CONGRESSO NAZIONALE IRC 2023

Vicenza

Italian Resuscitation Conference 2023

20 • 21 OTTOBRE

Vicenza Convention Centre

LA RIVOLUZIONE DEI SISTEMI

IRC Italian Resuscitation Council

Target: quali, quanto e come

Ovvero: come passare da istruzioni ‘di massa’ a strategie di precisione che si servano della fisiologia individuale del paziente per guidare il processo di rianimazione

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Direttore Dipartimento di Emergenza
As Friuli Occidentale

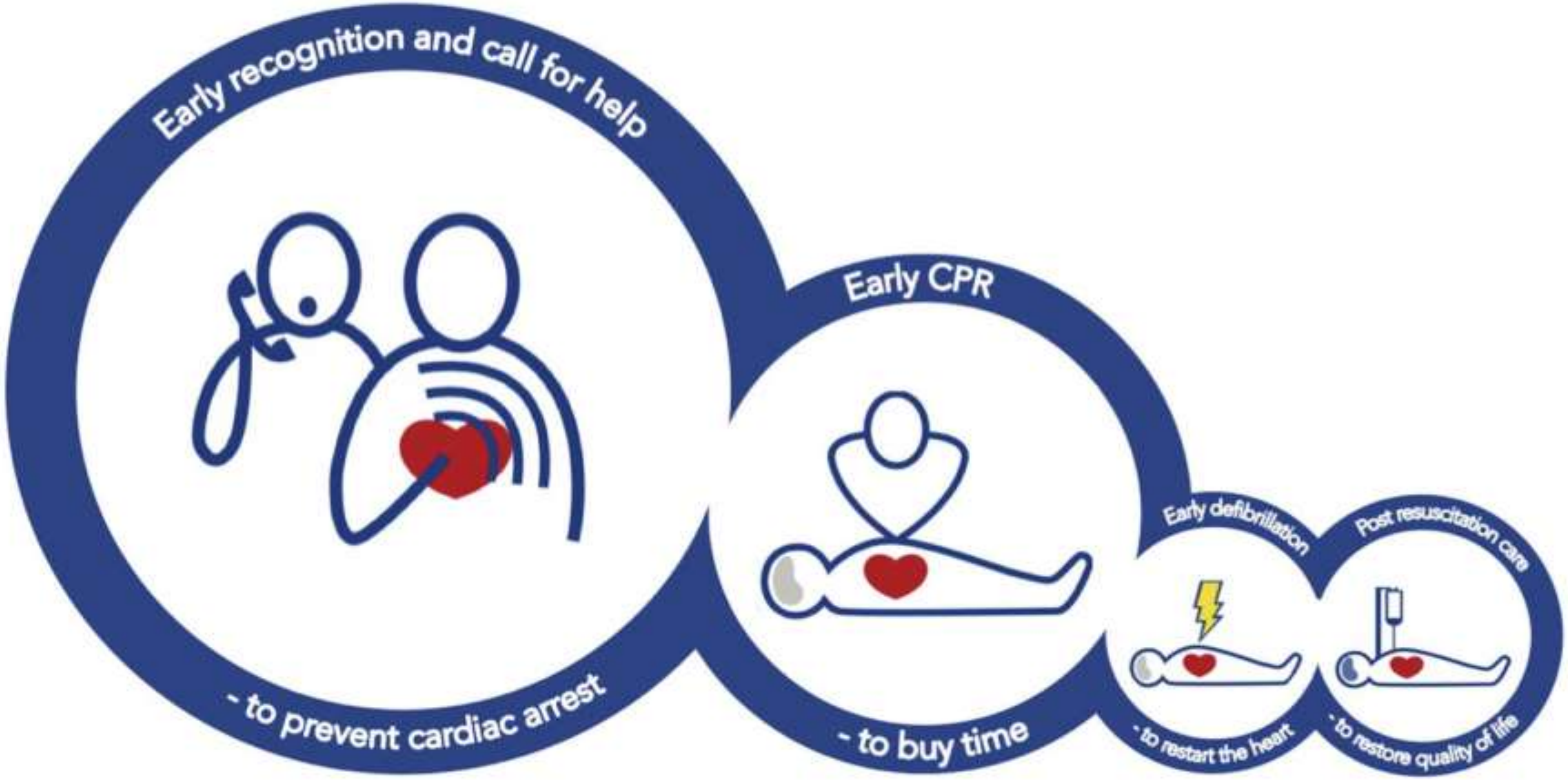


Fig. 1. Chain of survival for out-of-hospital cardiac arrest (Area ratios 1.0, 0.47, 0.12, 0.12).

ALS 2021

5 TOP MESSAGES

EUROPEAN RESUSCITATION COUNCIL

1. High-quality chest compression with minimal interruption, early defibrillation, and treatment of reversible causes remain the priority

2. Premonitory signs and symptoms often occur before cardiac arrest in- or out-of-hospital – cardiac arrest is preventable in many patients

3. Use a basic or advanced airway technique – only rescuers with a high success rate should use tracheal intubation

4. Use adrenaline early for non-shockable cardiac arrest

5. In select patients, if feasible, consider extracorporeal CPR (eCPR) as a rescue therapy when conventional ALS is failing

Even when delivered accordingly to guidelines, CPR provides only:

- 10% to 30% of normal blood flow to the heart
- 30% to 40% of normal blood flow to the brain

→ ***deliver the highest-quality CPR possible!***

Meaney et al. Circulation 2013

«**High-quality CPR**» refers to strict adherence to recommendations

- **Adequate depth (approximately 5 cm, but < 6 cm)**
- **Adequate rate (100-120/min)**
- **Duty cycle 50%**
- **Complete chest recoil**
- **Minimize interruptions**

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

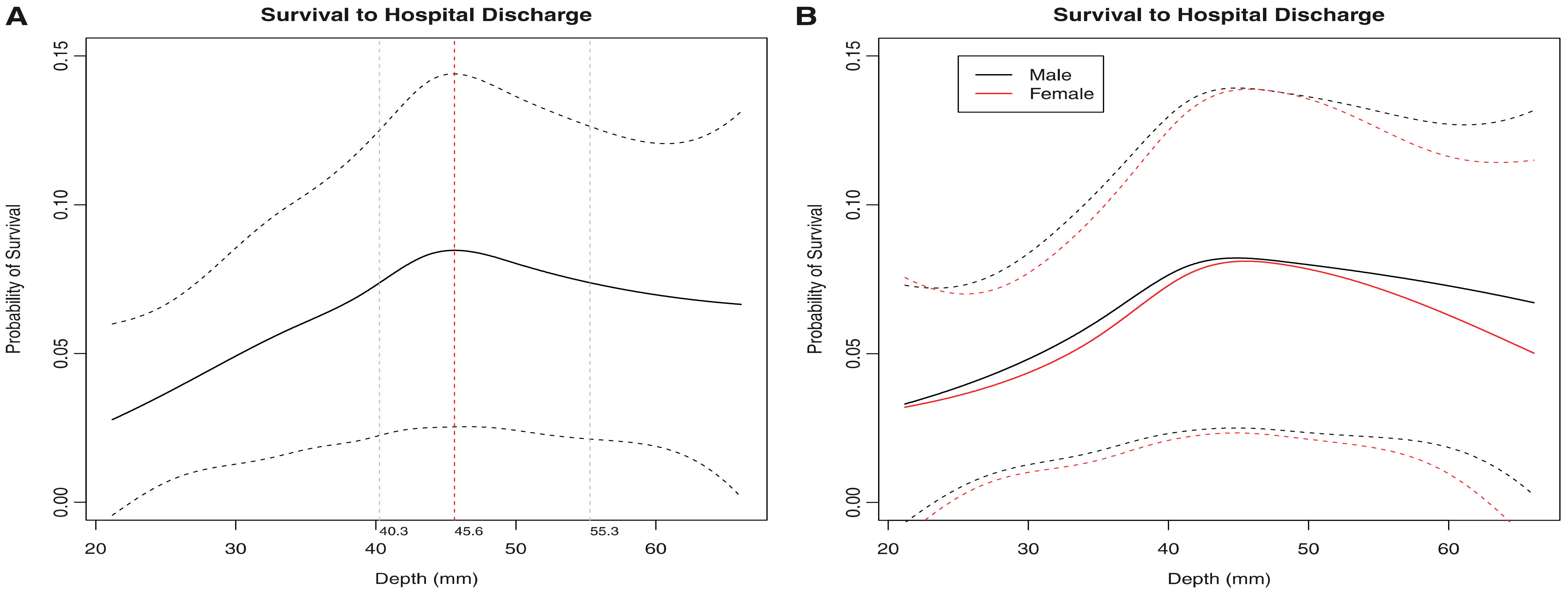
American Heart Association.

What is the Optimal Chest Compression Depth During Out-of-Hospital Cardiac Arrest Resuscitation of Adult Patients?

Ian G. Stiell, Siobhan P. Brown, Graham Nichol, Sheldon Cheskes, Christian Vaillancourt, Clifton W. Callaway, Laurie J. Morrison, James Christenson, Tom P. Aufderheide, Daniel P. Davis, Cliff Free, Dave Hostler, John A. Stouffer and Ahamed H. Idris
and the Resuscitation Outcomes Consortium (ROC) Investigators

Circulation. published online September 24, 2014;
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 0009-7322. Online ISSN: 1524-4539

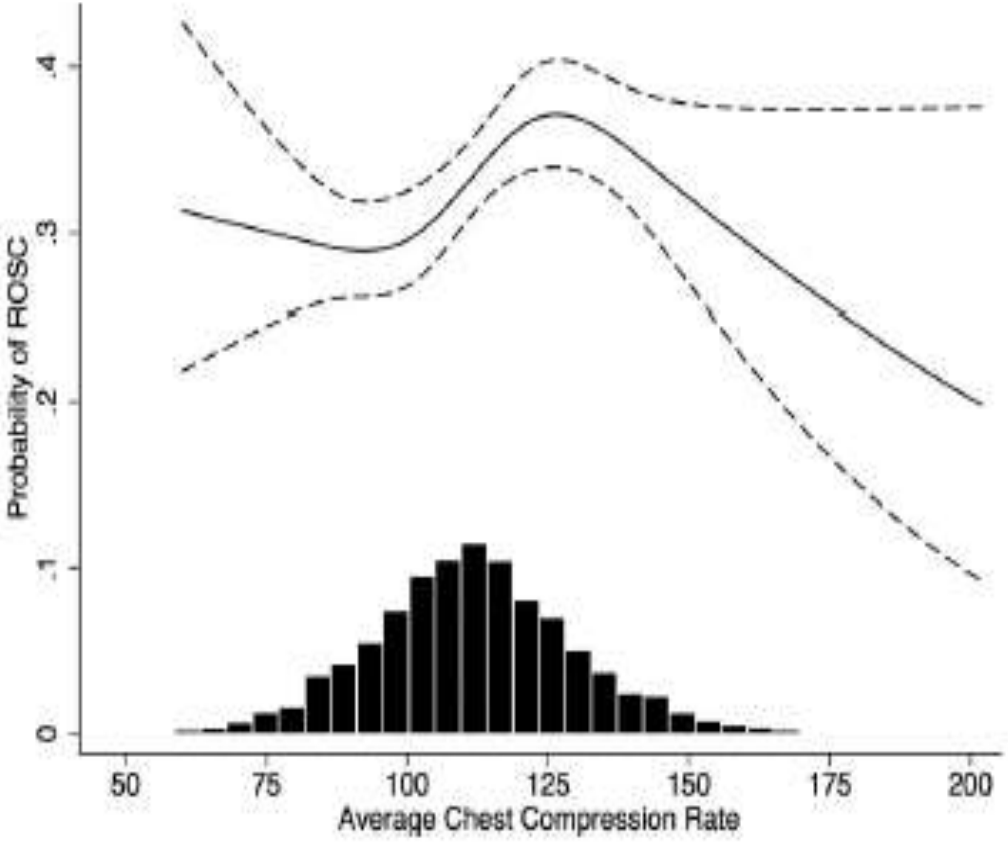


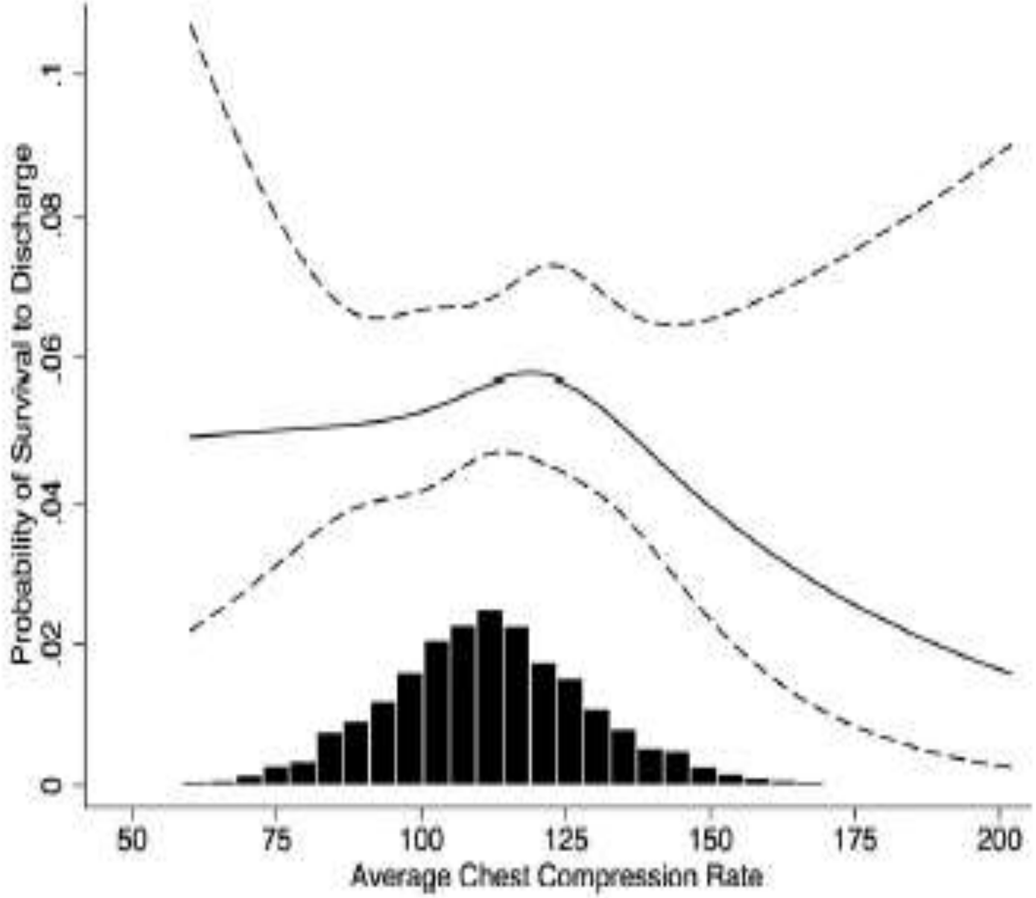
Circulation 2012

Relationship Between Chest Compression Rates and Outcomes From Cardiac Arrest

Ahamed H. Idris, MD; Danielle Guffey, BS; Tom P. Aufderheide, MD; Siobhan Brown, PhD;

