5 Most Important EMS Articles

EAGLES 2016

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Metro Nashville Fire Department
Nashville International Airport
Nashville, TN
Valsalva and PSVT
## PSVT Management

### Stable

<table>
<thead>
<tr>
<th>Younger</th>
<th>Older</th>
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<tbody>
<tr>
<td>Valsalva</td>
<td>Valsalva</td>
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<tr>
<td>Carotid massage</td>
<td>--</td>
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<tr>
<td>Both Valsalva and Carotid</td>
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<tr>
<td>Consider ice water</td>
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<tr>
<td>Adenosine 12 mgs IVP</td>
<td>Adenosine 12 mgs IVP</td>
</tr>
</tbody>
</table>
PSVT Management

Stable

- Younger
- Older

Unstable

- Conscious
- Unconscious
Valsalva’s effectiveness in SVT is variable

- Works 17 - 54% of the time
- Usually 10 – 20% effective
- “Usual way” not optimal
- Article discusses way to increase efficacy
Impact of a modified Valsalva manoeuvre in the termination of paroxysmal supraventricular tachycardia

S Walker, P Cutting

ABSTRACT
Paroxysmal supraventricular tachycardia (SVT) is a relatively common problem presented to the emergency department. Most sources advocate the use of vagal manoeuvres as first-line management, including Valsalva manoeuvre. Despite this, there is lack of re-entry tachycardias: atrioventricular nodal re-entry tachycardia and atrioventricular re-entry/reciprocating tachycardia. If the tachycardia involves the atrioventricular node as part of the re-entry circuit, then methods to increase atrioventricular nodal blockade, that is, vagal manoeuvres,

• Response improved from 5.3% to 31.7%
• Sitting up increases sympathetic tone
• Lie patient flat or reverse Trendelenburg
• Bear down maximally
• At least 15 seconds (not 5 seconds)
Can you really make the Valsalva a key therapy in PSVT?
Can lying the patient down and raising their legs 45° for 15 seconds immediately post Valsalva increase its effectiveness?

- 428 Patients with PSVT
- Randomized 1:1 for standard vs. modified
- Sitting vs sitting then lie back with legs raised

Postural modification to the standard Valsalva manoeuvre for emergency treatment of supraventricular tachycardias (REVERT): a randomised controlled trial

Andrew Appelboam, Adam Reuben, Clifford Mann, James Gagg, Paul Ewings, Andrew Barton, Trudie Lobban, Mark Dayer, Jane Vickery, Jonathan Benger, on behalf of the REVERT trial collaborators

Summary

Background The Valsalva manoeuvre is an internationally recommended treatment for supraventricular tachycardia, but cardioversion is rare in practice (5–20%), necessitating the use of other treatments including adenosine, which patients often find unpleasant. We assessed whether a postural modification to the Valsalva manoeuvre could improve its effectiveness.
Lying the patient back and raising their legs 45° maximizes venous return during the relaxation phase of the Valsalva
Modified Valsalva
5 Steps

- Patient sitting on stretcher
- Valsalva for 15 seconds
- Immediately lie patient flat and...lift
- Lift patient’s legs 45° for 15 seconds
- Return to sitting position
Valsalva Effectiveness
(n=214 each group)

Lancet 2015 online August 24

Standard  Lie back, Legs up

15%  47%

p < 0.0001
or = 4.9
Modifying the Valsalva in PSVT

Take Homes

• Great maneuver, free and easy
• No disadvantages
• Highest reported conversion rate
• Takes 15 seconds
• Legs up better than just supine

Practice Changing
The new AHA 2016 Guidelines for ACLS

- 147 references
- 15 writing groups
- All based on 2015 ILCOR topics
Oxygen Use

Use 100% O₂ during CPR

But not necessarily after ROSC
BVM vs SGA vs ETT

- No high quality evidence to favor any
- ETI may decrease compression fraction

“For healthcare providers trained in their use either an SGA or ETT may be used as the initial airway during CPR”
Ventilation Rate

