

# IRC 2021

CONGRESSO  
NAZIONALE

16•17•18 DICEMBRE

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



Italian  
Resuscitation  
Council





# ALS

# Linee Guida ERC-IRC 2021

GABRIELLA ARLOTTA

Cardioanestesia e Terapia Intensiva Cardiochirurgica

Fondazione Policlinico Universitario A.Gemelli IRCCS, Roma



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# OBIETTIVI

- LINEE GUIDA ERC-IRC 2021
- OUTCOME ARRESTO CARDIACO
- PREVENZIONE E FORMAZIONE
- ALGORITMO ALS
- ETCO2
- ADRENALINA
- POCUS
- ECPR

# 2021 GUIDELINES ADULT ADVANCED LIFE SUPPORT





ELSEVIER

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

# Resuscitation

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



## European Resuscitation Council Guidelines 2021: Adult advanced life support



*Jasmeet Soar<sup>a,\*</sup>, Bernd W. Böttiger<sup>b</sup>, Pierre Carli<sup>c</sup>, Keith Couper<sup>d</sup>,  
Charles D. Deakin<sup>e</sup>, Therese Djärv<sup>f</sup>, Carsten Lott<sup>g</sup>, Theresa Olasveengen<sup>h</sup>,  
Peter Paal<sup>i</sup>, Tommaso Pellis<sup>j</sup>, Gavin D. Perkins<sup>k</sup>, Claudio Sandroni<sup>l,m</sup>, Jerry P. Nolan<sup>n</sup>*



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Resuscitation

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



Clinical paper

**Out-of-hospital cardiac arrest across the World:  
First report from the International Liaison  
Committee on Resuscitation (ILCOR)**

Tekeyuki Kiguchi<sup>a,1</sup>, Masashi Okubo<sup>b,1</sup>, Chika Nishiyama<sup>c</sup>, Ian Maconochie<sup>d</sup>,  
Marcus Eng Hock Ong<sup>e,f</sup>, Karl B. Kern<sup>g</sup>, Myra H. Wyckoff<sup>h</sup>, Bryan McNally<sup>i</sup>,  
Erika F. Christensen<sup>j</sup>, Ingvild Tjelmeland<sup>k</sup>, Johan Herlitz<sup>l</sup>, Gavin D. Perkins<sup>m</sup>,  
Scott Booth<sup>n</sup>, Judith Finn<sup>o,p,q</sup>, Nur Shahidah<sup>f</sup>, Sang Do Shin<sup>r</sup>, Bentley J. Bobrow<sup>s</sup>,  
Laurie J. Morrison<sup>t</sup>, Ari Salo<sup>u</sup>, Enrico Baldi<sup>v,w</sup>, Roman Burkart<sup>x</sup>, Chih-Hao Lin<sup>y</sup>,  
Xavier Jouven<sup>z</sup>, Jasmeet Soar<sup>A</sup>, Jerrv P. Nolan<sup>B</sup>, Taku Iwami<sup>a,\*</sup>

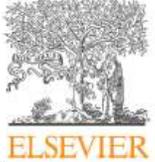
**INCIDENZA ARRESTI CARDIACI EXTRAOSPEDALIERI  
TRATTATI DAI SERVIZI DI EMERGENZA:  
EUROPA 40,6/100.000/ANNO  
NORD AMERICA 47,3/100.000/ANNO  
ASIA 45,9/100.000/ANNO  
AUSTRALIA 51,1 /100.000/ANNO**

