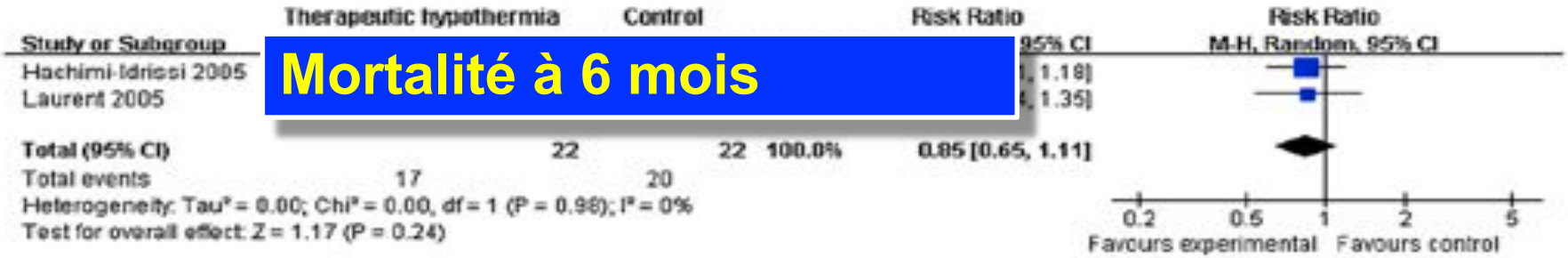

**Hypothermie thérapeutique ? pour les rythmes « non chocables »**



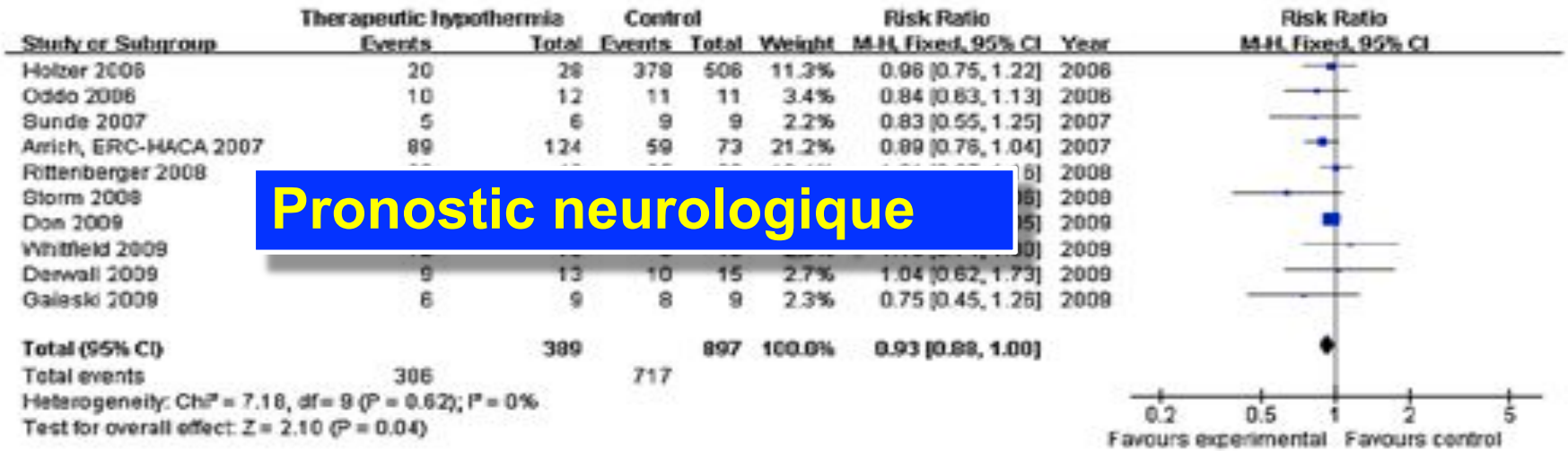
## Mortalité hospitalière




## Mortalité à 6 mois




## Pronostic neurologique




2014

# Is Hypothermia After Cardiac Arrest Effective in Both Shockable and Nonshockable Patients?

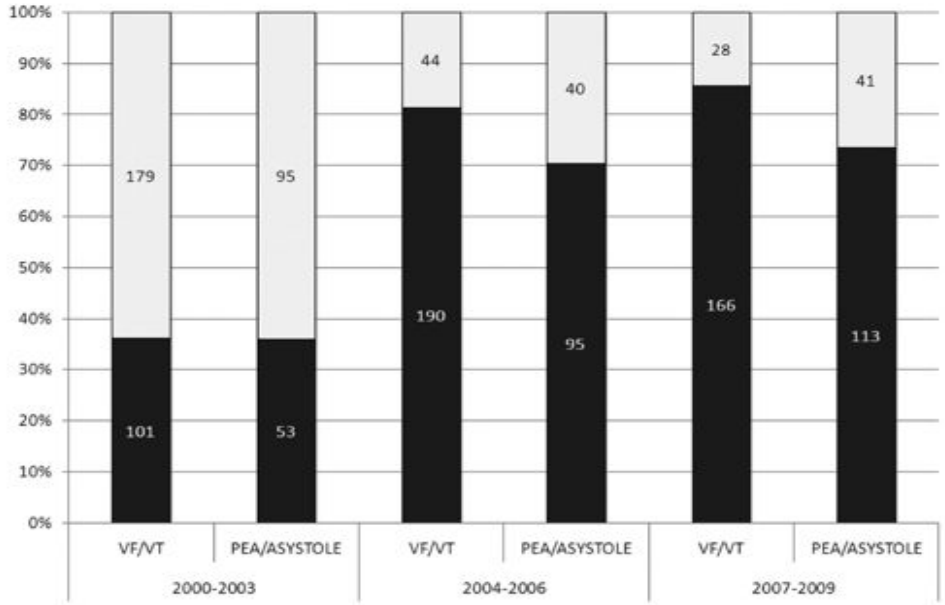
## Insights From a Large Registry

(*Circulation*. 2011;123:877-886.)