10 breaths per minute (Q 6 seconds) after advanced airway in place
Antiarrhythmic for VF/pVT

- Amiodarone may be considered
- Lidocaine may be considered as alternative
- Magnesium not recommended

“No antiarrhythmic as yet been shown to increase survival or neurologic outcome after cardiac arrest due to VF/pVT”
Vasopressin

- Vasopressin no longer recommended
- Vasopressin + Epinephrine no longer recommended

Vasopressin has been removed from ACLS algorithm
Summary

- Not many changes
- 10 breaths/min (Q 6 secs)
- Vasopressin gone
- Lidocaine back
- Epinephrine Q 3-5 min stays
Handouts

ACEP 2015 Boston

Atrial Fibrillation Update – Don’t Miss a Beat
Handout for a Presentation by Corey Slovis, MD for ACEP 2015 Boston

Cruising the Literature: Cardiology
Handout for a Presentation by Corey Slovis, MD for ACEP 2015 Boston

EMCREG International Symposium

Optimizing Collaboration Handout
CPR
2016
Compared continuous CPR with positive pressure ventilation vs Interrupted CPR with 30:2 compression:breaths

- 23,700 patients
- 8 ROC sites, 114 EMS agencies
- Evaluated survival to discharge
- Evaluated neurologic status of survivors
Methodology

• Methodology centered around 43 “clusters” of EMS agencies. After practice period, each cluster switched methods every 6 months

• 100 compressions/min + 10 breaths/min

  vs

• 30 compressions then 2 breaths within 5 seconds

• CPR efficacy via monitor - defibrillator
Compression Fraction

New Engl J Med 2015;Nov epub

Continuous CPR: 83%
Interrupted CPR: 77%
P < 0.001
Survival to Discharge

New Engl J Med 2015;Nov epub

<table>
<thead>
<tr>
<th>Continuous CPR</th>
<th>Interrupted CPR</th>
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<tr>
<td>9.0%</td>
<td>9.7%</td>
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P = 0.07
CI = (-1.5 – 0.1)
Modified Rankin Score 0 and 0-3

New Engl J Med 2015;Nov epub

Interrupted

Continuous

P = 0.07
Continuous vs Interrupted CPR Comments

- Continuous has a higher compression fraction (83% vs 77%)
- Trend toward Interrupted being better for neurologic outcomes and survival
- More Interrupted CPR patients got to the hospital
Take Homes
CPR: Continuous vs Interrupted

At the present time there is no proof that continuous CPR is better than 30:2
Interrupted compressions for 2 breaths may be preferred
Mobile-Phone Dispatch of Laypersons for CPR in Out-of-Hospital Cardiac Arrest

Mattias Ringh, M.D., Mårten Rosenqvist, M.D., Ph.D., Jacob Hollenberg, M.D., Ph.D.,
Martin Jonsson, B.Sc., David Fredman, R.N., Per Nordberg, M.D.,
Hans Järnbert-Pettersson, Ph.D., Ingela Hasselqvist-Ax, R.N., Gabriel Riva, M.D.,
and Leif Svensson, M.D., Ph.D.

Does a phone alert to those close to a cardiac arrest improve bystander CPR

- 5,989 volunteers CPR trained
- Used phones with GPS
- 667 cardiac arrests
- 911 system sends mobile alerts
This was a blinded study where phone activation to those within 0.3 miles (500 meters) was turned on or off in 1:1 randomized manner.
Bystander CPR

NEJM 2015; 372: 2316-25

P < 0.001
BCLS 2016
Take Homes

- Bystander CPR can double survival
- More than 80% of 30-day survivors will be neurologically intact
- 911 center cell phone activation of CPR providers increases the likelihood of bystander CPR pre EMS arrival
The new AHA 2016 Guidelines for ACLS

