

# IRC 2021

CONGRESSO  
NAZIONALE

16•17•18 DICEMBRE

NUOVE LINEE GUIDA 2021:  
RIANIMAZIONE CARDIOPOLMONARE  
**POST-LOCKDOWN**



Italian  
Resuscitation  
Council

**Dott. Niccolò B. Grieco**  
*Cardiologist at "De Gasperis Cardiocenter"  
Ospedale Niguarda - Milano*

## Angiografia e PCI: a chi e quando?







Sabato 11 Ottobre 2014

**N.Grieco, MD**

*Niguarda Hospital*

*Intensive Cardiac Care Unit & Prehospital*

*Emergency Care*

*IRC Board Member- ANMCO Fellow*

*Milan, Italy*



**LA RCP E' UN PUNTO D'INCONTRO DI DIVERSE PROFESSIONALITA': IL LAVORO DI EQUIPE**

**Chi sottoporre a coronarografia d'urgenza?  
Coronarografia durante e/o dopo RCP**



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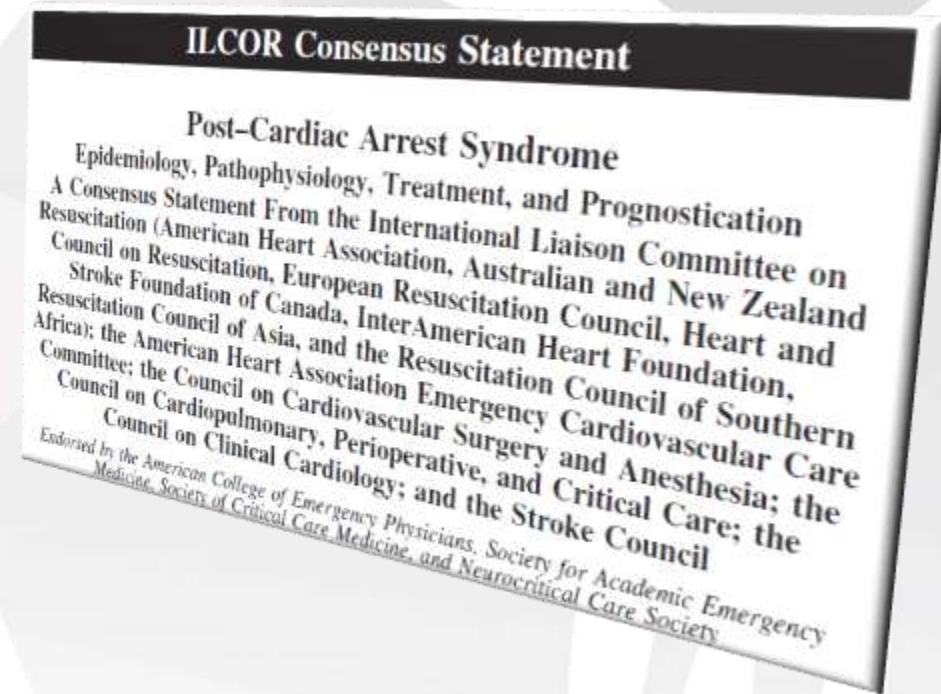
# Post Cardiac Arrest Myocardial Dysfunction

## Management of ACS

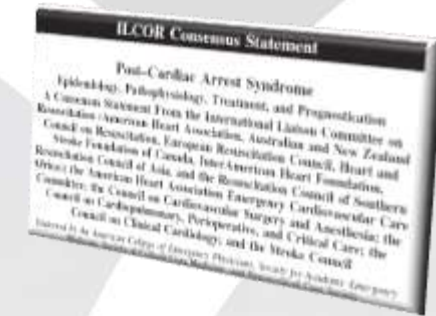
**CAD is present in the majority of out-of-hospital cardiac arrest patients, and acute myocardial infarction is the most common cause of sudden cardiac death. One autopsy study reported coronary artery thrombi in 74 of 100 subjects who died of ischemic heart disease within 6 hours of symptom onset and plaque fissuring in 21 of 26 subjects in the absence of thrombus.** A more recent review reported acute changes in coronary plaque morphology in 40% to 86% of cardiac arrest survivors and in 15% to 64% of autopsy studies. The feasibility and success of early coronary angiography and subsequent percutaneous coronary intervention (PCI) after out-of-hospital cardiac arrest are well described [...]

In several of these studies, PCI was combined with therapeutic hypothermia

*In this study, 21 (78%) of 27 hypothermia-treated 6-month survivors had a good neurological outcome (CPC of 1 or 2) compared with only 6 (50%) of 12 non-hypothermia-treated 6-month survivors.*



# Post Cardiac Arrest Myocardial Dysfunction



Studies with broader inclusion criteria (not limited to ST-elevation myocardial infarction) have also shown promising results. In 1 such study [...] revealed CAD in 97%; of these, 80% had total occlusion of a major coronary artery. Nearly half of these patients underwent reperfusion interventions, with the majority by PCI and a minority by coronary artery bypass graft. Among patients admitted after ROSC, the overall in-hospital mortality rate decreased from 72% before the introduction of a comprehensive post-cardiac arrest care plan (which included this intensive coronary reperfusion strategy and therapeutic hypothermia) to 44% ( $P0.001$ ), and 90% of survivors were neurologically normal. [...]

In summary, patients resuscitated from cardiac arrest who have electrocardiographic criteria for STEMI should undergo immediate coronary angiography, with subsequent PCI if indicated. Furthermore, given the high incidence of ACS in patients with out-of-hospital cardiac arrest and limitations of electrocardiography-based diagnosis, it is appropriate to consider immediate coronary angiography in all post-cardiac arrest patients in whom ACS is suspected.  
Standard guidelines for management of ACS and CAD should be followed.

# Coorte STEMI: conclusioni

**Tabella 1.** Studi sulla coronarografia nell'arresto cardiaco condotti su pazienti con sopraslivellamento del tratto ST all'ECG dopo ripristino di circolazione spontanea.

|  | Tipo di studio | N. pazienti | TV/FV          | CGF            | PTCA           | PTCA efficace <sup>a</sup> (TIMI 2-3) | Sopravvivenza (TIMI 2-3)                                 |
|--|----------------|-------------|----------------|----------------|----------------|---------------------------------------|--|
| Bendz et al. <sup>20</sup> , 2004      | R              | 40          | 36/40 (90%)    | 40/40 (100%)   | 40/40 (100%)   | 38/40 (95%)                           | 29/40 (73%) <sup>b</sup><br>29/40 (73%) <sup>c</sup>     |
| Garot et al. <sup>21</sup> , 2007      | R              | 186         | 186/186 (100%) | 186/186 (100%) | 186/186 (100%) | 161/186 (87%)                         | 103/186 (55%) <sup>b</sup><br>100/186 (54%) <sup>c</sup> |
| * Gorjup et al. <sup>22</sup> , 2007   | R              | 135         | 112/135 (83%)  | 117/135 (87%)  | 109/135 (81%)  | 102/135 (76%)                         | 93/135 (69%) <sup>b</sup><br>67/135 (50%) <sup>c</sup>   |
| ** Horjane et al. <sup>23</sup> , 2009 | R              | 98          | NN             | 98/98 (100%)   | 64/98 (65%)    | 62/98 (63%)                           | 63/98 (64%) <sup>b</sup><br>60/98 (61%) <sup>c</sup>     |
| Lettieri et al. <sup>24</sup> , 2009   | R              | 99          | 90/99 (91%)    | 99/99 (100%)   | 99/99 (100%)   | 80/99 (80%)                           | 77/99 (78%) <sup>b</sup><br>74/99 (75%) <sup>c</sup>     |

CGF, coronarografia; NN, non noto; PTCA, angioplastica coronarica percutanea; R, retrospettivo; TV/FV, tachicardia/fibrillazione ventricolare.  
<sup>a</sup> la definizione di PTCA efficace varia tra i diversi lavori; <sup>b</sup> sopravvivenza alla dimissione; <sup>c</sup> sopravvivenza a 6 mesi.