Florence Dumas, MD; David Grimaldi, MD; Benjamin Zuber, MD; Jérôme Fichet, MD; Julien Charpentier, MD; Frédéric Pène, MD, PhD; Benoît Vivien, MD, PhD; Olivier Varenne, MD; Pierre Carli, MD, PhD; Xavier Jouven, MD, PhD; Jean-Philippe Empana, MD, PhD; Alain Cariou, MD, PhD

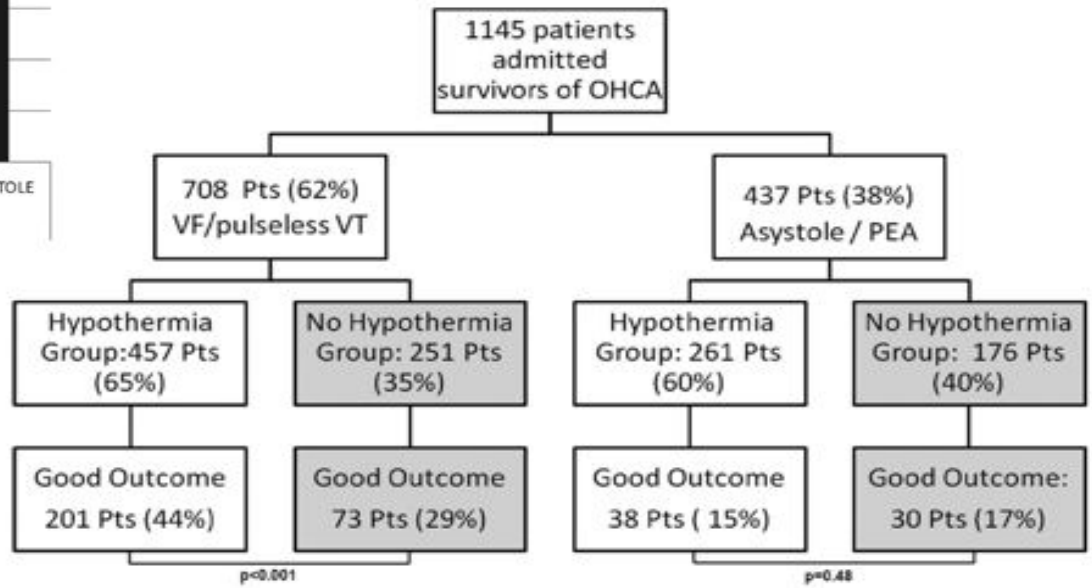
American Heart Association®

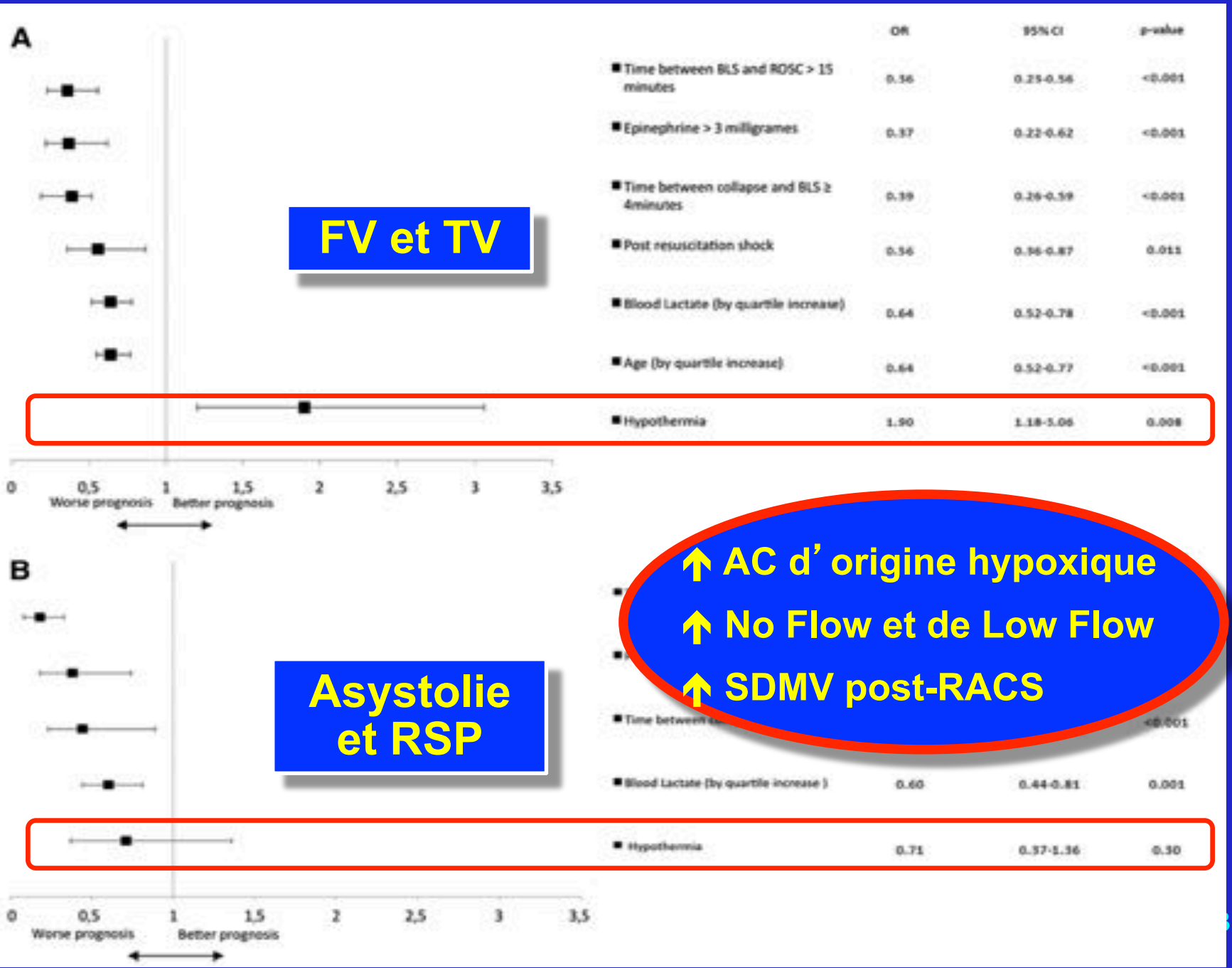
*Learn and Live*℠




**Pourquoi cette différence entre rythmes « chocables » et rythmes « non chocables »**

?