3.098 patients with OOH cardiac arrest





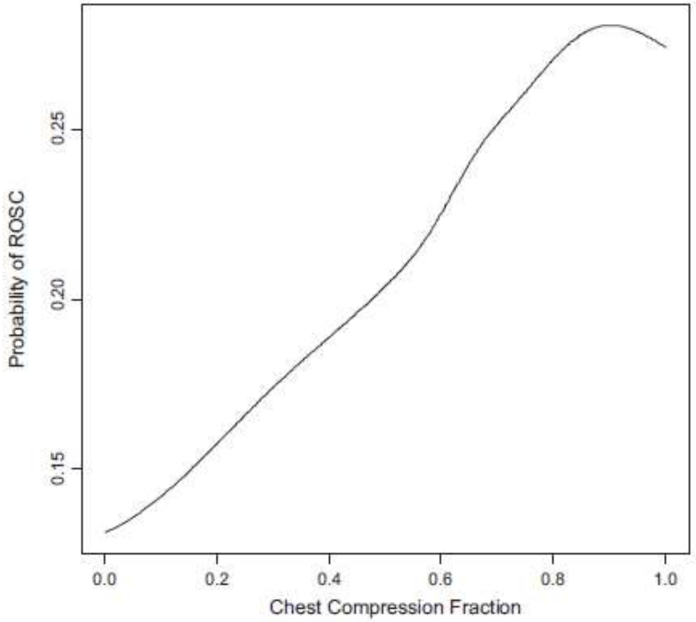
Clinical paper

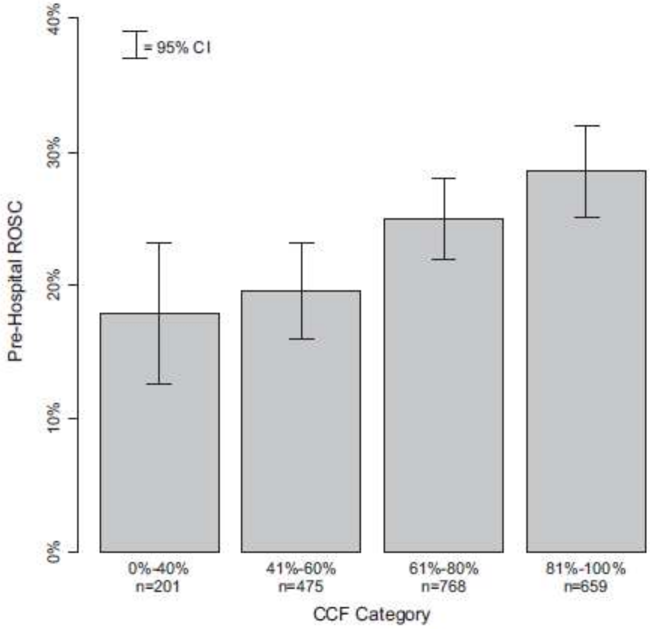
The impact of increased chest compression fraction on return of spontaneous circulation for out-of-hospital cardiac arrest patients not in ventricular fibrillation☆

Christian Vaillancourt[a,*], Siobhan Everson-Stewart[b], Jim Christenson[c], Douglas Andrusiek[c], Judy Powell[b], Graham Nichol[b], Sheldon Cheskes[d], Tom P. Aufderheide[e], Robert Berg[f], Ian G. Stiell[a], the Resuscitation Outcomes Consortium Investigators

Resuscitation 2011

2.103 adult patients from 10 U.S. and Canadian centers

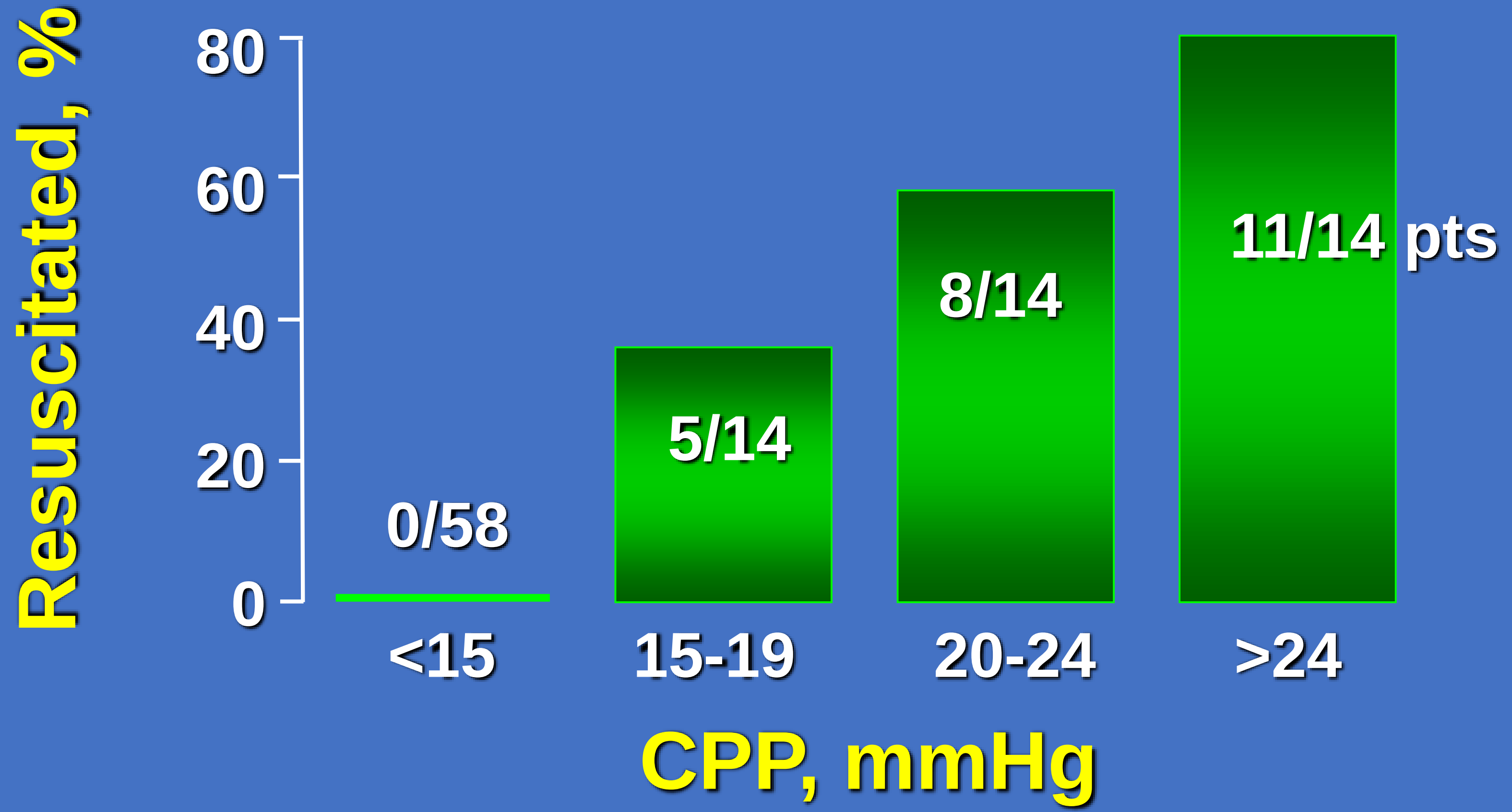




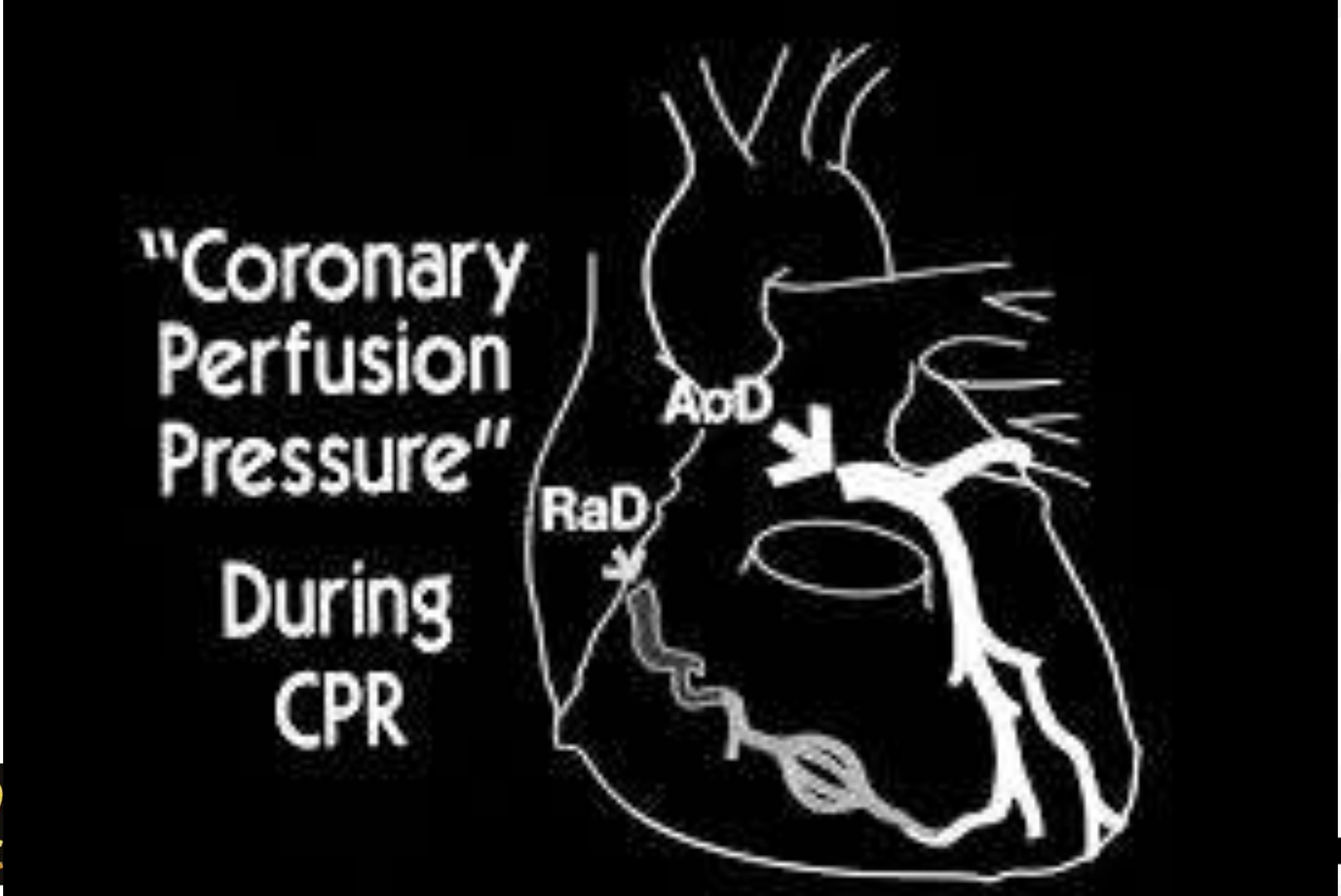
CPR MONITORING AND FEEDBACK DEVICES

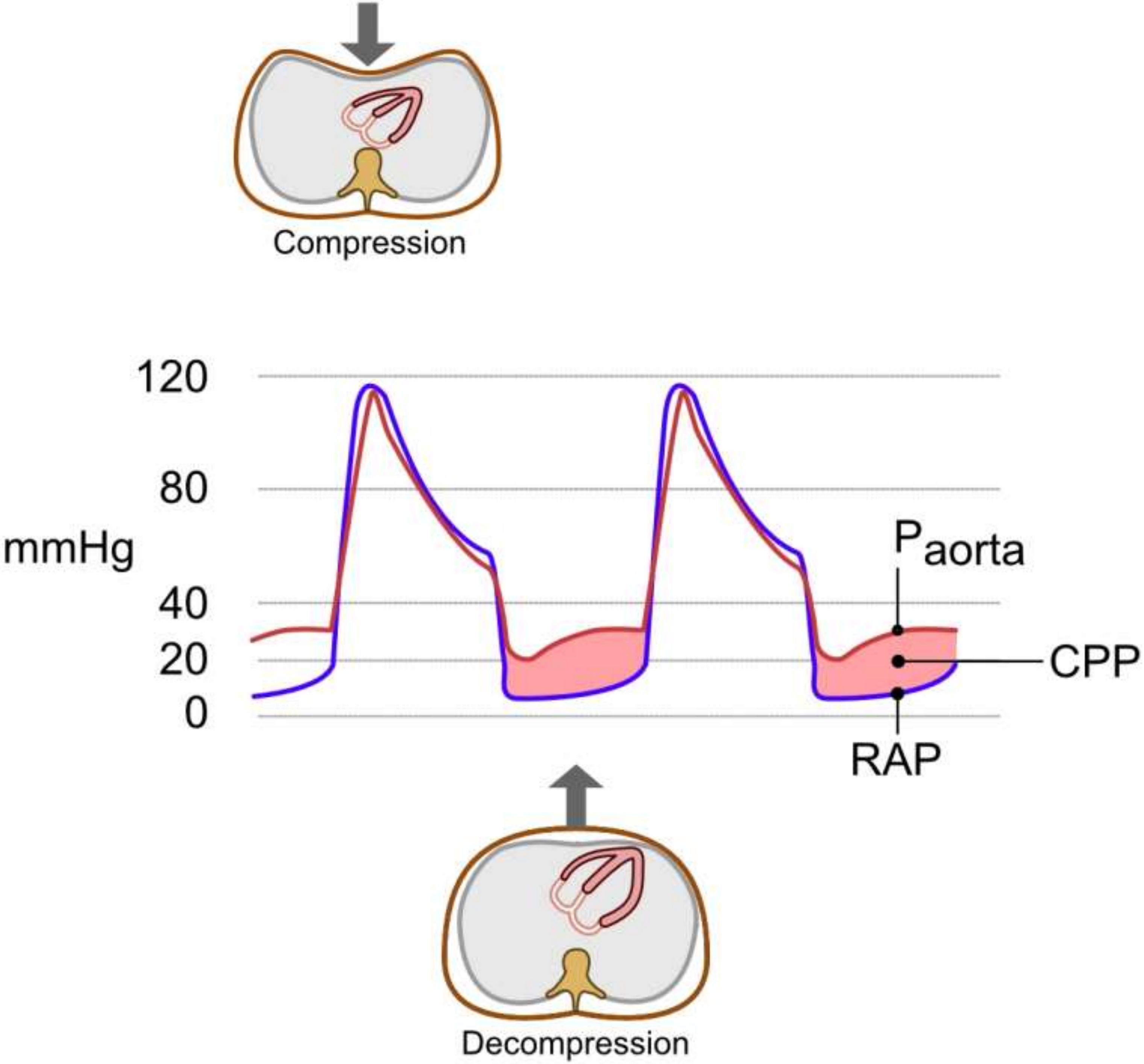
- HEALTH CARE SYSTEMS:
  - Monitor CPR quality to improve key CPR metrics within your system
- INDIVIDUAL RESCUERS:
  - Audio-visual feedback and prompt devices that give real-time feedback to rescuers during CPR do not improve survival

Coronary Perfusion Pressure during CPR



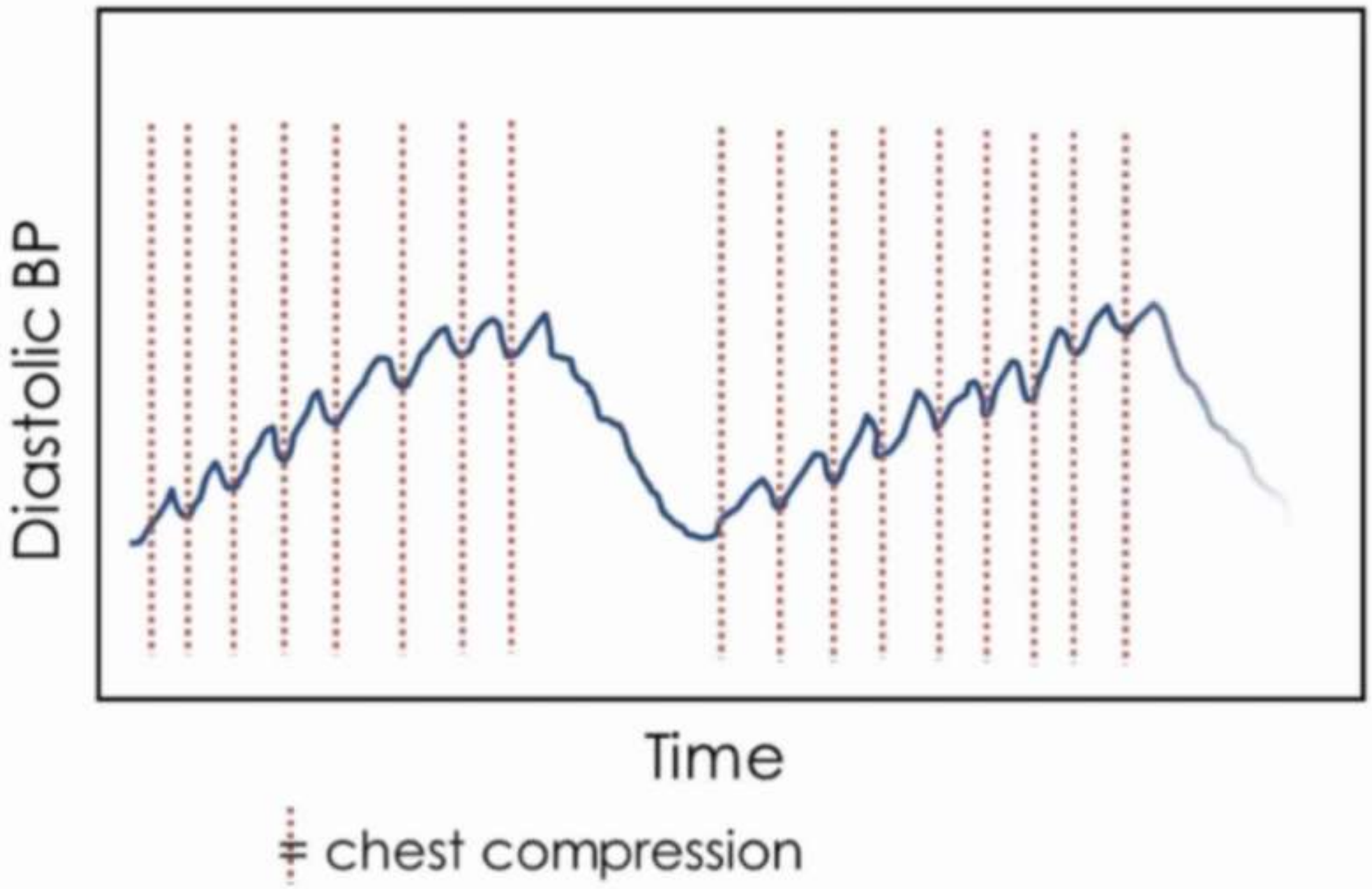
Adapted from: Paradis NA et al.
JAMA 1990;263:1105


"Coronary Perfusion Pressure" During CPR
AoD
RaD



Compression
120
80
mmHg
40
20
0
P aorta
CPP
RAP
Decompression

CC with pauses



Berg RA. CIRC. 2001

Target fisiologici individuali

- First-line physiologic targets during CPR should include:
  - CoPP
    - >20 mmHg
  - DBP
    - infants >25 mmHg
    - children and adults >30 mmHg

Individualized interventions?

