CONGRESSO NAZIONALE 2015

IRC Italian Resuscitation Council

Trattamento post-ROSC 2015

Claudio Sandroni

Istituto Anestesiologia e Rianimazione

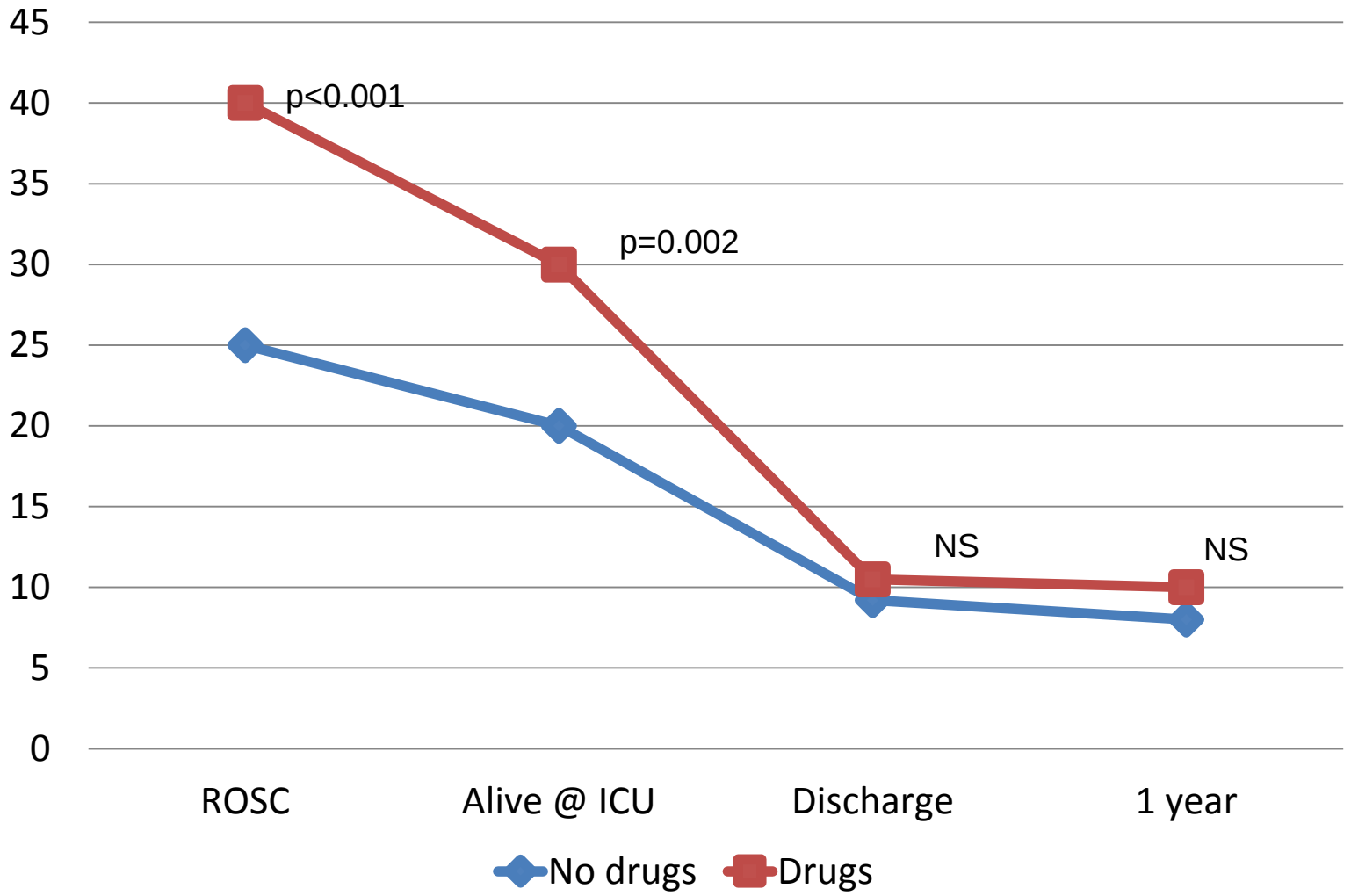
Università Cattolica del Sacro Cuore - Roma

IRC

ERC

JAMA Intravenous Drug Administration During Out-of-Hospital Cardiac Arrest: A Randomized Trial

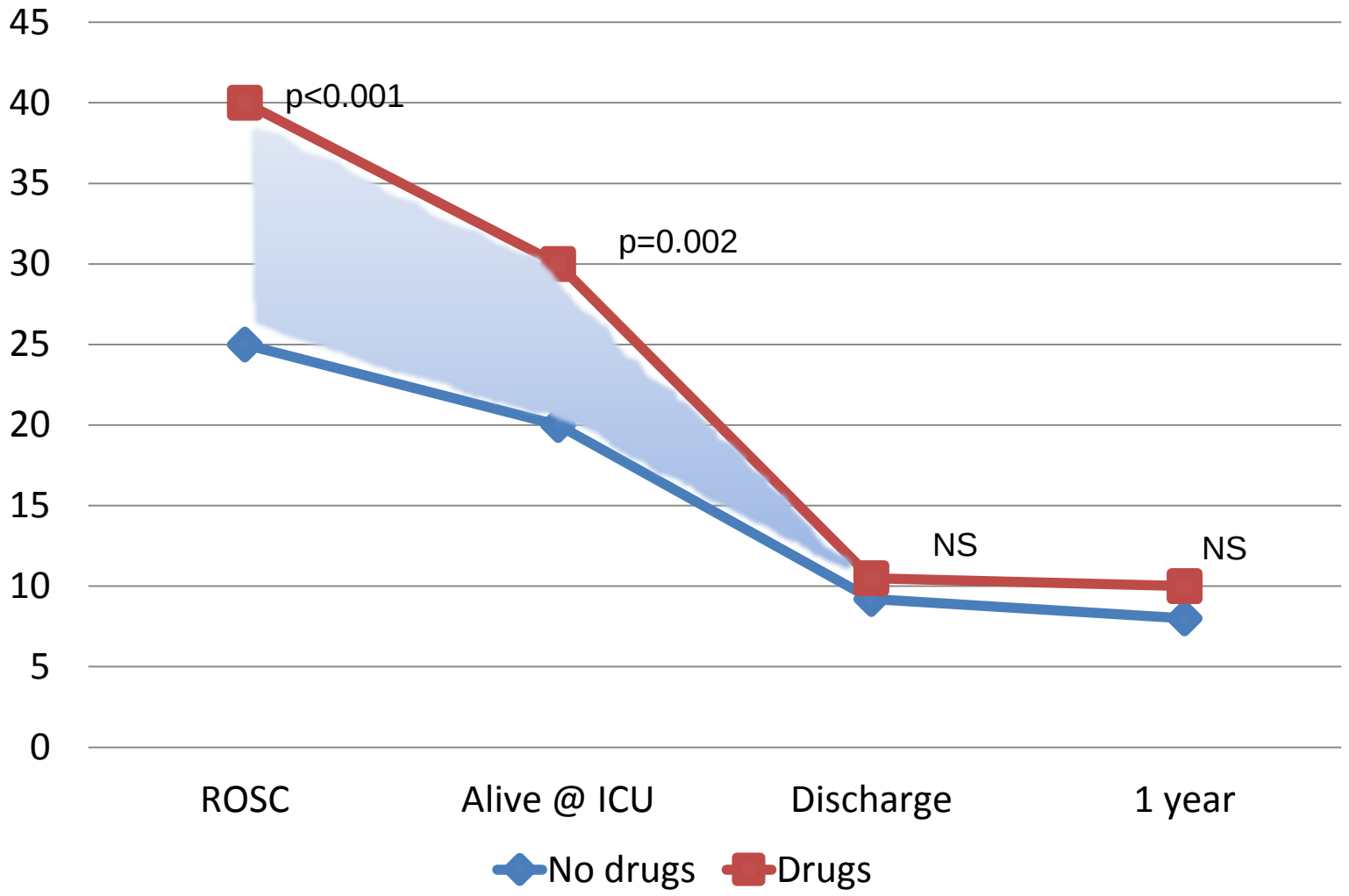
Theresa M. Olasveengen; Kjetil Sunde; Cathrine Brunborg; et al.



Olasveengen, JAMA 2009; 302:2222-9

JAMA Intravenous Drug Administration During Out-of-Hospital Cardiac Arrest: A Randomized Trial

Theresa M. Olasveengen; Kjetil Sunde; Cathrine Brunborg; et al.



Olasveengen, JAMA 2009; 302:2222-9

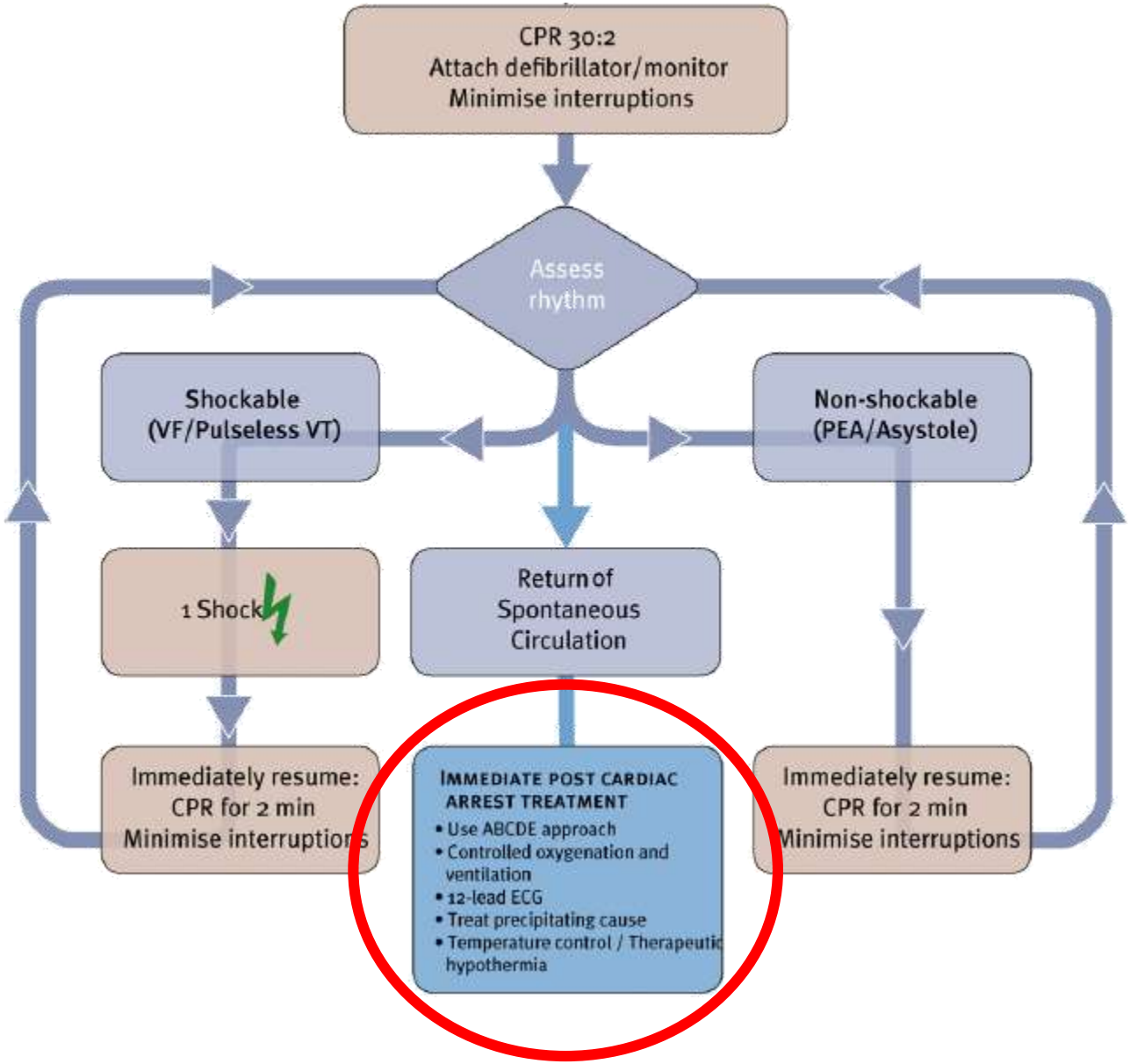
Chain of survival

BLS / ALS

Post-resus

IRC ERC

2010…..


