

ACEP 2019
Cardiology
Cruising the Literature

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Epinephrine

A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest

ABSTRACT

New Engl J Med 2018;379:711-21

What is the role of epinephrine in cardiac arrest?

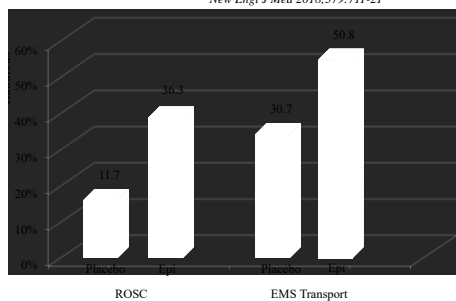
- Large double blind placebo controlled trial
- 8,014 pts, UK EMS, adults ≥ 16 yo
- 4,015 pts, 1 mg epi Q 3-5 min
- 3,999 placebo receiving patients

The study evaluated 30 day outcomes and functional neurologic outcomes at discharge and at 3 months

New Engl J Med 2018;379:711-21

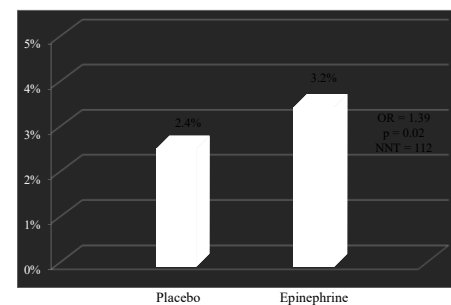
ROSC and EMS Transport

New Engl J Med 2018;379:711-21

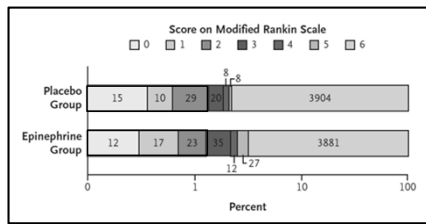


30 Day Survival

New Engl J Med 2018;379:711-21



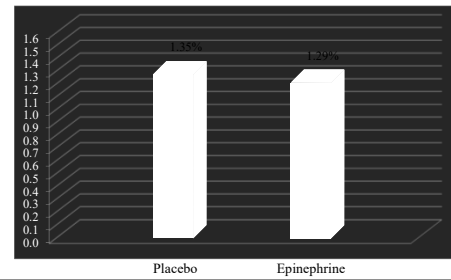
30 Day Neurologic Outcomes



New Engl J Med 2018;379:711-21

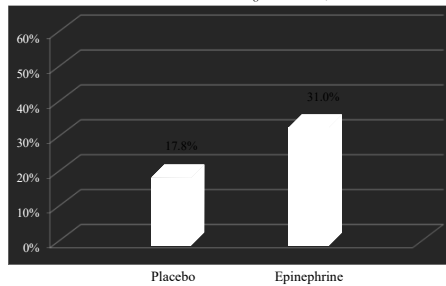
Favorable Neurologic Outcome Rankin 0 - 2

New Engl J Med 2018;379:711-21



Severe Neurologic Disability (30 d) Rankin 4, 5

New Engl J Med 2018;379:711-21



Adjusted Analysis Paramedic Witnessed

New Engl J Med 2018;379:711-21



Favors Placebo

Favors Epinephrine

Adjusted Analysis VF/pVT vs Non Shockable

New Engl J Med 2018;379:711-21

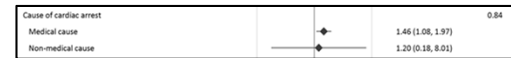


Favors Placebo

Favors Epinephrine

Adjusted Analysis Medical vs Traumatic

New Engl J Med 2018;379:711-21



Favors Placebo

Favors Epinephrine

Positive Result Conclusion


Epinephrine in OOHCA arrest improves ROSC and likelihood for hospital discharge

Neutral Result Conclusion

Epinephrine does not improve neurologically intact survival in OOHCA

Negative Result Conclusion

Epinephrine in OOHCA just increases the likelihood of being neurologically devastated without significantly increasing the number of neurologically intact survivors

ACP | JournalWise  May 29, 2019

Hello Corey Slovis,
In today's email you'll find specialty alerts.

Specialty Alerts: articles of relevance to the specialties you have selected

Review: In out-of-hospital cardiac arrest, controlled studies show epinephrine increases likelihood of ROSC, survival to hospital discharge, and 3-month survival.
Resuscitation
Tagged for: Internal Medicine - patients seen on referral

★★★★☆

The effects of adrenaline in out of hospital cardiac arrest with shockable and non-shockable rhythms: Findings from the PACA and PARAMEDIC-2 randomised controlled trials

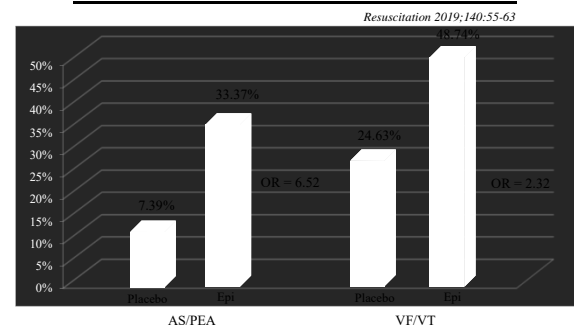
Gavin D. Perkins^{a,b,c}, Claire Kenna^a, Chen Ji^a, Charles D. Deakin^{a,d}, Jerry P. Nolan^{a,e}, Tom Quinn^a, Rachael Fothergill^a, Imogen Gurnson^a, Helen Pocock^a, Nigel Riese^a, Karl Charlton^a, Judith Finn^a, Simon Gates^a, Ranjit Lall^a

Resuscitation 2019;140:55-63

Does epinephrine affect shockable vs non-shockable rhythms differently?

