Società Medico Chirurgica di Ferrara

Dal 1846

Sabato 5 ottobre 2013
dalle ore 8.30 alle 13.30
Aula Magna
Nuovo Ospedale S. Anna
Cona - Ferrara

ARRESTO CARDIACO: PER UN PERCORSO INTEGRATO DELL'AZIENDA OSPEDALIERO UNIVERSITARIA DI FERRARA

IL TRATTAMENTO IN AMBIENTE INTENSIVO

dott.Stefano Petrini
U.O. Anestesia e Rianimazione Ospedaliera
Direttore dott. R. Zoppellari

American Heart Association.
GUIDELINES CPR ECC 2010

CATENA DELLA SOPRAVVIVENZA

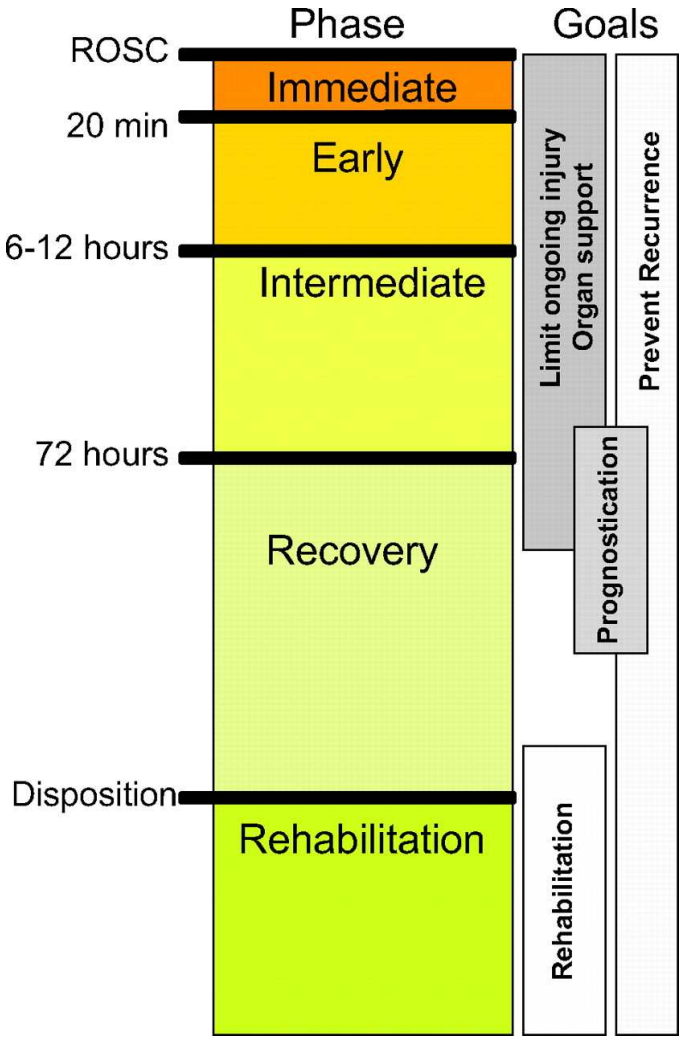
Post-cardiac arrest syndrome

Conseguente a ROSC dopo ischemia globale prolungata

Combinazione di processi fisiopatologici

Interventi diagnostici-terapeutici entro 6 ore

Figure. Phases of post–cardiac arrest syndrome.



Neumar R W et al. Circulation 2008;118:2452-2483

Periodo: 1 gen 2009 – 31 dic 2011:

60 RICOVERI PER ARRESTO CARDIACO

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association®

Heart Disease and Stroke Statistics—2013 Update A Report From the American Heart Association

Statistical Update	Out-of-Hospital Cardiac Arrest			In-Hospital Cardiac Arrest		
	Incidence	Survival rate (Discharge)	Survival rate (1-year)	Incidence	Survival rate	
					Discharge	1-year
2011	382,800	**11%**	**8%**	209,000	**23%**	**7%**
2011	13	(46%)	(31%)	4	(25%)	(25%)

Resuscitation 84 (2013) 292–297

Contents lists available at SciVerse ScienceDirect

Resuscitation

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

Clinical paper

Emergency department factors associated with survival after sudden cardiac arrest☆

Nicholas J. Johnson[a,*], Rama A. Salhi[b], Benjamin S. Abella[a,c], Robert W. Neumar[a,c], David F. Gaieski[a,c], Brendan G. Carr[a,b]

[a] Department of Emergency Medicine, Perelman School of Medicine, University of Pennsylvania, United States
[b] Department of Epidemiology and Biostatistics, Perelman School of Medicine, University of Pennsylvania, United States
[c] Center for Resuscitation Science, Department of Emergency Medicine, Perelman School of Medicine, University of PennsylvaniaUnited States

Campione: 966 Ospedali in 27 Stati U.S.A.

