

## HIPOTÈRMIA

*Sembla que la diabetis anul·la l'efecte beneficiós de la hipotèrmia terapèutica!*

**Resuscitation.** 2015 Feb 25. pii: S0300-9572(15)00072-6. doi: 10.1016/j.resuscitation.2015.02.006. [Epub ahead of print]

### **Interaction effects between hypothermia and diabetes mellitus on survival outcomes after out-of-hospital cardiac arrest.**

Ro YS1, Shin SD2, Song KJ3, Lee EJ4, Lee YJ5, Kim JY6, Jang DB7, Kim MJ8, Kong SY9.

#### **Abstract**

##### **OBJECTIVES:**

Mild therapeutic hypothermia (MTH) is the core hospital intervention to enhance neurological outcome after out-of-hospital cardiac arrest (OHCA). Diabetes mellitus (DM) has been known to be a harmful risk factor on survival after OHCA. This study aimed to investigate whether the effect of MTH on brain recovery after OHCA differed between patients with or without DM.

##### **METHODS:**

We used a Korean national OHCA database composed of hospital and ambulance data. We included adult OHCA patients who survived to admission with presumed cardiac etiology during the study period from 2009 to 2013. We excluded cases without hospital outcome data. The primary exposure was MTH, which included all kinds of cooling methods that had been initiated within 6h after return of spontaneous circulation. DM was coded positive when the patient had a clinical history diagnosed by a physician before an OHCA event. The endpoints were discharge with good neurological recovery (cerebral performance category 1 or 2) and survival to discharge. We compared outcomes between MTH vs. non-MTH groups using multivariable logistic regression with an interaction term between MTH and DM for calculating adjusted odds ratios (AORs) and 95% confidence intervals (CIs) after adjusting for potential confounders.

##### **RESULTS:**

Among 9735 patients following OHCA survived to hospital admission with cardiac etiology, MTH was performed in 16.5%. History of DM was observed in 25.4% among MTH group and 27.4% in non-MTH group ( $p=0.09$ ). MTH group showed better outcomes than non-MTH group; 23.6% vs. 15.7% for good neurological recovery ( $p<0.01$ ). AOR (95% CI) of MTH for good neurological recovery for all study groups was 1.23 (1.03-1.47). In the interaction model, AOR (95% CI) of MTH for good neurological recovery was 1.40 (1.16-1.70) in patients without DM vs. 0.69 (0.46-1.04) in patients with DM. For survival to discharge, the effects of MTH were different in patients without DM (1.97 (1.70-2.29)) and patients with DM (1.23 (0.96-1.57)).

##### **CONCLUSION:**

DM modified the effect of MTH on survival and neurological outcomes for OHCA survivors. MTH is significantly associated with good neurological recovery in patients without DM, but not in patients with DM.

## REGISTRES

*Caram! I al SEM que ho fem tres persones!!!*

**Resuscitation.** 2015 Feb 25. pii: S0300-9572(15)00086-6. doi: 10.1016/j.resuscitation.2015.02.019. [Epub ahead of print]

### **Volume versus outcome: More emergency medical services personnel on-scene and increased survival after out-of-hospital cardiac arrest.**

Warren SA1, Prince DK2, Huszti E3, Rea TD4, Fitzpatrick AL5, Andrusiek DL6, Darling S7, Morrison LJ8, Vilke GM9, Nichol G10; the ROC Investigators.

#### **Abstract**

##### **BACKGROUND AND AIM::**

The large regional variation in survival after treatment of out-of-hospital cardiac arrest (OHCA) is incompletely explained. Communities respond to OHCA with differing number of emergency medical services (EMS) personnel who respond to the scene. The effect of different numbers of EMS personnel on-scene upon outcomes is unclear. We sought to evaluate the association between number of EMS personnel on-scene and survival after OHCA.

