STRATEGIES TO IMPROVE SURVIVAL RATES FROM ADULT OUT-OF-HOSPITAL CARDIAC ARREST IN RURAL KENTUCKY

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Independence, KY

October 30, 2020

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Kentucky Office of Rural Health

American Heart Association.

OBJECTIVES

- To gain a better understanding of the importance of early CPR and defibrillation
- To describe solutions to increase utilization of bystander CPR and AED
- To understand EMS high-performance CPR and practical solutions for implementing
- To learn about other resources available to improve out-of-hospital cardiac arrest

OUT OF HOSPITAL CARDIAC ARREST IN THE US

- More than 356,000 out-of-hospital OHCAs annually
  - Nearly 1,000 assessed by EMS daily
  - 90% are fatal
- 25% of adults treated by EMS had not symptoms prior to arrest
- Large regional various rates of survival to hospital discharge (3.4%-22%)
  - Variations in the rates of layperson CPR and AED use explain much of this variation
  - Survival rates differ between urban and rural due largely to ambulance response times
- Median annual CPR training rate for US counites is 2.39%
  - Training rates are lower in rural areas and counties with lower median household incomes

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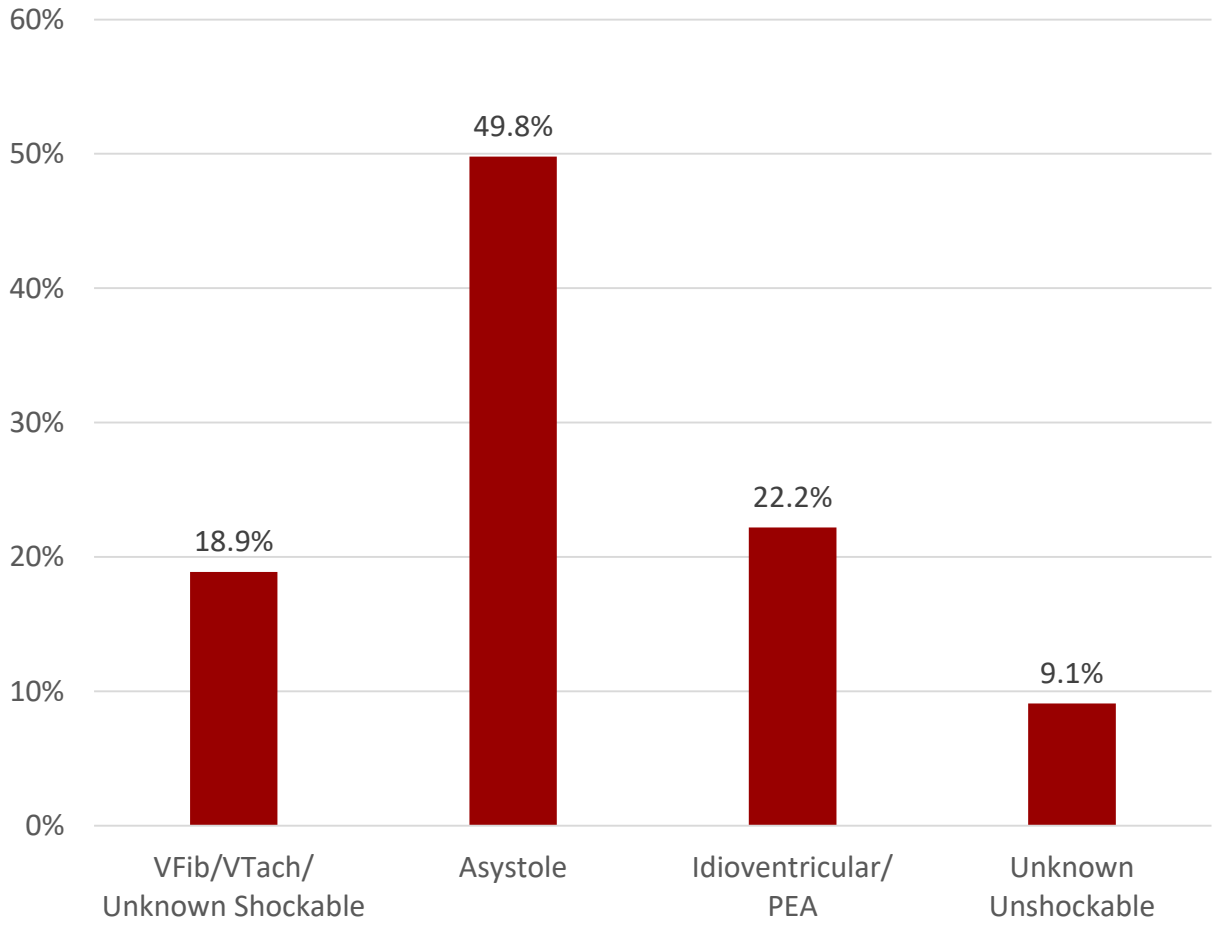
NATIONAL DATA - FIRST ARREST RHYTHM