38593 arresti extraH

DIMISSIONE OSPEDALIERA: **15,7%**

46,2%

Table 21-9. Quality of Care for In-Hospital Cardiac Arrest

	Overall
Time to first shock within 3 min*	92.1% (91.0%–93.2%)
Hypothermia after resuscitation maintained between 32°C and 34°C	35.6% (30.5%–40.7%)

*Among those with a first recorded rhythm of ventricular fibrillation, pulseless ventricular tachycardia, or shockable by automated external defibrillator.

Fisiopatologia

Persistenza della causa dell’arresto cardiaco

Danno neurologico

Disfunzione cardio-vascolare

Danno da ischemia/riperfusione sistemica

Approccio

- Anamnesi + E.O.(neurologico: risposta motoria)
- ECG, Ecocardiografia
- RX torace
- EGA, lattati, enzimi cardiaci, elettroliti
- Dosaggi tossicologici
- Intubazione tracheale, SNG
- Incann. Art., CVC

Journal of Intensive Care Medicine
Volume 24 Number 3
May/June 2009 179-186

10.1177/0885066609332725
http://jicm.sagepub.com
hosted at
http://online.sagepub.com

Coronary Angiography Predicts Improved Outcome Following Cardiac Arrest: Propensity-adjusted Analysis

Joshua C. Reynolds, MD, Clifton W. Callaway, MD, PhD, Samar R. El Khoudary, PhD, MPH, Charity G. Moore, PhD, MSPH, René J. Alvarez, MD, and Jon C. Rittenberger, MD, MS

Table 2. Comparison of the Percentage With Good Clinical Outcome for Patients who Received CATH and Those Who did not

	% Good Outcome		
	CATH	No CATH	*P*-value
Overall unadjusted	52/96 (54.2%)	36/145 (24.8%)	<.0001

Table 3. Catheterization Results in Patients With ECG Changes of STEMI or new LBBB

	All Rhythms (n = 46)	VF/VT (n = 27)	PEA (n = 11)	Asystole (n = 7)	Unknown (n = 1)
Received CATH	42 (91%)	27 (100%)	8 (73%)	6 (86%)	1 (100%)
Among those receiving CATH					
Positive CATH	39 (93%)	25 (93%)	7 (88%)	6 (100%)	1 (100%)
1 vessel	16 (38%)	13 (48%)	1 (13%)	2 (33%)	0 (0%)
2 vessels	11 (26%)	6 (22%)	3 (38%)	2 (33%)	0 (0%)
3 vessels	7 (17%)	4 (15%)	1 (13%)	2 (33%)	0 (0%)
4 vessels	3 (7%)	0 (0%)	2 (25%)	0 (0%)	1 (100%)
5 vessels	2 (5%)	2 (7%)	0 (0%)	0 (0%)	0 (0%)
Stent	29 (63%)	21 (78%)	4 (36%)	3 (43%)	1 (100%)

Table 4. Catheterization results in Patients Without ECG Changes of STEMI or new LBBB

	All Rhythms (n = 195)	VF/VT (n = 66)	PEA (n = 63)	Asystole (n = 45)	Unknown (n = 21)
Received CATH	54 (28%)	30 (45%)	16 (25%)	5 (11%)	3 (14%)
Among those receiving CATH					
Positive CATH	31 (57%)	17 (57%)	9 (56%)	3 (60%)	2 (66%)
1 vessel	13 (24%)	8 (27%)	3 (19%)	2 (40%)	0 (0%)
2 vessels	7 (13%)	2 (7%)	3 (19%)	0 (0%)	2 (66%)
3 vessels	5 (9%)	3 (10%)	1 (6%)	1 (20%)	0 (0%)
4 vessels	4 (7%)	3 (10%)	1 (6%)	0 (0%)	0 (0%)
5 vessels	2 (4%)	1 (3%)	1 (6%)	0 (0%)	0 (0%)
Stent	19 (10%)	10 (16%)	5 (9%)	1 (2%)	3 (15%)
CABG	11 (6%)	9 (14%)	1 (2%)	1 (2%)	0 (0%)
LVAD	4 (2%)	2 (3%)	1 (2%)	1 (2%)	0 (0%)
Transplant	6 (3%)	5 (8%)	0 (0%)	1 (2%)	0 (0%)
IABP	18 (10%)	11 (17%)	3 (5%)	3 (7%)	2 (10%)

NOTES: CATH = cardiac catheterization with coronary angiography; positive CATH = lesion ≥70% present on CATH; CABG = coronary artery bypass graft; IABP = intra-aortic balloon pump; LVAD = mechanical left-ventricular assist device; PEA = pulseless electrical activity; VF/VT = ventricular fibrillation or ventricular tachycardia.

