

RCP nel lattante e nel bambino

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Arresto Cardiaco in età Pediatrica

	<1 anno	1 – 11 anni	>11 anni	bambini	adulti
N°	277 (44%)	154 (25%)	193 (31%)	624	25405
incidenza	0,73/1000	0,04/1000	0,06/1000	0,08/1000	1,26/1000

- **Raro:** 2% OOH – 2.3% IH di tutti gli arresti cardiaci
- Di origine non cardiaca nel **70%** dei casi (asfissia/shock)
- Ritmo più frequente : **Asistolia**
- Sopravvivenza **dal 4 al 18 %** senza esiti neurologici alla dimissione

Donoghue AJ - Ann Emerg Med 2005
Atkins DL - Circulation. 2009

Survival After Out-of-Hospital Cardiac Arrest in Children

Natalie Jayaram, MD, MSB; Bryan McNally, MD, MPH; Fengming Tang, MS; Paul S. Chan, MD, MSc

Table 4. Bystander CPR and AED Use by Age and Arrest Rhythm

	Bystander CPR	AED Use
Age		
0 to 1 year	177/427 (41.5%)	45/427 (10.5%)
2 to 7 years	384/952 (40.3%)	113/952 (11.9%)
8 to 12 years	110/276 (39.9%)	49/276 (17.8%)
13 to 17 years	144/323 (44.6%)	97/323 (30.0%)

J Am Heart Assoc. 2015



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European Resuscitation Council Guidelines for Resuscitation 2015 Section 6. Paediatric life support



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Antonio Rodríguez-Núñez^e, Thomas Rajka^f, Patrick Van de Voorde^g, David A. Zideman^h,
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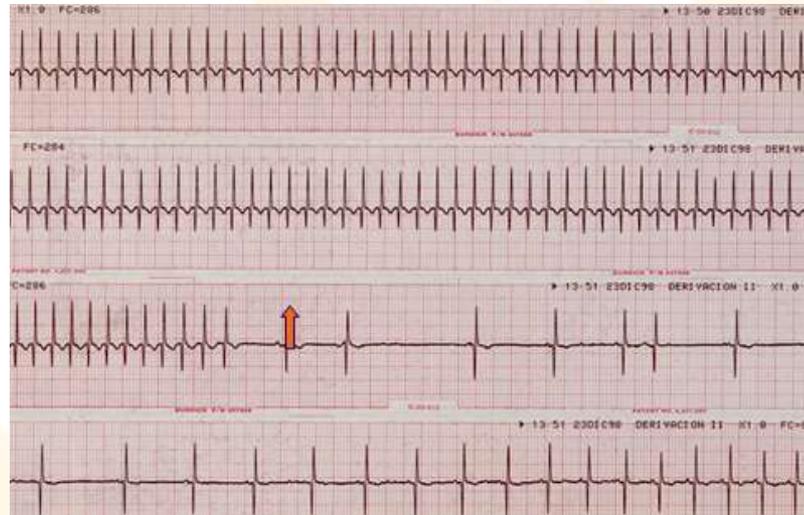
Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

- Gestione del bambino gravemente malato (periarresto)
- BLS Pediatrico
- Algoritmo dell'arresto cardiaco pediatrico
- Cure post-rianimazione (ROSC Pediatrico)

Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Gestione del bambino gravemente malato (periarresto)

- Per la **cardioversione di una TSV**, la dose iniziale di energia è stata modificata ad **un 1 J/kg** (LG 2010 – 0,5 -1 J/Kg)



Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Gestione del bambino gravemente malato (periarresto)

- Se **non** ci sono segni di **shock settico**, i bambini **con malattia febbrile** dovrebbero ricevere fluidi con cautela ed essere **rivalutati dopo la loro somministrazione**. In alcune forme di shock settico, la restrizione di fluidi con cristallodi isotonici è da preferirsi all'utilizzo abbondante di fluidi.

«che cavolo stai
dicendo Jan ...
(Maconochie)»



Fluids and drugs

When a child shows signs of circulatory failure caused by hypovolaemia, controlled volume administration is indicated.²³⁰ For children with febrile illness and not showing signs of circulatory failure, adopt a cautious approach to fluid therapy with frequent reassessment of the child.^{29,111–113} Isotonic crystalloids are recommended as the initial resuscitation fluid for infants and children with any type of circulatory failure.^{231,232} If there are signs that the systemic perfusion is inadequate, give a bolus of 20 ml kg^{-1} of an isotonic crystalloid even if the systemic blood pressure is normal. Following each bolus, re-assess the child's clinical state, using the ABCDE system of assessment, to decide whether a further bolus or other treatment is required (and how much and how fast). In some children, early inotropic or vasopressor support may be needed.^{108,233} In addition, owing to decreased/decreasing consciousness or progressive respiratory failure, some patients will need intubation and mechanical ventilation, so be prepared in case this occurs.