- ✓ Tutti gli STEMI hanno indicazione a coro/PTCA in emergenza
- ✓ quelli che recuperano precocemente lo stato neurologico hanno sopravvivenza uguale alla popolazione senza ACC \*
- ✓ Il vantaggio in termini di mortalità si mantiene anche nei pazienti in stato comatoso, sia immediato che a 6 mesi. \*\*



**Table 7 Cardiac arrest**

| Recommendations   | Class <sup>a</sup> | Level <sup>b</sup> | Ref <sup>c</sup> |
|---|--------------------|--------------------|------------------|
| All medical and paramedical personnel caring for a patient with suspected myocardial infarction must have access to defibrillation equipment and be trained in cardiac life support.              | I                  | C                  | -                |
| It is recommended to initiate ECG monitoring at the point of FMC in all patients with suspected myocardial infarction.  | I                  | C                  | -                |
| Therapeutic hypothermia is indicated early after resuscitation of cardiac arrest patients who are comatose or in deep sedation.   | I                  | B                  | 34–36            |
| Immediate angiography with a view to primary PCI is recommended in patients with resuscitated cardiac arrest whose ECG shows STEMI.   | I                  | B                  | 31–33            |
| Immediate angiography with a view to primary PCI should be considered in survivors of cardiac arrest without diagnostic ECG ST-segment elevation but with a high suspicion of ongoing infarction. | IIa                | B                  | 31, 33           |

ECG = electrocardiogram; FMC = first medical contact; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

<sup>a</sup>Class of recommendation.

<sup>b</sup>Level of evidence.

## Coorte NSTEMI...i dubbi si affollano:

- ✓ Quale peso ha la patologia coronarica nel determinare l'ACC?
- ✓ quale accuratezza ha l'ECG nel post-ACC? È sufficiente per escludere l'ischemia?
- ✓ la CGF routinaria modifica la prognosi di questi pazienti?
- ✓ la strategia invasiva ha senso anche nel paziente comatoso?





## Immediate Percutaneous Coronary Intervention Is Associated With Better Survival After Out-of-Hospital Cardiac Arrest Insights From the PROCAT (Parisian Region Out of Hospital Cardiac Arrest) Registry

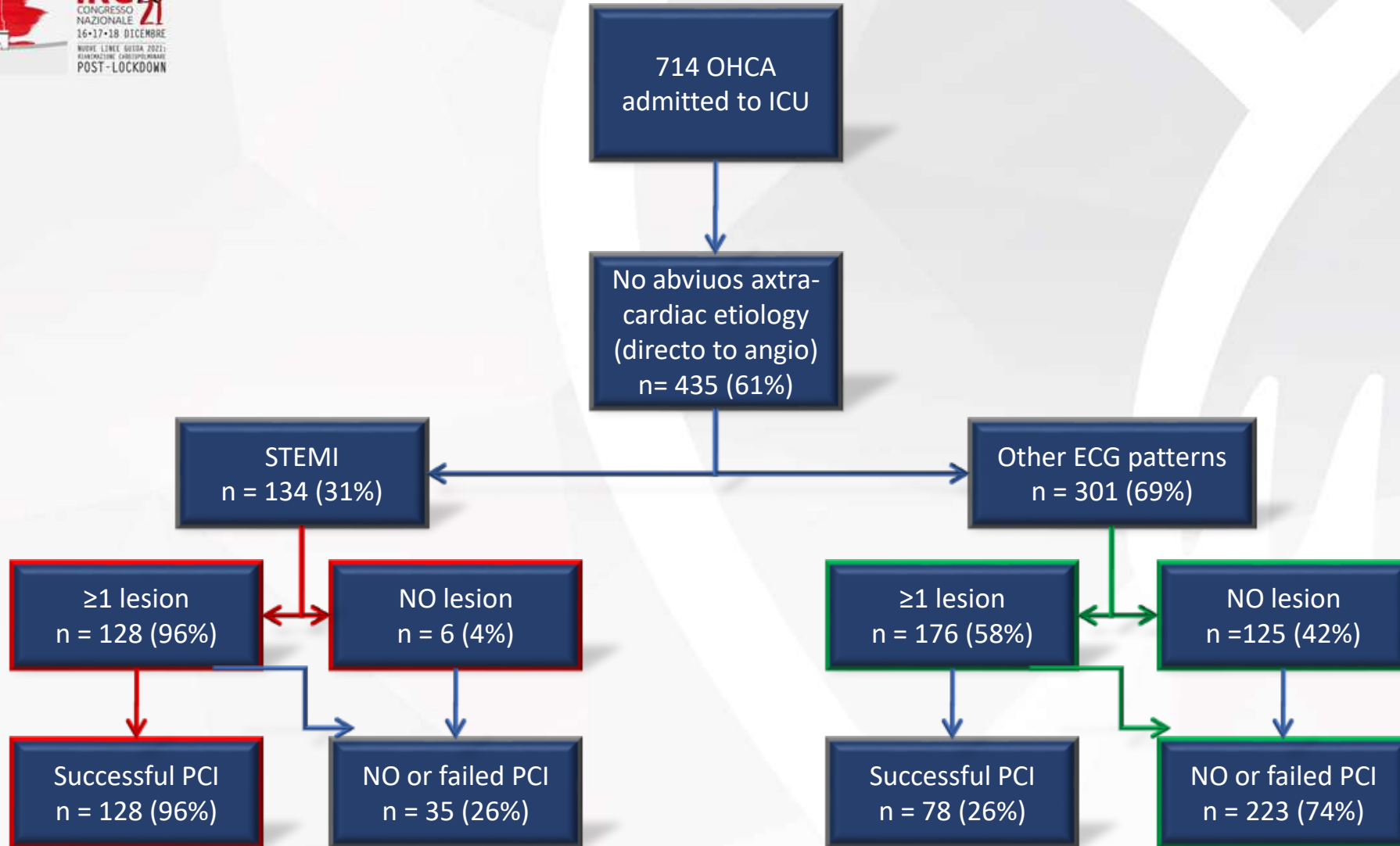
*Florence Dumas, MD; Alain Cariou, MD; Stéphane Manzo-Silberman, MD; David Grimaldi, MD; Benoît Vivien, MD; Julien Rosencher, MD; Jean-Philippe Empana, MD; Pierre Carli, MD; Jean-Paul Mira, MD; Xavier Jouven, MD; Christian Spaulding, MD*

Out-of-hospital cardiac arrest (OHCA) is a leading cause of death in western countries. Despite recent advances in public education and resuscitation process, few patients will survive up to hospital admission and even fewer will be discharged alive from the hospital. Hospital survival rates remain low, ranging from 21% to 33%, and clearly have not improved in recent years.

