EAGLES 2013
Most Important EMS Articles 2013

Corey M. Slovis, M.D.
Vanderbilt University Medical Center
Metro Nashville Fire Department
Nashville International Airport
Nashville, TN
CPR 2013
Compression Rate
Mean compression rate 112 (± 19) min

ROSC peaked at 125

< 80/min or > 140/min significantly decreased survival
BCLS/ACLS 2013
New, Changed, Modified

- Atropine gone in AS and PEA
- Epi’s role continues to decline
- Compression Fraction ≥ 80%
- Rate at 100 -120
- Not faster or slower
BCLS/ACLS 2013
New, Changed, Modified

• Switch compressors Q 1-2 min
• Depress 2 inches in adults
• Survival ↑ by 10%/0.2 inch ↑
• No ↑ if above 2 inches
• Metronome or light works
BCLS/ACLS 2013
New, Changed, Modified

- Interruptions cost 5 - 10 compressions
- Perishock pauses must be < 20 seconds
- Mechanical CPR benefits stay controversial
- ITD still controversial too
- Compression – decompression + ITD works
BCLS/ACLS 2013
New, Changed, Modified

• SGAs may be better than ETT
• SGAs may impair carotid blood flow
• Take all VF/VT arrests to lab
• TH for all VF/VT comatose pts
• No ST ↑ VF/VT = PCI too!!
The impact of increased chest compression fraction on return of spontaneous circulation for out-of-hospital cardiac arrest patients not in ventricular fibrillation

Christian Vaillancourt\textsuperscript{a,*}, Siobhan Everson-Stewart\textsuperscript{b}, Jim Christenson\textsuperscript{c}, Douglas Andrusiek\textsuperscript{c}, Judy Powell\textsuperscript{b}, Graham Nichol\textsuperscript{b}, Sheldon Cheskes\textsuperscript{d}, Tom P. Aufderheide\textsuperscript{e}, Robert Berg\textsuperscript{f}, Ian G. Stiell\textsuperscript{a}, the Resuscitation Outcomes Consortium Investigators

Resuscitation 2011;82:1501-1507

- 2013 Non-VF patients from ROC
- 64% Asystole, 28% PEA
- Median Compression Rate: 110/min
- ROSC 24.2%
- 2% Survival to D/C
The impact of increased chest compression fraction on return of spontaneous circulation for out-of-hospital cardiac arrest patients not in ventricular fibrillation

Resuscitation 2011;82:1501-1507

- Increasing CCP = Increased ROSC
- Target a CCP of 80%
Compression should be
100-120 / minute
Not faster, Not slower
Compression Depth
What is the role of chest compression depth during out-of-hospital cardiac arrest resuscitation?*

Ian G. Stiell, MD; Siobhan P. Brown; James Christenson; Sheldon Cheskes; Graham Nichol; Judy Powell; Blair Bigham; Laurie J. Morrison; Jonathan Larsen; Erik Hess; Christian Vaillancourt; Daniel P. Davis; Clifton W. Callaway; the Resuscitation Outcomes Consortium (ROC) Investigators

- Does Depth of Compression affect outcomes from cardiac arrest?
- 1,029 patients from 7 ROC sites
- 2006 – 2009 Data
ACLS Depth of Compression Recommendations

- 2005: 1.5-2 inches (38-50 mm)
- 2010: 2 inches (at least 50mm)
As Rate of CPR Increased,
Depth of Compression Decreased
For each 0.2 inches of increased depth, survival was increased by almost 10% (up to 2 inches total depth).
No increased survival for > 2.0 inches of compressions vs. prior recommendations of 1.5-2.0 inches.
What is the role of chest compression depth during out-of-hospital cardiac arrest resuscitation?*

Ian G. Stiell, MD; Siobhan P. Brown; James Christenson; Sheldon Cheskes; Graham Nichol; Judy Powell; Blair Bigham; Laurie J. Morrison; Jonathan Larsen; Erik Hess; Christian Vaillancourt; Daniel P. Davis; Clifton W. Callaway; the Resuscitation Outcomes Consortium (ROC) Investigators

If Compression 1.5-2.0 Inches

- ROSC Improved by 24%
- 1 Day Survival Improved by 52%
- Survival to Discharge Improved by 91%
CPR Compressions Take Homes

• 1.5-2.0 inches is essential for effective CPR

• Depth may fall as rate goes up (especially above 120)

• We must be vigilant on CPR compression depth

• Need objective measure of depth

• Current Recommendations of > 2 inches may not be based on objective data
Induction of a shorter compression phase is correlated with a deeper chest compression during metronome-guided cardiopulmonary resuscitation: a manikin study

Tae Nyoung Chung,¹ Jinkun Bae,¹ Eui Chung Kim,¹ Yun Kyung Cho,² Je Sung You,³ Sung Wook Choi,¹ Ok Jun Kim¹

ABSTRACT
Objectives Recent studies have shown that there may be an interaction between duty cycle and other factors depth, based on a comparison of the patterns of chest compression between CPR experts and non-experts.¹⁵ Deducing from the results of the

Can a two tone metronome Result in deeper compression?
Compression Depth
120 BPM

Emerg Med J; 2012: in press
Metronomes in CPR
Take Homes

• Use of a light or tone is essential for correct rate

• Two tone may even be better to determine cycle time to maximize depth
Do we quickly tire doing CPR?

