CONGRESSO NAZIONALE IRC 2023

Vicenza

Italian Resuscitation Conference 2023

20 • 21 OTTOBRE

Vicenza Convention Centre

LA RIVOLUZIONE DEI SISTEMI

IRC Italian Resuscitation Council

Terapie avanzate in ALS
Ventilazione: pro&con

Alberto Cucino
APSS Trento

Italian Resuscitation Council

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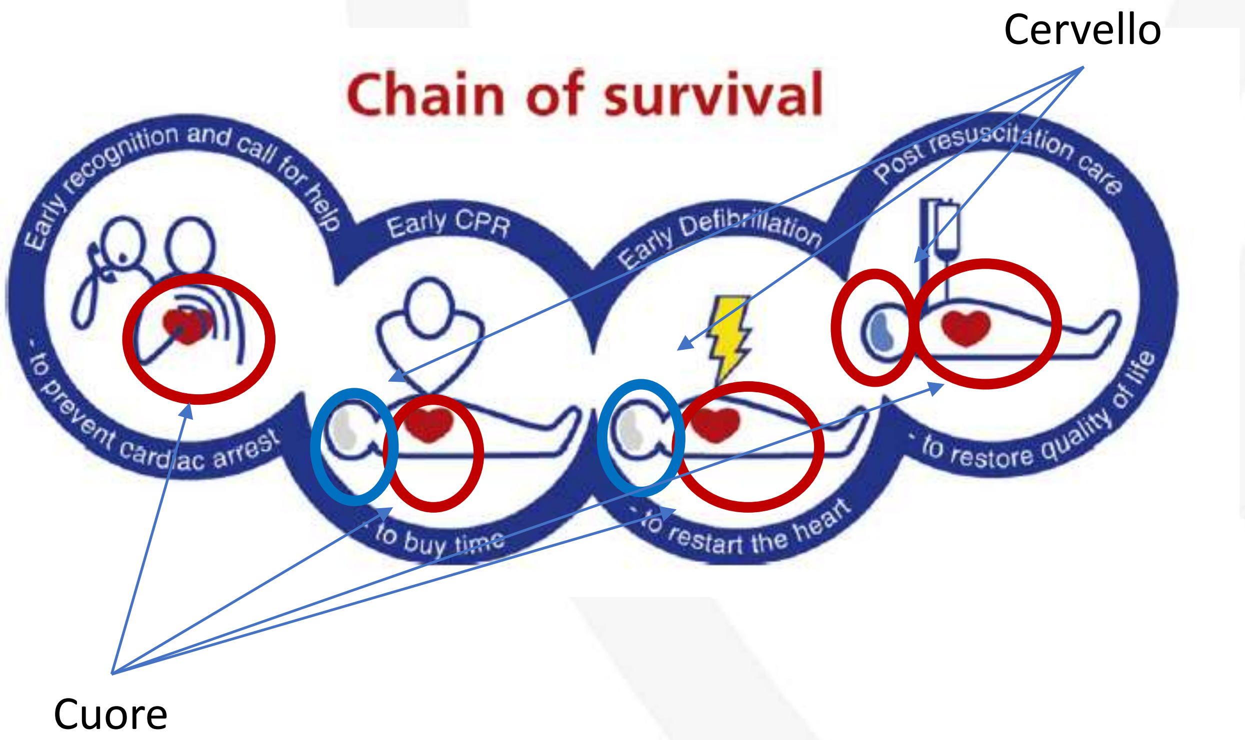
LA RIVOLUZIONE DEI SISTEMI

Ventilazione?



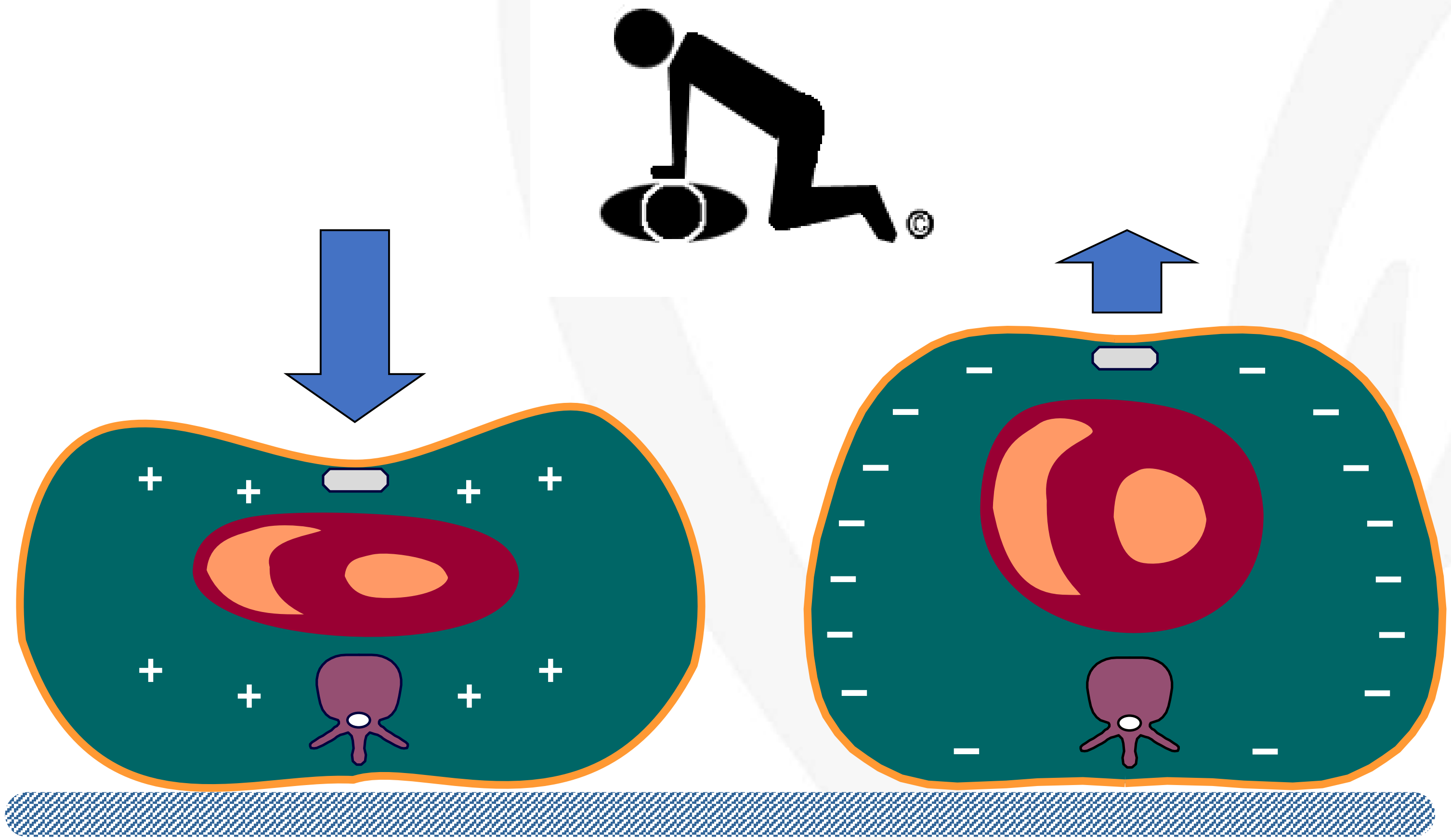
Ventilazione?