An approach is a titrated and individualized effort to optimize myocardial and cerebral perfusion using dynamic intra-arrest adjustments to the standard CPR-algorithm

Hemodynamic-Directed CPR

Hemodynamic Directed Cardiopulmonary Resuscitation Improves Short-Term Survival From Ventricular Fibrillation Cardiac Arrest*

Stuart H. Friess, MD[1]; Robert M. Sutton, MD, MSCE[2]; Utpal Bhalala, MD[3]; Matthew R. Maltese, Pl
Maryam Y. Naim, MD[2]; George Bratin (*Crit Care Med* 2013; 41:2698–2704) Mia Garuccio[2];
Vinay M. Nadkarni, MD, MS[2]; Lance B. Becker, MD[4]; Robert A. Berg, MD[2]

Resuscitation. 2014 September ; 85(9): 1298–1303. doi:10.1016/j.resuscitation.2014.05.040.

Hemodynamic Directed CPR Improves Cerebral Perfusion Pressure and Brain Tissue Oxygenation

Stuart H. Friess, MD[1], Robert M. Sutton, MD MSCE[2], Benjamin French, PhD[3], Utpal Bhalala, MD[4], Matthew R. Maltese, PhD[2], Maryam Y. Naim, MD[2], George Bratinov, MD[2], Silvana Arciniegas Rodriguez, MD[2], Theodore R. Weiland III, BS[2], Mia Garuccio[2], Vinay M. Nadkarni, MD MS[2], Lance B. Becker, MD[5], and Robert A. Berg, MD[2]

Resuscitation. 2013 May ; 84(5): 696–701. doi:10.1016/j.resuscitation.2012.10.023.

Hemodynamic Directed CPR Improves Short-term Survival from Asphyxia-Associated Cardiac Arrest

Robert M. Sutton, MD MSCE[1], Stuart H. Friess, MD[1], Utpal Bhalala, MD[1], Matthew R. Maltese, PhD[1], Maryam Y. Naim, MD[1], George Bratinov, MD[1], Dana Niles, MS[1], Vinay M. Nadkarni, MD MS[1], Lance B. Becker, MD[2], and Robert A. Berg, MD[1]

Resuscitation. 2014 August ; 85(8): 983–986. doi:10.1016/j.resuscitation.2014.04.015.

Hemodynamic–directed cardiopulmonary resuscitation during in–hospital cardiac arrest*

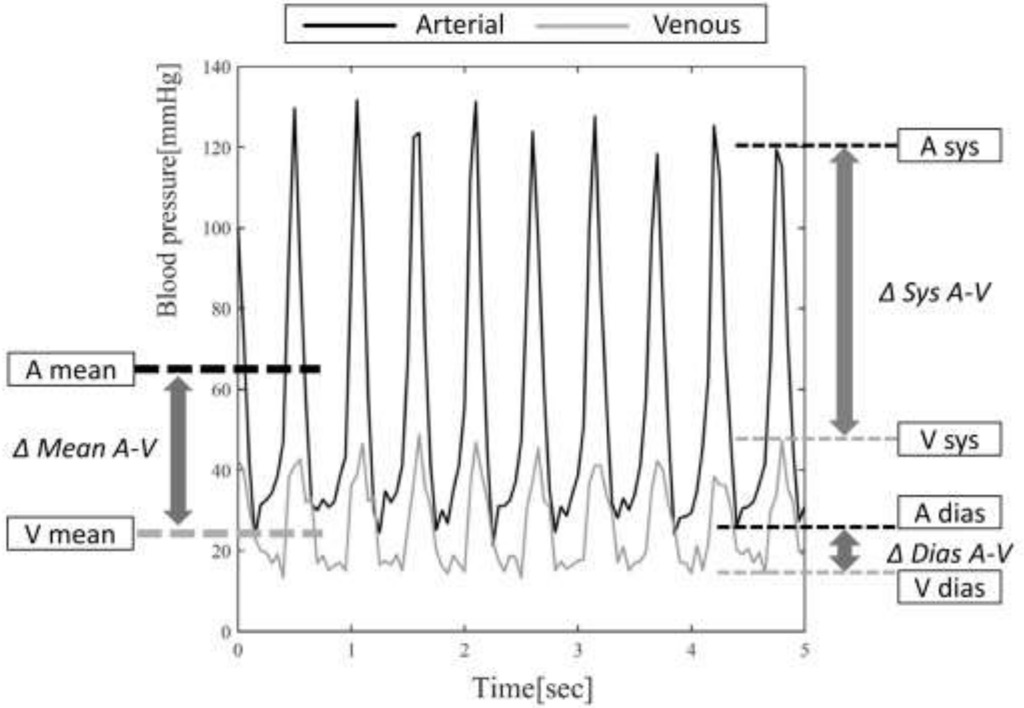
Robert M. Sutton[a], Stuart H. Friess[b], Matthew R. Maltese[a], Maryam Y. Naim[a], George Bratinov[a], Theodore R. Weiland[a], Mia Garuccio[a], Utpal Bhalala[c], Vinay M. Nadkarni[a], Lance B. Becker[d], and Robert A. Berg[a,*]

Resuscitation 2022

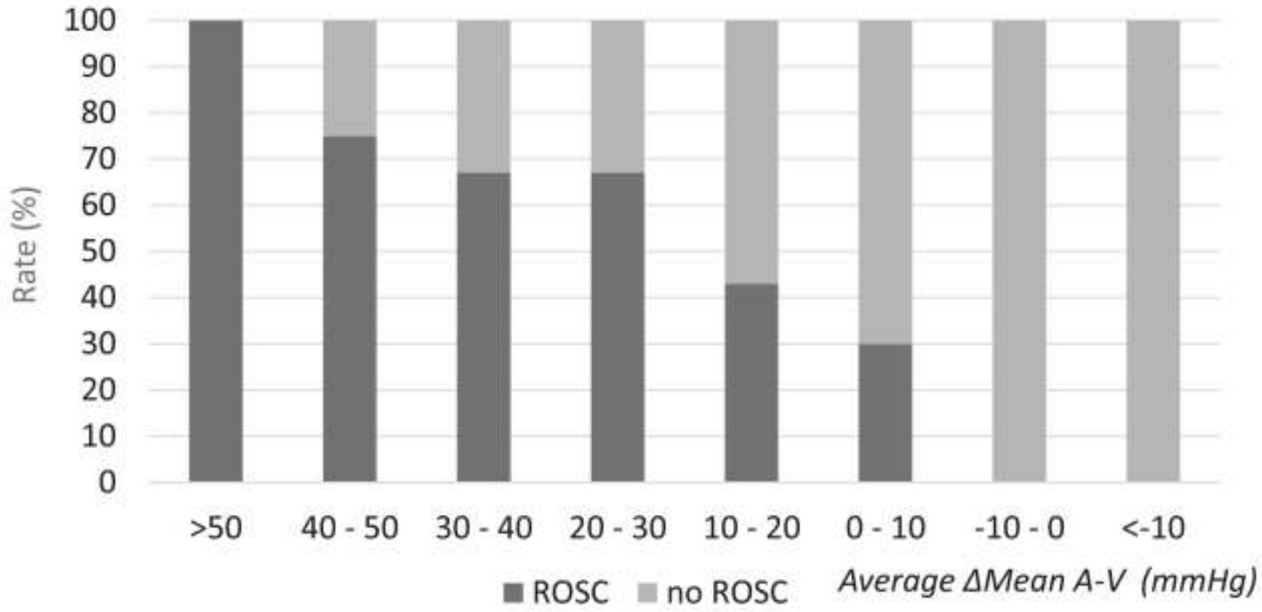
Clinical paper

Association between haemodynamics during cardiopulmonary resuscitation and patient outcomes

50 patients



a)



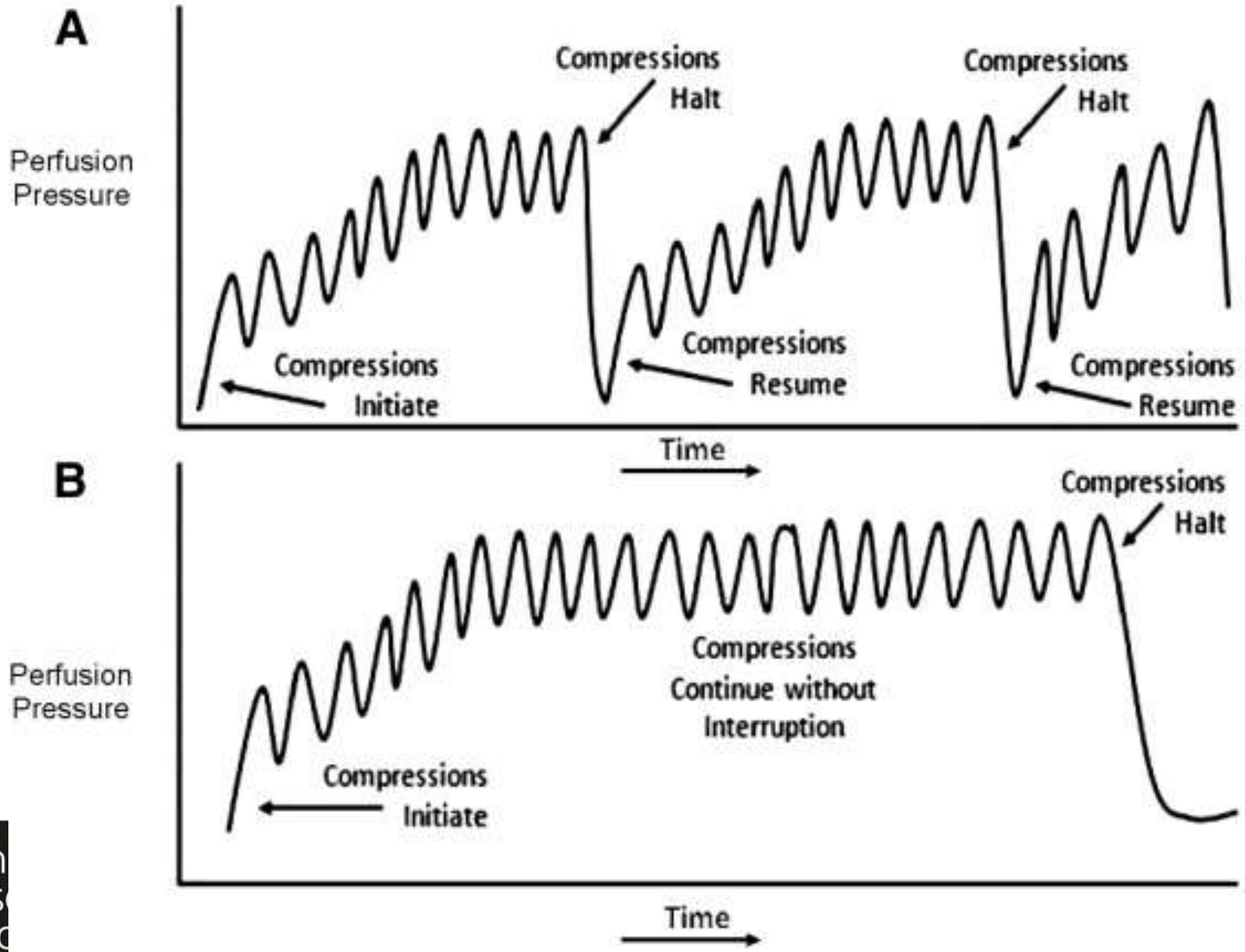
b)

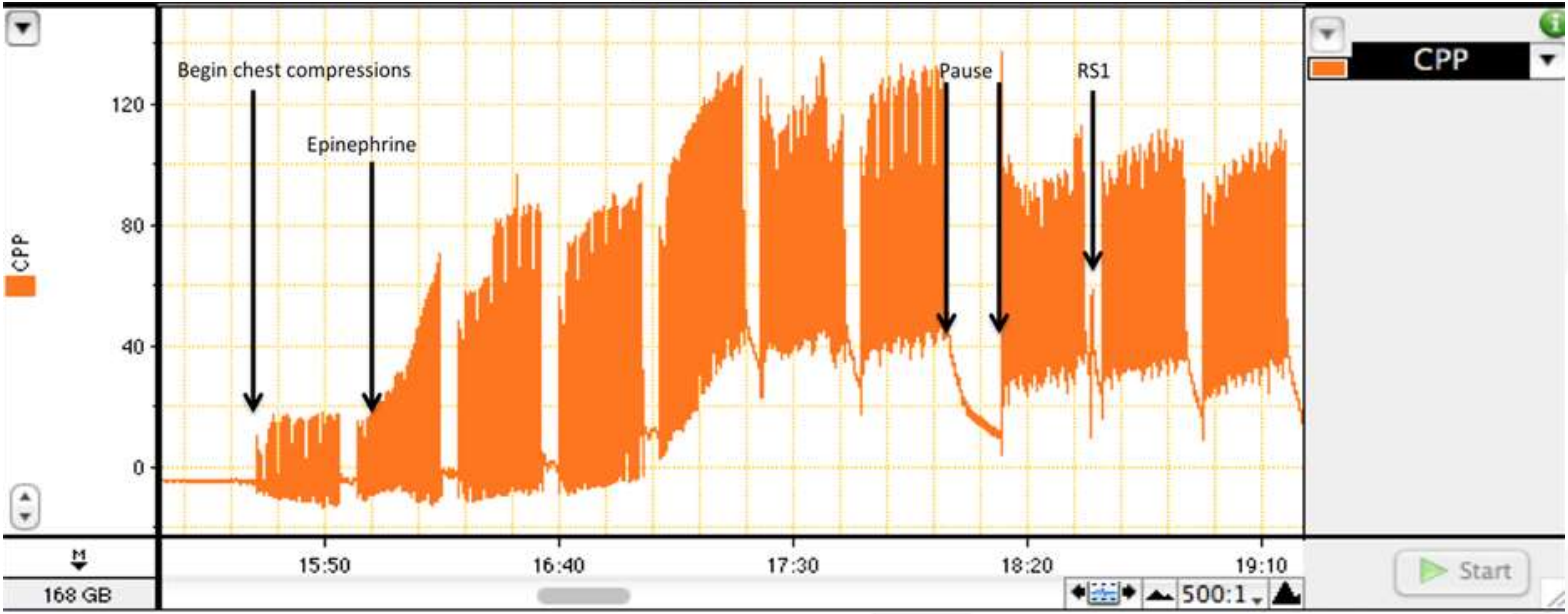
mmHg	>50	40 - 50	30 - 40	20 - 30	10 - 20	0 - 10	-10 - 0	<-10
ROSC, (n)	1	3	2	4	3	3	0	0
No ROSC, (n)	0	1	1	2	4	7	16	3

Italian Resuscitation Council

LA RIVOLUZIONE DEI SISTEMI

Perfusion During Cardiac Arrest with Chest Compressions





Begin chest compressions
Epinephrine
Pause
RS1
CPP
120
80
40
0
15:50
16:40
17:30
18:20
19:10
168 GB
500:1
Start

Target fisiologici individuali

Table 1. Summary of physiologic monitoring targets

Parameter	Advantages	Disadvantages	Goal	References
Coronary perfusion pressure	• Related to myocardial blood flow	• Invasive • Requires arterial and CVP catheters	CoPP >20 mmHg	Paradis 1990
DBP	• Determines CoPP	• Invasive • Requires arterial catheter	Infants: ≥25 mmHg Children: ≥30 mmHg Adults: ≥30 mmHg	Berg 2017
End-tidal carbon dioxide	• Related to cardiac output • Available in all intubated patients	• Confounded by etiology of arrest, ventilation rate, vasopressors	$ETCO_2$ >10 mmHg $ETCO_2$ >20 mmHg?	Levine 1997 Hartmann 2015
Cerebral oximetry	• Noninvasive • Measure of cerebral oxygenation	• Optimal values unknown • Technical variability	rSO_2 >50%	Parnia 2016
Cardiac ultrasound	• Noninvasive • Determines compression location	• Technically difficult • No standardization	NA	Hwang 2009 Huis in't Veld 2017

CoPP, coronary perfusion pressure; CVP, central venous pressure; $ETCO_2$, end-tidal carbon dioxide; rSO_2, regional oxygen saturation. Bold indicates best evidence-based targets.

