



Pre-hospital CPR: An Update



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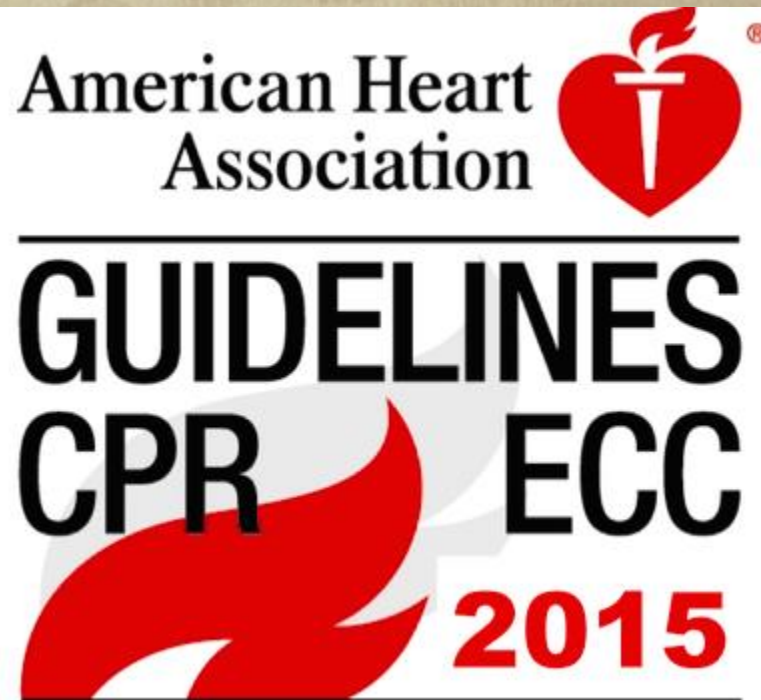


An Overview

- 1. BLS and ACLS 2015 Review**
- 2. Pre-hospital Resuscitation and How to improve quality in pre-hospital CPR**
- 3. What new in pre-hospital CPR**
- 4. Withholding CPR and Termination of Resuscitation Rules**



Basic Life Support



Making the Call



1 Bystanders: DO SOMETHING!

Bystanders should start CPR with or without ventilations concurrent with 911 activation once they determine an unconscious person is not breathing normally.

2 Dispatchers: If it ain't right, something's wrong!

Dispatchers should be capable of recognizing agonal respirations and instructing those on scene to initiate chest compressions.

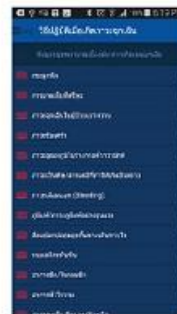
3 There's an App for that!

Communities can consider alerting willing and trained members of the public to nearby cardiac arrests using social media or cellphone technology.

EMS 1669



เมื่อข้อมูลถูกส่งไปที่แล้วควรกดปุ่ม "โทรทันที" เพื่อเป็นการติดต่อ 1669 เพื่อแจ้งรายละเอียดอาการของผู้ป่วยฉุกเฉิน



เข้าไปในส่วนเมนู > "วิธีปฏิบัติเมื่อเกิดภาวะฉุกเฉิน" จะเป็นการให้ความรู้ในการปฐมพยาบาลเบื้องต้นกับผู้ป่วยอาการต่างๆ



แสดงหน้าแรกของ Application ปุ่มสีแดง "กดเพื่อเรียกรถพยาบาล" เมื่อคลิกปุ่มจะเป็นการเริ่มการแจ้งเหตุ บันทึกข้อมูลส่วนตัว เป็นการบันทึกข้อมูลของผู้แจ้งเหตุไว้เพื่อใช้ในการแจ้งสามารถบันทึกไว้ล่วงหน้าได้



แสดงหน้า ข้อมูลลงทะเบียน สำหรับการใช้งานครั้งแรก ใ้กดที่แถบสีขาวเพื่อป้อนข้อมูล จะปรากฏที่ย่นจอร์จจำลองขึ้นมาบนหน้าจอ



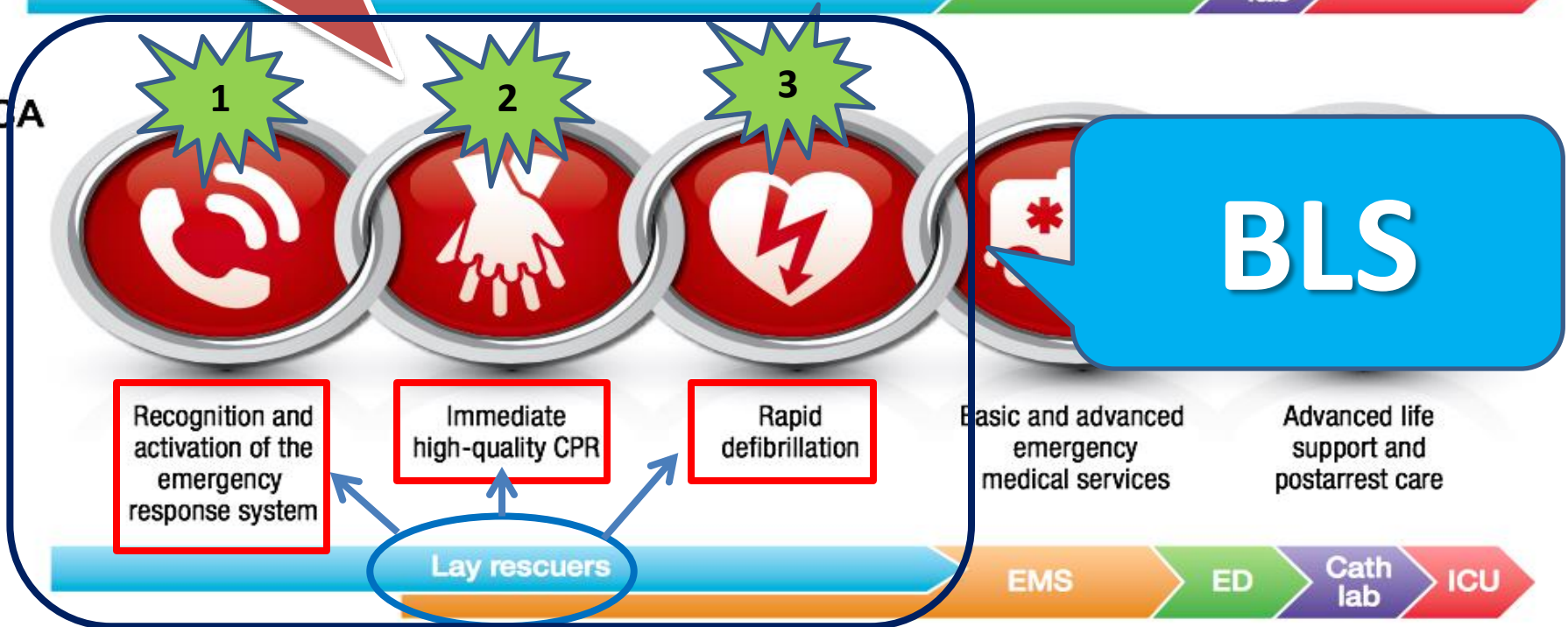
หลังจากกดปุ่ม "กดเพื่อเรียกรถพยาบาล" Application จะแสดงตำแหน่งพิกัดปัจจุบันของผู้แจ้ง และผู้แจ้งสามารถแนบรูปประกอบการแจ้งเหตุใ้กดปุ่ม "ส่ง" เพื่อส่งข้อมูลการแจ้งเหตุใ้ศูนย์รับแจ้งเหตุ



IHCA



OHCA





Read the complete 2015 AHA Guidelines at this link:
<https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/>

1



Compression rate: 100-120

A higher upper rate limit was added as CPR as quality decreases with >120 compressions per minute.

Maximize compression time

Increased emphasis has been placed on minimizing the time without compressions to maximize coronary perfusion.



2

3



Deep, but not too deep

An upper limit on the depth of chest compressions has been added. They should be between 5cm (2") and 6cm (2.5"). Deeper can be harmful.

Directive dispatchers

Callers can receive increased guidance from emergency dispatchers regarding when to begin CPR. Dispatchers can also utilize social media applications to direct nearby assistance.



4

5



Audiovisual feedback

Feedback to lay-providers may improve CPR. When available, audiovisual devices may be used to optimize CPR quality.



From: <https://eccguidelines.heart.org/index.php/circulation/cpr-ecc-guidelines-2/>
* For more Canadian content by the HSFC, check out <http://goo.gl/fHu8lc>

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Template designed by Aivin Chin MSc, MD (card) Summary by Brent Thoma MD, FRCPC and Pouri Benjamin, MD Reviewed by Teresa Chan MD, FRCPC

Special thanks to Laurie Morrison and the American Heart Association.



Summary of Key Issues and Major Changes

1

The Adult BLS Algorithm has been modified → to reflect that **rescuers can activate an emergency response** (use of a mobile phone) without leaving the victim's side.

2

Recommendations → encourage **immediate recognition of unresponsiveness, activation of the emergency response system, and initiation of CPR**

**Adult Basic Life Support and CPR
Quality: Lay Rescuer CPR**

**Not too fast;
Not too hard**



**100-120/min
5-6cm deep**

Summary of Key Issues and Major Changes

3

It is recommended that **communities with people at risk** for cardiac arrest implement **PAD programs**.



Summary of Key Issues and Major Changes



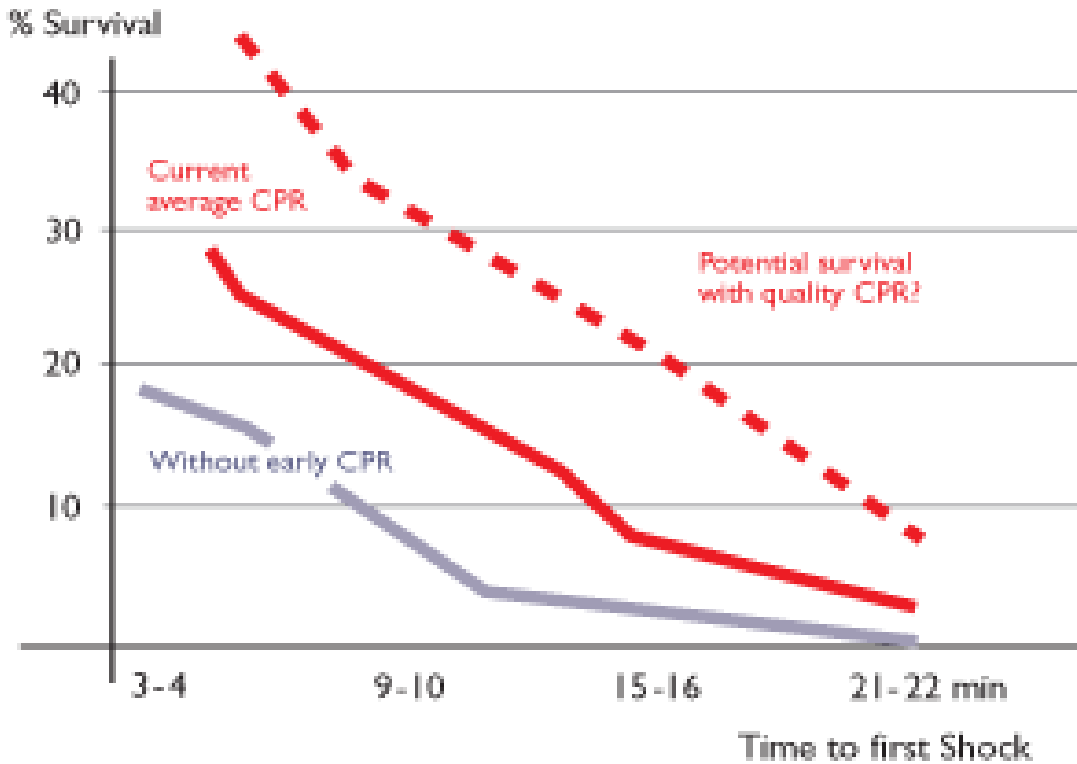
Emphasis has been increased about the **rapid identification** of potential cardiac arrest **by dispatchers**, with immediate provision of **CPR instructions** to the caller (ie, dispatch-guided CPR).