**SOPRAVVIVENZA ALLA DIMISSIONE O A 30 GIORNI 3,1-24,2%**

**OUTCOME NEUROLOGICO FAVOREVOLE ALLA DIMISSIONE O A 30 GIORNI 2,8-18,2%**



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Resuscitation

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



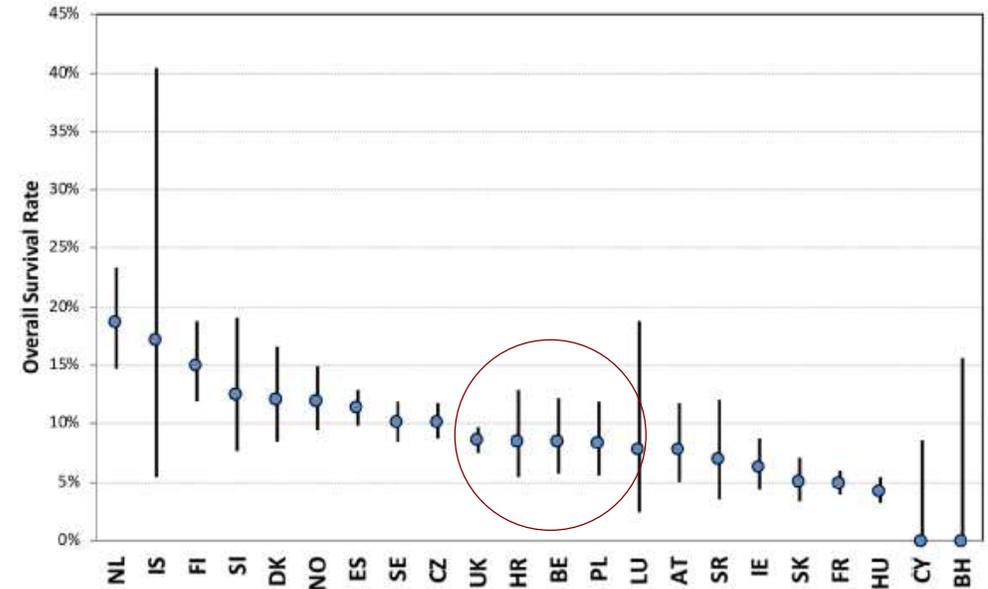
Clinical paper

## Survival after out-of-hospital cardiac arrest in Europe - Results of the EuReCa TWO study



Jan-Thorsten Gräsner<sup>a,b,1,\*</sup>, Jan Wnent<sup>a,b,c,1</sup>, Johan Herlitz<sup>d</sup>, Gavin D. Perkins<sup>e,f</sup>, Rolf Lefering<sup>g</sup>, Ingvild Tjelmeland<sup>h,a</sup>, Rudolph W. Koster<sup>i</sup>, Siobhán Masterson<sup>j</sup>, Fernando Rossell-Ortiz<sup>k</sup>, Holger Maurer<sup>l</sup>, Bernd W. Böttiger<sup>m,q</sup>, Maximilian Moertl<sup>n</sup>, Pierre Mols<sup>o</sup>, Hajriz Alihodić<sup>p</sup>, Irzal Hadibegović<sup>q</sup>, Marios Ioannides<sup>r</sup>, Anatolij Truhlář<sup>s,t</sup>, Mads Wissenberg<sup>u</sup>, Ari Salo<sup>v</sup>, Josephine Escutnaire<sup>w</sup>, Nikolaos Nikolaou<sup>x</sup>, Eniko Nagy<sup>y</sup>, Bergthor Steinn Jonsson<sup>z</sup>, Peter Wright<sup>a</sup>, Federico Semeraro<sup>b</sup>, Carlo Clarens<sup>c</sup>, Steffie Beesems<sup>d</sup>, Grzegorz Cebula<sup>e</sup>, Vitor H Correia<sup>f</sup>, Diana Cimpoesu<sup>g</sup>, Violetta Raffay<sup>h</sup>, Stefan Trenkler<sup>i</sup>, Andrej Markota<sup>j,k</sup>, Anneli Strömsöe<sup>l,m,n</sup>, Roman Burkart<sup>o</sup>, Scott Booth<sup>e</sup>, Leo Bossaert<sup>p,q</sup>

**SOPRAVVIVENZA ALLA DIMISSIONE 8% (0-18%)**



JAMA | Review

# In-Hospital Cardiac Arrest A Review

Lars W. Andersen, MD, MPH, PhD, DMSc; Mathias J. Holmberg, MD, MPH; Katherine M. Berg, MD;  
Michael W. Donnino, MD; Asger Granfeldt, MD, PhD, DMSc

JAMA March 26, 2019 Volume 321, Number 12

## INCIDENZA

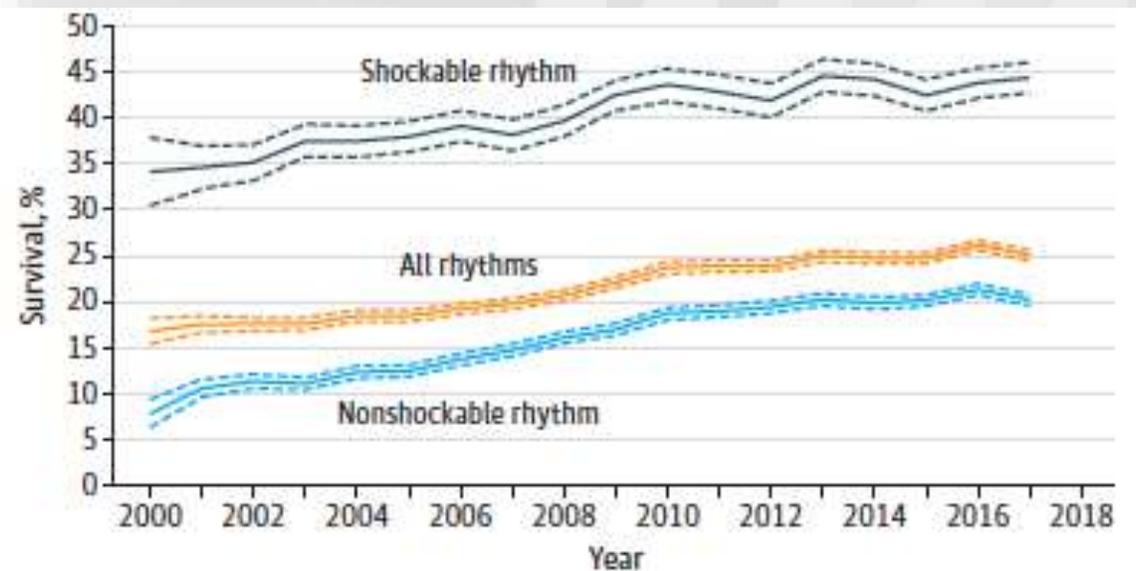
**1,5/1000 RICOVERI (National cardiac arrest  
Audit from the Resuscitation Council (UK))**