Based on past clinical studies, recent guidelines recommend that patients resuscitated from OHCA who have electrocardiographic criteria for myocardial infarction with STE should undergo immediate coronary angiography with subsequent percutaneous intervention (PCI), if indicated. However, the predictive value of the ECG for coronary artery occlusion is poor, and clinical data such as chest pain or risk factors often are lacking in the setting of OHCA. Furthermore, given the high incidence of acute coronary syndrome (ACS) in patients with OHCA, guidelines also recommend considering immediate coronary angiography in all patients with postcardiac arrest in whom ACS is suspected. **Therefore, it is difficult in clinical practice to select candidates for early coronary angiography.**



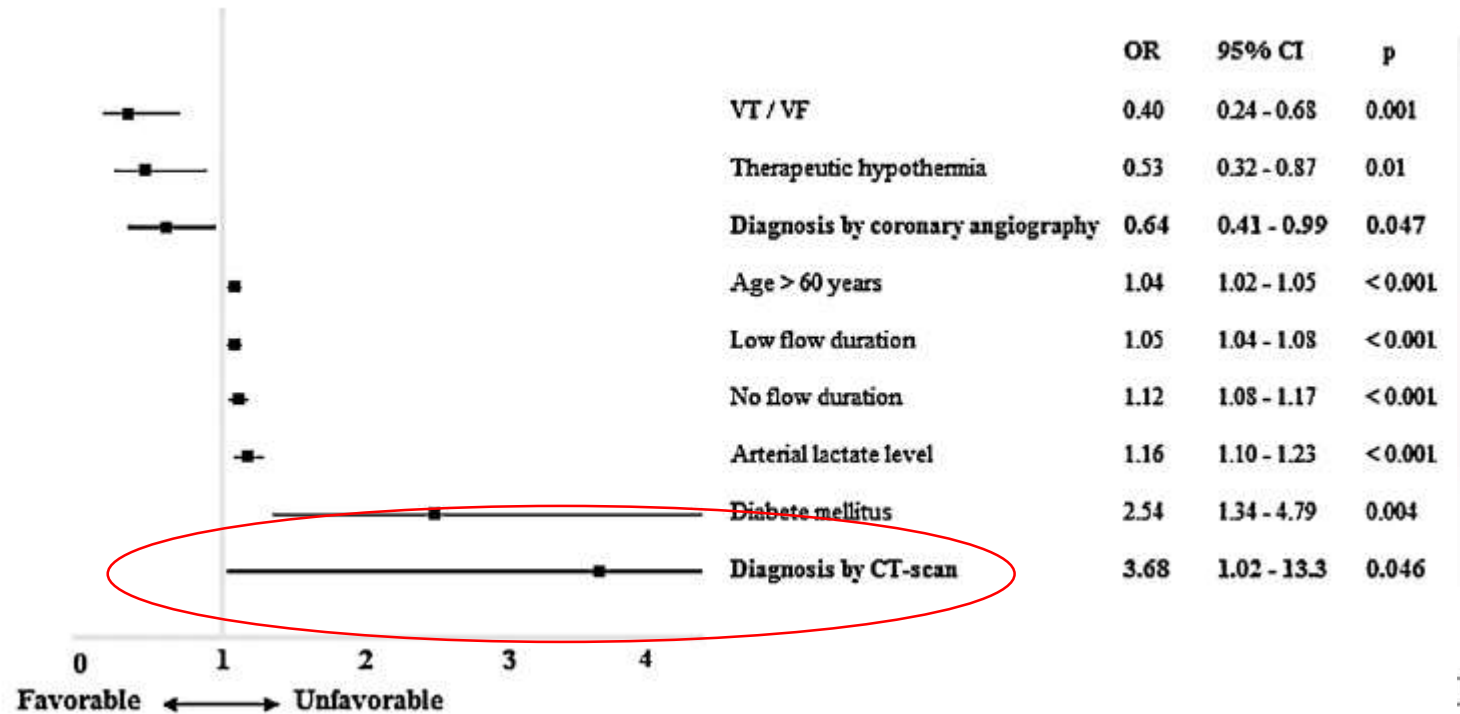
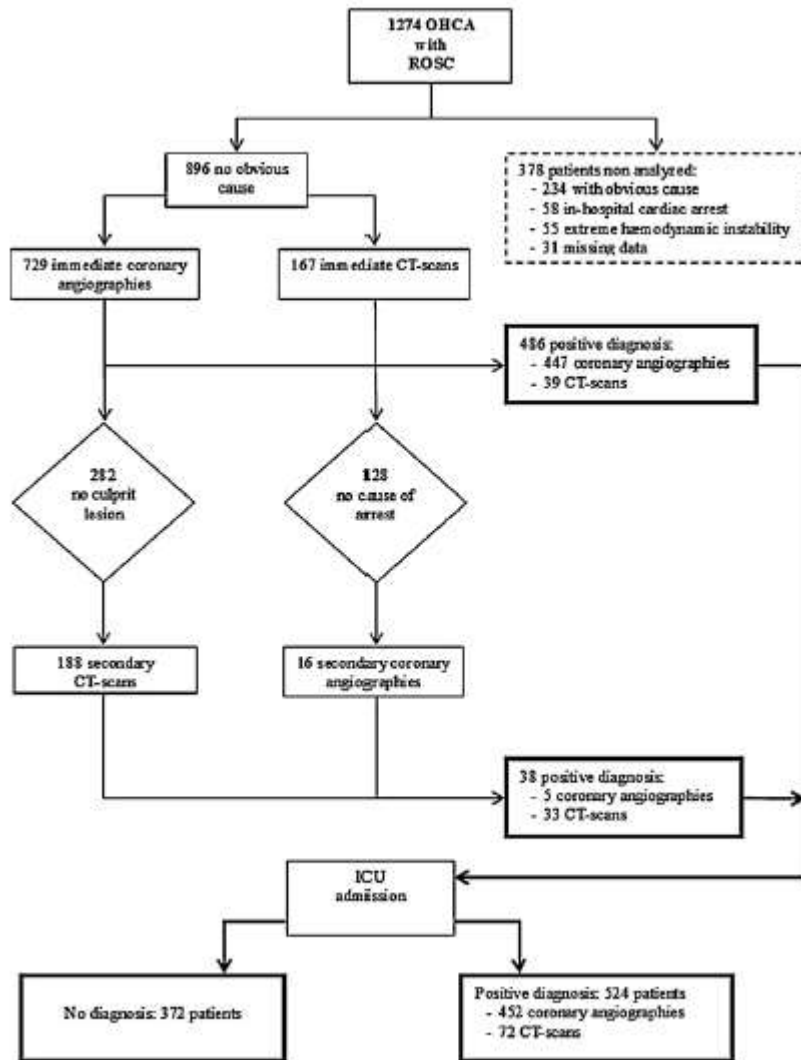
Italian  
Resuscitation  
Council