The **recommended sequence** for a **single rescuer** has been confirmed: the single rescuer is to **initiate chest compressions before** giving rescue breaths (C-A-B rather than A-B-C) to reduce delay to first compression.



Bystander CPR



TELEPHONE
CPR SIGNIFICANTLY IMPROVES
BYSTANDER CPR RATES



The 2015 guidelines call for dispatchers to identify the patient who is unresponsive with abnormal breathing or and agonal gasps and to provide chest compressions-only CPR instructions to callers

Data from the multi-center Cardiac Arrest Registry to Enhance Survival (CARES) system indicates that patients who received **bystander CPR had a higher rate of survival (11.2%)** than those who did not receive bystander CPR (7.0%)



Fear of infectious disease transmission is the most common reason posited for why bystanders might be reluctant to perform CPR. **Hands-only CPR is simplified** and easier to learn and perform and that avoiding instruction of rescue breathing with speed the initiation of chest compressions (1)

A two center randomized trial comparing the compressions-only CPR to traditional CPR instruction shows that **compressions-only CPR was associated with higher short- and long-term survival (2)**

1. American Heart Association Emergency Cardiovascular Care Committee. Circulation. 2008 Apr 22;117(16):2162-7
2. Chest compression alone cardiopulmonary resuscitation is associated with better long-term survival compared with standard cardiopulmonary resuscitation. Circulation. 2013 Jan 29;127(4):435-41.

Community Lay Rescuer AED Programs

The implementation of a PAD program requires 3 essential components:



Identification of locations and neighborhoods where there is **high risk of cardiac arrest**, **placement of AEDs** in those areas and ensuring that **bystanders are aware** of the location of the AEDs

สถานที่ที่ควรติดตั้งเครื่อง AED



- 1 สถานีรถไฟ สถานีรถโดยสารประจำทาง สนามบิน ท่าเรือ บนเครื่องบิน และการขนส่งมวลชนที่มีระยะทางไกล (รถไฟหรือเรือโดยสาร)
- 2 ฟิตเนส เซ็นเตอร์ สपोर्टคลับ สนามกีฬา สนามกอล์ฟ ห้างสรรพสินค้า ย่านร้านอาหารขนาดใหญ่ ที่มีคนมาใช้บริการประมาณ 5,000 คนต่อวัน
- 3 สถานที่ท่องเที่ยวต่างๆ สถานที่สาธารณะขนาดใหญ่
- 4 ศูนย์กลางชุมชน
- 5 สถานพยาบาล หรือสถานดูแลผู้สูงอายุ อพาร์ทเมนต์ที่มีผู้สูงอายุมากกว่า 50 คน
- 6 โรงเรียน โดยเฉพาะสนามกีฬาของโรงเรียน
- 7 บริษัท โรงงาน
- 8 สถานบันเทิง
- 9 โรงแรมหรือศูนย์ประชุมขนาดใหญ่
- 10 พื้นที่ห่างไกลจากหน่วยแพทย์ฉุกเฉิน เช่น เกาะ หุบเขา

1669
MS 1669

2 ปี สพด.ติดตั้งเครื่อง AED

ช่วยหัวใจวาย-หยุดเต้น
20 คน สพด.เป็นระเบียบ
ให้อาคารที่มีคนอยู่
เป็นจำนวนมากติดตั้ง



www.komchadluek.net [kom_chad_luek](https://www.facebook.com/kom_chad_luek) [คอมชัดลึ้ก](https://www.facebook.com/komchadluek) **คมชัดลึ้ก**

Community Lay Rescuer AED Programs



Training of anticipated rescuers in CPR and use of the AED



An integrated link with the local EMS system and ongoing quality improvement.



Adult Basic Life Support and CPR Quality: HCP BLS

high-quality CPR

Emphasis on Chest Compressions*

2015 (Updated): It is reasonable for HCPs to provide chest compressions and ventilation for all adult patients in cardiac arrest, whether from a cardiac or noncardiac cause.

Ventilation During CPR With an Advanced Airway

2015 (Updated): It may be reasonable for the provider to deliver 1 breath every 6 seconds (10 breaths per minute) while continuous chest compressions are being performed (ie, during CPR with an advanced airway).

Why: This simple single rate for adults, children, and infants—rather than a range of breaths per minute—should be easier to learn, remember, and perform.

Table 2 Summary of High-Quality CPR Components for BLS Providers

Component	Adults and Adolescents	Children (Age 1 Year to Puberty)	Infants (Age Less Than 1 Year, Excluding Newborns)
Scene safety	Make sure the environment is safe for rescuers and victim		
Recognition of cardiac arrest	<p>Check for responsiveness</p> <div data-bbox="788 648 1489 779" style="border: 2px solid red; padding: 5px;"> <p>No breathing or only gasping (ie, no normal breathing)</p> <p>No definite pulse felt within 10 seconds</p> </div> <p>(Breathing and pulse check can be performed simultaneously in less than 10 seconds)</p>		
Activation of emergency response system	<p>If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR</p> <p>Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available</p>	<p style="text-align: center;"><i>Witnessed collapse</i></p> <p style="text-align: center;">Follow steps for adults and adolescents on the left</p> <p style="text-align: center;"><i>Unwitnessed collapse</i></p> <p style="text-align: center;">Give 2 minutes of CPR</p> <p style="text-align: center;">Leave the victim to activate the emergency response system and get the AED</p> <p style="text-align: center;">Return to the child or infant and resume CPR; use the AED as soon as it is available</p>	

Component	Adults and Adolescents	Children (Age 1 Year to Puberty)	Infants (Age Less Than 1 Year, Excluding Newborns)
Compression-ventilation ratio <i>without</i> advanced airway	<p>hyperventilation decreased coronary perfusion pressures and survival rates by 69%</p>		<p>Adult CPR tidal volumes of approximately 500–600 mL (6 to 7 mL/kg) are recommended and can be described as producing a visible chest rise</p>
Compression-ventilation ratio <i>with</i> advanced airway	<p>Continuous compressions at a rate of 100-120/min Give 1 breath every 6 seconds (10 breaths/min)</p>		
Compression rate	<p>100-120/min</p>		
Compression depth	<p>At least 2 inches (5 cm)*</p>	<p>At least one third AP diameter of chest About 2 inches (5 cm)</p>	<p>At least one third AP diameter of chest About 1½ inches (4 cm)</p>
Hand placement	<p>2 hands on the lower half of the breastbone (sternum)</p>	<p>2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum)</p>	<p>1 rescuer 2 fingers in the center of the chest, just below the nipple line</p> <p>2 or more rescuers 2 thumb–encircling hands in the center of the chest, just below the nipple line</p>
Chest recoil	<p>Allow full recoil of chest after each compression; do not lean on the chest after each compression</p>		
Minimizing interruptions	<p>Limit interruptions in chest compressions to less than 10 seconds</p>		



Prehospital Resuscitation (ACLS)



European
Resuscitation
Council

American Heart
Association



Resuscitation Council (UK)

GUIDELINES
2015

IHCA and OHCA Chains of Survival

AHA 2015

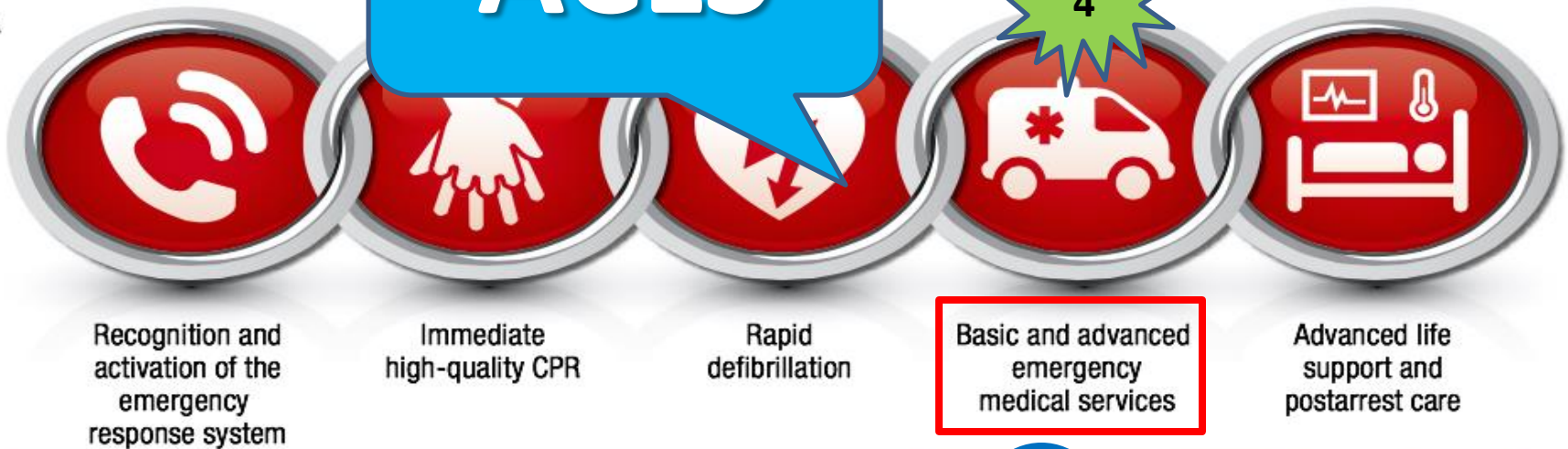
IHCA



ACLS

4

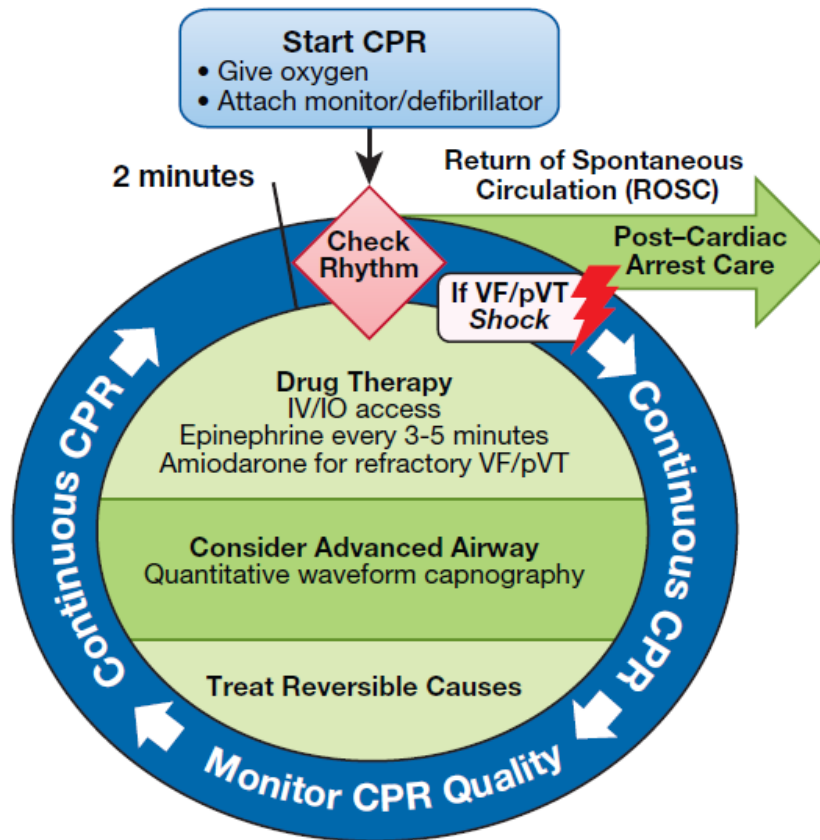
OHCA



Basic and advanced emergency medical services



Adult Cardiac Arrest Circular Algorithm – 2015 Update



CPR Quality
<ul style="list-style-type: none"> • Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil. • Minimize interruptions in compressions. • Avoid excessive ventilation. • Rotate compressor every 2 minutes, or sooner if fatigued. • If no advanced airway, 30:2 compression-ventilation ratio. • Quantitative waveform capnography <ul style="list-style-type: none"> – If PETCO₂ <10 mm Hg, attempt to improve CPR quality • Intra-arterial pressure. <ul style="list-style-type: none"> – If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.
Shock Energy for Defibrillation
<ul style="list-style-type: none"> • Biphasic: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered. • Monophasic: 360 J
Drug Therapy
<ul style="list-style-type: none"> • Epinephrine IV/IO dose: 1 mg every 3-5 minutes • Amiodarone IV/IO dose: First dose: 300 mg bolus. Second dose: 150 mg.
Advanced Airway
<ul style="list-style-type: none"> • Endotracheal intubation or supraglottic advanced airway • Waveform capnography or capnometry to confirm and monitor ET tube placement • Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions
Return of Spontaneous Circulation (ROSC)
<ul style="list-style-type: none"> • Pulse and blood pressure • Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg) • Spontaneous arterial pressure waves with intra-arterial monitoring
Reversible Causes
<ul style="list-style-type: none"> • Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia • Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary • Thrombosis, coronary