Coronarografia

a meno di causa non cardiaca **evidente**

TC encefalo
TC total body

Part 9: Post–Cardiac Arrest Care

2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

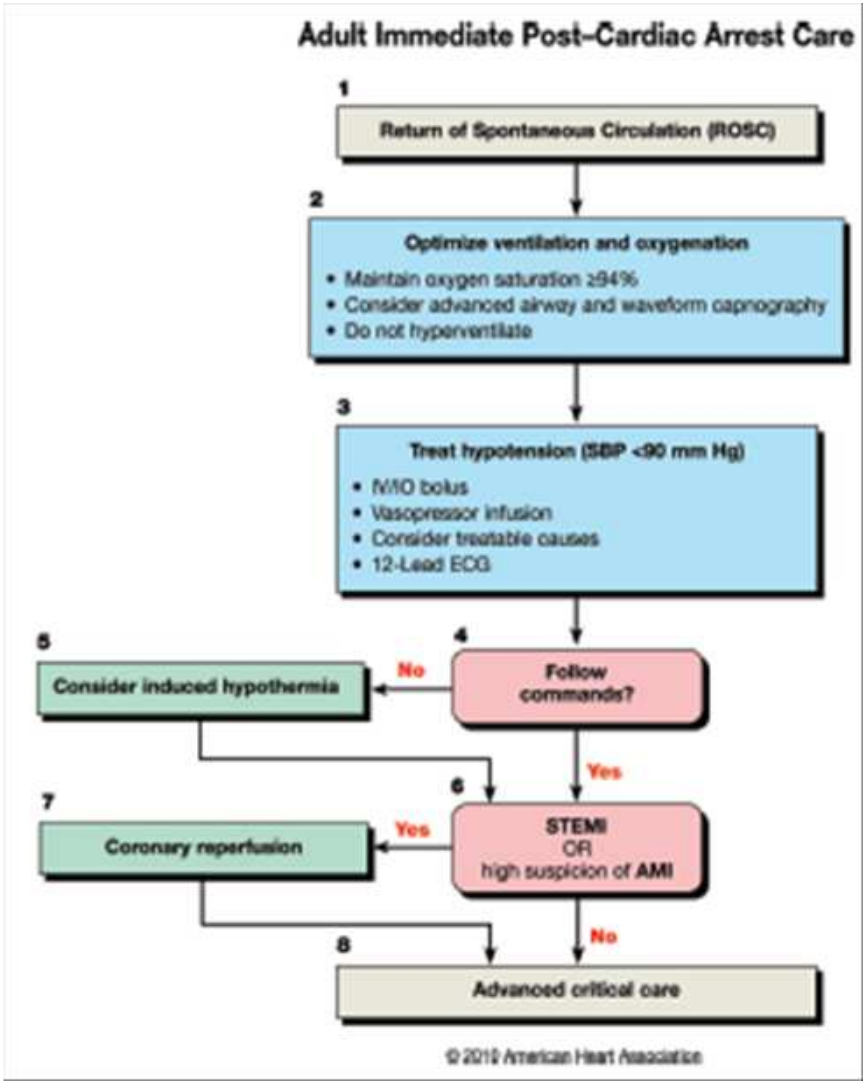


Table 1. Multiple System Approach to Post–Cardiac Arrest Care

Ventilation	Hemodynamics	Cardiovascular	Neurological	Metabolic
• Capnography	• Frequent Blood Pressure Monitoring/Hemodialysis	• Continuous Cardiac Monitoring	• Serial Neurological Exam	• Serial Lactate
• Rationale: Confirm secure airway and tissue ventilation	• Rationale: Maintain perfusion and prevent recurrent hypotension	• Rationale: Detect recurrent arrhythmia	• Rationale: Serial examinations define coma, brain injury, and prognosis	• Rationale: Confirm adequate perfusion
• Endotracheal tube when possible for comatose patients	• Mean arterial pressure ≥65 mm Hg or systolic blood pressure ≥90 mm Hg	• No prophylactic antiarrhythmics	• Response to verbal commands or physical stimulation	
• P_{ETCO_2} 35–40 mm Hg		• Treat arrhythmias as required	• Pupillary light and corneal reflex, spontaneous eye movement	
• P_{aCO_2} 40–45 mm Hg		• Remove reversible causes	• Gag, cough, spontaneous breaths	
• Chest X-ray	• Treat Hypotension	• 12-lead ECG/Telemetry	• EEG Monitoring If Comatose	• Serum Potassium
• Rationale: Confirm secure airway and detect causes or complications of arrest: pneumonia, pneumonia, pulmonary edema	• Rationale: Maintain perfusion	• Rationale: Detect Acute Coronary Syndrome/ST-Elevation Myocardial Infarction; Assess QT interval	• Rationale: Exclude seizures	• Rationale: Avoid hypokalemia which promotes arrhythmias
	• Fluid bolus if tolerated		• Antiarrhythmics if seizing	• Replace to maintain K >3.5 mEq/L
	• Dopamine 5–10 mcg/kg per min			
	• Norepinephrine 0.1–0.5 mcg/kg per min			
	• Epinephrine 0.1–0.5 mcg/kg per min			
• Pulse Oximetry/ABG	…	• Treat Acute Coronary Syndrome	• Core Temperature Measurement If Comatose	• Urine Output, Serum Creatinine
• Rationale: Maintain adequate oxygenation and ventilation P_{aO_2}	…	• Aspirin/heparin	• Rationale: Minimize brain injury and improve outcome	• Rationale: Detect acute kidney injury
• SpO_2 ≥94%	…	• Transfer to acute coronary treatment center	• Prevent hyperglycemia >37.7°C	• Maintain euvolemia
• P_{aO_2} >100 mm Hg	…	• Consider emergent PCI or fibrinolysis	• Induce therapeutic hypothermia if no contraindications	• Renal replacement therapy if indicated