Part 6: Pediatric basic life support and pediatric advanced life support
2015 International Consensus on Cardiopulmonary Resuscitation and
Emergency Cardiovascular Care Science with Treatment
Recommendations^{☆,☆☆}

Fluid resuscitation in septic shock

Treatment recommendations

We suggest using an initial fluid bolus of 20 mL kg⁻¹ for infants and children with shock, with subsequent patient reassessment, for patients with the following disease states:

- Severe sepsis (weak recommendation, low quality).
- Severe malaria (weak recommendation, low quality).
- Dengue shock syndrome (weak recommendation, low quality).

We suggest against the routine use of bolus intravenous fluids (crystalloids or colloids) for infants and children with a “severe febrile illness” and who are not in shock (weak recommendation, low-quality evidence). Reassessment, regardless of therapy administered, should be emphasized so that deterioration is detected at an early stage.

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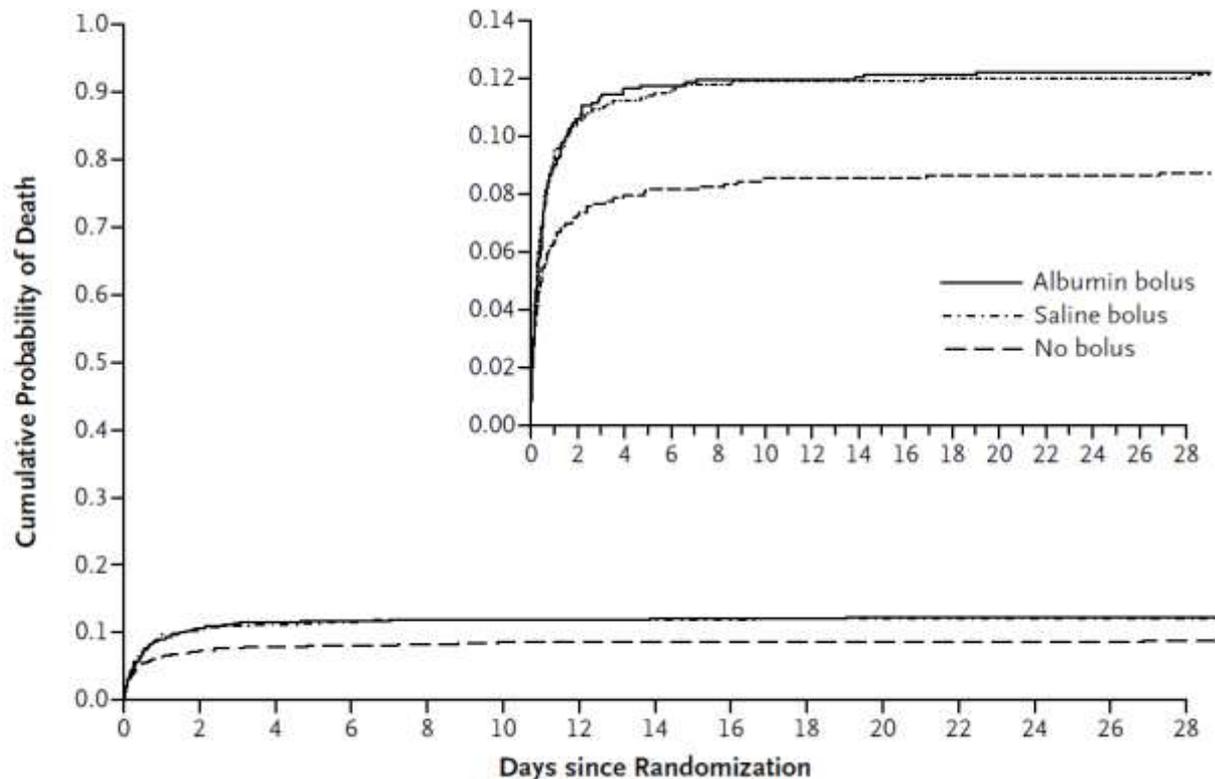
ESTABLISHED IN 1812

JUNE 30, 2011

VOL. 364 NO. 26

Mortality after Fluid Bolus in African Children with Severe Infection

Mortality at 4 Weeks



Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

BLS Pediatrico – Durata delle Ventilazioni

- La **durata della ventilazione** è di circa **1 sec**, sufficiente per vedere il torace espandersi, come nell'adulto,
- *(LG 2010 – 1 - 1,5 secondi, verificando l'espansione del torace).*
- **Evidenze:** Non ci sono nuove evidenze rispetto al 2010
- **Razionale:** coincide con la pratica sull'adulto

Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

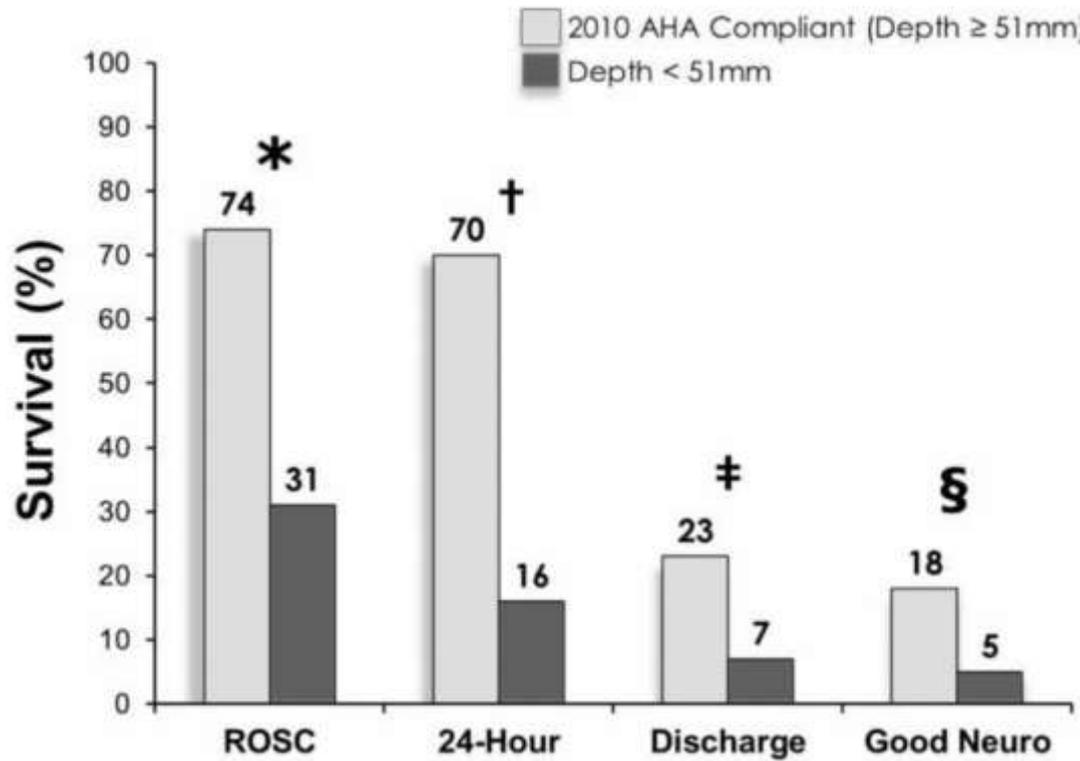
BLS Pediatrico – Profondità delle compressioni

- Per le compressioni toraciche, la porzione inferiore dello sterno dovrebbe abbassarsi:
 - di almeno **1/3 del diametro antero-posteriore del torace** o di **4 cm nel lattante**.
 - di almeno **1/3 del diametro antero-posteriore del torace** o di **5 cm nel bambino**.

(LG 2010 – Comprimere lo sterno per ridurre la profondità del torace approssimativamente di 1/3)

BLS Pediatrico – Profondità delle compressioni

Sutton RM et al – 2010 American Heart Association recommended compression depths during pediatric in-hospital resuscitations are associated with survival. **Resuscitation 2014**



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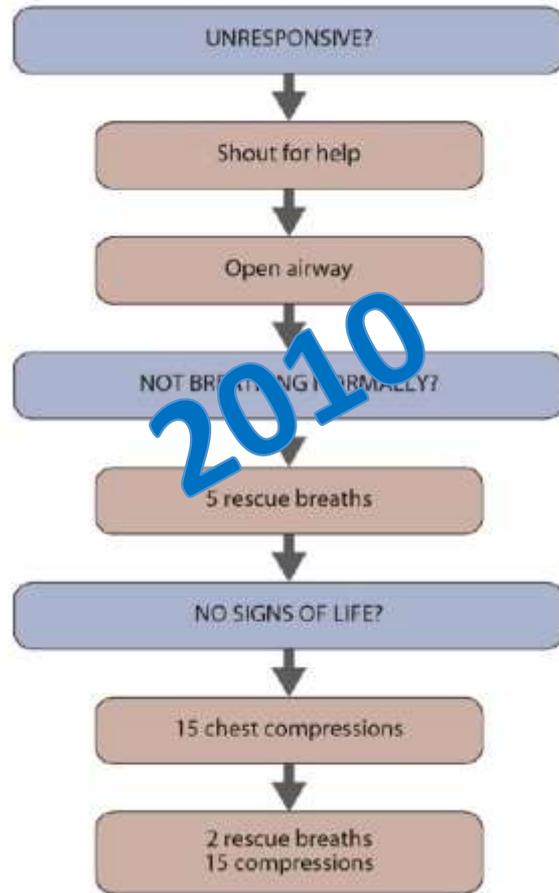
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Paediatric basic life support



