Top 10 Articles in 2016 in Emergency Medicine

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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,and all. Ann Emerg Med. 2016;-:1-12

Problematic: Mechanical chest compression devices have been developed to facilitate continuous delivery of highquality cardiopulmonary resuscitation (CPR). Despite promising hemodynamic data, evidence on clinical outcomes remains inconclusive.

Study objective: The aim of this study is to compare the effect of mechanical CPR versus manual CPR on clinical outcomes after out-of-hospital cardiac arrest.

Methods:a systematic search that includes all eligible studies (randomized controlled trials and non-randomized studies) that compared a cardiopulmonary resuscitation strategy including an automatic mechanical chest compression device with a manual CPR strategy only. Outcome variables were survival to hospital admission, survival to discharge, and favorable neurologic outcome.

Results: Twenty studies were included in the meta-analysis, of which 5 had a randomized design. The studies involved a total of 21,363 patients, of whom 9,391 were allocated to the mechanical arm and 11,972 to the manual arm.

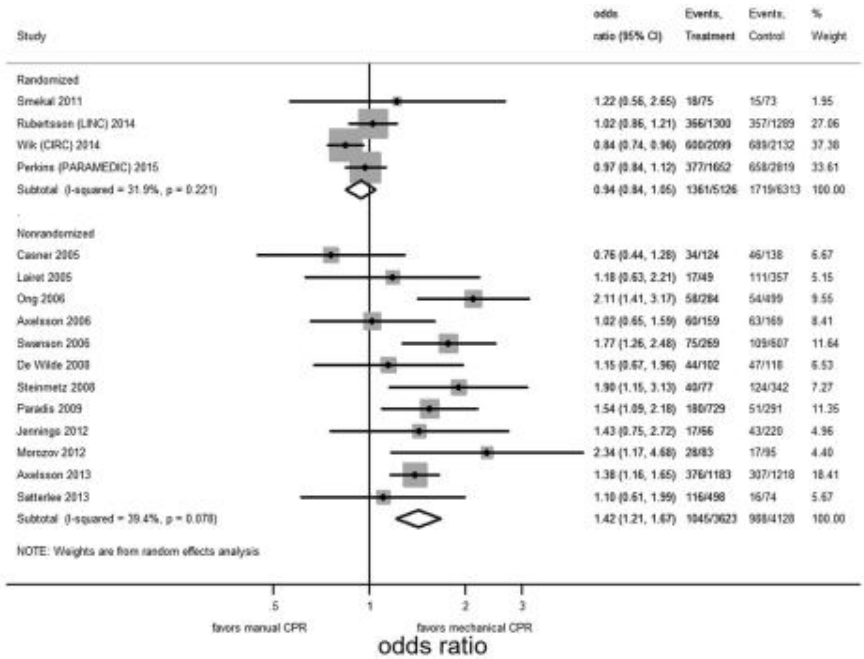


Figure 2. Individual study and pooled estimates for survival to hospital admission for patients who received mechanical versus manual CPR.

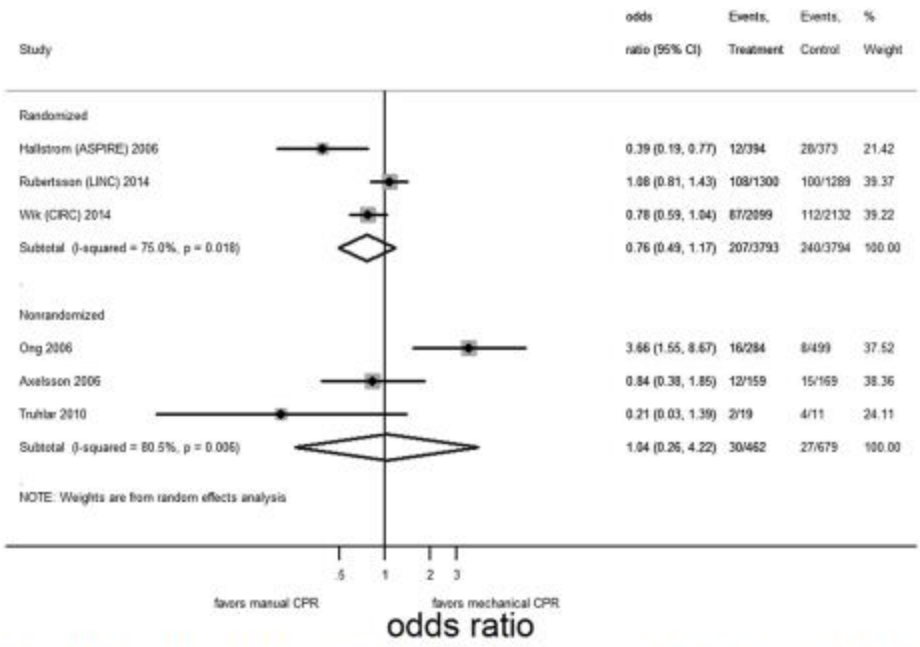


Figure 6. Individual study and pooled estimates for favorable neurologic outcome for patients who received mechanical versus manual CPR.