Manikin Study 62 students

5 minutes CPR recorded

Participants knew CPR quickly was being monitored
Rescuer Fatigue Results

- 7% decline in depth at 1-2 minutes
- Fatigue subsequently reported at 167 seconds
- No significant change in rate over 5 minutes
Rescuer Fatigue

% Correct

Minutes

53% 46% 42% 40% 38%
Rotating CPR Members
Take Homes

Rotate every 1-2 minutes
Every 1 minute may be best
Airway
Great Review

Authors are two EM Airway Experts

A must read kind of article
EMS Preoxygenation Aids

- CPAP
- Head Elevation 20°- 30°
- Reverse Trendelenburg
- Jaw Thrust / Nasal Trumpet
- Nasal Cannula at 15 L/min
Does ETI benefit patients?

- 1,414 pts, William Beaumont, Michigan
- 1,220 intubated
- 613 VF/VT; 742 non VF/VT
- Retrospective study
Endotracheal intubation significantly decreased survival to discharge in VF/VT patients by about 50% (OR = 0.52)

Intubation increased survival to hospital but not discharge alive in AS and PEA
• Is ETT better or worse than a SGA?

• 10,455 adult OHCA from ROC PRIMED

• 81.2% ETI vs. 18.8% King, Combitube or LMA

• ROSC, 24 hr survival, survival to discharge
Results

• Age, sex, bystander CPR, witnessed, initial rhythm all controlled for in multivariate analysis.

• ETT increased probability of ROSC by 1.78 (95% CI: 1.54 – 2.04)

• ETT increased of 24 hr survival by 1.74 (95% CI: 1.49 – 1.89)
• Do SGA’s impair carotid blood flow?

• Is large balloon in retropharyngeal space deleterious?

• Animal study: pigs in VF with CPR

• ETT vs. King LTD vs. LMA vs. Combitube
SGA’s vs. ETT
Results and Conclusions

- SGA’s significantly decreased carotid blood flow (p < 0.05)
- SGA’s appear to have potential deleterious effects
- An animal model study
- Imperative that human studies occur
We need a prospective multicenter trial before deciding whether ETI or SGA is better.
- 649,359 prehospital cardiac arrests
- Prospective nationwide Japanese Study
- 57% bag valve mask ventilation
- 43% advanced airway (6% ETT, 37% SGA)
- Evaluated which airway “best”
Overall Results

- 6.5% ROSC
- 4.7% 1 month survival
- 2.2% Neurologically good
Neurologically Favorable at 1 Month

JAMA 2013;309:257-266
Multivarient analysis with all possible arrest variables shows advanced airway techniques decrease likelihood for a neurologically intact pt by 55% for ETT and 63% for SGA.

Bag valve mask ventilation appeared more than twice as likely to give favorable neurologic outcomes.
Managing the Airway During Cardiac Arrest

Henry E. Wang, MD, MS
Donald M. Yealy, MD

Endotracheal intubation during cardiac arrest can interfere with mental, tube dislodgement, iatrogenic hypoxia and bradycardia, and frequent need for multiple tube insertion attempts.2,4,6

JAMA 2013;309:285-286

• Authors state we need a well done randomized US trial on out of hospital arrest patients

“Patients with cardiac arrest and the out-of-hospital rescuers who care for them deserve to know what is best”
STEMI 2013
2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: Executive Summary

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Emergency Physicians and Society for Cardiovascular Angiography and Interventions

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• D₂B of ≤ 90 minutes now reads “an ideal of FMC*-to-device time. System goal of ≤ 90 minutes” (1B)

• FMC of 120 minutes or less is new target for patients who arrive at a non-PCI center (1B)

* (FMC = First Medical Contact)
2013 ACC/AHA Guidelines

EMS

- FMC = Paramedic at patient
- 12 Lead performed by EMS (1B)
- EMS should transport to PCI hospital (1B)

EMS is now officially the Beginning of “D_{2}B”…E_{2}B
• Therapeutic hypothermia should be started ASAP for all comatose STEMI patients and out of hospital arrests due to VF or VT (1B)

• Immediate PCI is indicated in all STEMI arrest patients including those who are receiving therapeutic hypothermia (1B)
E2B < 90 min!!
Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

CRASH-2 trial collaborators

Summary
Background Tranexamic acid can reduce bleeding in patients undergoing elective surgery. We assessed the effects of early administration of a short course of tranexamic acid on death, vascular occlusive events, and the receipt of blood

Does TXA work in severe hemorrhage?