#### METHODS:

We performed a retrospective review of prospectively collected data on 16,122 EMS-treated OHCA events from December 1, 2005 to May 31, 2007 from a combined population over 21 million people residing in an area of over 33,000 square miles in Canada and the United States. Number of EMS personnel on-scene was defined as the number of EMS personnel who responded to the scene of OHCA within 15min after 9-1-1 call receipt and prior to patient death or transport away from the scene. Associations with survival to hospital discharge were assessed by using generalized estimating equations to construct multivariable logistic regression models.

#### RESULTS:

Compared to a reference number of EMS personnel on-scene of 5 or 6, 7 or 8 EMS personnel on-scene was associated with a higher rate of survival to hospital discharge, adjusted odds ratio [OR], 1.35 (95% CI: 1.05, 1.73). There was no significant difference in survival between 5 or 6 personnel on-scene versus fewer.

#### CONCLUSION:

More EMS personnel on-scene within 15min of 9-1-1 call was associated with improved survival of out-of-hospital cardiac arrest. It is unlikely that this finding was mediated solely by earlier CPR or earlier defibrillation.

## COMPRESSORS TORÀCICS MECÀNCICS

*Una de compressors toràcics pels que els agradi la tècnica...*

**Med Biol Eng Comput.** 2015 Mar 4. [Epub ahead of print]

### **A mechanical chest compressor closed-loop controller with an effective trade-off between blood flow improvement and ribs fracture reduction.**

Zhang G<sup>1</sup>, Wu T, Song Z, Wang H, Lu H, Wang Y, Wang D, Chen F.

#### Abstract

Chest compression (CC) is a significant emergency medical procedure for maintaining circulation during cardiac arrest. Although CC produces the necessary blood flow for patients with heart arrest, improperly deep CC will contribute significantly to the risk of chest injury. In this paper, an optimal CC closed-loop controller for a mechanical chest compressor (OCC-MCC) was developed to provide an effective trade-off between the benefit of improved blood perfusion and the risk of ribs fracture. The trade-off performance of the OCC-MCC during real automatic mechanical CCs was evaluated by comparing the OCC-MCC and the traditional mechanical CC method (TMCM) with a human circulation hardware model based on hardware simulations. A benefit factor (BF), risk factor (RF) and benefit versus risk index (BRI) were introduced in this paper for the comprehensive evaluation of risk and benefit. The OCC-MCC was developed using the LabVIEW control platform and the mechanical chest compressor (MCC) controller. PID control is also employed by MCC for effective compression depth regulation. In addition, the physiological parameters model for MCC was built based on a digital signal processor for hardware simulations. A comparison between the OCC-MCC and TMCM was then performed based on the simulation test platform which is composed of the MCC, LabVIEW control platform, physiological parameters model for MCC and the manikin. Compared with the TMCM, the OCC-MCC obtained a better trade-off and a higher BRI in seven out of a total of nine cases. With a higher mean value of cardiac output (1.35 L/min) and partial pressure of end-tidal CO<sub>2</sub> (15.7 mmHg), the OCC-MCC obtained a larger blood flow and higher BF than TMCM (5.19 vs. 3.41) in six out of a total of nine cases. Although it is relatively difficult to maintain a stable CC depth when the chest is stiff, the OCC-MCC is still superior to the TMCM for performing safe and effective CC during CPR. The OCC-MCC is superior to the TMCM in performing safe and effective CC during CPR and can be incorporated into the current version of mechanical CC devices for high quality CPR, in both in-hospital and out-of-hospital CPR settings.

## DESFIBRIL·LACIÓ

*Els paramèdics de Toronto ho fan prou bé*

**Resuscitation.** 2015 Feb 28. pii: S0300-9572(15)00090-8. doi: 10.1016/j.resuscitation.2015.02.022. [Epub ahead of print]

**The association between manual mode defibrillation, pre-shock pause duration and appropriate shock delivery when employed by basic life support paramedics during out-of-hospital cardiac arrest.**

Cheskes S1, Hillier M2, Byers A3, Verbeek PR4, Drennan IR5, Zhan C3, Morrison LJ6.