CPR 30:2
Attach defibrillator/monitor
Minimise interruptions
Assess rhythm
Shockable (VF/Pulseless VT)
Non-shockable (PEA/Asystole)
1 Shock
Return of Spontaneous Circulation
Immediately resume: CPR for 2 min Minimise interruptions
IMMEDIATE POST CARDIAC ARREST TREATMENT
• Use ABCDE approach
• Controlled oxygenation and ventilation
• 12-lead ECG
• Treat precipitating cause
• Temperature control / Therapeutic hypothermia
Immediately resume: CPR for 2 min Minimise interruptions

Post-rianimazione 2015

- Capitolo nuovo
- Due algoritmi
- In collaborazione con l'European Society of Intensive Care Medicine (ESICM)

IRC ERC

EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE

Resuscitation 95 (2015) 202–222

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

European Resuscitation Council and European Society of Intensive Care Medicine Guidelines for Post-resuscitation Care 2015 Section 5 of the European Resuscitation Council Guidelines for Resuscitation 2015☆

Intensive Care Med
DOI 10.1007/s00134-015-4051-3

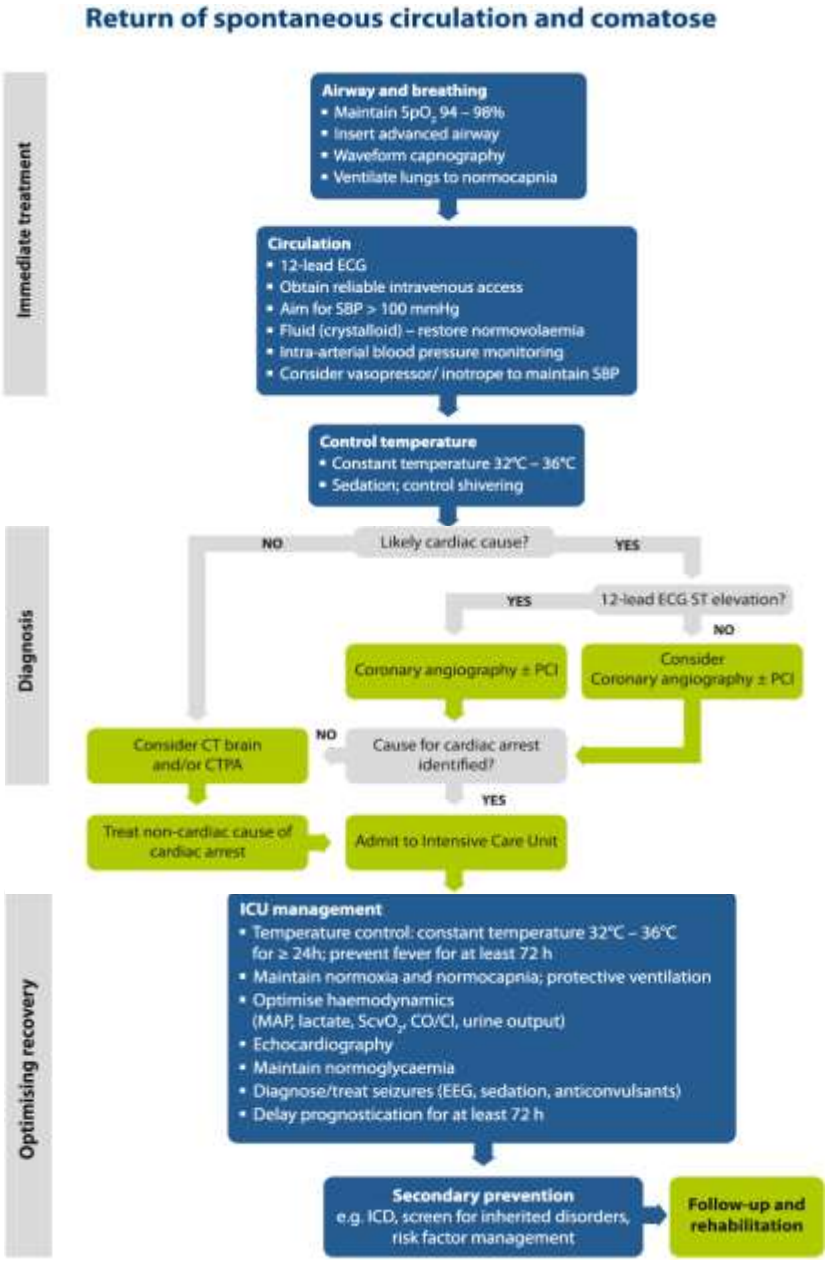
CONFERENCE REPORTS AND EXPERT PANEL

Jerry P. Nolan
Jasmeet Soar
Alain Cariou
Tobias Cronberg
Véronique R. M. Moulaert
Charles D. Deakin
Bernd W. Bottiger
Hans Friberg
Kjetil Sunde
Claudio Sandroni

European Resuscitation Council and European Society of Intensive Care Medicine 2015 guidelines for post-resuscitation care

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

Algoritmo post-ROSC 2015

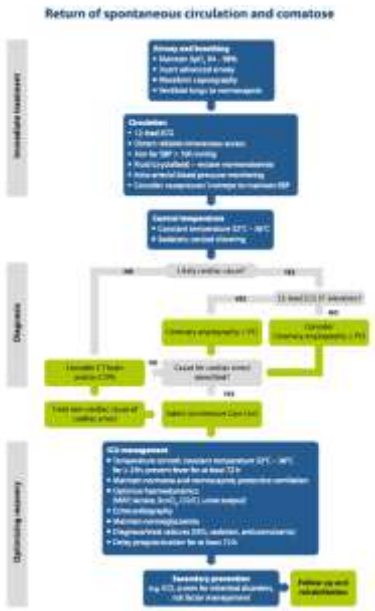


IRC ERC

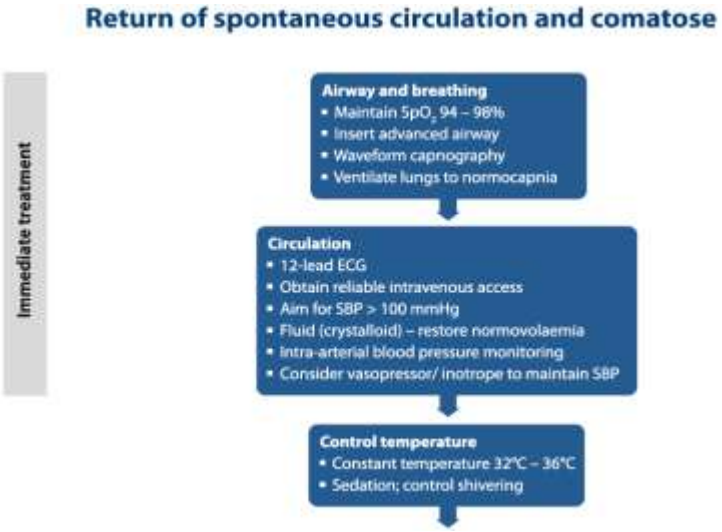
Algoritmo post-rianimazione 2015

Componenti

1. Stabilizzazione immediata
2. Diagnosi e trattamento delle cause
3. Recupero funzionale e prognosi



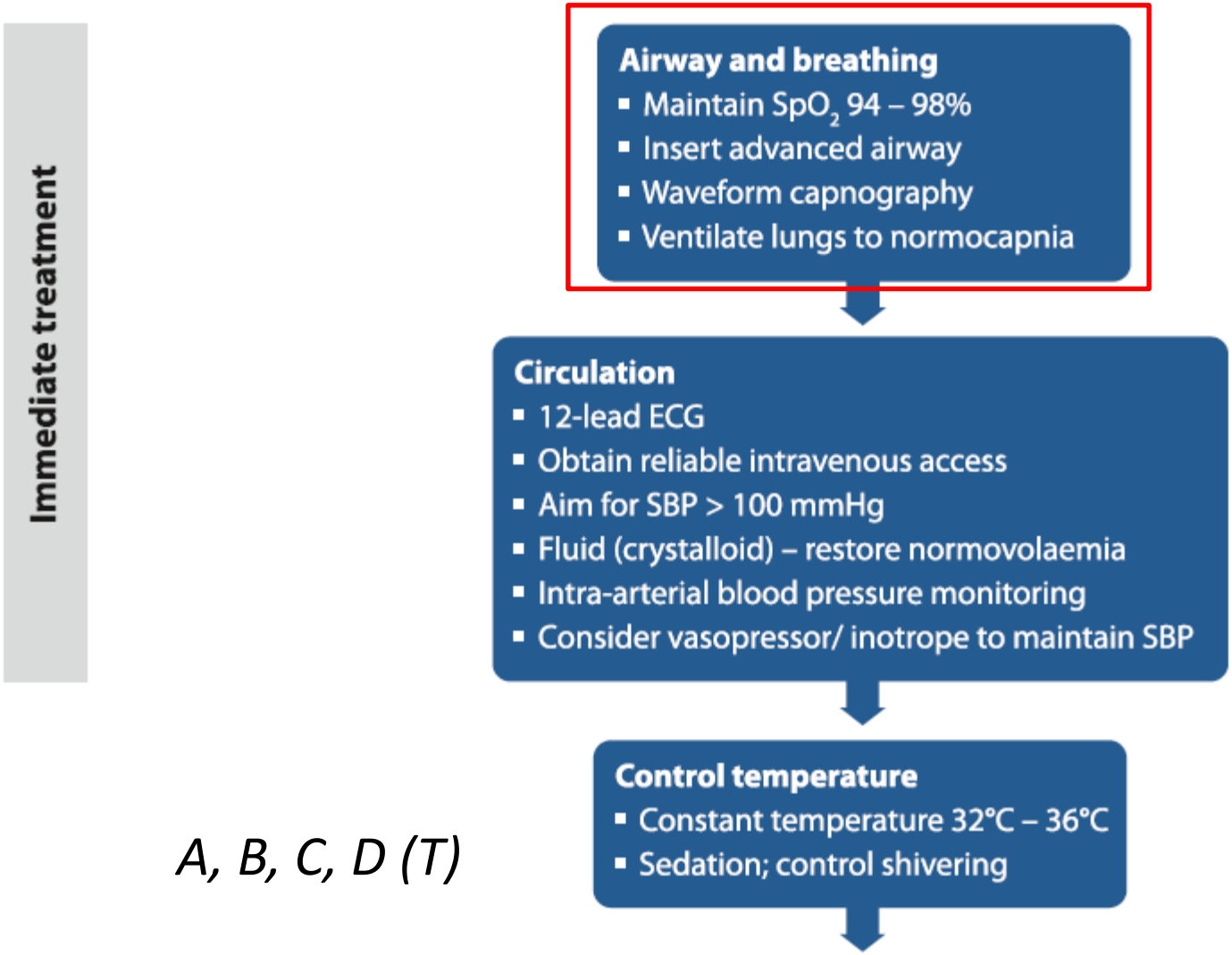
J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*