RCP di elevate qualità:

- Profondità adeguata (circa 5 cm, ma < 6 cm)
- Frequenza adeguata (100-120/min)
- Duty cycle 50%
- Rilasciamento toracico completo
- Minimizzare le interruzione
- Cambio dell’esecutore delle compressioni ogni 2 minuti
- Evitare la ventilazioen eccessiva

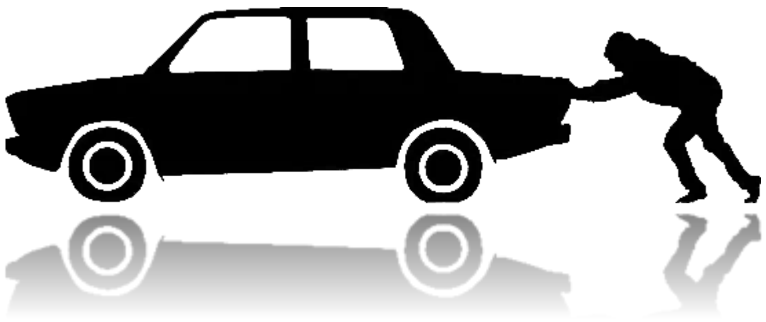
ERC Guidelines 2021

Il nostro obiettivo?



Il nostro obiettivo?

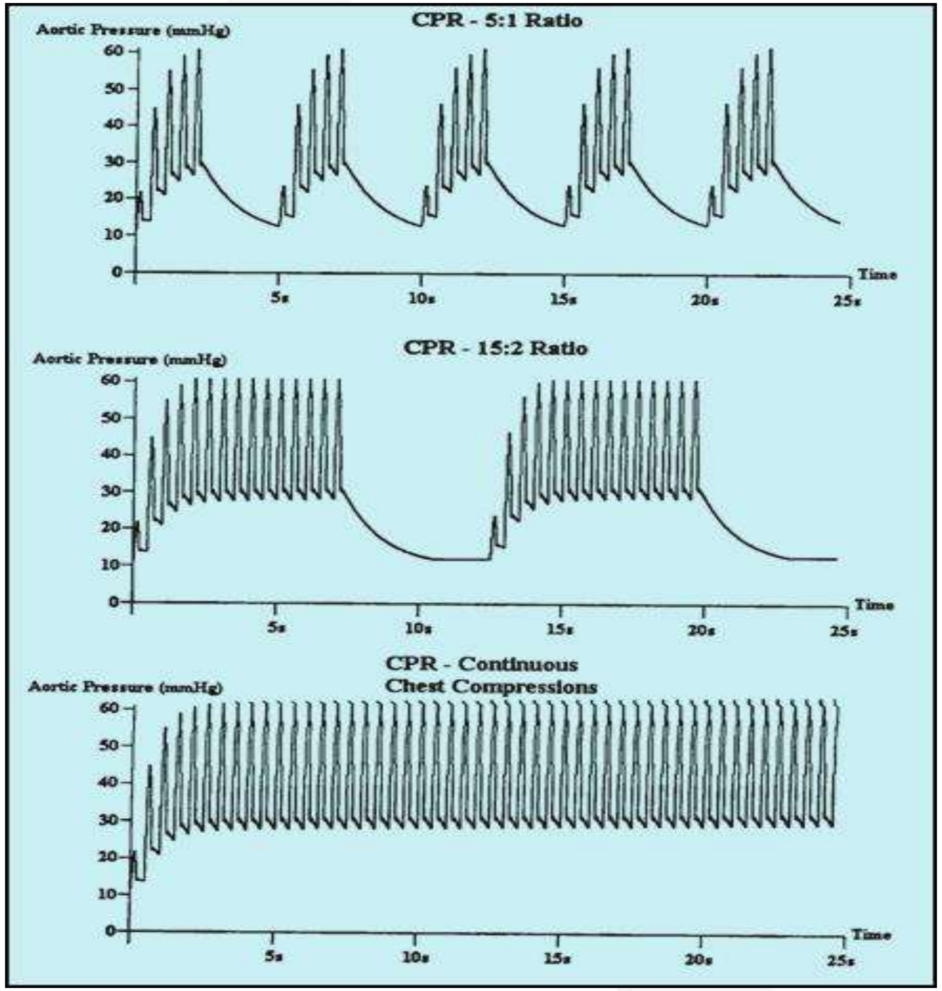
Una RCP di ELEVATA QUALITÀ è in grado di generare:



Solo il 10-30% del normale flusso al cuore

Solo il 30-40% del normale flusso al cervello

Il nostro obiettivo?



Berg et al Circulation 2001

Il nostro obiettivo?