A
OR
95% CI
p-value
Time between BLS and ROSC > 15 minutes
0.56
0.25-0.56
<0.001
Epineghrine > 3 milligrames
0.37
0.22-0.62
<0.001
Time between collapse and BLS ≥ 4minutes
0.39
0.26-0.59
<0.001
Post resuscitation shock
0.56
0.36-0.87
0.011
Blood Lactate (by quartile increase)
0.64
0.52-0.78
<0.001
Age (by quartile increase)
0.64
0.52-0.77
<0.001
Hypothermia
1.90
1.18-5.06
0.008
0
0,5
1
1,5
2
2,5
3
3,5
Worse prognosis
Better prognosis
FV et TV
B
Asystolie et RSP
Blood Lactate (by quartile increase )
0.60
0.44-0.81
0.001
Hypothermia
0.71
0.37-1.36
0.30
0
0,5
1
1,5
2
2,5
3
3,5
Worse prognosis
Better prognosis
↑ AC d' origine hypoxique
↑ No Flow et de Low Flow
↑ SDMV post-RACS

# HYPOTHERMIE

## En pré-hospitalier ?
## pré RACS ?

Review article

Resuscitation 84 (2013) 1021–1028

# Prehospital therapeutic hypothermia after cardiac arrest: A systematic review and meta-analysis of randomized controlled trials☆


Mengyuan Diao[a,b,e], Fenglou Huang[b,e], Jun Guan[a], Zhe Zhang[a], Yan Xiao[c], Yi Shan[a], Zhaofen Lin[a,*], Liangcai Ding[d,*]

[a] Department of Emergency and Critical Care Medicine, Shanghai Changzheng Hospital, Shanghai, China
[b] Naval Convalescent Department, Hangzhou Sanatorium, Nanjing Military District, Hangzhou, China
[c] Department of Emergency and Critical Care Medicine, No. 2 Affiliated Hospital of Soochow University, Suzhou, China
[d] Department of Critical Care Medicine, Changzhou 1st People's Hospital, Changzhou, China

ARTICLE INFO

*Article history:*
Received 19 September 2012
Received in revised form 2 February 2013
Accepted 3 February 2013

*Keywor*
Meta-a
Prehos
Hypoth
Cardiac

ABSTRACT

*Background:* Therapeutic hypothermia has been recommended for the treatment of cardiac arrest patients who remain comatose after the return of spontaneous circulation. However, the optimal time to initiate therapeutic hypothermia remains unclear. The objective of the present study is to assess the effi ess and safety of prehospital therapeutic hypothermia after cardiac arrest.

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nothermi ient
ever, no significant
differences were observed in the survival to the hospital discharge, favorable neurological outcome at hospital discharge, and rearrest. The risk of bias was low; however, the quality of the evidence was very low.

*Conclusion:* This review demonstrates that prehospital therapeutic hypothermia after cardiac arrest can decrease temperature on hospital admission. On the other hand, regarding the survival to hospital discharge, favorable neurological outcome at hospital discharge, and rearrest, our meta-analysis and review produces non-significant results. Using the Grading of Recommendations, Assessment, Development and Evaluation methodology, we conclude that the quality of evidence is very low.

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**Conclusion :**

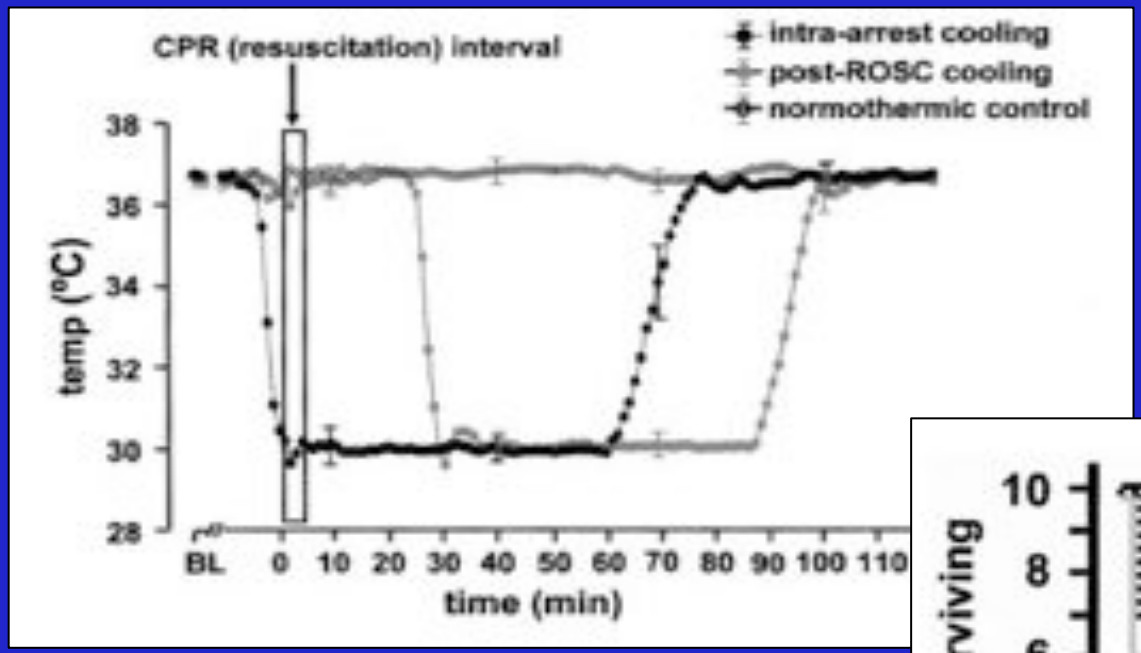
***« This review demonstrates that prehospital therapeutic hypothermia after cardiac arrest can decrease temperature on hospital admission. »***