## Clinical paper

## Benefit of an early and systematic imaging procedure after cardiac arrest: Insights from the PROCAT (Parisian Region Out of Hospital Cardiac Arrest) registry

Jonathan Chellya, Nicolas Mongardona, Florence Dumas, Olivier Varenne, Christian Spaulding, Olivier Vignaux, Pierre Carli, Julien Charpentiera, Frédéric Pènea, Jean-Daniel Chichea, Jean-Paul Miraa, Alain Carioua,



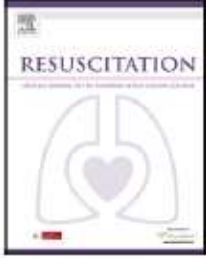




Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

# Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



## Clinical paper

### Cardiac catheterization is associated with superior outcomes for survivors of out of hospital cardiac arrest: Review and meta-analysis<sup>☆</sup>



Anthony C. Camuglia<sup>a,b,c,\*</sup>, Varinder K. Randhawa<sup>d</sup>, Shahar Lavi<sup>d</sup>, Darren L. Walters<sup>c,e</sup>

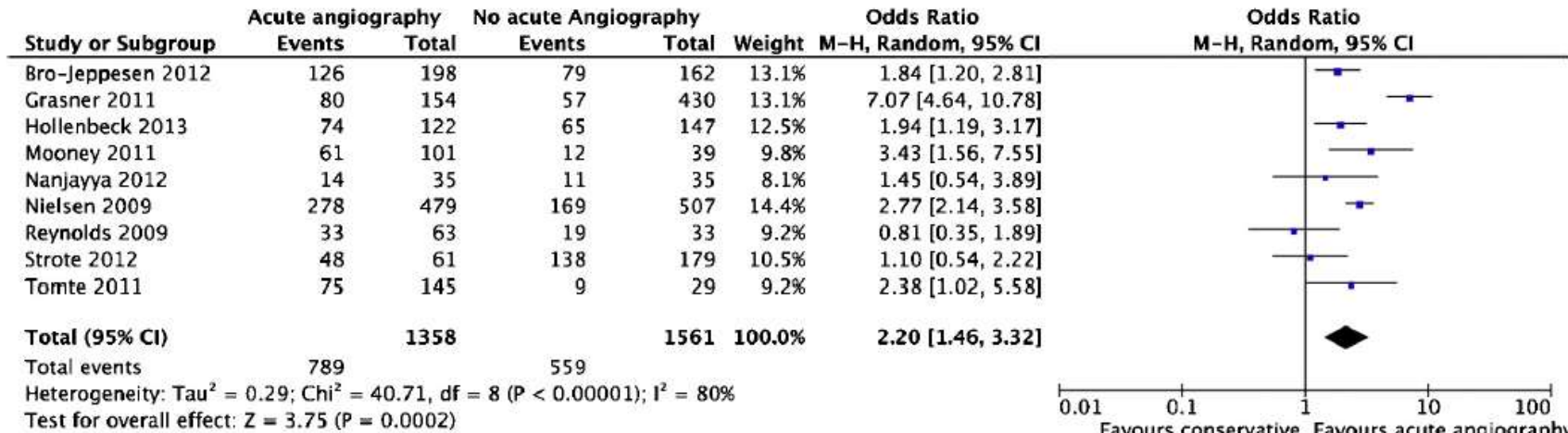


Fig. 3. Weighted hazard effects model of the relationship between acute coronary angiography and good neurological outcome after OHCA.

## Come la pensavamo nel 2014



### Coorte NSTEMI...i dubbi si affollano:

- ✓ Quale peso ha la patologia coronarica nel determinare l'ACC?
  - ✓ Studi autoptici, retrospettivi e prospettici dimostrano l'incidenza di una patologia coronarica in una grande percentuale di casi di ACC anche in assenza di ECG STE
- ✓ quale accuratezza ha l'ECG nel post-ACC? È sufficiente per escludere l'ischemia?
  - ✓ l'ECG post ACC ha un VPP 96% ma un VPN 42% non può quindi essere utilizzato per il rule-out
- ✓ la CGF routinaria modifica la prognosi di questi pazienti?
  - ✓ si, i miglioramento della sopravvivenza sono indipendenti dal pattern ECG
- ✓ la strategia invasiva ha senso anche nel paziente comatoso?
  - ✓ tale strategia si dimostra efficace anche in pazienti in stato comatoso. I predittori di ripresa dello stato di coscienza sono però molteplici. (sopravvivenza 75% vs 44%, recupero neurologico 55% vs 16% - Knafelj Resu 2007;74: 227-34)

# Raccomandazioni EAPCI

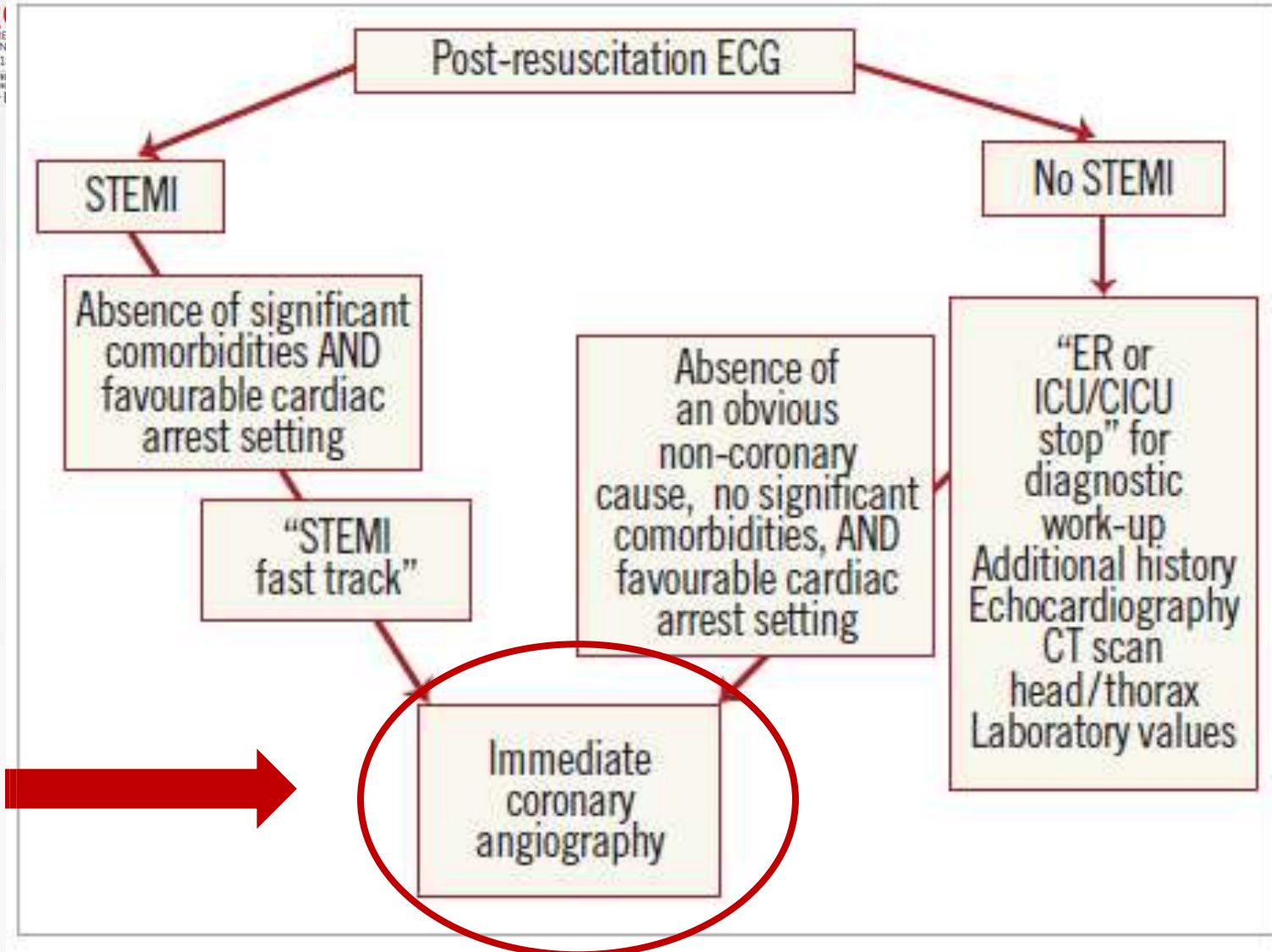
- Nei pazienti in arresto cardiaco extraospedaliero
  - Coronarografia immediata se  $\uparrow$ ST all'ECG
  - Coronarografia rapida (<2 ore) negli altri casi se
    - Non c'è causa non-coronarica evidente
    - Paziente emodinamicamente instabile

