

# IRC 2021

CONGRESSO  
NAZIONALE

16•17•18 DICEMBRE

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



Italian  
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# ARRESTO CARDIACO IPOTERMICO

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# ARRESTO CARDIACO IPOTERMICO



# Arresto Cardiaco Ipotermico: Perché?

- **Prognosi Favorevole**

- **Modifiche Algoritmo**
- **Specificità Trattamento:**

- **Manovre Prolungate**

- **Supporto Circolatorio Invasivo**



Rimini  
**IRC 2021**  
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RISPOSTE CARTELLONARIE  
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**Nessuno è morto,  
finché non è caldo e morto**



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# Fisiopatologia

TC centrale  $< 35^{\circ}\text{C}$

## Classificazione

- *Lieve:*  $32-35^{\circ}\text{C}$
- *Moderata:*  $28-32^{\circ}\text{C}$
- *Grave:*  $< 28^{\circ}\text{C}$

**Compenso inefficace  $< 30^{\circ}\text{C}$**

# Fisiopatologia



**Lieve (Stadio I)** – cosciente con brivido (32 to 35°C)

**Moderato (Stadio II)** – alterazione coscienza, no brivido (28 to 32°C)

**Grave (Stadio III)** – Incosciente (24 to 28°C)

**Molto Grave (Stadio IV)** – Morte **apparente** (13.7 to 24°)

**Morte (Stadio V)** – ipotermia irreversibile (<9 to 13.7°C)

**Si può trattare un arresto ipotermico,  
ma non si può rianimare un corpo  
«congelato»...**

# Fisiopatologia

**DO2**

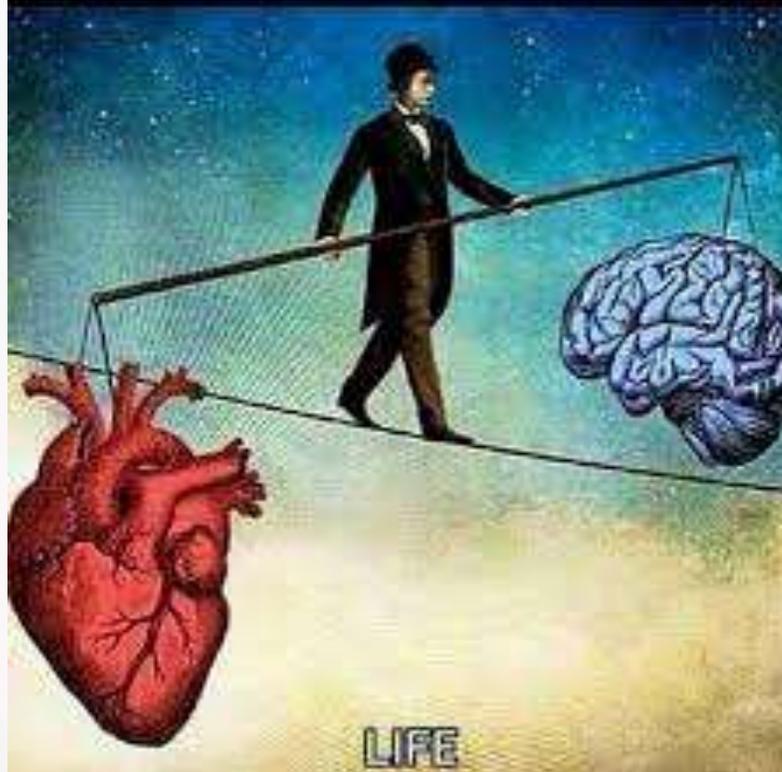
Shift curva  
dissociazione Hb

Vasocostrizione  
periferica

Aumento viscosità  
ematica

Mismatch V/Q

Ridotta contrattilità  
cardiaca



Riduzione metabolismo  
cerebrale

28°C: **50%**  
22°C: **25%**

# EPIDEMIOLOGIA



# DIAGNOSI

## *Principi Generali*

- Controllo del polso
- Temperatura centrale
- Storia clinica e Informazioni collaterali