20,211 patients with major trauma

10,046 patients got TXA within 8 hours

Hospitals in Africa, Asia, Eastern Europe
30d All Cause Mortality Crash-2

Lancet 2010;376:23-32

Placebo 16% vs TXA 14.5%

p=0.0035
Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

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Summary

Background Tranexamic acid can reduce bleeding in patients undergoing elective surgery. We assessed the effects of early administration of a short course of tranexamic acid on death, vascular occlusive events, and the receipt of blood

Lancet 2011;377:1096-1101

- Reanalyzes prior CRASH-2 data
- 20,211 trauma patients
- Randomized to TXA or placebo
- Administered up to 8 hours post trauma

Does time to TXA matter?
Bleeding Death with TXA vs Placebo

Lancet 2011;377:1096-1101

RR

<1 hr  1-3 hr  3 hr
0.68    0.79    1.44
Avoidable mortality from giving tranexamic acid to bleeding trauma patients: an estimation based on WHO mortality data, a systematic literature review and data from the CRASH-2 trial

Katharine Ker, Junko Kiriya, Pablo Perel, Phil Edwards, Haleema Shakur and Ian Roberts


- Crash-2 showed early TXA reduced mortality from traumatic bleeding
- Could it really affect worldwide mortality?
- Should TXA only be used in third world countries?
TXA Potential Benefits
(if given within 3 hours)


<table>
<thead>
<tr>
<th>Region</th>
<th>n/N</th>
<th>Risk ratio (95% CI)</th>
</tr>
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<tbody>
<tr>
<td>Africa</td>
<td>208/3,927</td>
<td>0.68 (0.52-0.90)</td>
</tr>
<tr>
<td>Asia</td>
<td>196/3,688</td>
<td>0.81 (0.62-1.08)</td>
</tr>
<tr>
<td>Europe, Australia &amp; North America</td>
<td>95/1,960</td>
<td>0.63 (0.42-0.94)</td>
</tr>
<tr>
<td>Central &amp; South America</td>
<td>316/3,909</td>
<td>0.72 (0.58-0.90)</td>
</tr>
<tr>
<td>Overall</td>
<td>815/13,484</td>
<td>0.72 (0.63-0.83)</td>
</tr>
</tbody>
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\[X^2 = 1.445; p = 0.70\]
TXA reduces trauma mortality from bleeding by about 1/3 if given within 3 hours
Current TXA Use

• At the present time both the US and British Armies include TXA in trauma protocol

• UK National Health Service recommends TXA for all major trauma victims

• TXA is now a WHO “Essential Medication”
Authors Conclude

TXA has the potential to save between 112,000-128,000 lives per year worldwide if given within 1-3 hours of trauma
Military Application of Tranexamic Acid in Trauma Emergency Resuscitation (MATTERs) Study

Jonathan J. Morrison, MB ChB, MKCS; Joseph J. Dubose, MD; Todd E. Rasmussen, MD; Mark J. Midwinter, BMedSci, MD, FRCS

**Objectives:** To characterize contemporary use of tranexamic acid (TXA) in combat injury and to assess the effect of its administration on total blood product use, thromboembolic complications, and mortality.

**Results:** The TXA group had lower unadjusted mortality than the no-TXA group (17.4% vs. 32.9%, p = 0.001).

**TXA vs. no-TXA**

**US Troops in Afghanistan**

**All pts required ≥1 unit blood**

**Subgroup got ≥10 units PRBC**

**Retrospective study, 896 pts**
TXA in US Military

Arch Surg 2012;147:113-1141

Mortality %

No TXA
N=603

TXA
N=293

ISS 22.5

ISS 25.2

p = 0.03

23.9%

17.4%
TXA in Massive Transfusion

Arch Surg 2012;147:113-114

No TXA
N=196

TXA
N=125

Mortality %

28.1%

14.4%

p = 0.004
Conclusions
TXA in the Military

- TXA dramatically decreased mortality
- Benefits greatest in those requiring massive transfusion
- TXA increased survival by factor of 7.228 for those requiring massive transfusion
- TXA decreased coagulopathy
• Seems to decrease bleeding deaths acutely
• Need to give within 3 hours of event
• Has potential to save 100,000 + lives
• Role in Level 1 Trauma unclear
Anaphylaxis
Online survey, 3357 NREMTs

98.9 recognized classic case

Evaluated Epi use

Evaluated routes of admin
Only 46.2% said Epi was initial drug in a classic case of a hypotensive, wheezing, tachycardia patient with tingling in his throat & hands, and hives on his chest.
Epinephrine in Anaphylaxis

- An almost equal number (40%) started with Benadryl as started with Epi (46.2%).
- More gave Epi SQ (58.4%) than IM (38.9%).
- 1.7% gave Epi IV!
Anaphylaxis Care
Take Home Points

- One of the most important EMS emergencies
- Half of our paramedics may not give Epi when they should
- More than half of our paramedics give Epi SQ rather than IM
- Too many in EMS (and Medicine) think Benadryl is the first line drug for anaphylaxis
Excellent literature review

407 articles screened; 15 evaluated

TPA is safe and effective

Use 3-4.5 hrs post stroke improves outcome without increasing morbidity
In Summary
Pump hard, deep, fast, perfect

SGA’s may decrease cerebral flow and survival

Bag valve mask must be best

Pre-hospital ECG begins D₂B

Anaphylaxis needs more teaching