**Abstract**

**BACKGROUND:**

Pre-shock pause duration of <20 seconds is associated with improved survival after cardiac arrest. Manual mode defibrillation has been associated with the shortest duration of pre-shock pause but is largely practiced by advanced life support paramedics (ALS) whereas defibrillator only paramedics (basic life support or BLS) routinely use the defibrillator in automatic mode.

**OBJECTIVE:**

We sought to explore the relationship between manual mode defibrillation, pre-shock pause duration and rate of inappropriate shocks when defibrillation is provided by ALS vs. BLS trained in manual mode defibrillation.

**METHODS:**

We performed a retrospective review of all treated non-traumatic adult out-of-hospital cardiac arrest (OHCA) presenting in a shockable rhythm over a one year period beginning January 1, 2012. Our primary outcome measure was the proportion of manual mode shocks delivered by BLS with pre-shock pause duration of <20 secs when compared to ALS. Our secondary outcome measures were the duration of pre-, post- and peri-shock pause and the proportion of appropriate shocks (defined as correct identification and shock delivery to patients in a shockable rhythm) delivered by either level of paramedic. This study had a power of 90% to detect an absolute difference of 15% between paramedic levels in proportion of shocks delivered with pre-shock pause duration <20 secs.

**RESULTS:**

Among 2019 treated OHCA, 335 (20%) presented in a shockable rhythm. Manual defibrillation was performed in 155 (46%) of these cases (196 shocks by ALS, 143 shocks by BLS). There were no differences in the proportion of shocks delivered with pre-shock pause duration <20 secs (ALS 82.8% vs BLS 84.8%,  $p=0.65$ ) nor pre-shock pause duration (sec) (median, Q1, Q3); ALS: 12.0 (7.0,17.0) vs. BLS: 11.0 (5.0,17.0),  $p=0.13$  while BLS had a significantly shorter peri-shock pause duration (sec) (median, Q1, Q3); ALS: 17.0 (12.0, 23.0) vs. BLS: 15.0 (9.0, 22.0),  $p=0.05$ . There were no differences in the rate of inappropriate shocks (ALS 1.0% vs BLS 0.7%),  $p=1.0$  between levels of paramedics.

**CONCLUSIONS:**

Manual mode defibrillation by BLS paramedics produced similar measures of pre-shock pause duration when compared to ALS paramedics without increasing the incidence of inappropriate shocks. Further study is required to determine the potential impact of BLS manual mode defibrillation on clinical outcomes.

## **PROTOCOL D'ESTUDI**

*Un protocol d'un assaig clínic del ROC Consortium per avaluar si les compressions toràciques contínues són millors que l'actual 30:2!*

**Am Heart J.** 2015 Mar;169(3):334-341.e5. doi: 10.1016/j.ahj.2014.11.011. Epub 2014 Nov 20.

**A randomized trial of continuous versus interrupted chest compressions in out-of-hospital cardiac arrest: Rationale for and design of the Resuscitation Outcomes Consortium Continuous Chest Compressions Trial.**

Brown SP1, Wang H2, Aufderheide TP3, Vaillancourt C4, Schmicker RH5, Cheskes S6, Straight R7, Kudenchuk P5, Morrison L6, Colella MR3, Condle J8, Gamez G9, Hostler D8, Kayea T9, Ragsdale S5, Stephens S2, Nichol G5; ROC Investigators.

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### **Abstract**

The Resuscitation Outcomes Consortium is conducting a randomized trial comparing survival with hospital discharge after continuous chest compressions without interruption for ventilation versus currently recommended American Heart Association cardiopulmonary resuscitation with interrupted chest compressions in adult patients with out-of-hospital cardiac arrest without obvious trauma or respiratory cause. Emergency medical services perform study cardiopulmonary resuscitation for 3 intervals of manual chest compressions (each ~2 minutes) or until restoration of spontaneous circulation. Patients randomized to the continuous chest compression intervention receive 200 chest compressions with positive pressure ventilations at a rate of 10/min without interruption in compressions. Those randomized to the interrupted chest compression study arm receive chest compressions interrupted for positive pressure ventilations at a compression: ventilation ratio of 30:2. In either group, each interval of compressions is followed by rhythm analysis and defibrillation as required. Insertion of an advanced airway is deferred for the first  $\geq 6$  minutes to reduce interruptions in either study arm. The study uses a cluster randomized design with every-6-month crossovers. The primary outcome is survival to hospital discharge. Secondary outcomes are neurologically intact survival and adverse events. A maximum of 23,600 patients (11,800 per group) enrolled during the post-run-in phase of the study will provide  $\geq 90\%$  power to detect a relative change of 16% in the rate of survival to discharge, 8.1% to 9.4% with overall significance level of 0.05. If this trial demonstrates improved survival with either strategy,  $>3,000$  premature deaths from cardiac arrest would be averted annually.