Target fisiologici individuali

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- Tuttavia ci sono evidenti problemi di applicabilità.
- Neanche nei dipartimenti di emergenze tutti i pazienti hanno monitorata la pressione invasiva al momento dell'arresto cardiaco (circa 70%)
- La pressione per quanto sia un determinante fondamentale, non è il flusso

Target fisiologici individuali

Table 1. Summary of physiologic monitoring targets

Parameter	Advantages	Disadvantages	Goal	References
Coronary perfusion pressure	• Related to myocardial blood flow	• Invasive • Requires arterial and CVP catheters	CoPP >20 mmHg	Paradis 1990
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- Quanto?
- Come?

$EtCO_2$

…non ci sono scuse…

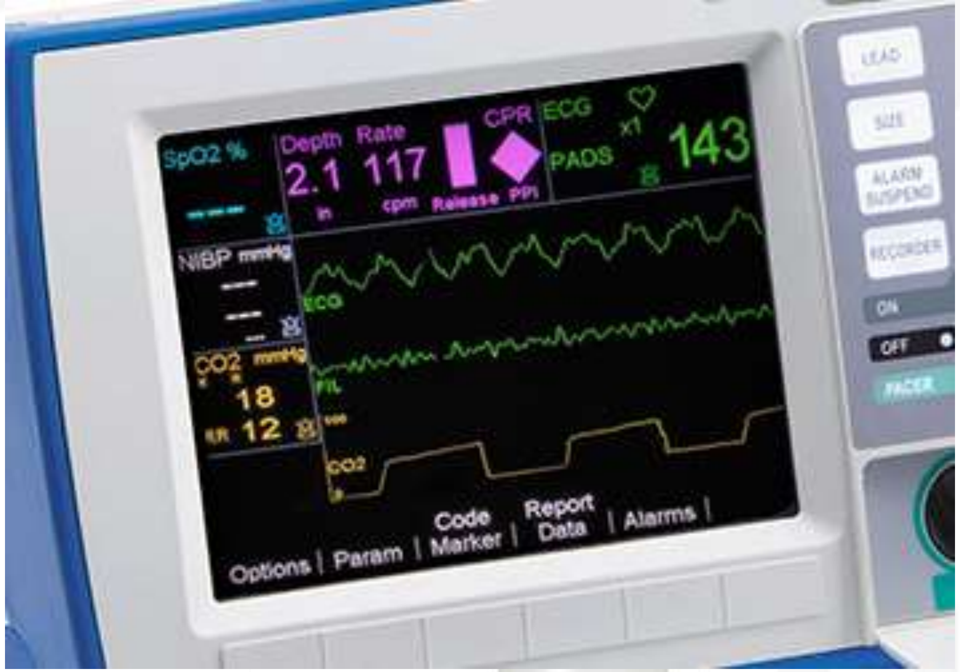
EtCO2

- Dal 2010, le linee guida raccomandano il monitoraggio dell'EtCO2 quale misura fisiologica non-invasiva dell'efficacia della RCP

- In assenza di patologia polmonare rilevante, l'EtCO2 riflette in modo diretto la quantità di flusso ematico polmonare e riflette la gittata cardiaca

- Variazioni nella qualità della RCP che modifichino la gittata cardiaco si riflettono sull'EtCO2


ETCO2 mmHg
39
13

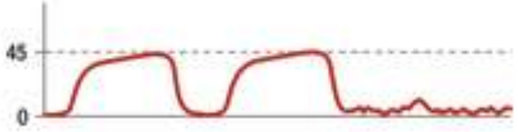

SpO2 %
Depth
Rate
2.1
117
in
cpm
CPR
Release
PPI
ECG
x1
PADS
143
NIBP mmHg
CO2 mmHg
18
RR 12
Options
Param
Code Marker
Report Data
Alarms
LEAD
SIZE
ALARM SUSPEND
RECORDER
ON
OFF
PACER


LIFEPAK 15 MONITOR/DEFIBRILLATOR
18:03:38
160
99
70
SpO2
CO2
P2 Not Zeroed
Demo Mode
SYNC
NIBP
ALARMS
OPTIONS
EVENT
120
80


Alarm Limits
Alarm limits and visual alarm status indicator, silence active alarms for two minutes
Capnograph
14.4 second sweep of CO2 values
Power Button
Warm-up time to full accuracy in 15 seconds
End-tidal Carbon Dioxide
Quantitative EtCO2 is updated every breath (Model 3678 displays in kPa)
Respiration Rate
RR is displayed after two breaths and updated every breath
Airway Adapter
Available in adult, pediatric and infant sizes
ETCO2 mmHg
39
/min
13

Sudden loss of waveform

- ET tube disconnected, dislodged, kinked or obstructed
- Loss of circulatory function

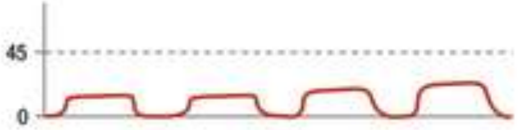


Decreasing $EtCO_2$

- ET tube cuff leak
- ET tube in hypopharynx
- Partial obstruction

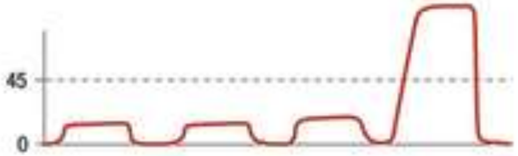
CPR Assessment

- Attempt to maintain minimum of 10mmHg



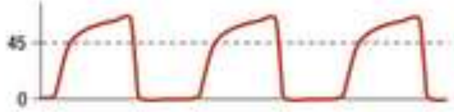
Sudden increase in $EtCO_2$

- Return of spontaneous circulation (ROSC)

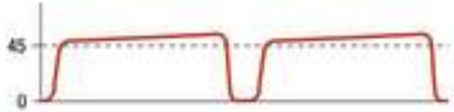


Bronchospasm ("Shark-fin" appearance)

- Asthma
- COPD



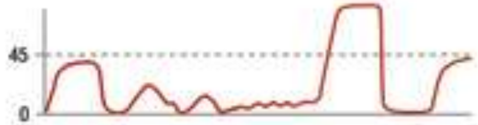
Hypoventilation



Hyperventilation

Decreased $EtCO_2$

- Apnea
- Sedation



EtCO2

- Studio prospettico multicentrico su IHCA e OHCA
- Raccolta di dati sulla performance della RCP da defibrillatori abilitiatia fornire un feedback che era sincronizzato temporalmente con i valori di EtCO2
  - Sheak KR, Wiebe DJ, Leary M, et al. Quantitative relationship between end-tidal carbon dioxide and CPR quality during both in-hospital and out-of-hospital cardiac arrest. Resuscitation 2015; 89:149 – 154.

- Dimostra una relazione quantitativa tra profondità delle compressioni e EtCO2
  - EtCO2 aumenta di 1.4 mmHg ogni 10 mm di profondità

EtCO2

- Oltre 35 studi hanno preso in esame l'associazione tra EtCO2 e l'outcome dopo arresto cardiaco

- **Messaggi chiave:**
  1. Sembra esserci un effetto soglia per cui valori bassi di EtCO2 sono predittivi di **mortalità** durante RCP
     - Questo cutoff è stato suffragato da Levine et al.: dopo 20 min di RCP una $EtCO_2$ < 10 mmHg era predittiva di morte con un valore predittivo negativo del 100%
       - Levine RL, Wayne MA, Miller CC. End-tidal carbon dioxide and outcome of & out-of-hospital cardiac arrest. N Engl J Med 1997; 337:301 – 306.

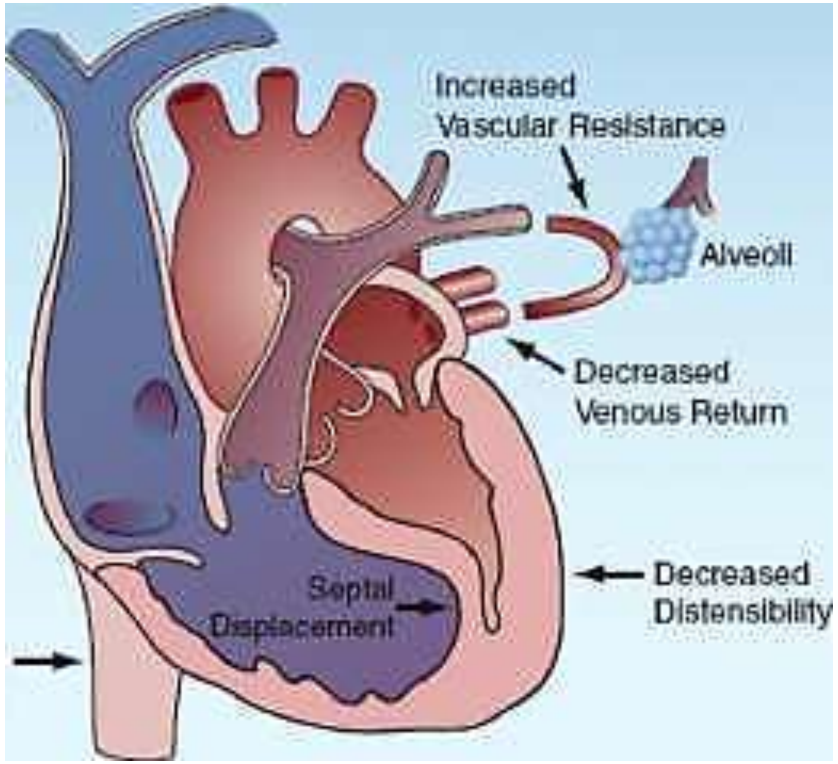
     - LG: ricorre solamente a valori soglia di EtCO2 quale predittore di mortalità o per sospedere la rianimazione … Not recommended.
     - È chiaro che non riuscire ad ottenere una EtCO2 di almeno 10 mmHg nel corso di una rianimazione prolungata è un segno prognostico sfavorevole