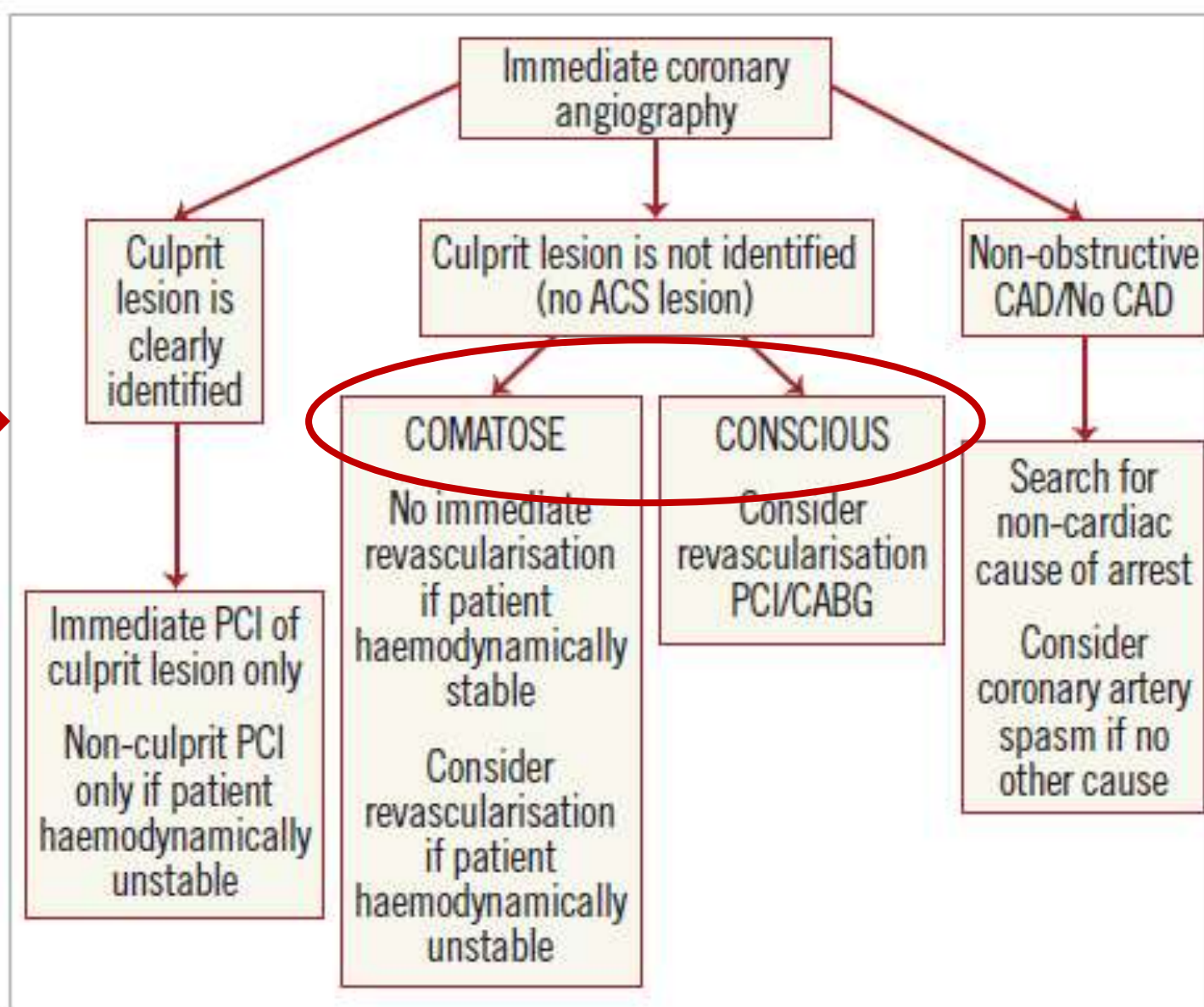
*Noc M et al. EuroIntervention 2014;10:31-7*

## **Invasive coronary treatment strategies for out-of-hospital cardiac arrest: a consensus statement from the European Association for Percutaneous Cardiovascular Interventions (EAPCI)/Stent for Life (SFL) groups**

Marko Noc<sup>1</sup>, MD; Jean Fajadet<sup>2</sup>, MD; Jens F. Lassen<sup>3</sup>, MD; Petr Kala<sup>4</sup>, MD; Philip MacCarthy<sup>5</sup>, MD; Goran K. Olivecrona<sup>6</sup>, MD; Stephan Windecker<sup>7</sup>, MD; Christian Spaulding<sup>8\*</sup>, MD











# The NEW ENGLAND JOURNAL of MEDICINE

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APRIL 11, 2019

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## Coronary Angiography after Cardiac Arrest without ST-Segment Elevation

***“In this multicenter trial, we randomly assigned 552 patients who had cardiac arrest without signs of STEMI to undergo immediate coronary angiography or coronary angiography that was delayed until after neurologic recovery. All patients underwent PCI if indicated. The primary end point was survival at 90 days.”***

Patients were eligible for the trial if they had had an out-of-hospital cardiac arrest with an initial shockable rhythm and were unconscious after the return of spontaneous circulation. Patients were excluded if they had signs of STEMI on ECG in the emergency department, shock, or an obvious noncoronary cause of the arrest.

