“Wowza!”

Have you seen all the “Stuff” in the 2015 AHA Guidelines Update for CPR & ECC
(Cardiopulmonary Resuscitation & Emergency Cardiovascular Care)

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No relevant financial relationship exists
New Evidence…New Update:

• Last Guidelines published in 2010

• The 2015 AHA Guidelines Update for CPR and ECC is based on an international evidence evaluation process that involved 250 evidence reviewers from 39 countries.
Highlights vs. Executive Summary vs. Full Text

- Highlights – 32 pages
- Executive Summary – 54 pages
- Full Text – About a Million Pages

https://circ.ahajournals.org/content/132/18_suppl_2.toc#content-block
2015 Version Is Only A Partial Update To The 2010 Guidelines

• Addressing only those topics addressed by the 2015 ILCOR evidence review, or those requested by the training network
  – As a result, the 2015 AHA Guidelines Update for CPR and ECC is not a comprehensive revision of the 2010 AHA Guidelines for CPR and ECC

• Old Recommendations Not Addressed Are Still “Active”
  – An integrated version is available online at ECCguidelines.heart.org
Class Of Recommendation & Levels Of Evidence Expanded
(Now a 5 x 5 system?)

• This version contains a modified Class III recommendation,
  – Class III: No Benefit, to be used infrequently when evidence suggests a strategy is demonstrated by a high or moderate quality study (Level of Evidence [LOE] A or B, respectively) to be no better than the control

• The Levels of Evidence have also been modified
  – LOE B is now divided into LOE B-R (randomized studies) and LOE B-NR (nonrandomized studies)
  – LOE C is now divided into LOE C-LD (limited data) and C-EO (expert opinion)
# New AHA Classification System for Classes of Recommendation and Levels of Evidence

## Class (Strength) of Recommendation

### Class I (Strong)

**Benefit >> Risk**

- Suggested phrases for writing recommendations:
  - Is recommended
  - Is indicated/useful/effective/beneficial
  - Should be performed/administered/other
  - Comparative-Effectiveness Phrases:
    - Treatment/strategy A is recommended/indicated in preference to treatment B
    - Treatment A should be chosen over treatment B

### Class IIa (Moderate)

**Benefit >> Risk**

- Suggested phrases for writing recommendations:
  - Is reasonable
  - Can be useful/effective/beneficial
  - Comparative-Effectiveness Phrases:
    - Treatment/strategy A is probably recommended/indicated in preference to treatment B
    - It is reasonable to choose treatment A over treatment B

### Class IIb (Weak)

**Benefit > Risk**

- Suggested phrases for writing recommendations:
  - May/might be reasonable
  - May/might be considered
  - Usefulness/effectiveness is unknown/unclear/uncertain or not well established

### Class III: No Benefit (Moderate)

**Benefit = Risk**

(Generally, LOE A or B use only)

- Suggested phrases for writing recommendations:
  - Is not recommended
  - Is not indicated/useful/effective/beneficial
  - Should not be performed/administered/other

### Class III: Harm (Strong)

**Risk > Benefit**

- Suggested phrases for writing recommendations:
  - Potentially harmful
  - Causes harm
  - Associated with excess morbidity/mortality
  - Should not be performed/administered/other

## Level (Quality) of Evidence

### Level A

- **Randomized**
  - High-quality evidence from more than 1 RCTs
  - Meta-analyses of high-quality RCTs
  - One or more RCTs corroborated by high-quality registry studies

### Level B-R

- **Randomized**
  - Moderate-quality evidence from 1 or more RCTs
  - Meta-analyses of moderate-quality RCTs

### Level B-NR

- **Nonrandomized**
  - Moderate-quality evidence from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies
  - Meta-analyses of such studies

### Level C-LD

- **Limited Data**
  - Randomized or nonrandomized observational or registry studies with limitations of design or execution
  - Meta-analyses of such studies
  - Physiological or mechanistic studies in human subjects

### Level C-EO

- **Expert Opinion**
  - Consensus of expert opinion based on clinical experience

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COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR I and IIa; LOE A and B only), studies that support the use of comparison verbs should involve direct comparisons of the treatments or strategies being evaluated.