# DIAGNOSI

*Controllo Polso*

**1'**

***Se in dubbio,  
iniziare la rianimazione  
cardio polmonare***

*Temperatura Centrale*



# DIAGNOSI

*Dove, quando, come e... chi?*

**”Sei morto, solo quando sei  
freddo perchè sei morto”**

- *Dove?*
- *Quando?*
  - Temperatura ambientale
  - Umidità
- *Chi?*



# DIAGNOSI

## *Indagini strumentali*

- Glucosio

- Insulino-resistenza

- **Potassio**

- Ipokaliemia

- **Iperkaliemia**

- Coagulopatia

- Trombocitopenia

- Aumento ematocrito

# TRATTAMENTO

## *Principi Generali*

### Compressioni Toraciche

- RCP intermittente
- Massaggiatori Automatici Esterni

### Farmaci

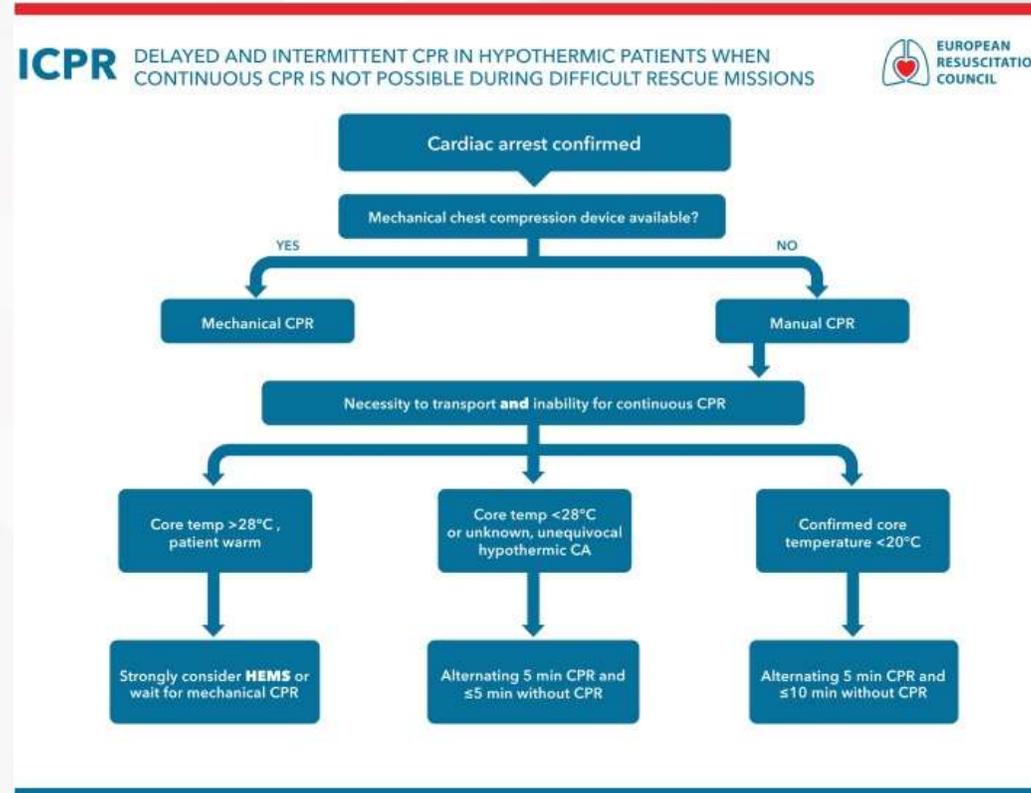
- TC < 30°: **MAI**
- 30-35°C: **ogni 6'- 10'**