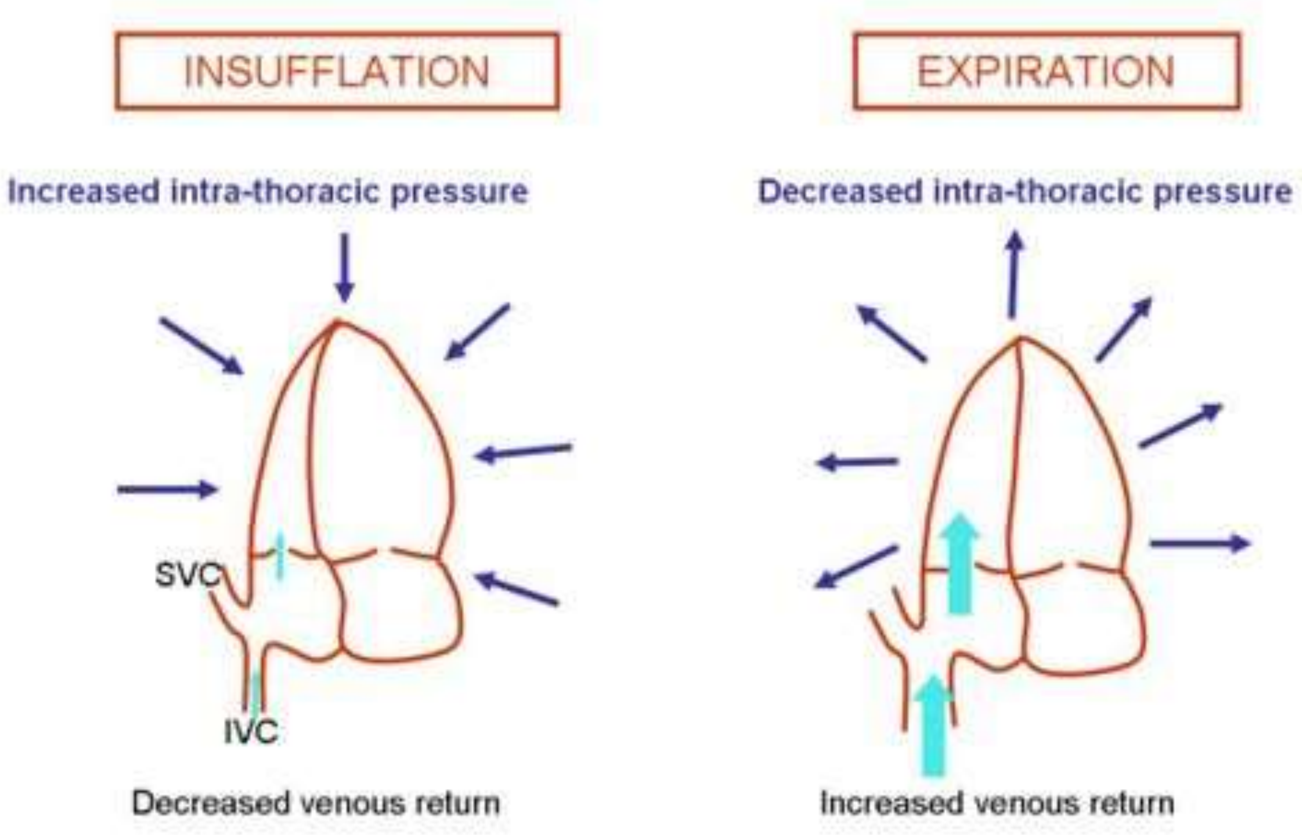
EtCO2

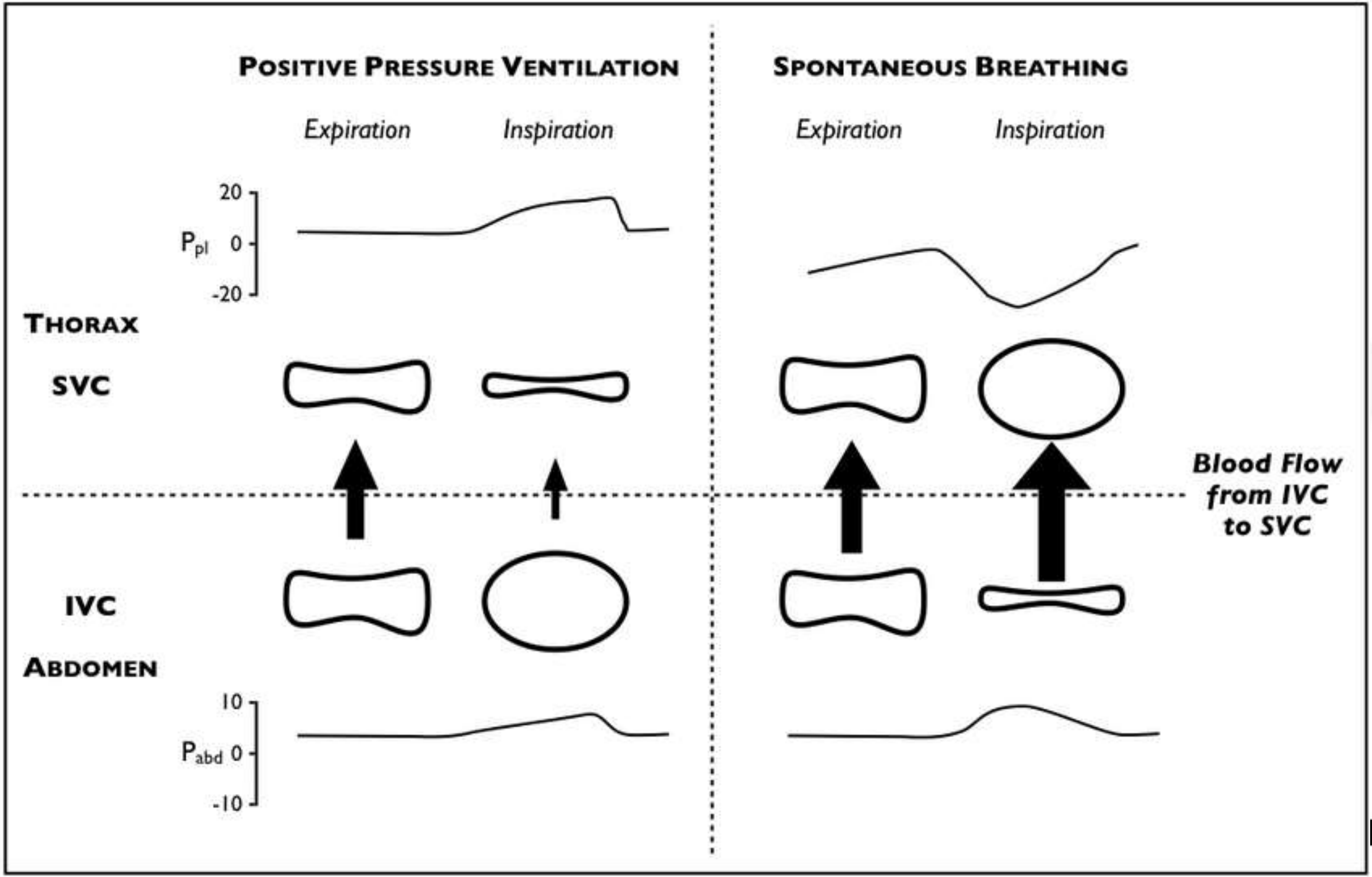
2. I valori di EtCO2 sono costantemente elevati nei pazienti in cui si ottiene il ROSC, suggerendone il **valore prognostico postivo**
   - AHA consensus statement che suggeriva di mantenere almeno una EtCO2 di 20 mmHg durante RCP per migliorare l'outcome

3. La possibilità di guidare e offrire un **feedback** sulla qualità della RCP
   - Evitare l'iperventilazione
   - Mantenere un buone qualità delle compressioni (inclusa posizione di mani/pistone, stanchezza operatore)
   - Evitare eccessive pause

Evitare Iperventilazione

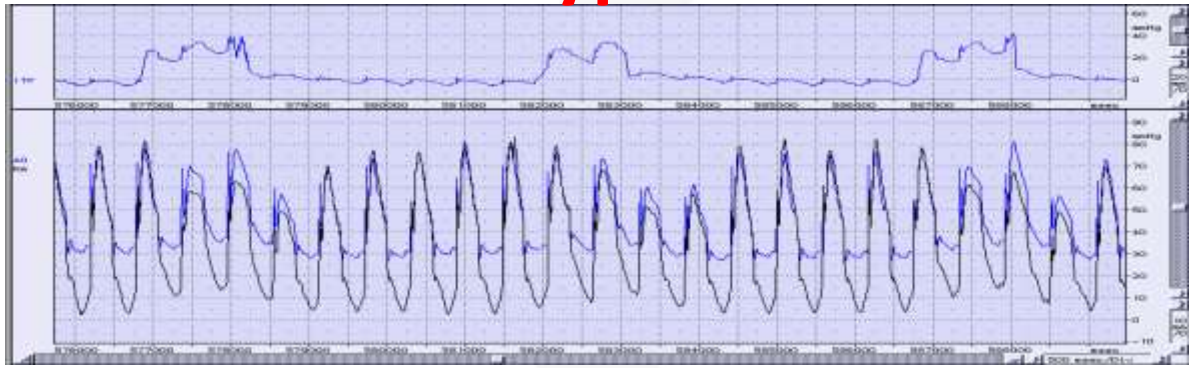






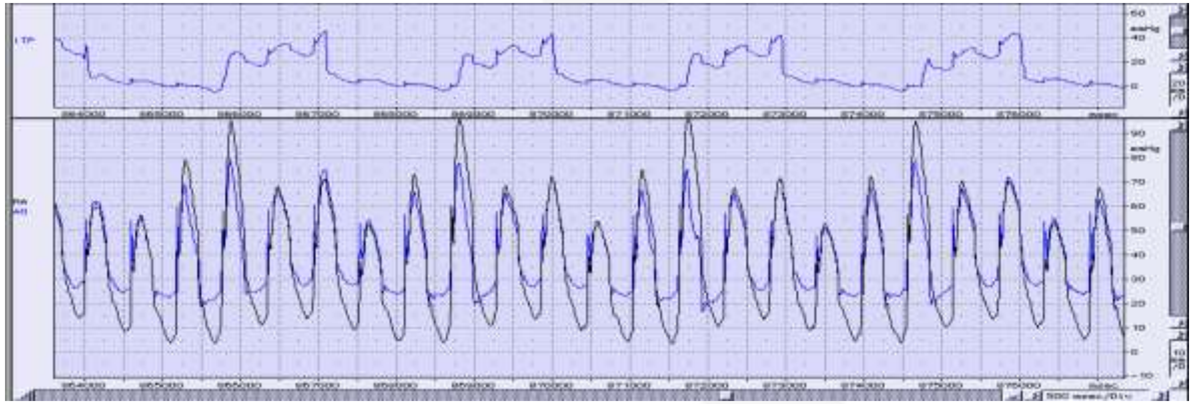
Positive Pressure Ventilation
Spontaneous Breathing
Expiration
Inspiration
Expiration
Inspiration
20
Ppl 0
-20
Thorax
SVC
Blood Flow from IVC to SVC
IVC
Abdomen
10
Pabd 0
-10

Do not hyperventilate!



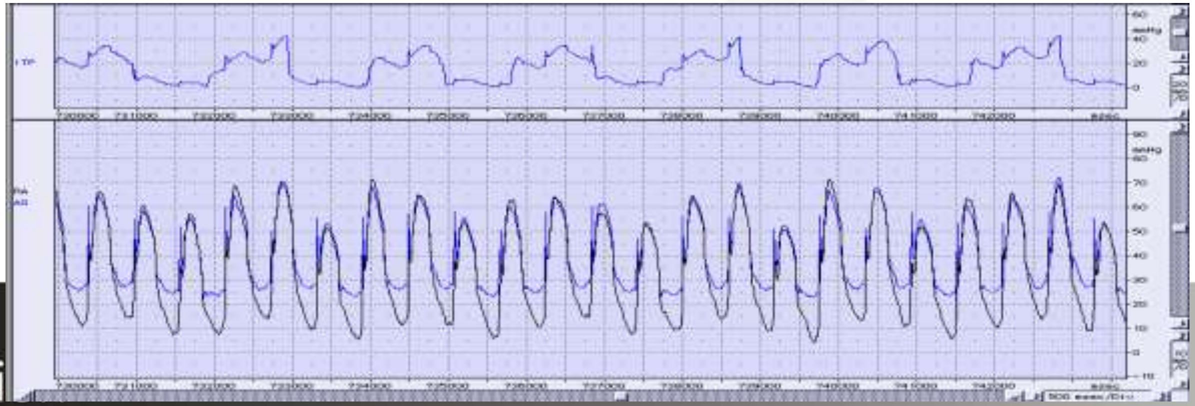
12 breaths/min

CPP 23.4 ± 1.0mmHg
MIP 7.1 ± 0.7 mmHg/min



20 breaths/min

CPP 19.5 ± 1.8 mmHg
MIP 11.6 ± 0.7 mmHg/min

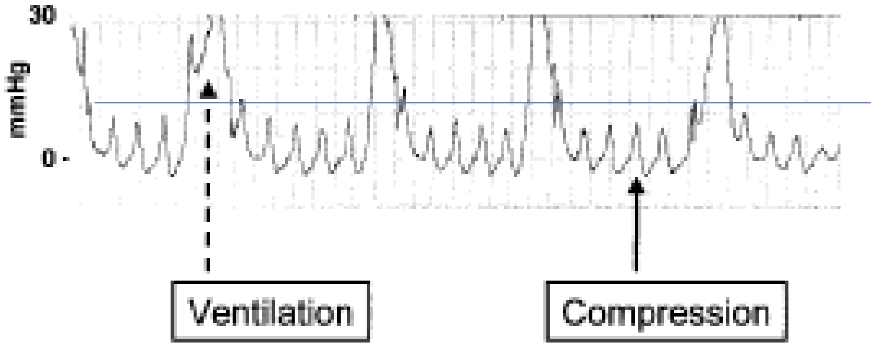


30 breaths/min

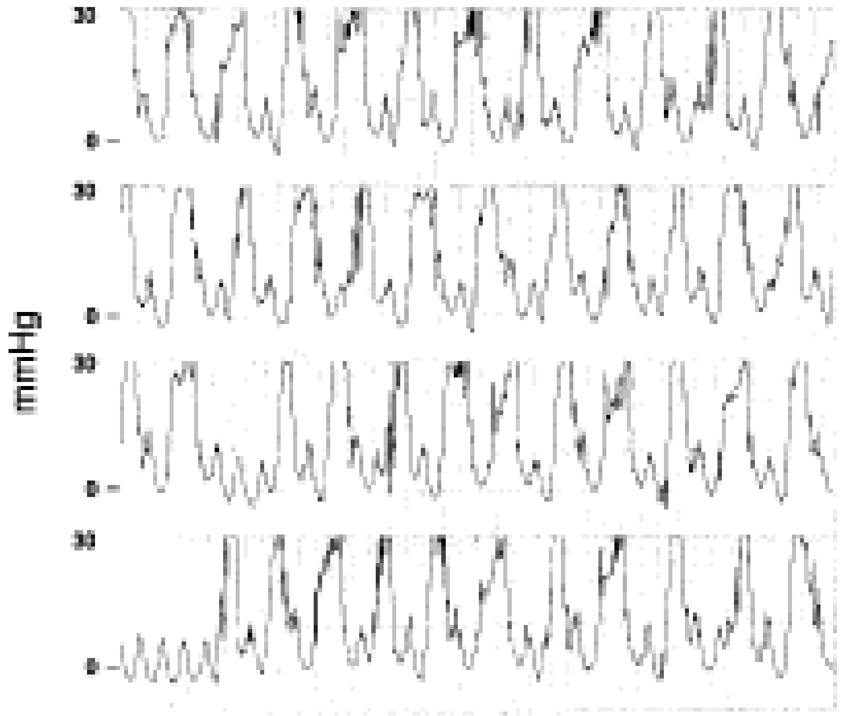
CPP 16.9 ± 1.8 mmHg
MIP 17.5 ± 1.0 mmHg/min

Prospective clinical study

Intrathoracic pressure during CPR close to guidelines



ventilation during performance of CPR by trained professional rescuers

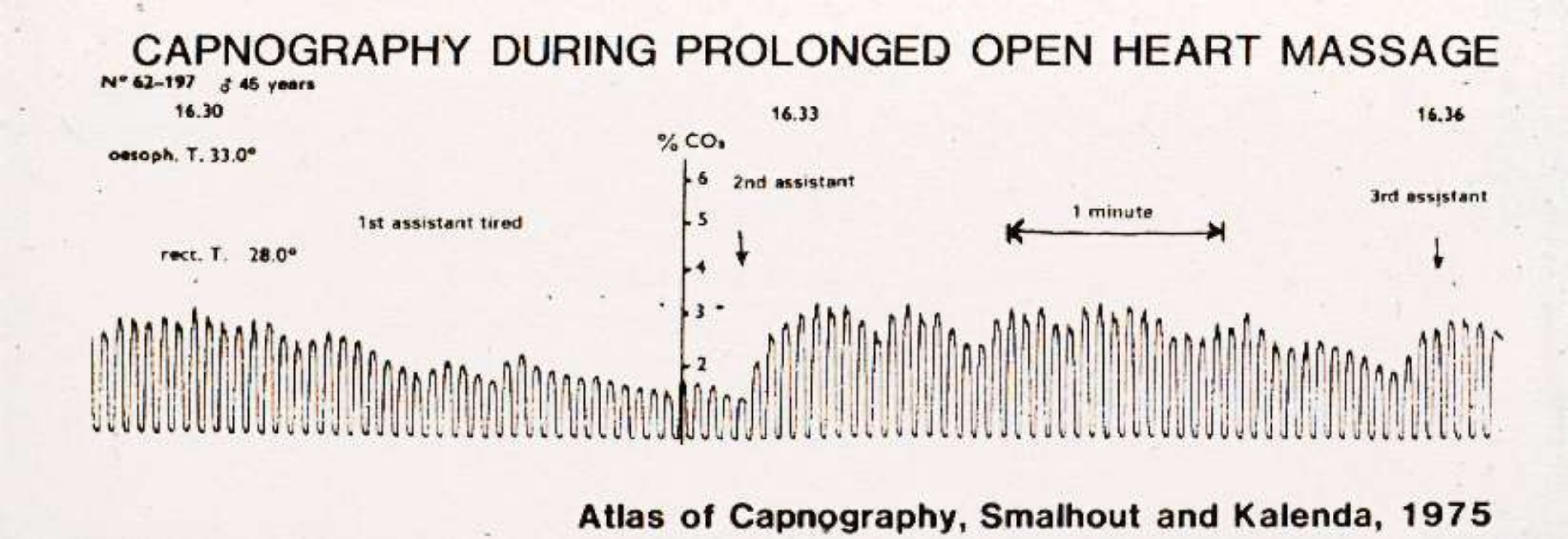


47 breaths/min

Table 1. Clinical observational study

Consecutive Case	Ventilation Rate (Breaths/Min
Group 1	
1	32
2	45
3	34
4	49
5	19
6	39
7	38
Mean ± SEM	37 ± 4[a]