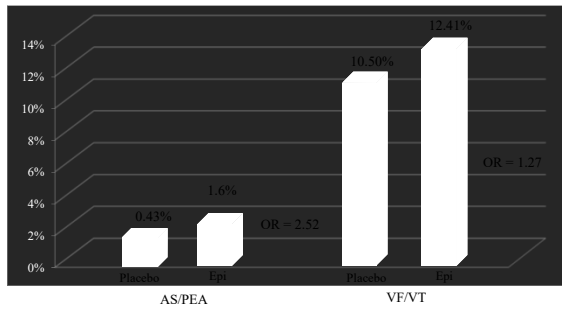
- England's PARAMEDIC-2 + Australian PACA combined
- 1518 VF/VT pts and 6330 AS/PEA pts
- These are the only 2 large randomized epi trials
- Compared 3919 epi pts to 3929 placebo pts
- ROSC, long term survival, and neuro outcomes compared

ROSC



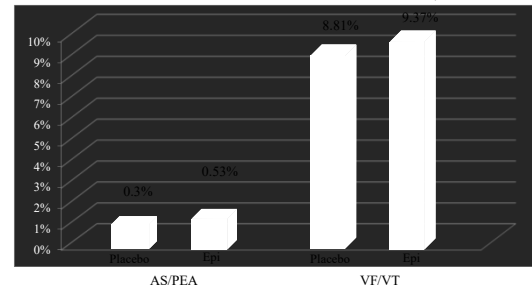
Survival to Discharge

Resuscitation 2019;140:55-63



Favorable Neuro Modified Rankin 0-3

Resuscitation 2019;140:55-63



Poor Neuro Modified Rankin 4-5

Resuscitation 2019;140:55-63

AS/PEA

- 16 neurologically devastated patients with epi
- 4 patients with placebo

VF/VT

- 23 neurologically devastated patients with epi
- 12 patients with placebo

“There was insufficient evidence to suggest that favorable neurological outcomes at discharge differed between treatments arms ($p = 0.288$) and it was not found to differ according to rhythm type ($p = 0.295$)”

Resuscitation 2019;140:55-63

How Effective Are Epinephrine and Vasopressin for Improving Survival Among Patients in Cardiac Arrest?

Michael Gottlieb MD (EBEM Commentator), Vishal K. Jain DO (EBEM Commentator), Yanina A. Purim-Shen-Tov MD, MSc (EBEM Commentator)

Annals Emerg Med 2019 online August

TAKE-HOME MESSAGE

Epinephrine is associated with improved overall survival rates, but no difference noted in favorable neurologic outcomes.

Repeated adrenaline doses and survival from an out-of-hospital cardiac arrest

Rachael T. Fothergill^{a,b,c}, Amber C. Emmerson^a, Rajeshwari Iyer^a, Johanna Lazarus^a, Mark Whitbread^a, Jerry P. Nolan^{a,d,e,f}, Charles D. Deakin^{a,c}, Gavin D. Perkins^{a,h}

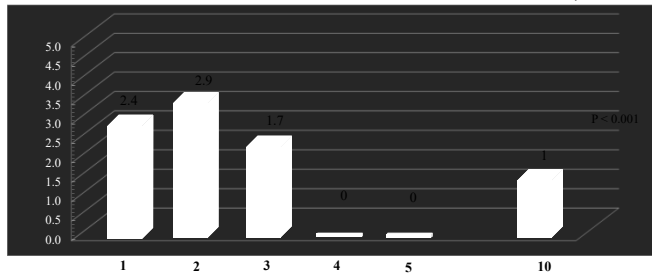
Resuscitation 2019 online May 1

How does number of repeat doses of epinephrine affect survival?

- Is there a number of doses of epinephrine that after which, survival is no longer seen?
- 1 year retrospective review from London Ambulance Service
- 3151 cardiac arrest cases
- Epinephrine administered every 3-5 minutes
- VF/VT pts received epi beginning after 3rd shock

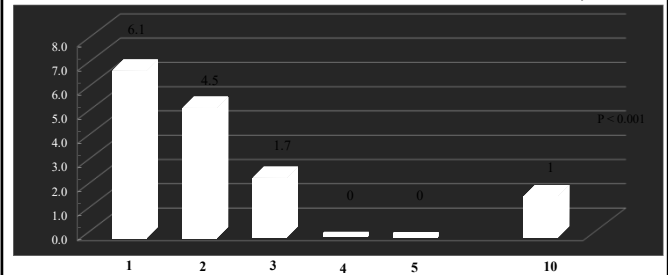
Epinephrine Doses and Survival Asystole

Resuscitation 2019 online May 1



Epinephrine Doses and Survival PEA

Resuscitation 2019 online May 1



Epinephrine and Survival Take Homes

- Survival falls as time of the arrest and epinephrine doses increase
- No one survives after 10 doses
- Almost no one survives after 5 doses
- We need to establish limits on epinephrine doses and use patient history and ETCO_2 also
- No ROSC after 5 doses = TOR?

Epinephrine in Cardiac Arrest Take Homes

- Epinephrine improves ROSC and Survival to Discharge
- Epinephrine effects are much more pronounced in non-shockable rhythms
- Epinephrine does not improve Neurologic Outcomes
- The increase in survival to discharge results in More Neurologically Devastated Survivors
- **Decide: how long, how many epi doses**

Antiarrhythmics in VF and VT



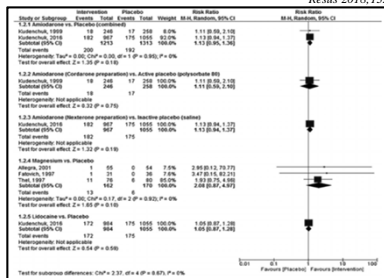
Resus 2018;132:63-72

How effective are antiarrhythmics in VF/pVT arrests?

- 14 randomized trials; 8 observational studies
- 1 additional pediatric observational study
- 1,213 pts studied with Amiodarone vs placebo
- 987 pts Amiodarone vs Lidocaine
- 19,517 pts Lidocaine vs placebo

Antiarrhythmics vs Placebo Amiodarone, Lidocaine, Magnesium

Resus 2018;132:63-72



Do Antiarrhythmics Make A Difference?