‡ The method of assessing quality is evolving, including the application of standardized, widely used, and potentially validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.
The 2015 AHA Guidelines Update for CPR and ECC is very different from the 2010 edition of the AHA Guidelines for CPR and ECC.

- **2010**
  - Vasopressin
  - 100 / min.

- **2015**
  - Shock First
  - 100 – 120 /min.
  - 2.0 – 2.4 inch compression
Systems of Care and Continuous Quality Improvement

• Now differentiating in-hospital cardiac arrests (IHCAs)

• …from out-of-hospital cardiac arrests (OHCAs)
IHCA and OHCA Chains of Survival

**IHCA**
- Surveillance and prevention
- Recognition and activation of the emergency response system
- Immediate high-quality CPR
- Rapid defibrillation
- Advanced life support and postarrest care

**OHCA**
- Recognition and activation of the emergency response system
- Immediate high-quality CPR
- Rapid defibrillation
- Basic and advanced emergency medical services
- Advanced life support and postarrest care

**Primary providers**
- Lay rescuers
- EMS
- ED
- Cath lab
- ICU

**Code team**
- Cath lab
- ICU

**Cath lab**
- ICU
A Call For Regionalization of Care of OHCA

• Reaffirmation of 2010 Recommendation:
  – A regionalized approach to OHCA resuscitation that includes the use of cardiac resuscitation centers may be considered

• A cardiac resuscitation center is a hospital that provides:
  – Evidence-based care in resuscitation and post–cardiac arrest care
  – 24-hour, 7-day percutaneous coronary intervention (PCI) capability
  – TTM with an adequate annual volume of cases
  – Commitment to ongoing performance improvement that includes measurement, benchmarking, and both feedback and process change
Out of Hospital Cardiac Arrest
Patients depend on their community for support

• Lay rescuers must:
  – Recognize the arrest
  – Call for help
  – Initiate CPR
  – Provide defibrillation (ie, public-access defibrillation [PAD]) until a team of professionally trained emergency medical service (EMS) providers assumes responsibility and then transports the patient to an emergency department and/or cardiac catheterization lab
In-Hospital Cardiac Arrest
Patients depend on a multidisciplinary team

• If In-Hospital cardiac arrest occurs, patients depend on the smooth interaction of the institution’s various departments and services and on a multidisciplinary team of professional providers, including:
  – Physicians
  – Nurses
  – Respiratory therapists
  – Others

RRT = Rapid Response Team
Shock First vs. CPR First for Witnessed OOHA & AED Available…

• For witnessed adult cardiac arrest when an AED is immediately available, it is reasonable that the defibrillator be used as soon as possible.

• For adults with unmonitored cardiac arrest or for whom an AED is not immediately available, it is reasonable that CPR be initiated while the defibrillator equipment is being retrieved and applied and that defibrillation, if indicated, be attempted as soon as the device is ready for use.
CPR is as easy as C-A-B

Compressions: Push hard and fast on the center of the victim's chest
Airway: Tilt the victim's head back and lift the chin to open the airway
Breathing: Give mouth-to-mouth rescue breaths
CPR For Single Rescuer = CAB
Circulation, Airway, Breathing
(Not ABC!)

• 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

• The single rescuer should begin CPR with 30 chest compressions followed by 2 breaths
Chest Compression Rate

• In adult victims of cardiac arrest, it is reasonable for rescuers to perform chest compressions at a rate of 100 to 120/min
  • Class IIa, LOE C-LD
    – Updated from “at least’ 100/min
• BG’s
  – (What is “BG’s”?)
Oh, not BG’s… Bee Gee’s!

- Stayin’ Alive
- Compression Rate 100 to 120 / minute
TWO STEPS TO STAYING ALIVE WITH HANDS-ONLY CPR

1. Call 911
2. Push hard & fast at the center of the chest

Keep the Beat, Learn Hands-Only CPR

Check out this video to see Hands-Only CPR in action.