**Méta-analyse**
**633(314/319c)**
**mai 2012**

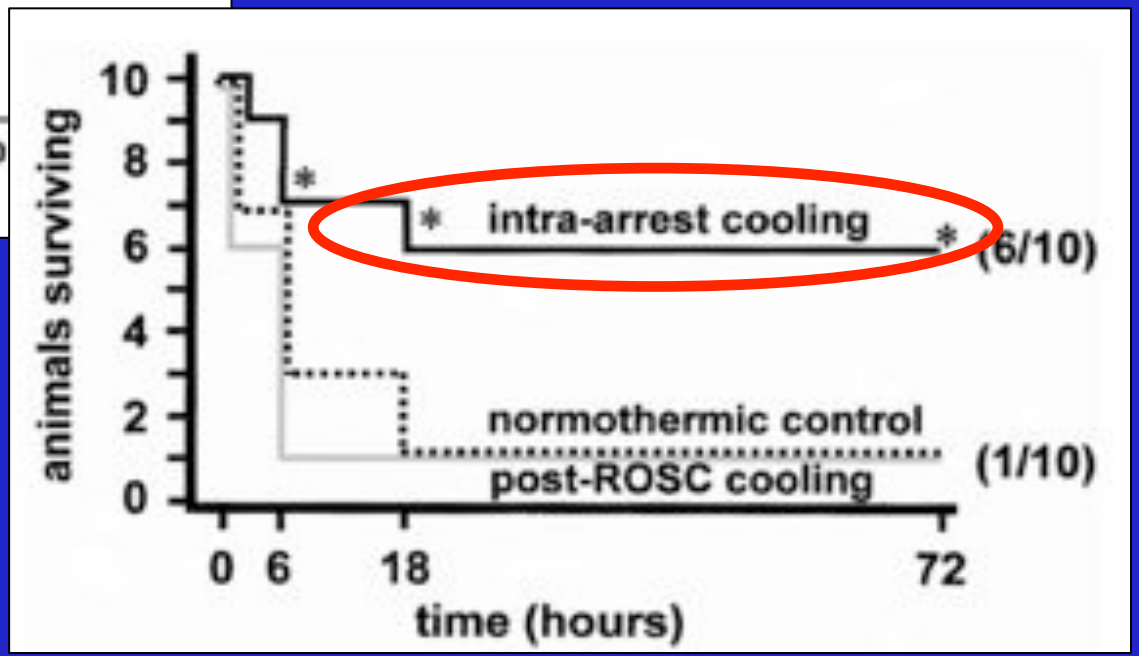
# Intra-Arrest Cooling Improves Outcomes in a Murine Cardiac Arrest Model

Benjamin S. Abella, MD, MPhil; Danhong Zhao, MD, PhD; Jason Alvarado, BA; Kim Hamann, PhD; Terry L. Vanden Hoek, MD; Lance B. Becker, MD

*Circulation* 2004, 109:2786-2791


N=10x3



RESEARCH Open Access

CRITICAL CARE

# Intra-arrest hypothermia during cardiac arrest: a systematic review

2012, 16 : R41

Sabino Scolletta[1], Fabio Silvio Taccone[1], Per Nordberg[2], Katia Donadello[1], Jean-Louis Vincent[1*] and Maaret Castren[3]

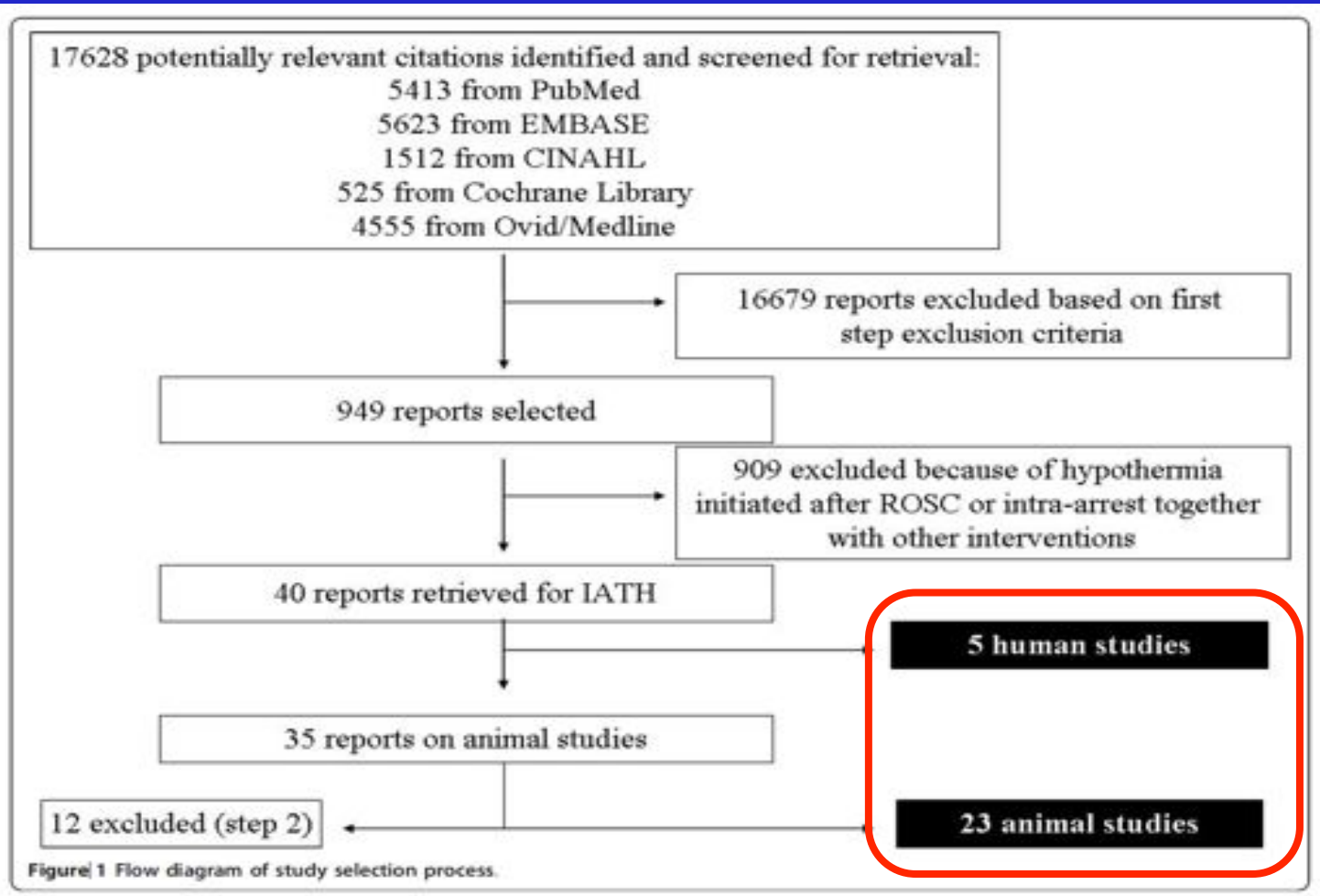



Figure 1 Flow diagram of study selection process.

