Massaggiatori meccanici ed RCP sul territorio: c'è ancora un ruolo?

dott.ssa Federica Stella

C.O.P. SUEM 118 Mestre-Venezia, Azienda ULSS 12 Veneziana

Napoli, 20 novembre 2016, X congresso nazionale SIMEU

da circa 10 anni i massaggiatori cardiaci esterni sono disponibili per il supporto alla RCP in ambito preospedaliero

1– dispositivi a pompa (LUCAS)

2– dispositivi a fascia (AutoPulse)

da circa 10 anni i massaggiatori cardiaci esterni sono disponibili per il supporto alla RCP in ambito preospedaliero

Treatment of out-of-hospital cardiac arrest with LUCAS, a new device for automatic mechanical compression and active decompression resuscitation☆

Stig Steen [a,*], Trygve Sjöberg [a], Paul Olsson [a], Marie Young [b]

[a] *Department of Cardiothoracic Surgery, Heart Lung Division, University Hospital of Lund, SE-221 85 Lund, Sweden*
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Resuscitation 67 (2005) 25–30

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Treatment of out

a ne

Clinical paper

Comparison of team-focused CPR vs standard CPR in resuscitation from out-of-hospital cardiac arrest: Results from a statewide quality improvement initiative☆

David A. Pearson[a,*], R. Darrell Nelson[b], Lisa Monk[c], Clark
Christopher B. Granger[c], Claire Corbett[d], Lee Garvey[a], Mi

[a] Depa

Manual Cardiopulmonary Resuscitation Versus CPR Including a Mechanical Chest Compression Device in Out-of-Hospital Cardiac Arrest: A Comprehensive Meta-analysis From d and Observational Studies

; MD, PhD; Eliano P. Navarese, MD, PhD; Dominique V. M. Verhaert, BSc;

Clinical paper

CPR-related injuries after manual or mechanical chest compressions with the LUCAS™ device: A multicentre study of victims after unsuccessful resuscitation☆

D. Smekal[a,*], E. Lindgren[a], H. Sandler[b,c], J. Johansson[a], S. Rubertsson[a]

Review: Mechanical and manual CPR do not differ for survival or neurologic

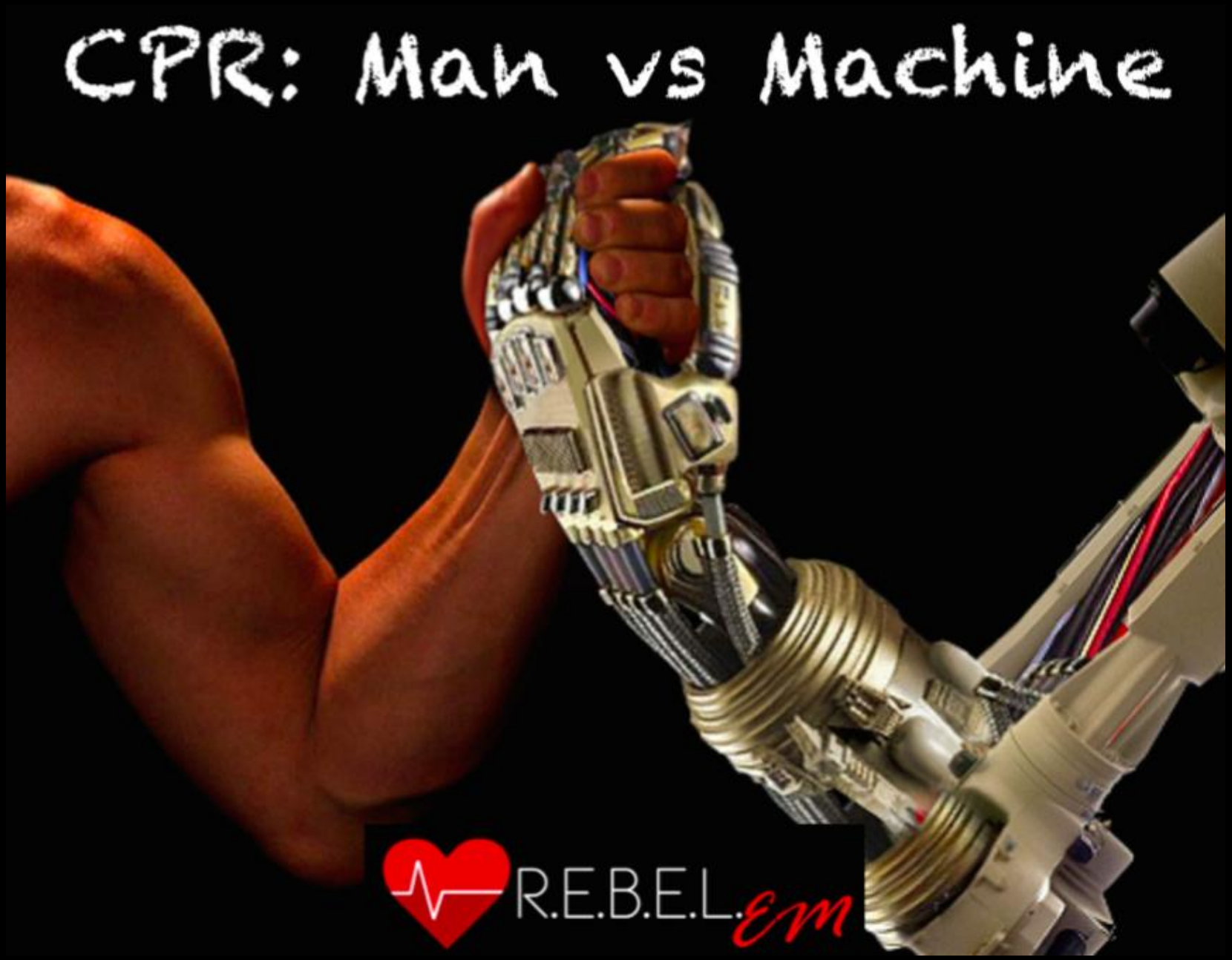
Bonnes JL, Brouwer MA, Navarese EP, et al. ***Manual cardiopulmonary resuscitation versus CPR including a mechanical chest compression device in out-of-hospital cardiac arrest: a comprehensive randomized and observational studies.*** *Ann 7:349-60.*

Original Contribution

Quality between mechanical compression on reducible stretcher versus manual compression on standard stretcher in small elevator☆

Tae Han Kim, MD[a], Ki Jeong Hong, MD[b,*], Sang Do Shin, MD, PhD[c], Chu Hyun Kim, MD[d], Sung Wook Song, MD[e], Kyoung Jun Song, MD, PhD[c], Young Sun Ro, MD, DrPH[f], Ki Ok Ahn, MD, PhD[f], Dayea Beatrice Jang, MPH[f]

sitivi a fascia (AutoPulse)


CPR: Man vs Machine
R.E.B.E.L.EM

… in linea teorica con i massaggiatori meccanici si ottiene

- **Garanzia di profondità e frequenza standardizzate**
- **Livello costante della qualità non vincolata alla stanchezza degli operatori**