Trasporto d’ossigeno = portata cardiaca x contenuto arterioso d’ossigeno

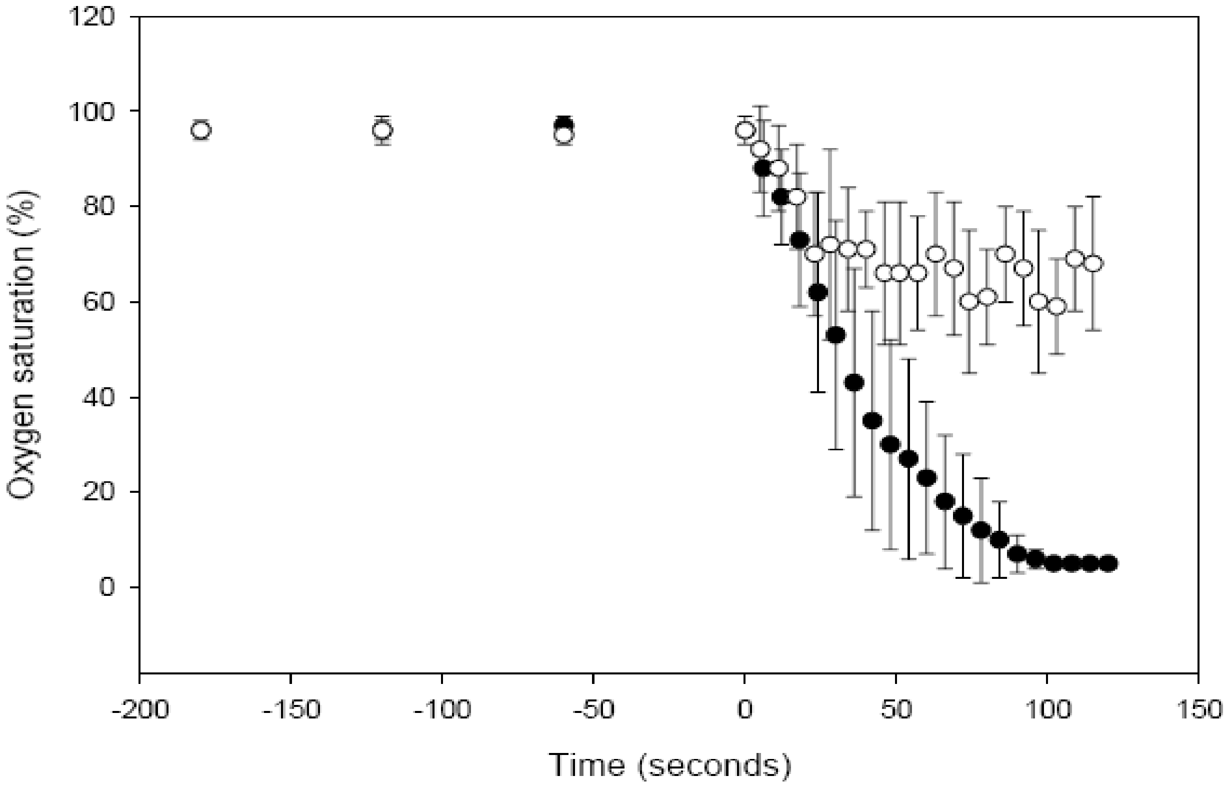


Fig. 1. Mean (±S.D.) arterial oxygen saturation (%) during the 3 min no-flow period and the initial 2 min of BLS for chest compressions only (●) and ratio 2:30 (○). End of no-flow period and start of BLS period is set to zero (0) seconds.

With chest compression-only CPR, arterial oxygen stores deplete in 2–4 min

Airway

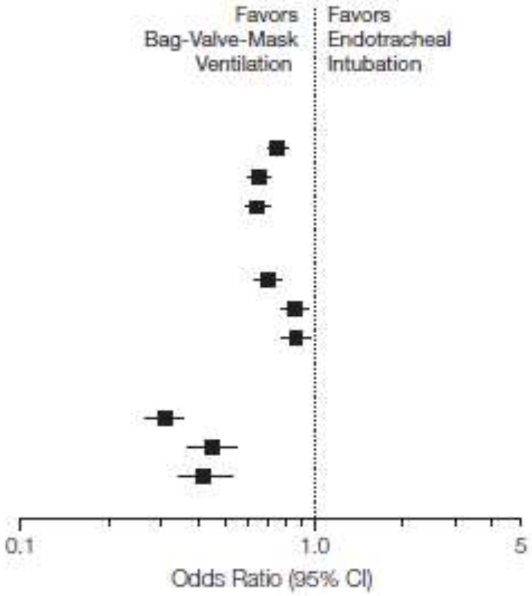
Table 2. Airway and ventilation techniques for cardiac arrest

Technique	Compression-only CPR	Mouth-to-mouth	Bag-mask	Supraglottic airway	Tracheal intubation
Difficulty of technique	Easiest	+	+++	++	+++++
Pause in compressions needed for ventilations	None	++++	++	+	None
Gastric inflation	No	++	+++	+	No
Risk of gastric aspiration	+++	++++	++++	++	+
Level of training and experience required	Untrained lay persons usually with EMS telephone dispatcher instructions	+	+++	++	+++++

Soar & Nolan, Co Crit Care 2013

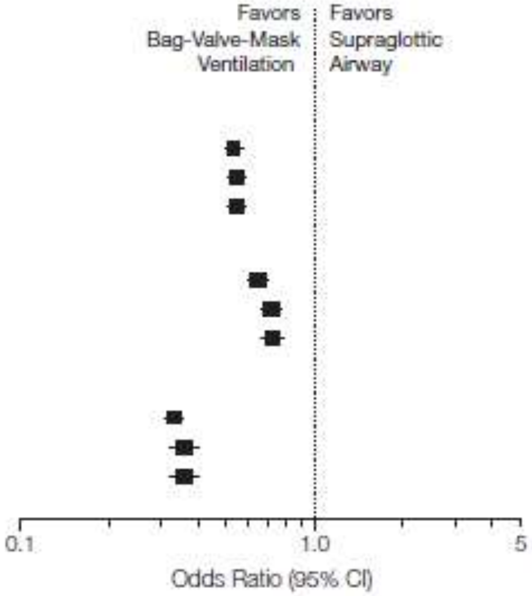
A Endotracheal intubation vs bag-valve-mask ventilation

Model	Total No. of Patients	No. (%) Endotracheal Intubation	No. (%) Bag-Valve-Mask Ventilation	Odds Ratio (95% CI)[a]
Total		26013 (7.3)	178614 (50.0)	
Return of spontaneous circulation				
Unadjusted	357228	1734 (6.7)	14824 (8.3)	0.76 (0.71-0.81)
Adjusted for selected variables[b]				0.66 (0.61-0.72)
Adjusted for all variables[c]				0.64 (0.58-0.70)
1-month survival				
Unadjusted	357228	1069 (4.1)	10373 (5.8)	0.70 (0.65-0.76)
Adjusted for selected variables[b]				0.87 (0.79-0.97)
Adjusted for all variables[c]				0.88 (0.79-0.98)
Neurologically favorable survival				
Unadjusted	357228	257 (1.0)	5799 (3.2)	0.31 (0.27-0.35)
Adjusted for selected variables[b]				0.45 (0.37-0.55)
Adjusted for all variables[c]				0.42 (0.34-0.53)



B Supraglottic airway vs bag-valve-mask ventilation

Model	Total No. of Patients	No. (%) Supraglottic Airway	No. (%) Bag-Valve-Mask Ventilation	Odds Ratio (95% CI)[a]
Total		152601 (42.7)	178614 (50.0)	
Return of spontaneous circulation				
Unadjusted	357228	6933 (4.5)	14824 (8.3)	0.53 (0.51-0.54)
Adjusted for selected variables[b]				0.54 (0.52-0.56)
Adjusted for all variables[c]				0.54 (0.52-0.56)
1-month survival				
Unadjusted	357228	5718 (3.8)	10373 (5.8)	0.63 (0.61-0.65)
Adjusted for selected variables[b]				0.71 (0.68-0.74)
Adjusted for all variables[c]				0.72 (0.68-0.75)
Neurologically favorable survival				
Unadjusted	357228	1697 (1.1)	5799 (3.2)	0.33 (0.32-0.35)
Adjusted for selected variables[b]				0.36 (0.33-0.39)
Adjusted for all variables[c]				0.36 (0.33-0.40)