Resus 2018; 132: 63-72

No proven benefits of antiarrhythmic therapy in cardiac arrest due to shockable rhythms in OHCA when measuring survival to hospital discharge and especially when evaluating favorable neurologic outcomes and long term survival.

Managing VTach

Managing VTach

- Shock
- Valsava
- Lidocaine
- Amiodarone
- Procainamide
- Diltiazem
- Verapamil
- Beta Blockade
- Adenosine

Procainamide Versus Amiodarone for Stable Ventricular Tachycardia

Kylie Neilson MD, Ian deSouza MD

Acad Emerg Med 2019;26:1049-1101

“Brass Tacks Review of Published Evidence”

- Reviews the data of Pharmacologic Reversion
- Only for Hemodynamically stable patients
- Notes this is relatively rare
- Electricity is usual therapy in VT

Amiodarone vs Procainamide

Acad Emerg Med 2019;26:1049-1101

- Reviews and discusses PROCAMIO study
- Amiodarone 5mg/kg over 20 minutes
- Procainamide 10mg/kg over 20 minutes
- 74 patients randomized over 6 years

We need to have a strategy
for refractory VF

What do you do after 3
unsuccessful shocks?

Refractory VFib

- Move pads Ant-Lat ↔ Ant-Post
- Consider Beta Blockade
- Consider Double Sequential Defibrillation (DSD)
- PCI
- ECMO

Procainamide Versus Amiodarone for Stable Ventricular Tachycardia

Kyle Kelson MD, Ian deSouza MD

Acad Emerg Med 2019;26:1049-1101

Procainamide is twice as good as Amiodarone
with ¼ the number of hemodynamic complications

- 67% converted over 40 min vs 38% with Amio ($p=0.026$)
- 9% complication rate vs 41% ($p=0.006$)

*Up to 10% of these pts could have had PSVT
review authors note true answer is "elusive"*

Best therapy for more VT is Shock!

DSD

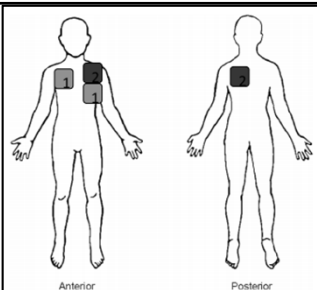


Figure 1. Graphic depiction of pad placement for DSD. The primary set of pads (blue) is placed in the anterolateral position. The second set of pads (red) is placed in the anterior/posterior orientation. DSD = double sequential defibrillation.

Acad Emerg Med 2018;00:1-8

DOUBLE SEQUENTIAL DEFIBRILLATION FOR REFRACTORY VENTRICULAR FIBRILLATION: A CASE REPORT

Aurora M. Lybeck, MD, Hawmwan 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 7 resuscitative attempts, including 3 more biphasic shocks (200J), the patient was transported to the emergency department. Upon arrival, the patient was intubated and received 1 mg of epinephrine. The ALS pads were removed and replaced with new pads for the emergency department. DSD defibrillation was performed with a 200J biphasic shock.

continued resuscitative efforts, and prepared for transport. At 1433 the ALS departed the scene, per protocol, and provided 3 more biphasic shocks (200J) en route to the hospital. Upon hospital arrival at 1443, 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. DSD defibrillation was performed with a 200J biphasic shock.

Prehosp Emerg Care 2015;19:554-7

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

Prehospital Double Sequential Defibrillation: A Matched Case-Control Study

Julian G. Mapp MD, MPH, Alan J. Hans MD, Anthony M. Darrington MD, Elliot M. Ross MD, MPH, Calvin C. Ho MD, MS, David A. Miramontes MD, Stephen A. Harper MD, MPH for ... See all authors ...
First published: 10 December 2018 | <https://doi.org/10.1111/acem.13672>

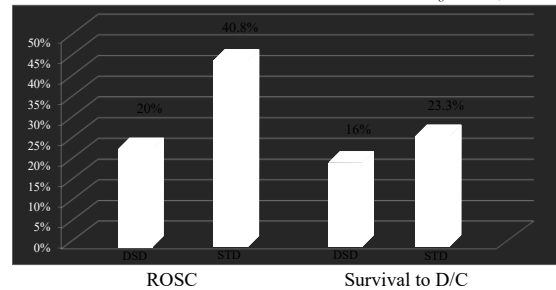
Acad Emerg Med 2018;00:1-8

Is DSD more effective in refractory VF?

- Matched case control comparison
- 205 patients with refractory VF (3 shocks)
- 64 DSD vs 64 Standard defibrillations
- 2 blinded observers; matched same year pts
- Same epi doses, downtimes, witnessed, bystander CPR

DSD vs Standard Defibrillation ROSC and Survival to Discharge

Acad Emerg Med 2018;00:1-8



“Our current protocol of considering DSD after the third conventional defibrillation in out-of-hospital cardiac arrest is ineffective”

Title: Double sequential external defibrillation for refractory ventricular fibrillation out-of-hospital cardiac arrest: a systematic review and meta-analysis

Authors: Ashleigh Delorenzo, Ziad Nehme, James Yates, Stephen Bernard, Karen Smith

Resuscitation 2019;135:124-29

- No increase in ROSC
- No improvement on survival to discharge

Effectiveness of Prehospital Dual Sequential Defibrillation for Refractory Ventricular Fibrillation and Ventricular Tachycardia Cardiac Arrest

Lauren R. Beck, Daniel G. Ostermayer, Joseph N. Ponce, Saranya Srinivasan & Henry E. Wang

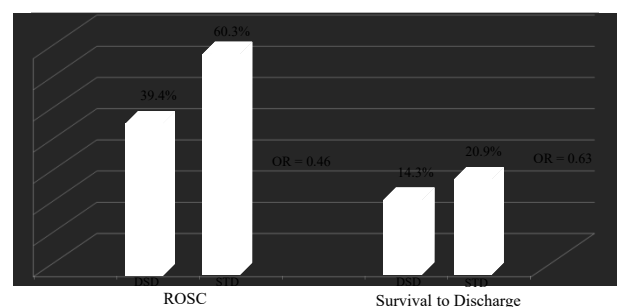
PreHospital Emerg Care 2019 online August

Largest study to date evaluating DSD

- 310 patients, 71 (23%) received DSD
- Houston Fire Department and UT Health
- Evaluated ROSC, hospital admission, discharge

Effectiveness of DSD

PreHospital Emerg Care 2019 online August




DSD 2019 – 2020 Take Homes

No study has shown benefit of DSD and there is a consistent trend of inferiority

Lastly, on Arrhythmias

Cardiac arrhythmias among teenagers using cannabis in the United States

Dr. Kamleshun Ramsdahl¹ * ^{ORCID}, Dr. Jyotsna Jayasudh²

Am J Card 2019 online Oct 10

Does marijuana increase arrhythmias in teenage users?