HANDS-ONLY CPR CAN SAVE LIVES.

Most people who experience cardiac arrest at home, work or in a public location die because they don't receive immediate CPR from someone on the scene. As a bystander, don't be afraid. Your actions can only help.

When calling 911, you will be asked for your location. Be specific, especially if you're calling from a mobile phone as that is not associated with a fixed address. Answering the dispatcher's questions will not delay the arrival of help.

HOW TO GIVE HANDS-ONLY CPR.

If you see a teen or adult suddenly collapse, call 9-1-1 and push hard and fast in the center of the chest to the beat of the classic disco song "Stayin' Alive." CPR can more than double a person's chances of survival, and "Stayin' Alive" has the right beat for Hands-Only CPR.

http://cpr.heart.org/AHAEC/CPRAndECC/Programs/HandsOnlyCPR/UCM_473196_Hands-Only-CPR.jsp
Chest Compressions Between 2 – 2.4 Inches

• During manual CPR, rescuers should perform chest compressions at a depth of at least 2 inches or 5 cm for an average adult, while avoiding excessive chest compression depths (greater than 2.4 inches [6 cm])
  – Class I, LOE C-LD
How Deep is 2 – 2.4 Inches?

Height:
- 2.125 in high
- 53.98 mm high
- 5.4 cm high

Height = 66 mm (2.6 inches)
Width = 156 mm (6.1 inches)
Don’t Lean On The Chest !!!

• Chest wall recoil creates a relative negative intrathoracic pressure that promotes venous return and cardiopulmonary blood flow
  – Leaning on the chest wall between compressions precludes full chest wall recoil

• Incomplete recoil raises intra-thoracic pressure and reduces venous return, coronary perfusion pressure, and myocardial blood flow and can influence resuscitation outcomes
Chest Recoil

• It is reasonable for rescuers to avoid leaning on the chest between compressions, to allow full chest wall recoil for adults in cardiac arrest.
Minimizing Interruptions in Chest Compressions

- Rescuers should attempt to minimize the frequency and duration of interruptions in compressions to maximize the number of compressions delivered per minute.
- In adult cardiac arrest, total pre-shock and post-shock pauses in chest compressions should be as short as possible (Class I, LOE C-LD) because shorter pauses can be associated with greater shock success, ROSC, and, in some studies, higher survival to hospital discharge.
## BLS Dos and Don’ts of Adult High-Quality CPR

<table>
<thead>
<tr>
<th>Rescuers Should</th>
<th>Rescuers Should <em>Not</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform chest compressions at a rate of 100-120/min</td>
<td>Compress at a rate slower than 100/min or faster than 120/min</td>
</tr>
<tr>
<td>Compress to a depth of at least 2 inches (5 cm)</td>
<td>Compress to a depth of less than 2 inches (5 cm) or greater than 2.4 inches (6 cm)</td>
</tr>
<tr>
<td>Allow full recoil after each compression</td>
<td>Lean on the chest between compressions</td>
</tr>
<tr>
<td>Minimize pauses in compressions</td>
<td>Interrupt compressions for greater than 10 seconds</td>
</tr>
<tr>
<td>Ventilate adequately (2 breaths after 30 compressions, each breath delivered over 1 second, each causing chest rise)</td>
<td>Provide excessive ventilation (ie, too many breaths or breaths with excessive force)</td>
</tr>
</tbody>
</table>
Vasopressin Removed...