Call cardiac arrest team or Paediatric ALS team

Paediatric basic life support



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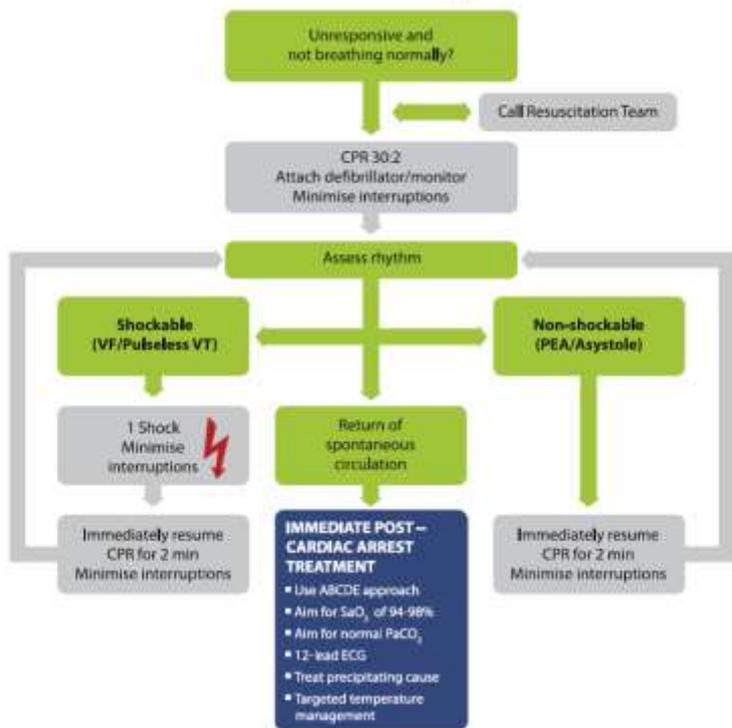
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Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Algoritmo dell'arresto cardiaco pediatrico