Qualità delle compressioni

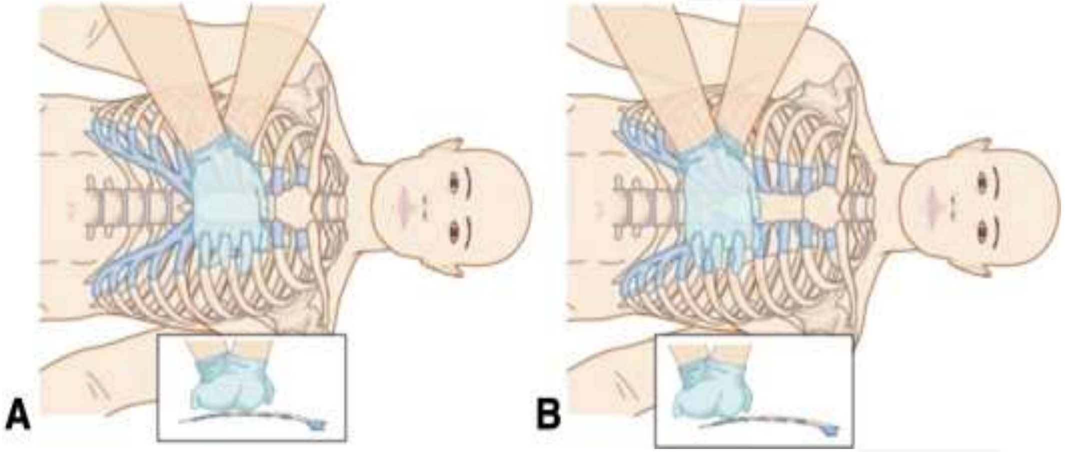


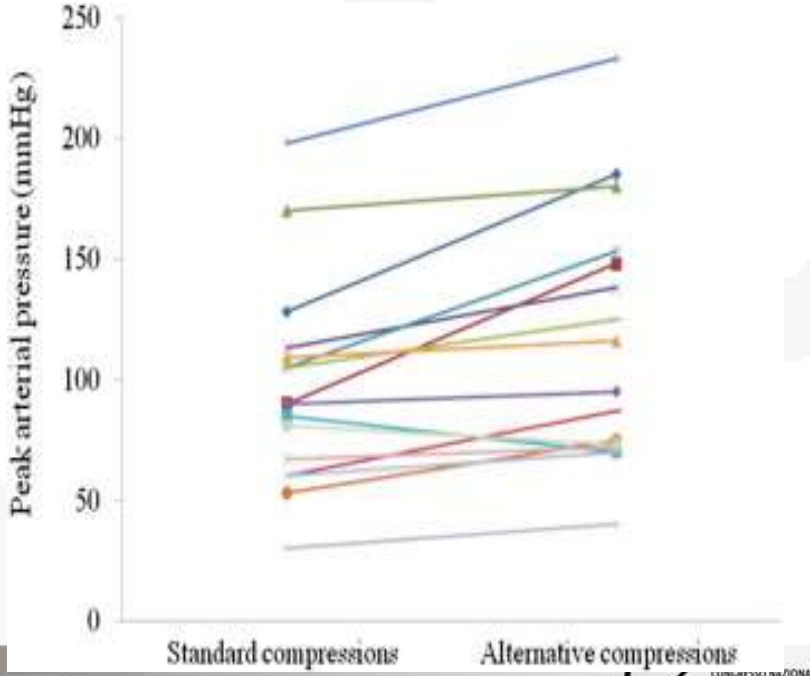
The Journal of Emergency Medicine
Volume 44, Issue 3, March 2013, Pages 691–697

67939||
Brief Reports

Hemodynamic Effect of External Chest Compressions at the Lower End of the Sternum in Cardiac Arrest Patients

Kyoung Chul Cha, MD*, Ho Jung Kim, MD†, Hyung Jin Shin, MD*, Hyun Kim, MD*, Kang Hyun Lee, MD*, Sung Oh Hwang, MD*



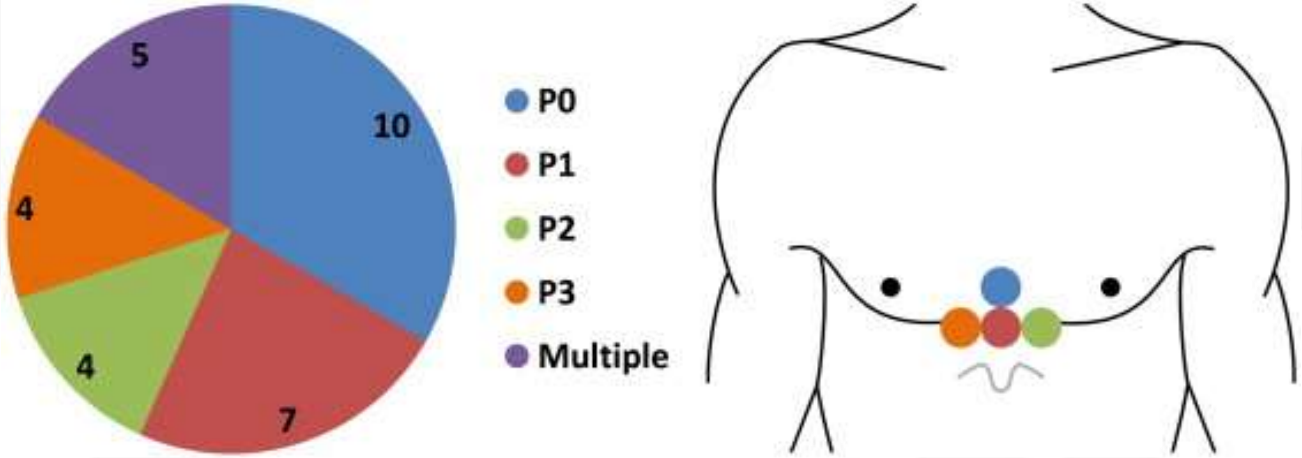


Resuscitation
Volume 84, Issue 9, September 2013, Pages 1203–1207

77394||
Clinical paper

Clinical pilot study of different hand positions during manual chest compressions monitored with capnography ☆

Eric Qvigstad[a], Jo Kramer-Johansen[b], Øystein Tømte[c], Tore Skålhegg[d], Øyvar Sørensen[d], Kjetil Sunde[e], Theresa M. Olasveengen[b]



$EtCO_2$ generated at four different hand positions.

	P0	P1	P2	P3	*p*-value
All (*n* = 30)	3.1 (0.7–8.7)	3.5 (0.5–10.7)	3.5 (0.5–10.3)	3.8 (0.4–8.8)	0.4
	23 (5–65)	*26 (4–80)*	*26 (4–77)*	*29 (3–66)*	


AutoPulse
HEAD
LUCAS


(a)
P
S
R
RV
LV
L
LL
A
TS
RL
(b)
P
R
I
L
RV
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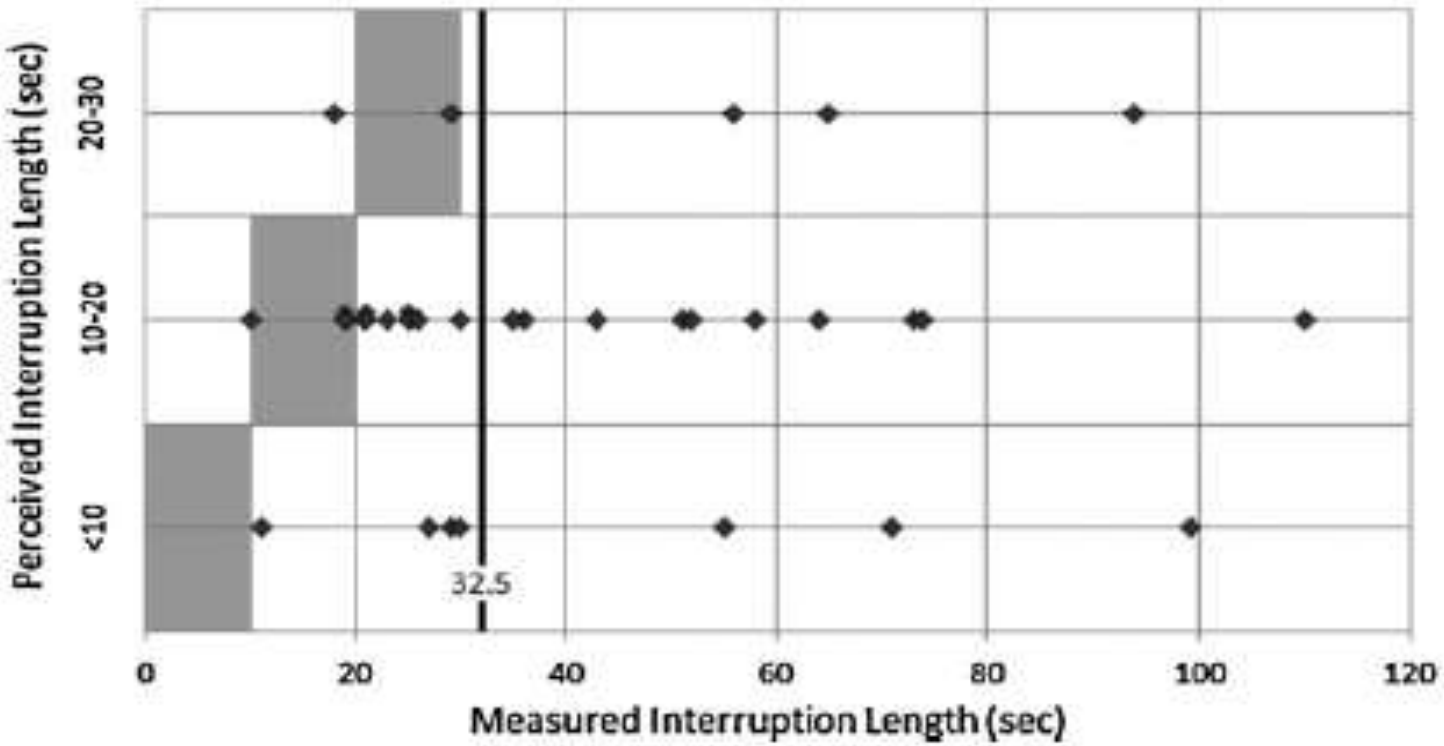
ELSEVIER
Contents lists available at SciVerse ScienceDirect
Resuscitation
journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Assessment of CPR interruptions from transthoracic impedance during use of the LUCAS™ mechanical chest compression system☆

Dana Yost[a,*], Reid H. Phillips[b], Louis Gonzales[c], Charles J. Lick[d], Paul Satterlee[d], Michael Levy[e], Joseph Barger[f], Pamela Dodson[f], Stephen Poggi[g], Karen Wojcik[h], Robert A. Niskanen[i], Fred W. Chapman[h]



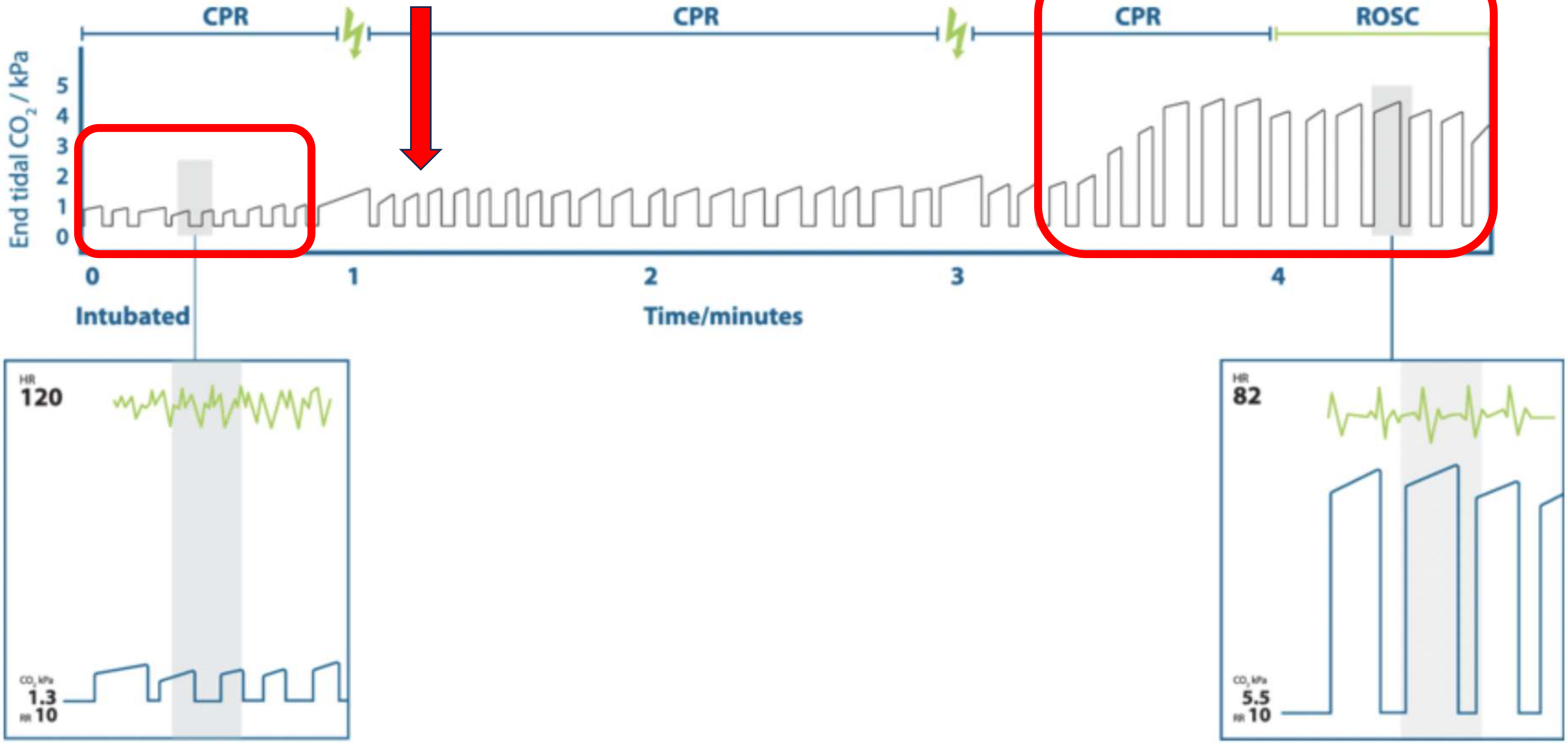
Interruptions in chest compressions to apply LUCAS can be <20 s but are often much longer, and users do not perceive pause time accurately

→ TRAINING!

EtCO2

4. Un improvviso e sostenuto aumento dell'EtCO2 può indicare un ROSC durante le compressioni toraciche, e quindi evitare inutili interruzioni della RCP per la verifica del polso

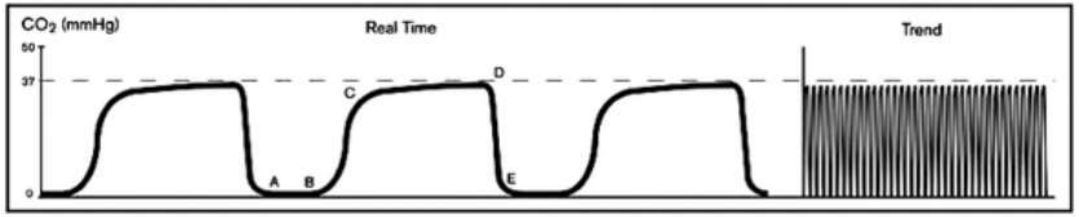
Higher quality CC



EMNote.org

EtCO2 monitoring during CPR: PQRST

P: **Position of endotracheal tube (ETT)**
Q: **Quality of CPR (EtCO2 persistently >20)**
R: **ROSC (EtCO2 sudden increase to >40)**
S: **Strategies for treatment and ventilator settings**
T: **Termination of CPR (EtCO2 persistently <10 after 20 min)**



The "normal" capnogram is a waveform which represents the varying CO_2 level throughout the breath cycle.