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RESEARCH Open Access

CRITICAL CARE

# Intra-arrest hypothermia during cardiac arrest: a systematic review

2012, 16 : R41

Sabino Scolletta[1], Fabio Silvio Taccone[1], Per Nordberg[2], Katia Donadello[1], Jean-Louis Vincent[1*] and Maaret Castren[3]

**Table 2 Evidence on intra-arrest hypothermia for human cardiac arrest**

| Quality of Evidence | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Good | ** Castrén, ABCD<br>* Castrén, E | | | | |
| Fair | | | | | |
| Poor | | | * Garrett, A<br>** Garrett, BCD<br>** Callaway, E | * Bruel, E<br>* Kämäräinen, E | |

Level of Evidence

Outcomes: A, return of spontaneous circulation; B, survival of event; C, survival to hospital discharge; D, intact neurological survival; E, reduction in temperature. Evidence, * supporting; ** neutral; *** opposing

**Table 3 Ongoing clinical trials on intra-arrest therapeutic hypothermia in cardiac arrest**

| STATUS | NCT | STUDY |
|---|---|---|
| Active, recruiting | NCT01400373 | PRINCESS: Prehospital Resuscitation Intra Nasal Cooling Effectiveness Survival Study |
| Active, recruiting | NCT00886184 | HITUPPAC-BIO: Intra-arrest therapeutic hypothermia in pre-hospital cardiac arrest |
| Active, recruiting | NCT01413399 | A pilot study of intra-arrest hypothermia in patients suffering non-traumatic out-of-hospital cardiac arrest |
| Active, recruiting | NCT01173393 | Rapid Infusion of Cold Normal Saline During CPR for Patients With Non-VF Out-of-hospital Cardiac Arrest (RINSE) |

JSEB 2014

RESEARCH Open Access

CRITICAL CARE

# Intra-arrest hypothermia during cardiac arrest: a systematic review

2012, 16 : R41

Sabino Scolletta[1], Fabio Silvio Taccone[1], Per Nordberg[2], Katia Donadello[1], Jean-Louis Vincent[1*] and Maaret Castren[3]

## Abstract

**Introduction:** Therapeutic hypothermia is largely used to protect the brain following return of spontaneous circulation (ROSC) after cardiac arrest (CA), but it is unclear whether we should start therapeutic hypothermia earlier, that is, before ROSC.

**Methods:** We performed a systematic search of PubMed, EMBASE, CINAHL, the Cochrane Library and Ovid/Medline databases using "arrest" OR "cardiac arrest" OR "heart arrest" AND "hypothermia" OR "therapeutic hypothermia" OR "cooling" as keywords. Only studies using intra-arrest therapeutic hypothermia (IATH) were selected for this review. Three authors independently assessed the validity of included studies and extracted data regarding characteristics of the studied cohort (animal or human) and the main outcomes related to the use of IATH: Mortality, neurological status and cardiac function (particularly, rate of ROSC).

**Results:** A total of 23 animal studies (level of evidence (LOE) 5) and five human studies, including one randomized controlled trial (LOE 1), one retrospective and one prospective controlled study (LOE 3), and two prospective studies without a control group (LOE 4), were identified. IATH improved survival and neurological outcomes when compared to normothermia and/or hypothermia after ROSC. IATH was also associated with improved ROSC rates and with improved cardiac function, including better left ventricular function, and reduced myocardial infarct size, when compared to normothermia.

**Conclusions:** IATH improves survival and neurological outcome when compared to normothermia and/or conventional hypothermia in experimental models of CA. Clinical data on the efficacy of IATH remain limited.

# Hypothermie Thérapeutique
# Comment ?


# TECHNIQUES DE REFROIDISSEMENT

- Déshabillage du patient
- Insufflation d'air froid
- Méthodes par évaporation
- Application de packs de glace
- Matelas à eau, couvertures et patchs
- Casques réfrigérants
- immersion du patient dans un bain d'eau glacée
- Canulation des vaisseaux carotidiens
- Perfusions de volumes importants de solutés quasi-glacés
- Lavage de cavités physiologiques
- Refroidissement endo-vasculaire

Coolgard®-

RapidBlue Endovascular Cooling and Warming System®

- CEC
- Refroidissement intra nasal

Rhinochill brain freeze®



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# CORONAROGRAPHIE ET HYPOTHERMIE

Intensive Care Med (2014) 40:846–854
DOI 10.1007/s00134-014-3252-5

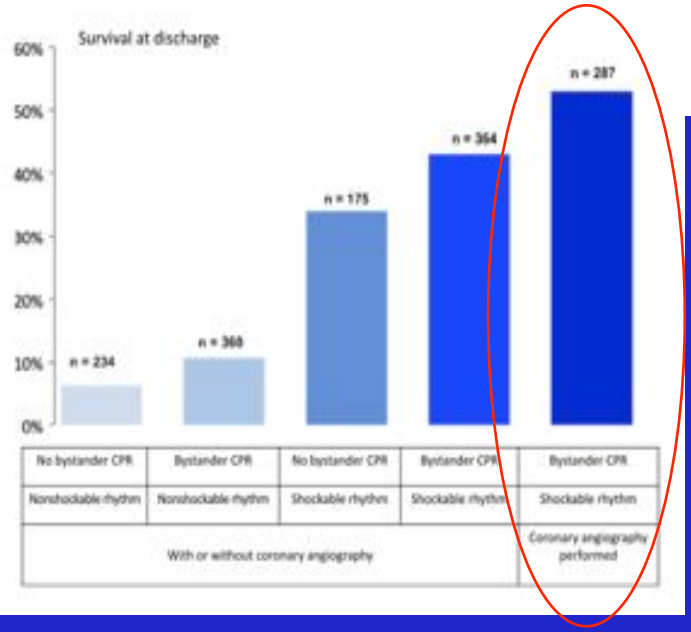
ORIGINAL

Wulfran Bougouin
Lionel Lamhaut
Eloi Marijon
Daniel Jost
Florence Dumas
Nicolas Deye
Frankie Beganton
Jean-Philippe Empana
Emilie Chazelle
Alain Cariou
Xavier Jouven

## Characteristics and prognosis of sudden cardiac death in Greater Paris

### Population-based approach from the Paris Sudden Death Expertise Center (Paris—SDEC)

Fig. 2 Survival at hospital discharge among patients admitted alive, according to main prognostic factors




Contents lists available at ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resuscitation

Clinical Paper

## Early coronary angiography and induced hypothermia are associated with survival and functional recovery after out-of-hospital cardiac arrest☆

Clifton W. Callaway[a,*], Robert H. Schmicker[b], Siobhan P. Brown[b], J. Michael Albrich[c], Douglas L. Andrusiek[d], Tom P. Aufderheide[e], James Christenson[d], Mohamud R. Daya[f], David Falconer[g], Ruchika D. Husa[h], Ahamed H. Idris[i], Joseph P. Ornato[j], Valeria E. Rac[g], Thomas D. Rea[b], Jon C. Rittenberger[a], Gena Sears[b], Ian G. Stiell[k], ROC Investigators