...for simplicity

- Both epinephrine and vasopressin administration during cardiac arrest have been shown to improve ROSC.
- Review of the available evidence shows that efficacy of the 2 drugs is similar and that there is no demonstrable benefit from administering both epinephrine and vasopressin as compared with epinephrine alone.
- In the interest of simplicity, vasopressin has been removed from the Adult Cardiac Arrest Algorithm.
Bystander **Naloxone** in Opioid-Associated Life-Threatening Emergencies

- For patients with known or suspected opioid addiction who are unresponsive with no normal breathing but a pulse, it is reasonable for appropriately trained lay rescuers and BLS providers, in addition to providing standard BLS care…
- …to administer intramuscular (IM) or intranasal (IN) naloxone
Bystander **Naloxone** in Opioid-Associated Life-Threatening Emergencies

**HOW TO GIVE NASAL SPRAY NARCAN**

1. Pull or pry off yellow caps
2. Pry off red cap
3. Grip clear plastic wings
4. Screw capsule of naloxone into barrel of syringe
5. Insert white cone into nostril; give a short, vigorous push on end of capsule to spray naloxone into nose: one half of the capsule into each nostril
6. If no reaction in 2-5 minutes, give the second dose
Use of Social Media to Summon Rescuers

• It may be reasonable for communities to incorporate social media technologies that summon rescuers who are in close proximity to a victim of suspected OHCA and are willing and able to perform CPR

  – Kind of like an “Amber Alert”
Example of Social Media App for Community CPR & AED support

- **Pulsepoint**
  - Implement Partner: Physio-Control
- Provides two apps that work with local public safety agencies to improve communications with citizens and ultimately empower them to help during a cardiac emergency
  - Pulsepoint Respond
  - Pulsepoint AED

*Note: It is NOT free!*
Ethical Issues

• Ethical issues surrounding whether to start or when to terminate CPR are complex and may vary across settings
  – in- or out-of-hospital
  – providers (basic or advanced)
  – patient population (neonatal, pediatrics, adult)
• Although ethical principles have not changed since the 2010 Guidelines were published, the data that inform many ethical discussions have been updated through the evidence review process
• The 2015 ILCOR evidence review process and resultant AHA Guidelines Update include several science updates that have implications for ethical decision making for peri-arrest, arrest, and post-arrest patients
Ethical Issue: ECPR (ECMO)  
…When to Stop?

• The use of extracorporeal CPR (ECPR) for cardiac arrest has made decisions to discontinue resuscitation measures more complicated

• The increased use of targeted temperature management (TTM) has led to new challenges for predicting neurologic outcomes in comatose post–cardiac arrest patients
Acute Coronary Syndrome
Acute Coronary Syndromes: Key Issues and Major Changes (Chapter 9)

- Prehospital ECG acquisition and interpretation
- Choosing a reperfusion strategy when prehospital fibrinolysis is available
- Choosing a reperfusion strategy at a non–PCI-capable hospital
- Troponin to identify patients who can be safely discharged from the emergency department
- Interventions that may or may not be of benefit if given before hospital arrival
  - (Medications)
• The ILCOR ACS Task Force did not review areas in which it found a paucity of new evidence between 2010 and 2015
  – Therefore, the 2010 Guidelines for these un-reviewed areas remain current
• For example, acetylsalicylic acid (Aspirin) administration has been shown to be of benefit in ACS and was recommended by the 2010 Guidelines
Symptom Onset vs. First Medical Contact

- The following recommendations are not in conflict with, and do not replace, the 2013 ACC/AHA STEMI Guidelines, which are endorsed by this ACS Writing Group.

- These 2015 Guidelines Update recommendations are derived from a different set of studies that examined the interval between symptom onset and reperfusion, rather than the interval between first medical contact and reperfusion.
Prehospital ECG and
Prehospital STEMI Activation of the Catheterization Laboratory

- Prehospital 12-lead ECG should be acquired early for patients with possible ACS
  - (Class I, LOE B-NR).
- Prehospital notification of the receiving hospital (if fibrinolysis is the likely reperfusion strategy) and/or prehospital activation of the catheterization laboratory should occur for all patients with a recognized STEMI on prehospital ECG
  - (Class I, LOE B-NR).
Computer-Assisted ECG STEMI Interpretation

• Because of high false-negative rates, we recommend that computer-assisted ECG interpretation not be used as a sole means to diagnose STEMI
  – (Class III: Harm, LOE B-NR).