• Reduce F_{IO_2} as tolerated	…		• Cold IV fluid bolus 30 mL/kg if no contraindication	
• P_{aO_2}/F_{IO_2} ratio to follow acute lung injury	…		• Surface or endovascular cooling for 32°C–34°C×24 hours	
	…		• After 24 hours, slow rewarming 0.25°C/hr	
• Mechanical Ventilation	…	• Echocardiogram	• Consider Non-enhanced CT Scan	• Serum Glucose
• Rationale: Minimize acute lung injury, prevent oxygen toxicity	…	• Rationale: Detect global dysfunction, wall motion abnormalities, structural problems or cardiomyopathy	• Rationale: Exclude primary intracranial process	• Rationale: Detect hyperglycemia and hypoglycemia
• Tidal Volume 6–8 mL/kg	…			• Treat hyperglycemia (>180 mg/dL) with insulin
• Titrate minute ventilation to P_{aCO_2} 35–40 mm Hg P_{ETCO_2} 35–40 mm Hg P_{aCO_2} 40–45 mm Hg	…			• Treat hyperglycemia to target glucose 144–180 mg/dL
• Reduce F_{IO_2} as tolerated to keep SpO_2 or S_{aO_2} ≥94%	…			• Local insulin protocols
	…	• Treat Myocardial Stunning	• Sedation/Muscle Relaxation	• Avoid Hypotonic Fluids
	…	• Fluids to optimize volume status (requires clinical judgment)	• Rationale: To control shivering, agitation, or ventilator dyssynchrony as needed	• Rationale: May increase edema, including cerebral edema
	…	• Dobutamine 5–10 mcg/kg per min		
	…	• Mechanical augmentation (IABP)		

TERAPIA MULTIMODALE

- **Trattare causa arresto cardiaco**
- **Ipotermia terapeutica**
- **Ventilazione**
- **Ottimizzazione emodinamica**
- **Controllo glicemico**
- **Antiepilettici**

Persistenza della Causa dell’arresto cardiaco

- Infarto miocardico (50% arresti extraosp.)
- Lesioni traumatiche
- Embolia polmonare
- Patologie polmonari
- Ipovolemia / Anemia
- Sepsi
- Acidosi / Disturbi elettrolitici
- Intossicazioni

Sedoanalgesia

(neuroprotezione farmacologica)

- Riduzione consumo O_2
- Nursing
- Riduzione agitazione
- Adattam. ventilatore
- Azione anticomiziale

- Dopo le prime 48 ore adattamento continuo livello sedazione

Febbre

- Non significa sempre infezione
- Disregolazione ipotalamica
- Prelievi colturali seriati e tempestiva terapia antibiotica mirata
- Febbre e Brivido: aumento consumo O_2 (danno 2° da aggravamento ischemia perilesionale)
- Misurazione temperatura centrale (vescicale)
- Obiettivo: normotermia (**T≤ 37,6° C**)
- Terapia:
  - Fisica: raffreddamento con mezzi fisici
  - Farmacologica: paracetamolo, diclofenac in infusione

Critical Care Med,2004;32:1489-95

Ventilazione

- $PaCO_2$ 40-45 mmHg
- Normossia ($PaO_2$100 mmHg con FiO2 0,4)
- Posizione 30-45 gradi