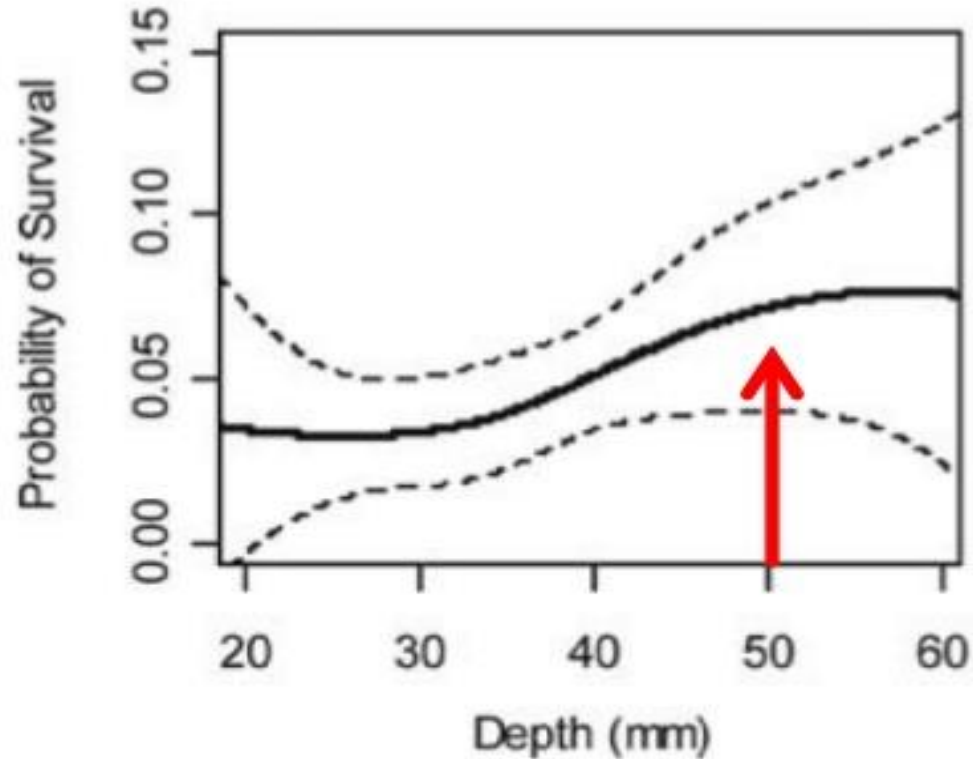
Optimal Rate?

- ROC PRIMED Study
- Prospective observational study
- OHCA
- After adjusting for
 - chest compression fraction &
 - depth

highest survival to discharge was found when the rate was...

100 – 119 per minute!

CPR Depth

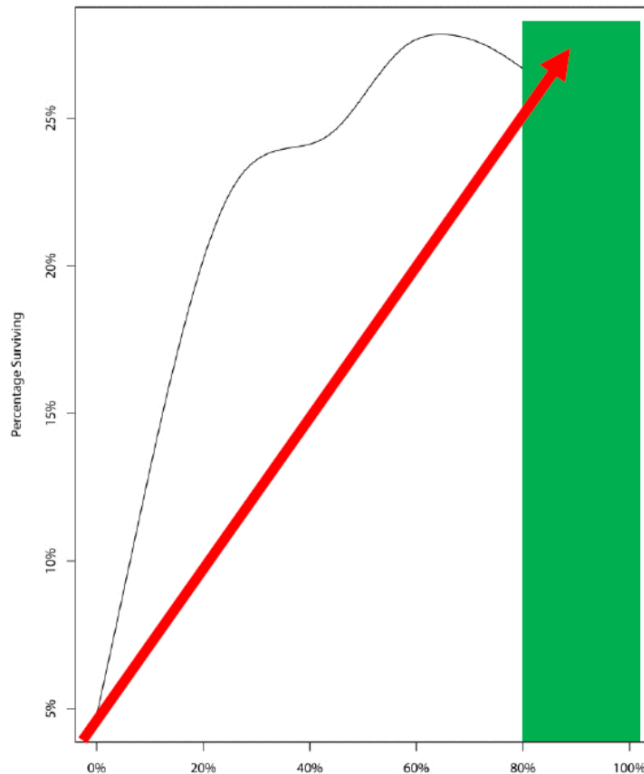


Stiell et al. Crit Care Med 2012; 40:1192-1198

Push Hard ... How deep?

“The 2015 AHA guidelines recommend a target CCF of at least 60% and that CCF of 80% is achievable in high performance systems”

Smoothing Spline of Survival on CCF



Compression Fraction

- The amount of time spent providing compressions
- May also be called “compression ratio”
- Goal: At least 80%!

Is it acceptable to be off the chest for 20% of an arrest?





Team Work – the pre-hospital resuscitation team should ideally comprise **4 individuals**, who undertake roles as **team leader**, manage the **airway**, and alternate in the delivery of **chest compressions** and assisting with **vascular access and drug delivery**.

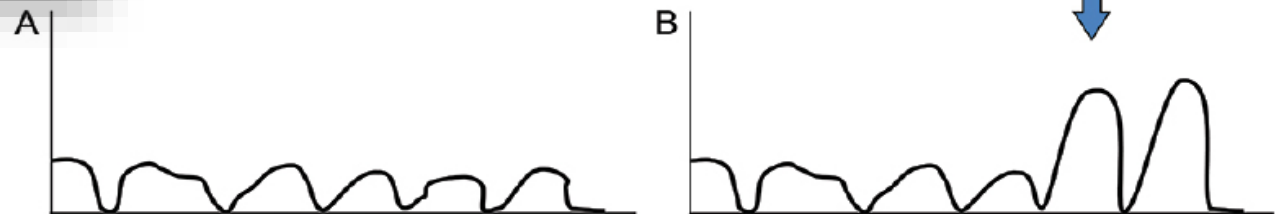




- **Confirm ETT placement**
- **Guide compression quality:** improve technique or switch providers if <10 mmHg with goal >20 mmHg
- **Consider ROSC for an abrupt sustained increase to a normal level (35-40 mmHg) or of at least 10 mmHg above previous baseline**
- **Help guide the decision on when to terminate CPR:** Levels <10 mmHg after 20 minutes indicate a very low chance of achieving ROSC



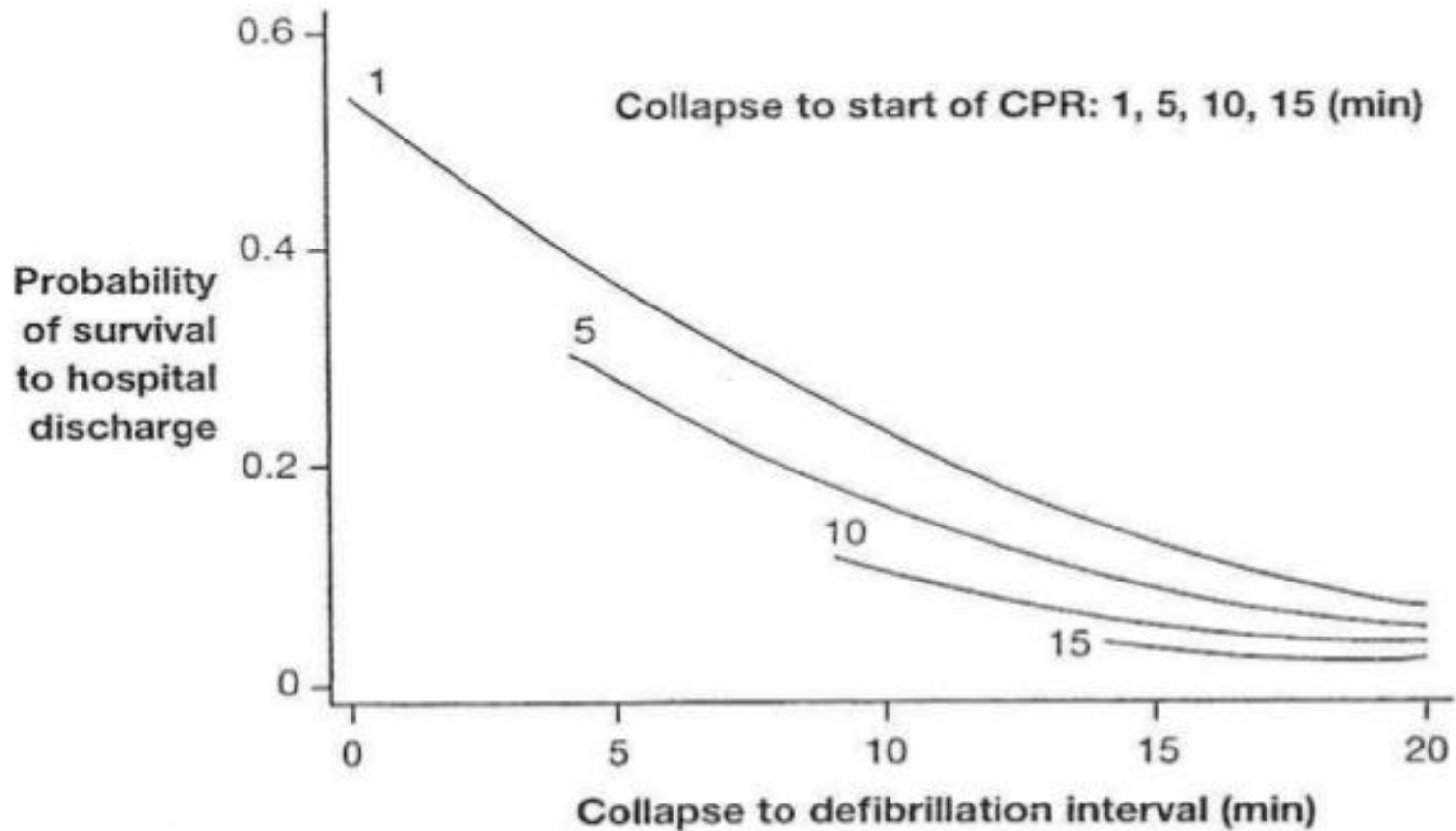
CO₂ waveform during CPR



An abrupt increase in PETCO₂ may indicate return of spontaneous circulation (ROSC). Increase in pulmonary circulation brings more CO₂ into lungs for elimination



There is no evidence that a period of CPR before defibrillation improves success rates and solo responders arriving at a cardiac arrest should prioritize attaching a defibrillator and defibrillation if indicated.