## **HIPOTÈRMIA ACCIDENTAL**

*Es recomana realitzar RCP amb compressors toràcics mecànics en casos d'hipotèrmia accidental per mantenir les compressions toràciques contínues*

**Resuscitation.** 2015 Feb 25. pii: S0300-9572(15)00084-2. doi: 10.1016/j.resuscitation.2015.02.017. [Epub ahead of print]

### **Delayed and intermittent CPR for severe accidental hypothermia.**

Gordon L1, Paal P2, Ellerton JA3, Brugger H4, Peek GJ5, Zafren K6.

### **Abstract**

#### **INTRODUCTION:**

Cardiac arrest (CA) in patients with severe accidental hypothermia (core temperature  $<28^{\circ}\text{C}$ ) differs from CA in normothermic patients. Maintaining CPR throughout the prehospital period may be impossible, particularly during difficult evacuations. We have developed guidelines for rescuers who are evacuating and treating severely hypothermic CA patients.

#### **METHODS:**

A literature search was performed. The authors used the findings to develop guidelines.

#### **RESULTS:**

Full neurological recovery is possible even with prolonged CA if the brain was already severely hypothermic before CA occurred. Data from surgery during deep hypothermic CA and prehospital case reports underline the feasibility of delayed and intermittent CPR in patients who have arrested due to severe hypothermia.

#### **CONCLUSIONS:**

Continuous CPR is recommended for CA due to primary severe hypothermia. Mechanical chest-compression devices should be used when available and CPR-interruptions avoided. Only if this is not possible should CPR be delayed or performed intermittently. Based on the available data, a patient with a core temperature  $<28^{\circ}\text{C}$  or unknown with unequivocal

hypothermic CA, evidence supports alternating 5min CPR and ≤5min without CPR. With core temperature <20°C, evidence supports alternating 5min CPR and ≤10min without CPR.

## PEDIATRIA

*Sobre la valoració de la qualitat de la RCP en un maniquí pediàtric (en un video...)*

**Resuscitation.** 2015 Feb 26. pii: S0300-9572(15)00074-X. doi: 10.1016/j.resuscitation.2015.01.036. [Epub ahead of print]

### **Visual assessment of CPR quality during pediatric cardiac arrest: Does point of view matter?**

Jones A1, Lin Y2, Nettel-Aguirre A3, Gilfoyle E4, Cheng A5.

#### **Abstract**

AIM:

many clinical settings, providers rely on visual assessment when delivering feedback on CPR quality. Little is known about the accuracy of visual assessment of CPR quality. We aimed to determine how accurate pediatric providers are in their visual assessment of CPR quality and to identify the optimal position relative to the patient for accurate CPR assessment.

METHODS:

We videotaped high-quality CPR (based on 2010 American Heart Association guidelines) and 3 variations of poor quality CPR in a simulated resuscitation, filmed from the foot, head and the side of the manikin. Participants watched 12 videos and completed a questionnaire to assess CPR quality.

RESULTS:

One hundred and twenty-five participants were recruited. The overall accuracy of visual assessment of CPR quality was 65.6%. Accuracy was better from the side (70.8%) and foot (68.8%) of the bed when compared to the head of the bed (57.2%;  $p<0.001$ ). The side was the best position for assessing depth ( $p<0.001$ ). Rate assessment was equivalent between positions ( $p=0.58$ ). The side and foot of the bed were superior to the head when assessing chest recoil ( $p<0.001$ ). Factors associated with increased accuracy in visual assessment of CPR quality included recent CPR course completion ( $p=0.034$ ) and involvement in more cardiac arrests as a team member ( $p=0.003$ ).