- Molti aspetti sono in comune con la pratica dell'adulto

Advanced Life Support



DURING CPR

- Ensure high-quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

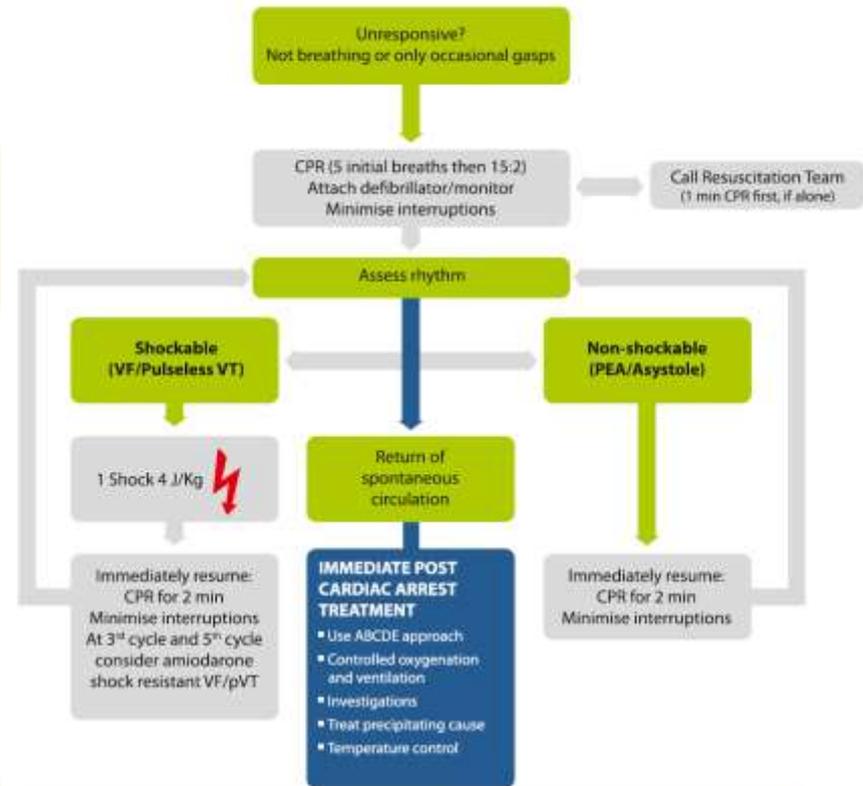
TREAT REVERSIBLE CAUSES

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

CONSIDER

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

Paediatric Advanced Life Support



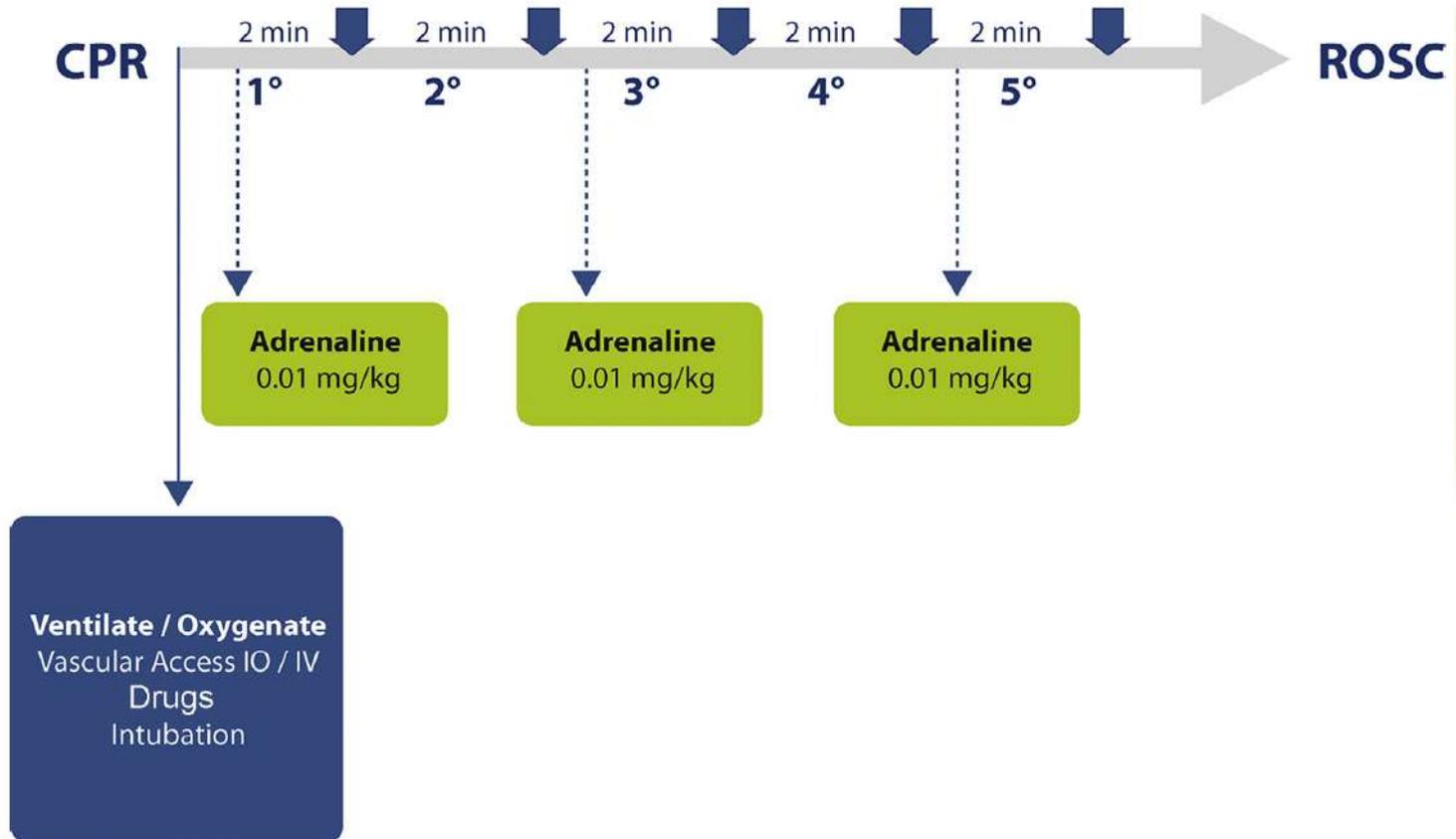
DURING CPR

- Ensure high-quality CPR: rate, depth, recoil
- Plan actions before interrupting CPR
- Give oxygen
- Vascular access (intravenous, intraosseous)
- Give adrenaline every 3-5 min
- Consider advanced airway and capnography
- Continuous chest compressions when advanced airway in place
- Correct reversible causes