Scarico venoso giugulare favorevole
Antiatelettasica
Riduzione VAP

- Vt 6-8 ml/kg peso ideale
- Pplat < 28 cmH_2O
- PEEP 5 cmH_2O

Ventilazione protettiva

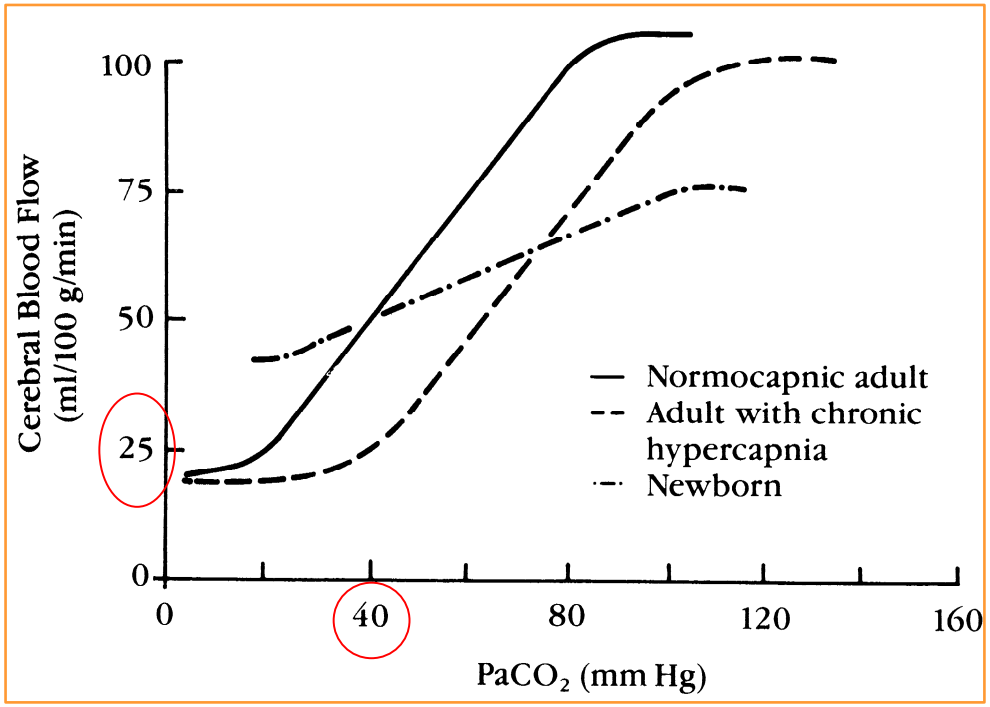

Crit Care Med. 2011 Jun;39(6):1482-92.

Management and outcome of mechanically ventilated neurologic patients.

Pelosi P, Ferguson ND, Frutos-Vivar F, Anzueto A, Putensen C, Raymondos K, Apezteguia C, Desmery P, Hurtado J, Abroug F, Elizalde J, Tomicic V, Cakar N, Gonzalez M, Arabi Y, Moreno R, Esteban A; Ventila Study Group.

CO_2

- ↓ CO_2 1 mmHg: ↓ CBF 2,5-4%
- Ipoafflusso cerebrale dopo ROSC
- Correzione CO_2 per T 33° C (> di 6-7 mmHg)