**6-7/1000 (2003-2007) – 9-10/1000 (2008-2017)**

**SOPRAVVIVENZA ALLA DIMISSIONE 25%**

**OUTCOME NEUROLOGICO FAVOREVOLE (CPC 1-2) ALLA  
DIMISSIONE 85%**

**(Get With The Guidelines Resuscitation Registry 2017  
From American Heart Association)**



# Circulation

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## **Education, Implementation, and Teams**

**2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations**

*Circulation.* 2020;142(suppl 1):S222–S283.



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# PREVENZIONE DELL'ARRESTO CARDIACO

PAZIENTI CON ARRESTO  
CARDIACO INTRA ED  
EXTRAOSPEDALIERO SPESSO  
MANIFESTANO **SEGNI E  
SINTOMI PREMONITORI**

- SINCOPE (DURANTE ESERCIZIO FISICO)  
DOLORE TORACICO,  
PALPITAZIONI, VERTIGINI, DISPNEA
- IN UN CONTESTO CLINICO  
UTILIZZARE **EWS**



- MONITORAGGIO E RICONOSCIMENTO  
Personale intraospedaliero  
addestrato a al riconoscimento  
precoce dei segnali di allarme



- CHIAMATA DI AIUTO  
Comunicazione strutturata (SBAR)
- RISPOSTA
- Team dell'emergenza (MET/RRS/CCOT)





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RISPOSTE CARDIOPOLMONE  
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#### Give high-quality chest compressions and

- Give oxygen
- Use waveform capnography
- Continuous compressions if advanced airway
- Minimise interruptions to compressions
- Intravenous or intraosseous access
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks
- Identify and treat reversible causes

#### Identify and treat reversible causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalemia/metabolic
- Hypo-/hyperthermia
- Thrombosis - coronary or pulmonary
- Tension pneumothorax
- Tamponade- cardiac
- Toxins