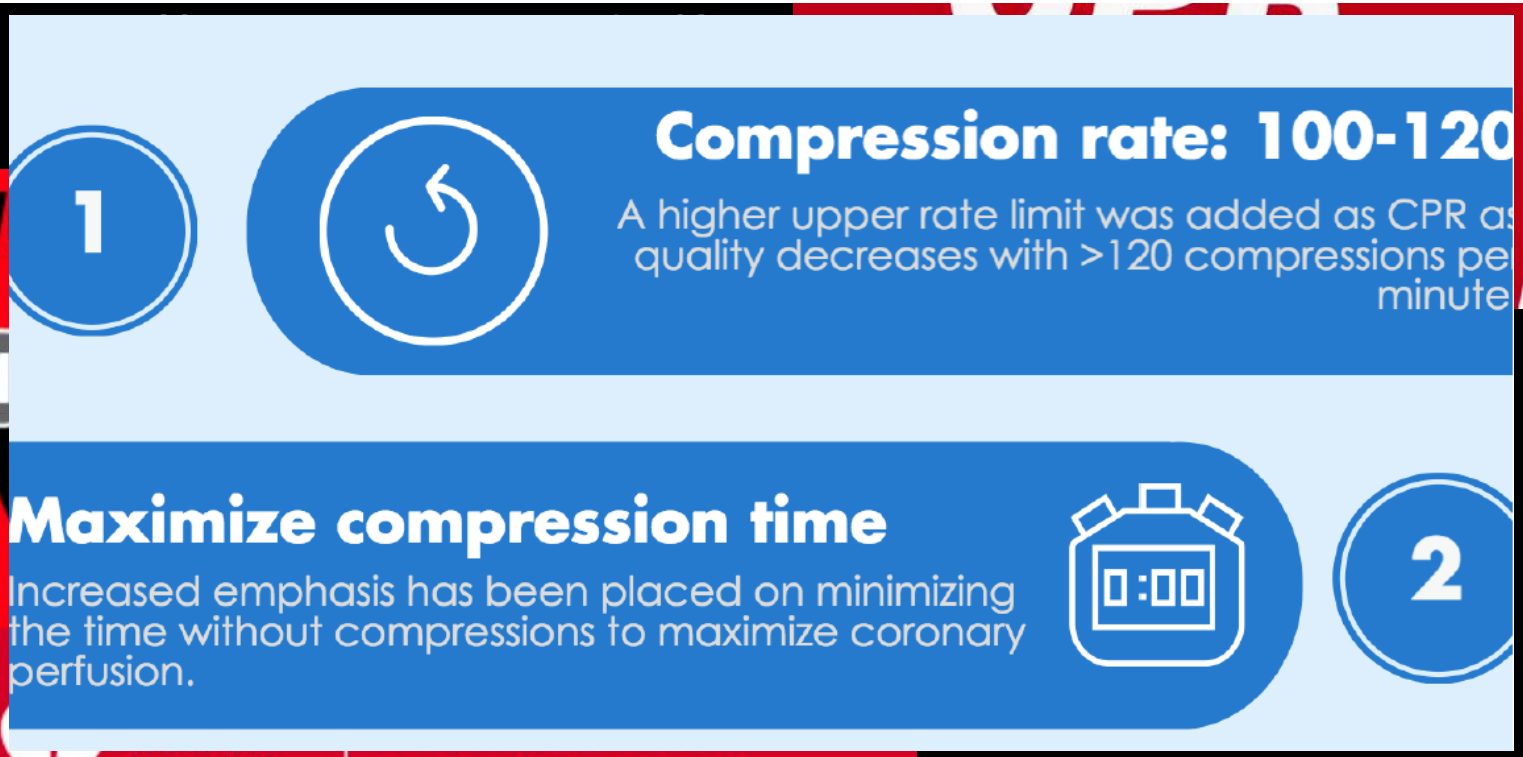
… in linea teorica con i massaggiatori meccanici si ottiene

- **Garanzia di profondità [illegible] standardizzate**
- **Livello costante della [illegible] alla stanchezza degli o[illegible]**

… in linea teorica con i massaggiatori meccanici si ottiene

Part 7: Adult Advanced Cardiovascular Life Support

2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

- 

… in linea teorica con i massaggiatori meccanici si ottiene

- **Garanzia di profondità e frequenza standardizzate**
- **Livello costante della qualità non vincolata alla stanchezza degli operatori**

→ dovrebbe essere dimostrabile migliore sopravvivenza e migliore outcome neurologico

… quindi ..? RCP meccanica?

Review article

Mechanical chest compression for out of hospital cardiac arrest: Systematic review and meta-analysis☆

Simon Gates[a,*], Tom Quinn[b,g], Charles D. Deakin[c,d], Laura Blair[e], Keith Couper[a,f], Gavin D. Perkins[a]

A B S T R A C T

Aim: To summarise the evidence from randomised controlled trials of mechanical chest compression devices used during resuscitation after out of hospital cardiac arrest.

Methods: Systematic review of studies evaluating the effectiveness of mechanical chest compression. We included randomised controlled trials or cluster randomised trials that compared mechanical chest compression (using any device) with manual chest compression for adult patients following out-of-hospital cardiac arrest. Outcome measures were return of spontaneous circulation, survival of event, overall survival, survival with good neurological outcome. Results were combined using random-effects meta-analysis.

Data sources: Studies were identified by searches of electronic databases, reference lists of other studies and review articles.

Results: Five trials were included, of which three evaluated the LUCAS or LUCAS-2 device and two evaluated the AutoPulse device. The results did not show an advantage to the use of mechanical chest compression devices for survival to discharge/30 days (average OR 0.89, 95% CI 0.77, 1.02) and survival with good neurological outcome (average OR 0.76, 95% CI 0.53, 1.11).

Conclusions: Existing studies do not suggest that mechanical chest compression devices are superior to manual chest compression, when used during resuscitation after out of hospital cardiac arrest.

Resuscitation 94 (2015) 91–97

Mechanical chest compression
Systematic review and meta-ar

Simon Gates [a,*], Tom Quinn [b,g], Charles I
Gavin D. Perkins [a]

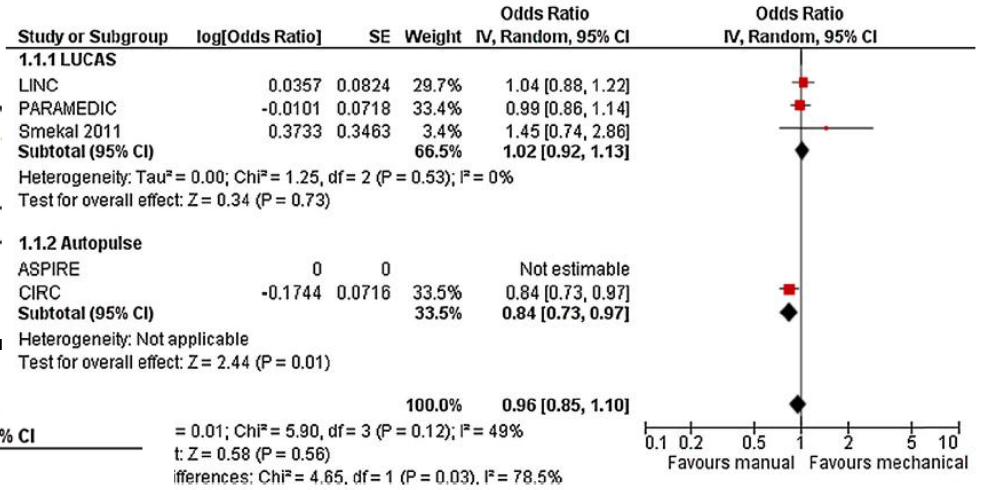


Fig. 2. Return of spontaneous circulation.

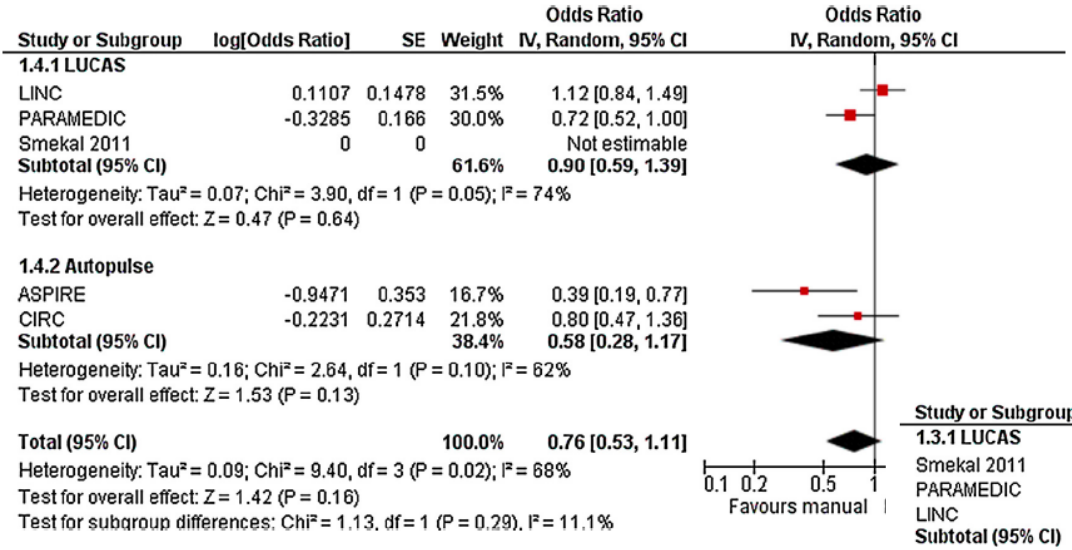


Fig. 5. Survival with CPC 1–2 or mRS 0–3.