- Retrospective database, 4000 US hospitals
- 68,793 patients with cannabis use or dependence

Cardiac arrhythmias among teenagers using cannabis in the United States

Dr. Kamleshun Ramsdahl¹ * ^{ORCID}, Dr. Jyotsna Jayasudh²

Am J Card 2019 online Oct 10

	Number of cases (per 100,000 teenagecannabis users)
Ventricular fibrillation	26 (37.8)
Palpitation	96 (139.5)
Atrial flutter	25 (36.3)
Atrial fibrillation	80 (116.3)
Pre-excitation syndrome	57 (82.9)
Long QT	353(513.1)

PCI S/P Cardiac Arrest

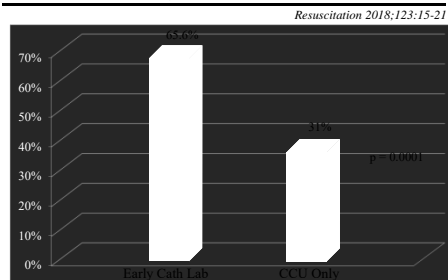


Resuscitation 2018;123:15-21

How valuable is PCI s/p cardiac arrest?

- 599 OHCA registry pts
- UPMC and Mercy Hospitals
- Early vs Later vs no Cath/PCI
- STEMI and no AMI pts

Survival to Discharge Early PCI vs CCU



Early Coronary Angiography Take Homes

- Early CCL essential to find intervenable lesions
- If PCI indicated: survival doubles with good neuro
- Non ST elevation AMI: intervenable lesions about 30% of time
- They, too, greatly benefit
- Be aggressive for high ROI

AVR

Diagnostic value of lead aVR in electrocardiography for identifying acute coronary lesions in patients with out-of-hospital cardiac arrest

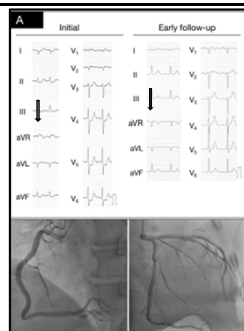
Cheney Yamamoto, M. B., Victor W. Smith, Shuang Wu, Huiyao Han, Yuchao Zhang

Resuscitation 2019 online July

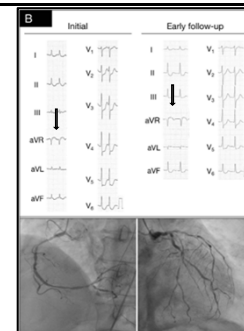
Can AVR assist in determining who has an acute coronary lesion s/p cardiac arrest in patients with no ST elevation?

- Retrospective review 74 pts s/p arrest
- No significant ST elevation
- Initial ST elevation in AVR > 0.5 mm not predictive
- Also evaluated **failure to resolve** AVR elevation in 2 hours

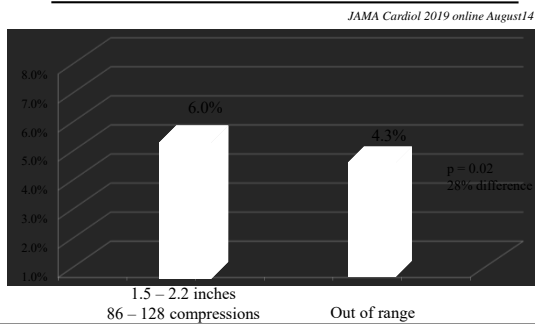
Resolved AVR Elevation



Persistent AVR Elevation



Survival with Optimal BLS



High quality CPR is done less than 50% of the time in some of the best EMS services in the country, with personnel who know they are having their CPR quality monitored

Supervising CPR

Our Job is to Ensure High Quality

- 100 – 120 compressions/min
- 2 inches depth
- Allow full recoil
- Minimize interruptions
- Only 8 – 10 breaths/min

Rotate your compressors every 2 minutes

ACS
NTG in AMI
Aminophylline in HB

Acute Hypotension with NTG

5 Causes

- Right Ventricular AMI
- Relative or Absolute Volume depletion
- Viagra, Levitra, Cialis
- Bezold-Jarisch Reflex
- Drug Sensitivity (valvular dsx, idiopathic)

PREHOSPITAL NITROGLYCERIN SAFETY IN INFERIOR ST ELEVATION MYOCARDIAL INFARCTION

Laurie Robichaud, MDCM, Dave Ross, MD, Marie-Hélène Proulx, FCP, MSc, Sébastien Légaré, FCP, Charlene Vacon, AEMT-CC, PhD, Xiaoping Xue, MSc, Eli Segal, MD, FRCPC, CSPQ, FACEP

ABSTRACT

Patients with inferior ST elevation myocardial infarction (STEMI), associated with right ventricular infarction, are thought to be at higher risk of developing hypotension when administered sublingual NTG. However, previous studies have

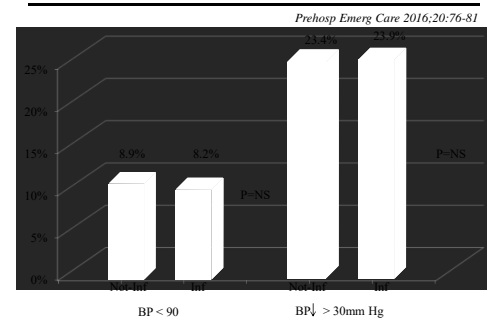
while controlling for various factors. Over a 28-month period, we identified 1,466 STEMI cases. Of those, 821 (56%) received NTG. We excluded 16 cases because of missing data. Hypotension occurred post NTG in 36/846 inferior STEMI and 30/336 non-inferior STEMI, 8.2% vs. 8.9%, $p = 0.73$. A