1. Stabilizzazione immediata

IRC ERC

Return of spontaneous circulation and comatose



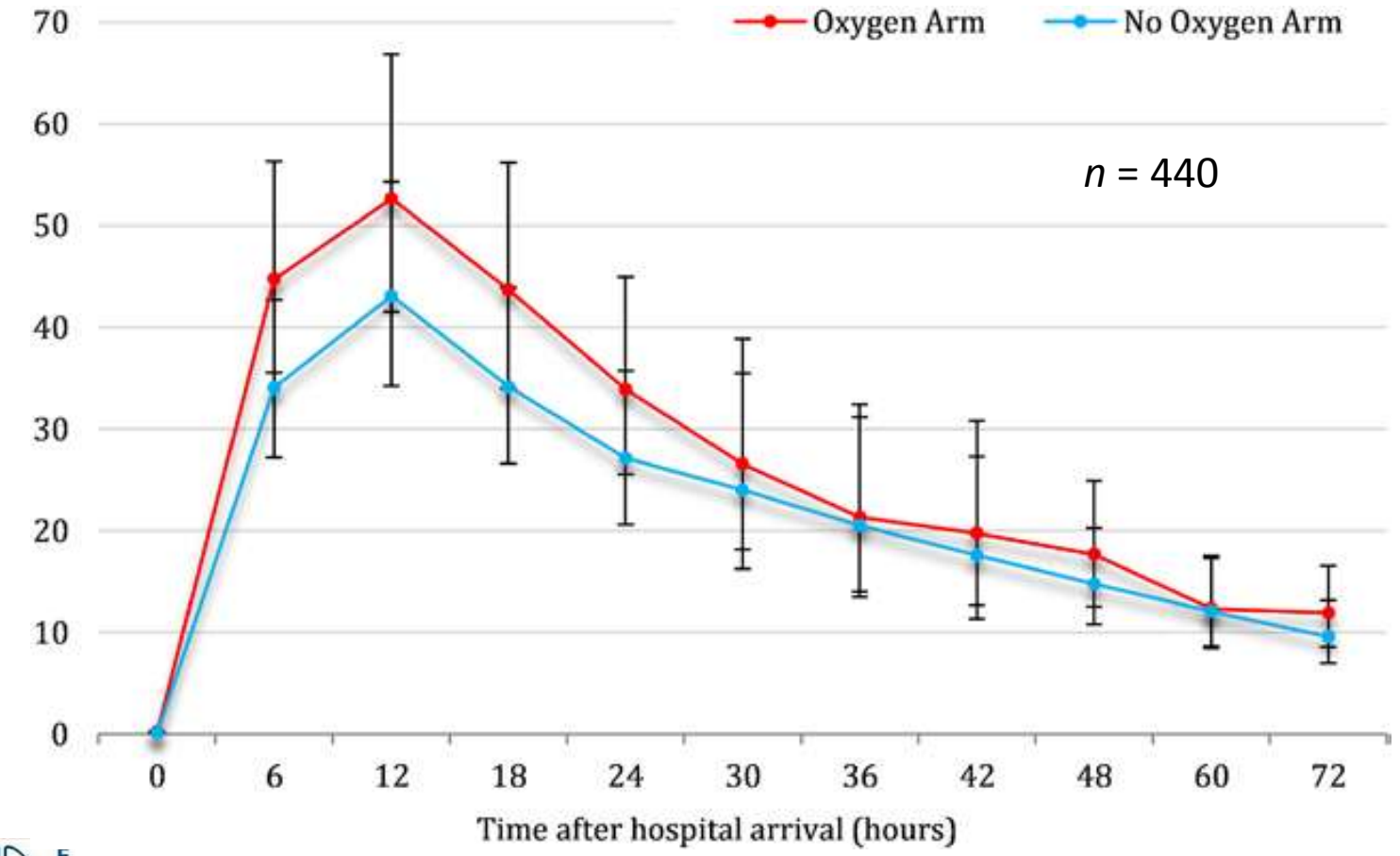
A, B, C, D (T)

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

Che PaO_2 mantenere?

Air Versus Oxygen in ST-Segment–Elevation Myocardial Infarction

Dion Stub, MBBS, PhD; Karen Smith, BSc, PhD; Stephen Bernard, MBBS, MD;



Stub D et al. Circulation 2015; 131:2143-2150

Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

J. Hope Kilgannon, MD
Alan E. Jones, MD
Nathan I. Shapiro, MD, MPH
Mark G. Angelos, MD

Context Laboratory investigations suggest that exposure to hyperoxia after resuscitation from cardiac arrest may worsen anoxic brain injury; however, clinical data are lacking.

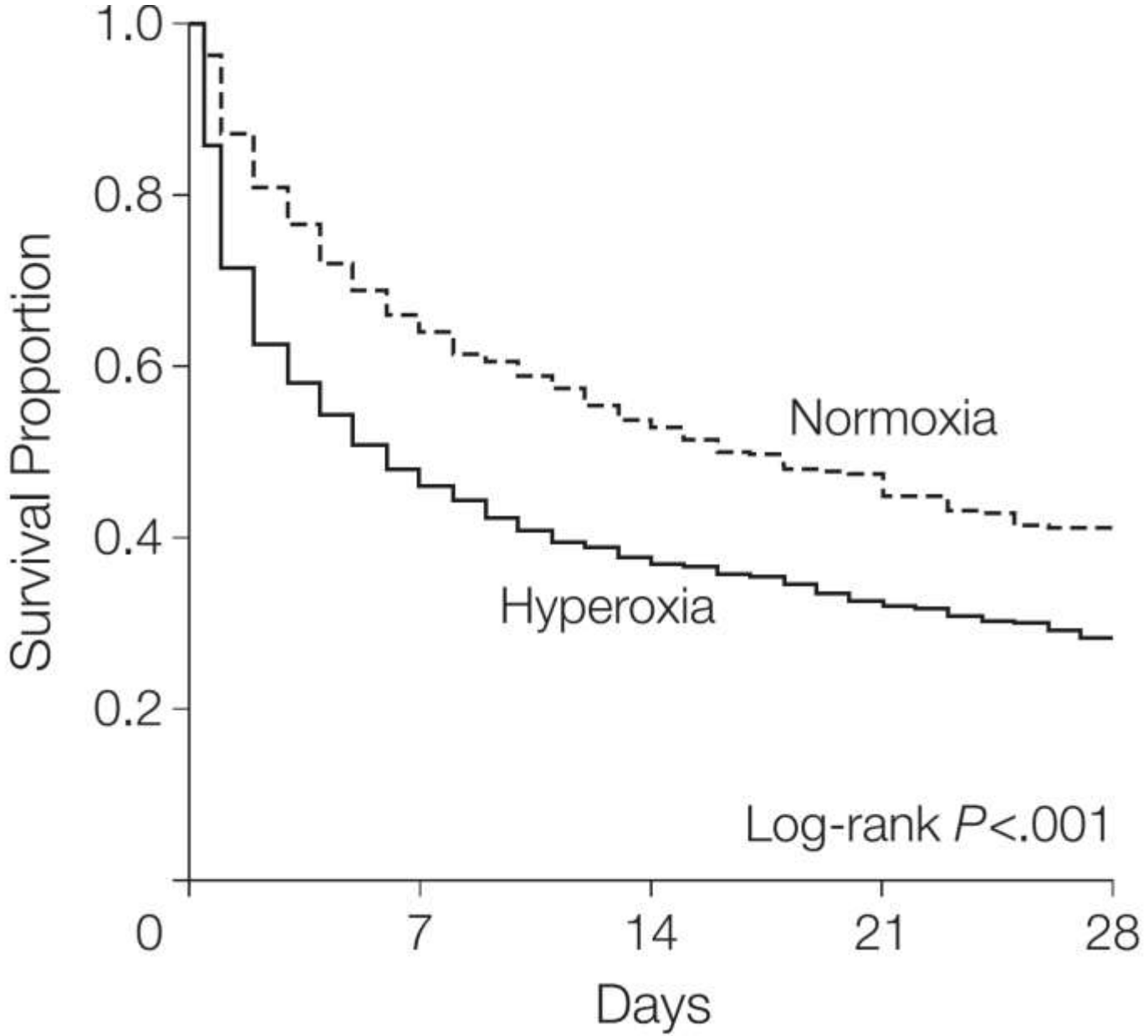
Objective To test the hypothesis that postresuscitation hyperoxia is associated with increased mortality.

Table 4. Outcomes of Study Patients

	All Patients (N = 6326)	Hypoxia (n = 3999)	Normoxia (n = 1171)	Hyperoxia (n = 1156)
In-hospital mortality, No. (%) [95% CI][a]	3561 (56) [55-58]	2297 (57) [56-59]	532 (45) [43-48]	732 (63) [60-66]
Survivors, No. (%)	2765 (44)	1702 (43)	639 (55)	424 (37)
Independent functional status at hospital discharge, No. (%) [95% CI][b]	939 (34) [32-36]	570 (33) [31-36]	245 (38) [35-42]	124 (29) [25-34]

IRC ERC

JAMA. 2010;303(21):2165-2171



IRC ERC

JAMA. 2010;303(21):2165-2171

Limiti

I risultati non erano stati corretti per FiO_2, gravità della malattia e variabili pre-ospedaliere

Ipo- ed iperossia definite sulla base del primo EGA

Possibile bias selettivo (30% esclusi per la mancanza di EGA)

IRC ERC

JAMA. 2010;303(21):2165-2171

Arterial hyperoxia and in-hospital mortality after resuscitation from cardiac arrest

Rinaldo Bellomo[1*], Michael Bailey[1], Glenn M Eastwood[3], Alistair Nichol[1], David Pilcher[2], Graeme K Hart[2], Michael C Reade[3], Moritoki Egi[4], D James Cooper[1], the Study of Oxygen in Critical Care (SOCC) Group

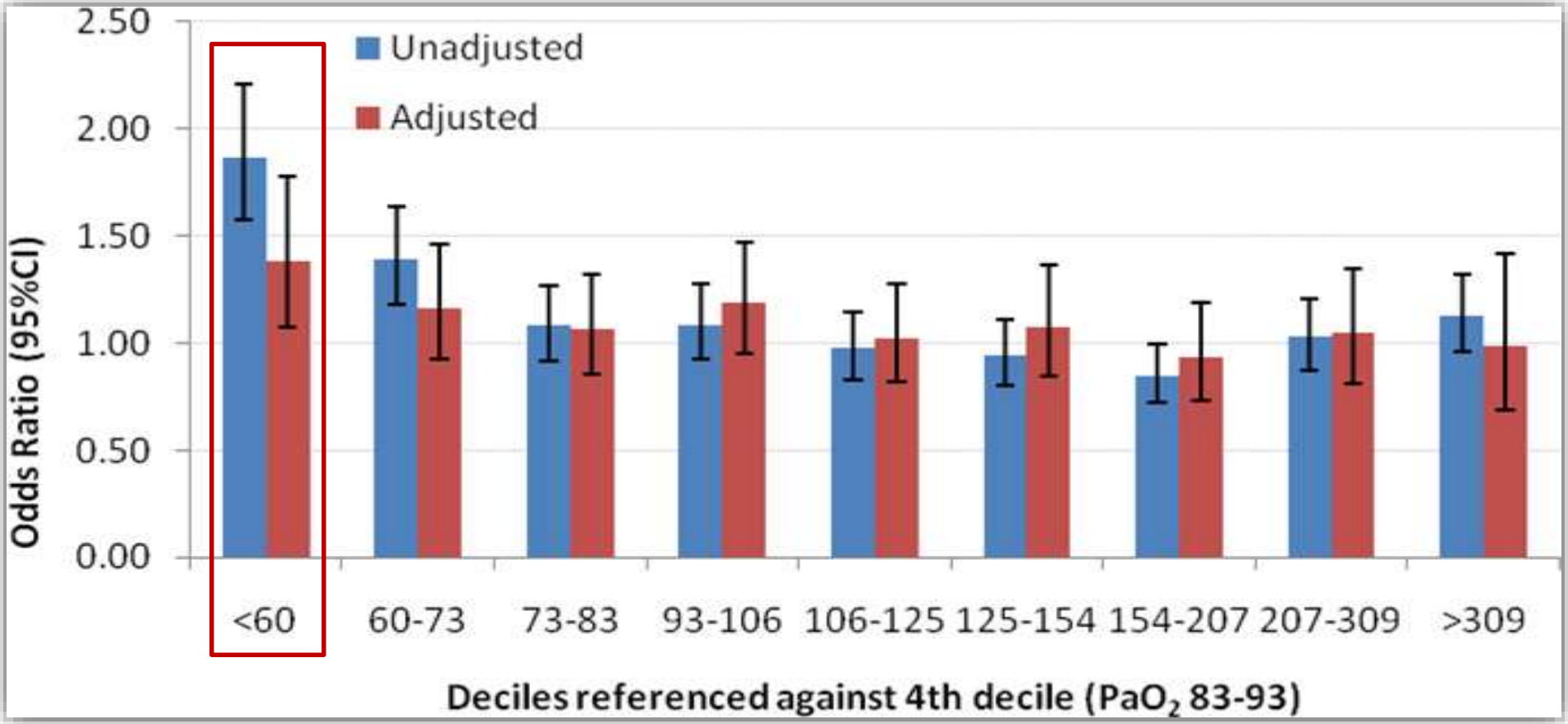
- Multicentrico osservazionale, da registro clinico di ICU in Australia
- *n* = 11.000 pazienti rianimati da OHCA
- Outcome primario: mortalità intraospedaliera