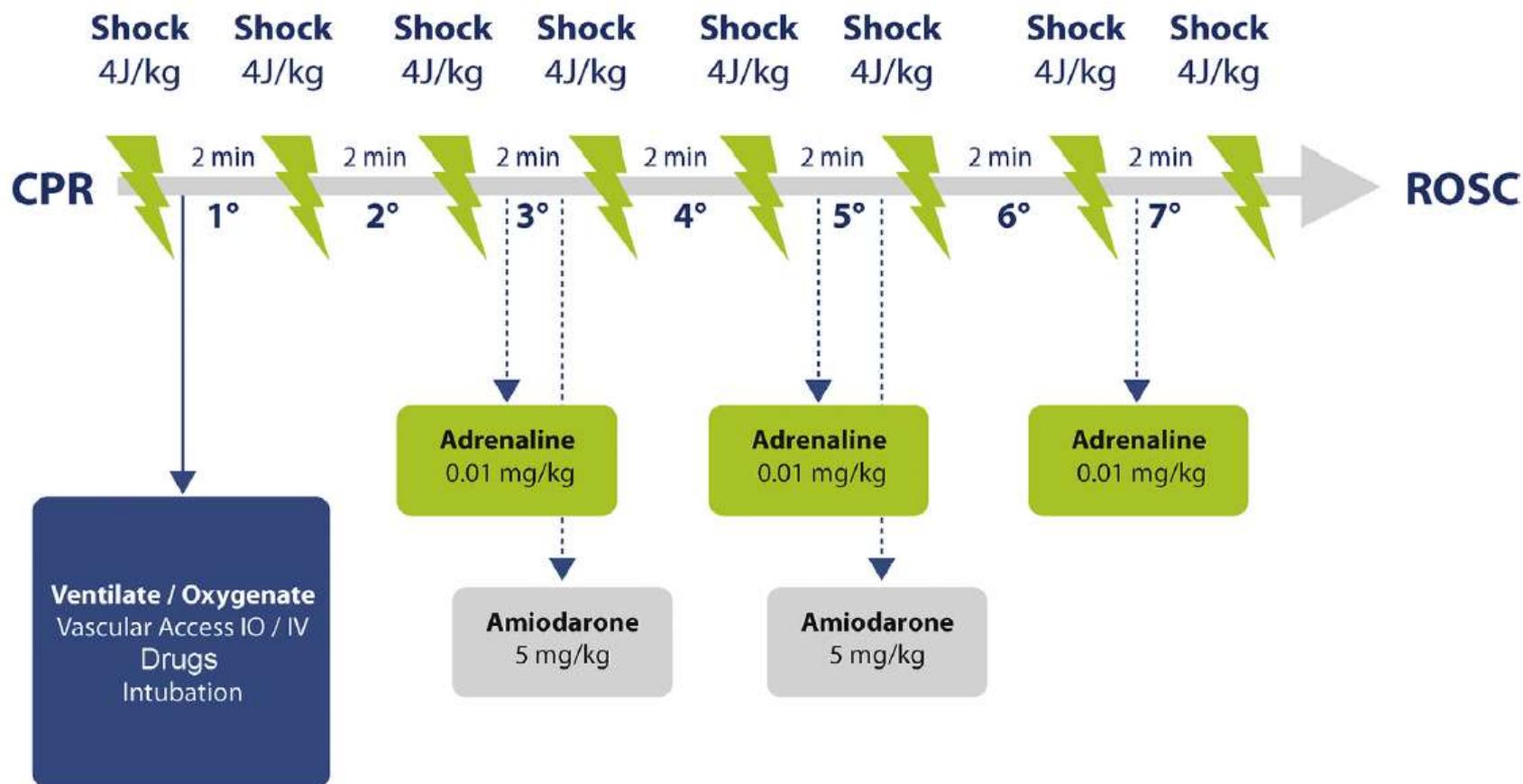
REVERSIBLE CAUSES

- Hypoxia
- Hypovolaemia
- Hyper/hypokalaemia, metabolic
- Hypothermia
- Thrombosis (coronary or pulmonary)
- Tension pneumothorax
- Tamponade (cardiac)
- Toxic/therapeutic disturbances