Prehosp Emerg Care 2016;20:76-81

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



Safety and Effectiveness of Field Nitroglycerin in Patients with Suspected ST Elevation Myocardial Infarction

Robichaud L, Ross D, Proulx M, Légaré S, Vacon C, Xue X, Segal E. Prehosp Emerg Care 2019 online

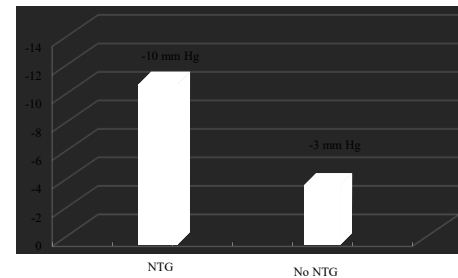
PreHospital Emerg Care 2019 online

How safe is NTG in r/o AMI and does it effectively relieve pain?

- Prospective study, 780 pts, suspected STEMI
- LA County EMS and UCLA
- “Suspected STEMI” by ECG plus paramedic
- 0.4 mg SL NTG, up to 2 more doses
- BP < 100 mm SBP pts excluded

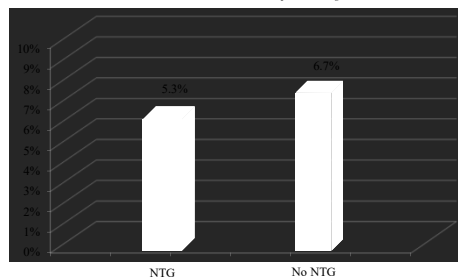
NTG in suspected STEMI Median BP Fall

PreHospital Emerg Care 2019 online



NTG in suspected STEMI Systolic BP fall > 30 mm Hg

PreHospital Emerg Care 2019 online



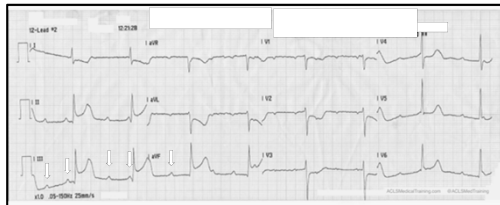
Hypotension from NTG

- Borderline BPs
- Increasing Tachycardia

NTG for r/o AMI

- NTG is safe in AMI
- NTG is safe in Inferior AMI
- NTG relieves Anginal pain in ACS
- *Respect NTG but use it*

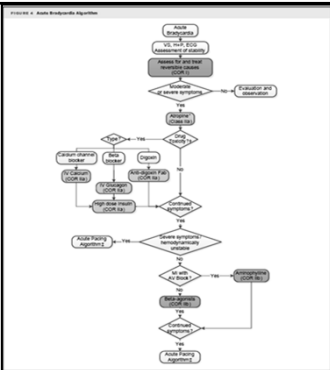
Treating Heart Block and Bradycardia



2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay

JACC 2019 ;140:382-482

- 2019 Guidelines for Bradycardia
- Provider recommendations for BB and CAB
- Now also recommends **bolus** aminophylline
- Excellent Flow Diagrams



Indication	Dosage	Comments
Trigeminal neuralgia (trigeminal or arteriovenous block)		
Amproline	0.5–1 mg/kg IV (may be repeated every 3–5 min to a maximum dose of 3 mg)	
Propofol	0.2–2.0 mg/kg IV (may be repeated every 3–5 min to a maximum dose of 10 mg/kg)	
Desflurane	5–10 mg/kg inhaled, IV, starting at 5 mg/kg and increasing by 5 mg/kg every 10 min (0.5–2.0 mg/kg)	Dosages of >10 mg/kg may cause hypotension and bradycardia
Isosflurane	20–40 mg/kg inhaled, IV, followed 20 min after 10–20 mg/kg, or in addition to 20 mg/kg based on heart rate response (0.5–2.0 mg/kg or 0.5–2.0 mg/kg)	Desflurane is associated with development of ischaemic chest pain
Lignocaine	2–4 mg/kg IV over 0.5–1 h (may be repeated to desired effect) (0.5–2.0 mg/kg, 0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	
Second- or third-degree arteriovenous block associated with acute ischaemia MI		
Amproline	200–500 mg IV	
Carbon monoxide poisoning		
10% calcium chloride	1–2 mg/kg IV (20–40 mg for an adult) (0.2–0.44 mg/kg) (0.5–2.0 mg/kg, 0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	
10% calcium gluconate	2–4 mg/kg IV (20–40 mg for an adult) (0.2–0.44 mg/kg) (0.5–2.0 mg/kg, 0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	
Acute bradycardia or calcium channel blocker overdose		
Atropine	3–10 mg/kg with infusion of 1 mg/kg (0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	
High dose insulin therapy	0.5–1 mg/kg IV over 10 min, followed by 0.5 mg/kg IV (0.5–2.0 mg/kg, 0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	High glucose and potassium levels
Organic overdose		
Organic anticholinergic	Dosage is dependent on amount ingested or known drug concentrations (0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	<ul style="list-style-type: none"> • One oral block approximately 0.5 mg of drug • Minimum time of about 30 min • May be repeated
Post-heart transplant		
Amproline	6 mg/kg IV, 100–200 mg IV of IV fluid over 20–30 min	
Amproline	400 mg/kg IV, 100–200 mg IV of IV fluid over 20–30 min to reduce reflex	<ul style="list-style-type: none"> • Therapeutic serum levels range from 10–20 mg/kg • Usual post-transplant dosages range 400 mg/kg/100 mg/kg
Spinal cord injury		
Amproline	6 mg/kg IV, 100–200 mg IV of IV fluid over 20–30 min (0.5–2.0 mg/kg, 0.5–2.0 mg/kg)	
Amproline	One dose of 0.5 mg/kg/ml injected into 10–20 mg/kg	Effective dosages often result in serum levels below the usual effective range of 10–20 mg/kg