LIMITATIONS : This meta-analysis is based on the results of both randomized and nonrandomized studies. The actual adherence to the endorsed protocols was not studied because these data were not scored or reported in the majority of studies.

Passive leg raising (PRP) for predicting fluid responsiveness: a systematic review and meta-analysis.

Xavier Monnet, Paul Marik, Jean-Louis Teboul Intensive Care Med (2016) 42:1935–1947

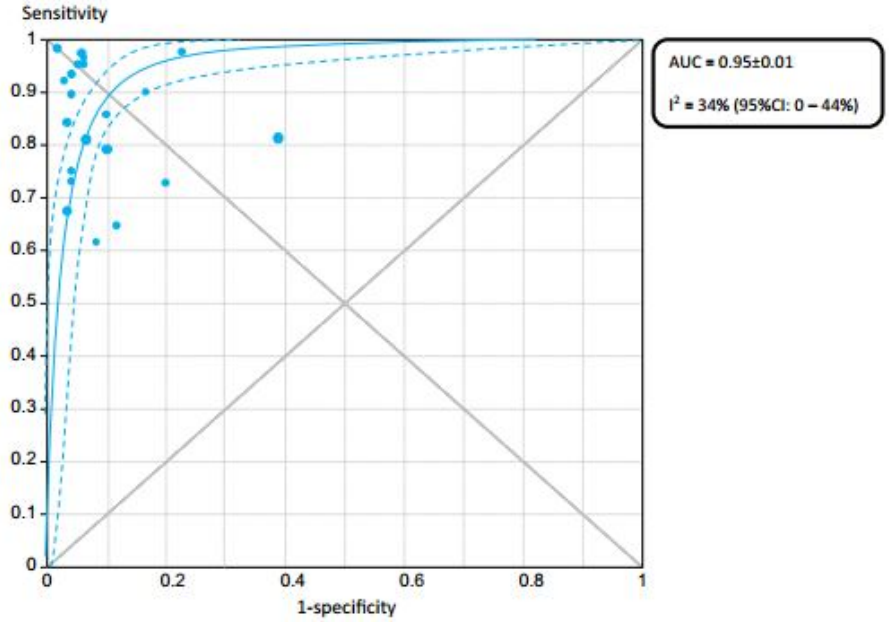
Problematic : In patients with acute circulatory failure, predicting whether volume expansion will actually induce a significant increase in CO has become a common practice, is recommended by International guidelines.

Study objective : evaluate the changes in cardiac output (CO) and pulsed arterial pressure (PP) induced by passive leg elevation (PRP) as predictors of fluid response in adults.

Methods : a systematic review of all studies evaluating the ability of the PLR test to predict a significant increase in CO, cardiac index, stroke volume compared to that induced by a subsequent fluid infusion.

Results : 21 studies were included in the meta-analysis (991 adult patients, 995fluid challenges) that reported the ability of the PLR to predict fluid responsiveness.

Receiver operating characteristics curve for the prediction of fluid responsiveness by the effects of passive leg raising on cardiac output or surrogates.



LIMITATIONS:The heterogeneity of the included studies represents a limitation of the meta-analysis.A further limitation of this study is that the included studies were mainly conducted in the ICU, the sample size was generally small and that several different methods of measuring of CO were used.
Additional limitations include the fact that studies not reporting sensitivity/specificity were not included, non-full-text studies, studies not in English, and unpublished studies.
Finally, two of the authors (X.M. and J.L.T.) were the authors of a large number of the studies included in the meta-analysis.

The Use of Very Low Concentrations of High-sensitivity Troponin T to Rule Out Acute Myocardial Infarction Using a Single Blood Test Richard Body, Christian Mueller, Evangelos Giannitsis, Michael Christ, Jorge Ordonez-Llanos et all ACADEMIC EMERGENCY MEDICINE 2016;23:1004–1013.

Problematic : serial troponin dosing remains necessary before the diagnosis of AMI can safely be excluded. This causes anxious waiting for patients, contributes to the growing problem of overcrowding in the emergency, and entails a financial cost.

Study objective: Determine whether hs-cTnT concentrations measured at the time of arrival in the ED can safely exclude AMI using cutoffs below the 99th percentile, when used either alone or in combination with ECG findings.

Methods: a prospective diagnostic cohort study including patients with suspected cardiac chest pain within 6 hours of peak symptoms. The primary outcome, prevalent AMI, was adjudicated based on sensitive troponin I levels. Major adverse cardiac events (MACE) including AMI, death, or rehospitalization for acute coronary syndrome with coronary revascularization were determined after 30 days.