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compression devices for survival to discharge/3
with good neurological outcome (average OR 0.
Conclusions: Existing studies do not suggest tha
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spontaneous circulation, survival of event,

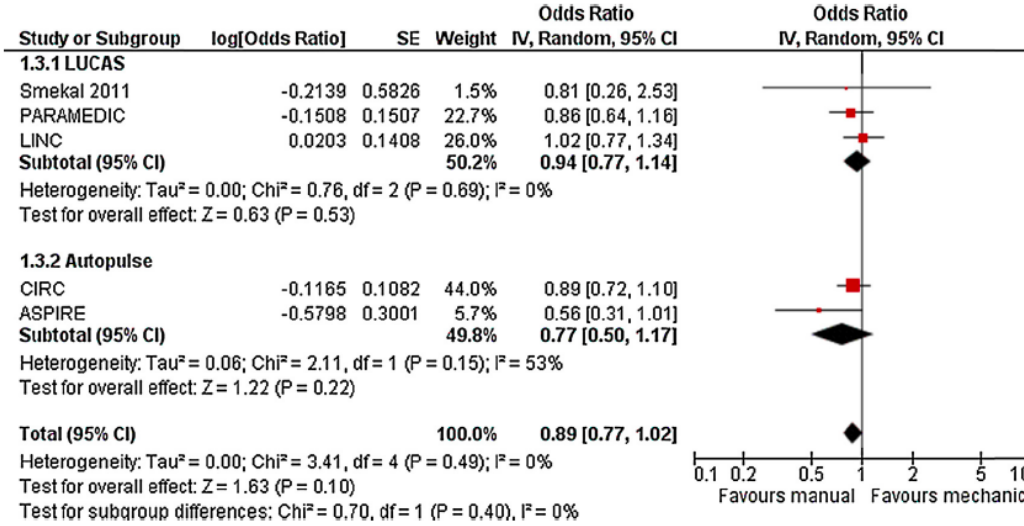

Fig. 4. Survival to discharge from hospital or 30 days.

Manual Cardiopulmonary Resuscitation Versus CPR Including a Mechanical Chest Compression Device in Out-of-Hospital Cardiac Arrest: A Comprehensive Meta-analysis From Randomized and Observational Studies

Judith L. Bonnes, MD*; Marc A. Brouwer, MD, PhD; Eliano P. Navarese, MD, PhD; Dominique V. M. Verhaert, BSc; Freek W. A. Verheugt, MD, PhD; Joep L. R. M. Smeets, MD, PhD; Menko-Jan de Boer, MD, PhD

Study objective: Mechanical chest compression devices have been developed to facilitate continuous delivery of high-quality cardiopulmonary resuscitation (CPR). Despite promising hemodynamic data, evidence on clinical outcomes remains inconclusive. With the completion of 3 randomized controlled trials, we conduct a meta-analysis on the effect of in-field mechanical versus manual CPR on clinical outcomes after out-of-hospital cardiac arrest.

Methods: With a systematic search (PubMed, Web of Science, EMBASE, and the Cochrane Libraries), we identified all eligible studies (randomized controlled trials and nonrandomized studies) that compared a CPR strategy including an automated mechanical chest compression device with a strategy of manual CPR only. Outcome variables were survival to hospital admission, survival to discharge, and favorable neurologic outcome.

Results: Twenty studies (n=21,363) were analyzed: 5 randomized controlled trials and 15 nonrandomized studies, pooled separately. For survival to admission, the pooled estimate of the randomized controlled trials did not indicate a difference (odds ratio 0.94; 95% confidence interval 0.84 to 1.05; P=.24) between mechanical and manual CPR. In contrast, meta-analysis of nonrandomized studies demonstrated a benefit in favor of mechanical CPR (odds ratio 1.42; 95% confidence interval 1.21 to 1.67; P<.001). No interaction was found between the endorsed CPR guidelines (2000 versus 2005) and the CPR strategy (P=.27). Survival to discharge and neurologic outcome did not differ between strategies.

Conclusion: Although there are lower-quality, observational data that suggest that mechanical CPR used at the rescuer's discretion could improve survival to hospital admission, the cumulative high-quality randomized evidence does not support a routine strategy of mechanical CPR to improve survival or neurologic outcome. These findings are irrespective of the endorsed CPR guidelines during the study periods. [Ann Emerg Med. 2016;67:349-360.]

Manual Cardiopulmonary Resuscitation Versus CPR Including a Mechanical Chest Compression Device in Out-of-Hospital Cardiac Arrest: A Comprehensive Meta-analysis From Randomized and O[illegible]

Judith L. Bonnes, MD*; Marc A. Brouwer, MD, PhD; Elian
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Study objective: Mechanical chest compression devices
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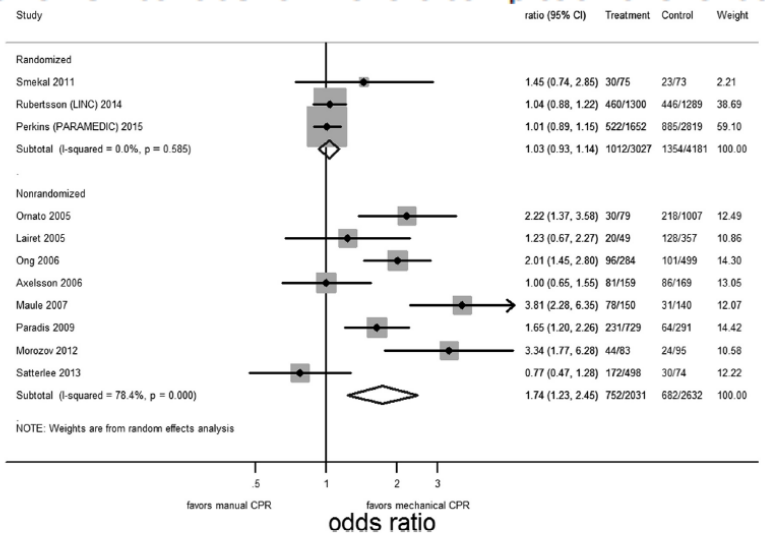

Figure 4. Individual study and pooled estimates for out-of-hospital return of spontaneous circulation for patients who received mechanical versus manual CPR.

Conclusion: Although there are lower-quality, observatior
rescuer's discretion could improve survival to hospital ac
does not support a routine strategy of mechanical CPR t
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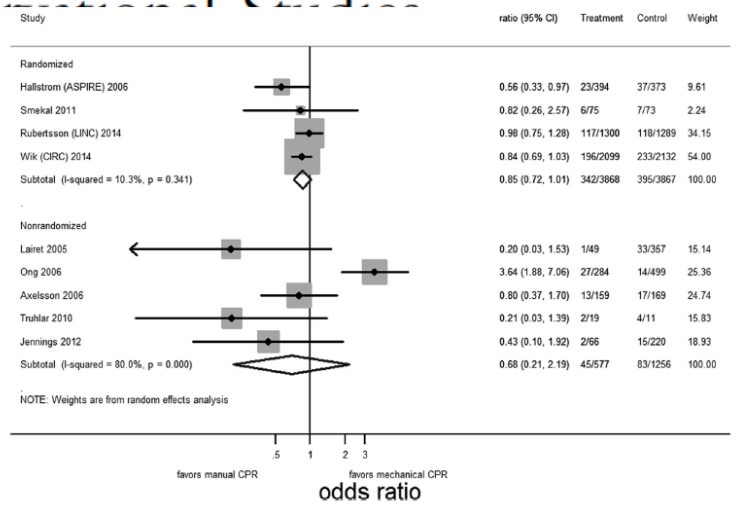


Figure 5. Individual study and pooled estimates for survival to hospital discharge for patients who received mechanical versus manual CPR.