Research

JAMA | Original Investigation

Effect of Bag-Mask Ventilation vs Endotracheal Intubation During Cardiopulmonary Resuscitation on Neurological Outcome After Out-of-Hospital Cardiorespiratory Arrest

A Randomized Clinical Trial

Patricia Jabre, MD, PhD; Andrea Penaloza, MD, PhD; David Pinero, MD; Francois-Xavier Duchateau, MD; Stephen W. Borron, MD, MS; Francois Javaudin, MD; Olivier Richard, MD; Diane de Longueville, MD; Guillem Bouilleau, MD; Marie-Laure Devaud, MD; Matthieu Heidet, MD, MPH; Caroline Lejeune, MD; Sophie Fauroux, MD; Jean-Luc Greingor, MD; Alessandro Manara, MD; Jean-Christophe Hubert, MD; Bertrand Guihard, MD; Olivier Vermylen, MD; Pascale Lievens, MD; Yannick Auffret, MD; Celine Maisondieu, MD; Stephanie Huet, MD; Benoît Claessens, MD; Frederic Lapostolle, MD, PhD; Nicolas Javaud, MD, PhD; Paul-Georges Reuter, MD, MS; Elinor Baker, MD; Eric Vicaut, MD, PhD; Frédéric Adnet, MD, PhD

2043 out-of-hospital cardio-respiratory arrest in France and Belgium

Primary outcome: favorable neurological outcome at 28 days (CPC 1-2)

Favorable functional survival (CPC 1-2) at day 28:

- 44 of 1018 patients (4.3%) in the BMV group
- 43 of 1022 patients (4.2%) in the ETI group

Difference: 0.11% [1-sided 97.5% CI, −1.64% to infinity]; p = .11

JAMA | Original Investigation

Effect of a Strategy of a Supraglottic Airway Device vs Tracheal Intubation During Out-of-Hospital Cardiac Arrest on Functional Outcome

Table 2. Primary Outcome, Survival Status, and Main Secondary Outcomes

	No. of Patients/Total No. (%)[a]	
	Tracheal Intubation (n = 4410)	Supraglottic Airway Device (n = 4886)
Primary Outcome: Modified Rankin Scale Score at Hospital Discharge or 30 d		
0-3 range (good outcome)	300/4407 (6.8)	311/4882 (6.4)
0 (no symptoms)	124/4407 (2.8)	117/4882 (2.4)
1	48/4407 (1.1)	41/4882 (0.8)
2	50/4407 (1.1)	58/4882 (1.2)
3	78/4407 (1.8)	95/4882 (1.9)
4-6 range (poor outcome to death)	4107/4407 (93.2)	4571/4882 (93.6)
4	46/4407 (1.0)	45/4882 (0.9)
5	27/4407 (0.6)	39/4882 (0.8)
6 (died)	4034/4407 (91.5)	4487/4882 (91.9)
Secondary Outcomes		
Survival status		
Died at scene	2488/4407 (56.5)	2623/4882 (53.7)
Died prior to ICU admission	1058/4407 (24.0)	1226/4882 (25.1)
Died prior to ICU discharge	369/4407 (8.4)	503/4882 (10.3)
Died prior to hospital discharge	120/4407 (2.7)	138/4882 (2.8)
Survived to 30 d or hospital discharge	372/4407 (8.4)	392/4882 (8.0)

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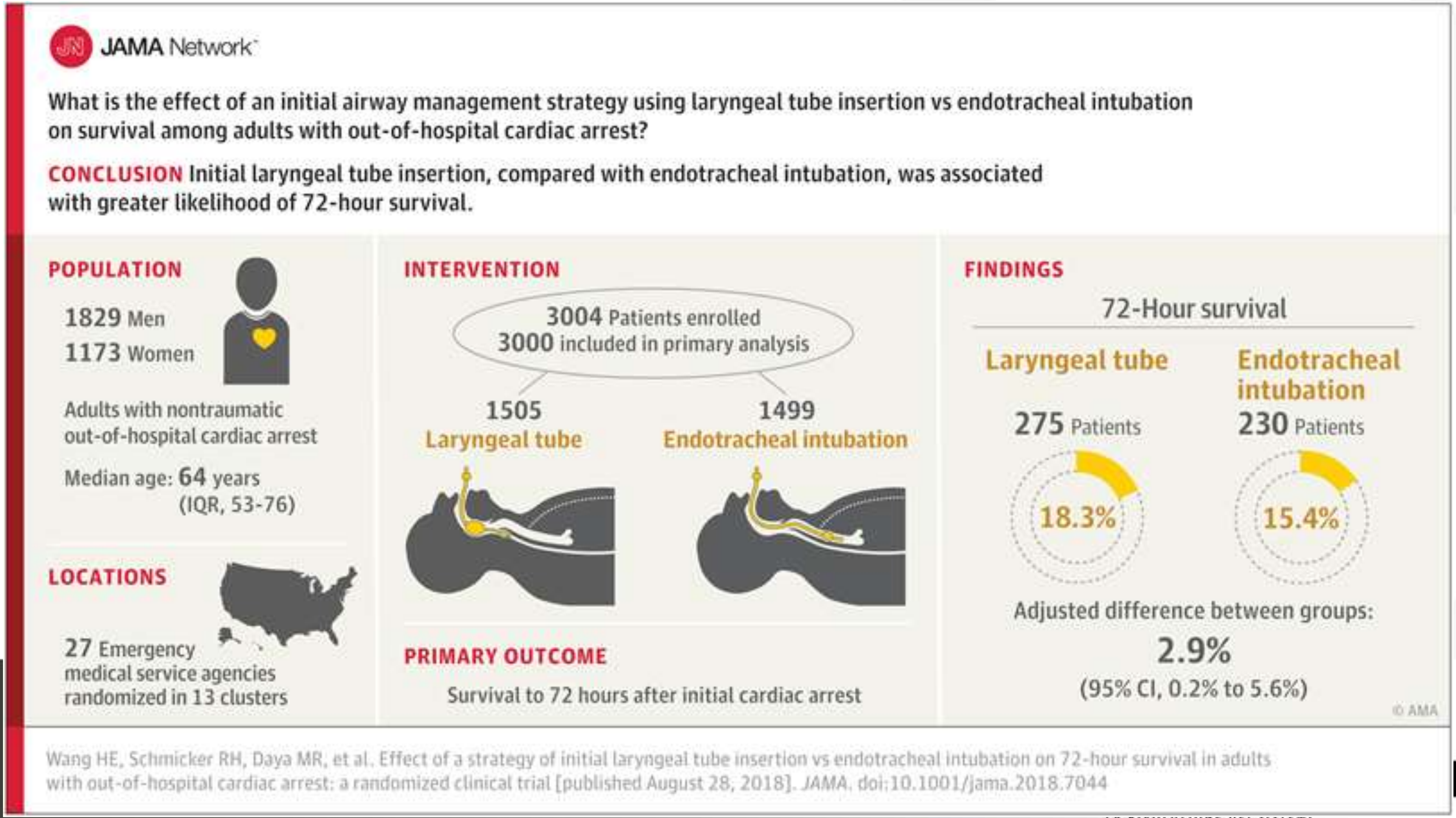
LA RIVOLUZIONE DEI SISTEMI