CARES
Cardiac Arrest Registry to Enhance Survival

Source: 2019 National Report Summary

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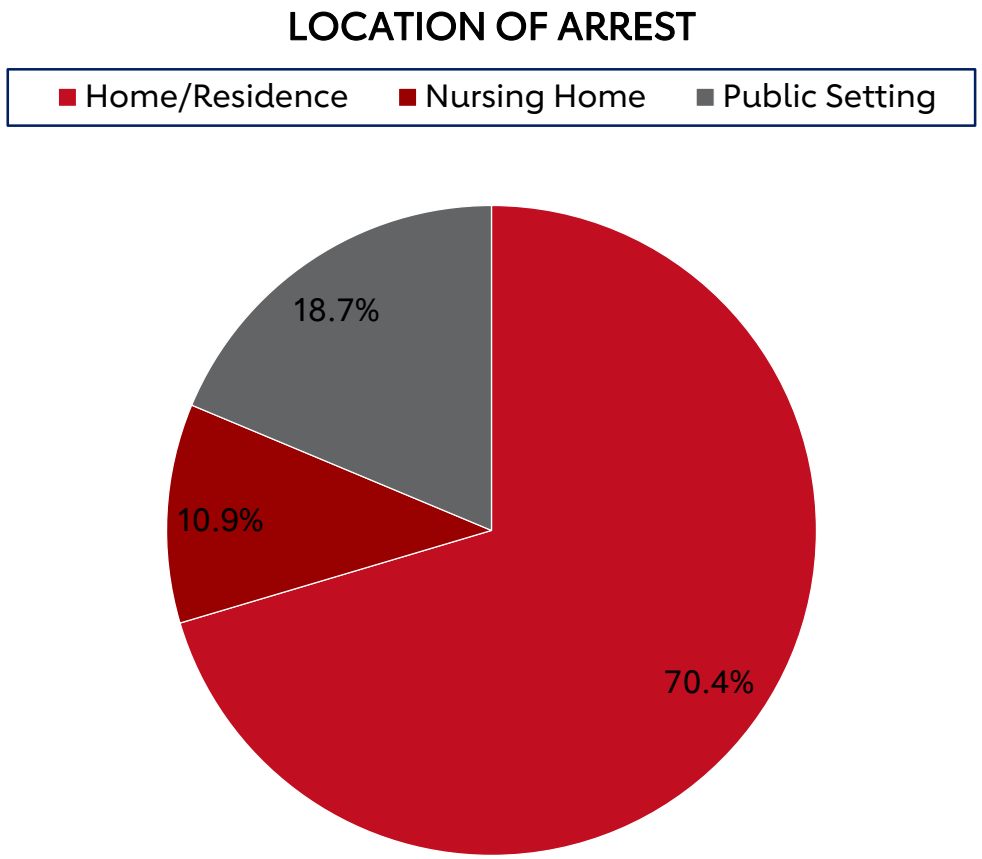
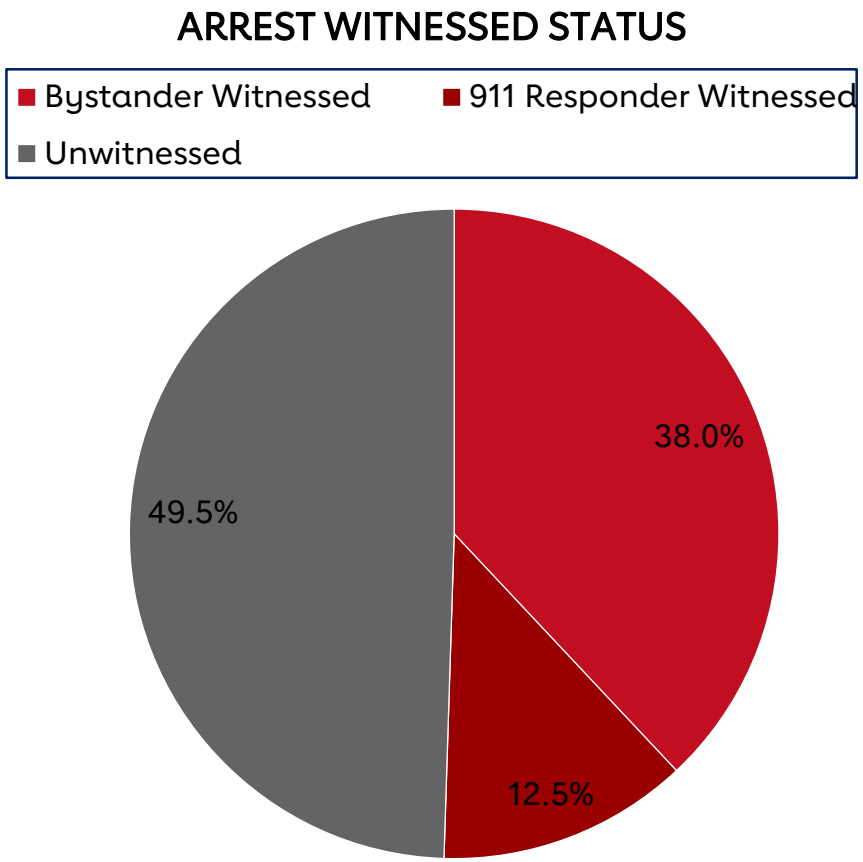
NATIONAL DATA - LOCATION OF ARREST AND ARREST WITNESS STATUS