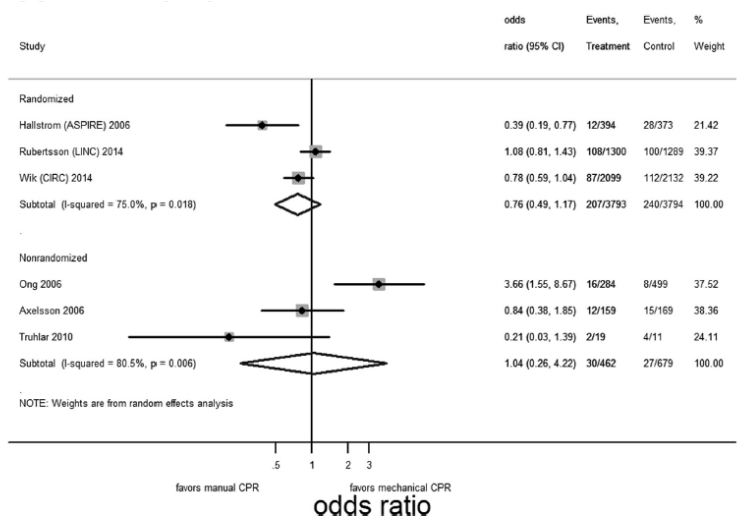
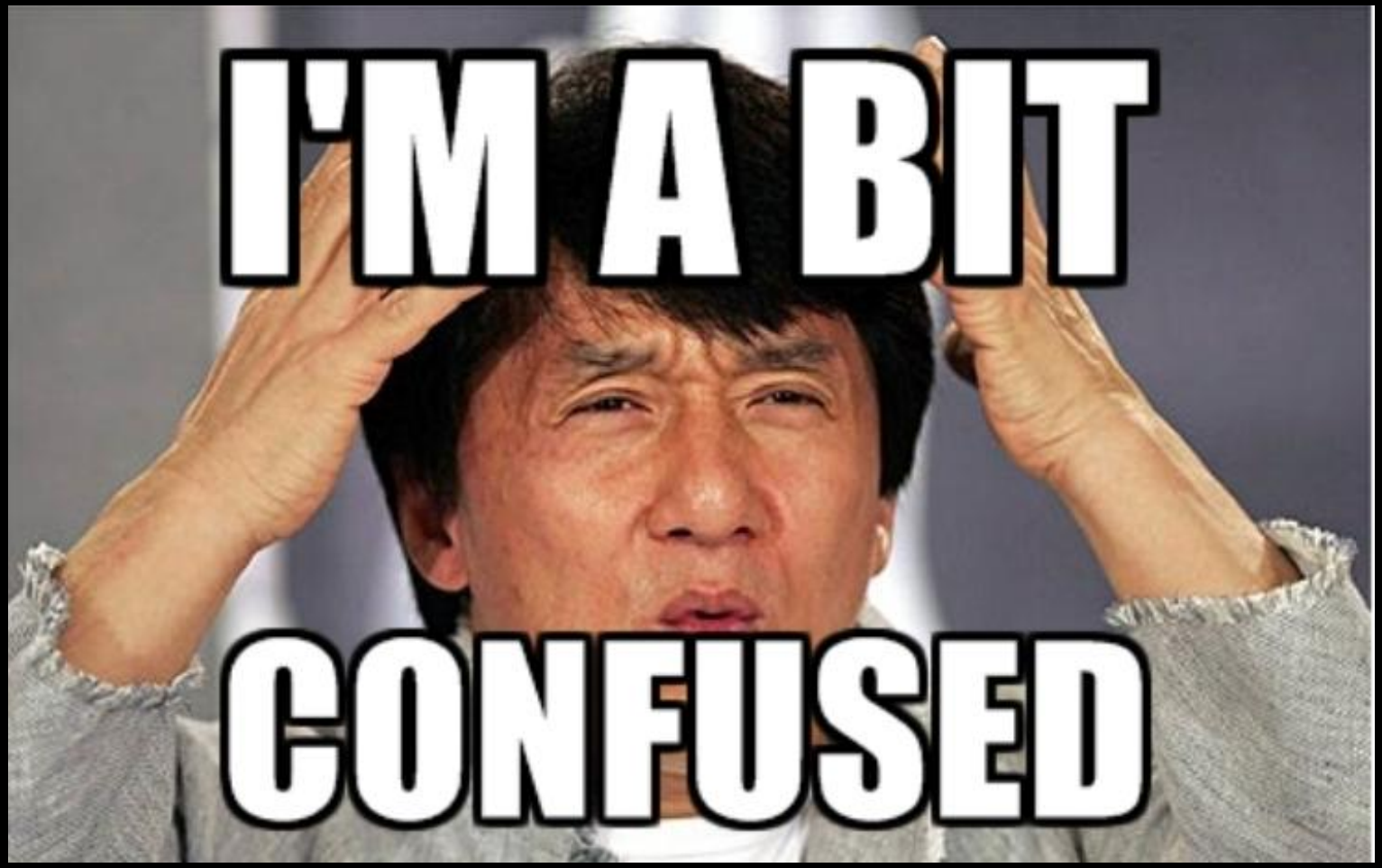


Figure 6. Individual study and pooled estimates for favorable neurologic outcome for patients who received mechanical versus manual CPR.


I'M A BIT
CONFUSED

Ritardo defibrillazione – ASPIRE trial

Manual Chest Compression vs Use of an Automated Chest Compression Device During Resuscitation Following Out-of-Hospital Cardiac Arrest

A Randomized Trial

Al Hallstrom, PhD
Thomas D. Rea, MD, MPH
Michael R. Sayre, MD

Context High-quality cardiopulmonary resuscitation (CPR) may improve both cardiac and brain resuscitation following cardiac arrest. Compared with manual chest compression, an automated load-distributing band (LDB) chest compression device produces greater blood flow to vital organs and may improve resuscitation outcomes.

Another possible explanation for the outcomes is that deployment time for the LDB-CPR device was prolonged. Mean time to first shock in primary cases with initial rhythm of ventricular fibrillation occurred 2.1 minutes later in the LDB-CPR group. While device deployment time was not measured directly, site C applied the device earlier and more frequently than the other sites and yet showed greater relative hazard for the intervention (Table 5).

JAMA, June 14, 2006—Vol 295, No. 22

Ritardo defibrillazione – LINC trial

Original Investigation

Mechanical Chest Compressions and Simultaneous Defibrillation vs Conventional Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest

The LINC Randomized Trial

Sten Rubertsson, MD, PhD; Erik Lindgren, MD; David Smekal, MD, PhD; Ollie Östlund, PhD; Johan Silfverstolpe, MD; Robert A. Lichtveld, MD, PhD; Rene Boomars, MPA; Björn Ahlstedt, MD; Gunnar Skoog, MD; Robert Kastberg, MD; David Halliwell, RN; Martyn Box, RN; Johan Herlitz, MD, PhD; Rolf Karlsten, MD, PhD

mechanical compressions and to the first defibrillation. However, the first defibrillation occurred 1.5 minutes later in the mechanical CPR group than in the manual CPR group (Table 1). By protocol, the first countershock was to be delivered 90 seconds after starting mechanical compressions; if it had been delivered at the start of mechanical compressions instead, time to defibrillation could have been similar in the 2 groups. This adjustment to the protocol might improve survival in the mechanical CPR group by several percent.[23] However, it is also possible that the additional compressions before defibrillation were beneficial.