Results :

Diagnostic Accuracy of Each Early Rule-out Strategy Evaluated for the Diagnosis of AMI

Strategy to Exclude AMI	Number (%) of Patients With AMI Excluded	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	LR+ (95% CI)	LR– (95% CI)
Initial hs-cTnT < 3 ng/L (LoB)	419 (32.7)	98.6 (95.9–99.7)	38.9 (36.0–41.9)	24.3 (21.5–27.3)	99.3 (97.9–99.9)	1.61 (1.53–1.70)	0.04 (0.01–0.11)
Initial hs-cTnT < 5 ng/L (LoD)	560 (43.7)	98.1 (95.3–99.5)	52.0 (49.0–55.0)	29.0 (25.1–32.4)	99.3 (98.2–99.8)	2.04 (1.92–2.18)	0.04 (0.01–0.10)
Initial hs-cTnT < 14 ng/L (99th percentile)	895 (69.8)	88.7 (83.7–92.7)	81.5 (79.0–83.8)	43.8 (43.8–54.0)	97.3 (96.0–98.3)	4.79 (4.19–5.48)	0.14 (0.09–0.20)
Initial hs-cTnT < 3ng/L (LoB) and no ECG ischemia*	350 (27.3)	99.5 (97.4–100.0)	32.7 (29.8–35.6)	21.8 (20.1–25.6)	99.7 (98.4–100.0)	1.48 (1.42–1.54)	0.01 (0.00–0.10)
Initial hs-cTnT < 5 ng/L (LoD) and no ECG ischemia*	471 (36.7)	99.1 (96.7–99.9)	43.9 (40.9–46.9)	26.0 (23.0–29.2)	99.6 (98.5–100.0)	1.76 (1.67–1.86)	0.02 (0.01–0.09)
Initial hs-cTnT < 14 ng/L (99th percentile) and no ECG ischemia*	694 (54.1)	94.8 (91.0–97.4)	63.9 (60.9–66.8)	34.4 (30.5–38.4)	98.4 (97.2–99.2)	2.63 (2.41–2.86)	0.08 (0.05–0.14)

AMI = acute myocardial infarction; ECG = electrocardiogram; hs-cTnT = high-sensitivity cardiac troponin T; LoB = limit of blank; LoD = limit of detection; LR+ = positive likelihood ratio; LR– = negative likelihood ratio; NPV = negative predictive value; PPV = positive predictive value.
*Patients were classified as having no ECG ischemia when the initial ECG was evaluable and did not show ST-segment elevation or depression, T-wave inversion, left bundle branch block, or a paced rhythm.

LIMITATIONS: The study is observational in nature.

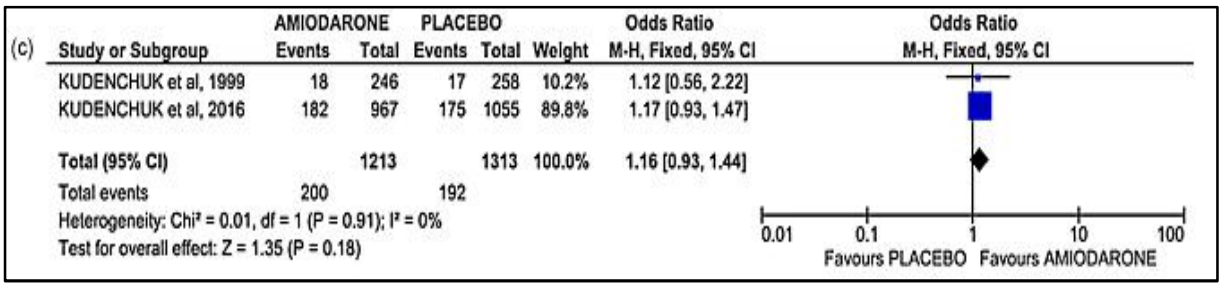
Amiodarone or lidocaine for cardiac arrest: A systematic review and meta-analysis. F. Sanfilippo a,*, C. Corredor b, C. Santonocito a, G. Panarello a, A. Arcadipane a, G. Ristagno c,d, T. Pellis d,eResuscitation 107 (2016) 31–37