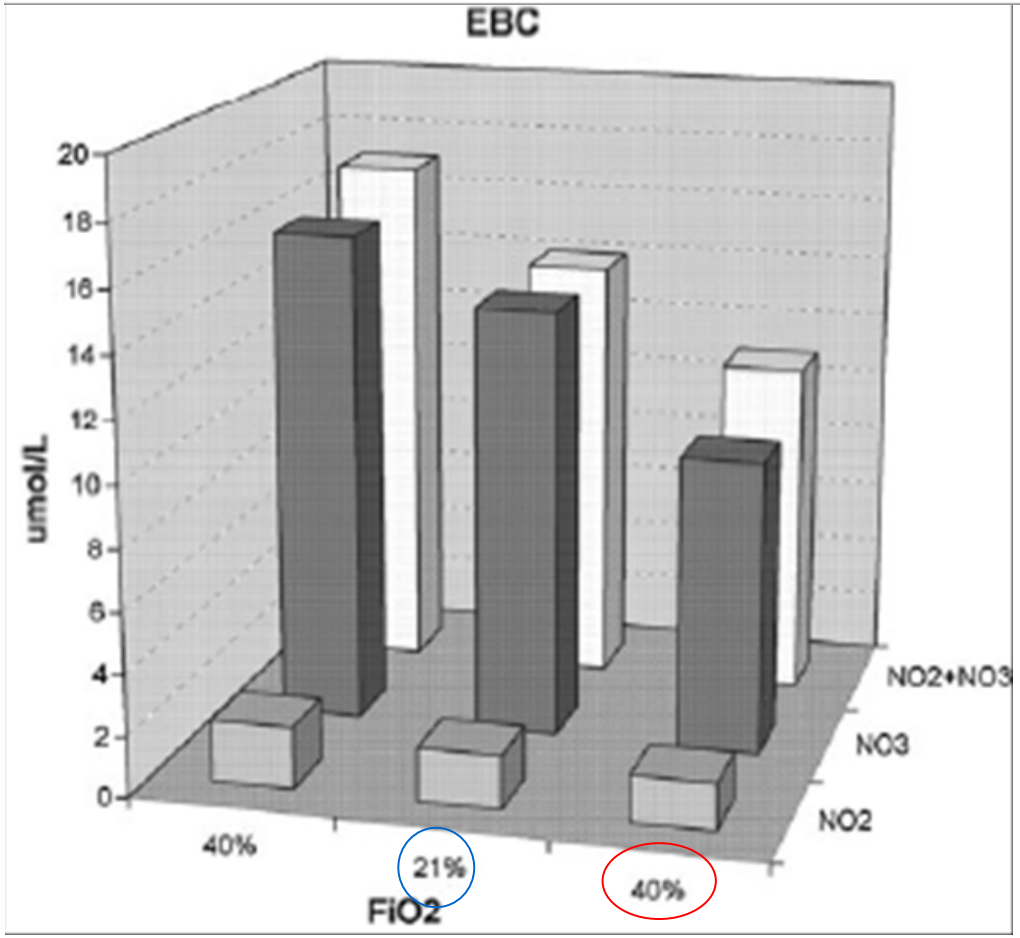


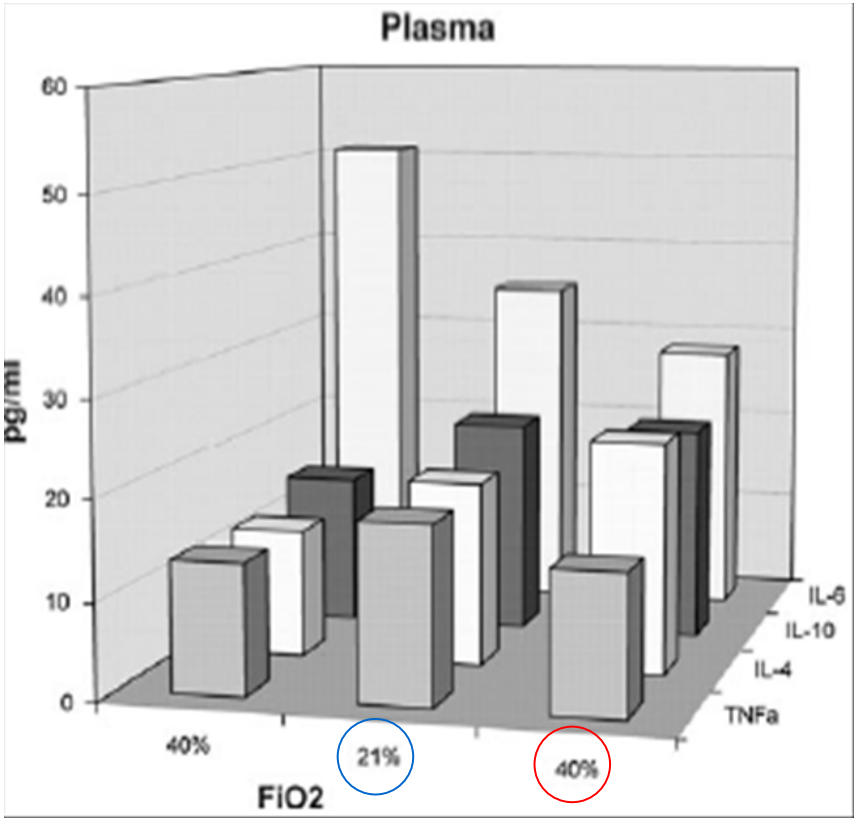
Intensive Care Med (2013) 39:711–716
DOI 10.1007/s00134-012-2801-z

ORIGINAL

Rafael Fernandez
Gisela Gili
Ana Villagra
Josefina Lopez-Aguilar
Antonio Artigas

Assessment of the inflammatory effect of low-dose oxygen in mechanically ventilated patients