IN CASO DI UTILIZZO DI MASSAGGIATORI MECCANICI, INIZIARE SEMPRE LA RCP MANUALMENTE, E SOLO DOPO I PRIMI CICLI DI MCE E DEFIBRILLAZIONE POSIZIONARE IL DEVICE

EJA

Eur J Anaesthesiol 2016; **33**:553–556

EDITORIAL

Don't forget to ventilate during cardiopulmonary resuscitation with mechanical chest compression devices

Michael Bernhard, Björn Hossfeld, Bernhard Kumle, Torben K. Becker, Bernd Böttiger and Torsten Birkholz

Table 1 Outcomes and parameters of the three automatic cardiac compression device (ACCD) trials

	LINC[a]		PARAMEDIC[a]		CIRC[a]	
Study	LUCAS-2[b]	Manual	LUCAS-2[b]	Manual	AutoPulse[b]	Manual
n	1300	1289	1652	2819	2099	2132
ROSC (*n*, %)	460 (35.4%)	446 (34.6%)	522 (31.5%)	885 (31.3%)	600 (28.6%)	689 (32.3%)
ED arrival with pulse (*n*, %)	366 (28.2%)	357 (27.7%)	377 (22.8%)	658 (23.3%)	n.r.	n.r.
4-h survival (*n*, %)	307 (23.6%)	305 (23.7%)	n.r.	n.r.	n.r.	n.r.
24-h survival (*n*, %)	n.r.	n.r.	n.r.	n.r.	456 (21.8%)	532 (25.0%)
1-month survival (*n*, %)	8.6%	8.5%	n.r.	n.r.	n.r.	n.r.
30-day survival (%)	n.r.	n.r.	6%	7%	n.r.	n.r.
Subgroup VF/pVT	n.r.	n.r.	OR 0.71 (95%CI 0.52 to 0.98)		n.r.	n.r.
Survival to hospital	117 (9.0%)	118 (9.2%)	n.r.	n.r.	196 (9.4%)	233 (11.0%)
Discharge (*n*, %)						
Survival 3 months (*n*, %)	n.r.	n.r.	96 (5.8%)	182 (6.4%)	n.r.	n.r.
Survival 6 months (*n*, %)	111 (8.5%)	104 (8.1%)	n.r.	n.r.	n.r.	n.r.
Survival 12 months (*n*, %)	n.r.	n.r.	89 (5.3%)	175 (6.2%)	n.r.	n.r.
Favourable						
Neurological	8.1%[c]	7.3%[c]	77 (4.7%)[d]	168 (5.9%)[d]	87 (44.4%)[e]	112 (48.1%)[e]
Outcome (%) or (*n*, %)			aOR 0.72 (95% CI 0.52 to 0.99)			

ACCD, automatic cardiac compression device; aOR, adjusted odds ratio; CPC, cerebral performance category; ED, emergency department; mRS, modified Rankin Scale; n.r., not reported; OR, odds ratio; pVT, pulseless ventricular tachycardia; ROSC, return of spontaneous circulation; VF, ventricular fibrillation. [a] See text for details. [b] Types of ACCD. [c] At 6 months in LINC (CPC 1 to 2). [d] At 3 months in PARAMEDIC (CPC 1 to 2). [e] At hospital discharge in CIRC (mRS 0 to 3).

EJA

Eur J Anaesthesiol 2016; **33**:553–556

EDITORIAL

Don't forget to ventilate during cardiopulmonary resuscitation with mechanical chest compression devices

mle, Torben K. Becker, Bernd Böttiger

ling).[17,18] As chest compressions alone without oxygenation and ventilation are recommended only for the brief time period of basic life support performed by laypersons (compression-only cardiopulmonary resuscitation), a safe strategy for airway management and ventilation is an integral part of any resuscitative measures. After the arrival of healthcare professionals (e.g. paramedics and Emergency Medical Service physicians) and during advanced life support, ensuring oxygenation and elimination of carbon dioxide is crucial – even if the optimal strategy for managing the airway has not been determined yet.[19] High-quality chest compressions only, with and without automated mechanical chest compression devices, will remain unsuccessful without oxygenation and decarboxylation of the blood. Desaturated blood does not contribute to myocardial and cerebral oxygenation, and hypercapnia may be detrimental (e.g. acidosis and cardiodepressive effects).[20]

In the authors' clinical experience, automated mechanical chest compression devices make continuous high-quality ventilation difficult and sometimes impossible. None of the available automated mechanical chest compression devices were constructed with particular regard to effective and safe ventilation. In general, the use of a

All studies suffer from missing data regarding ventilation quality when automated mechanical chest compression devices are used. Surprisingly, in all three automated mechanical chest compression device trials mentioned earlier,[4–6] detailed data on advanced airway management interventions (e.g. successful intubation of the trachea, successful insertion of a supraglottic airway device) are missing. In the PARAMEDIC trial, 39 vs. 38% of patients

aOR 0.72 (95% CI 0.52 to 0.99)

ACCD, automatic cardiac compression device; aOR, adjusted odds ratio; CPC, cerebral performance category; ED, emergency department; mRS, modified Rankin Scale; n.r., not reported; OR, odds ratio; pVT, pulseless ventricular tachycardia; ROSC, return of spontaneous circulation; VF, ventricular fibrillation. [a] See text for details. [b] Types of ACCD. [c] At 6 months in LINC (CPC 1 to 2). [d] At 3 months in PARAMEDIC (CPC 1 to 2). [e] At hospital discharge in CIRC (mRS 0 to 3).

IN CASO DI UTILIZZO DI MASSAGGIATORI MECCANICI,L'INTUBAZIONE OROTRACHEALE RIVESTE UN PUNTO CRUCIALE PER GARANTIRE UNA ADEGUATA OSSIGENAZIONE

Clinical paper

CPR-related injuries after manual or mechanical chest compressions with the LUCAS™ device: A multicentre study of victims after unsuccessful resuscitation☆

D. Smekal[a,*], E. Lindgren[a], H. Sandler[b,c], J. Johansson[a], S. Rubertsson[a]

[a] Department of Surgical Sciences, Anaesthesiology & Intensive Care, Uppsala University, S-751 85 Uppsala, Sweden
[b] Department of Surgical Sciences, Forensic Medicine, Uppsala University, S-751 85 Uppsala, Sweden
[c] National Board of Forensic Medicine, S-751 40 Uppsala, Sweden

A B S T R A C T

Aim: The reported incidence of injuries due to cardiopulmonary resuscitation using manual chest compressions (manual CPR) varies greatly. Our aim was to elucidate the incidence of CPR-related injuries by manual chest compressions compared to mechanical chest compressions with the LUCAS device (mechanical CPR) in non-survivors after out-of-hospital cardiac arrest.

Methods: In this prospective multicentre trial, including 222 patients (83 manual CPR/139 mechanical CPR), autopsies were conducted after unsuccessful CPR and the results were evaluated according to a specified protocol.

Results: Among the patients included, 75.9% in the manual CPR group and 91.4% in the mechanical CPR group ($p = 0.002$) displayed CPR-related injuries. Sternal fractures were present in 54.2% of the patients in the manual CPR group and in 58.3% in the mechanical CPR group ($p = 0.56$). Of the patients in the manual CPR group, there were 64.6% with at least one rib fracture versus 78.8% in the mechanical CPR group ($p = 0.02$). The median number of rib fractures among patients with rib fractures was 7 in the manual CPR group and 6 in the mechanical CPR group. No CPR-related injury was considered to be the cause of death.

Conclusion: In patients with unsuccessful CPR after out-of-hospital cardiac arrest, rib fractures were more frequent after mechanical CPR but there was no difference in the incidence of sternal fractures. No injury was deemed fatal by the pathologist.