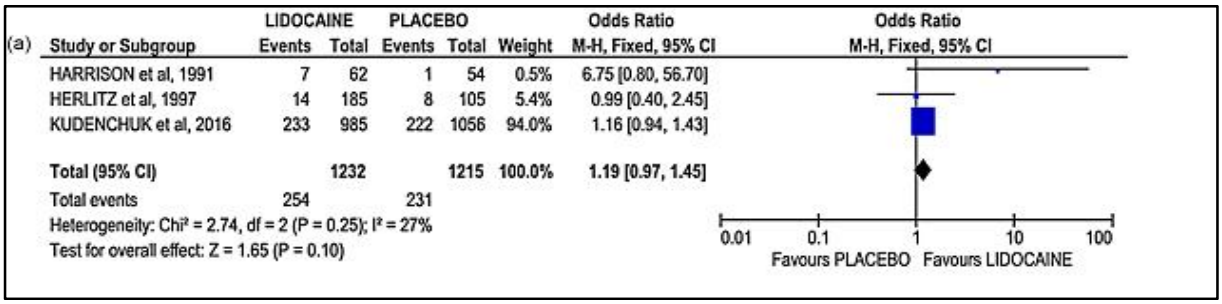
Problematic: Guidelines for treatment of out-of-hospital cardiac arrest (OOH-CA) with shockable rhythm recommend amiodarone, while lidocaine may be used if amiodarone is not available. Recent underpowered evidence suggests that amiodarone, lidocaine or placebo are equivalent with respect to survival at hospital discharge.

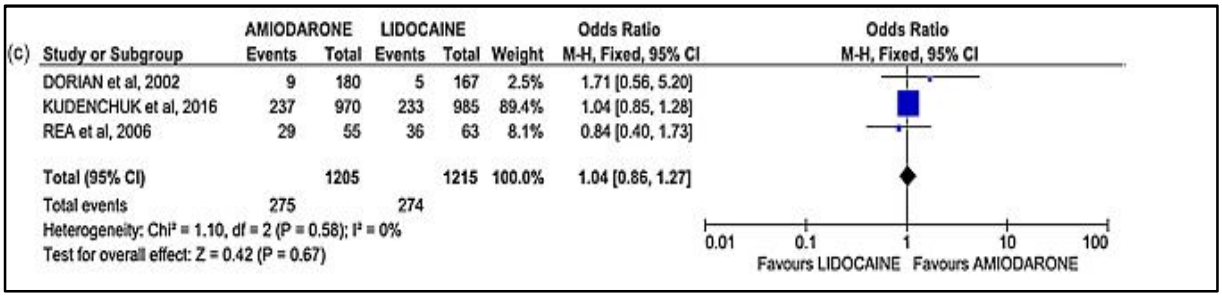
Study objective: evaluate the efficacy of amiodarone versus lidocaine versus placebo.

Methods: a systematic review and meta-analysis including studies published in PubMed and EMBASE databases from inception until May 15th, 2016. (7 studies). The primary outcomes were survival at hospital admission and discharge in out-of-hospital cardiac arrest OOH-CA

Results: A total of seven findings were included in the metanalysis (three RCTs, 4 non-RCTs).







LIMITATIONS:the studies included are largely different in several aspects. These studies, in fact, reported pooled data from patients who presented differences in the setting of collapse, rate of witnessed events and bystander-initiated CPR, resuscitative protocols employed, that varied based on concurrent guidelines, with different shock protocols and time to drug administration.

Delivering safe and effective analgesia for management of renal colic in the emergency department: a double-blind, multigroup, randomised controlled trial. Sameer A Pathan, Biswadev Mitra, Lahn D Straney, Muhammad Shuaib Afzal, Shahzad Anjum, Dharmesh Shukla, Kostantinos Morley, et all. Lancet 2016; 387: 1999–2007

Problematic: The excruciating pain of patients with renal colic requires effective analgesia to be administered in the shortest possible time. Trials comparing intramuscular non-steroidal anti-inflammatory drugs with intravenous opioids or paracetamol have been inconclusive.

Study objective: the aim of the study is to develop definitive evidence regarding the choice of initial analgesia and the route of administration in patients with renal colic in the emergency department.

Methods: a double-blind, randomised controlled trial with three treatment groups : diclofenac (75 mg/3 mL intramuscular), morphine (0·1 mg/kg intravenous), or paracetamol (1 g/100 mL intravenous)
Inclusion criteria : patients aged 18 years or older and younger than 65 years who presented with renal colic of intensity on a Numerical pain Rating Scale (NRS 0 to 10)21 of 4 or moreThe primary outcome was the proportion of participants achieving at least a 50% reduction in initial pain score at 30 min after analgesia,

Results:

	Diclofenac (n=547)	Paracetamol (n=548)	Morphine (n=549)	p value
Median pain scores				
NRS-0	8 (7–10)	8 (7–10)	8 (7–10)	0·1689
NRS-30	3 (2–5)	3 (2–5)	4 (2–5)	0·0049
NRS-60	0 (0–2)	1 (0–3)	1 (0–4)	0·0001
NRS-90	0 (0–1)	0 (0–2)	0 (0–2)	0·0001
Time to NRS score ≤2 (min)	60 (30–60)	60 (30–90)	60 (30–90)	0·0008
Primary outcome				
Reduction in initial pain by ≥50%, at 30 min	371 (68%)	364 (66%)	335 (61%)	0·041
OR (95% CI); p value	1·35 (1·05–1·73); 0·0187	1·26 (0·99–1·62); 0·0629	1	..
Secondary outcomes				
NRS-30	3·3 (2·3)	3·3 (2·4)	3·8 (2·6)	0·0049
Reduction by NRS score ≥3, at 30 min	448 (82%)	448 (82%)	429 (78%)	0·190
Rescue analgesia required	63 (12%)	111 (20%)	126 (23%)	<0·0001
Persistent pain at 60 min (NRS >2)	131 (24%)	162 (30%)	207 (38%)	<0·0001
Acute adverse events	7 (1%)	7 (1%)	19 (3%)	0·012