Consider ultrasound imaging to identify reversible causes

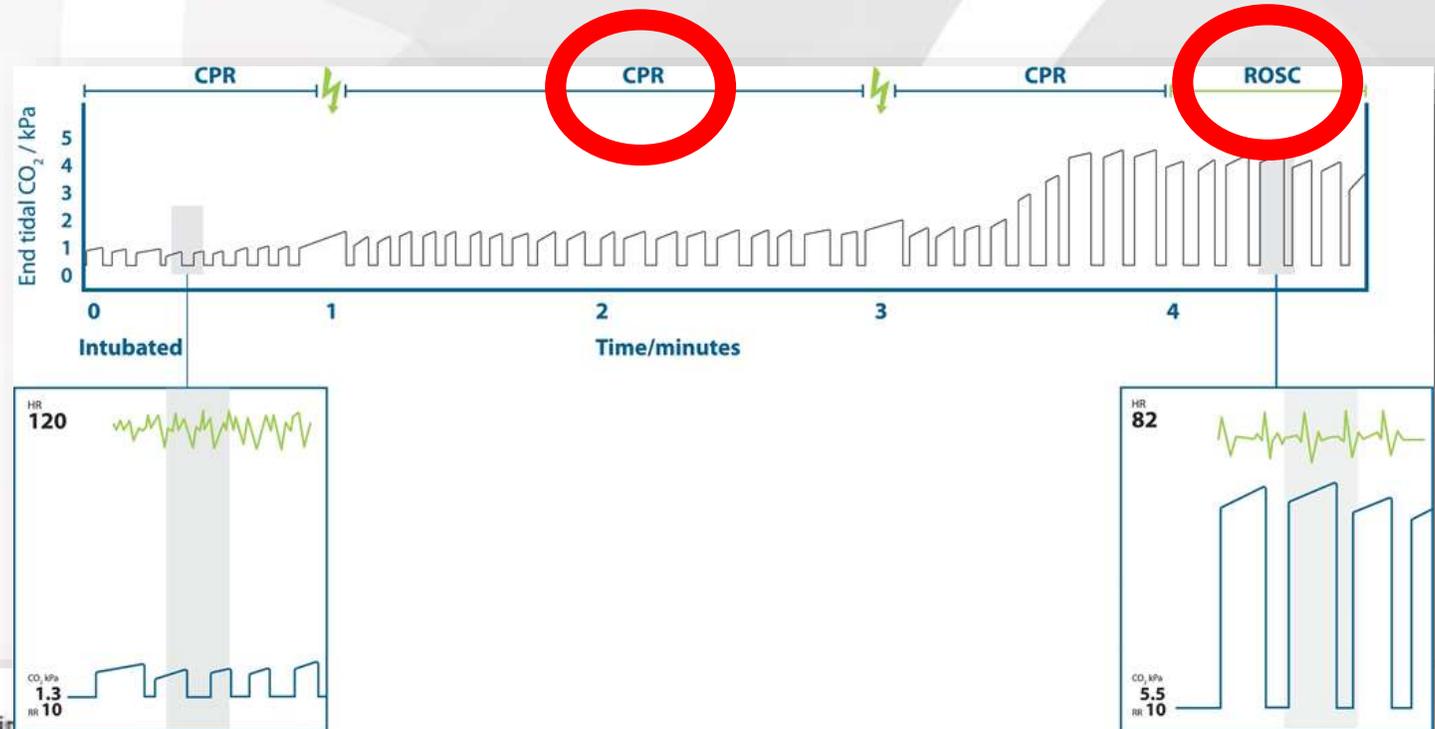
#### Consider

- Coronary angiography/percutaneous coronary intervention
- Mechanical chest compressions to facilitate transfer/treatment
- Extracorporeal CPR



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- CONFERMA POSIZIONE TUBO ET
- MONITORAGGIO QUALITA' RCP
- INDIVIDUARE ROSC  
(SE UNICO ELEMENTO NON  
INTERROMPERE MCE MA RIMANDARE  
SOMMINISTRAZIONE DI ADRENALINA)
- ETCO2 < 10 MMHG PROGNOSE PEGGIORE  
NON UTILIZZARE COME UNICO CRITERIO  
PER SOSPENDERE RCP



**Table 2**  
Diagnostic characteristics of ETCO<sub>2</sub> change in

	ETCO <sub>2</sub> rise ≥ 10 mmHg	ETCO <sub>2</sub> rise ≥ 20 mmHg	ETCO <sub>2</sub> rise ≥ 10 mmHg and ETCO <sub>2</sub> value ≥ 40 mmHg	ETCO <sub>2</sub> rise ≥ 20 mmHg and ETCO <sub>2</sub> value ≥ 40 mmHg
Sensitivity, 95% CI	33% (22-47%)	20% (11-33%)	18% (10-31%)	15% (8-27%)
Specificity, 95% CI	97% (91-99%)	98% (93-100%)	98% (93-100%)	99% (95-100%)
Positive predictive value, 95% CI	83% (62-95%)	86% (56-97%)	85% (54-97%)	90% (54-99%)
Negative predictive value, 95% CI	74% (66-81%)	71% (63-77%)	70% (63-77%)	70% (62-76%)
Positive likelihood ratio, 95% CI	9.8 (3.5-27.5)	11.8 (2.7-51)	10.8 (2.5-47.2)	17.7 (2.3-136.5)
Negative likelihood ratio, 95% CI	0.7 (0.6-0.8)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.9 (0.8-1)

# ADRENALINA

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest

G.D. Perkins, C. Ji, C.D. Deakin, T. Quinn, J.P. Nolan, C. Scomparin, S. Regan,  
J. Long, A. Slowther, H. Pocock, J.J.M. Black, F. Moore, R.T. Fothergill, N. Rees,  
L. O'Shea, M. Docherty, I. Gunson, K. Han, K. Charlton, J. Finn, S. Petrou,  
N. Stallard, S. Gates, and R. Lall, for the PARAMEDIC2 Collaborators\*

N Engl J Med. 2018 Aug 23;379(8):711-721.