• We recommend that computer-assisted ECG interpretation may be used in conjunction with physician or trained provider interpretation to recognize STEMI
  – (Class IIb, LOE C-LD).
EMS Can Interpret STEMI!

- While transmission of the prehospital ECG to the ED physician may improve positive predictive value (PPV) and therapeutic decision-making regarding adult patients with suspected STEMI…

- …if transmission is not performed, it may be reasonable for trained non-physician ECG interpretation to be used as the basis for decision-making, including activation of the catheterization laboratory, administration of fibrinolysis, and selection of destination hospital
  - (Class IIa, LOE B-NR)
Biomarkers in ACS
(In the Emergency Department or Hospital)

• More than 8 million patients are evaluated for potential ischemic chest pain in US EDs each year
  – with troponin measurement serving as one of the crucial diagnostic tests

Biomarkers in ACS
(Without a formal risk assessment)

• Two observational studies used troponin (cTnI, cTnT, or hscTnT) measured at 0 and 2 hours to assess whether patients could be safely discharged from the ED

• ACS would have been missed in 2.5% to 7.8% of the patients studied
  – A formal risk assessment instrument was not used in either of these 2 studies
Clinical Decision Rules Along With Troponin Measurements

- Six additional observational studies combined troponin testing (using cTnI, cTnT, hs-cTnI, or hs-cTnT) with use of clinical decision rules such as:
  - TIMI
  - Vancouver
  - North American
  - HEART
- The proportion of false-negative results among patients with 30-day MACE ranged from 0% to 1.2%
  - When the age cutoff for low-risk patients was increased from 50 years to 60 years for the North American Chest Pain Rule, the proportion of false-negative results rose from 0% to 1.1%
Chest Pain “Rule-Outs” Need BOTH Troponin & a Risk Score

• We recommend against using hs-cTnT and cTnl alone measured at 0 and 2 hours (without performing clinical risk stratification) to identify patients at low risk for ACS
  – (Class III:Harm, LOE B-NR).

• We recommend that hs-cTnl measurements that are less than the 99th percentile, measured at 0 and 2 hours, may be used together with low-risk stratification (TIMI score of 0 or 1 or low risk per Vancouver rule) to predict a less than 1% chance of 30-day MACE
  – (Class IIa, LOE B-NR).

• We recommend that negative cTnl or cTnT measurements at 0 and between 3 and 6 hours may be used together with very low-risk stratification (TIMI score of 0, low-risk score per Vancouver rule, North American Chest Pain score of 0 and age less than 50 years, or low-risk HEART score) to predict a less than 1% chance of 30-day MACE
  – (Class IIa, LOE B-NR).
Urban vs. Rural

- Are the Guidelines a one-size fits all…
- …no matter where you are?

2007-2010 Acute Myocardial Infarction (ICD10 I21 & I22)
35+ Age-Adjusted Mortality per 100,000
STEMI Receiving/Referral Centers

“…prehospital administration of medication adds complexity to patient care”

• When a medication reduces morbidity or mortality, prehospital compared with hospital administration of that medication allows the drug to begin its work sooner and may further decrease morbidity or mortality.

• However, when urban* EMS response and transport times are short, the opportunity for beneficial drug effect may not be great.

*Highlights of the 2015 AHA Guideline Update for CPR and ECC; (page 17-18)
Still Give Aspirin for Suspected ACS!

1 adult, or 2 to 4 baby Aspirins

• (Aspirin) administration has been shown to be of benefit in ACS and was recommended by the 2010 Guidelines

• Because aspirin should be administered as soon as possible after symptom onset to patients with suspected ACS, it is reasonable for EMS dispatchers to instruct patients with no history of aspirin allergy and without signs of active or recent gastrointestinal bleeding to chew an aspirin (160 to 325 mg) while awaiting the arrival of EMS providers – (Class IIa, LOE C)
Differences between individual ADP inhibitors were not examined

• The preferred reperfusion strategy for patients with STEMI is identification and restoration of normal flow in the infarct-related artery using primary percutaneous intervention