Data are median (IQR), n (%), or mean (SD). The number with the NRS score indicates the time the NRS score was measured at—eg, NRS-30 is the NRS score measured at 30 min. NRS=Numerical pain Rating Scale.

Table 2: **Primary and secondary outcomes in the intention-to-treat population**

LIMITATIONS:This study has some limitations, including enrolment of patients from a single centre who were mostly young and healthy.The dose of morphine was chosen as 0·1 mg/kg on the basis of participant weight. A higherdose might have been more effective, but the dose chosen is the recommended single initial dose for adult participants in severe pain, and higher doses might be associated with higher rates of adverse events.

The Effects of Low-Dose Ketamine on AcutePain in an Emergency Setting: A Systematic Review and Meta-Analysis

Eun Nam Lee, Jae Hoon Lee. PLOS ONE 2016.

Problematic: Currently ketamine is not used often as an analgesic in the emergency department (ED). Nonetheless, it can increase the efficiency of opioids and decrease their side effects.

Study objective: The purpose of this study was to evaluate whether low-dose ketamine in the ED provides better analgesia with fewer adverse effects.

Methods:a systematic review and meta-analysis : 6 studies fulfill the inclusion criteria form the basis of this review.The primary outcome measure was the acute pain score 30 minutes after the injection of ketamine, placebo, or opioids. The secondary outcome measures were the cumulative frequencies of all the adverse events described in the studies

Results:

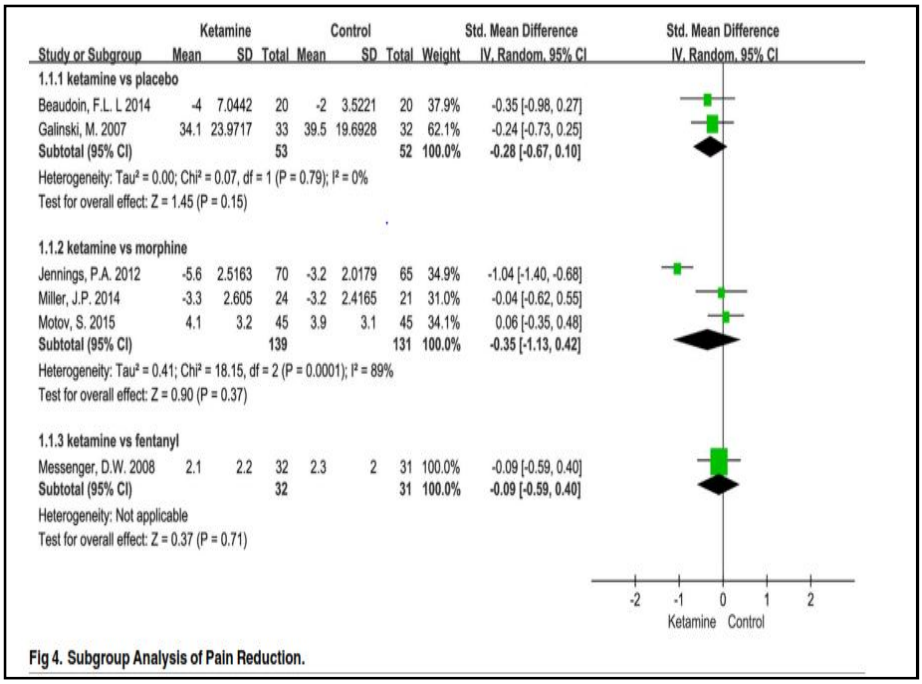
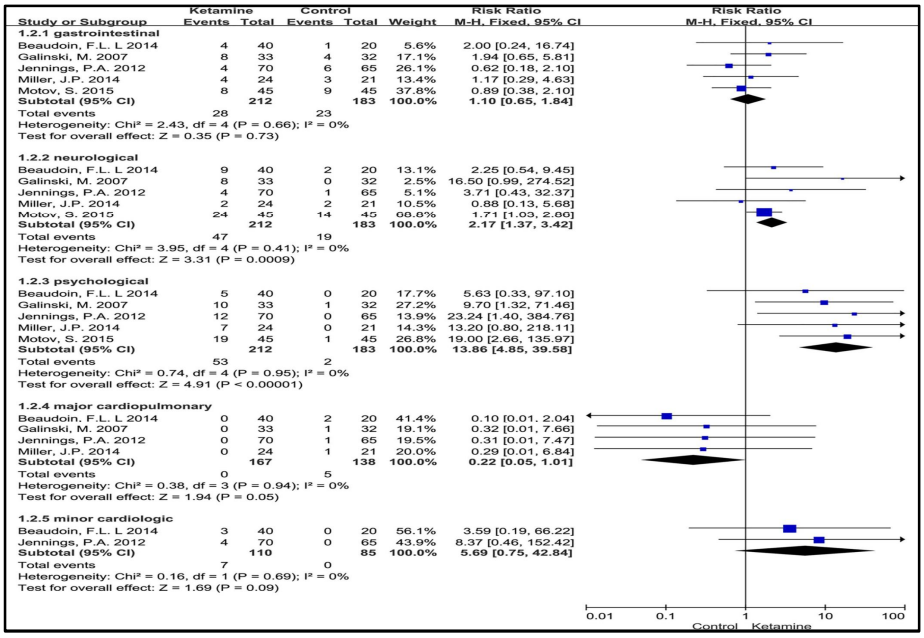