8014 PAZIENTI CON ARRESTO CARDIACO EXTRAOSPEDALIERO



# ADRENALINA

**Table 3. Primary and Secondary Outcomes.\***

Outcome	Epinephrine	Placebo	Odds Ratio (95% CI) <sup>†</sup>	
			Unadjusted	Adjusted
<b>Primary outcome</b>				
Survival at 30 days — no./total no. (%) <sup>‡</sup>	130/4012 (3.2)	94/3995 (2.4)	1.39 (1.06–1.82)	1.47 (1.09–1.97)
<b>Secondary outcomes</b>				
Survival until hospital admission — no./total no. (%) <sup>§</sup>	947/3973 (23.8)	319/3982 (8.0)	3.59 (3.14–4.12)	3.83 (3.30–4.43)
Median length of stay in ICU (IQR) — days				
Patients who survived	7.5 (3.0–15.0)	7.0 (3.5–12.5)	NA	NA
Patients who died <sup>¶</sup>	2.0 (1.0–5.0)	3.0 (1.0–5.0)	NA	NA
Median length of hospital stay (IQR)				
Patients who survived	21.0 (10.0–41.0)	20.0 (9.0–38.0)	NA	NA
Patients who died <sup>  </sup>	0	0	NA	NA
Survival until hospital discharge — no./total no. (%)	128/4009 (3.2)	91/3995 (2.3)	1.41 (1.08–1.86)	1.48 (1.10–2.00)
Favorable neurologic outcome at hospital discharge — no./total no. (%)	87/4007 (2.2)	74/3994 (1.9)	1.18 (0.86–1.61)	1.19 (0.85–1.68)
Survival at 3 mo — no./total no. (%)	121/4009 (3.0)	86/3991 (2.2)	1.41 (1.07–1.87)	1.47 (1.08–2.00)
Favorable neurologic outcome at 3 mo — no./total no. (%)	82/3986 (2.1)	63/3979 (1.6)	1.31 (0.94–1.82)	1.39 (0.97–2.01)

# ADRENALINA

*Intensive Care Med* (2020) 46:426–436  
<https://doi.org/10.1007/s00134-019-05836-2>

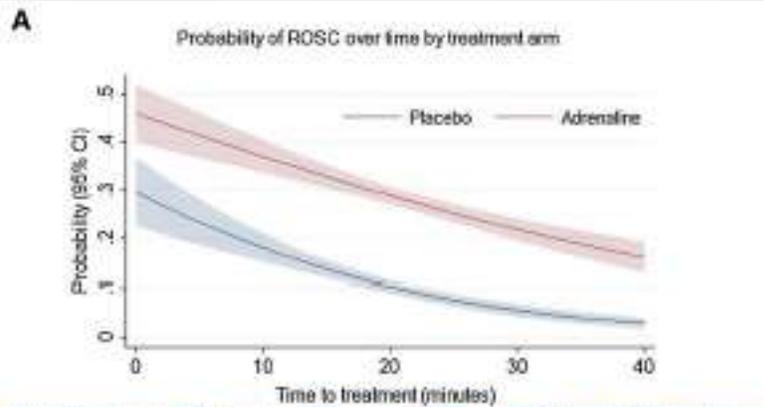
ORIGINAL

## The influence of time to adrenaline administration in the Paramedic 2 randomised controlled trial



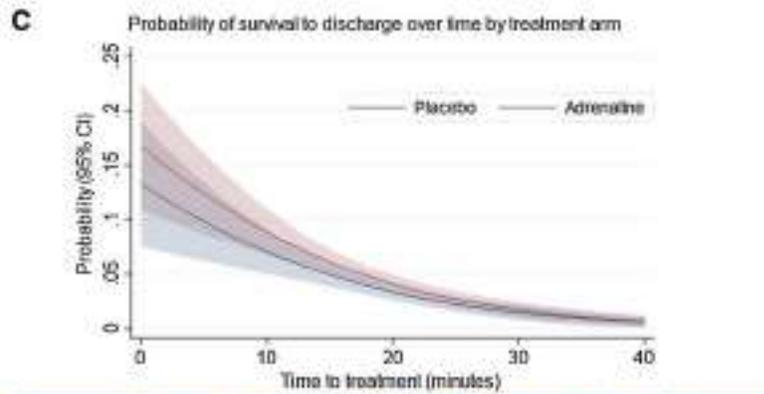
Gavin D. Perkins<sup>1,2\*</sup> , Claire Kenna<sup>1</sup>, Chen Ji<sup>1</sup>, Charles D. Deakin<sup>3,4</sup>, Jerry P. Nolan<sup>1,5</sup>, Tom Quinn<sup>6</sup>, Charlotte Scomparin<sup>1</sup>, Rachael Fothergill<sup>1,7</sup>, Imogen Gunson<sup>8</sup>, Helen Pocock<sup>3</sup>, Nigel Rees<sup>9</sup>, Lyndsey O'Shea<sup>9</sup>, Judith Finn<sup>10</sup>, Simon Gates<sup>11</sup> and Ranjit Lall<sup>1</sup>