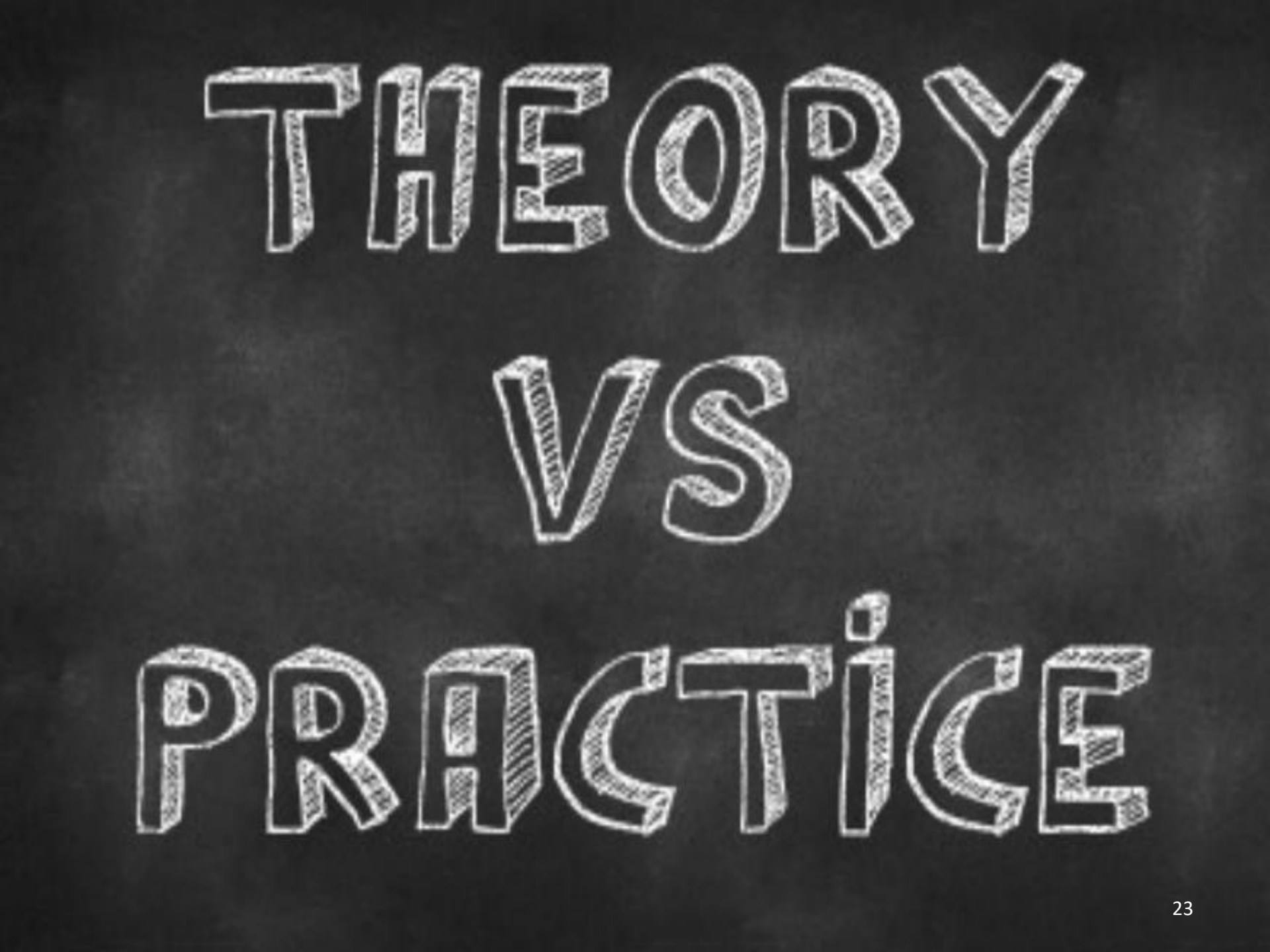
Clinical paper

CPR-related injuries after manual or mechanical chest compressions with the LUCAS™ device: A multicentre study of victims after unsuccessful resuscitation☆

D. Smekal[a,*], E. Lindgren[a], H. Sandler[b,c], J. Johansson[a], S. Rubertsson[a]

[a] Department of Surgical Sciences, Anaesthesiology & Intensive Care, Uppsala University, S-751 85 Uppsala, Sweden
[b] Departmen
[c] National Bo

Injury	Manual CPR, *n* (%)	Mechanical CPR, *n* (%)
Mediastinal bleeding	8 (9.6)	14 (10.1)
Retrosternal bleeding	19 (22.9)	45 (32.4)
Epicardial bleeding	7 (8.4)	13 (9.4)
Pericardial bleeding	2 (2.4)	5 (3.6)
Haemothorax	2 (2.4)	6 (4.3)
Pneumothorax	2 (2.4)	4 (2.9)
Injury to capsule of the liver	2 (2.4)	6 (4.3)
Injury to parenchyma of the liver	1 (1.2)	5 (3.6)
Fracture of vertebral body	0 (0.0)	2 (1.4)
Fracture of collar bone	1 (1.2)	0 (0.0)
Rupture of the thoracic aorta	0 (0.0)	2 (1.4)
Lung bleeding	1 (1.2)	1 (0.7)
Bleeding in pectoral muscle	0 (0.0)	1 (0.7)
Rupture of the abdominal aorta	0 (0.0)	1 (0.7)
Rupture to the adventitia in pulmonary artery	0 (0.0)	1 (0.7)
Other injuries to the heart	2 (2.4)	3 (2.2)