Table 6 Multiple regression models for in-hospital mortality and survival time using an APACHE III-based marker of severity[a]

Variable	Hospital mortality OR (95% CI)	*P* value	Time to death HR (95% CI)	*P* value
AP3no-ox[b]	1.5 (1.5 to 1.6)	<0.0001	1.2 (1.2 to 1.2)	<0.0001
Treatment limitation[c]	5.3 (3.8 to 7.2)	<0.0001	1.7 (1.5 to 1.8)	<0.0001
Year of admission	0.9 (0.9 to 0.9)	<0.0001	0.97 (0.96 to 0.98)	<0.0001
Lowest glucose in first 24 hours	1.1 (1.1 to 1.1)	<0.0001	1.02 (1.02 to 1.03)	<0.0001
Hospital admission from home	1.3 (1.1 to 1.4)	0.0002	1.1 (1.0 to 1.1)	0.02
Hypoxia/poor O_2 exchange versus normoxia	1.2 (1.1 to 1.4)	0.002	1.1 (1.0 to 1.2)	0.01
Hyperoxia versus normoxia	1.2 (1.0 to 1.5)	0.04	1.1 (1.0 to 1.2)	0.20

IRC ERC

Bellomo *et al. Critical Care* 2011, **15**:R90



Non differenze significative di mortalità tra i differenti livelli di iperossia in confronto alla popolazione di riferimento (pazienti con $83<PaO_2<93$ mmHg)
Confermato l'effetto sfavorevole dell'ipossia

IRC ERC

Bellomo *et al. Critical Care* 2011, **15**:R90

ERC Guidelines 2015

- Non appena la saturazione di ossigeno può essere monitorata in modo attendibile (con EGA o pulsiossimetria), regolare la FiO2 per ottenere una SaO2 di 94–98%.
- Evitare l'ipossiemia
  - Assicurarsi di avere una misurazione attendibile della SaO_2 prima di ridurre la FiO_2

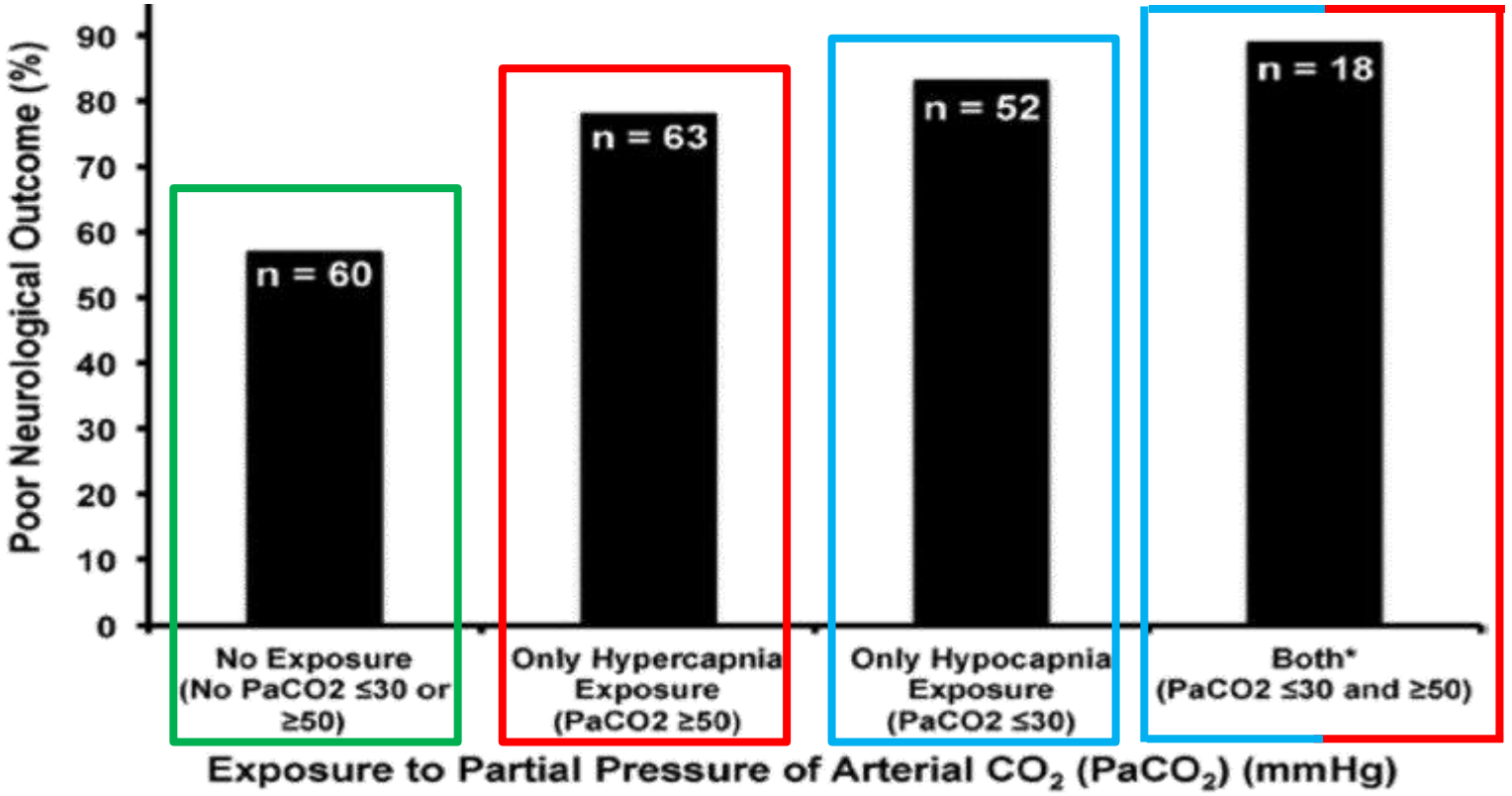
IRC ERC

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

Che $PaCO_2$ mantenere?

Association Between Postresuscitation Partial Pressure of Arterial Carbon Dioxide and Neurological Outcome in Patients With Post–Cardiac Arrest Syndrome

Brian W. Roberts, MD; J. Hope Kilgannon, MD; Michael E. Chansky, MD; Neil Mittal, MD; Jonathan Wooden, MD; Stephen Trzeciak, MD, MPH



Circulation. 2013;127:2107-2113;

Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Arterial carbon dioxide tension and outcome in patients admitted to the intensive care unit after cardiac arrest☆

Antoine G. Schneider[a,b,1], Glenn M. Eastwood[a,1], Rinaldo Bellomo[a,b,*], Michael Bailey[b], Miklos Lipcsey[a,c], David Pilcher[d], Paul Young[e,f], Peter Stow[g], John Santamaria[h], Edward Stachowski[i], Satoshi Suzuki[a], Nicholas C. Woinarski[a], Janine Pilcher[f]

- 1600 pazienti ricoverati in ICU dopo ROSC
- Mortalità ospedaliera outcome primario
- Analisi multivariata
  - Corretta per comorbidità, gravità, TTM, limitazioni di trattamento, glicemia, provenienza, PaO_2.

	OR (95% CI)	p-Value	HR (95% CI)	p-Value
Mortality				
Hypo- vs. normocapnia	1.12 (1.00–1.24)	0.04	1.04 (0.98–1.10)	0.24
Hyper- vs. normocapnia	1.05 (0.97–1.15)	0.19	1.04 (0.99–1.09)	0.11
Hyper- vs. hypocapnia	0.95 (0.85–1.06)	0.34	1.00 (0.94–1.07)	0.91
Death OR failure to be discharged home				
Hypo- vs. normocapnia	1.24 (1.12–1.37)	<0.001	1.05 (1.00–1.11)	0.06
Hyper- vs. normocapnia	0.97 (0.89–1.06)	0.52	1.00 (0.96–1.05)	0.83
Hyper- vs. hypocapnia	0.79 (0.70–0.89)	<0.001	0.96 (0.91–1.01)	0.09

Resuscitation 2013; 84:927-34

Eastwood *et al. Trials* (2015) 16:135
DOI 10.1186/s13063-015-0676-3

TRIALS

STUDY PROTOCOL Open Access

A pilot feasibility, safety and biological efficacy multicentre trial of therapeutic hypercapnia after cardiac arrest: study protocol for a randomized controlled trial

Glenn M Eastwood[1,2,3], Antoine G Schneider[4], Satoshi Suzuki[5], Michael Bailey[3], Rinaldo Bellomo[1,6*], for the CCC trial investigators

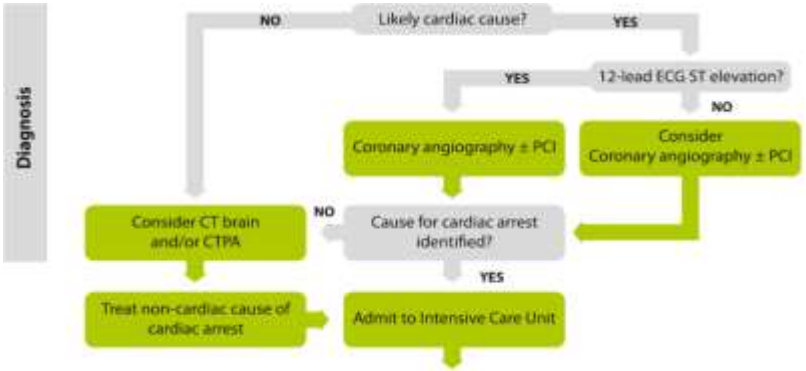
Methods/Design: The CCC trial is a pilot multicentre feasibility, safety and biological efficacy randomized controlled trial recruiting adult cardiac arrest patients admitted to the intensive care unit after return of spontaneous circulation. At admission, using concealed allocation, participants are randomized to 24 h of either normocapnia ($PaCO_2$ 35 to 45 mmHg) or mild hypercapnia ($PaCO_2$ 50 to 55 mmHg). Key feasibility outcomes are recruitment rate and protocol compliance rate. The primary biological efficacy and biological safety measures are the between-groups difference in serum neuron-specific enolase and S100b protein levels at 24 h, 48 h and 72 h. Secondary outcome measure include adverse events, in-hospital mortality, and neurological assessment at 6 months.