Key Success for Defibrillation



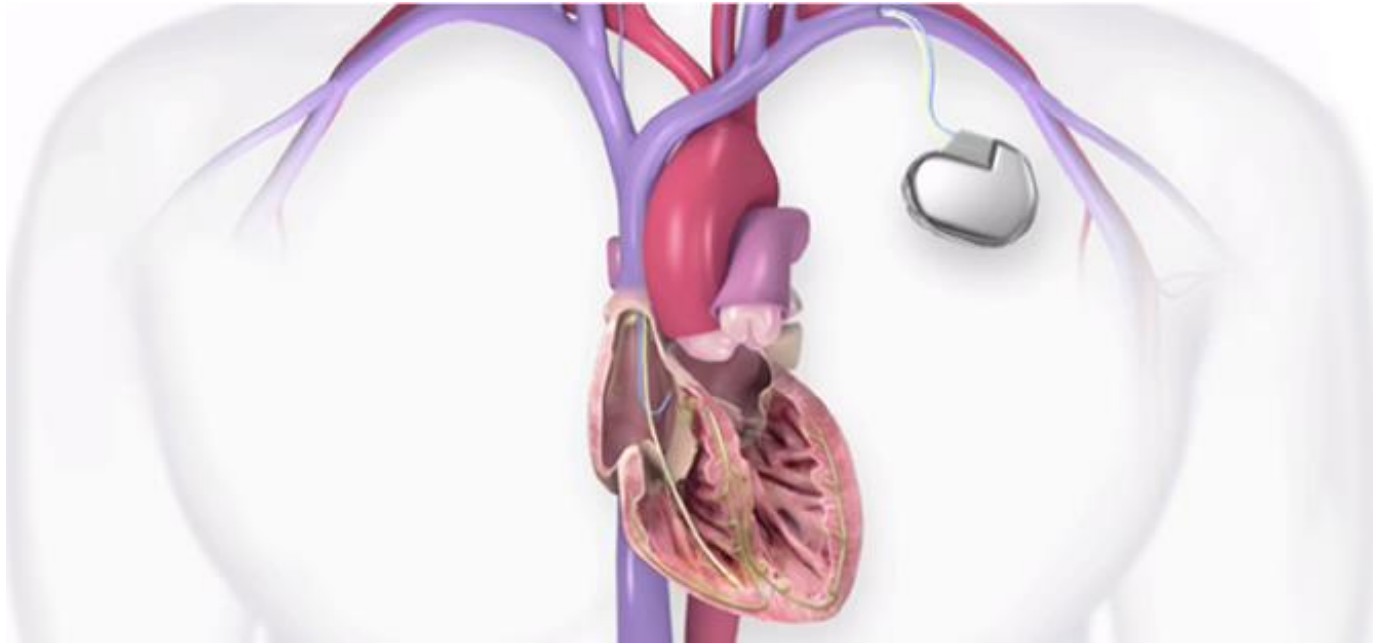
The shock from a manual defibrillator can be applied using paddles or adhesive pads. Paddles require a conductive gel or pad to be used on the patient and **firm pressure** to each paddle to maximize contact with the patient's chest. Healthcare workers need to apply **12 kg** of paddle force against the chest wall to be effective

Early studies showed that shocks were delivered **more quickly** and were effective at terminating ventricular fibrillation when using **adhesive pads** with manual defibrillators

Key Success for Defibrillation

The American Heart Association acknowledges the reasonableness of placing the defibrillation electrodes in any one of four pad positions: anterolateral, anteroposterior, anterior-left infrascapular, and anterior-right- infrascapular. One position has not proven superior to any others.

AHA recommends positioning the external defibrillation pad at least 1 inch (2.5 cm) away from the device.

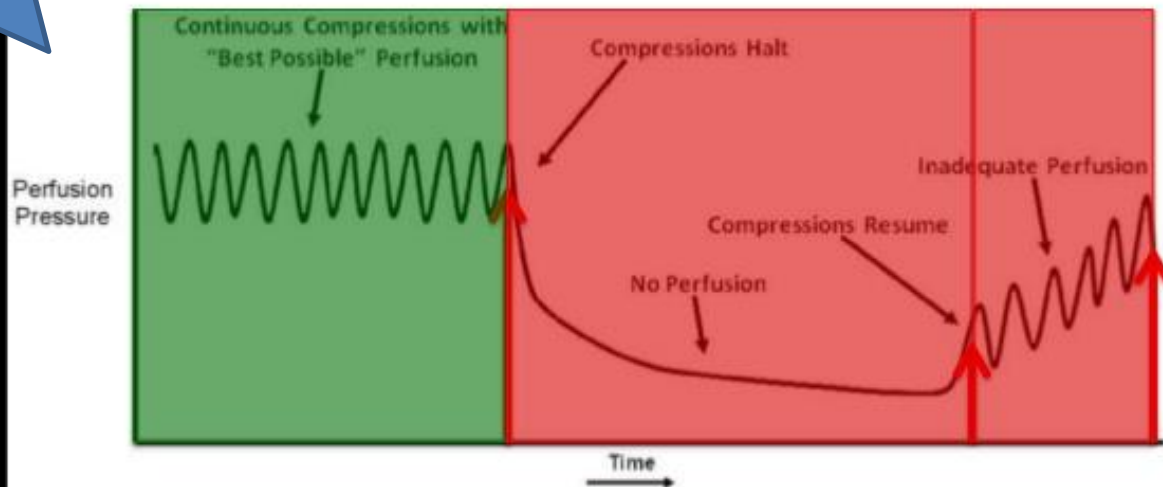


Minimize peri-defibrillation pause

Inadequate Perfusion Pressure

10 Sec?

Chest Compressions During Cardiac Arrest
Magnitude of Perfusion Resulting from Chest Compressions



Cunningham LM et al. American Journal of Emergency Medicine 2012

Current AHA guidelines call for limiting interruptions in CPR to no longer than 10 seconds, except for specific interventions like defibrillation.



A study from San Diego found that patients who experienced less than 3 seconds of pause prior to the shock and less than 6 seconds post shock had higher likelihood of ROSC (2)

The best chance for survival existed when the peri-shock pause was less than 20 seconds. A separate multi-center trial found that the odds of successful defibrillation increase for every five-second decrease in pre-shock pause (1)



1. Effects of compression depth and pre-shock pauses predict defibrillation failure during cardiac arrest. Resuscitation. 2006 Nov;71(2):137-45.
2. Minimizing pre- and post-defibrillation pauses increases the likelihood of return of spontaneous circulation (ROSC). Resuscitation. 2010 Jul;81(7):822-5. doi: 10.1016/j.resuscitation.2010.03.013. Epub 2010 Apr 15.

Minimize Pre & Post Shock pauses

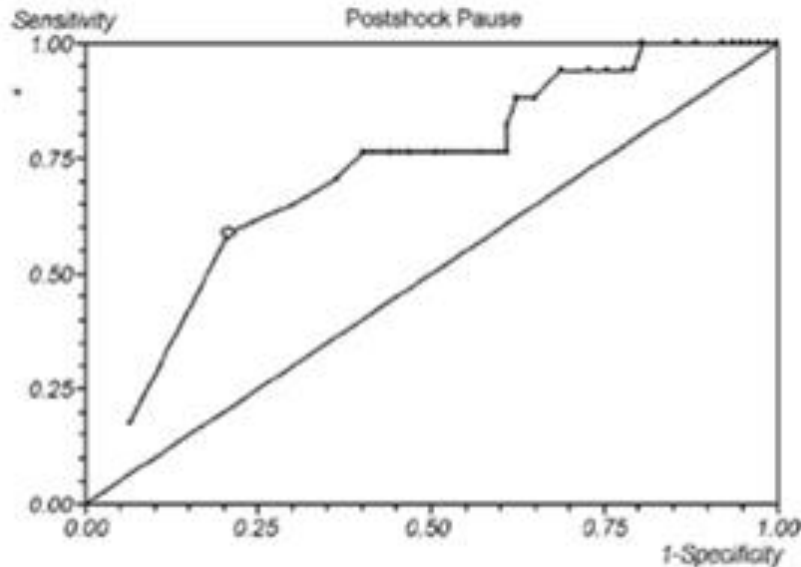


Fig. 3. Receiver-operator curve for pre-shock interval using return of spontaneous circulation (ROSC) as the outcome variable (area under the curve 0.72). The optimal pre-shock interval was defined as <3 s.

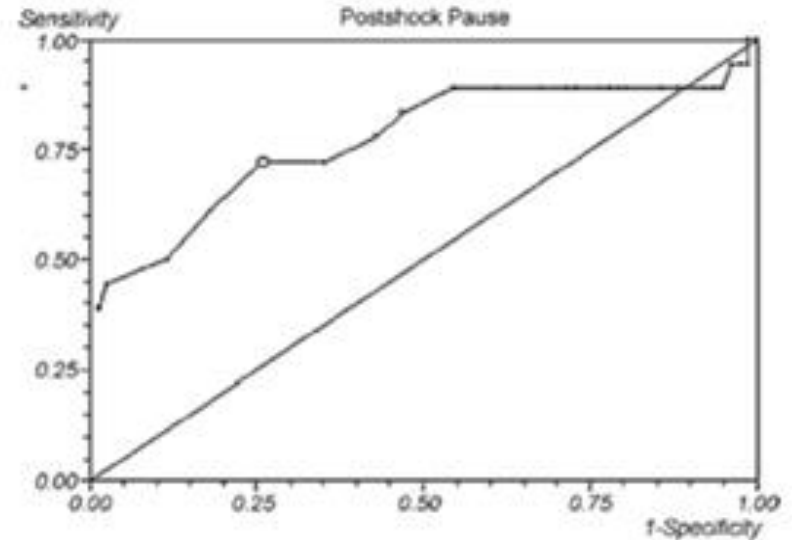
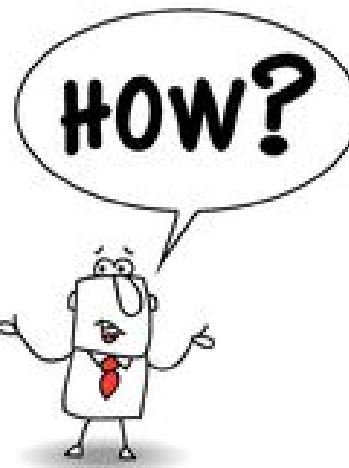


Fig. 4. Receiver-operator curve for post-shock interval using return of spontaneous circulation (ROSC) as the outcome variable (area under the curve 0.77). The optimal post-shock interval was defined as <6 s.

Pre-Shock pause < 3 seconds



Post-Shock pause < 6 seconds

Minimize Pre & Post Shock pauses

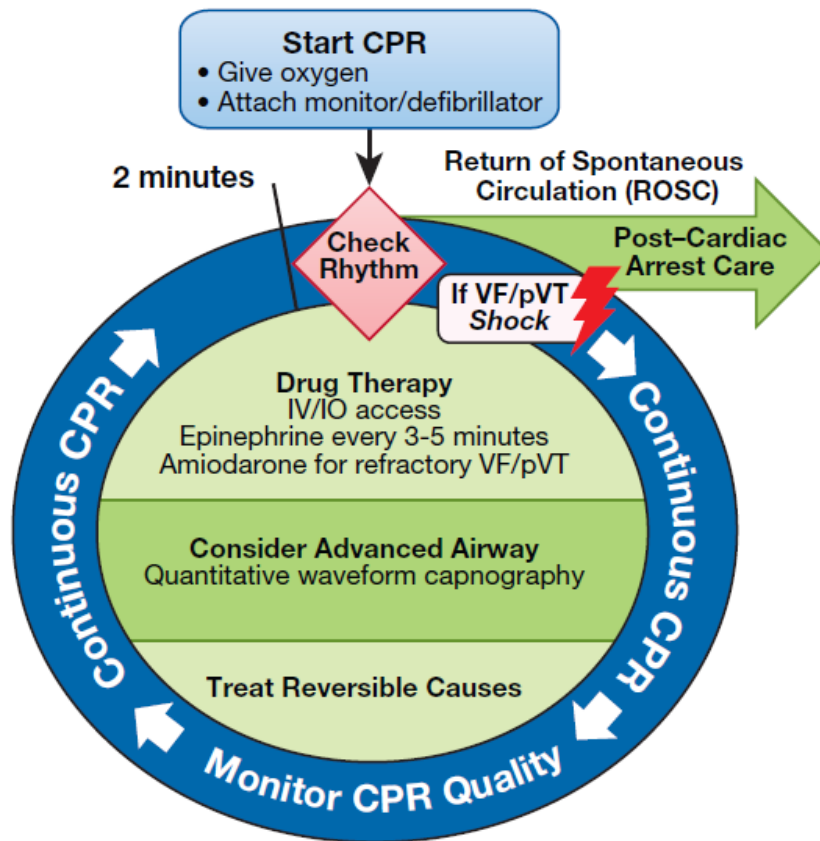
“One option is to allow trained personnel to use the manual feature of the defibrillator, rather than continuing in AED mode”

A possibility that is undergoing study is to explore whether the rescuer can be “grounded” against the shock through the use of exam gloves, thus allowing CPR to continue during the shock.