• The use of potent dual antiplatelet therapy in STEMI patients undergoing PPCI is associated with improved clinical outcomes as well as lower rates of acute stent thrombosis

• Given the short time from first medical contact to balloon inflation, treatment with oral ADP inhibitors in a prehospital setting has the potential to enhance platelet inhibition and improve procedural and clinical outcomes after PCI
ADP Inhibitor

• In patients with suspected STEMI intending to undergo PPCI, initiation of ADP inhibition may be reasonable in either the prehospital or in-hospital setting – (Class IIb, LOE C-LD).
Heparin

• In suspected STEMI patients for whom there is a planned PPCI reperfusion strategy, administration of unfractionated heparin (UFH) can occur either in the prehospital or in-hospital setting
  – (Class IIb, LOE B-NR)
What About Oxygen?

• Before the 2010 recommendations, oxygen was routinely administered to all patients with suspected ACS regardless of oxygen saturation or respiratory condition
  – In 2010, weak evidence of no benefit and possible harm prompted a recommendation that supplementary oxygen was not needed for patients with ACS who had an oxyhemoglobin saturation of 94% or greater (ie, no hypoxemia) and no evidence of respiratory distress

• Further evidence that the routine administration of supplementary oxygen may be harmful, supported by a multicenter randomized controlled trial published since the 2015 systematic review, strengthens the recommendation that oxygen be withheld from patients with possible ACS who have a normal oxygen saturation (ie, who are without hypoxemia).
Prehospital Fibrinolysis?

• Benefit from prehospital fibrinolysis was found consistently by 3 RCTs performed more than 20 years ago
  – However, these studies were performed at a time when hospital fibrinolytic administration typically took well in excess of 60 minutes

• It is not clear the extent to which that mortality benefit would be maintained today when the hospital time to fibrinolytic treatment is typically considerably shorter than it was 20 years ago
Prehospital Fibrinolysis?

• Several studies in the past 15 years have compared transport directly for PPCI with prehospital fibrinolysis and found no mortality benefit of either therapy
  – Although the relatively rare harm from intracranial hemorrhage is greater with fibrinolysis
Prehospital Fibrinolysis?

• Where prehospital fibrinolysis is available as part of a STEMI system of care, and in-hospital fibrinolysis is the alternative treatment strategy, it is reasonable to administer prehospital fibrinolysis when transport times are more than 30 minutes
  • (Class IIa, LOE B-R)

• Where prehospital fibrinolysis is available as part of the STEMI system of care and direct transport to a PCI center is available, prehospital triage and transport directly to a PCI center may be preferred
  – Because of the small relative decrease in the incidence of intracranial hemorrhage without evidence of mortality benefit to either therapy
  • (Class IIb, LOE B-R).
ED Fibrinolysis and Immediate PCI Versus Immediate PCI Alone

• A number of randomized clinical trials have addressed clinical outcomes after initial treatment with a half- or full-dose fibrinolytic agent followed by dedicated immediate PCI compared with immediate PCI alone
  – The studies showed no benefit to mortality, nonfatal MI, or target vessel revascularization when fibrinolytic administration is combined with immediate PCI as compared with immediate PCI alone

• The studies did, however, identify harm from intracranial Hemorrhage or major bleeding when fibrinolytic administration is combined with immediate PCI versus immediate PCI alone
ED Fibrinolysis and Immediate PCI Versus Immediate PCI Alone
(New 2015 Recommendation)

• In the treatment of patients with suspected STEMI, the combined application of fibrinolytic therapy followed by immediate PCI (as contrasted with immediate PCI alone) is not recommended
  – (Class III: Harm, LOE B-R)
“Expected Delays” Drive Decisions

Regardless of whether time of symptom onset is known, the interval between first medical contact and reperfusion should not exceed 120 minutes (Class I, LOE C-EO).

In STEMI patients presenting within 2 hours of symptom onset, immediate fibrinolysis rather than PPCI may be considered when the expected delay to PPCI is more than 60 minutes (Class IIb, LOE C-LD).