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[i] University of Texas, Southwestern, Dallas, TX, United States
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*Background:* The rate and effect of coronary interventions and induced hypothermia after out-of-hospital cardiac arrest (OHCA) are unknown. We measured the association of early (≤24 h after arrival) coronary angiography, reperfusion, and induced hypothermia with favorable outcome after OHCA.
*Methods:* We performed a secondary analysis of a multicenter clinical trial (NCT00394706) conducted between 2007 and 2009 in 10 North American regions. Subjects were adults (≥18 years) hospitalized after OHCA with pulses sustained ≥60 min. We measured the association of early coronary catheterization, percutaneous coronary intervention, fibrinolysis, and induced hypothermia with survival to hospital discharge with favorable functional status (modified Rankin Score ≤ 3).
*Results:* From 16,875 OHCA subjects, 3981 (23.6%) arrived at 151 hospitals with sustained pulses. 1317 (33.1%) survived to hospital discharge, with 1006 (25.3%) favorable outcomes. Rates of early coronary catheterization (19.2%), coronary reperfusion (17.7%) or induced hypothermia (39.3%) varied among hospitals, and were higher in hospitals treating more subjects per year. Odds of survival and favorable outcome increased with hospital volume (per 5 subjects/year OR 1.06; 95%CI: 1.04–1.08 and OR 1.06; 95%CI: 1.04, 1.08, respectively). Survival and favorable outcome were independently associated with early coronary angiography (OR 1.69; 95%CI 1.06–2.70 and OR 1.87; 95%CI 1.15–3.04), coronary reperfusion (OR 1.94; 95%CI 1.34–2.82 and OR 2.14; 95%CI 1.46–3.14), and induced hypothermia (OR 1.36; 95%CI 1.01–1.83 and OR 1.42; 95%CI 1.04–1.94).
*Interpretation:* Early coronary intervention and induced hypothermia are associated with favorable outcome and are more frequent in hospitals that treat higher numbers of OHCA subjects per year.

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The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

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

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

**2013**

**Dec 2013**
**N=950**
**2 groupes 33 et 36**
**Mortalité**
**Neuro**



**JSEB 2014**

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

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

Niklas Nielsen, M.D., Ph.D., Jørn Wetterslev, M.D., Ph.D., Tobias Cronberg, M.D., Ph.D.,

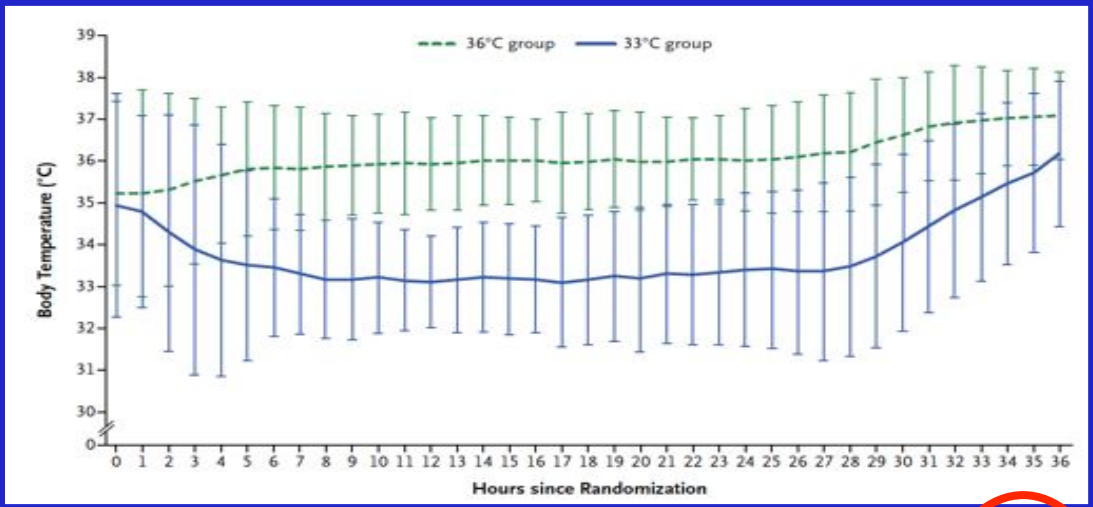
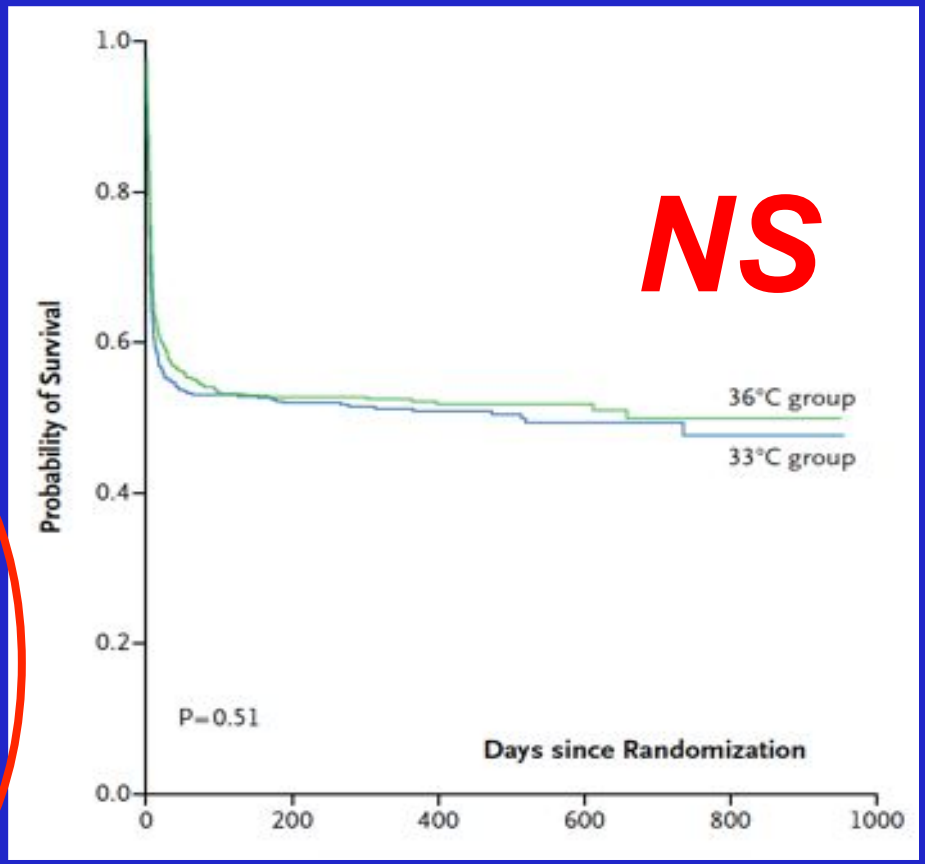