- 147 references
- 15 writing groups
- All based on 2015 ILCOR topics
Oxygen Use

Use 100% O\textsubscript{2} during CPR

But not necessarily after ROSC
BVM vs SGA vs ETT

- No high quality evidence to favor any one
- ETI may decrease compression fraction

“For healthcare providers trained in their use either an SGA or ETT may be used as the initial airway during CPR”
Assessment of ETT Placement

Continuous waveform capnography is recommended for placement and monitoring

*If not available then colorimetric, EDD or ultrasound may be used*
Part 7: Adult Advanced Cardiovascular Life Support
2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Mark S. Link, Chair; Lauren C. Berkow; Peter J. Kudenchuk; Henry R. Halperin; Erik P. Hess; Vivek K. Moitra; Robert W. Neumar; Brian J. O’Neil; James H. Paxton; Scott M. Silvers; Roger D. White; Demetris Yannopoulos; Michael W. Donnino

Ventilation Rate

10 breaths per minute (Q 6 seconds) after advanced airway in place
Antiarrhythmic for VF/pVT

- Amiodarone may be considered
- Lidocaine may be considered as alternative
- Magnesium not recommended

“No antiarrhythmic as yet been shown to increase survival or neurologic outcome after cardiac arrest due to VF/pVT”
Beta Blockers

- Use not addressed during VF/pVT
- “Inadequate evidence” to support post CPR use
- May be considered
- Not enough evidence to be for or against lidocaine or beta blockers s/p VF/pVT
Vasopressin

- Vasopressin + Epinephrine no longer recommended
- Vasopressin no longer recommended

Vasopressin has been removed from ACLS algorithm
Epinephrine Use

Standard dose epinephrine (1 mg Q 3-5 min) may be reasonable for patients with cardiac arrest (class 11b)

- Early administration may improve ROSC and neurologic outcomes – later administration may decrease both
Steroids

- There is no recommendation for or against steroids for in-hospital cardiac arrest
- Use of steroids in out-of-hospital arrests are “of uncertain benefit”
How important is PCI s/p out-of-hospital cardiac arrest?

- 9,762 patients; 1,140 received PCI (11.7%)
- Korean study 2009-2013; propensity matched
- Evaluated survival and neurological outcomes
- Compared shockable vs non-shockable
Survival and Neuro Outcomes
Propensity Matched

Survival to D/C

PCI: 67.5%
No PCI: 60.5%

Favorable neuro (CPC 1-2)

PCI: 45.7%
No PCI: 33.5%

OR = 1.45
OR = 2.21
Shockable Rhythm
Propensity Matched

Survival to D/C
PCI: 76.4%
No PCI: 65.2%
OR = 1.33

Favorable neuro (CPC 1-2)
PCI: 60.4%
No PCI: 38.3%
OR = 2.51

Resuscitation 2015:97;115-21
• PCI significantly improves survival and favorable neurological outcomes

• Favorable neurological improvements seen in all subgroups including non-shockable rhythms and HD and no-HD

• Survival benefits only seen in patients without a history of heart disease
PCI S/P OHCA
Take Homes

• PCI should be actively considered even in patients without HD and/or a non-shockable rhythm

• Note: About 25% had delayed PCI which have been shown to decrease survival and neuro benefits
Is ALS superior to BLS for: major trauma, stroke, AMI and/or Respiratory Failure

- Measured survival and neurological outcome
- 78,000 - 119,000 pts for each complaint
- Data from 2006 – 2011
- Medicare database for survival
- Billing data for BLS vs ALS use
• Propensity matching to adjust for survival
• Measured un-adjusted and adjusted survival
• Used ICD-9 coding for neurologic outcomes
• Not a randomized trial
Major Trauma – 30 Day Survival
ALS vs BLS