Aminophylline in the treatment of atropine-resistant bradysystole

Timothy J. Mader ^{a,*, A. B.}, Barry Berthelot ^a, Joseph P. Ornato ^a, Jeffrey M. Guterman ^{a, b}
AB Show more
[https://doi.org/10.1016/S0305-9672\(00\)00234-3](https://doi.org/10.1016/S0305-9672(00)00234-3) Get rights and content

Resuscitation 2000;47:105-12

200mg IV bolus during cardiac arrest in patients with Brady-Asystole (“slow” PEA) may be effective

Aminophylline for AV Block in Inferior AMI

Resuscitation 2000;47:105-12

- Review of 5 reports of Aminophylline in Inf AMI with A-V block resistant to atropine
- Patients received 125-300mg
- Worked in 15/19 pts
- All infusions were over 10-20 minutes

Effect of Aminophylline in Patients with Atropine-Resistant Late Advanced Atrioventricular Block during Acute Inferior Myocardial Infarction

Aminogün Ayhan MD, Çela A. Kırmaz MD, * Gülay Özyılmaz MD
Cardiology Department, Faculty of Medicine, Trakya University, Edirne; *Cardiology Division, State Hospital, Edirne, Turkey

Clin Card 1998;21:754-67

- 8 Inferior AMI patients
- All with atropine resistant A-V block
- 240 mg aminophylline over 10 min

Worked in 8/8 pts, many required second dose 1 hr later. Increases AV conduction not native atrial rate

Intravenous loading dosage (dosage is expressed as theophylline)

Adults, Adolescents, and Children

4.6 mg/kg IV loading dose infused over 30 minutes in a patient who has received no theophylline in the previous 24 hours will produce an average peak serum theophylline concentration of 10 mcg/mL (range 6 to 16 mcg/mL); calculate mg/kg dose based on ideal body weight. In patients who have received theophylline within the previous 24 hours, a theophylline serum concentration must be drawn and loading dose, if needed, calculated accordingly. If dosing with theophylline is continued, follow maintenance dosage below.

PDR 2019

Aminophylline in Symptomatic HB

- Give slowly, if at all
- 250 mg over 10 – 20 minutes or longer
- Be careful, follow HR closely

Do NOT follow current AHA/ACC guidelines

Atrial Fibrillation

Early or Delayed Cardioversion in Recent-Onset Atrial Fibrillation

N.A.H.A. Plugmakers, E.A.M.P. Dudink, J.G.L.M. Luermans, J.G. Meeder,
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L.R. Dekker, B.A.B. Essers, J.G.P. Tijssen, I.C. Van Gelder, and H.J.G.M. Crijns,
for the RACE 7 ACWARDS Investigators*

NEJM 2019;380:1499-1508

Can Cardioversion be safely delayed in ED patients with new onset Atrial Fibrillation?

- 427 pts assigned to early vs delayed cardioversion
- Randomized 1:1, multicenter trial
- Atrial Fibrillation of < 36 hours studied
- Evaluated rhythm at 4 weeks
- Also evaluated complications including CVA

Methods

NEJM 2019;380:1499-1508

- 15 Hospitals in the Netherlands
- October 2014 - September 2018
- Only hemodynamically patients
- Rate Control via BB, CAB or Digoxin
- Wait and See pts discharged when HR < 110

Wait and See patients were seen
24 - 48 hours later and if still in
Atrial Fibrillation were sent to the
ED for Cardioversion

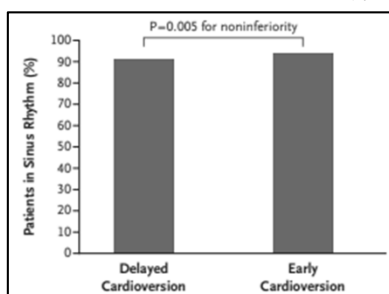
Delayed Cardioversion

NEJM 2019;380:1499-1508

- 69% (150/218) spontaneously converted by 48 hours
- 28% (61) required ED Cardioversion
- 9 by flecainide and 52 electrically

Sinus Rhythm at 4 Weeks

NEJM 2019;380:1499-1508



Complications at 4 weeks

NEJM 2019;380:1499-1508

- 1 Stroke / TIA each in Immediate vs Delayed
- 3 ACS episodes in each group
- Same incidence of AF recurrence in both groups (29% vs 30%)

Rate Controlling AF and Discharging Take Homes

Appears safe and effective as long as stable
patients are discharge rate controlled AND
seen for follow up in 24-48 hours

This I believe will be the new US “standard of care”

Chest Pain r/o ACS
Heart Score
Gestalt
HS Troponin

Can the HEART Score Rule Out Acute Coronary Syndromes in
the Emergency Department?
Nathan M. Finerly MD (EBEM Commentator), Michael B. Waltsch MD (EBEM Commentator)
Show more
<https://doi.org/10.1016/j.annemergmed.2017.12.010> Get rights and content

Annals of Emerg Med 2018;72:668-9

Can you depend on a HEART Score
to provide safe discharge of CP pts
who are “not ACS”?

Patients presenting to the emergency department (ED)
with possible acute coronary syndrome and a
HEART score of 0 to 3 are at low risk for a
subsequent major adverse cardiac event.

Annals of Emerg Med 2018;72:668-9

- Meta-analysis 9 studies, 11,217 pts
- Know the data
- Know HS 2 \neq HS 3

HEART Score Sensitivity

Annals of Emerg Med 2018;72:668-9

0-2 99.4 (96.8 – 99.9)

0-3 96.7 (94.0 – 98.2)

Can a HEART Pathway Improve Safety and
Diagnostic Efficiency for Patients With Chest Pain?