Fig 4. Subgroup Analysis of Pain Reduction.



LIMITATIONS: Heterogeneity among the studies was significant.

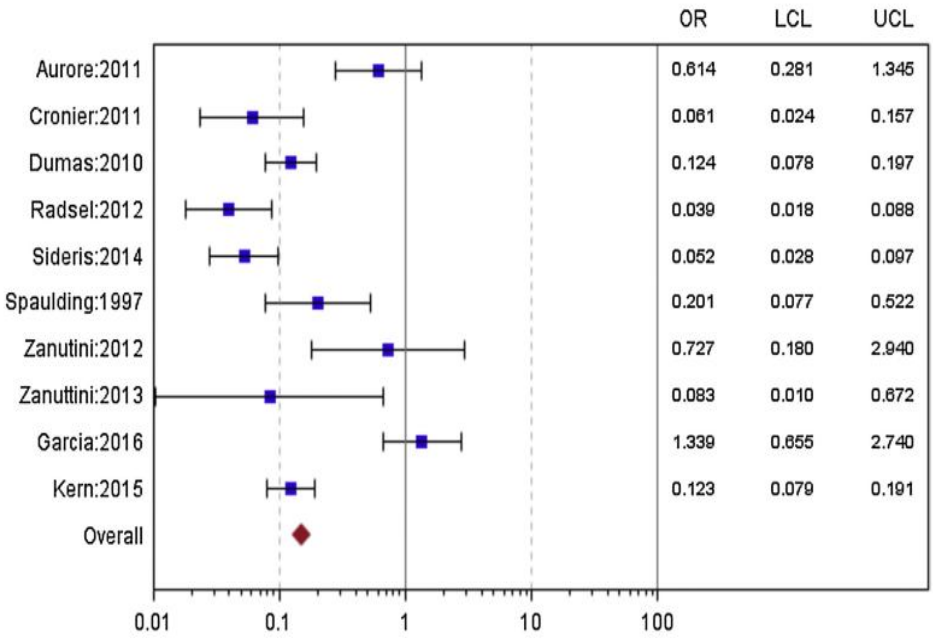
Patients withoutST elevation after return of spontaneous circulation may benefit from emergent percutaneous intervention : A systematic review and meta-analysis MichaelG.Millin,AngelaC.Comer,JoseV.Nable,PeterV.Johstet al. Resuscitation September 2016

Problematic: The American Heart Association recommends that post-arrest patients with evidence of ST elevation myocardial infarction (STEMI) on electrocardiogram (ECG) be emergently taken to the catheterization lab for percutaneous coronary intervention (PCI). However, recommendations regarding the utility of emergent PCI for patients without ST elevation are less specific.

Study objective: This review examined the literature on the utility of PCI in post-arrest patients without ST elevation compared to patients with STEMI.

Methods: A systematic review of the English language literature was performed for all years to March 1, 2015. Primary end point: presence of an expandable lesion.

Results: 6 studies are included in this study.



Limitations :Heterogeneity among the studies.

Therapeutic hypothermia after cardiac arrest: A systematic review/meta-analysis exploring the impact of expanded criteria and targeted temperature. Aldo L.Schenone. Resuscitation,2016.

Problematic: Therapeutic hypothermia (TH) is mainly indicated in patients with post-cardiac arrest who have a shockable initial rhythm. However, the benefit of this therapy has not been demonstrated in any type of cardiac arrest.

Study objective: The purpose of this study was to assess the performance of TH after OHCA on hospital mortality and good neurological outcome at hospital discharge.