THEORY
VS
PRACTICE

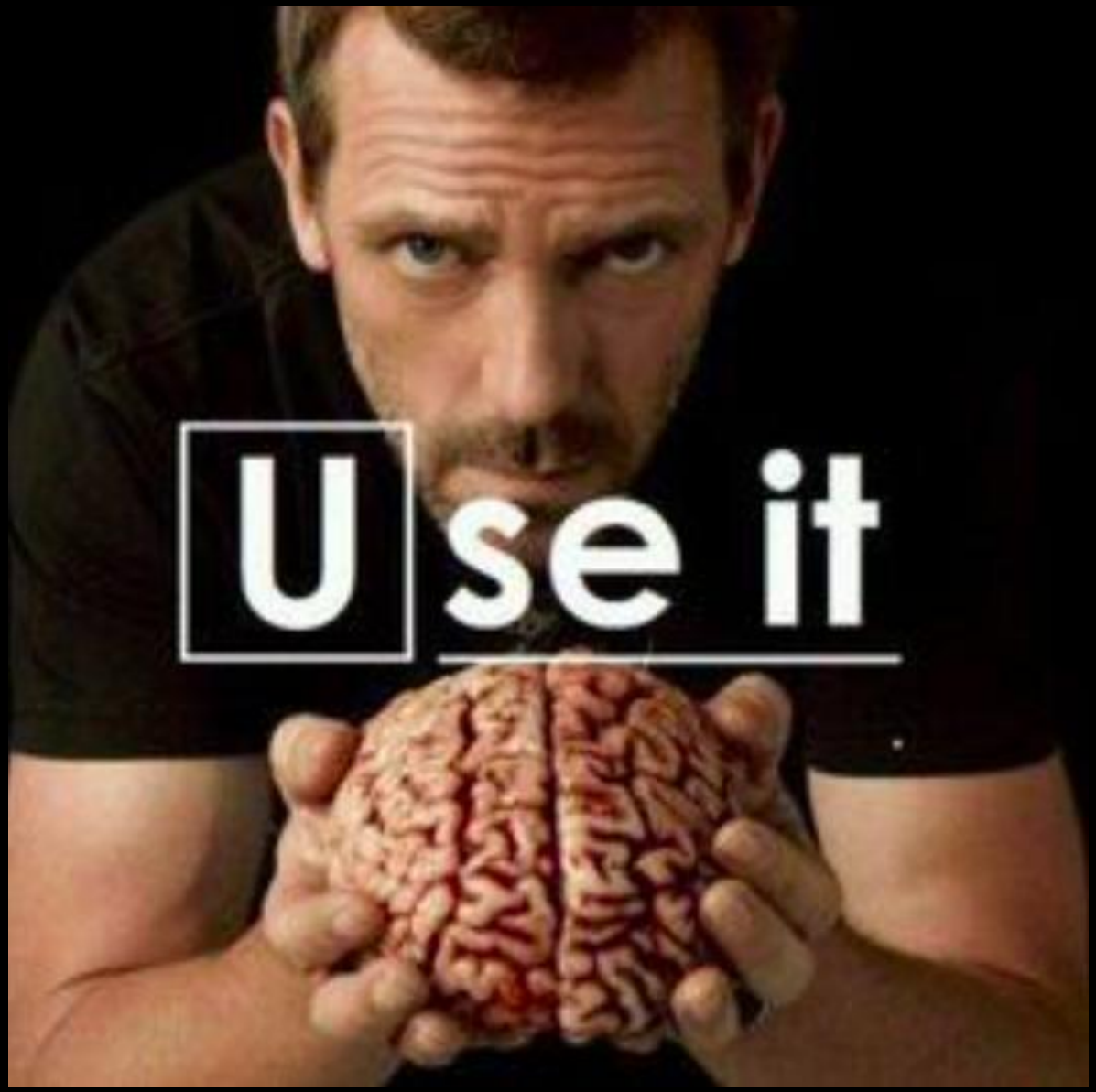

PROS
CONS

Setting non modificabili

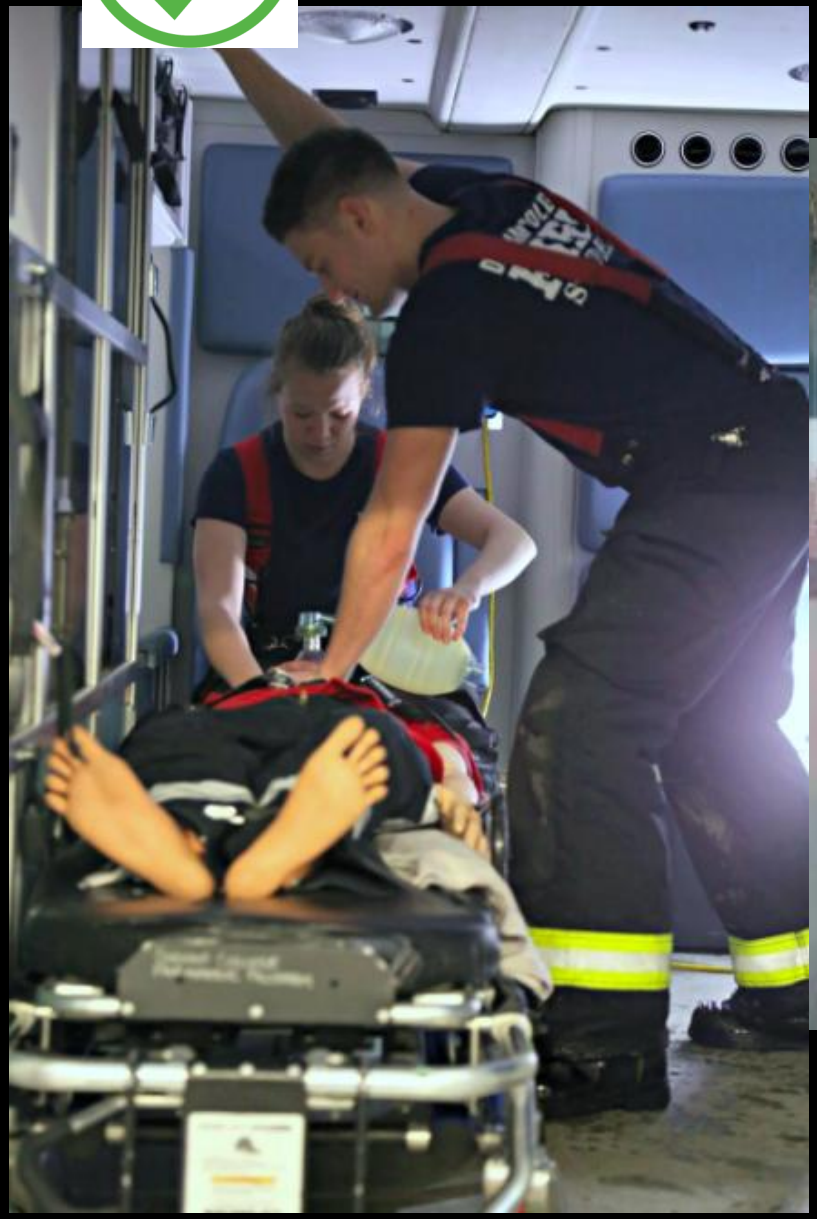
Non idoneo per tutti i pazienti

Stanchezza fisica e scarsità di personale

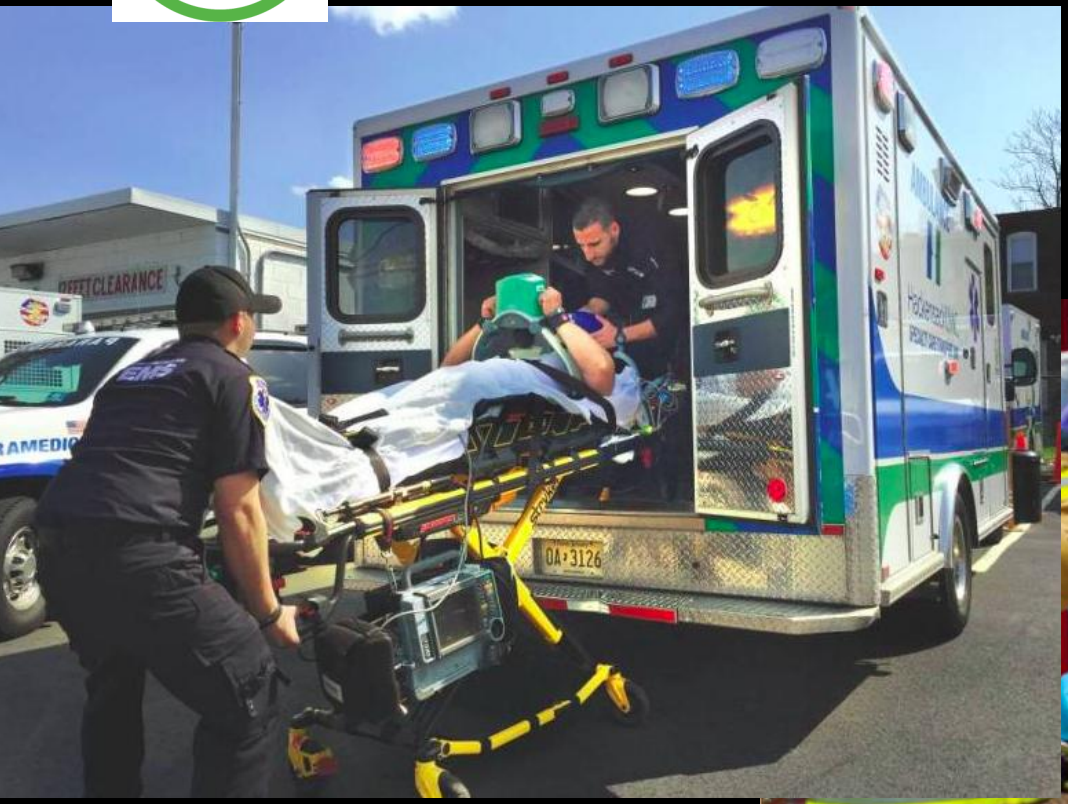
Concentrarsi sulle cause dell'ACC



RCP in movimento



RCP in movimento

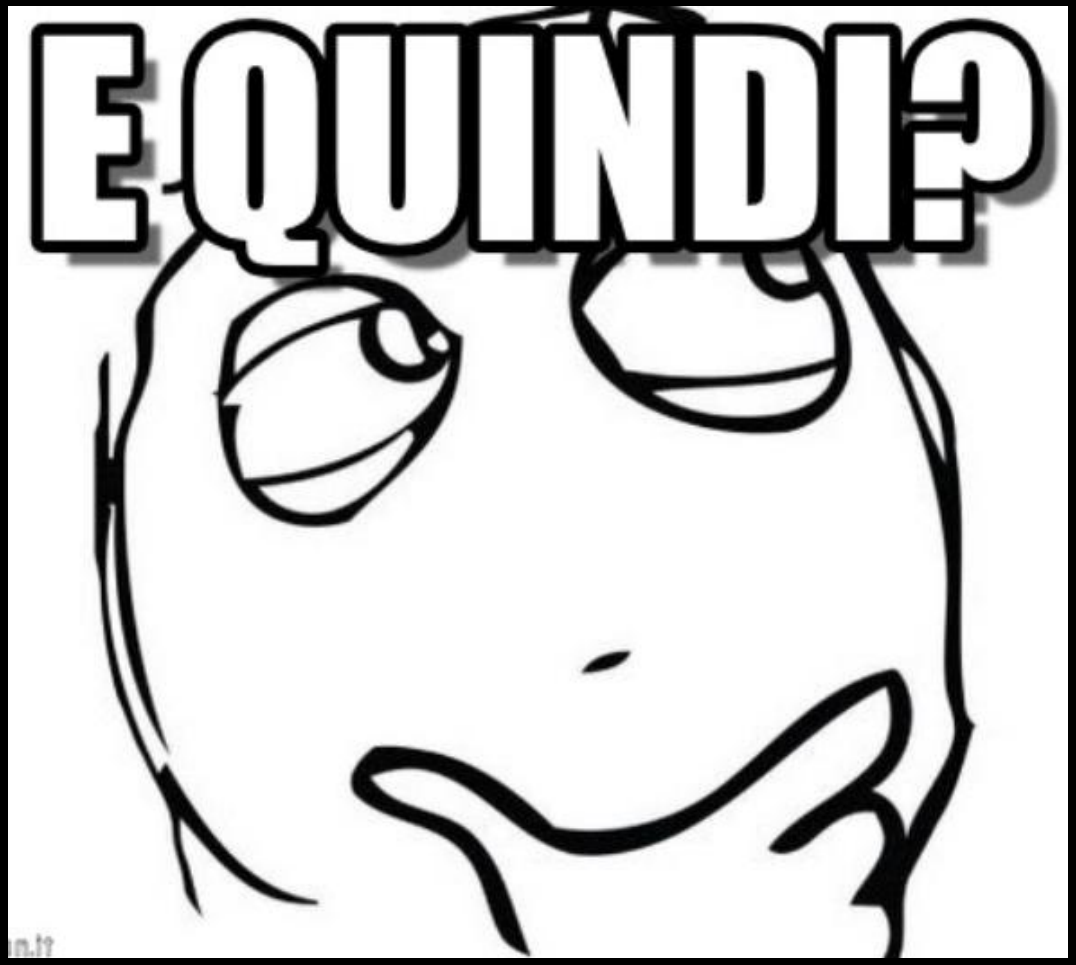


Ambienti impervi

Trasporto con RCP continuativa paziente travolto da valanga

Indicata RCP continuativa per emodinamica

Indicata RCP continuativa a ponte per espianto organi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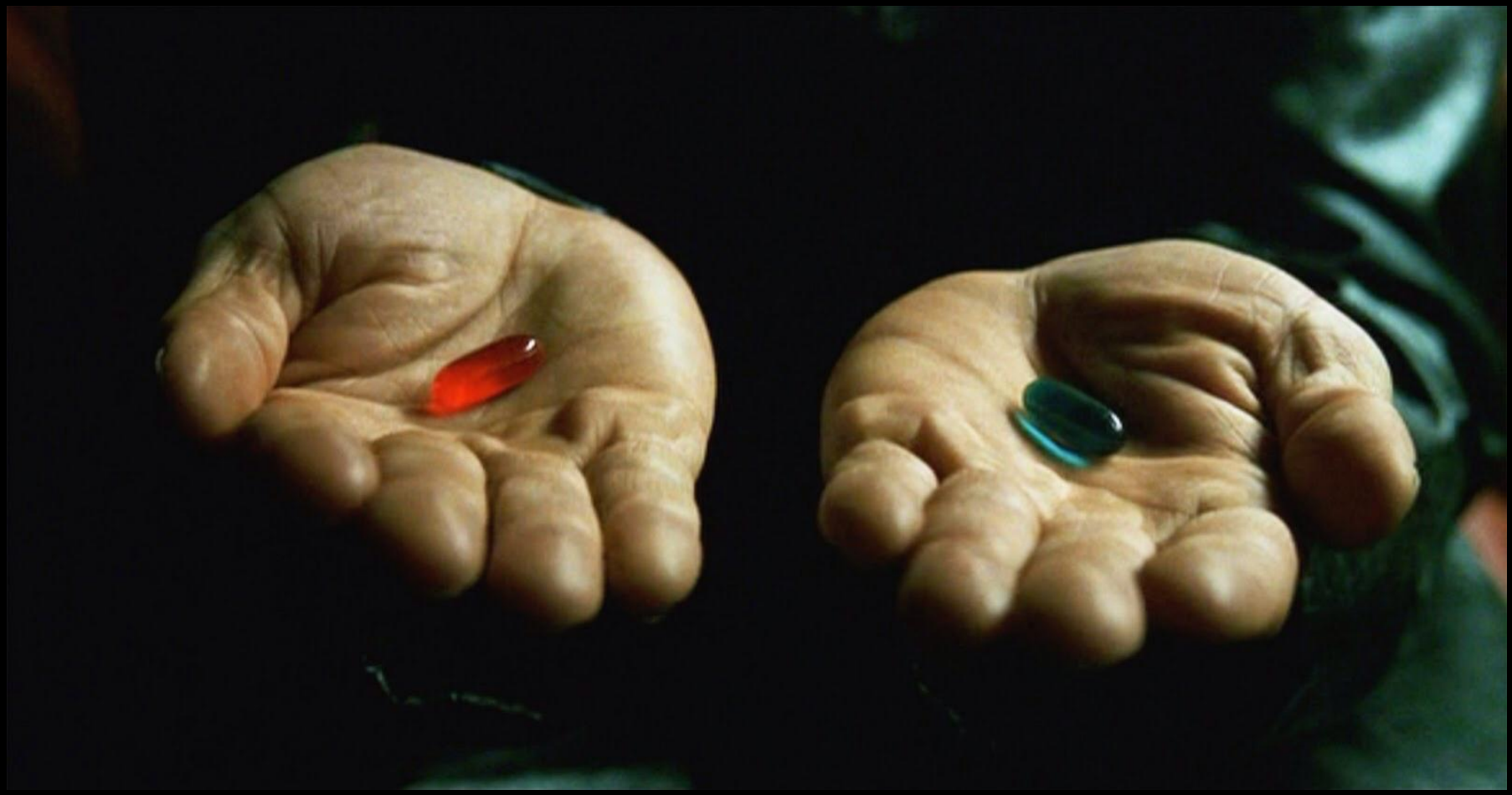

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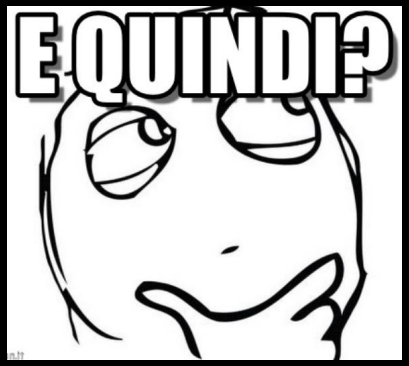


1. La letteratura scientifica non indica un uso preferenziale dei massaggiatori meccanici alla luce di una non superiorità di outcome neurologico e sopravvivenza alla dimissione.

Part 6: Alternative Techniques and Ancillary Devices for Cardiopulmonary Resuscitation