Grant D. Innes, MD, MSc*

Annals Emerg Med 2019;74:181-84

- “For unclear reasons, the HEART score is now the flavor of the day”
- “...it has subjective components...”
- “For me, the future looks like clinical gestalt and high sensitivity troponin testing”

HEART NPV and ACS Prevalence

Ann Emerg Med 2019;74:181-84

<u>Prevalence</u>	<u>NPV</u>
Low (0.4%)	99.8%
Moderate (15.5%)	98.7%

Effect of a HEART Care Pathway on Chest Pain Management Within an Integrated Health System

Adam L. Sharp, MD, MSc; Adam D. Blackner, PhD; Ernest Steen, PhD; Rita Rotherberg, MD; Ming-Suen Lee, MD, PhD; Martin Frenkel, MD, PhD; Shaw Nussair, MD, MPH; Chengyi Zhang, PhD; Anshel Kesselman, PhD; Michael R. Gossel, MD, MSc; Benjamin G. Siro, MD, MSc

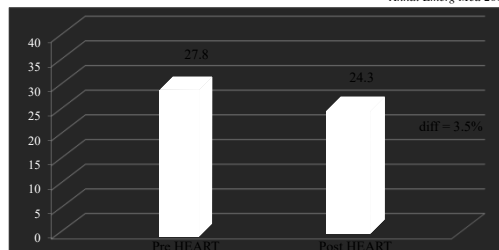
Ann Emerg Med 2019;74:171-80

Does HEART use decrease admissions and/or incidence of stress testing?

- 65,393 pts, 13 Kaiser EDs
- Before-After implementation study
- 30,522 before HEART, 34,871 after
- No differences found in AMI rate
- No differences in mortality

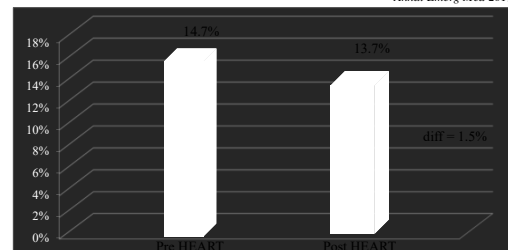
Pre and Post HEART Implementation Stress Testing

Ann Emerg Med 2019;74:171-80



Pre and Post HEART Implementation Hospital Admission Rates

Ann Emerg Med 2019;74:171-80



HEART Take Homes

- HEART is not HEART anymore
- Positive T and Ischemic ECGs = N-STEMI or UA
- Decreases longer workups
- Decreases admissions and stress testing
- Great for early discharge without Stress

HEART Score Risk Stratification of Low-Risk Chest Pain Patients in the Emergency Department: A Systematic Review and Meta-Analysis

Jessica Laureano-Phillips, MPH; Richard D. Robinson, MD; Subhash Aryal, PhD; Somer Blair, PhD; Diamalia Wilson, MD; Kellie Boyd, MSc; Chet D. Schrader, MD; Nestor R. Zemerova, MD; Hao Wang, MD, PhD

Ann Emerg Med 2019;74:187-203

- Meta-analysis of 25 studies, 25,266 pts
- 39.3% (9919) Low Risk HS 0-3
- 3855 pts had High sensitivity used
- Refined analysis by removing troponin positive pts
- Independently evaluated HS troponin studies

Clinical Gestalt and/or HEART to r/o ACS Take Homes

- Don't use just gestalt
- Hubris and CP do not mix well
- HEART and/or Gestalt are adjuncts
- HS Troponin is the key to r/o ACS

Understanding HS Troponin

HS Troponin The Way Things Should Be

Negative

No AMI
Discharge

Positive

AMI
Admit

HS Troponin The Way Things Are

Undetectable
No AMI

Detectable
but < 99th %
Maybe early
AMI
Maybe Not

Positive
AMI

Dealing with Detectable Troponin Delta Troponin

Repeat (Delta) Troponin

+ rise = AMI

- rise = no AMI

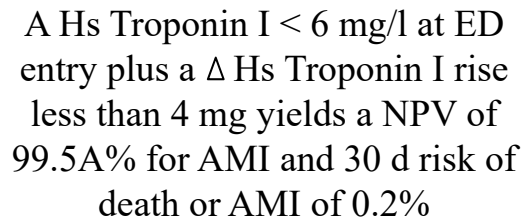
Application of High-Sensitivity Troponin in Suspected Myocardial Infarction

Johannes T. Neumann, M.D., Raphael Tavenhild, M.D., Francisco Ojeda, Ph.D., Nils A. Sörensen, M.D., Andrew R. Chapman, M.D., Anoop S.V. Shah, M.D., Atul Arand, M.D., Jasper Beekdijk, M.D., Thomas Neutberger, M.D., Patrick Badertscher, M.D., Anesh Mukherji, M.D., Ph.D., John W. Pickering, Ph.D., et al.

New Engl J Med 2019;380:2529-40

Can Hs Troponin be used to determine the 30 d possibility of AMI?

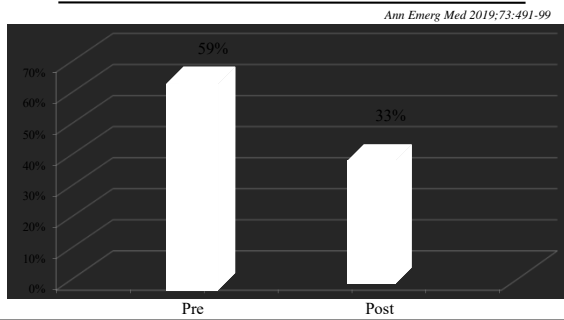
- 22,651 pts from 15 international studies; STEMI included
- 9604 for derivation, 13,047 for validation
- Used serial and delta values
- Evaluated Hs Troponin I and Hs T
- Overall AMI prevalence was 15.3%



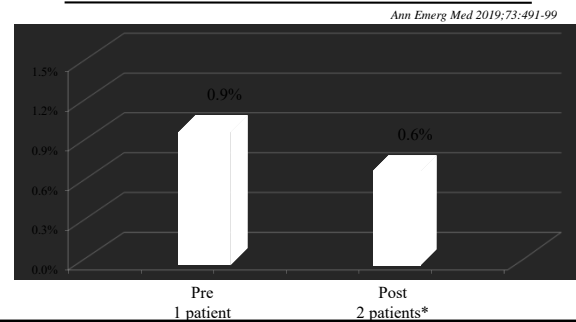
- Study used Δ Troponin changes
- All Hs Troponin levels below 99th%
- Delta Hs Troponin I < 6 mg/l
- Delta Hs Troponin T < 3 mg/l



Hospital Admissions



AMI Within Next 30 days



Both discharged patients who had AMIs within 30 days were discharged with an elevated Δ Troponin and a HEART score > 3

Outcome of Applying the ESC 0/1-hour Algorithm in Patients With Suspected Myocardial Infarction

Is 1 hour rule out safe and can it have widespread use?