Annals Int Med 2015;163:681-90

30 d survival

BLS
89.2

ALS
83.1

Poor neuro outcome

BLS
0.17

ALS
0.43
Respiratory Failure – 30 Day Survival

ALS vs BLS

Annals Int Med 2015;163:681-90

30 d survival

Poor neuro outcome
Acute Stroke – 30 Day Survival

ALS vs BLS

30 d survival

BLS

ALS

84.4

79.3

.51

.21

Poor neuro outcome

Annals Int Med 2015;163:681-90
ALS vs BLS
Patient Characteristics

- ALS younger (2-7 y)
- ALS more males (2-7%)
- ALS less co-morbidities
- ALS W > B except trauma

Annals Int Med 2015;163:681-90
Summary Statistics

ALS vs BLS

- **Trauma:** BLS > ALS by 6.1%
  (95% CI 5.4-6.8)

- **Stroke:** BLS > ALS by 7.0%
  (95% CI 6.7-7.7)

- **Resp Failure:** BLS > ALS by 3.7%
  (95% CI 2.5-4.8)

- **AMI:** ALS > BLS by 1.0%
  (95% CI 0.1-1.4)

*90 Day Results*
Neurological outcomes favored BLS over ALS for all four disease entities
Take Homes

ALS vs BLS

• Another study suggesting “scoop and run” by BLS > advanced on-scene ALS care

• Not a randomized trial

• Results not easily explained away

• ALS must prove its worth long-term
Importance of BCLS
Take Homes

- The more bystander CPR the better
- Can double survival rate
- Low cost, high yield
- AEDs in public locations < $1,000
- Less A and more B in CLS
Non-shockable Rhythm Propensity Matched

Survival to D/C
- PCI: 58.3%
- No PCI: 30.8%

Favorable neuro (CPC 1-2)
- PCI: 30.6%
- No PCI: 8.6%

OR = 3.15
OR = 4.56
Not yet a definitive study as too many variables not well controlled for: PCI timing, technique, definition of “successful” PCI

Peter Kudenchuk
Do 911 call centers teach CPR over the phone during a cardiac arrest?

- 1,924/3,555 911 call centers
- 51% provided pre-arrival instructions
- 71% provided compression & ventilation instruction
- Only 7% taught compression only

Be sure your 911 center teaches CPR and that it is compression only
DOUBLE SEQUENTIAL DEFIBRILLATION FOR REFRACTORY VENTRICULAR FIBRILLATION: A CASE REPORT
Aurora M. Lybeck, MD, Hawnwan Philip Moy, MD, David K. Tan, MD

ABSTRACT
A 40-year-old male struck his chest against a pole during a basketball game and had sudden out-of-hospital cardiac arrest. After bystander cardiopulmonary resuscitation, fire and emergency medical services personnel provided six defibrillation attempts prior to emergency department arrival. A 7th attempt in the emergency department using a different vector was unsuccessful. On the 8th attempt, using a second de-continued resuscitative efforts, and prepared for transport. At 14:33 the ALS departed the scene, per protocol, and provided 3 more biphasic shocks (200J) en route to the hospital. Upon hospital arrival at 14:43, the patient was noted to be in persistent ventricular fibrillation (VF). The ALS pads were removed and replaced with new pads for the emergency department (ED) defibrillator and a 7th attempt at 160J was admin-

First case report of neurologically intact survival after double sequential defibrillation for refractory VF

• 40 yo, 40 min of VF, 7 shocks
• 8th was dual defibrillation < 1 second apart
• Patient D/C’d 24 d later, neuro intact at 1 yr
Dual Sequential Defibrillation

Take Homes

- Consider after 4-5 unsuccessful shocks
- May provide more even distribution over large area of myocardium
- Two vectors may be better than one
- Longer time of total defibrillation in different directions
- Regardless, one more tool for refractory VF
A Novel Approach to Improve Time to First Shock in Prehospital STEMI Complicated by Ventricular Fibrillation