IRC ERC

ERC Guidelines 2015

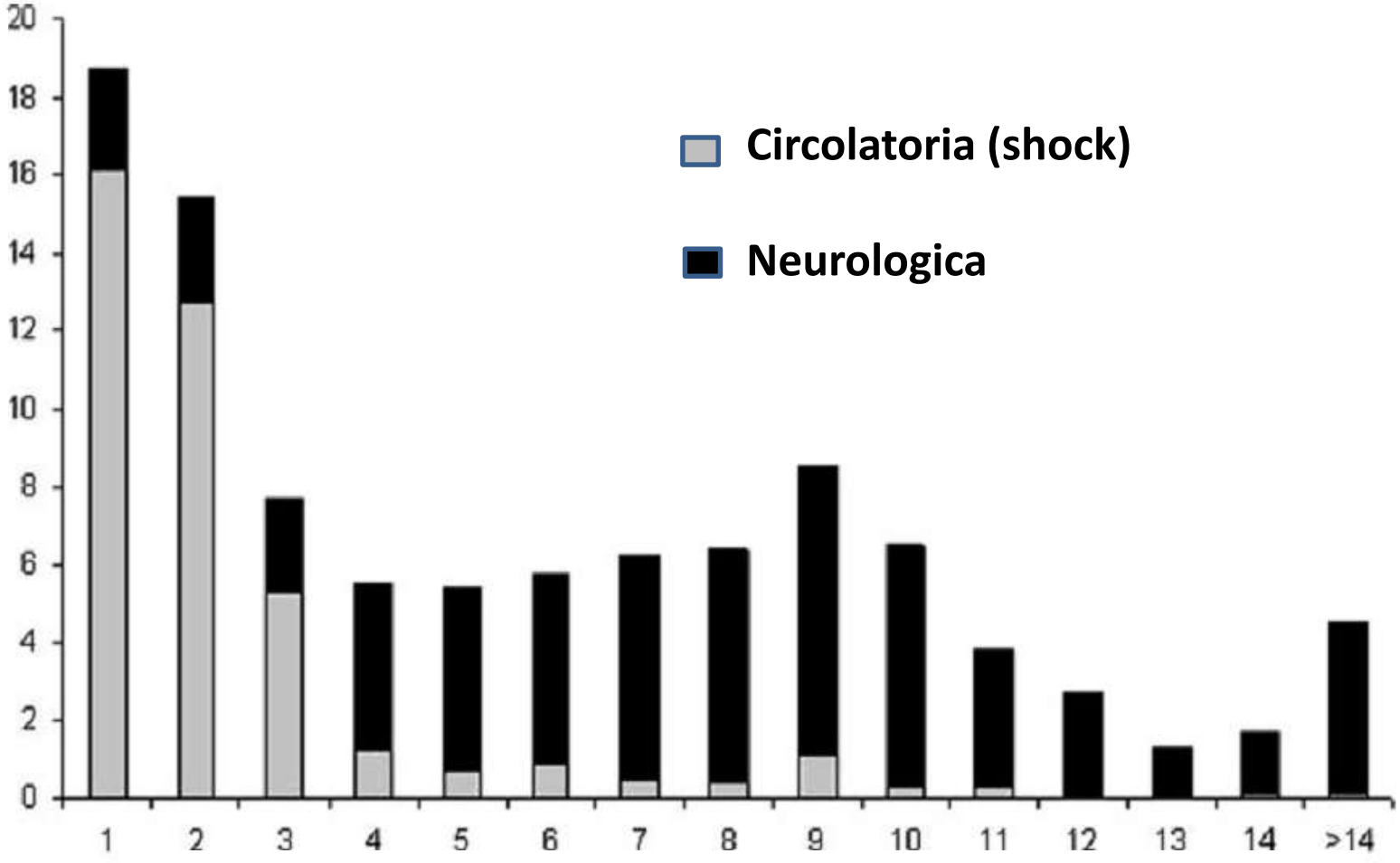
- Fino a quando non saranno disponibili dati prospettici, è ragionevole mantenere la normocapnia
  - Monitorare la CO_2 con la $ETCO_2$ e l'EGA
  - L'ipotermia può ridurre la produzione di CO_2 e causare ipocapnia durante il TTM

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*



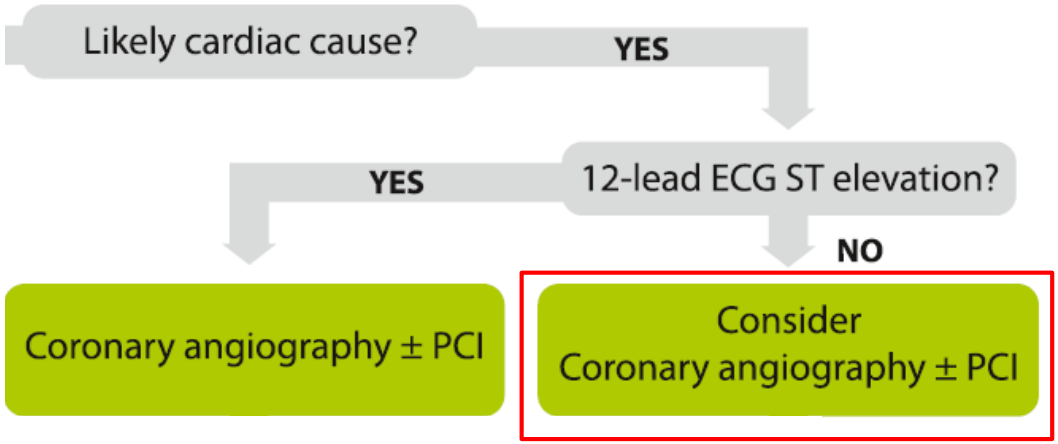
2. Diagnosi e trattamento delle cause

% Cause di morte dopo arresto cardiaco



Lemiale V et al, *Intensive Care Med* 2013; 39: 1972–80

Diagnosis



J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

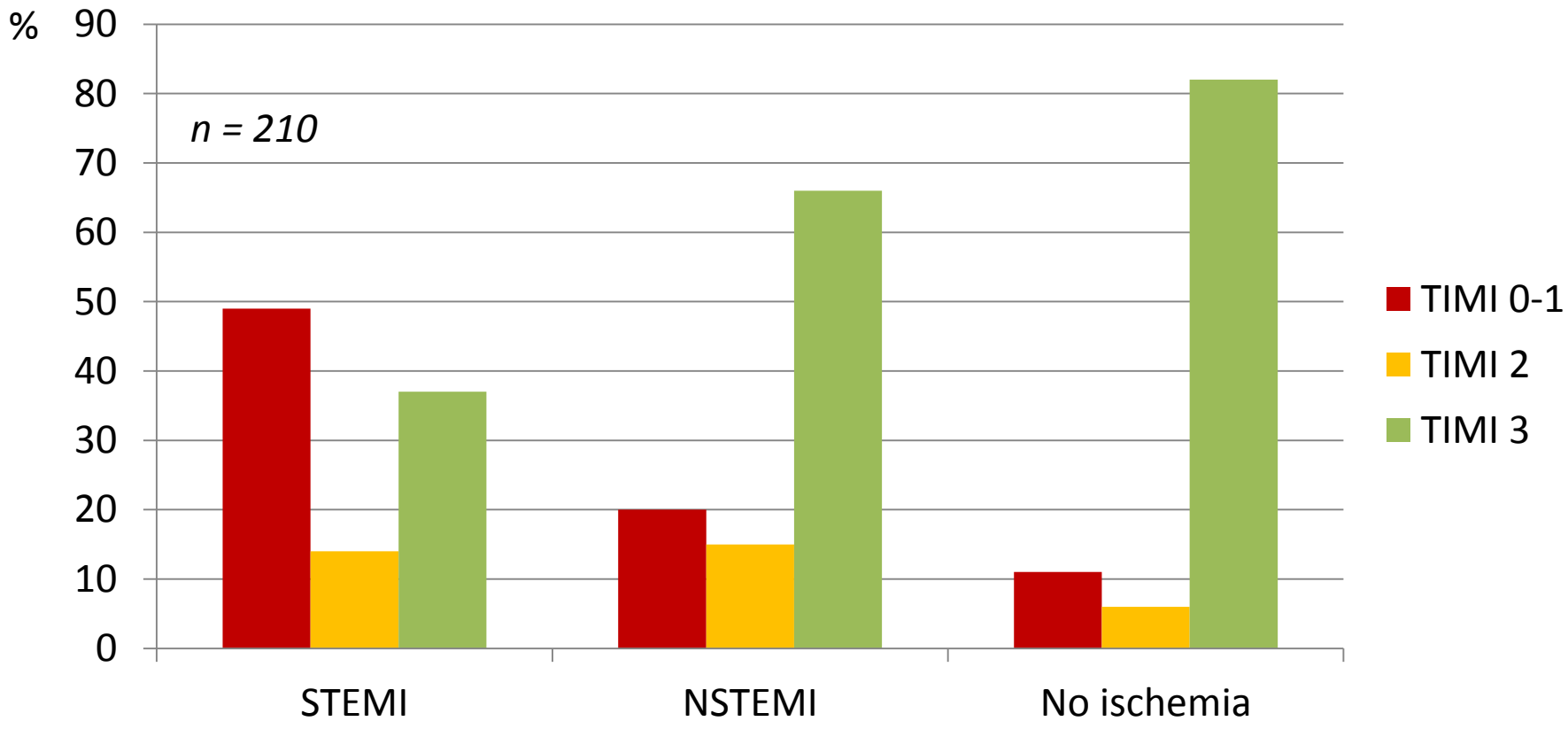
Table 2. Predictive Values of ST-Segment Elevation for Significant Coronary Lesion and PCI

n = 310

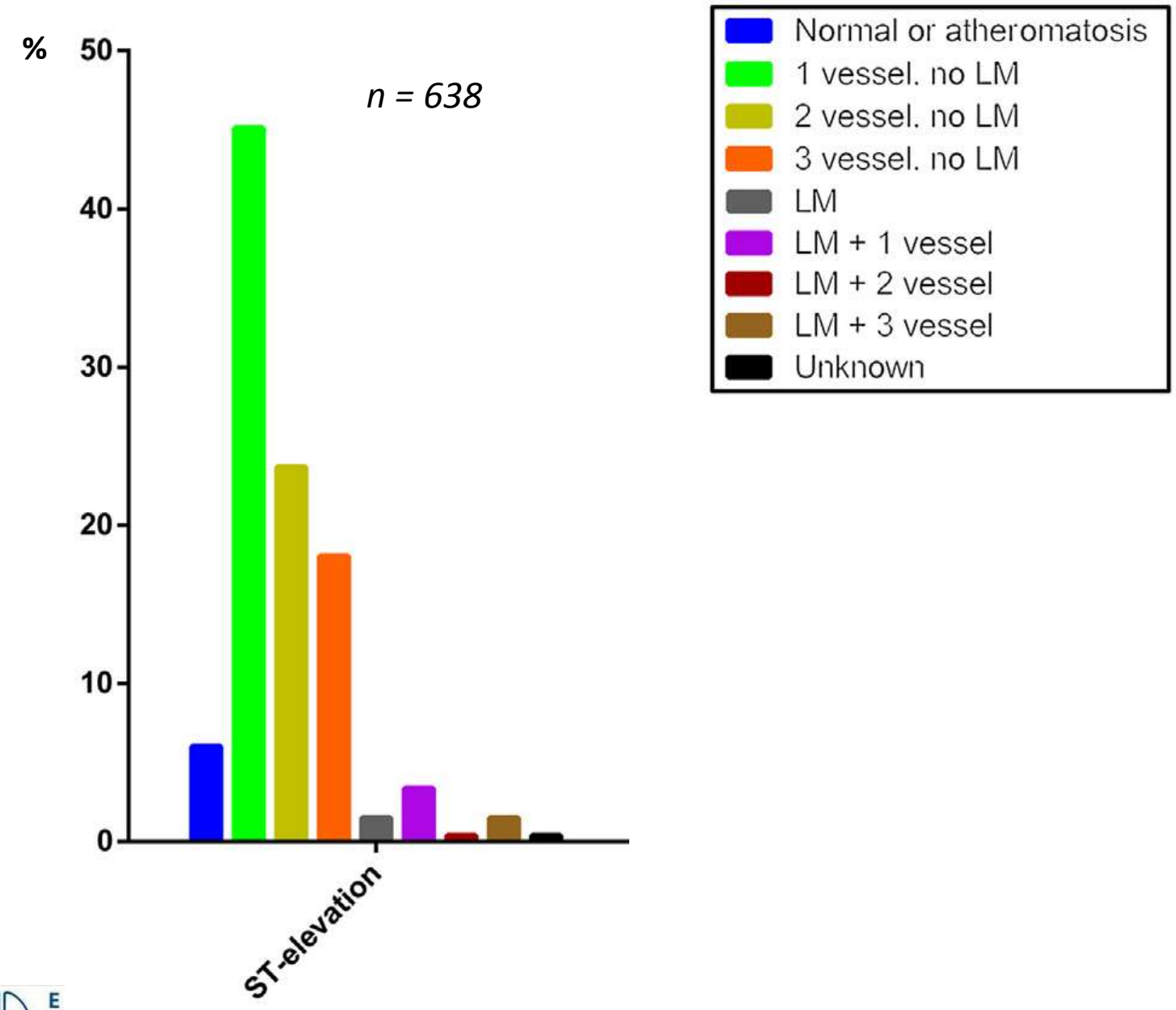
ST-Segment Elevation Predictive Values	Significant Coronary Lesion	Significant PCI
Positive predictive value	0.96	0.74
Specificity	0.95	0.83