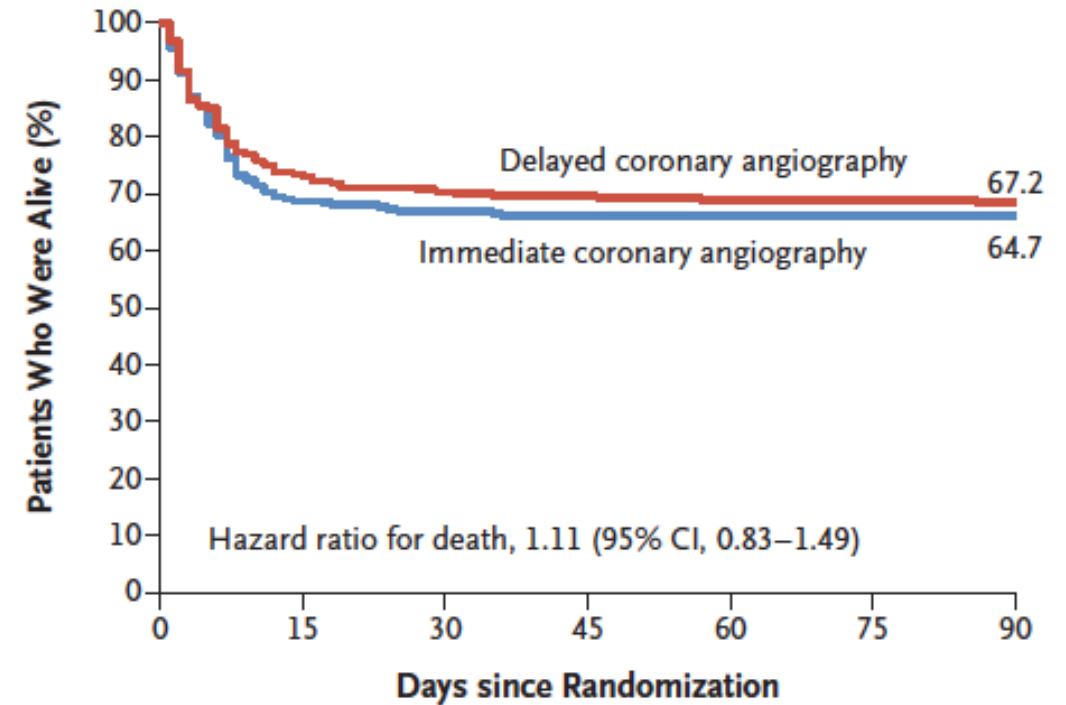
The results of the trial did not show a significant difference between the two treatment groups in the primary end point of survival at 90 days.

A reason for the lack of benefit of early coronary intervention may be that the majority of nonsurvivors died of neurologic complications after the cardiac arrest.

### Limiti:

- Non in cieco
- Il gruppo early angio raggiungeva TT più tardivamente
- Il gruppo PCI aveva ASA + P2Y12

E infine....**sono sopravvissuti molto di più dell'atteso** (inficiando il power statistico)



| No. at Risk |     |     |     |     |     |     |     |
|-------------|-----|-----|-----|-----|-----|-----|-----|
| Delayed     | 265 | 191 | 183 | 181 | 179 | 179 | 178 |
| Immediate   | 273 | 183 | 178 | 176 | 176 | 176 | 176 |

**Figure 1.** Kaplan–Meier Estimates of Survival among Patients Who Underwent Immediate or Delayed Coronary Angiography after Cardiac Arrest.

There was no significant difference between the two groups in overall survival at 90 days.

ORIGINAL ARTICLE

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

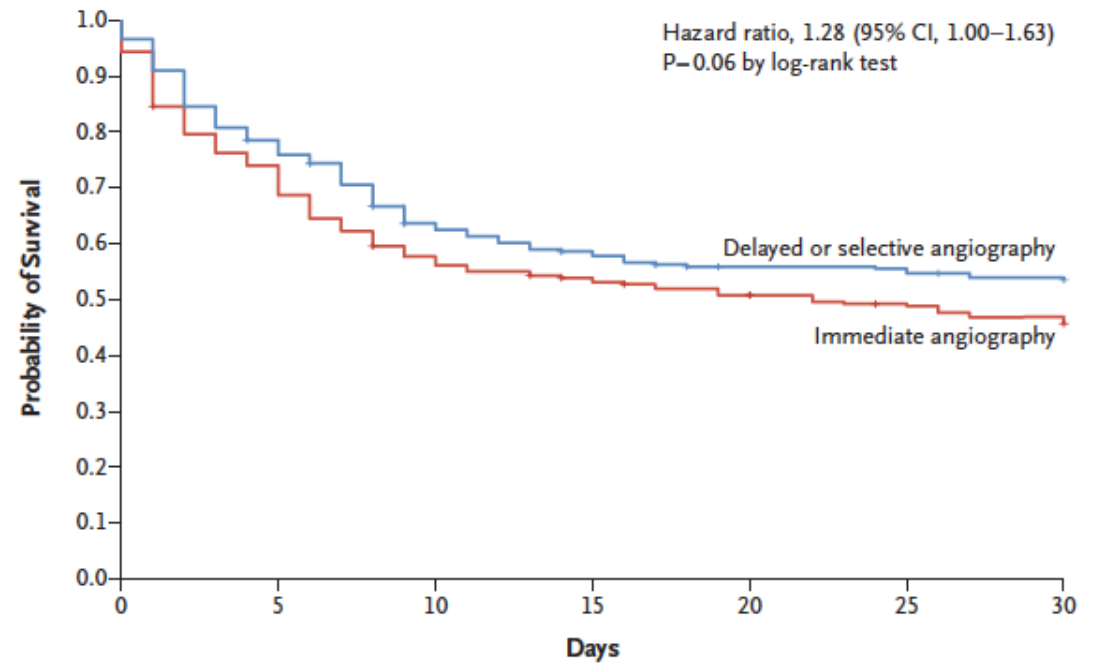
August 29, 2021, at NEJM.org.

- Randomized trial, international (30 Germany 1 denmark), multicenter, open-label
- 554 pts age > 30
- Both shockable (55%) or not (45%) OHCA – ROSC at H admission
- NSTEMI EKG (no new LBB)



**Table 2. Prevalence, Characteristics, and Treatment of Coronary Artery Disease.**

| Variable   | Immediate Angiography (N = 265) | Delayed or Selective Angiography (N = 265) |
|--|---------------------------------|--|
| Coronary angiography performed — no. (%)                   | 253 (95.5)                      | 165 (62.2)                                 |
| Median time from arrest to coronary angiography (IQR) — hr | 2.9 (2.2–3.9)                   | 46.9 (26.1–116.6)                          |
| Catheterization access — no./total no. (%)                 |                                 |  |
| Femoral  | 179/250 (71.6)                  | 96/161 (59.6)                              |
| Radial   | 70/250 (28.0)                   | 65/161 (40.4)                              |
| Brachial   | 1/250 (0.4)                     | 0/161                                      |
| Severity of coronary artery disease — no./total no. (%)    |                                 |  |
| No substantial disease                                     | 99/252 (39.3)                   | 46/165 (27.9)                              |
| 1-vessel disease   | 37/252 (14.7)                   | 21/165 (12.7)                              |
| 2-vessel disease   | 32/252 (12.7)                   | 26/165 (15.8)                              |
| 3-vessel disease   | 84/252 (33.3)                   | 72/165 (43.6)                              |
| Culprit lesion identified — no./total no. (%)              | 94/247 (38.1)                   | 67/156 (43.0)                              |
| PCI performed — no./total no. (%)                          | 93/250 (37.2)                   | 70/162 (43.2)                              |
| Median amount of contrast dye (IQR) — ml                   | 107 (70–178)                    | 125 (70–202)                               |