Waveform Characteristics:

A-B	Baseline	D	End-Tidal Concentration
B-C	Expiratory Upstroke	D-E	Inspiration
C-D	Expiratory Plateau		

Target fisiologici individuali

Table 1. Summary of physiologic monitoring targets

Parameter	Advantages	Disadvantages	Goal	References
Coronary perfusion pressure	• Related to myocardial blood flow	• Invasive • Requires arterial and CVP catheters	CoPP >20 mmHg	Paradis 1990
DBP	• Determines CoPP	• Invasive • Requires arterial catheter	Infants: ≥25 mmHg Children: ≥30 mmHg Adults: ≥30 mmHg	Berg 2017
End-tidal carbon dioxide	• Related to cardiac output • Available in all intubated patients	• Confounded by etiology of arrest, ventilation rate, vasopressors	$ETCO_2$ >10 mmHg $ETCO_2$ >20 mmHg?	Levine 1997 Hartmann 2015

- Richiede l'intubazione
- In alternativa un device sovraglottico ben poszionato

Target fisiologici individuali

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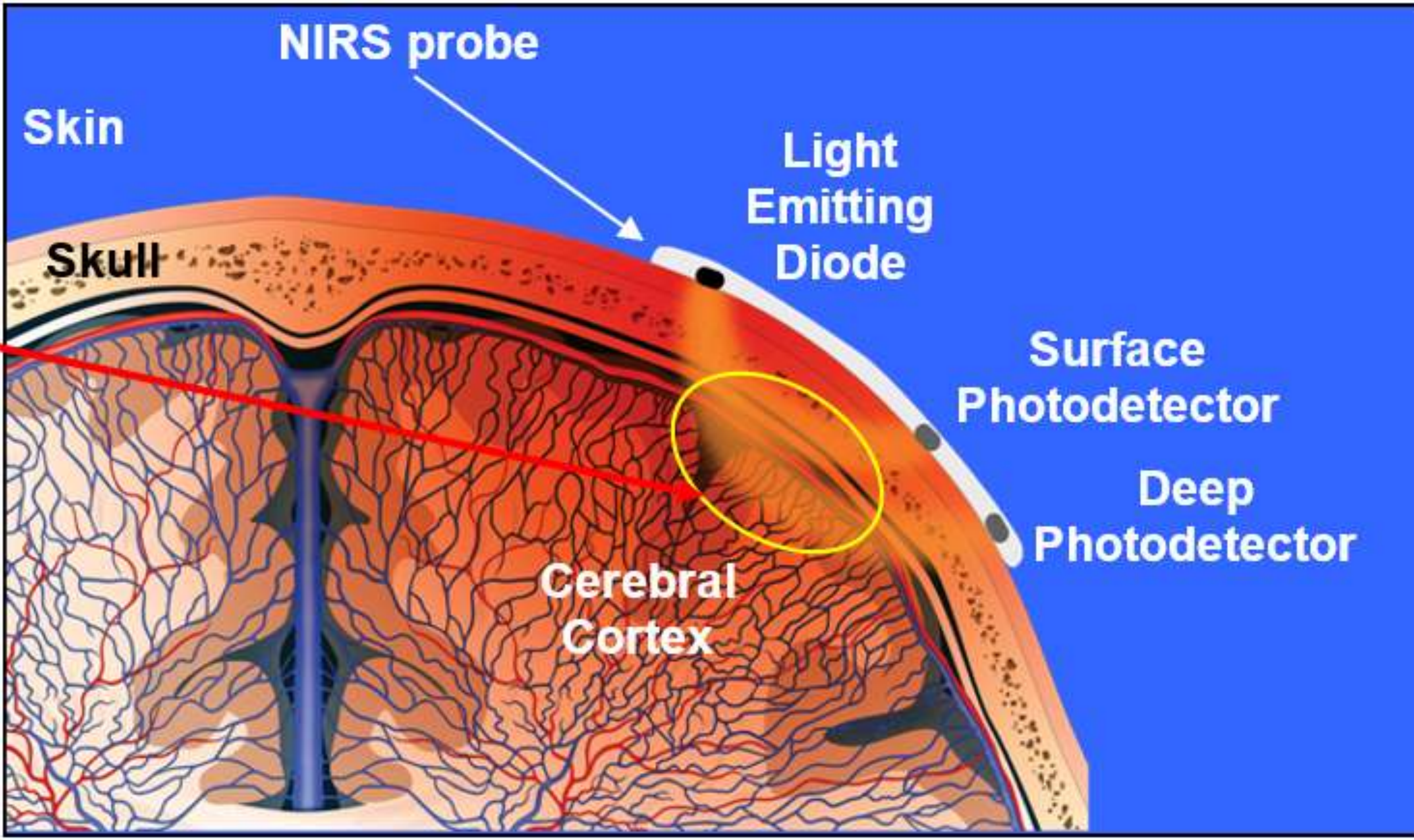
- Quanto?
- Come?

- Despite substantial evidence supporting ETCO2 as an indirect measure of cardiac output during CPR, its accuracy may be distorted in certain settings.
- First, ETCO2 is significantly higher initially during asphyxia-associated cardiac arrest compared to ven- tricular fibrillation arrest, and becomes a useful marker of cardiac output only after 1 – 2 min of CPR
- In addition, ETCO2 may be transiently reduced with epinephrine administra- tion, which can redistribute pulmonary blood flow through pulmonary vasoconstriction [48 – 51]
- Finally, ETCO2 is influenced by changes in minute ventilation, mechanical problems, and ventilation- perfusion mismatch. Despite these limitations, ETCO2 is an appealing parameter to monitor during CPR because of its availability, simplicity, and noninvasive technique

NIRS

regional brain tissue oxygen saturation

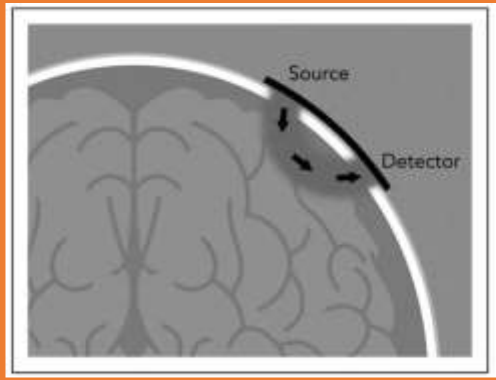
Note the regional tissue venous saturations are only detected in the superficial area of cerebral cortex



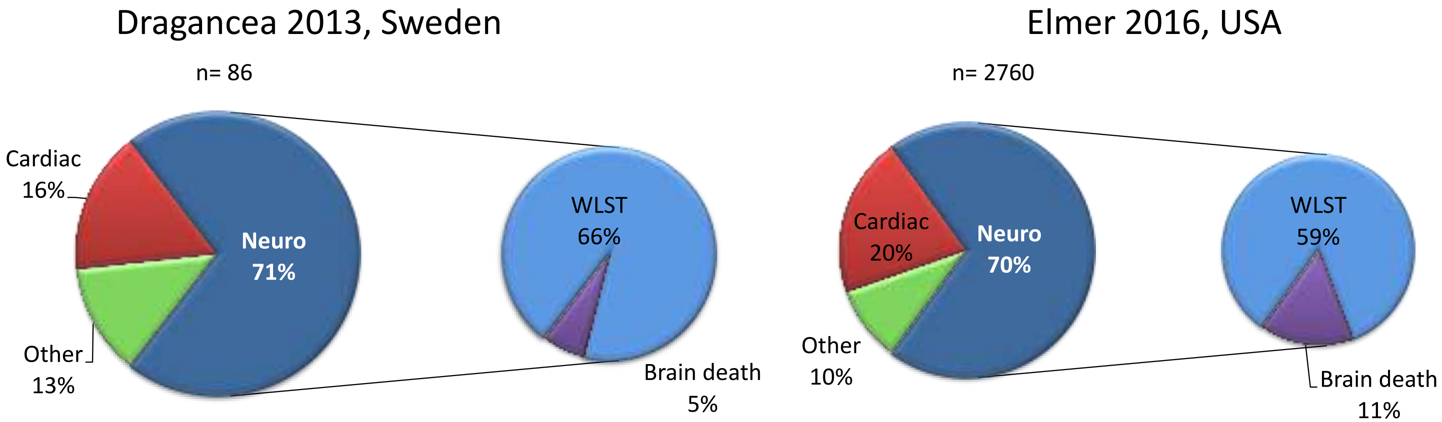
Changes in light intensity are attributed to differential light absorption characteristics of oxy and deoxy-hemoglobin, resulting in regional brain tissue oxygen saturation (rSO2)

rSO2 is based on nonpulsatile blood flow primarily made up of venous blood in the cerebral microvasculature, and normal values approximate 70%

NIRS



Neurologic morbidity is common among survivors of cardiac arrest.



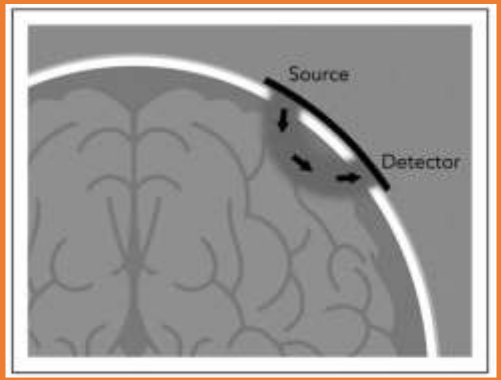
WLST = Withdrawal of Life-Sustaining Treatment

Dragancea I et al Resuscitation 2013; 84:337-42

Elmer J et al Resuscitation 2016; 102:127-35

Maintaining sufficient cerebral perfusion during CPR is strongly associated with survival and favorable neurologic outcome

NIRS



A dispetto delle difficoltà tecniche il monitoraggio della rSO2 è possibile e non distrae ed interferisce con un high-quality CPR

Letteratura?

Regional cerebral oxymetry rSO_2
Near Infrared Spectroscopy NIRS

672 patients

Resuscitation 85 (2014) 778–784

Contents lists available at ScienceDirect

Resuscitation

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

Clinical Paper

Noninvasive regional cerebral oxygen saturation for neurological prognostication of patients with out-of-hospital cardiac arrest: A prospective multicenter observational study☆,☆☆

Noritoshi Ito[a,b], Kei Nishiyama[c,*], Clifton W. Callaway[d], Tomohiko Orita[e], Kei Hayashida[f], Hideki Arimoto[g], Mitsuru Abe[h], Tomoyuki Endo[i], Akira Murai[j], Ken Ishikura[k], Noriaki Yamada[l], Masahiro Mizobuchi[m], Hideki Anan[n], Kazuo Okuchi[o], Hideto Yasuda[p], Toshiaki Mochizuki[q], Yuka Tsujimura[r], Takeo Nakayama[r], Tetsuo Hatanaka[s], Ken Nagao[t], for the J-POP Registry Investigators[u]

Hayashida *et al. Critical Care* 2014, **18**:500
http://ccforum.com/content/18/5/500

CRITICAL CARE

RESEARCH Open Access

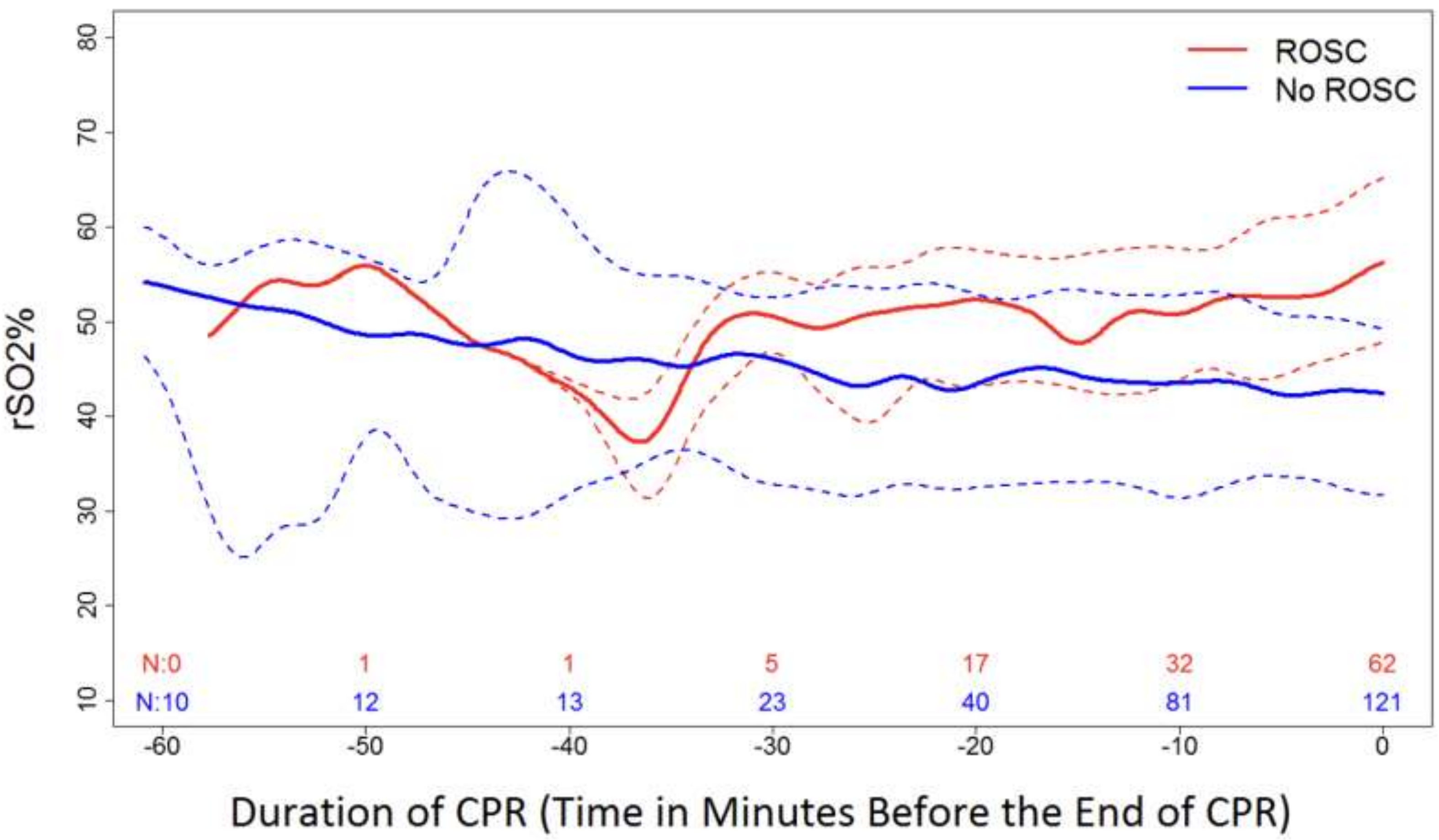
Estimated cerebral oxyhemoglobin as a useful indicator of neuroprotection in patients with post-cardiac arrest syndrome: a prospective, multicenter observational study

Kei Hayashida[1*], Kei Nishiyama[2], Masaru Suzuki[1], Takayuki Abe[3], Tomohiko Orita[4], Noritoshi Ito[5], Shingo Hori[1] and J-POP Registry Investigators

492 patients

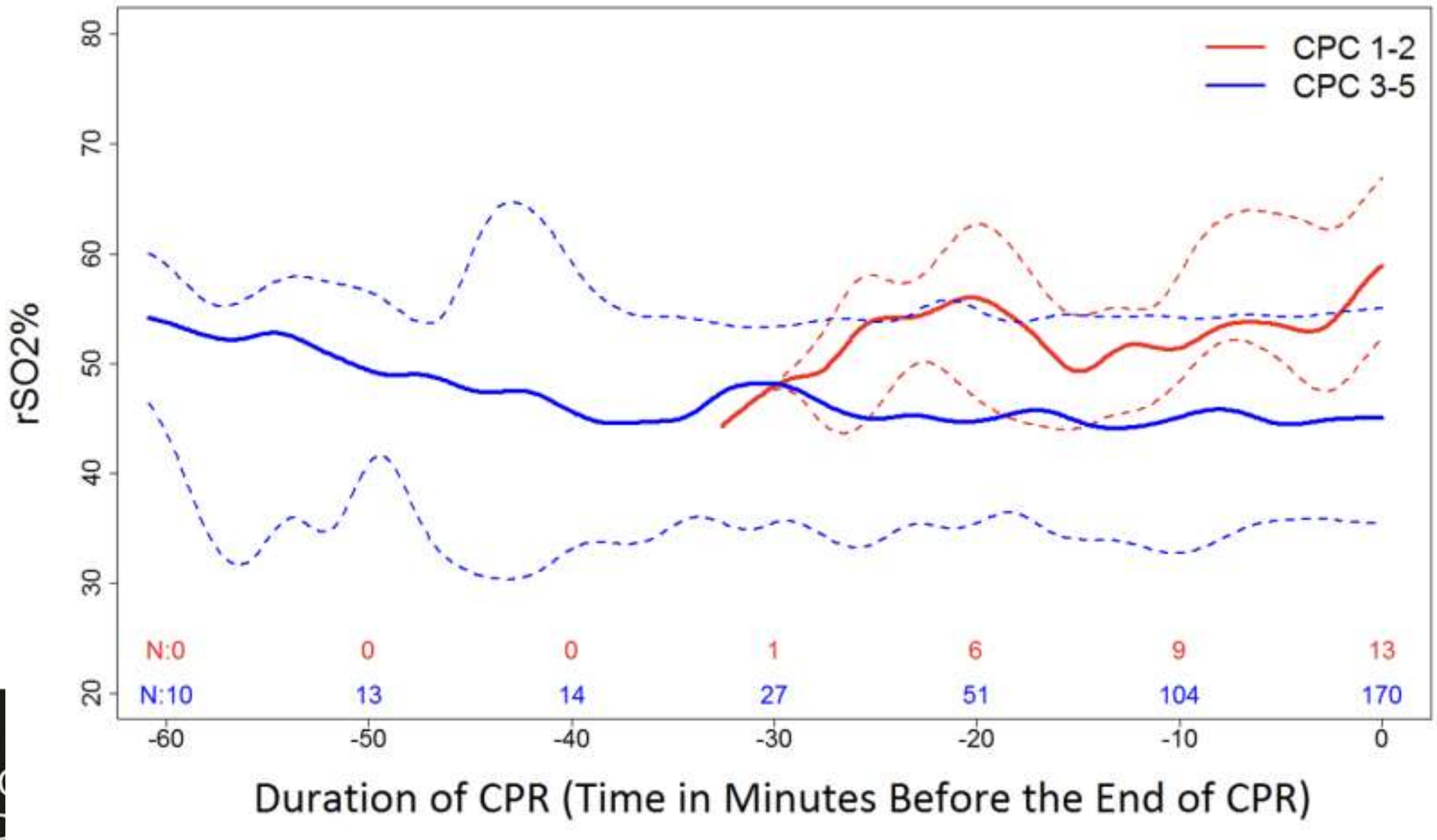
NIRS

Parnia S, et al. Cerebral oximetry during cardiac arrest: a multicenter study of neurologic outcomes and survival. Crit Care Med 2016; 44:1663 – 1674.