In STEMI patients presenting within 2 to 3 hours after symptom onset, either immediate fibrinolysis or PPCI involving a possible delay of 60 to 120 minutes might be reasonable (Class IIb, LOE C-LD).

In STEMI patients presenting within 3 to 12 hours after symptom onset, performance of PPCI involving a possible delay of up to 120 minutes may be considered rather than initial fibrinolysis (Class IIb, LOE C-LD).

It is acknowledged that fibrinolysis becomes significantly less effective more than 6 hours after symptom onset, and thus a longer delay to PPCI may be the better option for patients more than 6 hours after symptom onset.

In STEMI patients, when delay from first medical contact to PPCI is anticipated to exceed 120 minutes, a strategy of immediate fibrinolysis followed by routine early (within 3 to 24 hours) angiography and PCI if indicated may be reasonable for patients with STEMI (Class IIb, LOE B-R).

• Notice the 120 min window FMC to PCI....
• …not 90 minutes
Hospital Reperfusion Decisions After ROSC
PCI After ROSC With and Without ST Elevation

• Coronary angiography should be performed emergently (rather than later in the hospital stay or not at all) for OHCA patients with suspected cardiac etiology of arrest and ST elevation on ECG
  – (Class I, LOE B-NR)
• Emergency coronary angiography is reasonable for select (eg, electrically or hemodynamically unstable) adult patients who are comatose after OHCA of suspected cardiac origin but without ST elevation on ECG
  – (Class IIa, LOE B-NR)
• Coronary angiography is reasonable in post–cardiac arrest patients where coronary angiography is indicated regardless of whether the patient is comatose or awake
  – (Class IIa, LOEC-LD)
Figure 7

BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update

Verify scene safety.

Victim is unresponsive. Shout for nearby help. Activate emergency response system via mobile device (if appropriate).

Activate emergency response system (if not already done). Return to victim and monitor until emergency responders arrive.

Normal breathing, has pulse

Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?

Provide rescue breathing: 1 breath every 3-5 seconds, or about 12-20 breaths/min.
- Add compressions if pulse remains ≤60/min with signs of poor perfusion.
- Activate emergency response system (if not already done) after 2 minutes.
- Continue rescue breathing; check pulse about every 2 minutes. If no pulse, begin CPR (go to “CPR” box).

No normal breathing, has pulse

No breathing or only gasping, no pulse

Witnessed sudden collapse?

No

CPR
1 rescuer: Begin cycles of 30 compressions and 2 breaths. (Use 15:2 ratio if second rescuer arrives.) Use AED as soon as it is available.

After about 2 minutes, if still alone, activate emergency response system and retrieve AED (if not already done).

AED analyzes rhythm. Shockable rhythm?

Yes, shockable

Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.

No, nonshockable

Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.

Activate emergency response system (if not already done), and retrieve AED/defibrillator.
<table>
<thead>
<tr>
<th>Component</th>
<th>Adults and Adolescents</th>
<th>Children (Age 1 Year to Puberty)</th>
<th>Infants (Age Less Than 1 Year, Excluding Newborns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scene safety</td>
<td>Make sure the environment is safe for rescuers and victim</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Recognition of cardiac arrest    | Check for responsiveness  | No breathing or only gasping (i.e., no normal breathing) | No definite pulse felt within 10 seconds  
(Breathing and pulse check can be performed simultaneously in less than 10 seconds) |
| Activation of emergency response system | If you are alone without a mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR.  
Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available | Witnessed collapse  
Follow steps for adults and adolescents on the left  
Unwitnessed collapse  
Give 2 minutes of CPR  
Leave the victim to activate the emergency response system and get the AED  
Return to the child or infant and resume CPR; use the AED as soon as it is available |                                                   |
| Compression-ventilation ratio without advanced airway | 1 or 2 rescuers  
30:2 | 1 rescuer  
30:2  
2 or more rescuers  
15:2 |                                                   |
| Compression-ventilation ratio with advanced airway | Continuous compressions at a rate of 100-120/min  
Give 1 breath every 6 seconds (10 breaths/min) |                                                   |                                                   |
| Compression rate                 | 100-120/min            |                                                  |                                                   |
| Compression depth                | At least 2 inches (5 cm)*  
About 2 inches (5 cm) | At least one third AP diameter of chest  
About 2 inches (5 cm) | At least one third AP diameter of chest  
About 1½ inches (4 cm) |
| Hand placement                   | 2 hands on the lower half of the breastbone (sternum) | 2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum) | 1 rescuer  
2 fingers in the center of the chest, just below the nipple line  
2 or more rescuers  
2 thumb—encircling hands in the center of the chest, just below the nipple line |
| Chest recoil                      | Allow full recoil of chest after each compression; do not lean on the chest after each compression |                                                   |                                                   |
| Minimizing interruptions          | Limit interruptions in chest compressions to less than 10 seconds |                                                   |                                                   |