August 28, 2018

Effect of a Strategy of Initial Laryngeal Tube Insertion vs Endotracheal Intubation on 72-Hour Survival in Adults With Out-of-Hospital Cardiac Arrest

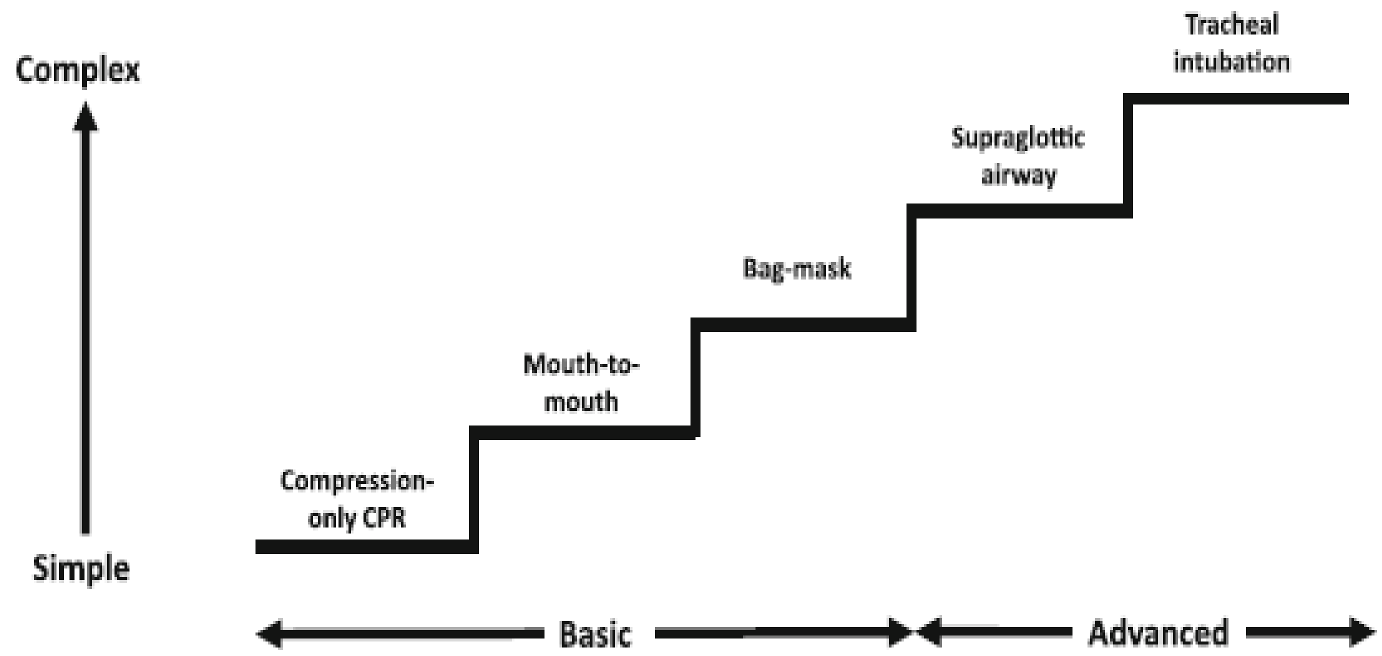
A Randomized Clinical Trial

Henry E. Wang, MD, MS[1,2]; Robert H. Schmicker, MS[3]; Mohamud R. Daya, MD, MS[4]; et al



IRC Italian Resuscitation Council

In conclusione…

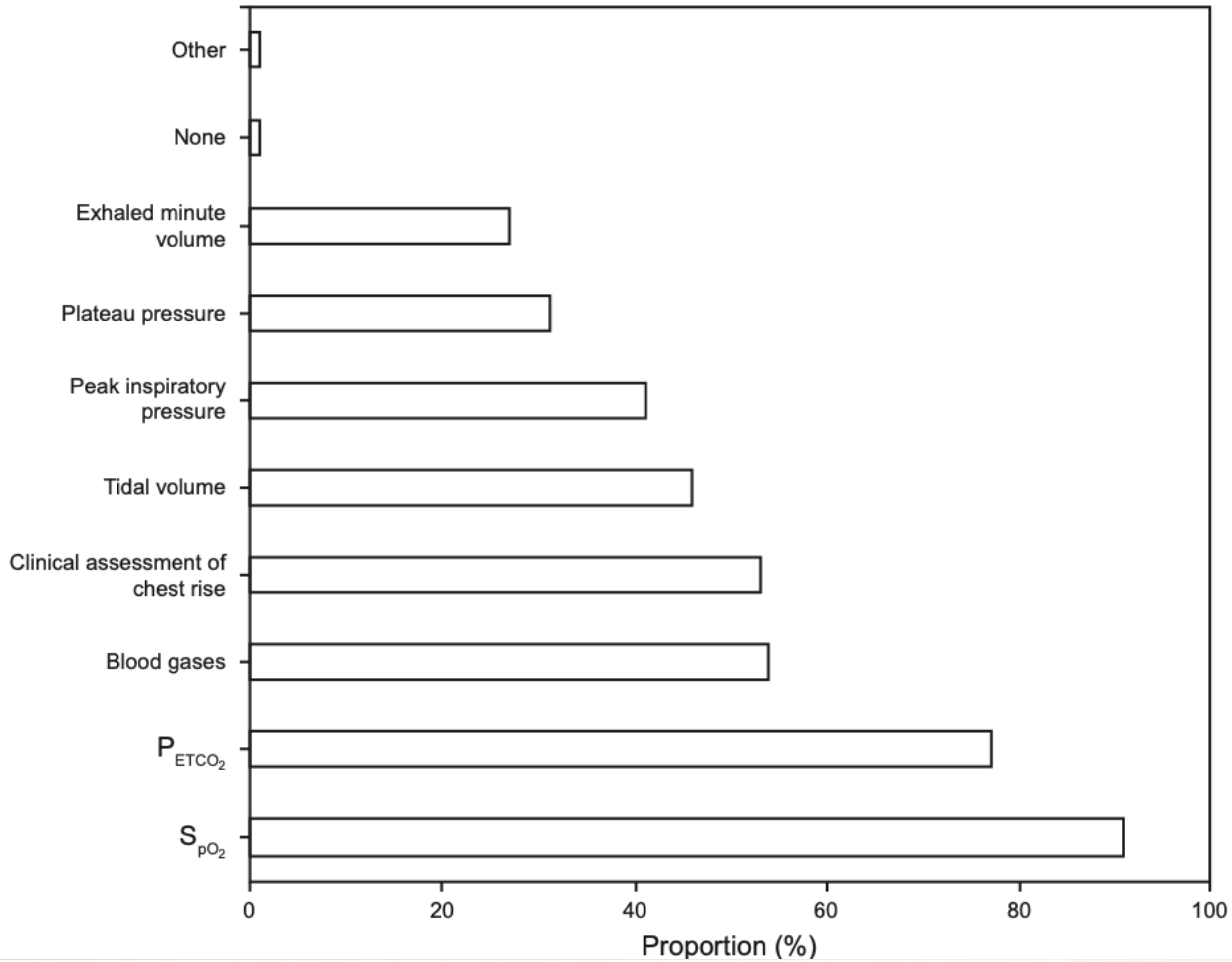


Stepwise approach to airway management during cardiopulmonary resuscitation

Newell et al. Critical Care (2018)