Dumas F et al Circ Cardiovasc Interv. 2010;3:200-207

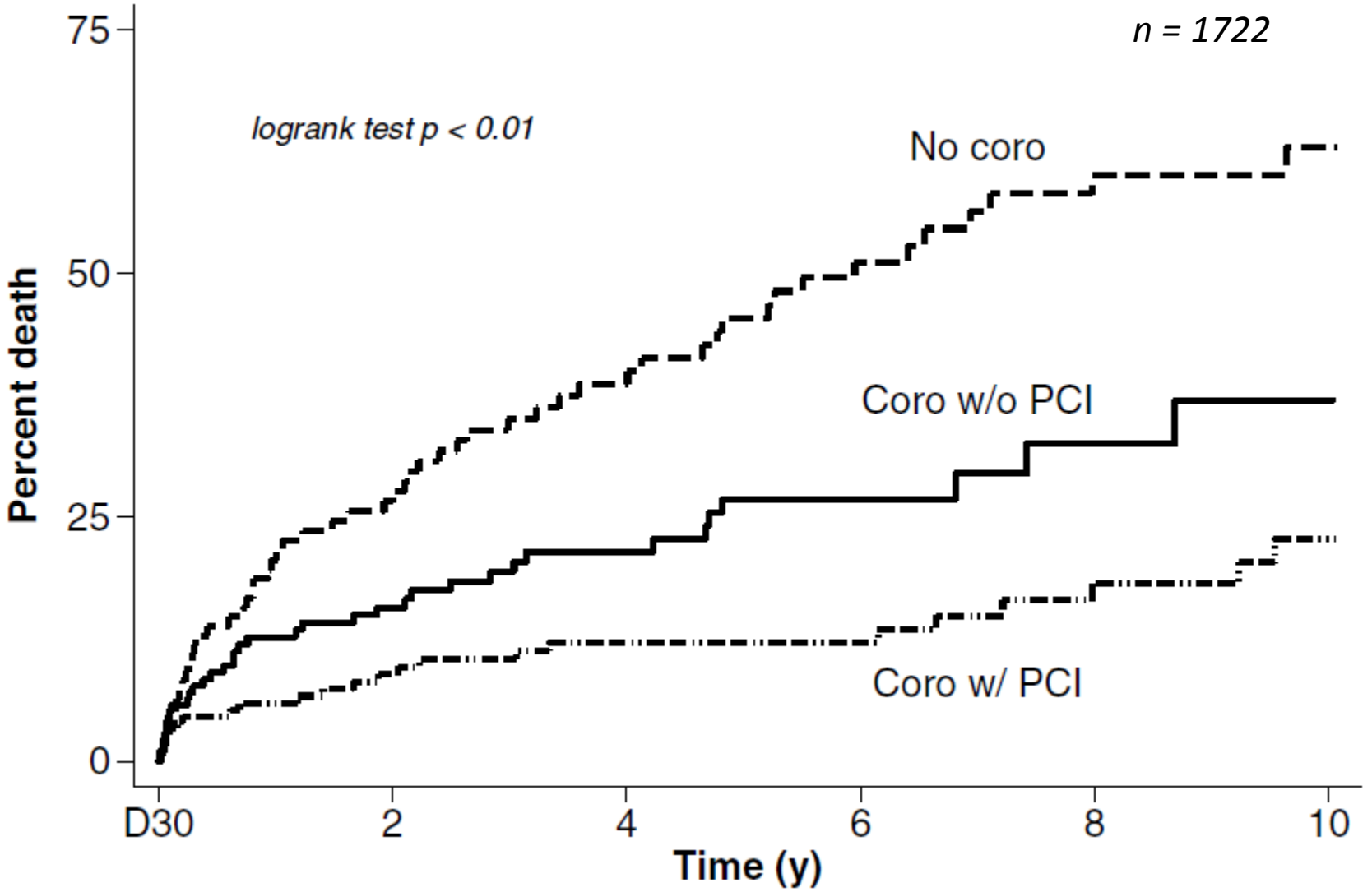
Quadro ECG post-ROSC e TIMI



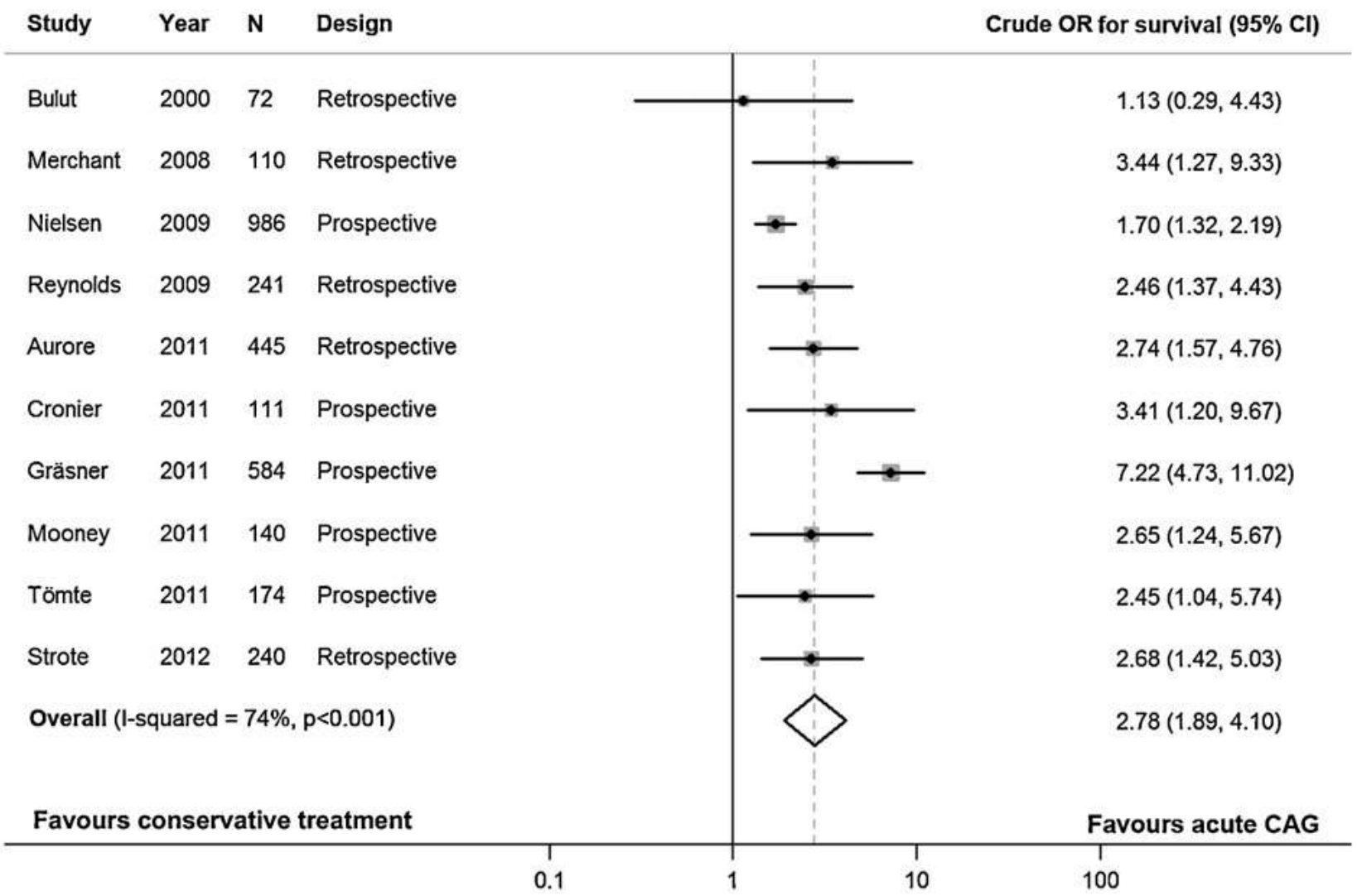
Staer-Jensen H et al Circ Cardiovasc Interv. 2015;8:e002784 *in press.*