# ADRENALINA



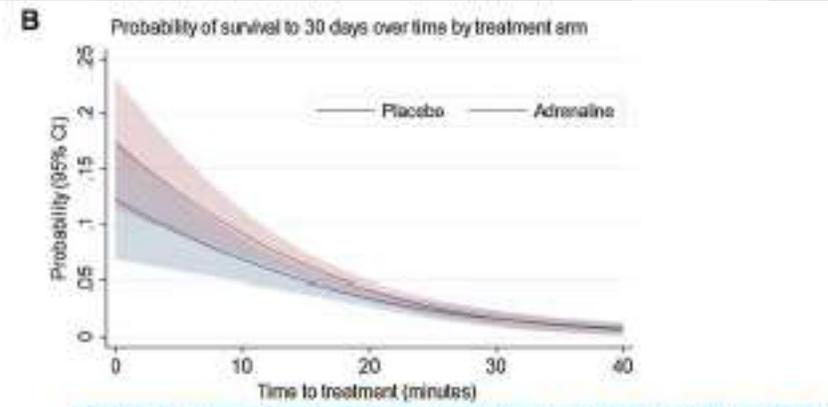
Time (minutes)	0-10	10-20	20-30	30-40	40-60	Total
Adrenaline	67/213	273/811	231/880	82/325	16/96	641/2305
Placebo	87/193	115/831	66/890	11/303	5/95	254/2312

Survivor frequencies and number at risk for adjusted model (n survivors/n at risk)



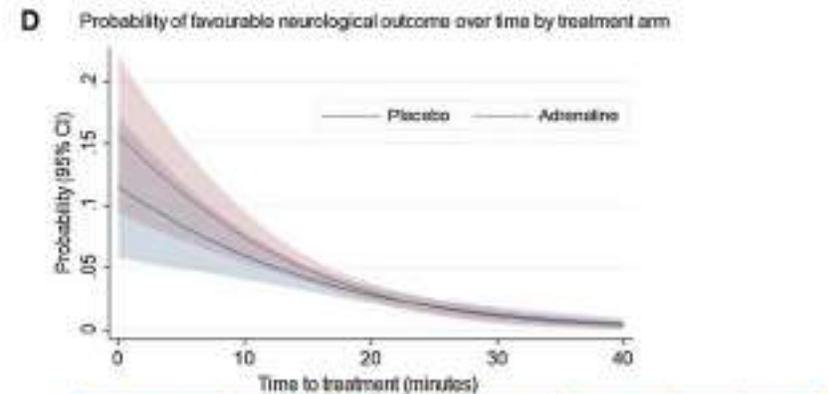
Time (minutes)	0-10	10-20	20-30	30-40	40-60	Total
Adrenaline	13/213	60/811	24/880	4/325	0/96	101/2305
Placebo	11/193	46/831	14/890	8/303	1/95	76/2312

Survivor frequencies and number at risk for adjusted model (n survivors/n at risk)



Time (minutes)	0-10	10-20	20-30	30-40	40-60	Total
Adrenaline	15/213	60/811	25/880	4/325	0/96	104/2305
Placebo	10/193	47/831	15/890	6/303	1/95	79/2312

Survivor frequencies and number at risk for adjusted model (n survivors/n at risk)



Time (minutes)	0-10	10-20	20-30	30-40	40-60	Total
Adrenaline	12/213	44/811	17/880	2/325	0/96	75/2305
Placebo	8/193	40/831	11/890	4/303	1/95	64/2312

Survivor frequencies and number at risk for adjusted model (n survivors/n at risk)

# ADRENALINA

SOMMINISTRARE L'ADRENALINA 1 MG EV IL PRIMA POSSIBILE NEI RITMI  
NON DEFIBRILLABILI

*(Raccomandazione forte, livello di evidenza basso-moderato)*

SOMMINISTRARE L'ADRENALINA 1 MG EV DOPO 3 SHOCK NEI RITMI  
DEFIBRILLABILI PERSISTENTI

*(Raccomandazione debole, livello di evidenza molto basso)*

REPETERE L'ADRENALINA OGNI 3-5 MIN DURANTE ALS

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 Penalzoza, 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; Benoit 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

JAMA 2018 Feb 27;319(8):779-787.

JAMA | Original Investigation

## 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; Robert H. Schmicker, MS; Mohamud R. Daya, MD, MS; Shannon W. Stephens, EMT-P; Ahamed H. Idris, MD; Justin N. Carlson, MD, MS; M. Riccardo Colella, DO, MPH; Heather Herren, MPH, RN; Matthew Hansen, MD, MCR; Neal J. Richmond, MD; Juan Carlos J. Puyana, BA; Tom P. Aufderheide, MD, MS; Randal E. Gray, MEd, NREMT-P; Pamela C. Gray, NREMT-P; Mike Verkest, AAS, EMT-P; Pamela C. Owens; Ashley M. Brienza, BS; Kenneth J. Sternig, MS-EHS, BSN, NRP; Susanne J. May, PhD; George R. Sopko, MD, MPH; Myron L. Weisfeldt, MD; Graham Nichol, MD, MPH

JAMA 2018;320(8):769-778.