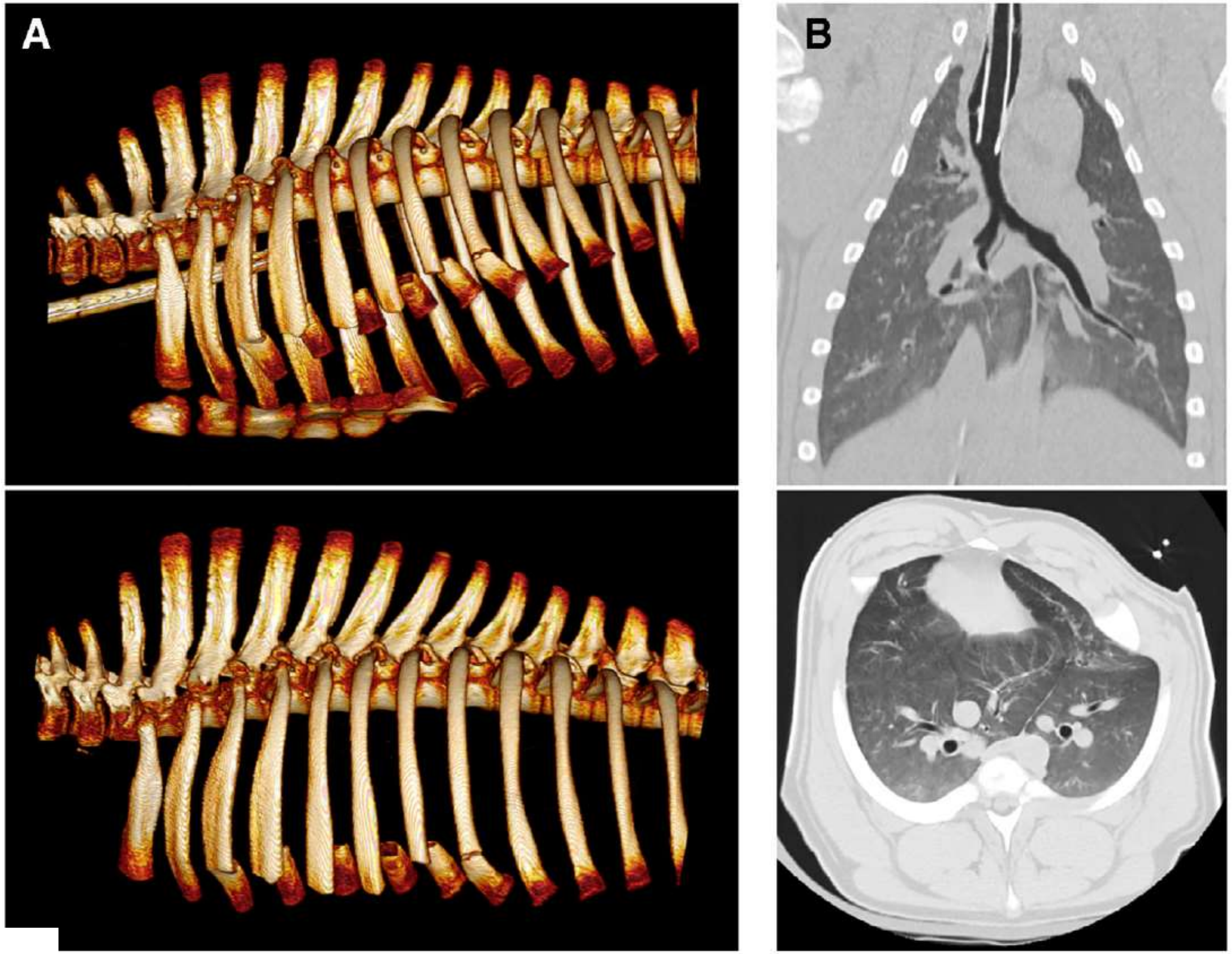
How Ventilation Is Delivered During Cardiopulmonary Resuscitation: An International Survey

Ricardo Luiz Cordioli MD PhD, Laurent Brochard MD, Laurent Suppan MD,
Aissam Lyazidi PhD, François Templier MD, Abdo Khoury MD, Stephane Delisle RRT PhD,
Dominique Savary MD, and Jean-Christophe Richard MD PhD



RESPIRATORY CARE • OCTOBER 2018 VOL 63 NO 10

Rib fractures occurr in up to 97% of CPRs



A. Magliocca et al. / Heart & Lung 00 (2018) 1–2

Clinical paper

Intra-thoracic injuries associated with cardiopulmonary resuscitation – Frequent and serious☆

Lucia Ihnát Rudinská[a,b,*], Petr Hejna[c], Peter Ihnát[d,e], Hana Tomášková[f], Margita Smatanová[a,b], Igor Dvořáček[a,b]

Thoracic injuries in study population.

	Gender	
	Male ($n = 61$)	Female ($n = 19$)
Rib fractures, *n* (%)		
No rib fractures	15 (24.6)	6 (31.6)
Median number of fractures per person	8.1	5.7
Sternal fractures, *n* (%)	41 (67.2)	12 (63.2)
Intra-thoracic injuries, *n* (%)		
Lung contusion	20 (32.8)	5 (26.3)
Lung laceration	2 (3.3)	0 (0.0)
Hemothorax	3 (4.9)	1 (5.3)
Heart contusion	11 (18.0)	3 (15.8)
Hemopericard due to heart rupture	3 (4.9)	2 (10.5)
Hemopericard due to aortic rupture	0 (0.0)	2 (10.5)

CPR-associated injuries were found in 93.7% of cases

Resuscitation 2016

Lung Injury after Resuscitation

- A significant incidence of lung injury in the post-cardiac arrest (CA) period has been reported (up to 79% of pts)

Beitler et al. *Am J Respir Crit Care Med* 2017;195:1198–1206
Johnson et al. *Resuscitation* 2019;135:37–44