*Compression depth should be no more than 2.4 inches (6 cm).  
Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.
BLS Healthcare Provider Adult Cardiac Arrest Algorithm—2015 Update

Verify scene safety.

Victim is unresponsive. 
Shout for nearby help. 
Activate emergency response system via mobile device (if appropriate). 
Get AED and emergency equipment (or send someone to do so).

Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely set within 10 seconds?

Normal breathing, has pulse

No normal breathing, has pulse

No breathing or only gasping, no pulse

Monitor until emergency responders arrive.

CPR
Begin cycles of 30 compressions and 2 breaths. 
Use AED as soon as it is available.

AED arrives.

Check rhythm. 
Shockable rhythm?

Yes, shockable
Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). 
Continue until ALS providers take over or victim starts to move.

No, nonshockable
Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). 
Continue until ALS providers take over or victim starts to move.

Provide rescue breathing: 
1 breath every 5-6 seconds, or about 10-12 breaths/min.

- Activate emergency response system if not already done after 2 minutes.
- Continue rescue breathing; check pulse about every 2 minutes. If no pulse, begin CPR (go to “CPR” box).
- If possible opioid overdose, administer naloxone if available per protocol.

By this time in all scenarios, emergency response system or backup is activated, and AED and emergency equipment are retrieved or someone is retrieving them.
Verify scene safety.

Victim is unresponsive. Shout for nearby help. First rescuer remains with victim. Second rescuer activates emergency response system and retrieves AED and emergency equipment.

Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?

- Normal breathing, has pulse: Monitor until emergency responders arrive.
- No normal breathing, has pulse: Provide rescue breathing; 1 breath every 3-5 seconds, or about 12-20 breaths/min.
  - Add compressions if pulse remains <60/min with signs of poor perfusion.
  - Activate emergency response system (if not already done) after 2 minutes.
  - Continue rescue breathing; check pulse about every 2 minutes. If no pulse, begin CPR (go to “CPR” box).

CPR
- First rescuer begins CPR with 30:2 ratio (compressions to breaths). When second rescuer returns, use 15:2 ratio (compressions to breaths). Use AED as soon as it is available.

AED analyzes rhythm. Shockable rhythm?

- Yes, shockable: Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
- No, nonshockable: Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
**Opioid-Associated Life-Threatening Emergency (Adult) Algorithm—New 2015**

**Assess and activate.**
Check for unresponsiveness and call for nearby help. Send someone to call 9-1-1 and get AED and naloxone. Observe for breathing vs no breathing or only gasping.

**Begin CPR.**
If victim is unresponsive with no breathing or only gasping, begin CPR.*
If alone, perform CPR for about 2 minutes before leaving to phone 9-1-1 and get naloxone and AED.

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

**Does the person respond?**
At any time, does the person move purposefully, breathe regularly, moan, or otherwise respond?

- **Yes**
  - Stimulate and reassess.
    - Continue to check responsiveness and breathing until advanced help arrives.
    - If the person stops responding, begin CPR and repeat naloxone.

- **No**
  - Continue CPR and use AED as soon as it is available.
    - Continue until the person responds or until advanced help arrives.

*CPR technique based on rescuer’s level of training.