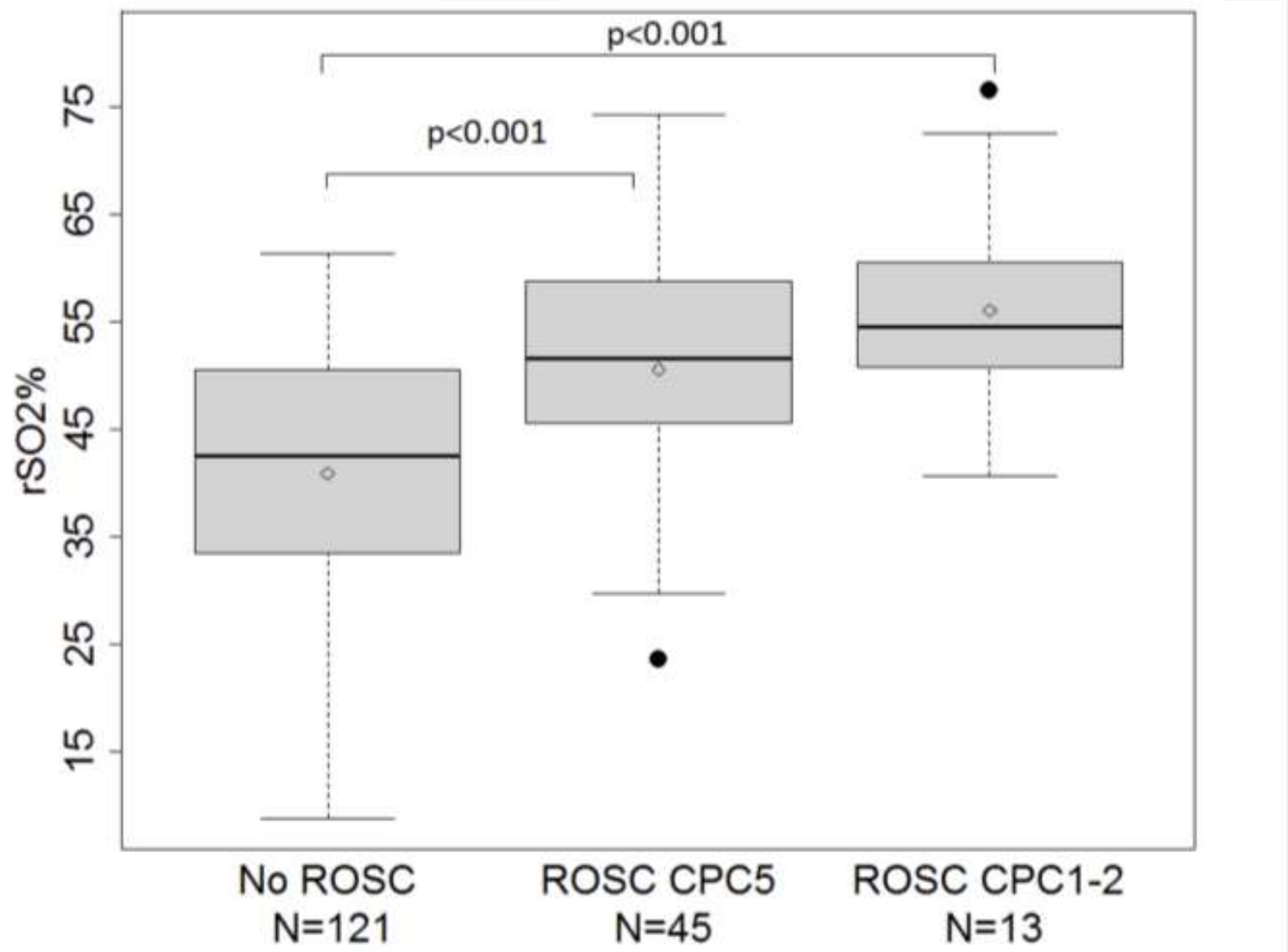
NIRS

Parnia S, et al. Cerebral oximetry during cardiac arrest: a multicenter study of neurologic outcomes and survival. Crit Care Med 2016; 44:1663 – 1674.



NIRS

Parnia S, et al. Cerebral oximetry during cardiac arrest: a multicenter study of neurologic outcomes and survival. Crit Care Med 2016; 44:1663 – 1674.



No patients with rSO2 less than 25% achieved ROSC.

Resuscitation 94 (2015) 67–72

Contents lists available at ScienceDirect

ELSEVIER

Resuscitation

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

EUROPEAN RESUSCITATION COUNCIL

Review article

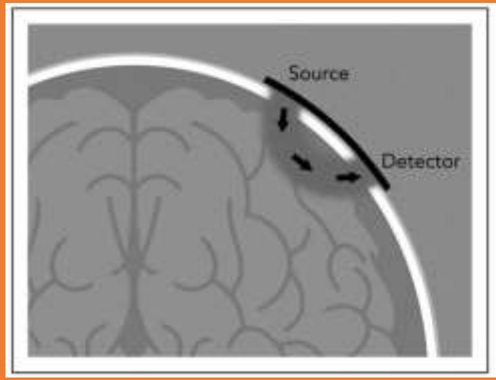
Cerebral oximetry and return of spontaneous circulation after cardiac arrest: A systematic review and meta-analysis☆

CrossMark

Filippo Sanfilippo[a,*], Giovanni Serena[a], Carlos Corredor[a], Umberto Benedetto[b], Marc O. Maybauer[c], Nawaf Al-Subaie[a], Brendan Madden[a], Mauro Oddo[d], Maurizio Cecconi[e]

[a] Cardiothoracic Intensive Care Unit, Intensive Care Directorate – St. Georges Healthcare NHS Trust, London SW17 0QT, United Kingdom
[b] Department of Cardiothoracic Surgery, Oxford Heart Centre, Oxford University Hospitals, Oxford OX3 9DU, United Kingdom
[c] Critical Care Research Group, University of Queensland and the Prince Charles Hospital, Rode Road, Chermside, Brisbane, QLD 4032, Australia
[d] Department of Intensive Care Medicine, CHUV-Lausanne University Medical Center, CH-1011 Lausanne, Switzerland
[e] Anaesthesia and Critical Care St. George's Hospital and Medical School, London SW17 0QT, United Kingdom

NIRS



- In pazienti per lo più con OHCA, la rSO2 media in coloro che ottenevano ROSC era di 44.9% rispetto al 29.4% di chi non lo otteneva

Target fisiologici individuali

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Cerebral oximetry	• Noninvasive • Measure of cerebral oxygenation	• Optimal values unknown • Technical variability	rSO_2 >50%	Parnia 2016

- Quanto?
- Come?

Data la varietà e limitazioni tecniche dei presidi disponibili in commercio, i valori di rSO2 andrebbero interpretati con cautela

Ecocardio

Transesofageo

Ecocardio

- Trova principalmente interesse per il work-up delle cause reversibili (‘4 H e 4 T’) e per tentare di predire gli esiti delle rianimazione

- Valutazione e miglioramento della meccanica delle compressioni (posizione mani) di precisione, sartoriale rispetto alla anatomia specifica di quel paziente

- Da studi di imaging si apprezza che le strutture al di sotto della linea intermammillare possono essere nell’80%:
  - Aorta
  - LVOT – tratto di efflusso del ventricolo sinistro

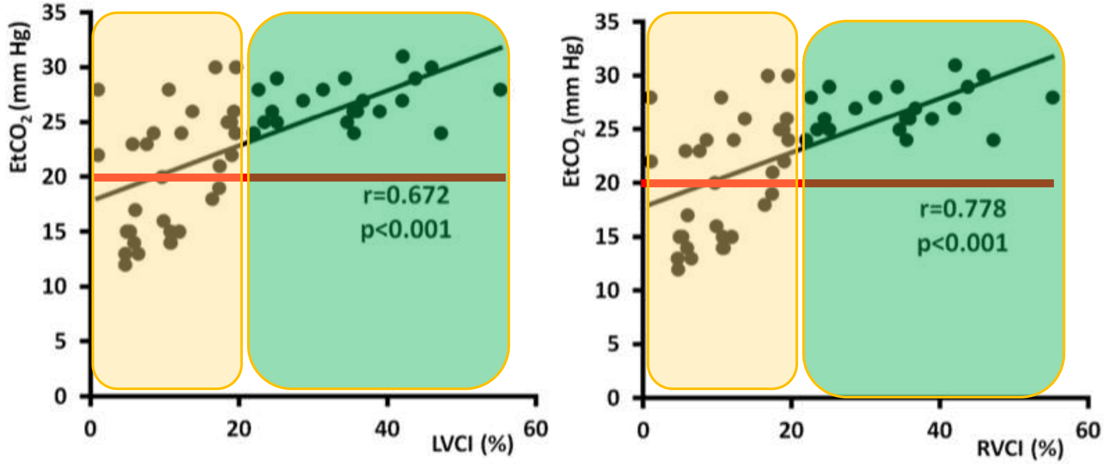
- Valutazione della RCP TEE-guidata per evitare compressioni di LVOT e aorta:
  - aumento SV del VS all’approssimarsi dell’area di massima compressione alla cavità ventricolare, dimastrata mediante regressione lineare
    - Hwang SO, et al. Compression of the left ventricular & outflow tract during cardiopulmonary resuscitation. Acad Emerg Med 2009; 16:928 – 933.

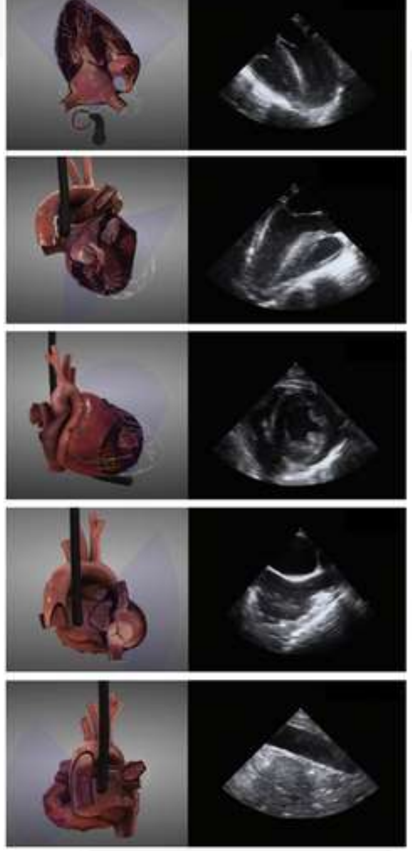
Skulec *et al. Critical Care* (2019) 23:334
https://doi.org/10.1186/s13054-019-2607-2

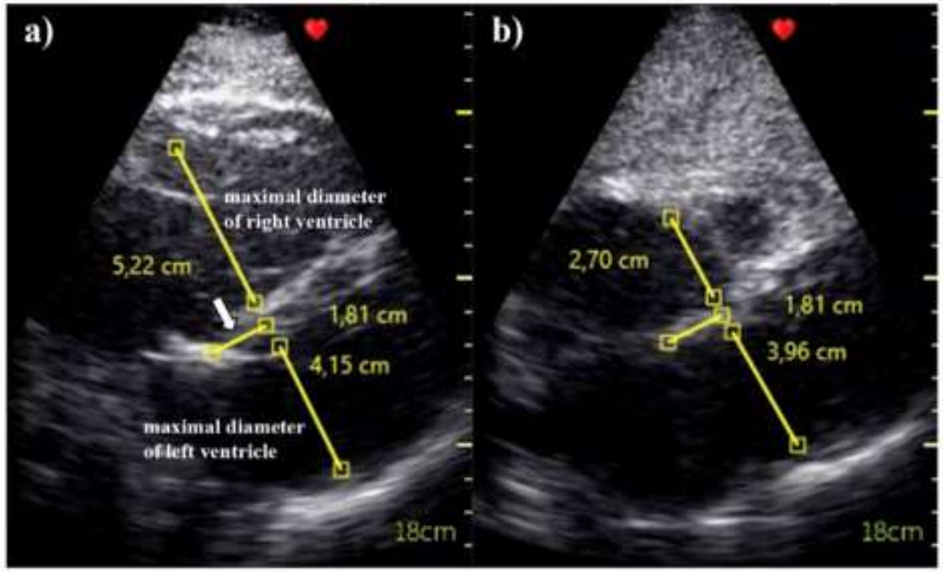
Critical Care

RESEARCH Open Access

Correlation between end-tidal carbon dioxide and the degree of compression of heart cavities measured by transthoracic echocardiography during cardiopulmonary resuscitation for out-of-hospital cardiac arrest







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Cerebral oximetry	• Noninvasive • Measure of cerebral oxygenation	• Optimal values unknown • Technical variability	rSO_2 >50%	Parnia 2016
Cardiac ultrasound	• Noninvasive • Determines compression location	• Technically difficult • No standardization	NA	Hwang 2009 Huis in't Veld 2017

CoPP, coronary perfusion pressure; CVP, central venous pressure; $ETCO_2$, end-tidal carbon dioxide; rSO_2, regional oxygen saturation. Bold indicates best evidence-based targets.

THANK YOU

in senso lato: numero unico europeo - team RCP formato - TOR e saper accendere ma anche spegnere e riporre le macchine

Quando si rianima non si procacciano organi

Poster session & Lunch

Aggiornamento formatori IRC
Non technical skills

14.00-14.20 La 'nascita' del nuovo gruppo *(D. Pasquali)*
14.20-14.40 "Inclusività"... per essere 'inclusivi' bisogna iniziare con il conoscere gli individui, capire i loro "bisogni" *(A. Trevisan, S. Calizzano)*
14.40-15.00 Apprendimento Cooperativo, Metacognitivo nella didattica degli adulti *(L. Langella)*
15.00-15.20 Le "skills" più importanti nella fase iniziale della didattica: le NTS *(J. Wykes)*
15.20-15.40 La "survey": cosa dicono i nostri colleghi che hanno sperimentato il "tutoraggio" *(S. Di Marco)*
17.40-16.30 Discussione

Workshop:
Terapie avanzate nell'ALS

- *14.00-14.30* Epidemiologia dell'arresto cardiaco *(T. Scquizzato)*
- *14.30-15.00* Strategie alternative di defibrillazione *(G. Ristagno)*
- *15.00-15.30* Ventilazione: pro&con *(A. Cucino)*
- *15.30-16.00* eCPR *(C. Ruffini)*
- *16.00-16.30* Target: quali, quanto e come *(T. Pellis)*

14.00-15.00 **Poster session**
G. Imbriaco, G. Stirparo

CHIUSURA CONGRESSO

Risultati elezioni e presentazione nuovo Consiglio Direttivo - Premiazione best abstract