- Risk factors for lung injury after CA: pulmonary ischemia–reperfusion, aspiration of gastric content, pulmonary contusion, and systemic inflammation

Johnson et al. *Chest* 2018;153:1466–1477
Yang et al. *J Am Heart Assoc* 2019;8: e012441

- An autoptic study showed that lung lesions were more frequent in patients after mechanical chest compression (CC) compared to manual (18% vs. 4%)

Ondruschka et al. *Forensic Sci Med Pathol* 2018;14:515–525

Multiple Organ Dysfunction After Return of Spontaneous Circulation in Postcardiac Arrest Syndrome

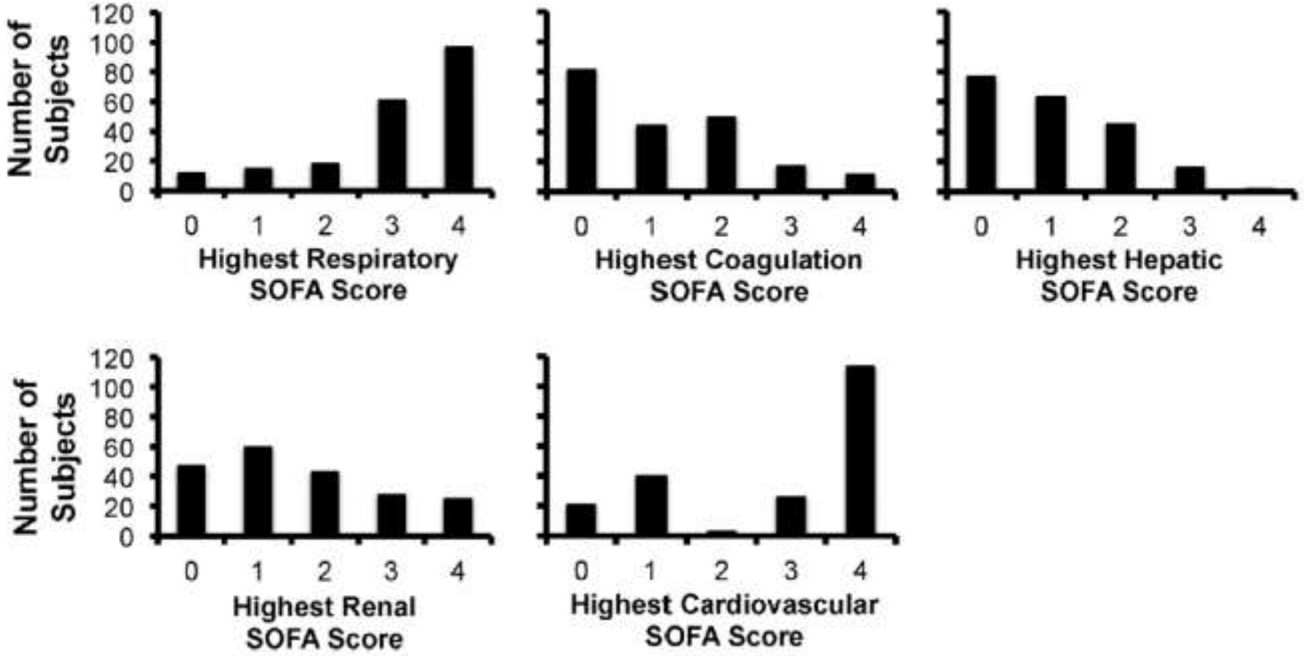
Crit Care Med 2013

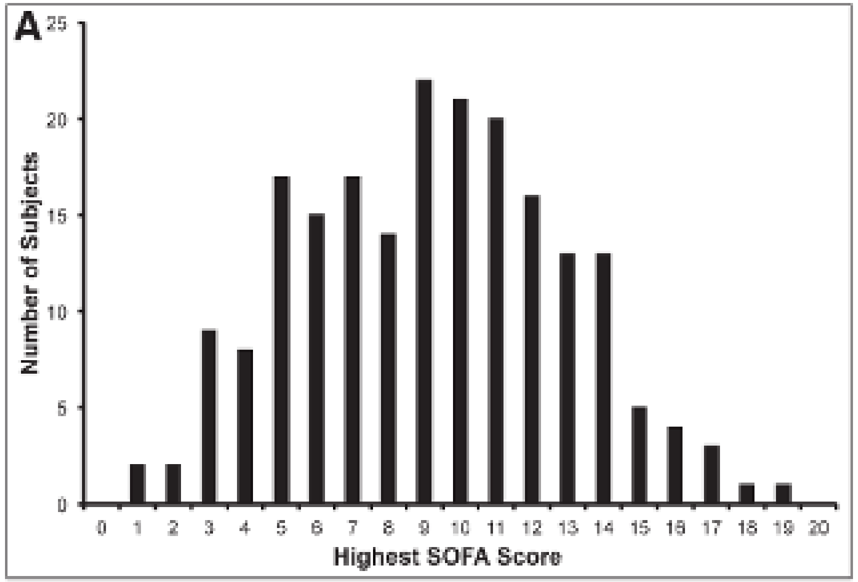
Brian W. Roberts, MD[1]; J. Hope Kilgannon, MD[1]; Michael E. Chansky, MD[1]; Neil Mittal, MD[1]; Jonathan Wooden, MD[1]; Joseph E. Parrillo, MD[2]; Stephen Trzeciak, MD, MPH[1,2]

203 pts: 96% some degree of extra cerebral organ dysfunction

66% severe dysfunction in 1 or 2 extra cerebral organs (cardiovascular/respiratory)

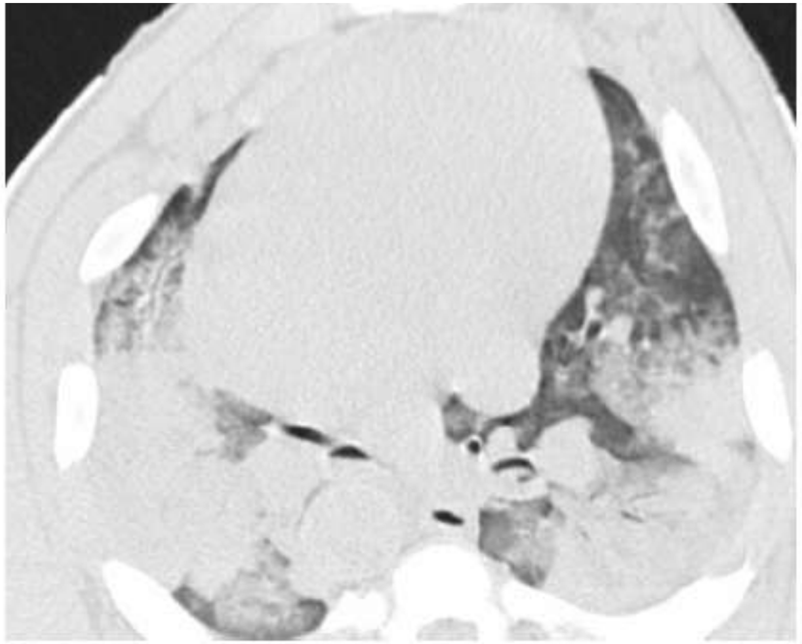
Component	All Subjects	Survivors	Nonsurvivors
Respiratory	3 (3–4)	3 (2–3)	4 (3–4)
Coagulation	1 (0–2)	1 (0–2)	1 (0–2)
Hepatic	1 (0–2)	1 (0–2)	1 (0–2)
Renal	1 (1–3)	1 (0–2)	1 (1–3)
Cardiovascular	4 (1–4)	1 (1–4)	4 (3–4)