- 2296 patients, 2 hospitals
- Switzerland and Argentina
- 0 and 1 hour HS Troponin T

Also used direct rule outs at ED entry if
HS Troponin < 5mg/l and CP duration > 3 hrs

All Discharged from ED Patients

EXCELLENT OUTPATIENT SAFETY

30-day MACE Rate 0.1%

2 MIs occurred over 30 days (0.1%).
Both had been triaged to in-patient rule outs

Overall median ED stays were 2.5 hours

JACC 2019;74:483-94

Hs Troponin Take Homes

- Can predict presence of AMI and subsequent risk
- Undetectable levels coupled with small rises provide almost 100% (99.5%) NPV without factoring in a risk prediction scoring system like HEART
- Used together, these are currently the two best ways to r/o AMI
- Beware any detectable Troponin +/- ischemic ECGs

HS Troponin Testing Take Homes

- This is the current best practice
- Use Delta levels
- 1 hour rule out is safe and effective

Accuracy of pre-hospital HEART score risk classification using point of care versus high sensitive troponin in suspected NSTEMI-ACS

Dominique N. van Dongen^{a,*}, Marion J. Fokker^{a,1}, Rudolf T. Toes^a, Aize van der Sluis^a, Robert J. Sijpe^a, Erik A. Badiou^a, Arnold W. J. van 't Hof^{a,1}, Jan Paul Otteranger^a

Am J Emerg Med 201 online Oct 13

Pre-Hospital Troponin Testing is Here!
and can be coupled with
EMS and ED HEART Score

Evaluation of Outpatient Cardiac Stress Testing After Emergency Department Encounters for Suspected Acute Coronary Syndrome

Shaw Natanael, MD, MPH, Benjamin C. Sun, MD, MPH, Everett Shien, PhD, Yi-Lin Wu, MD, Rita F. Redberg, MD, MSc, Ming-Guo Lee, MD, PhD, Maria Fernandez, MD, PhD, Chengyi Zheng, PhD, Richard A. Kohnen, PhD, MD, Michael K. Gould, MD, MS, Adam L. Shugis, MD, MS¹

Ann Emerg Med 2019;74:216-33

How helpful are stress tests post a negative ED CP evaluation?

- 24,459 CP pts from 13 Kaiser EDs
- 7,988 discharged to obtain stress tests
- Evaluated stress test completions
- Evaluated MACE prevention

Current ACC/AHA guidelines recommends non-invasive cardiac stress testing within 3 days of ED discharge for CP patients who have AMI excluded

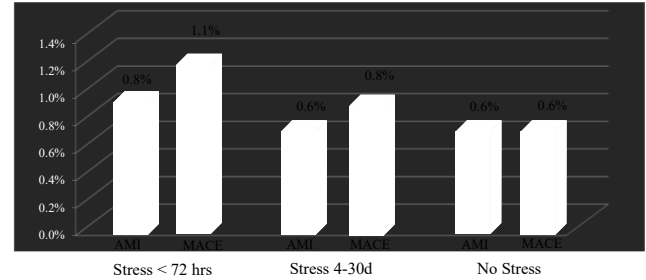
Stress Testing Timeline

Annal Emerg Med 2019;74:216-33

- Only 31% completed stress testing within the recommended 3 days (58.7%)
- Most patients performed their stress testing within 4-30 days
- 10% of patients never returned for stress testing

30 day MACE and AMI (AMI, PCI, CABG, Unstable Angina)

Prehosp Emerg Care 2018;22:691-697



Stress Testing post ED Discharge Take Homes

- Designed to uncover non-troponin leak myocardial ischemia/pre infarctional angina
- Is a national ACC/AHA recommendation
- Does not seem to uncover occult ischemia any better than watchful watching

R/O ACS

- Do a very careful history
- Use HEART or Gestalt or diaphoresis or radiation or an Abn ECG = High Risk
- Understand HS Troponins and use Delta Troponins
- Be more careful in HEART Score of 3
- Always involve the patient and family

R/O ACS 5 Core Concepts

- HEART: don't use Troponin or Ischemic ECG
- HEART 2 ≠ 3
- High Sensitivity Troponin is the new Standard
- Use HS Troponin changes

R/O ACS 5 Core Concepts

Gestalt and/or HEART plus ECG plus Troponin testing is the optimal R/O ACS workup and approaches 100% NPV for safe ED discharge



Circulation 2018;137:1638-40

Only 47% received CPR in these witnessed arrests

Maybe put on defib pads and hook up AED during the warm up

Dog Ownership and Survival

A Systematic Review and Meta-Analysis

Caroline K. Kramer, Sadia Mehmood, Renée S. Suen

Circulation: Card Qual and Outcomes 2019;12:1-8

Owning a dog increases longevity

- Meta-analysis, 10 studies
- 3,837,005 patients over at least 10 years
- 25% decreased risk of all cause mortality
- 31% decreased risk for cardiovascular mortality

Summary

Role of Epinephrine remains unclear

Five doses seems like enough

Antiarrhythmics are not of great value

DSD: NO

Do PCI s/p VF/pVT

Summary

Ensure optimal BCLS

NTG is safe in Inferior AMI

Bolus Aminophylline: NO NO NO

Rate Controlled Atrial Fibrillation

Use HS Troponin Values



VanderbiltEM.com