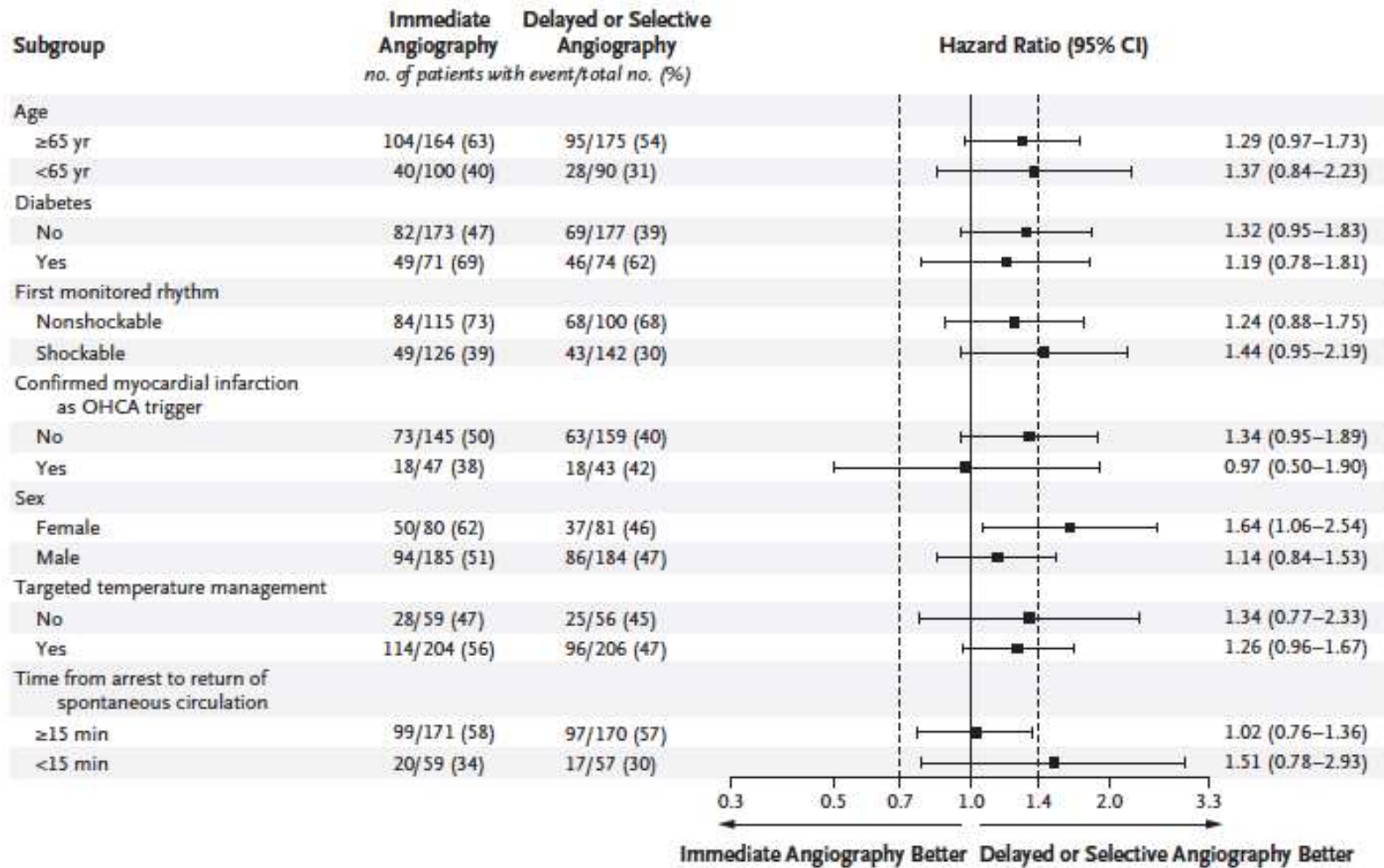


**No. at Risk**

|                                  |     |     |     |     |     |     |     |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|
| Delayed or selective angiography | 265 | 207 | 163 | 149 | 139 | 138 | 133 |
| Immediate angiography            | 265 | 195 | 151 | 138 | 129 | 123 | 117 |

**Figure 1. Kaplan–Meier Estimates of Death from Any Cause at 30 Days.**

Shown is the risk of death at 30 days (the primary end point) among patients who underwent either immediate angiography or delayed or selective angiography after out-of-hospital cardiac arrest without ST-segment elevation.



**Figure 2. Subgroup Analyses of the Primary End Point.**

Shown is a forest plot of the risk of death from any cause at 30 days among the patients with out-of-hospital cardiac arrest (OHCA) who were included in the primary analysis.



## DISCUSSION

In this randomized, international trial, we found that among patients with successfully resuscitated out-of-hospital cardiac arrest and no ST segment elevation, **a strategy of immediate unselected coronary angiography provided no benefit over a delayed and selective approach** with respect to the primary end point of death from any cause. **Furthermore, a prespecified composite secondary end point of death or severe neurologic deficit occurred more frequently among patients assigned to undergo immediate angiography** — a finding that should be interpreted with caution because of statistical concerns regarding multiple testing. However, if it was a true finding, then a possible cause would be that immediate coronary catheterization could lead to delays in diagnosing other triggers of out-of-hospital cardiac arrest.

The current findings support the results from the randomized Coronary Angiography after Cardiac Arrest (COACT) trial, which showed no significant differences in clinical outcome among patients with out-of-hospital cardiac arrest between immediate and delayed coronary angiography at 90 days and at 1 year

# Angiografia e PCI: a chi e quando?

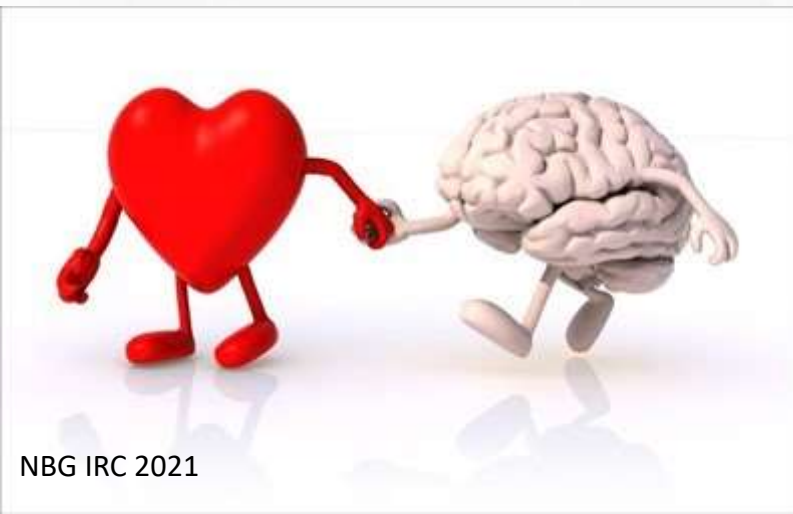
Sperando di aver studiato meglio che nel 2014...