Cardiopulmonary Resuscitation-Associated Lung Edema (CRALE) - A Translational Study

Aurora Magliocca [1], Emanuele Rezoagli [2], Davide Zani [3], Martina Manfredi [3], Daria De Giorgio [4], Davide Olivari [4], Francesca Fumagalli [5], Thomas Langer [2], Leonello Avalli [6], Giacomo Grasselli [7, 8], Roberto Latini [9], Antonio Pesenti [10], Giacomo Bellani [11], Giuseppe Ristagno [12]



Mechanical CPR + Mechanical Ventilation

Manual CPR + Mechanical Ventilation

Am J Respir Crit Care Med. 2020 Sep

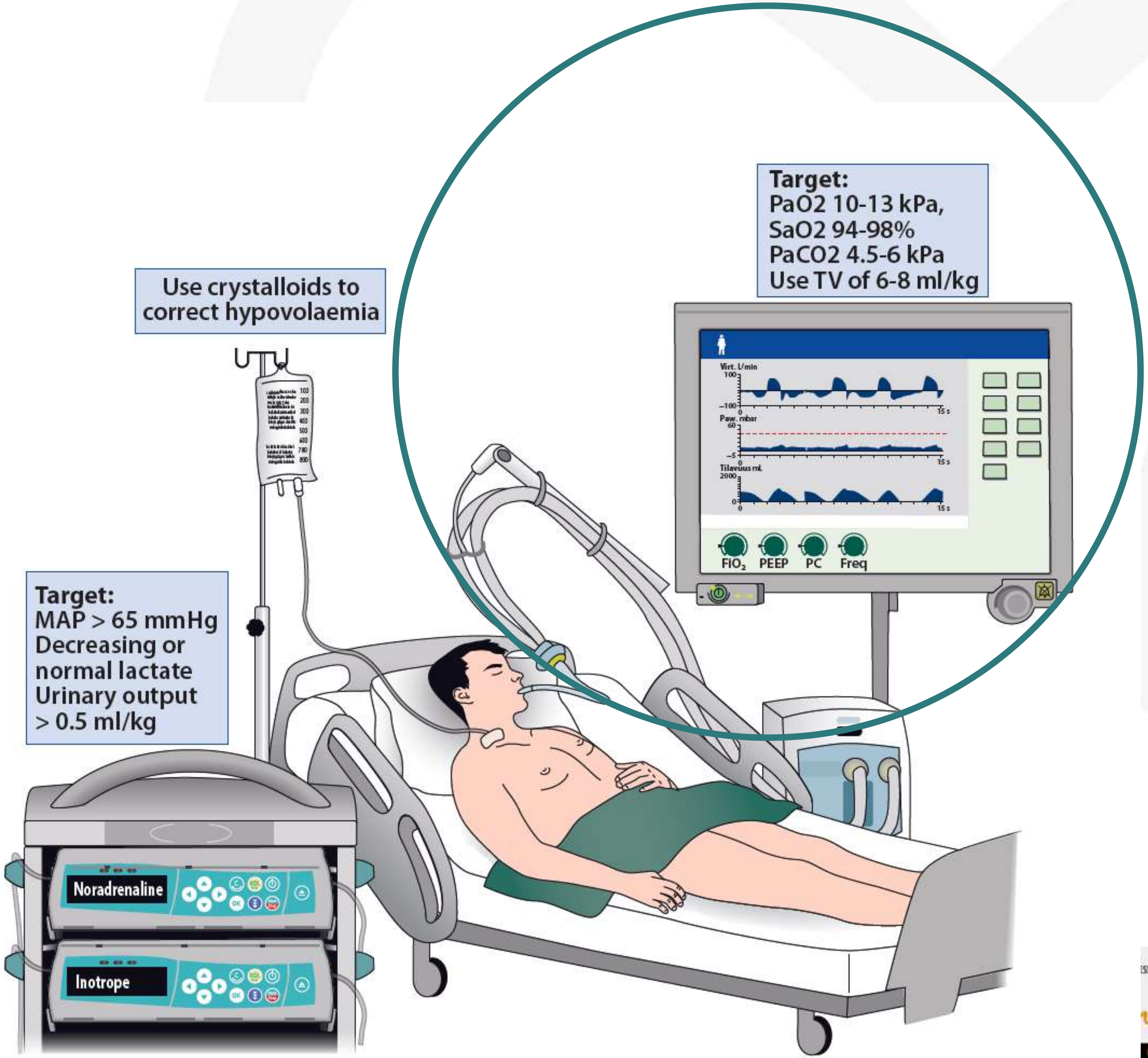
↓Ground glass attenuation
↓Airspace consolidation
↓Overall inflated lung tissue

Intensive Care Med (2021) 47:369–421
https://doi.org/10.1007/s00134-021-06368-4

CONFERENCE REPORTS AND EXPERT PANEL

European Resuscitation Council and European Society of Intensive Care Medicine guidelines 2021: post-resuscitation care

Jerry P. Nolan[1,2*], Claudio Sandroni[3,4], Bernd W. Böttiger[5], Alain Cariou[6], Tobias Cronberg[7], Hans Friberg[8], Cornelia Genbrugge[9,10], Kirstie Haywood[11], Gisela Lilja[12], Véronique R. M. Moulaert[13], Nikolaos Nikolaou[14], Theresa Mariero Olasveengen[15], Markus B. Skrifvars[16], Fabio Taccone[17] and Jasmeet Soar[18]



CONCLUSIONS

Prevalence of lung injury after cardiaca arrest is high

It is reasonable to assess respiratory mechanics to identify early patients developing a CRALE

Patiets with CRALE may particularly benefit from lung protective ventilation

C_{CW} measurements in patients with or without CRALE are consistent with those reported in ARDS patients, suggesting that chest compressions do not significantly impact chest wall mechanics

Prolonged chest compressions may contribute to lung edema and thus to a reduction in aerated lung volume and CRALE

These alterations may also relate with the intensity of intrathoracic pressure swings during CC

Further research should be focused on the identification of the optimal ventilation strategy during CPR to prevent or reduce the occurrence of CRALE