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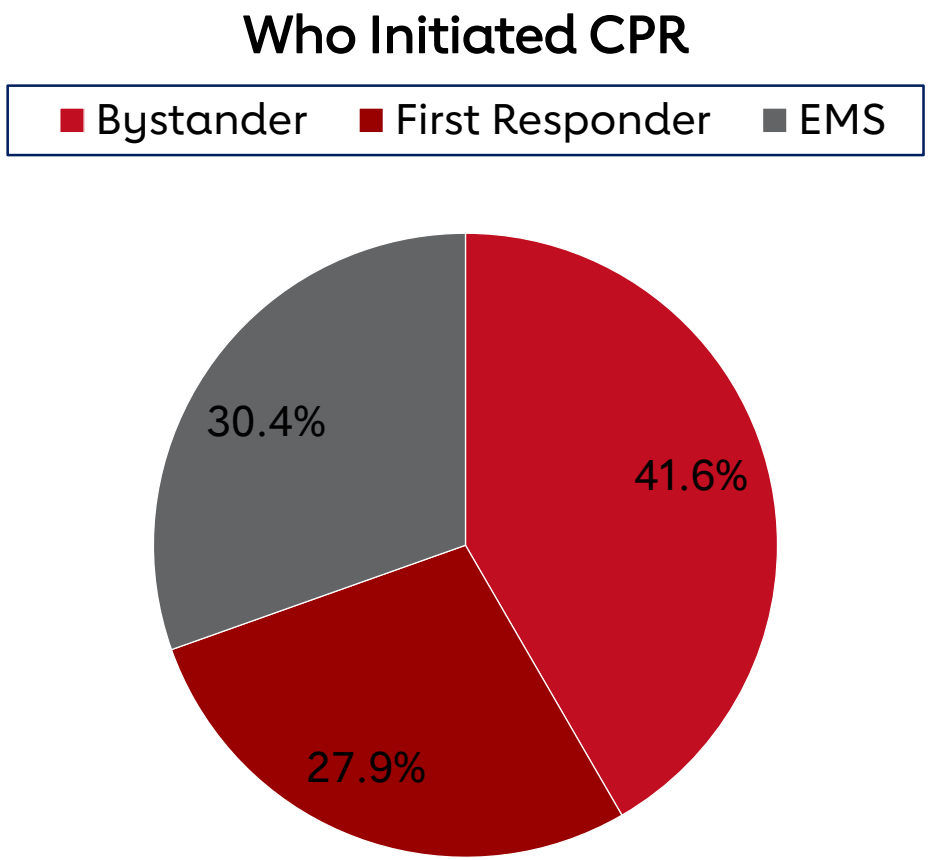