B. Redfors et al. Resuscitation 2015; 90:13–20



Geri G et al Circ Cardiovasc Interv. 2015;8:e002303 *in press.*



Larsen and Ravkilde, Resuscitation 2012; 83:1427–33

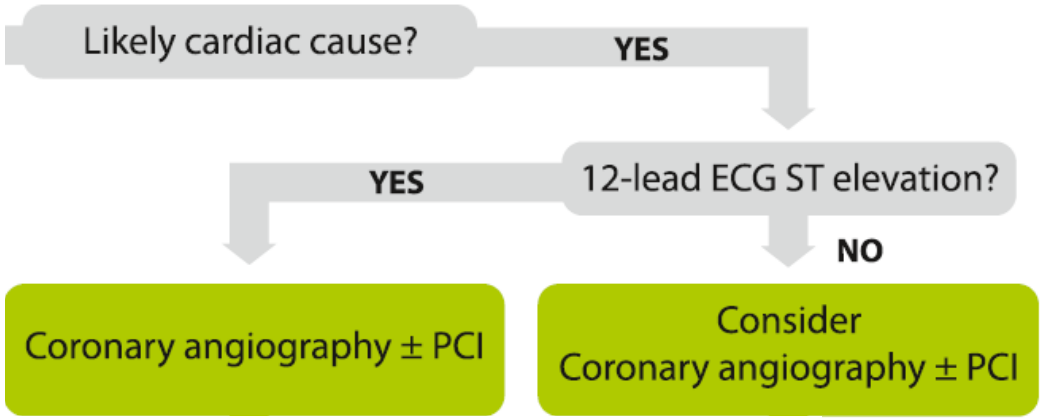
Raccomandazioni EAPCI

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

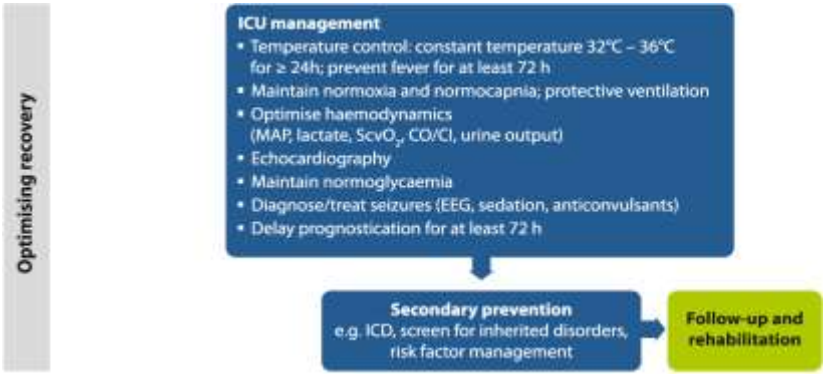
IRC ERC

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

Diagnosis

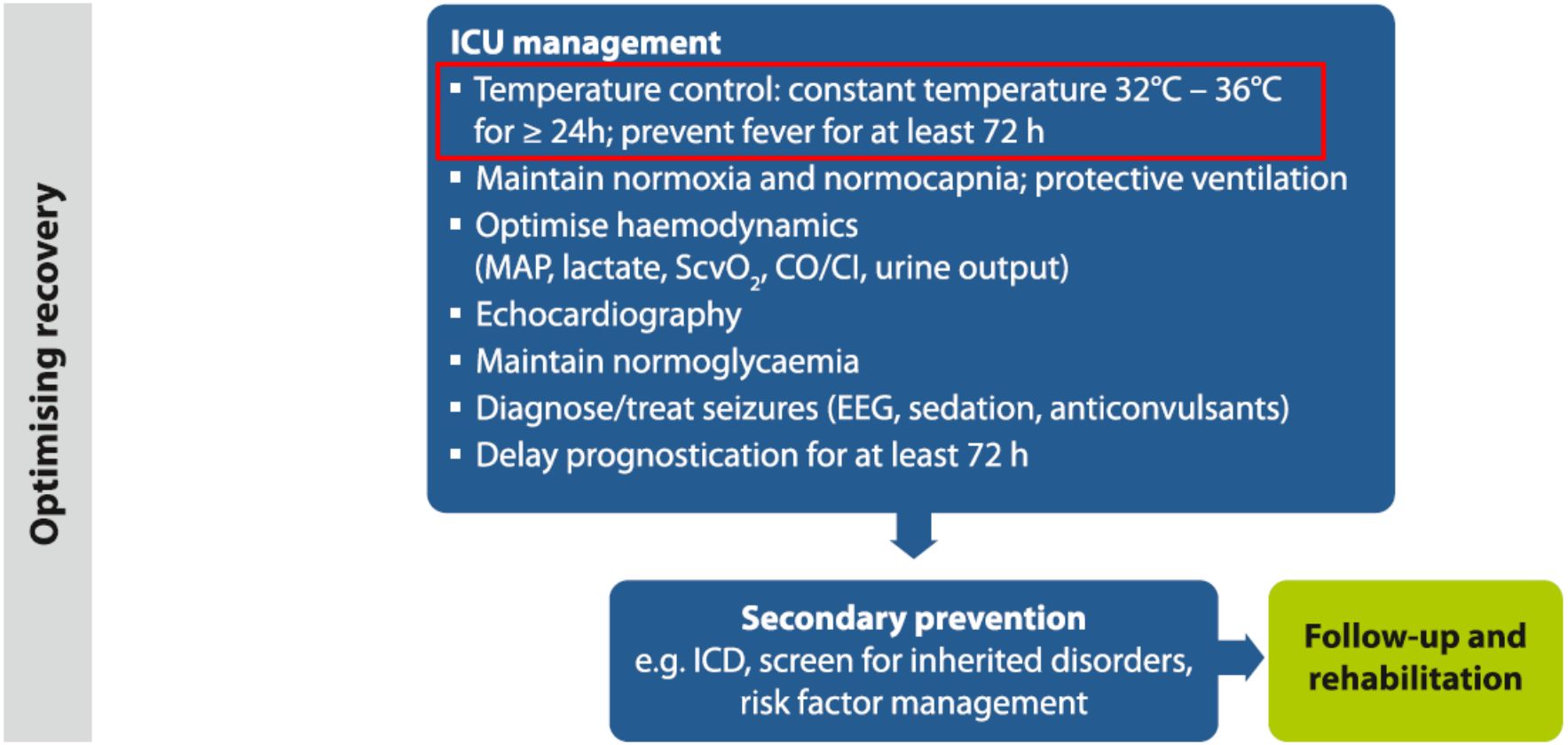


J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*



3. Recupero funzionale e prognosi

IRC ERC



IRC ERC

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

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*

IRC ERC

Nielsen N et al, N Engl J Med 2013; 369:2197-2206

Esito neurologico TTM trial

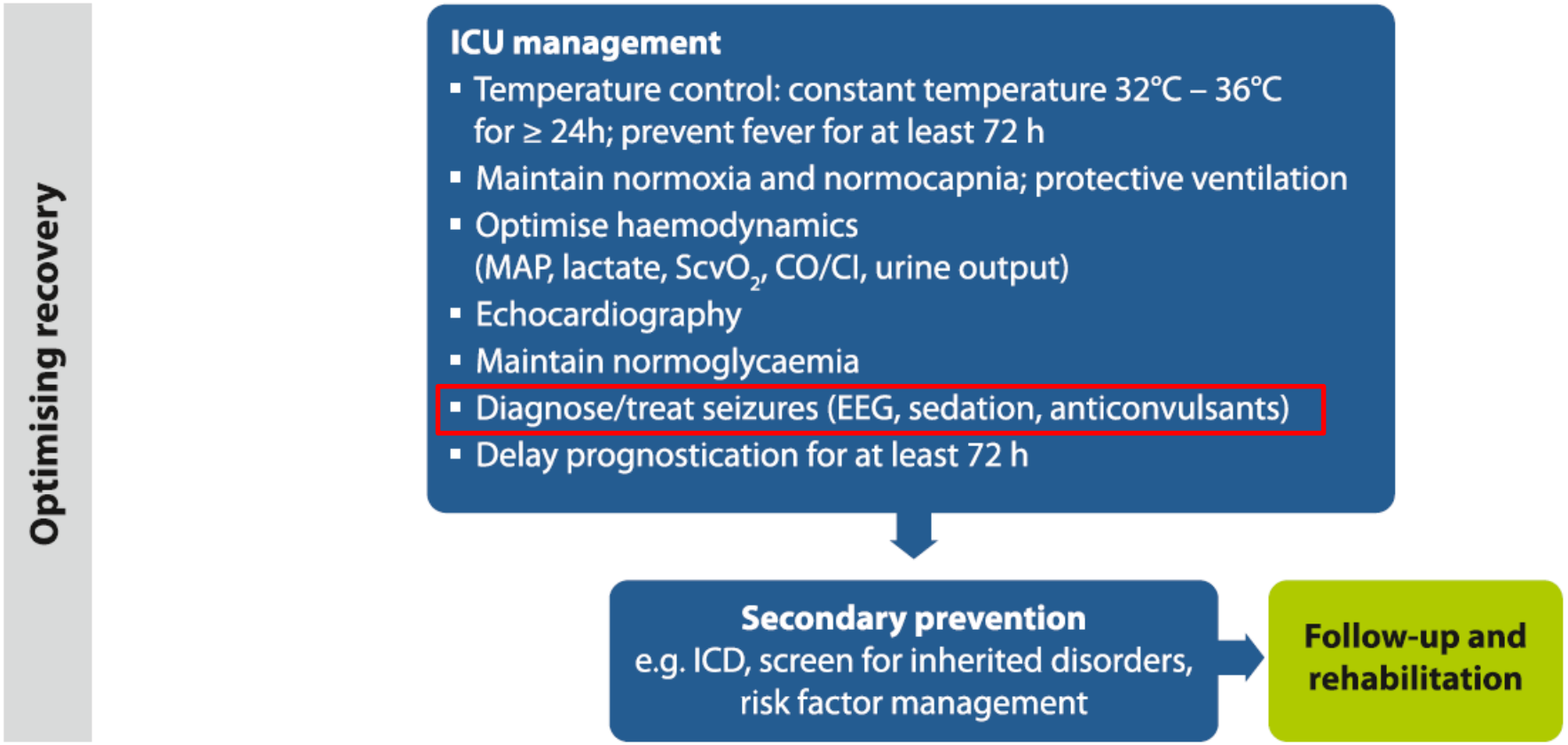
Variable	33°C Group	36°C Group
CPC at follow-up†		
Total no. of patients	469	464
Category — no. (%)		
1	195 (42)	183 (39)
2	23 (5)	39 (8)
3	17 (4)	20 (4)
4	6 (1)	2 (0.5)
5	228 (49)	220 (47)
P value for trend	0.85	

Good

Poor

† = at 180±14 days

Nielsen N et al, N Engl J Med 2013; 369:2197-2206



IRC ERC

J.P. Nolan et al. Resuscitation 2015; 95:202-22
Intensive Care Medicine 2015; *epub ahead of print.*

Contents lists available at SciVerse ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical Paper

The frequency and timing of epileptiform activity on continuous electroencephalogram in comatose post-cardiac arrest syndrome patients treated with therapeutic hypothermia☆,☆☆

Ram Mani[a], Sarah E. Schmitt[a], Maryann Mazer[b], Mary E. Putt[c,d], David F. Gaieski[e,f,*]

Clinical Paper

Prognostic value of electrographic postanoxic status epilepticus in comatose cardiac-arrest survivors in the therapeutic hypothermia era☆

Stéphane Legriel[a,*], Julia Hilly-Ginoux[a], Matthieu Resche-Rigon[b], Sybille Merceron[a], Jeanne Pinoteau[a],

- Fino al 25%-30% dei pazienti in coma dopo ACC presenta attività epilettica all'EEG
- Lo stato di male epilettico postanossico ha un esito sfavorevole nel >90% dei casi

Mani et al. Resuscitation 2012; 83: 840–7
Legriel et al. Resuscitation 2013; 84: 343–50

EEG intermittente o continuo?

Alvarez *et al. Critical Care* 2013, **17**:R190
http://ccforum.com/content/17/5/R190

CRITICAL CARE

RESEARCH Open Access

Yield of intermittent versus continuous EEG in comatose survivors of cardiac arrest treated with hypothermia

Vincent Alvarez[1], Alba Sierra-Marcos[1], Mauro Oddo[2] and Andrea O Rossetti[1*]

- Comparazione tra cEEG e 2 tracciati da 20 minuti estratti dal cEEG ("sEEG")
- 34 tracciati analizzati
- Concordanza cEEG/sEEG:
  - 97% per discontinuità e reattività
  - 94% per attività epilettica

Alvarez et al. Crit Care 2013; 17: R190.

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical Paper

Value analysis of continuous EEG in patients during therapeutic hypothermia after cardiac arrest☆

Amy Z. Crepeau[a,b,g,*], Jennifer E. Fugate[a,c,1], Jay Mandrekar[d,1], Roger D. White[e,f,1], Eelco F. Wijdicks[a,c,1], Alejandro A. Rabinstein[a,c,1], Jeffrey W. Britton[a,b,1]

- Controllo storico tra 91 pazienti con EEG intermittente vs. 62 con cEEG
- 5/62 (8%) convulsioni individuate con cEEG vs. 2/91 (2%)
- Costo $ 4214 vs. $ 1571 per paziente
- Nessuna differenza di prognosi

Crepeau et al. Resuscitation 2014; 85: 785-9.