JAMA | Original Investigation

## Effect of a Strategy of a Supraglottic Airway Device vs Tracheal Intubation During Out-of-Hospital Cardiac Arrest on Functional Outcome The AIRWAYS-2 Randomized Clinical Trial

Jonathan R. Benger, MD; Kim Kirby, MRCS; Sarah Black, DClinRes; Stephen J. Brett, MD; Madeleine Clout, BSc; Michelle J. Lazaroo, MSc; Jerry P. Nolan, MBChB; Barnaby C. Reeves, DPhil; Maria Robinson, MSt; Lauren J. Scott, MSc; Helena Smartt, PhD; Adrian South, BSc (Hons); Elizabeth A. Stokes, DPhil; Jodi Taylor, PhD; Matthew Thomas, MBChB; Sarah Voss, PhD; Sarah Wordsworth, PhD; Chris A. Rogers, PhD

JAMA 2018 Feb 27;320 (8):779-791.

# VIE AEREE

NEL PAZIENTE ADULTO IN ARRESTO CARDIACO UTILIZZARE **IN OGNI AMBITO VENTILAZIONE CON PALLONE E MASCHERA O ASSICURARE LE VIE AEREE CON PRESIDIO AVANZATO**

*(Raccomandazione debole, livello di evidenza basso)*

SE SI UTILIZZA UN PRESIDIO AVANZATO NELL'ARRESTO CARDIACO **EXTRAOSPEDALIERO** IN UN SETTING IN CUI LA **PERCENTUALE DI SUCCESSO DELL'INTUBAZIONE E' BASSA (<95%)** UTILIZZARE UN **PRESIDIO SOPRAGLOTTICO**

*(Raccomandazione debole, livello di evidenza basso)*

SE SI UTILIZZA UN PRESIDIO AVANZATO NELL'ARRESTO CARDIACO **EXTRAOSPEDALIERO** IN UN SETTING IN CUI LA **PERCENTUALE DI SUCCESSO DELL'INTUBAZIONE E' ALTA (>95%)** UTILIZZARE UN **PRESIDIO SOPRAGLOTTICO O INTUBAZIONE TR.**

*(Raccomandazione debole, livello di evidenza molto basso)*

NELL'ARRESTO CARDIACO **INTRAOSPEDALIERO** UTILIZZARE **PRESIDIO SOPRAGLOTTICO O INTUBAZIONE TR.**

*(Raccomandazione debole, livello di evidenza molto basso)*

# POCUS (POINT OF CARE ULTRASONOGRAPHY)

- SOLO **OPERATORI ESPERTI** DOVREBBERO UTILIZZARE LA POCUS
- **EVITARE PAUSE PROLUNGATE** DEL MASSAGGIO CARDIACO
- UTILE NEL DIAGNOSTICARE **IL TAMPONAMENTO CARDIACO E LO PNEUMOTORACE IPERTESO**
- **NON DIAGNOSTICARE L'EMBOLIA POLMONARE** IN PRESENZA DELLA SOLA DILATAZIONE DEL VENTRICOLO DESTRO
- NON UTILIZZARE LA POCUS PER VALUTARE LA CONTRATTILITA' DEL MIOCARDIO COME INDICATORE DEL TERMINE DELLA RCP