### Defibrillazione

- Ritmo defibrillabile: **SHOCK x 3**
- Se inefficace: **> 30°C**

# TRATTAMENTO

## RCP intermittente



# TRATTAMENTO

## Riscaldamento

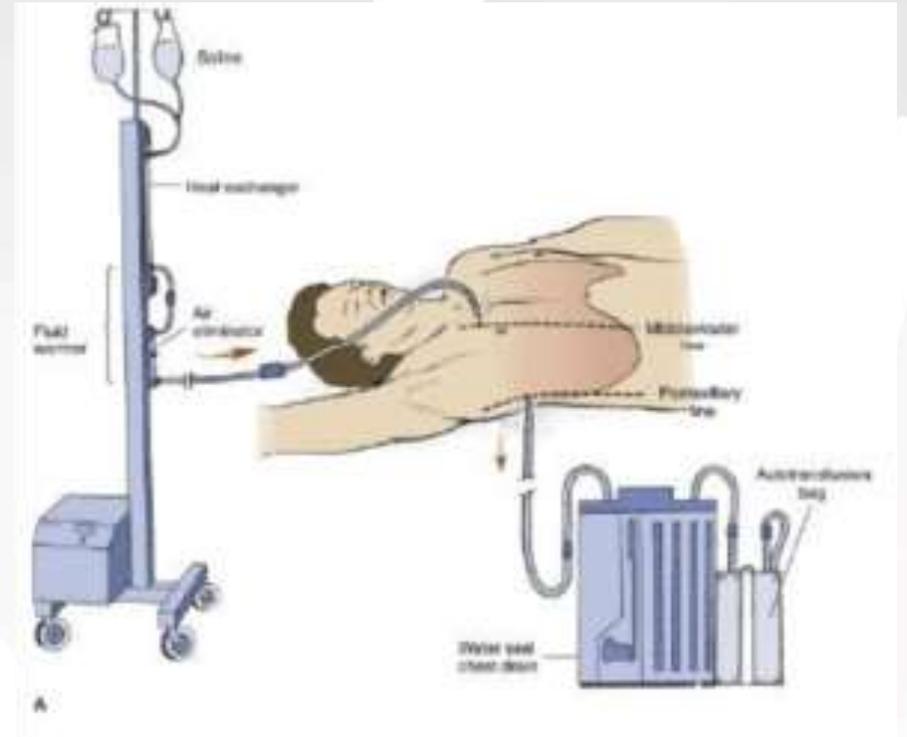
ESTERNO				INTERNO		EXTRACORPOREO	
PASSIVO		ATTIVO					
Coperte	+ 0.5°/h	Bair Hugger	1-2°/h	O2 umidificato caldo	0.5-1°C/min	ECMO	7-10°C/h
		Immersione acqua calda	2-4°C/h	Fluidi endovenosi caldi			
				Lavaggio pleurico, peritoneale			
				Dialisi peritoneale			