## A chi:

- Sicuramente a tutti gli STEMI
- Sicuramente in caso di instabilità emodinamica (shock, elettrica, nuove modificazioni ECG)
- Ai Pazienti NSTEMI secondo stratificazione del rischio

## Quando:

- Guidati da ECG ed emodinamica
- Se NSTEMI dopo neuro assesment, stabilizzazione clinica e esclusione di altre cause (metaboliche, neuro, etc)



**IN QUESTO CASO (MA NON SI PUO' GENERALIZZARE!) IL CERVELLO DEVE GUIDARE IL CUORE**

## Note a piè di pagina

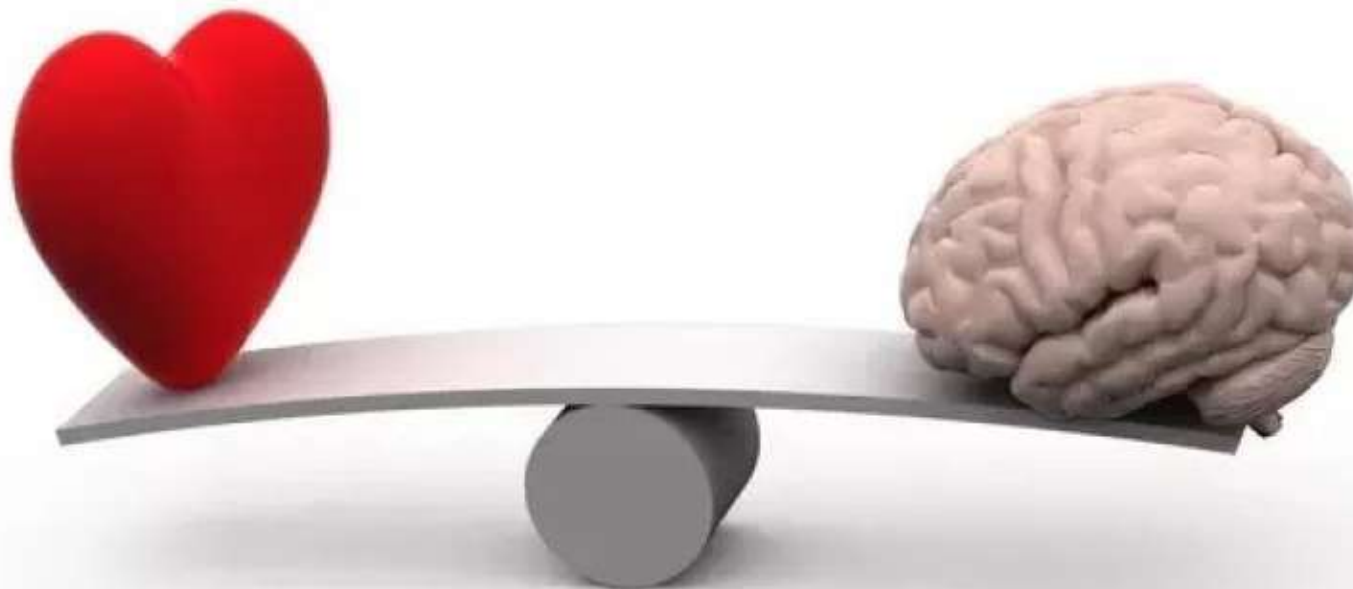
*L'angiografia si può fare molto presto (anche prima del ROSC) o molto tardi, anche a paziente già in supporto di circolo; tuttavia è buon senso considerare quali sono le risorse locali e condividere una flow-chart decisionale tra tutti gli specialisti*







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RISUSCITAZIONE CARDIOPULMONARE  
POST-LOCKDOWN



**Grazie della pazienza...dal 2014**

(ci vediamo nel 2028)



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RISPOSTE E ORGANIZZAZIONE  
POST-LOCKDOWN

# Italian Resuscitation Council

 **ircouncil.it**



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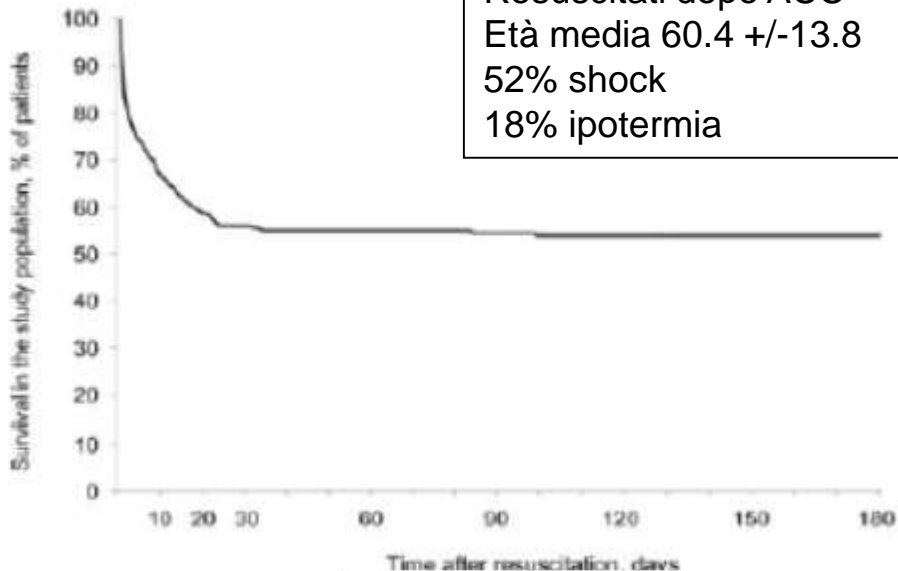






# PCI PRIMARIA

186 pz STEMI 1995-2005  
 Resuscitati dopo ACC  
 Età media 60.4 +/-13.8  
 52% shock  
 18% ipotermia



**Health Services and Outcomes Research**

**Six-Month Outcome of Emergency Percutaneous Coronary Intervention in Resuscitated Patients After Cardiac Arrest Complicating ST-Elevation Myocardial Infarction**

Philippe Garot, MD; Thierry Lefevre, MD; Hélène Elchaniouff, MD, PhD; Marie-Claude Morice, MD; Fabrice Tamion, MD; Bernard Abry, MD; Pierre-François Lesault, MD; Jean-Yves Le Tarnec, MD; Claude Ponges, MD; Alain Margence, MD; Mehran Monchi, MD; Ivan Laurent, MD; Pierre Dumas, MD; Jérôme Garot, MD, PhD; Yves Louvard, MD

**SOPRAVVIVENZA**  
 54% a 6 mesi  
 46% senza sequele neurologiche