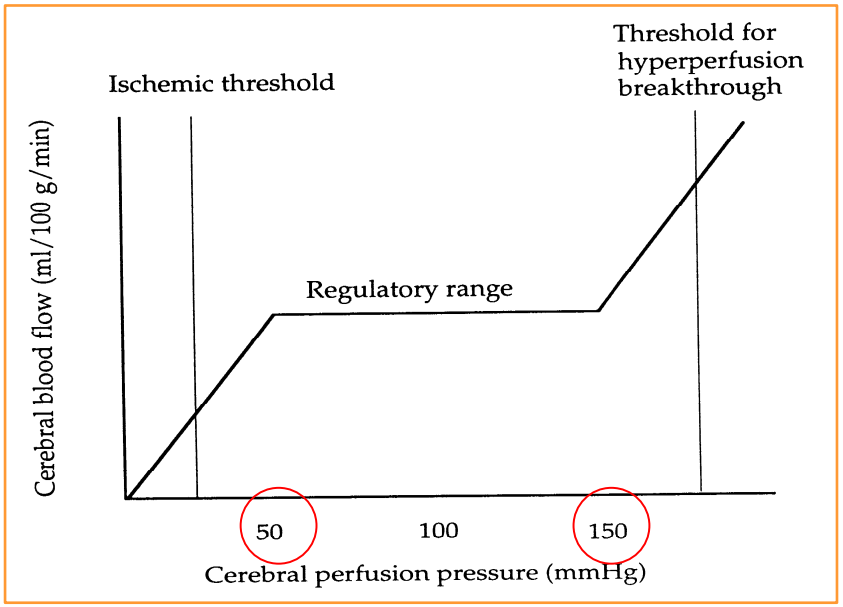




Emodinamica

$DO_2 = CBF \times CaO_2$

$CaO_2 = PaO_2 \times 0.003 + (g\ Hb \times 1.36 \times \%\ HbO_2)$



Supporto Emodinamico

- Riperfusione coronarica
- Riempimento volemico
- Inotropi
- Vasopressori
- Antiaritmici
- IABP

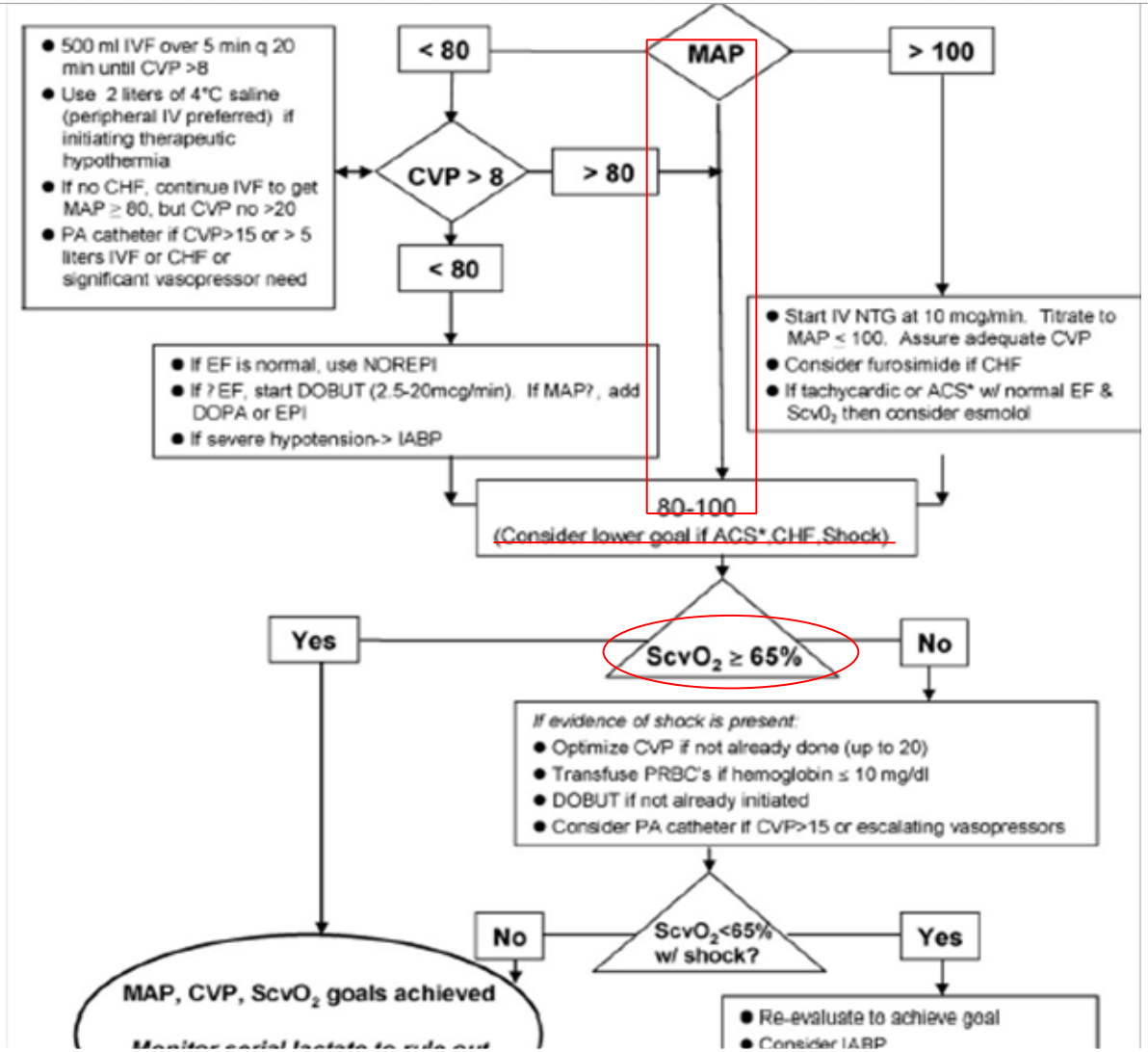
Resuscitation 80 (2009) 418–424

Contents lists available at ScienceDirect

Resuscitation

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

Early goal-directed hemodynamic optimization combined with therapeutic hypothermia in comatose survivors of out-of-hospital cardiac arrest☆,☆☆