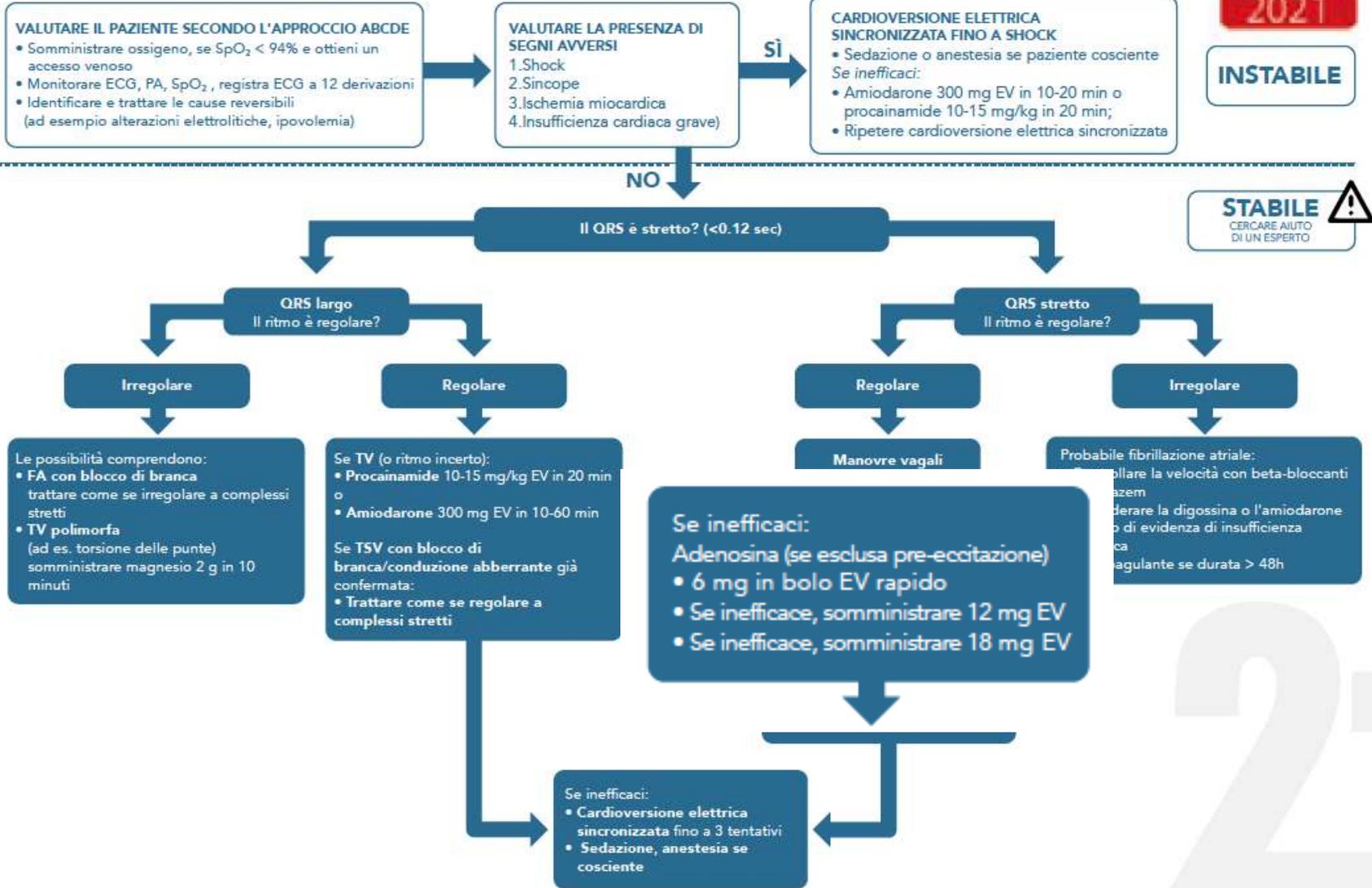
## Advanced reperfusion strategies for patients with out-of-hospital cardiac arrest and refractory ventricular fibrillation (ARREST): a phase 2, single centre, open-label, randomised controlled trial

Demetris Yannopoulos, Jason Bartos, Ganesh Raveendran, Emily Walser, John Connett, Thomas A Murray, Gary Collins, Lin Zhang, Rajat Kalra, Marinos Kosmopoulos, Ranjit John, Andrew Shaffer, RJ Frascone, Keith Wesley, Marc Conterato, Michelle Biros, Jakub Tolar, Tom P Aufderheide

	ECMO-facilitated resuscitation (n=15)		Standard ACLS treatment (n=15)		Risk difference or p value
	Number of patients with data	Patients	Number of patients with data	Patients	
<b>Primary outcome (95% CrI)</b>					
Survival to hospital discharge	14	6 (43%, 21-3-67-7)	15	1 (7%, 1-6-30-2)	36% (3-7-59-2; posterior probability- 0-9861)

- CONSIDERARE E-CPR IN PAZIENTI SELEZIONATI SE ALS FALLISCE
- CONSIDERARE IN SITUAZIONI PARTICOLARI PER FACILITARE SPECIFICI INTERVENTI (ANGIOPLASTICA CORONARICA, TROMBECTOMIA POLMONARE, RISCALDAMENTO IN IPOTERMIA)
- RICHIEDE UN APPROCCIO SISTEMATICO INTRA ED AXTRAOSPEDALIERO E NOTEVOLI RISORSE

# TACHICARDIA





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NUOVE LINEE GUIDA 2021:  
RISPOSTE CRISTOPORANE  
POST-LOCKDOWN



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# RIASSUMENDO

ALS 2021

## 5 MESSAGGI PRINCIPALI



- 1.** Le priorità rimangono le compressioni toraciche di alta qualità con interruzioni minime, la defibrillazione precoce, e il trattamento delle cause reversibili
- 2.** Segni e sintomi premonitori spesso si manifestano prima di un arresto cardiaco intra- o extra-ospedaliero - l'arresto cardiaco è prevenibile in molti pazienti
- 3.** Utilizzare una gestione delle vie aeree di base o avanzata - l'intubazione tracheale dovrebbe essere utilizzata soltanto da soccorritori con un elevato successo nella manovra
- 4.** Somministrare precocemente l'adrenalina in caso di arresto cardiaco non defibrillabile
- 5.** Considerare, se fattibile, la RCP extracorporea (eRCP) come terapia di soccorso in pazienti selezionati nei quali l'ALS è stato infruttuoso



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POST-LOCKDOWN

# Italian Resuscitation Council

 [ircouncil.it](http://ircouncil.it)



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