CARDIAC ARREST: NON SHOCKABLE RHYTHM



CARDIAC ARREST – SHOCKABLE RHYTHM



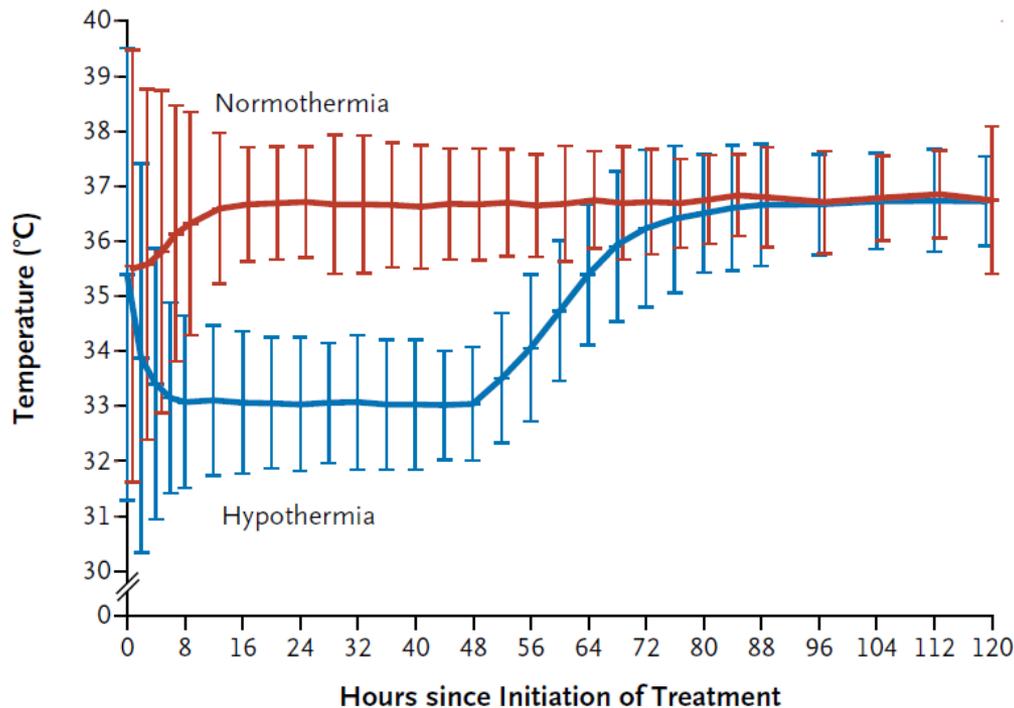
Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Cure post-rianimazione (ROSC Pediatrico)

- **Prevenire la febbre** nei bambini dopo il ROSC in ambiente **extraospedaliero**
- La gestione della temperatura corporea indicata nei bambini post ROSC dovrebbe **includere il trattamento con normotermia o lieve ipotermia.**
- Non esiste un singolo fattore predittivo sul momento in cui **sospendere la rianimazione.**

Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Cure post-rianimazione (ROSC Pediatrico)



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ORIGINAL ARTICLE

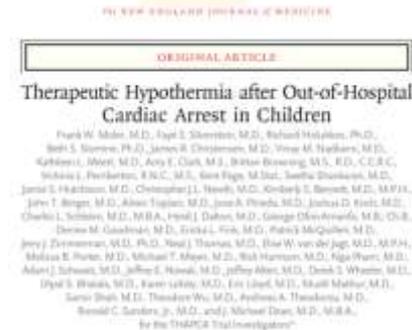
Therapeutic Hypothermia after Out-of-Hospital Cardiac Arrest in Children

Frank W. Moler, M.D., Faye S. Silverstein, M.D., Richard Holubkov, Ph.D.,
Beth S. Slomine, Ph.D., James R. Christensen, M.D., Vinay M. Nadkarni, M.D.,
Kathleen L. Meert, M.D., Amy E. Clark, M.S., Brittan Browning, M.S., R.D., C.C.R.C.,
Victoria L. Pemberton, R.N.C., M.S., Kent Page, M.Stat., Seetha Shankaran, M.D.,
Jamie S. Hutchison, M.D., Christopher J.L. Newth, M.D., Kimberly S. Bennett, M.D., M.P.H.,
John T. Berger, M.D., Alexis Topjian, M.D., Jose A. Pineda, M.D., Joshua D. Koch, M.D.,
Charles L. Schleien, M.D., M.B.A., Heidi J. Dalton, M.D., George Ofori-Amanfo, M.B., Ch.B.,
Denise M. Goodman, M.D., Ericka L. Fink, M.D., Patrick McQuillen, M.D.,
Jerry J. Zimmerman, M.D., Ph.D., Neal J. Thomas, M.D., Elise W. van der Jagt, M.D., M.P.H.,
Melissa B. Porter, M.D., Michael T. Meyer, M.D., Rick Harrison, M.D., Nga Pham, M.D.,
Adam J. Schwarz, M.D., Jeffrey E. Nowak, M.D., Jeffrey Altan, M.D., Derek S. Wheeler, M.D.,
Utpal S. Bhalala, M.D., Karen Lidsky, M.D., Eric Lloyd, M.D., Mudit Mathur, M.D.,
Samir Shah, M.D., Theodore Wu, M.D., Andreas A. Theodorou, M.D.,
Ronald C. Sanders, Jr., M.D., and J. Michael Dean, M.D., M.B.A.,
for the THAPCA Trial Investigators*

n engl j med 372;20 2015

RIASSUNTO DEI CAMBIAMENTI 2015 RISPETTO ALLE LINEE GUIDA ERC 2010

Cure post-rianimazione (ROSC Pediatrico)