Methods: a meta-analysis including 11 studies (3RTCs and 8 cohort studies).

Results:

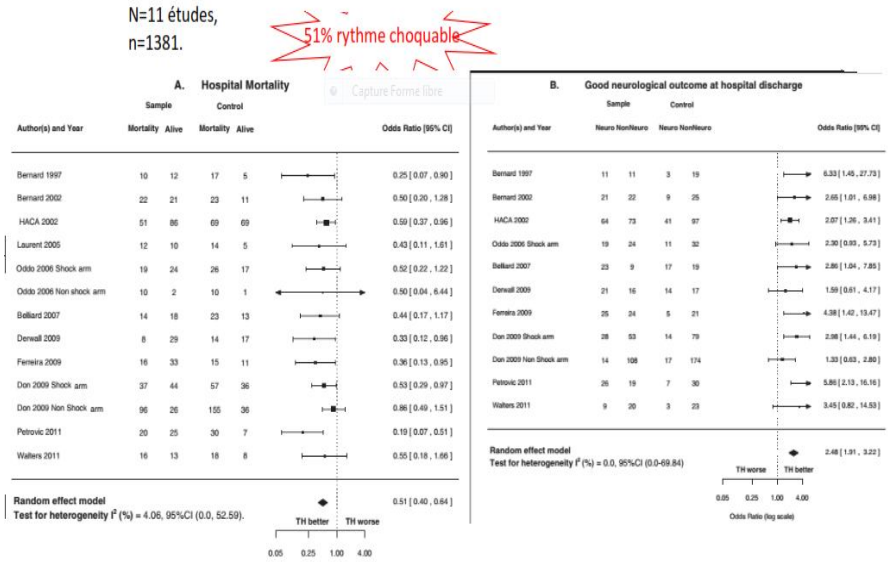


Fig. 2. Impact of expanded use of TH after OHCA on mortality and neurological outcomes at hospital discharge.(A) Results of 11 studies (3 RCTs and 8 cohort studies) on the impact of expanded use of TH after OHCA on hospital mortality. Summary OR = 0.51

Limitations: The addition of observational cohort studies leads to potential for a higher risk of bias. The study enrollment was restricted to only those studies reporting achieved temperatures during cooling, which might have led to selection bias.

Intensive Blood-Pressure Lowering in Patients with Acute Cerebral Hemorrhage. Adnan I. Qureshi. N Engl J Med 2016.

Problematic: Limited data are available to guide the choice of a target for the systolic blood-pressure level when treating acute hypertensive response in patients with intracerebral hemorrhage.

Study objective: The aim of this study is to determine the effectiveness of rapidly lowering the level of systolic blood pressure during cerebral hemorrhage in patients in a window of earlier time after onset of symptoms.

Methods: a randomized, multicenter, twogroup, open-label trial to determine the relative efficacy of intensive versus standard antihypertensive treatment that was initiated within 4.5 hours after symptom onset and continued for the next 24 hours in patients with spontaneous supratentorial intracerebral hemorrhage. Inclusion criteria: participants with intracerebral hemorrhage (volume, <60 cm3) and a Glasgow Coma Scale (GCS) score of 5 or more (on a scale from 3 to 15, with lower scores indicating worse condition). The primary outcome was death or disability (modified Rankin scale score of 4 to 6, on a scale ranging from 0 [no symptoms] to 6 [death]) at 3 months after randomization, as ascertained by an investigator who was unaware of the treatment assignments.

Results: Among 1000 participants with a mean (±SD) systolic blood pressure of 200.6±27.0 mm Hg at baseline, 500 were assigned to intensive treatment and 500 to standard treatment.

Table 2. Primary, Secondary, and Safety Outcomes, According to Treatment Group.*

Outcome	Intensive Treatment (N=500)	Standard Treatment (N=500)	Unadjusted Analysis		Adjusted Analysis†	
			Relative Risk or Beta Estimate (95% CI)	P Value	Relative Risk or Beta Estimate (95% CI)	P Value
Primary outcome: death or disability — no./total no. (%)‡	186/481 (38.7)	181/480 (37.7)	1.02 (0.83 to 1.25)	0.84	1.04 (0.85 to 1.27)	0.72
Hematoma expansion — no./total no. (%)§	85/450 (18.9)	104/426 (24.4)	0.78 (0.59 to 1.04)	0.09	0.78 (0.58 to 1.03)	0.08
Neurologic deterioration within 24 hr — no. (%)¶	55 (11.0)	40 (8.0)	1.38 (0.92 to 2.07)	0.13	1.39 (0.92 to 2.09)	0.11
Treatment-related serious adverse event within 72 hr — no. (%)‖	8 (1.6)	6 (1.2)	1.33 (0.46 to 3.84)	0.59	1.37 (0.47 to 3.95)	0.56
Any serious adverse event within 3 mo — no. (%)	128 (25.6)	100 (20.0)	1.28 (0.99 to 1.66)	0.06	1.30 (1.00 to 1.69)	0.05
Hypotension within 72 hr — no. (%)	6 (1.2)	3 (0.6)	2.00 (0.50 to 8.00)	0.33	1.96 (0.49 to 7.87)	0.34
Death — no. (%)	33 (6.6)	34 (6.8)	0.97 (0.60 to 1.57)	0.90	0.99 (0.61 to 1.60)	0.97
EQ-5D utility index score**††			−0.01 (−0.05 to 0.02)	0.47	−0.02 (−0.05 to 0.02)	0.29
Median	0.7	0.7				
Range	−0.1 to 1.0	0 to 1.0				
EQ-5D visual-analogue scale score**‡‡			−1.14 (−5.28 to 2.99)	0.59	−1.32 (−5.25 to 2.60)	0.51
Median	62.5	70				
Range	0 to 100	0 to 100				