Very concerning: 7.5% of single gloves and 6.2% of gloves allowed at least 10 mA of current flow with external defibrillation

Adult Cardiac Arrest Circular Algorithm – 2015 Update



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If $PETCO_2 < 10$ mm Hg, attempt to improve CPR quality
- Intra-arterial pressure.
 - If relaxation phase (diastolic) pressure < 20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥ 40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

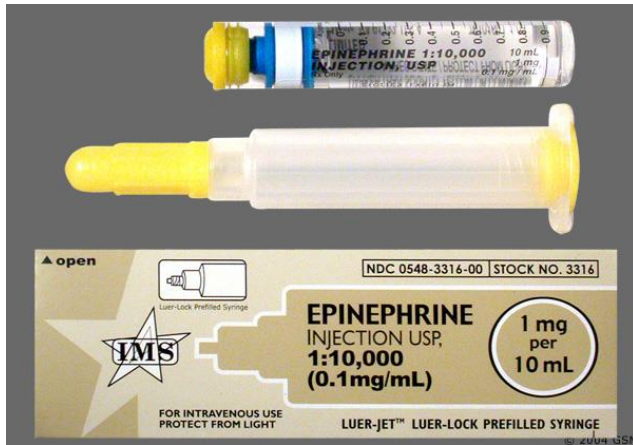
Reversible Causes

- | | |
|---------------------------|-------------------------|
| • Hypovolemia | • Tension pneumothorax |
| • Hypoxia | • Tamponade, cardiac |
| • Hydrogen ion (acidosis) | • Toxins |
| • Hypo-/hyperkalemia | • Thrombosis, pulmonary |
| • Hypothermia | • Thrombosis, coronary |

- **Vasopressin** has been **removed** from the ACLS 2015 Update.
- In **non-shockable** rhythm cardiac arrest patients , **the early provision of epinephrine** is suggested → early epinephrine (1-3 min) → increased ROSC, survival to hospital discharge, and neurologically intact survival.
- **Low ETCO₂** in intubated patient after 20 minutes of CPR is associated with a very **low likelihood of resuscitation**.

Color-coded prefilled medication syringes decrease time to delivery and dosing errors in simulated prehospital pediatric resuscitations: A randomized crossover trial☆☆

Allen D. Stevens, Caleb Hernandez, Seth Jones, Maria E. Moreira, Jason R. Blumen, Emily Hopkins, Margaret Sande, Katherine Bakes, Jason S. Haukoos



New!

Not breathing? Naloxone!

The administration of naloxone (IM or IN) by trained BLS providers is reasonable in patients with abnormal breathing and suspected opioid ingestion.

Administer naloxone.
 Give naloxone as soon as it is available.
 2 mg intranasal or 0.4 mg intramuscular.
 May repeat after 4 minutes.

Original Paper

A Mobile Device App to Reduce Time to Drug Delivery and Medication Errors During Simulated Pediatric Cardiopulmonary Resuscitation: A Randomized Controlled Trial

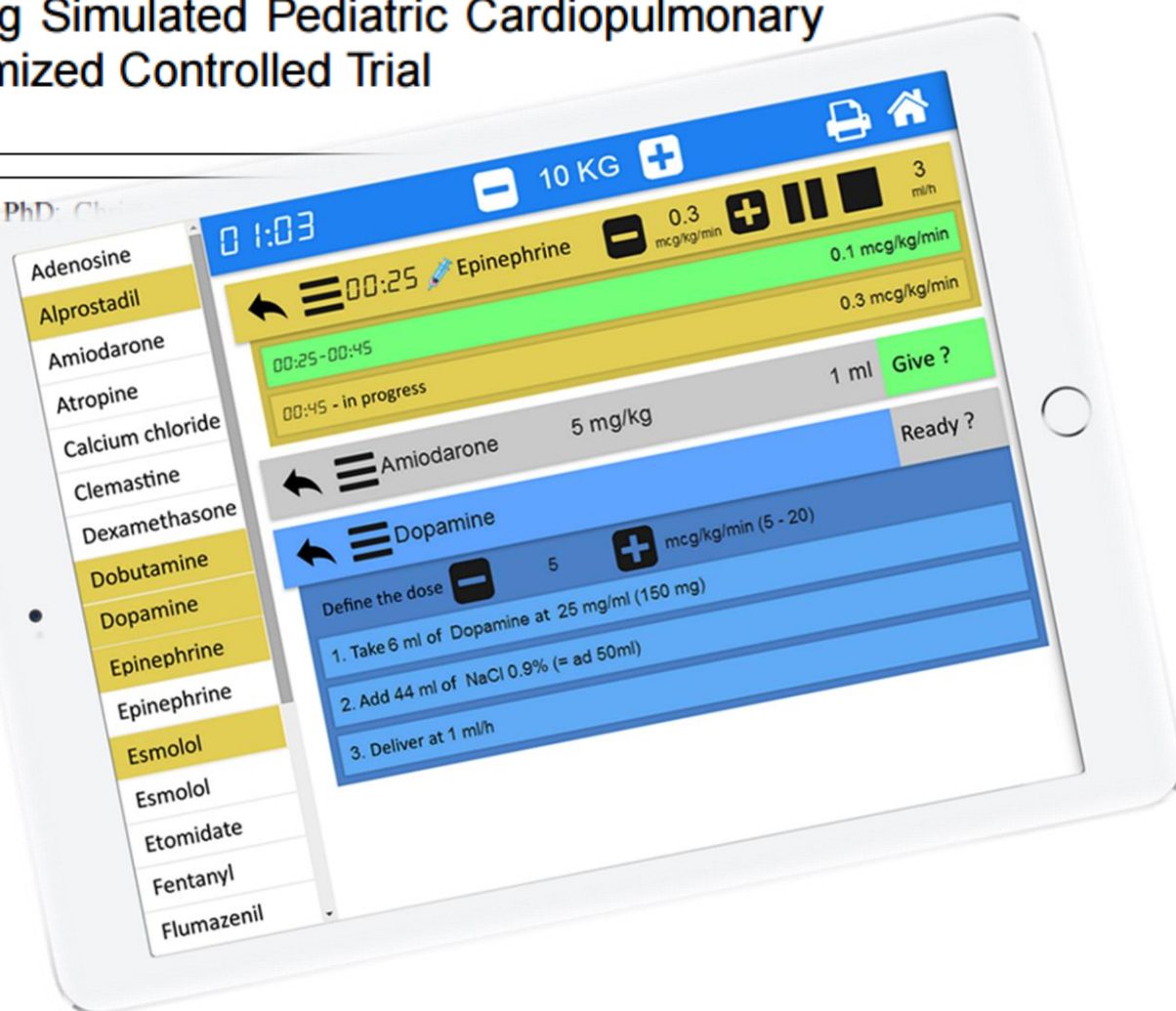
Johan N Siebert^{1*}, MD; Frederic Ehrler^{2*}, PhD; Clément
Haddad¹, RN; Oliver Sanchez⁴, MD; /

¹Department of Pediatric Emergency Medicine, Geneva

²Department of Radiology and Medical Informatics

³Department of Health and Community Medicine, Geneva, Switzerland

⁴Department of Pediatric Surgery, Geneva Children's



Alternative Routes of Drug Administration



Endotracheal Tube Deliverable Drugs

“O NAVEL”

O

Oxygen

Oxygen therapy is a treatment that provides you with extra oxygen. Oxygen is a gas that your body needs to function



N

Naloxone

Naloxone is used to treat a narcotic overdose in an emergency situation



A

Atropine

Atropine also has effects on the heart. It is used during surgery to maintain proper heart function, during emergencies involving the heart, and to treat certain heart disorders.



V

Ventolin (albuterol)

Ventolin (albuterol) is used to treat or prevent breathing problems in patients who have asthma or certain other airway diseases.



E

Epinephrine

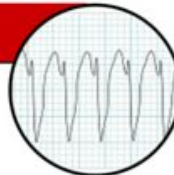
Epinephrine injection is used along with emergency medical treatment to treat life-threatening allergic reactions caused by insect bites or stings, foods, medications, latex, and other causes.



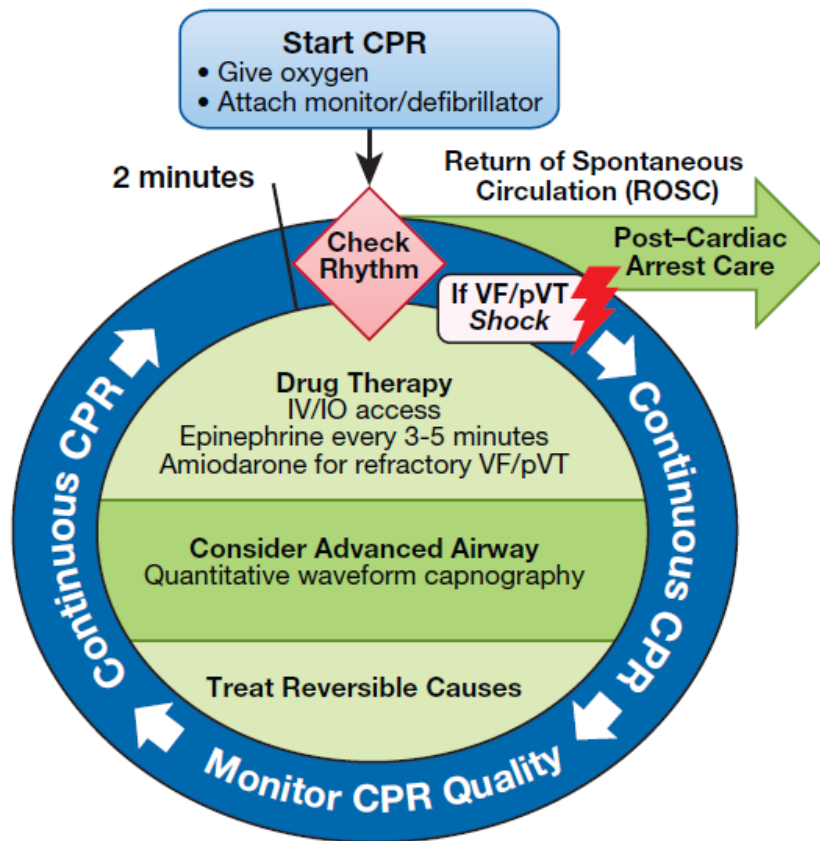
L

Lidocaine

Lidocaine, also known as xylocaine and lignocaine, is a medication used to numb tissue in a specific area and to treat ventricular tachycardia.