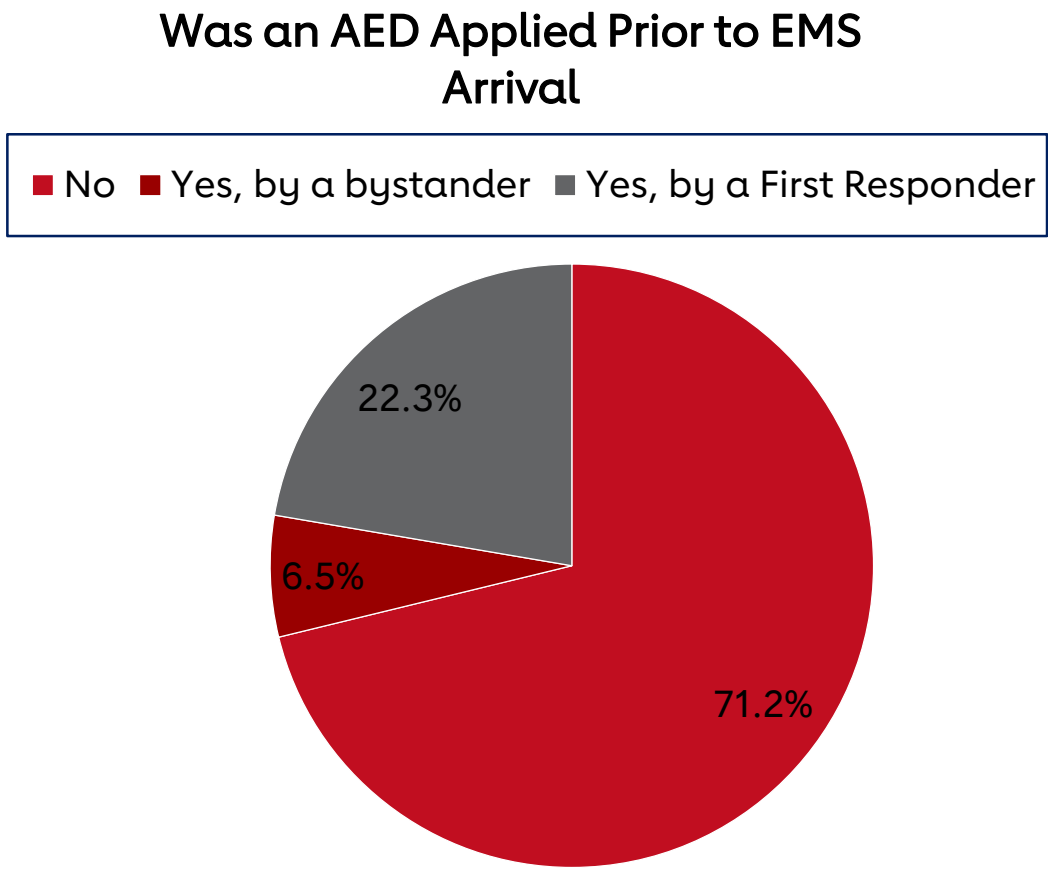
Source: CARES 2019 National Report Summary