# TRATTAMENTO

*Riscaldamento Esterno Attivo*

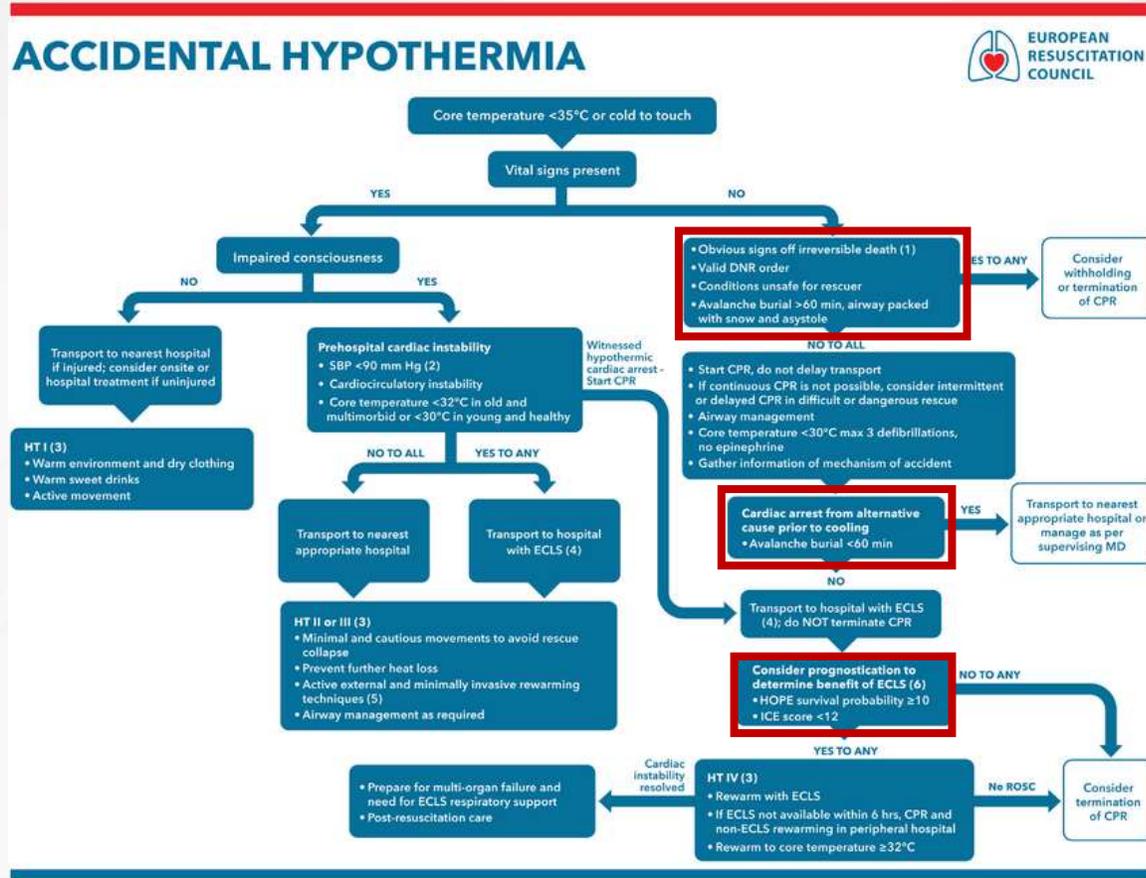


*Riscaldamento Interno Attivo*



# TRATTAMENTO

## Riscaldamento Extracorporeo



# PROGNOSI

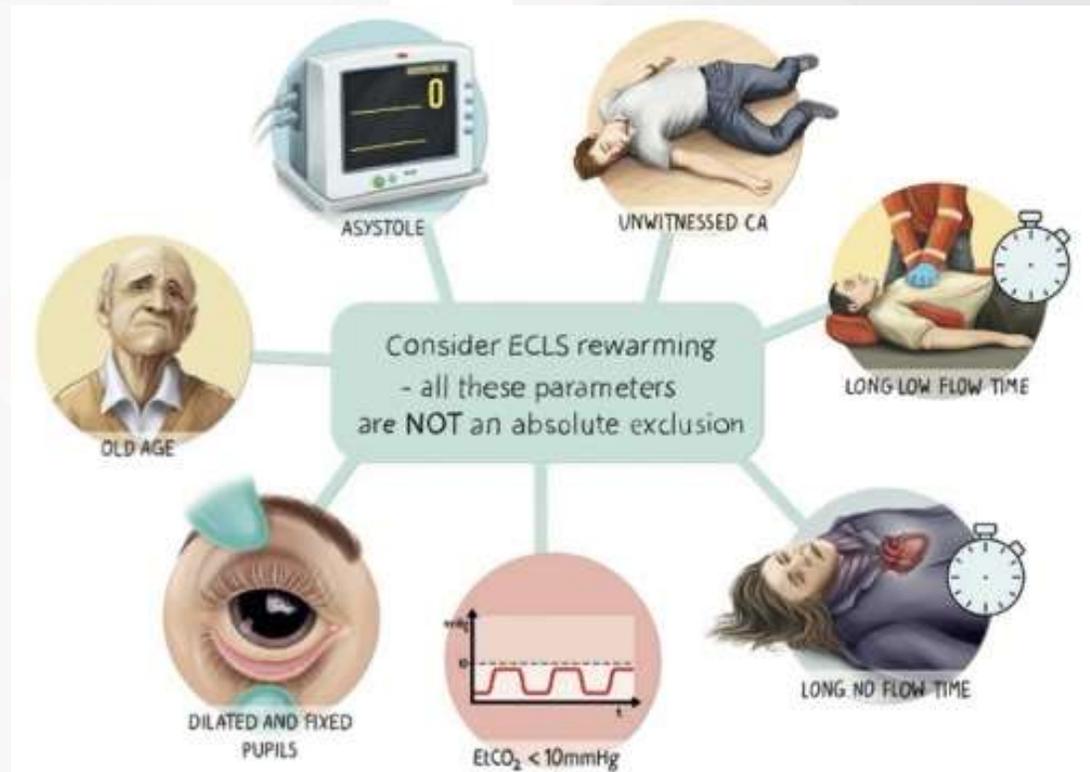
## *Fattori Prognostici Tradizionali*

- **Lesioni incompatibili con la vita**
  - Incomprimibilità del torace
  - Seppellimento in valanga > 60 min
    - + Asfissia
    - + Asistolia

- ~~Iper K+ gave (> 10 mmol/L)~~
- ~~Trauma grave~~
- ~~Fallimento nel riscaldamento~~

# PROGNOSI

## Fattori Prognostici Tradizionali



# PROGNOSI

## HOPE: Hypothermia Outcome Prediction after ECLS

- Età
- Sesso
- Causa ipotermia
  - Asfissia
  - Immersione
- Durata rianimazione
- Temperatura

Estimates are desirable if variables are not known (e.g. age, CPR duration and temperature).