Maxwell Osei-Ampofo, MBChB, MBA, MGCS (EM), MPH, Sheldon Cheskes, MD, CCFP (EM), FCFP, Adam Byers, MDEM, BSc, AEMCA, Ian R. Drennan, ACP BScHK, PhD(c), Jason E. Buick, MSc PCP AEMCA, and P. Richard Verbeek, MD, FRCPC

Abstract

Lethal cardiac arrhythmias such as ventricular fibrillation and pulseless ventricular tachycardia (VF/pVT) complicate up to 6% of all out-of-hospital STEMIs. Typically, paramedics respond to this by applying defibrillation pads and delivering a shock as soon as possible. A recently introduced

Introduction

Improvements in prehospital ST-elevation myocardial infarction (STEMI) identification through serial electrocardiograms (ECGs),1 as well as STEMI bypass programs that allow paramedics to bypass nearest

Prehospital Emerg Care 2015;Oct Online

- Up to 6% of STEMIs have VF/pVT
- Article recommends “pads-on” for all STEMIs
- Decreased time to shock from 72min to < 30 sec
How dangerous is NTG in Inferior AMI?

- 1,466 STEMIs, 56% received NTG
- Montreal Quebec EMS 2010-2012
- Evaluated BP changes in Inf vs Non-Inf AMIs
- BP < 90 or BP↓ > 30mm Hg s/p NTG
STEMI BP Changes Post NTG

Prehosp Emerg Care 2016;20:76-81

<table>
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<tr>
<th>Condition</th>
<th>Inf</th>
<th>Not-Inf</th>
<th>P=NS</th>
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<tbody>
<tr>
<td>BP &lt; 90</td>
<td>8.2</td>
<td>8.9</td>
<td>P=NS</td>
</tr>
<tr>
<td>BP ↓ &gt; 30mm Hg</td>
<td>23.4</td>
<td>23.9</td>
<td>P=NS</td>
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</table>
Hypotension S/P NTG in AMI

Take Homes

- Common – up to $\frac{1}{4}$ pts of all STEMIs
- Study does not show increased risk in Inferior AMI vs Non-Inferior AMI
- Be careful in all AMI pts who receive NTG
Is the ATLS guideline to decompress tension pneumothorax via the 2nd ICS in the midclavicular line with a 5cm angiocath optimal?

- Meta-analysis of 13 studies
- 6,192 insertions at different anatomic sites
- Measured failure rates at 3 sites
- 2nd ICS MCL; 4/5 ICS MAL, 4/5 ICS AAL
Failure Rate for Needle Thoracostomy

- 2nd ICS Mid Clavicular Line 38%
- 4/5 ICS Mid Axillary Line 31%
- 4/5 ICS Anterior Axillary Line 13%
Tension Pneumothorax
Take Homes

• Failure rates with 5 cm angiocath may be high in ATLS recommended site

• Cadaver studies show 5 cm too short in 4% to 50% of 2\textsuperscript{nd} ICS MCL pts

• 4/5 ICS AAL may be superior

• For sure, if one site fails, go to another
Summary

- Lay down feet up 45° Valsalva
- Vasopressin gone, lidocaine back
- Beware Hypotension s/p NTG
- Phone alerts for CPR coming
- 2nd ICS MCL may not be optimal
Sedating Delirious ED Patients

Ketamine
THE USE OF PREHOSPITAL KETAMINE FOR CONTROL OF AGITATION IN A METROPOLITAN FIREFIGHTER-BASED EMS SYSTEM

David Keseg, MD, Eric Cortez, MD, Douglas Rund, MD, Jeffrey Caterino, MD, MPH

Abstract

Introduction. Prehospital personnel frequently encounter agitated, combative, and intoxicated patients in the field. In recent years, ketamine has been described as an effective sedative agent to treat such patients; however, a paucity of studies assessing its use in this setting has been identified.