Adult Cardiac Arrest Circular Algorithm – 2015 Update



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If $PETCO_2 < 10$ mm Hg, attempt to improve CPR quality
- Intra-arterial pressure.
 - If relaxation phase (diastolic) pressure < 20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation

- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥ 40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- | | |
|---------------------------|-------------------------|
| • Hypovolemia | • Tension pneumothorax |
| • Hypoxia | • Tamponade, cardiac |
| • Hydrogen ion (acidosis) | • Toxins |
| • Hypo-/hyperkalemia | • Thrombosis, pulmonary |
| • Hypothermia | • Thrombosis, coronary |

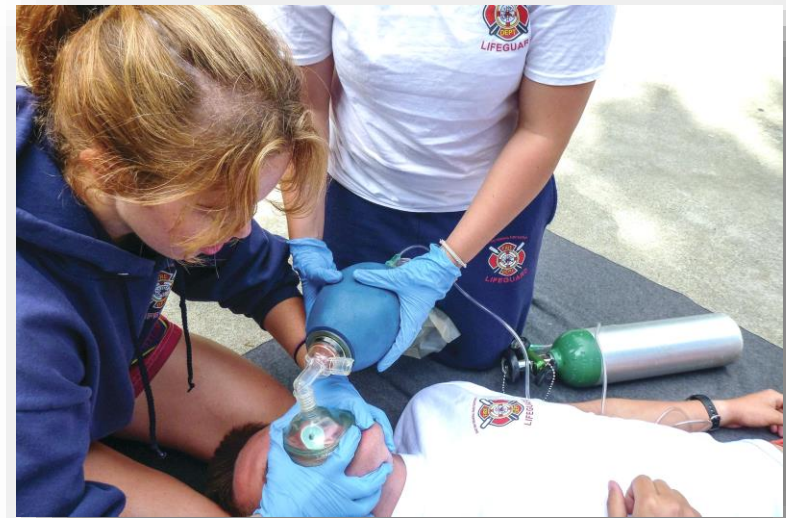


Simpler airway devices such as **supraglottic airways**, including the laryngeal mask airway, i-gel, and King LT enable oxygenation and ventilation to be achieved rapidly. Tracheal intubation should be attempted only by those with adequate training and only if simpler airways prove inadequate.





There is **no evidence** that outcome from OHCA is improved by tracheal intubation and **several studies have suggested that simpler airway techniques** during CPR (i.e. **bag-mask, SGA**) result in at least as good, if not better, **patient outcomes**.



ACLS-New Airway Management

- Quantitative Waveform Capnography is indicated for confirmation of ETT placement (PetCO₂ over 10)and monitoring of CPR quality (PetCO₂ over 35).
- Cricoid Pressure during intubation is no longer recommended
- Passive ventilation with CPR may be adequate, although ACLS providers may continue with ventilation that does not interfere with chest compressions and defibrillation



Delayed Ventilation

2015 (New): For witnessed OHCA with a shockable rhythm, it may be reasonable for EMS systems with priority-based, multitiered response to delay positive-pressure ventilation (PPV) by using a strategy of up to 3 cycles of 200 continuous compressions with passive oxygen insufflation and airway adjuncts.



Passive Oxygen Insufflation Is Superior to Bag-Valve-Mask Ventilation for Witnessed Ventricular Fibrillation Out-of-Hospital Cardiac Arrest

[Bentley J. Bobrow, MD](#), [Gordon A. Ewy, MD](#), [Lani Clark, BS](#), [Vatsal Chikani, MPH](#), [Robert A. Berg, MD](#), [Arthur B. Sanders, MD](#), [Tyler F. Vadeboncoeur, MD](#), [Ronald W. Hilwig, DVM, PhD](#), [Karl B. Kern, MD](#)

Annals of Emergency Medicine
An International Journal

There was not enough evidence to show that continuous passive oxygen insufflations would be superior to conventional ventilation strategies for OHCA, although passive oxygen delivery may be beneficial for witnessed OHCA.

[< Previous Article](#)

[January 2013](#) Volume 84, Issue 1, Pages e9–e10

[Next Article >](#)

Continuous passive oxygen insufflation for out-of-hospital cardiac arrest: A systemic review of clinical studies

[Huang Yu^c](#), [He Qing^c](#), [Yang Min](#)

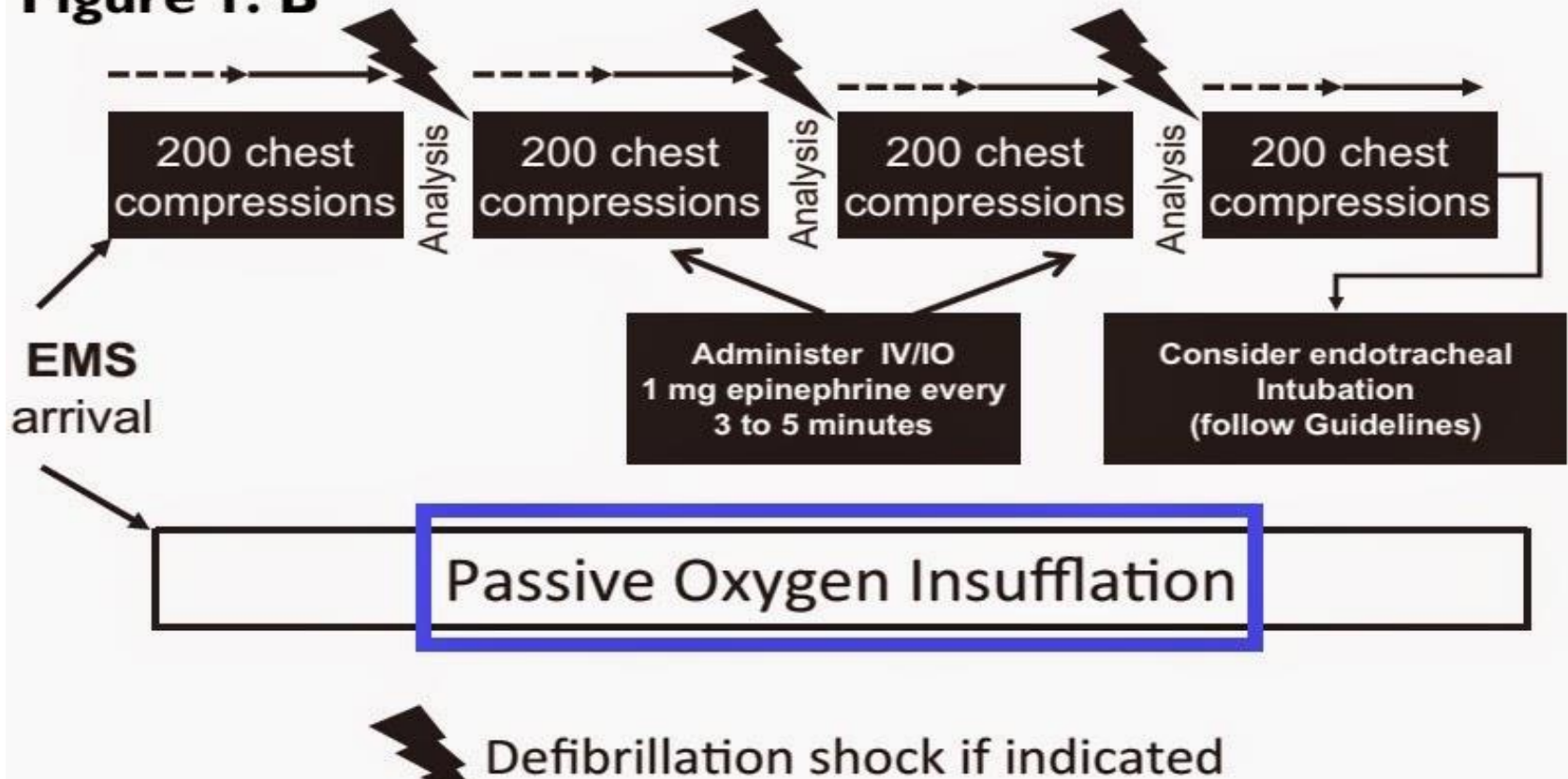
RESUSCITATION

OFFICIAL JOURNAL OF THE
EUROPEAN RESUSCITATION COUNCIL



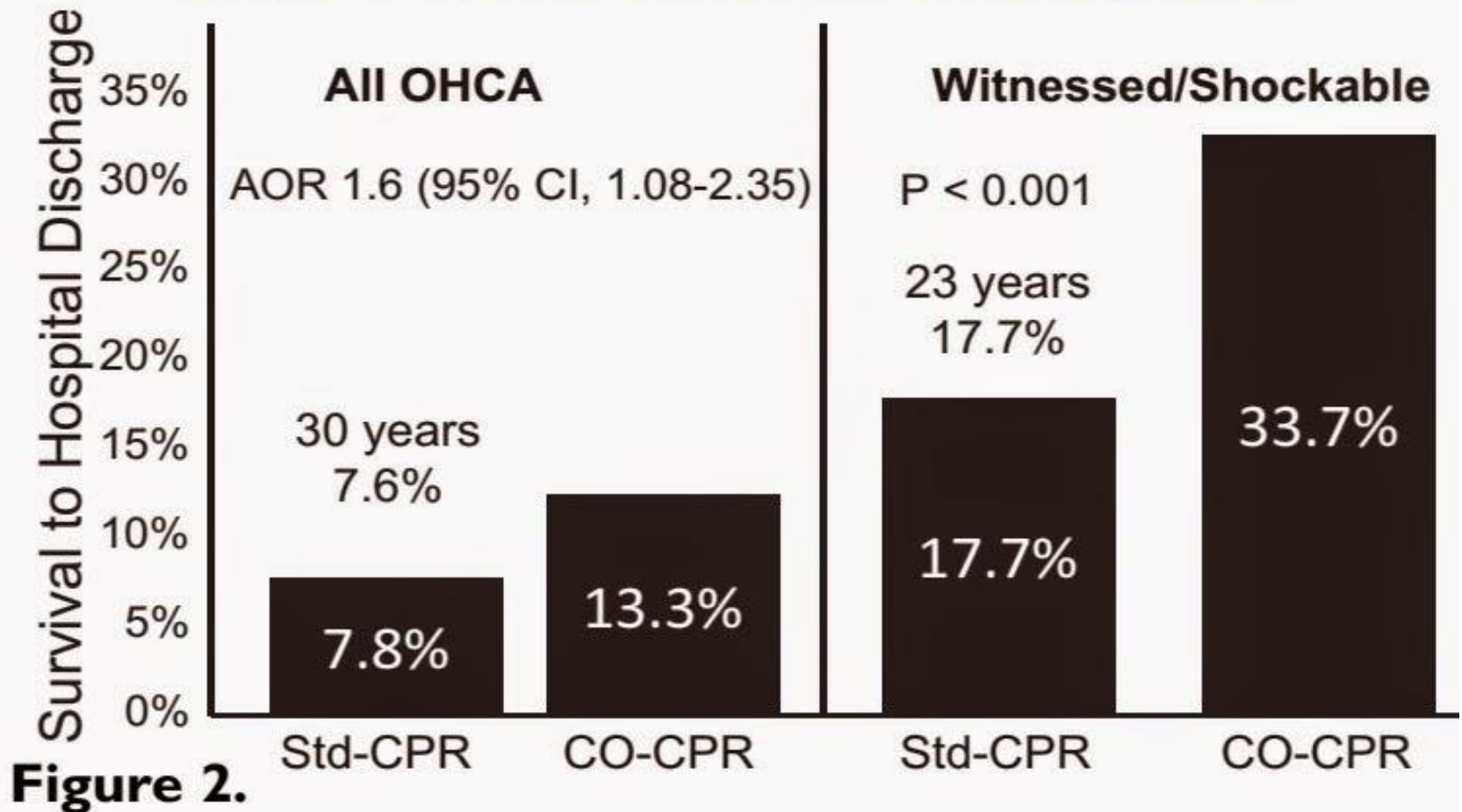
Cardiocerebral Resuscitation

Figure 1. B



**Do any drugs improve outcomes? We don't know.
Does intubation improve outcomes? We don't know.
Without ventilation survival doubles.**

Why don't we want to DOUBLE our resuscitation rates?




CO-CPR means passive oxygen insufflation by EMS.