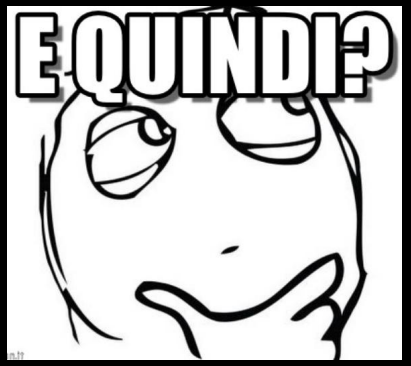
2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Steven C. Brooks, Chair; Monique L. Anderson; Eric Bruder; Mohamud R. Daya; Alan Gaffney; Charles W. Otto; Adam J. Singer; Ravi R. Thiagarajan; Andrew H. Travers

2015 Recommendations—New

The evidence does not demonstrate a benefit with the use of mechanical piston devices for chest compressions versus manual chest compressions in patients with cardiac arrest. Manual chest compressions remain the standard of care for the treatment of cardiac arrest, but mechanical piston devices may be a reasonable alternative for use by properly trained personnel (Class IIb, LOE B-R). The use of mechanical piston devices

concludendo



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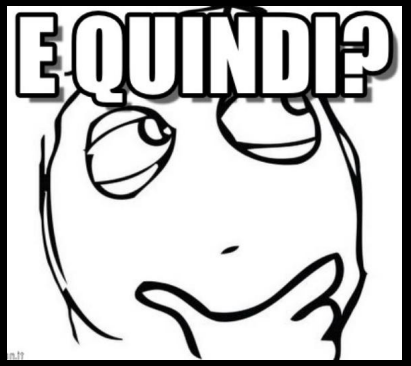

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3. I MASSAGGIATORI MECCANICI SONO DEVICE DI GRANDE SUPPORTO TECNICO IN AMBIENTE PREOSPEDALIERO.

THANKS FOR YOUR ATTENTION

AND PLEASE ASK!