Age (in years)

Sex  Male  Female

Hypothermia  with asphyxia (head fully covered by water or snow) AND in cardiac arrest at extrication  
 without asphyxia (immersion, outdoor or indoor cold exposure)

CPR duration (min)

Serum Potassium (mmol/L)

Temperature scale  Celsius  Fahrenheit

Temperature

If you are using the HOPE survival probabilities to guide your decision about a real case, we would appreciate if you could give us your email address. We may contact you for additional information, specifically if ECLS was provided, and whether the patient survived or not.

Validate / submit

# PROGNOSI

## *Vecchie controindicazioni, nuove indicazioni*

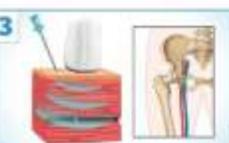
### Controindicazioni NON assolute:

- Singolo valore di K<sup>+</sup>
  - Prelievo Eco-guidata
- Tradizionali controindicazioni
- Trauma cranico:
  - ECMO anticoagulazione sistemica

ASAIO Journal 2021 Review Article

### Extracorporeal Life Support in Accidental Hypothermia with Cardiac Arrest—A Narrative Review

JUSTYNA SWIDA<sup>1</sup>,\* TOMASZ DARDUCHA<sup>2</sup>,† PETER PAAL<sup>3</sup>,‡ HERMANN BRUGGER<sup>4</sup>,§ PAWEŁ PODSIADŁO<sup>5</sup>,¶ SYLWIA KOSIŃSKI<sup>6</sup>,|| MATEJUSZ PUŚLECKI<sup>7</sup>,#\*\* MARCIN LIGONSKI<sup>8</sup>,\*\* AND MATHIEU PASQUIER<sup>9</sup>,††

<p><b>1</b></p>  <p>Continue CPR</p>	<p><b>4</b></p>  <p>Use the HOPE estimated survival probability to assess indication for ECLS rewarming</p> <p><a href="http://www.hopeforlife.org">www.hopeforlife.org</a></p>
<p><b>2</b></p>  <p>Measure core temperature (usually esophageally)</p>	<p>The clinical factors usually considered as contraindications for ECPR in normothermic CA (asystole, unwitnessed CA, unknown no-flow duration, prolonged CPR duration, advanced age) ARE NOT a contraindication for ECLS rewarming in AHCA patients. Blood sampling should avoid hemolysis, and minimize trauma to femoral vessels.</p> <p>Inclusion criteria for ECLS rewarming should not be based on a single potassium level. Extreme serum potassium levels are possible. A second blood sample obtained at a different site and verifying measurement may be reasonable.</p> <p>If some variables of the HOPE score are not clear (e.g., the presence or absence of asphyxia), taking into account the variable that will lead to the highest survival probabilities when calculating the HOPE score will offer the best chances of survival to the patient.</p> <p>Concomitant trauma, especially traumatic brain injury is not an absolute contraindication for ECLS rewarming. Anticoagulation free ECLS run is possible<sup>24</sup>.</p>
<p><b>3</b></p>  <p>Measure potassium</p> <p><small>Blood sample should be obtained by ultrasound-guided puncture to open structure of the femoral vessels. CPR may be temporarily stopped. Blood sampling should avoid hemolysis, and minimize trauma to femoral vessels.</small></p>	

# Take Home Messages

- Necessarie **modifiche ALS** and BLS
- Identificare **segni di circolo** può essere difficile: se in dubbio, inizia RCP
- Misura accurata della **temperatura interna** è fondamentale
- Non somministrare **farmaci** se  $T < 30^{\circ}$
- **Defibrillazione** meno efficace, massimo 3 shock se  $T < 30^{\circ}$
- Metodo di riscaldamento più efficace è **ECLS**
- **Prognosi migliore** di altri arresti non traumatici

# Domande



# Ringraziamenti

Grazie!

# Bibliografia

- [ERC Guidelines 2021](#): Section 4. Cardiac arrest in special circumstances
- <https://www.rcemlearning.co.uk/reference/cardiac-arrest-in-special-circumstances-hypothermic-cardiac-arrest>
- Gilbert M, Busund R, Skagseth P, et al. Resuscitation from accidental hypothermia of 13.7 C with circulatory arrest. Lancet 2000;355:375-37.6
- Pasquier M, et al. Hypothermic Outcome prediction after Extracorporeal Life Support for hypothermic cardiac arrest patients: the HOPE score
- Swole J, et al. Extracorporeal Life Support in Accidental Hypothermia with Cardiac Arrest: a narrative review. ASAIO J 2021.



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