Alternative Techniques and Ancillary Devices for Cardiopulmonary Resuscitation






high- quality evidence did not demonstrate benefit or harm associated with the ITD when used as an adjunct to conventional CPR

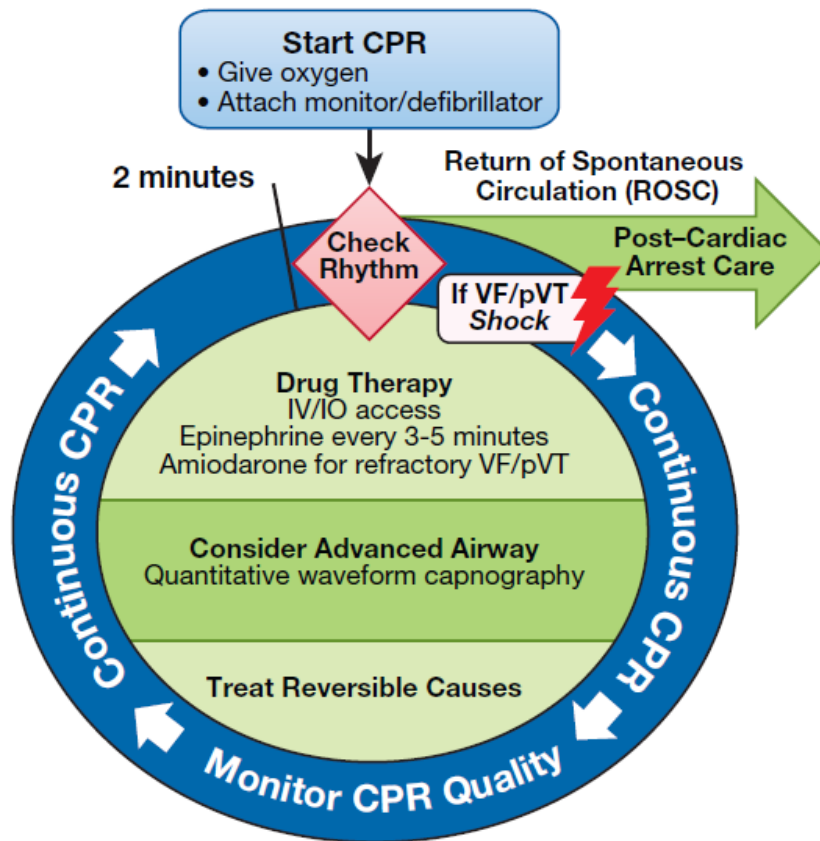
 The routine use of the impedance threshold device (ITD) as an adjunct to conventional CPR is not recommended.

 A recent randomized controlled trial suggests that the use of the ITD plus active compression-decompression CPR is associated with improved neurologically intact survival for patients with OHCA.

 The routine use of mechanical chest compression devices is not recommended, but special settings where this technology may be useful are identified.

AHA2015 does not support the routine use of ACD-CPR+ITD

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Advanced Airway

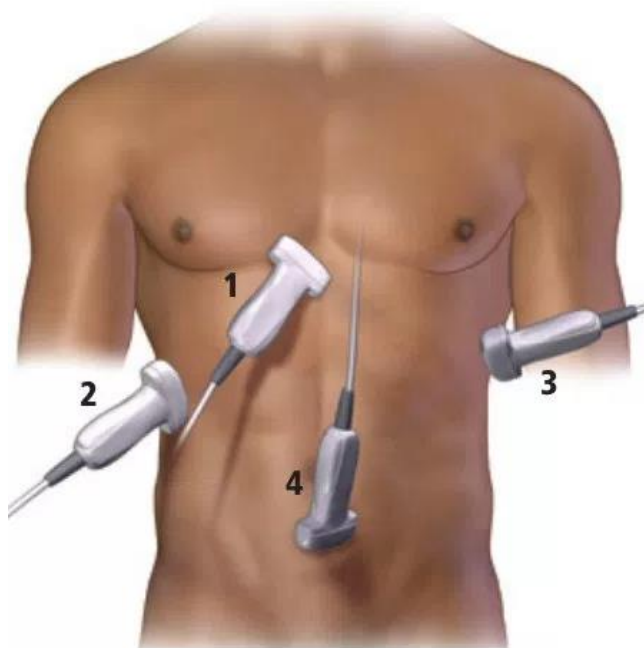
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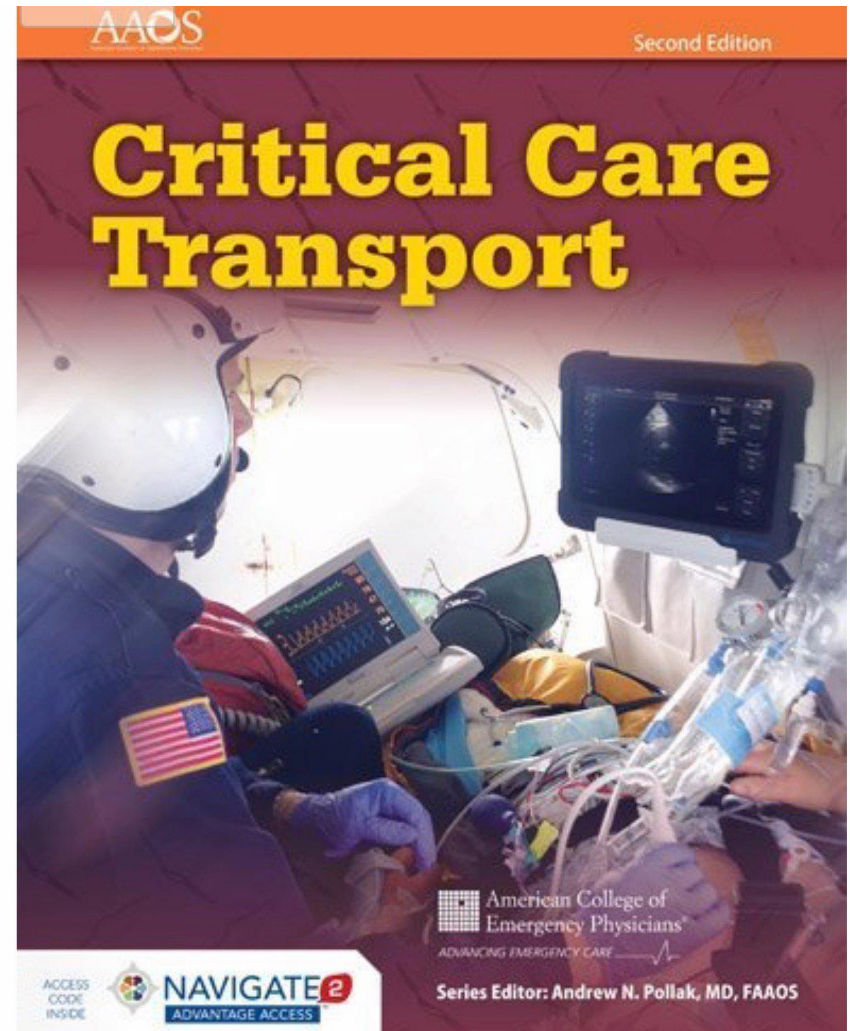
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- Hypothermia
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- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary





Post-Cardiac Arrest Care

Out-of-Hospital Cooling

2015 (New): The routine prehospital cooling of patients with rapid infusion of cold IV fluids after ROSC is not recommended.

Why: Before 2010, cooling patients in the prehospital setting had not been extensively evaluated. It had been assumed that earlier initiation of cooling might provide added benefits and also that prehospital initiation might facilitate and encourage continued in-hospital cooling. Recently published high-quality studies demonstrated no benefit to prehospital cooling and also identified potential complications when using cold IV fluids for prehospital cooling.

Hemodynamic Goals After Resuscitation

2015 (New): It may be reasonable to avoid and immediately correct hypotension (systolic blood pressure less than 90 mm Hg, mean arterial pressure less than 65 mm Hg) during post-cardiac arrest care.

2015 Recommendation—New

- The evidence **does not demonstrate a benefit** with the use of **mechanical piston devices and Load-distributing band** device for chest compressions VS manual chest compressions
- **Manual chest compressions remain the standard of care** for the treatment of cardiac arrest,
- But mechanical piston devices **may be a reasonable alternative** for use by properly trained personnel (Class IIb, LOE B-R).

Mechanical Compression Devices in specific settings

Where the delivery of high-quality manual compressions may be challenging or dangerous for the provider

1. limited rescuers available,
2. prolonged CPR,
3. during hypothermic cardiac arrest,
4. in a moving ambulance,
5. in the angiography suite,
6. during preparation for extracorporeal CPR [ECPR]),

*** Rescuers strictly limit interruptions in CPR during deployment and removal of the devices (Class IIb, LOE C-EO) ***

Termination of Resuscitation Rule (TOR Rule)

- Attempts at resuscitation are not always indicated (lividity, rigor mortis, DNAR)
- Out-of-hospital cardiac arrest patients
- Avoiding transport in patients with no chance of recovery

**No termination
rule is perfect**



Termination of Resuscitation

Positive predictive value for death > 99.5%

Arrest not witnessed by emergency medical services personnel
No return of spontaneous circulation (prior to transport)
No AED shock was delivered (prior to transport)

If ALL criteria are present,
consider termination of resuscitation

If ANY criteria are missing,
continue resuscitation and transport

© 2015 American Heart Association

termination-of-resuscitation rule for adult OHCA.

Applied after no more than 3 cycles (6 minutes)

External Validation of the Universal Termination of Resuscitation Rule for Out-of-Hospital Cardiac Arrest in British Columbia

Brian Grunau, MD, MHSc*; John Taylor, MD, MPH; Frank X. Scheuermeyer, MD, MHSc; Robert Stenstrom, MD, PhD; William Dick, MD, MSc; Takahisa Kawano, MD, PhD; David Barbic, MD, MSc; Ian Drennan, MD, MSc; Jim Christenson, MD

*Corresponding Author. E-mail: bgrunau@mail.ubc.ca.

Ann Emerg Med. 2017 Mar 14.