**Table 2. Outcomes.**

| Outcome | 33°C Group | 36°C Group | Hazard Ratio or Risk Ratio (95% CI) | P Value |
|---|---|---|---|---|
| | *no./total no. (%)* | | | |
| Primary outcome: deaths at end of trial | 235/473 (50) | 225/466 (48) | 1.06 (0.89–1.28) | 0.51 |
| Secondary outcomes | | | | |
| Neurologic function at follow-up† | | | | |
| CPC of 3–5 | 251/469 (54) | 242/464 (52) | 1.02 (0.88–1.16) | 0.78 |
| Modified Rankin scale score of 4–6 | 245/469 (52) | 239/464 (52) | 1.01 (0.89–1.14) | 0.87 |
| Deaths at 180 days | 226/473 (48) | 220/466 (47) | 1.01 (0.87–1.15) | 0.92 |

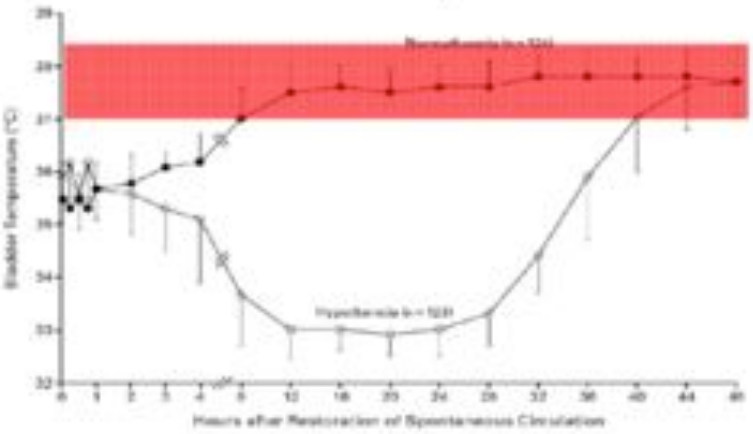



**NS**

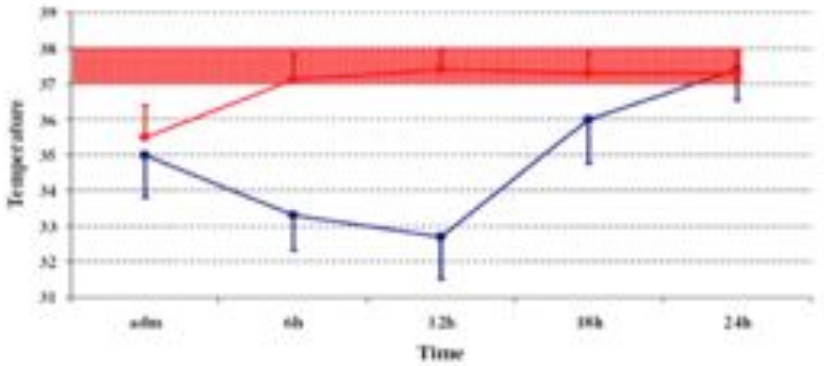
# Limites des deux études princeps

* Patients du groupe contrôle légèrement hyperthermes (37-38°pendant les 48 premières heures)

Europe



Australie




**Pas de traitement en aveugle**

**Hyperselection des patients**

**Randomisation médiocre ( pair /impair**

**Effets secondaires à reconsidérer**

# HYPOTHERMIE A QUEL PRIX ?

## Infectious complications in out-of-hospital cardiac arrest patients in the therapeutic hypothermia era*

(Crit Care Med 2011; 39:1359–1364)

Nicolas Mongardon, MD; Sébastien Perbet, MD; Virginie Lemiale, MD; Florence Dumas, MD; Hélène Poupet, MD; Julien Charpentier, MD; Frédéric Péne, MD; Jean-Daniel Chiche, MD; Jean-Paul Mira, MD; Alain Cariou, MD

| | Therapeutic Hypothermia (n = 334) | No Therapeutic Hypothermia (n = 87) | p |
|---|---|---|---|
| Age, yr | 60 (50–73) | 60 (49–71) | .86 |
| MacCabe score | | | |
| 0 | 288 | 69 | .2 |
| 1–2 | 47 | 17 | |
| Male, n (%) | 240 (72) | 71 (82) | .08 |
| Simplified Acute Physiology Score II | 64 (56–75) | 63 (53–77) | .41 |
| No-flow (min) | 5 (0–10) | 3 (0–10) | .07 |
| Low-flow (min) | 15 (8–25) | 10.5 (5–26) | .17 |
| Shockable rhythm, n (%) | 160 (48%) | 40 (46%) | .75 |
| Cardiac etiology, n (%) | 209 (63%) | 38 (44%) | .002[a] |
| Postresuscitation shock, n (%) | 180 (54%) | 42 (49%) | .35 |
| Infectious complication, n (%) | 230 (69%) | 51 (59%) | .03[a] |
| Cerebral performance category 1–2, n (%) | 120 (36%) | 29 (33%) | .66 |
| Intensive care unit mortality, n (%) | 208 (62%) | 58 (67%) | .45 |

Data are expressed as median (with interquartile range) or absolute value (%).
[a]Significant.



JSEB 2014

# THROMBOSE DE STENT ET HYPOTHERMIE

Resuscitation. 2014 Jun;85(6):769-73. doi: 10.1016/j.resuscitation.2014.02.013. Epub 2014 Feb 23.

## Stent thrombosis: An increased adverse event after angioplasty following resuscitated cardiac arrest.

Joffre J[1], Varenne O[2], Bougouin W[1], Rosencher J[2], Mira JP[3], Carlou A[4].

⊕ Author information

Abstract

**BACKGROUND:** The leading cause of sudden cardiac death is myocardial ischemia. As for uncomplicated acute myocardial infarction (AMI), international guidelines plead for early coronary angiography with, in case of culprit lesion, angioplasty and stent implantation. However after cardiac arrest (CA), shock, hypothermia and changes in antiplatelet pharmacokinetic may promote stent thrombosis (ST). Incidence of ST in this situation has never been studied.

**OBJECTIVE:** The aim of this study was to investigate incidence and determinants of ST after ischemic CA successfully revascularized.