Limitations: Primary treatment failure was seen in 12 % of the participants within 2 hour and in 15% of the participants within 24h after randomization.

Immediate total-body CT scanning versus conventional imaging and selective CT scanning in patients with severe trauma(REACT-2): a randomised controlled trial.The Lancet 2016

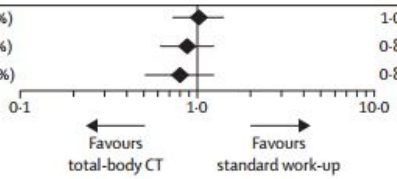
Problematic:Published work suggests a survival benefit for patients with trauma who undergo total-body CT scanning during the initial trauma assessment; however, level 1 evidence is absent.

Study objective: to aim of study is to examine the eff ect of immediate total-body CT scanning as part of the primary assessment of patients with severe trauma on in-hospital mortality, and compared it with that of the standard work-up of conventional imaging supplemented with selective CT scanning.

Methods: an international, multicentre, randomised controlled trial. Patients aged 18 years or older with trauma with compromised vital parameters, clinical suspicion of life-threatening injuries, or severe injury were randomly assigned (1:1) by ALEA randomisation to immediate total-body CT scanning or to a standard work-up with conventional imaging supplemented with selective CT scanning.The primary endpoint was in-hospital mortality

Results: 1403 patients were randomly assigned: 702 to total-body CT scanning and 701 to standard work-up. 203 patients were excluded after random allocation.

Mortality	Total-body CT *vs* standard work-up	Total-body CT n (%)	Standard work-up n (%)	Odds ratio (95% CI)	p value
All patients	541 *vs* 542	86 (16%)	85 (16%)	1·02 (0·73–1·41)	0·92
Patients with polytrauma	362 *vs* 331	81 (22%)	82 (25%)	0·88 (0·62–1·24)	0·46
Patients with traumatic brain injury	178 *vs* 151	68 (38%)	66 (44%)	0·80 (0·51–1·24)	0·31



Radiation exposure (mSv)‡					
In the trauma resuscitation room					
All patients, ITT	520	20·9 (20·6–20·9)	531	20·6 (9·9–22·1)	<0·0001†
Patients with polytrauma	346	20·9 (20·1–20·9)	323	20·6 (17·6–22·7)	0·27†
Patients with TBI	172	20·9 (20·0–20·9)	146	20·6 (10·5–22·4)	0·040†
Total during hospital stay					
All patients, ITT	520	21·0 (20·9–25·2)	531	20·6 (11·8–27·6)	<0·0001†
Patients with polytrauma	346	22·3 (20·7–26·5)	323	22·5 (20·0–33·1)	0·77†
Patients with TBI	172	22·7 (20·6–26·4)	146	21·4 (15·1–29·1)	0·068†
Hospital outcomes					
Hospital costs (€)	479	24 967 (95% CI 21 880–28 752)	488	26 995 (95% CI 23 326–30 908)	0·44
Complications	541	129 (24%)	540	124 (23%)	0·73*
Blood transfusions in hospital§	540	147 (27%)	542	150 (28%)	0·91*
Duration of stay¶					
Days in intensive care unit	286	3 (1–8)	295	3 (1–8)	0·83†
Ventilation days	286	2 (1–5)	295	1 (1–6)	0·78†
Readmission within 6 months‖	395	67 (17%)	412	44 (11%)	0·01*
Serious adverse events (safety endpoint)**	541	3 (1%)	542	1 (<1%)	0·37††

Limitations:46% of patients in the standard work-up group underwent sequential segmental CT scans of all body regions, comprising a total-body CT scan in the end. This high percentage might introduce bias in the interpretation.The number of total-body CT scans in the standard work-up group might have been higher than in daily practice because trauma team members became more experienced during the course of the trial.A common limitation in trauma care is the unmasked randomisation procedure.