TELSTAR: Treatment of ELectroencephalographic STatus epilepticus After cardiopulmonary Resuscitation

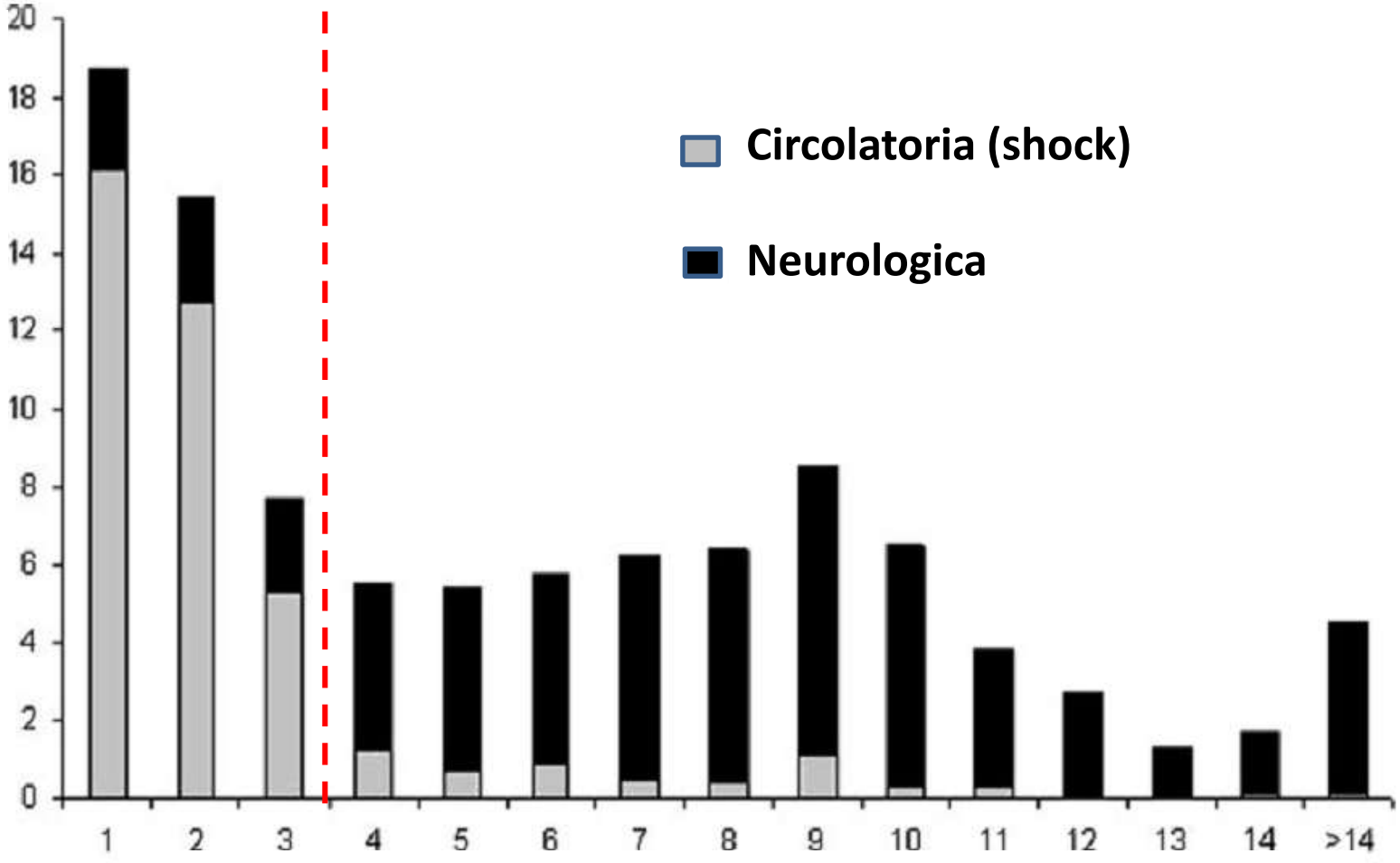
- PI: Jeannette Hofmeijer (Twente, NL)
- Pazienti: in coma dopo arresto cardiaco con stato epilettico
- Comparazione: trattamento farmacologico (3 step) vs. nessun trattamento
- Outcome measure: esito neurologico

IRC ERC

Clinicaltrials.gov NCT02056236

Prognosi

% Cause di morte dopo arresto cardiaco



Lemiale V et al, Intensive Care Med 2013; 39: 1972–80

Morte da causa neurologica

- Rappresenta il 40-66% delle morti nei pazienti ricoverati dopo arresto extraospedaliero
- Prevale dopo i primi 3-4 giorni dal ROSC
- Dovuta principalmente a sospensione dei trattamenti

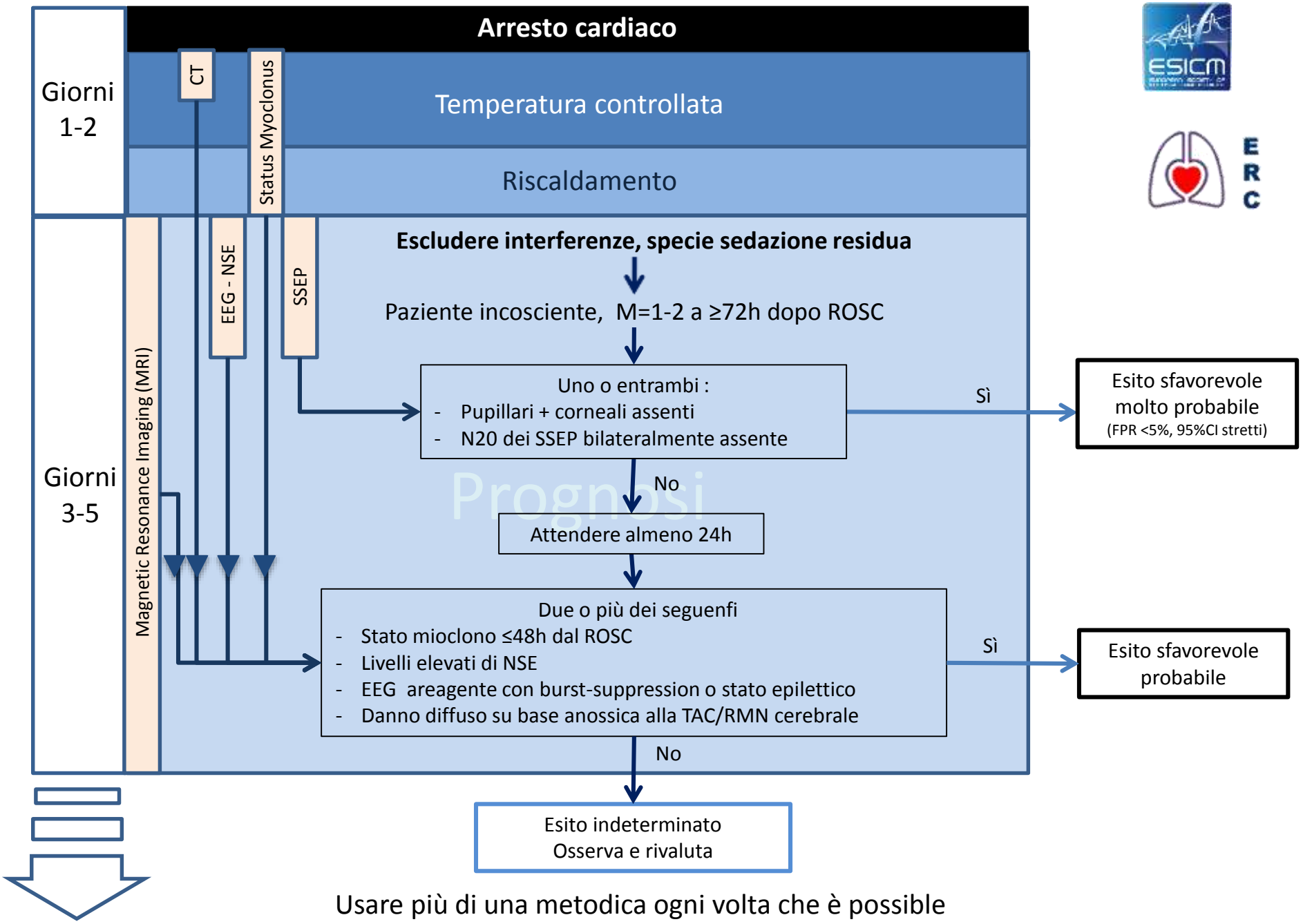
Laver S and Nolan JP Intensive Care Med 2004; 30:2126–2128
Lemiale V et al, Intensive Care Med 2013; 39: 1972–80
Nielsen N et al, N Engl J Med 2013; 369:2197-2206

IRC ERC

Previsione del danno neurologico

- Utile per:
  - Informare correttamente i familiari
  - Valutare la prosecuzione dei trattamenti
- Va effettuata ad almeno 72 ore
  - Alcuni test possono essere effettuati prima
- Escludere le interferenze

IRC ERC



Usare più di una metodica ogni volta che è possible

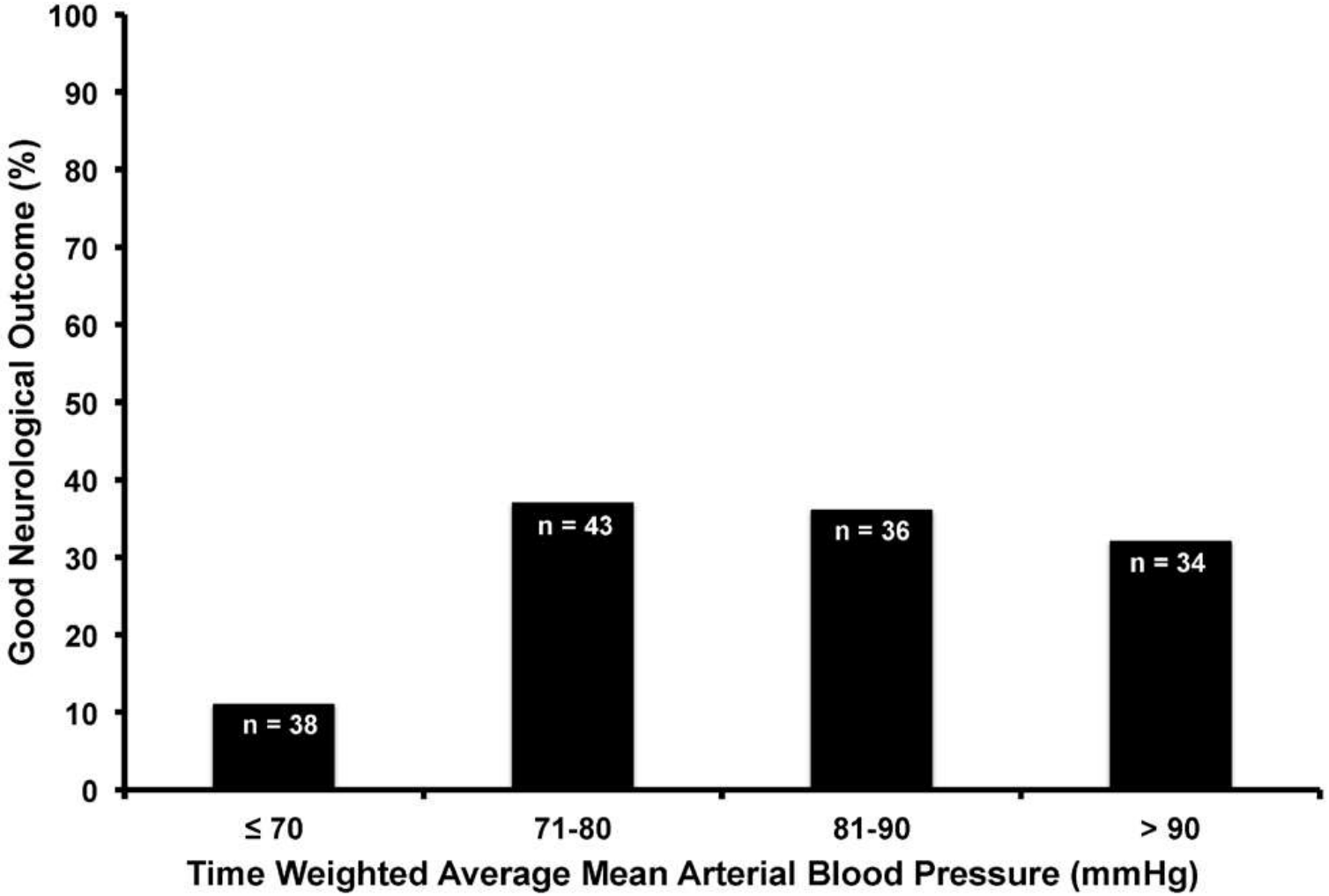
Conclusioni

- Il trattamento post-rianimatorio è essenziale per il successo della rianimazione
- 3 fasi:
  - Stabilizzazione iniziale
  - Trattamento della causa
  - Recupero funzionale e prognosi
- È importante sapere quando è necessario sospendere i trattamenti

IRC ERC

Grazie dell'attenzione!

sandroni@rm.unicatt.it



Kilgannon et al., *Crit Care Med* 2014; 42:2083–2091