**METHODS:** We analyzed 208 consecutive patients admitted in our institution for AMI and who underwent PCI with stent implantation. Among these patients, 55 presented a resuscitated CA and were compared to 153 without CA (control group). All patients in the CA group received hypothermia (33°C for 24h) following resuscitation and PCI.

**RESULTS:** There was no difference between the 2 groups for age, gender, cardiovascular risk factors, coronary lesions and type of stent. In the CA group, patients were less frequently pre-treated with heparin (50.9% vs 98.7%, p<0.001) and aspirin (52.7% vs 99%, p<0.001). In the CA group, we observed a significantly higher incidence of confirmed acute or subacute ST than in the control group: 10.9% vs 2.0% (p=0.01). None of CA patients had received a dual antiplatelets therapy (0% vs 99%). LVEF at admission was lower in the CA group (40.3% vs 48%; p<0.001), and shock was more frequent (83.6% vs 8.5%; p<0.001). Survival at 28 days was 50.1% in CA group vs 98.0% (p<0.001). In multivariate analysis, CA before stenting appears to be an independent risk factor for confirmed ST (OR=12.9; 95%CI 1.3-124.6; p=0.027).

**CONCLUSION:** In CA patients treated with cooling, stenting for AMI is associated with a high risk of ST. Shock, insufficient antithrombotic treatment, pharmacokinetic changes related to hypothermia may contribute to this higher risk. A strategy aiming to reduce this complication may probably improve prognosis of patients who underwent coronary sudden death.

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# CONCLUSION

## Strategies for Improving Survival After In-Hospital Cardiac Arrest in the United States: 2013 Consensus Recommendations

### A Consensus Statement From the American Heart Association

*Induction of Goal-Directed Mild Therapeutic Hypothermia*

Mild therapeutic hypothermia (32°C to 34°C) improves outcome of comatose survivors of witnessed OHCA when the initial rhythm is VF.[109,110] Similar studies have not been performed in patients who achieve ROSC after IHCA. The potential detrimental or beneficial effect of mild therapeutic hypothermia on active pathologies, comorbidities, and ongoing therapies must be considered. The role of therapeutic hypothermia in the management of IHCA and with initial rhythms other than VF in either the out-of-hospital or in-hospital setting is an important knowledge gap that needs to be addressed by future research. Despite this gap in research, the *2010 AHA Guidelines for CPR and ECC* recommend that induced hypothermia may be considered for comatose adult patients with ROSC after IHCA of any initial rhythm.[111]

*Circulation* April 9, 2013



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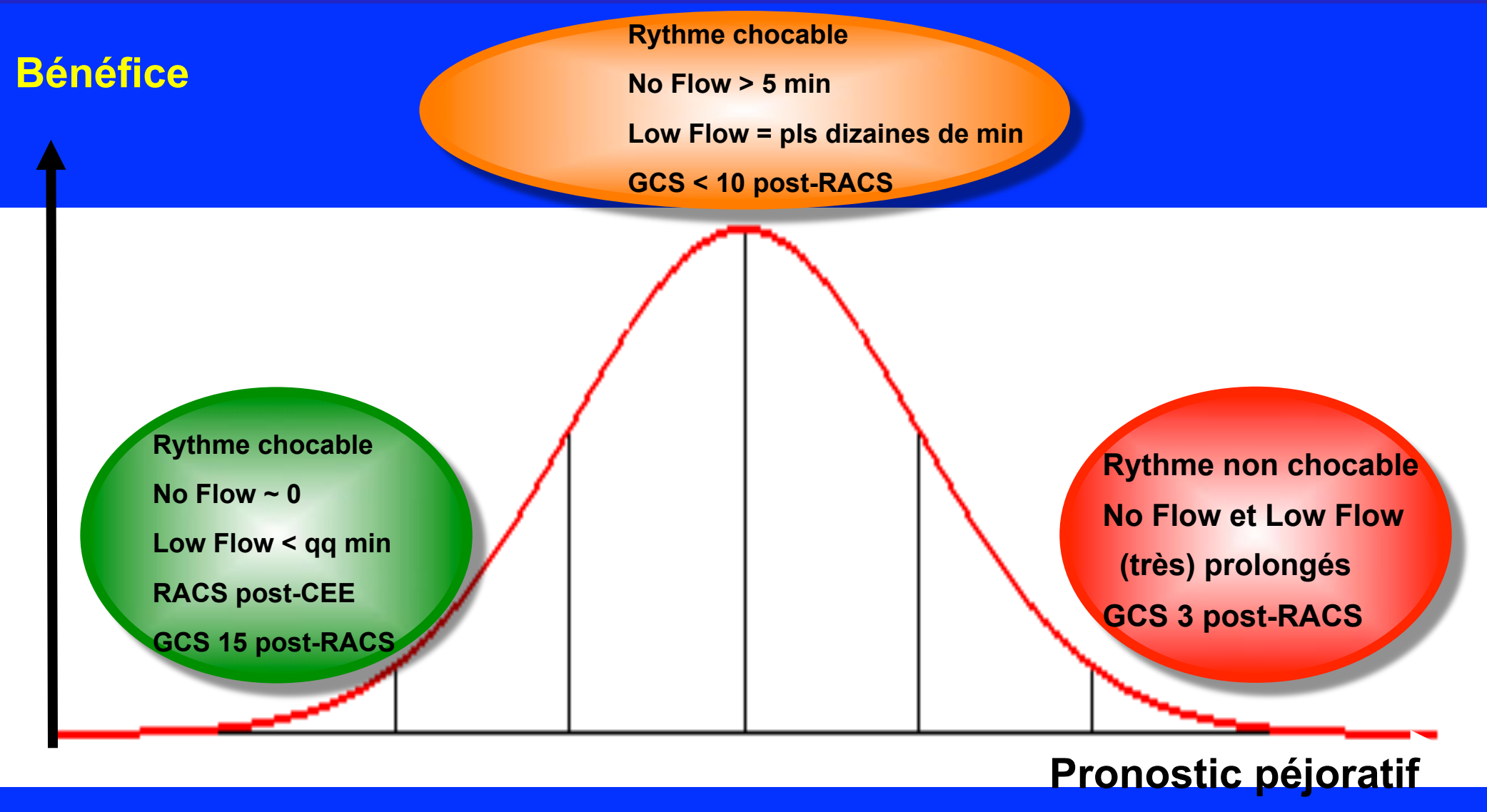
# Quels patients bénéficient réellement de l'Hypothermie Thérapeutique post-AC ?



ARTICLES

# Biarritz : sauvetage héroïque en pleine tempête

## Un PECO hypotherme sauvé des eaux !

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