Conclusion. We found that in a cohort of patients administered ketamine, paramedics reported a subjective improvement in patient condition. Endotracheal intubation was performed in 8 patients. Key words: prehospital; agitation; ketamine

Prehospital Emerg Care 2015;19:110-15

- Ketamine for excited delirium
- 35 agitated patients from Columbus EMS
- Only admitted by EMS supervisors
- 4mg/kg IM (mean dose=324mg; 100-500mg)
- 2 mg/kg IV
- 8 patients got pre-ketamine sedation / 6 post
Results with Ketamine

- 91% improved (32/35)
- 8.6% no improvement (3/35)
- 40% required additional sedation (benzo or taser)
- 23% (8/35) had to be intubated
Ketamine for Agitation Reasons for Intubation

• Agitation (4)

• Lethargic or Unresponsive (3)

• Cardiac Arrest (1)
Ketamine for Agitated Delirium

Take Homes

- 4mg/kg IM or 2 mg/kg IV
- Not a panacea
- 8/35 intubated = 23% complication rate
- Beware: again significant morbidity
- Use ketamine as a last resort, not first line
How often is epinephrine given to pediatric patients with true anaphylaxis

- 205 allergic reactions, 98 had anaphylaxis
- Epinephrine given to only 54% (53/98) pts with anaphylaxis
Study looked at epinephrine use pre vs post EMS

53 total patients got epi

Epi used pre EMS in 47 of these 53

Thus in only 12% of cases (6 of remaining 51 cases) was epinephrine given by EMS for anaphylaxis!

71% got albuterol and/or benadryl

9% of anaphylaxis patients got nothing
Anaphylaxis

Take Homes

• Study after study shows low epi use

• It is safe and the drug of choice

• Non-use is the #1 cause of death in anaphylaxis

• 0.3 IM; 0.15 IM

• 1cc = 1mg
Seizures
Is midazolam (Versed) really superior to diazepam (Valium) for seizures?

- 577 anti-seizure administration for seizures
- Buffalo, NY EMS System, Adult pts only
- Compared IM and IV dosing for each
- Evaluated first dose effectiveness
- Diazepam: 5mg IV/IM; Versed: 5mg IM, 2.5 mg IV
First Dose Effectiveness for Seizures

Prehospital Emerg Care 2015;19:218-23

<table>
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<tr>
<th>Route</th>
<th>Diazepam</th>
<th>Versed</th>
<th>Diazepam</th>
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<tr>
<td>IM</td>
<td>25%</td>
<td>69%</td>
<td>58%</td>
<td>62%</td>
</tr>
<tr>
<td>IV</td>
<td>69%</td>
<td>P=0.0001</td>
<td>58%</td>
<td>P=NS</td>
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P=NS indicates statistical insignificance.
No – this study reminds us that you should never depend on IM valium – it’s been known for more than a quarter of a century that IM valium is poorly absorbed and should not be given IM.

“This study demonstrates that midazolam is superior to diazepam for seizure control in the prehospital setting”
Anti-seizure Medication

Take Homes

• Valium = Versed = Ativan when given IV
• IM: Ativan or Versed
• IN: Versed
• PR: Valium

Know your drugs and routes!
How does a prehospital ECG affect care in a large urban EMS system?

- 7,768 *** acute AMI *** ECGs
- 2,156 / 7,768 transmitted to base stations
- Evaluated D₂B, PCI activations and E₂B
- Retrospective study
Field activation decreases $D_2B$ but may lead to false activations for non-STEMIs.

28% of STEMI ECGs were transmitted.

PCI lab activated 78% of the time.
ECG Transmission & False Activations
(False activation=no PCI or CABG during hospitalization)
Prehospital ECG
Take Homes

• Cannot use **** Acute MI **** in isolation

• Very high FP rate influenced by “no PCI” not those who were not taken to PCI

• LA EMS system changing how it approaches CCL activation

• Using paramedic overreads, MD direction and patient’s clinical presentation