Obiettivi

- MAP 80 mmHg
- Ø vena cava 2 cm (PVC 10 mmHg)
- Hb > 9 g/dl

- $ScvO_2$ >65%
- Diuresi 1 ml/kg/h
- Lattacidemia < 2 mmol/L

indici di perfusione

Controllo Glicemico

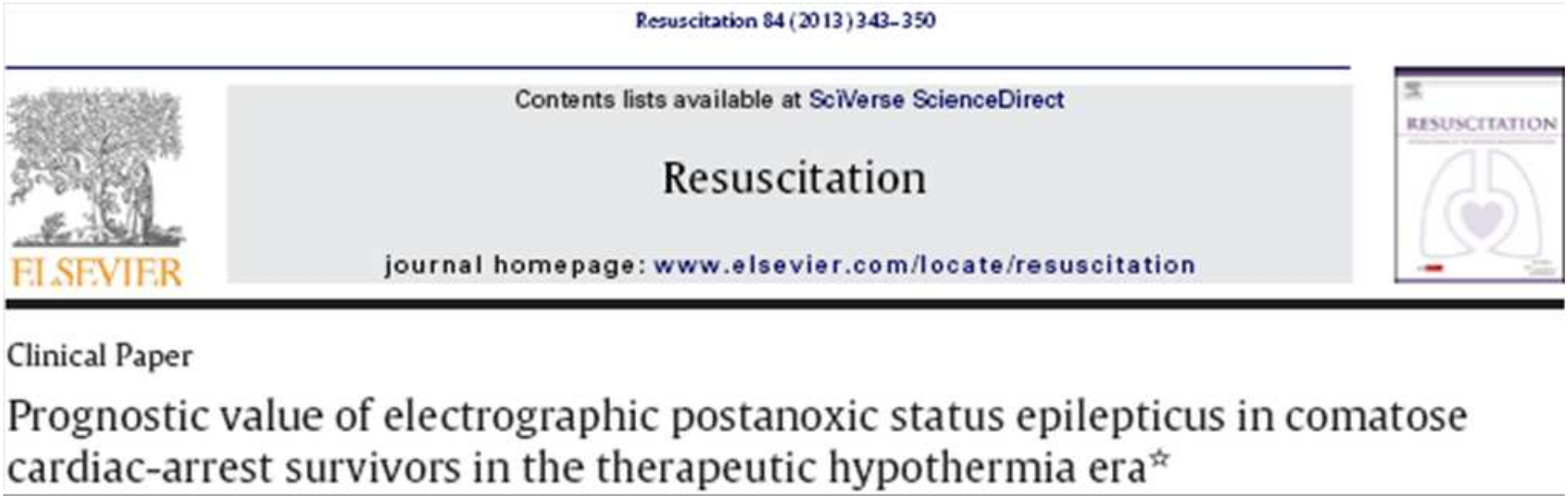
- Glicemia 100-150 mg/dl
- Controlli frequenti durante ipotermia e riscaldamento
- Protocollo infusione continua Insulina

Terapia Antiepilettica

- EEG
- Ipotermia e sedazione (midazolam/propofol)
- EEG ripetuti se crisi epilettiche
- Fenitoina, Levetiracetam, Fenobarbitale

Stato epilettico post-anossico

- Associazione due o più antiepilettici
- Se refrattario: Burst suppression (propofol e midazolam in infusione continua)



Resuscitation 84 (2013) 343–350

Contents lists available at SciVerse ScienceDirect

Resuscitation

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

Clinical Paper

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

Terapia di Base

- Antibiotici
- Inibitori pompa protonica
- Tp anticoagulante/antiaggregante
- Nutrizione Enterale

FATTORI PROGNOSTICI

- Valutazione neurologica a 72 ore
- EEG, potenziali evocati somato-sensoriali
- Tac, RM encefalo
- Enolasi neurono-specifica a 48-72 ore

N.B.: ipotermia altera progressione del danno

Adrie et al. “Predicting survival with good recovery at hospital admission after successful resuscitation..” Eur Heart J 2006; 27:2840

Donazione d'organi

Intensive Care Med (2008) 34:132–137
DOI 10.1007/s00134-007-0885-7

ORIGINAL

Christophe Adrie
Hakim Haouache
Mohamed Saleh
Nathalie Memain
Ivan Laurent

An underrecognized source of organ donors: patients with brain death after successfully resuscitated cardiac arrest