	Hypothermia	Normothermia	
Alive at 1 yr	57/151 (38%)	39/136 (29%)	RD 9.1 OR 1.29 (0.93 to 1.79)
Good outcome	27/138 (20%)	15/122 (12%)	RD 7.3 OR 1.54 (0.86 to 2.76)

n engl j med 372;20 2015

Riassunto dei cambiamenti 2015 rispetto alle Linee Guida ERC 2010

Cure post-rianimazione (ROSC Pediatrico)

- E' possibile utilizzare una temperatura di **36 - 37.5° C** o di **32 – 34° C**
- La temperatura post ROSC nei bambini deve **essere rigorosamente controllata**



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Dominique Biarentⁱ, on behalf of the Paediatric life support section Collaborators¹

CAB
VS
ABC



CAB vs ABC



- **Very low quality evidence** dai 3 studi RCT
 - 2 studi su manichi adulti (Marsch 2013, Sekiguchi 2013)
 - 1 studio su manichino adulto (Lubrano 2012)
- Nessuno studio con dati clinico sull'uomo
- La sequenza ABC è diventata una procedura assodata e ben riconosciuta nella pratica della RCP pediatrica in Europa.
- Le precedenti linee guida 2010 sono state apprese da molte centinaia di migliaia di operatori sanitari e laici.

CAB vs ABC



Vantaggi di CAB

Tempo più breve per l'inizio delle CC
Da 18,0 a 24,3 sec per 1 soccorritore
9 sec per 2 soccorritori

Semplifica l'insegnamento per il provider del BLS adulto



Vantaggi di ABC

Tempo più breve per l'inizio delle prime ventilazioni (da 5,7 a 6,0 sec)

La causa asfittica è preponderante nell'arresto cardiaco pediatrico





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30:2

vs

15:2



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Sequenza delle azioni nel BLS Pediatrico

Bystander CPR is associated with a better neurological outcome in adults and children.²²⁻²⁶

Rescuers who have been taught adult BLS or the chest compression-only sequence and have no specific knowledge of paediatric resuscitation may use this, as the outcome is worse if they do nothing. However, it is better to provide rescue breaths as part of the resuscitation sequence when applied to children as the asphyxial nature of most paediatric cardiac arrests necessitates ventilation as part of effective CPR.^{25,26}



Conventional and chest-compression-only cardiopulmonary resuscitation by bystanders for children who have out-of-hospital cardiac arrests: a prospective, nationwide, population-based cohort study.

In children aged 1–17 years who had arrests of **non-cardiac causes**, favourable neurological outcome was more common after

- Bystander CPR than no CPR (**5.1%** [51/1004] vs **1.5%** [20/1293]; OR 4.17, 2.37–7.32).
- Conventional CPR produced more favourable neurological outcome than did compression-only CPR (**7.2%** [45/624] vs **1.6%** [six of 380]; OR 5.54, 2.52–16.99).

In children aged 1–17 years who had arrests of **cardiac causes**, favourable neurological outcome was more common after

- bystander CPR than no CPR (**9.5%** [42/440] vs **4.1%** [14/339]; OR 2.21, 1.08–4.54),
- **did not differ** between conventional and compression-only CPR (**9.9%** [28/282] vs **8.9%** [14/158]; OR 1.20, 0.55–2.66).

Kitamura T et al - Lancet. 2010 Apr

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Sequenza delle azioni nel BLS Pediatrico

Non-specialists who wish to learn paediatric resuscitation because they have responsibility for children (e.g. teachers, school nurses, lifeguards), should be taught that **it is preferable to modify adult BLS and perform five initial breaths** followed by one minute of CPR before they go for help (see adult BLS guidelines).



Conclusioni

Linee Guida ERC 2015

- **Non ci sono cambiamenti significativi rispetto alle precedenti**
- **Alcune raccomandazioni sono state rinforzate**
- **La Formazione beneficerà della continuità del messaggio**

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Grazie per l'attenzione



«Il bambino non è un piccolo adulto...»

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 @marcodelucadoc



«..e a volte è anche migliore...»