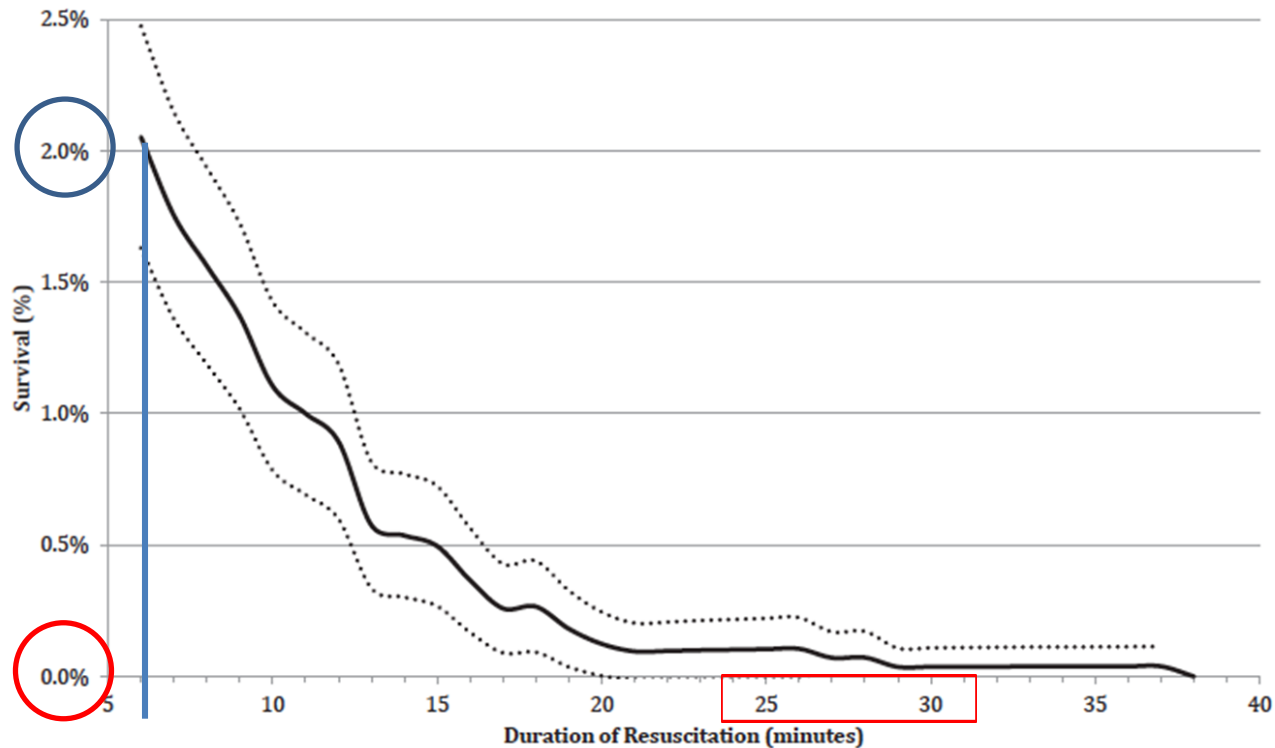
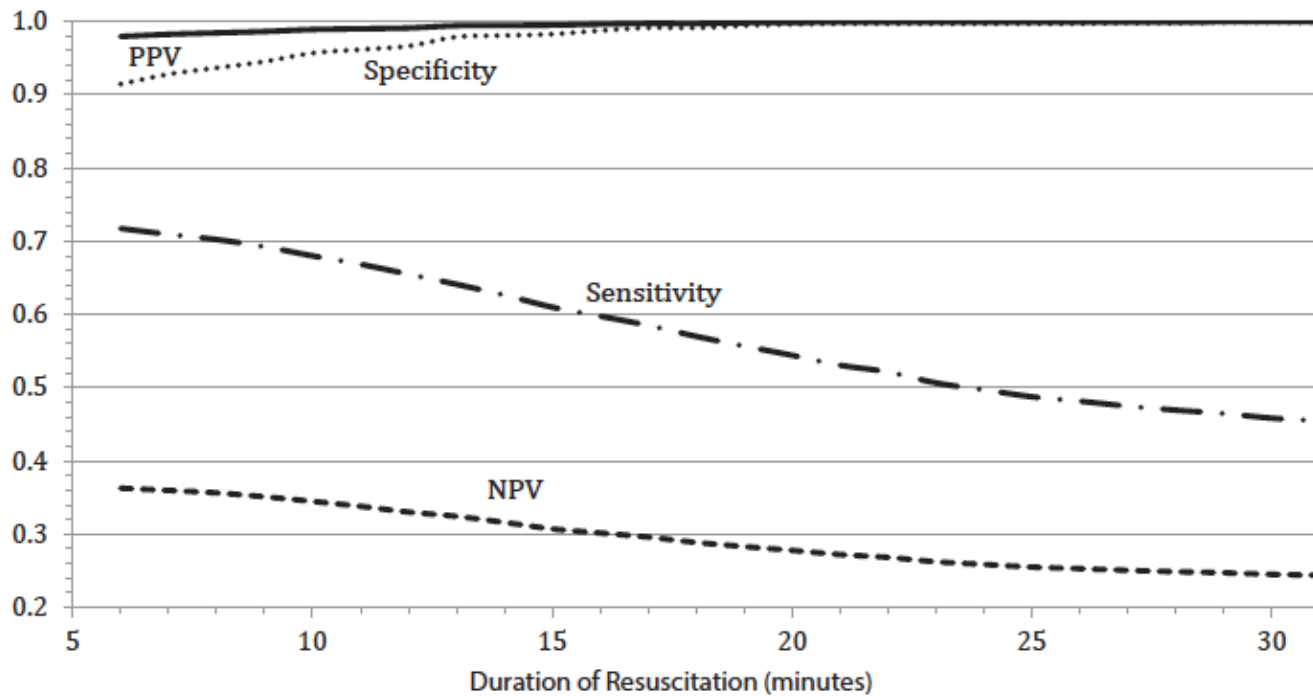


Figure 2. Proportion of survivors (with 95% CI) among patients with TOR Rule-recommended termination of resuscitation at successive resuscitation time increments.



6 min
 Sense 72
 spec 91
 PPV 98
 NPV 36

30 min
 Sense 46
 spec 100
 PPV 100
 NPV 25

Sensitivity = Deaths among TOR Rule-positive cases / Total deaths;
 Specificity = Survivors among TOR Rule-negative cases / Total survivors
 PPV = Deaths among TOR Rule-positive cases / Total TOR Rule-positive cases
 NPV = Survivors among TOR Rule-negative cases / Total TOR Rule-negative cases

Figure 3. Classification accuracy of the TOR Rule at successive resuscitation time increments. *PPV*, Positive predictive value; *NPV*, negative predictive value.

Medical Criteria for TOR (Adult- BLS)

One potential rule (Morrison-Verbeek)

- Three periods of high quality CPR
- Three AED analyses without a shock
- No return of spontaneous circulation

Same as AHA Recommendation



Medical Criteria for TOR (Adult-ALS)

- Failure to regain pulses in 20-25 minutes if unwitnessed arrest (30 minutes if witnessed)
- Asystole
- Persistent ETCO₂ level <10mmHg

Does not apply to persistent VF or hypothermia

Medical Criteria for TOR (Pediatrics)

- Little data to guide
- Absence of return of pulses in 20-25 minutes of ACLS initiation ??
- Generally, pediatric arrests are transported to the hospital

*** TOR for pediatrics not universally recommended ***





TRAUMATIC ARREST:

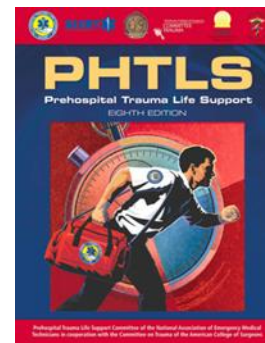
WHAT ARE WE TREATING?

1. MORTALITY 2. MIND 3. ME 4. MENTALITY 5. MORTALITY

Withholding CPR

If, during the primary assessment, patients are found to meet the following criteria, CPR may be withheld and the patient declared dead“

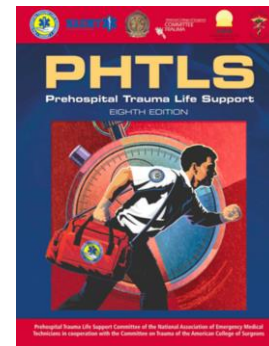
Resuscitation efforts are not indicated when the patient has sustained an **obviously fatal injury** (e.g., **decapitation**) or when evidence exists of dependent **lividity, rigor mortis, and decomposition.**



- Victims of **drowning, lightning strike, or hypothermia** and patients in whom **the mechanism of injury does not correlate** with the clinical situation (suggesting a nontraumatic cause) **deserve special consideration before a decision** is made to withhold or terminate resuscitation.
- A patient found in cardiopulmonary arrest at the scene of a traumatic event may have experienced **the arrest because of a medical problem** (e.g., myocardial infarction), especially if the patient is elderly and evidence of injury is minimal.

Traumatic CPR in the prehospital setting

extremely low likelihood of survival



“Most studies → victims of **penetrating trauma** have a **slightly increased chance of survival** over those of blunt trauma”

Blunt Trauma Criteria for TOR (Adults)

- **Apneic or pulseless with clearly associated trauma**

Exceptions:

- Shockable rhythm
- Simple airway blockage
- Pregnant with potentially survivable fetus
- Becomes pulseless 2-3 min from receiving facility
- Narrow QRS at >80 bpm
- Concern for hypothermia or drug overdose
- Carbon monoxide or cyanide overdose (fire victims)



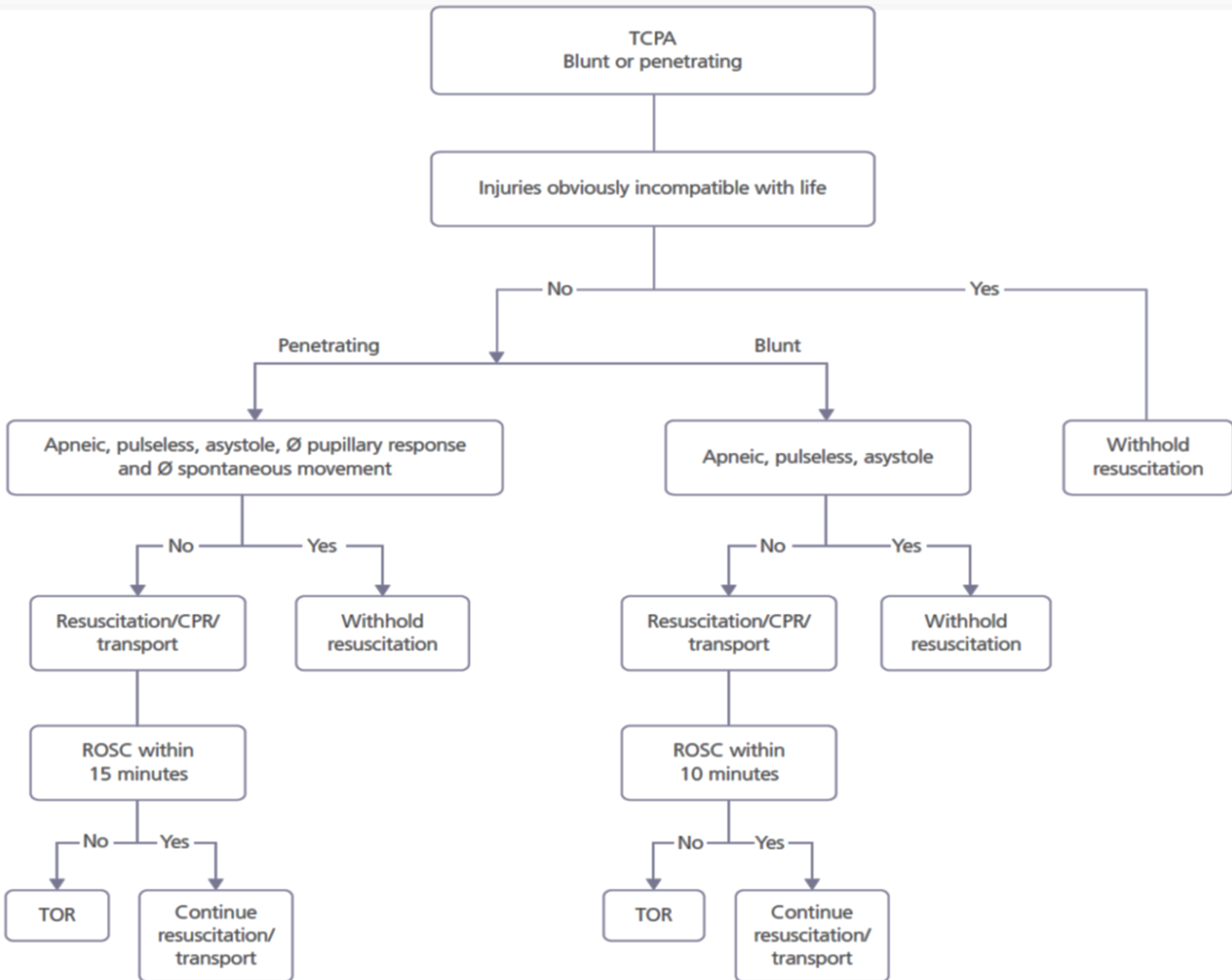
Penetrating Trauma Criteria for TOR (Adults)

- No signs of life on scene including spontaneous movement and pupillary response
- Asystole (confirm in two leads)

Trauma Criteria for TOR (Pediatrics)

- No literature to guide us
- Generally, best to transport
- Remember potential for organ donation





Terminating CPR

- Termination of resuscitation for trauma patients should be considered when **there are no signs of life and no ROSC** despite appropriate field EMS treatment that includes minimally interrupted CPR.
- The position statement notes that "protocols should require a specific interval of CPR that accompanies other resuscitative interventions.
- Past guidance has **indicated that up to 15 minutes of CPR** should be provided before resuscitative efforts are terminated, but the science in this regard **remains unclear.**"



AMERICAN COLLEGE OF SURGEONS
Verified Trauma Center





EMS

Everyday Heroes