CONCLUSION:

Healthcare providers struggle to accurately assess the quality of CPR using visual assessment. If visual assessment is being used, providers should stand at the side of the bed.

## FORMACIÓ

*Les aplicacions dels smartphones milloren la qualitat de la RCP...en maniquís*

*Circ J.* 2015 Feb 9. [Epub ahead of print]

### **Cardiopulmonary Resuscitation Support Application on a Smartphone.**

Sakai T1, Kitamura T, Nishiyama C, Murakami Y, Ando M, Kawamura T, Tasaki O, Kuwagata Y, Shimazu T, Iwami T.

#### **Abstract**

Background: This simulation trial aimed to compare the quality of cardiopulmonary resuscitation (CPR) with and without the newly-developed CPR support application on smartphones.

Methods and Results: In this trial, participants were randomly assigned to either the CPR support application group or the control group, stratified by sex and previous CPR training. Participants' CPR skills were evaluated by a 2-min case-based scenario test using the Leardal Resusci Anne PC Skillreporting Manikin System®. The outcome measures were the proportion of chest compressions performed in each group and the number of total chest compressions and appropriate chest compressions performed during the 2-min test period. A total of 84 participants were enrolled and completed the protocol. All participants in the CPR support application group performed chest compressions, compared with only 31 (75.6%) in the control group ( $P<0.001$ ). Among participants who performed chest compressions during the 2-

min test period, the number of total chest compressions was significantly higher in the CPR support application group than in the control group (211.6±29.5 vs. 77.0±43.3, P<0.001). The number of appropriate chest compressions tended to be greater in the CPR support application group than in the control group, although it was statistically insignificant (30.3±57.3 vs. 17.2±28.7, P=0.246).

Conclusions: In this cohort of laypersons, the newly-developed CPR support application for smartphones contributed to increasing the implementation rate and the number of total chest compressions performed and may assist in improving the survival rate for out-of-hospital cardiac arrests

*Una petita píldora d'entrenament als 6 mesos, millora la qualitat de la RCP a l'any de la formació*

**Resuscitation.** 2015 Feb 24. pii: S0300-9572(15)00082-9. doi: 10.1016/j.resuscitation.2015.02.015. [Epub ahead of print]

**Effectiveness of simplified 15-min refresher BLS training program: A randomized controlled trial.**

Nishiyama C1, Iwami T2, Murakami Y3, Kitamura T4, Okamoto Y5, Marukawa S6, Sakamoto T7, Kawamura T3.

#### **Abstract**

##### **OBJECTIVES:**

To evaluate the long-term effectiveness of 15-min refresher basic life support (BLS) training following 45-min chest compression-only BLS training.

##### **METHODS:**

After the 45-min chest compression-only BLS training, the participants were randomly assigned to either the refresher BLS training group, which received a 15-min refresher training 6 months after the initial training (refresher training group), or to the control group, which did not receive refresher training. Participants' resuscitation skills were evaluated by a 2-min case-based scenario test 1 year after the initial training. The primary outcome measure was the number of appropriate chest compressions during a 2-min test period.

##### **RESULTS:**

140 participants were enrolled and 112 of them completed this study. The number of appropriate chest compressions performed during the 2-min test period was significantly greater in the refresher training group (68.9±72.3) than in the control group (36.3±50.8, p=0.009). Time without chest compressions was significantly shorter in the refresher training group (16.1±2.1s versus 26.9±3.7s, p<0.001). There were no significant differences in time to chest compression (29.6±16.7s versus 34.4±17.8s, p=0.172) and AED use between the groups.

##### **CONCLUSIONS:**

A short-time refresher BLS training program 6 months after the initial training can help trainees retain chest compression skills for up to 1 year. Repeated BLS training, even if very short, would be adopted to keep acquired CPR quality optimal