NATIONAL DATA – WHO INITIATED CPR AND WAS AED APPLIED





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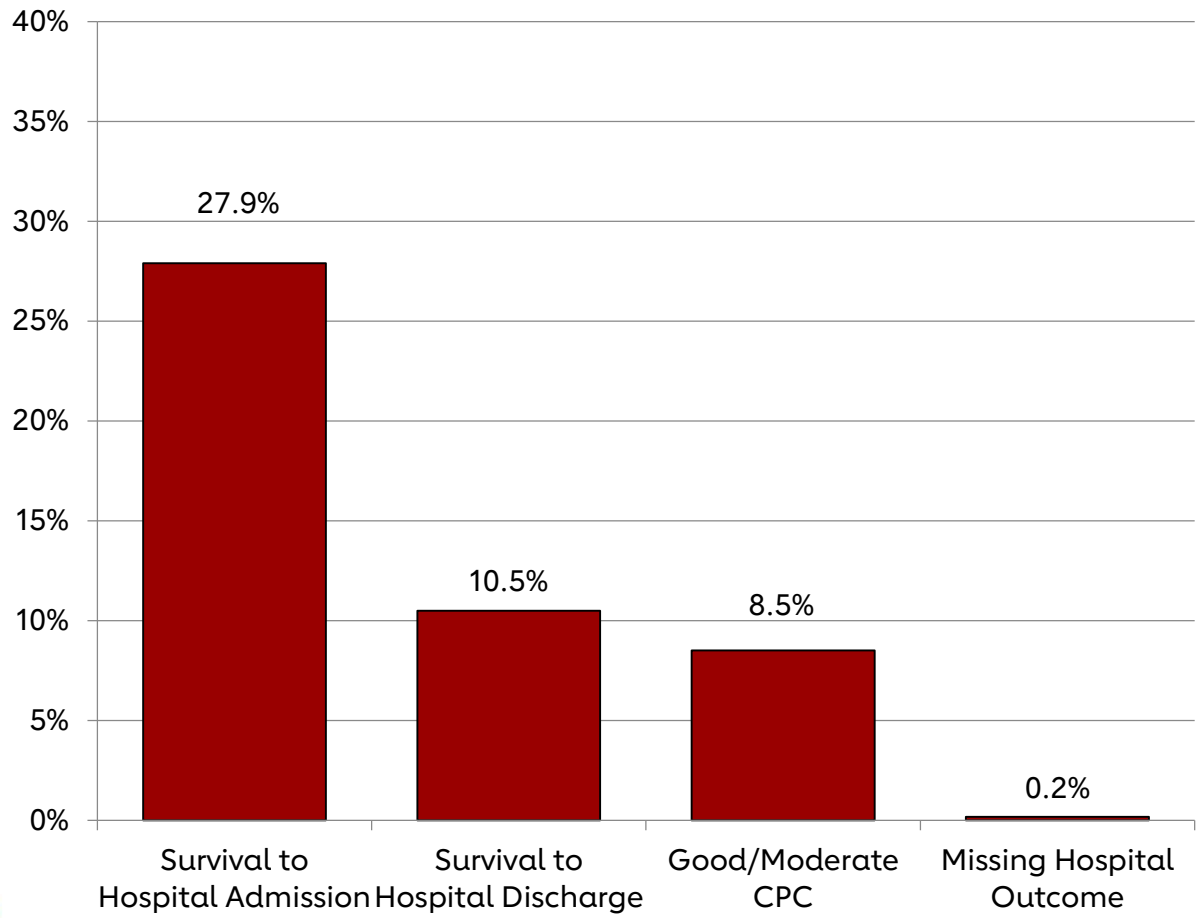
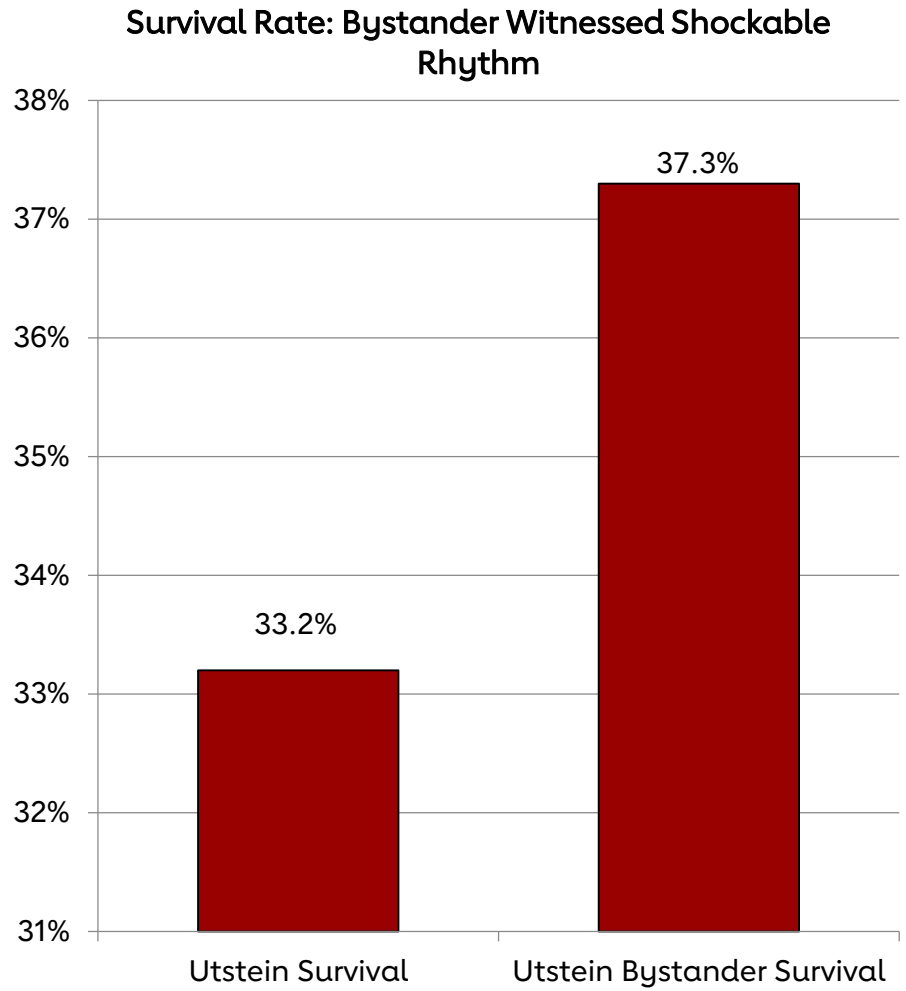
Source: CARES 2019 National Report Summary

NATIONAL DATA - SURVIVAL RATES





- *Utstein = Witnessed by bystander and found in a shockable rhythm*
- *Utstein Bystander = Witnessed by bystander, found in shockable rhythm, and received some bystander intervention (CPR and/or AED application)*

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Source: CARES 2019 National Report Summary

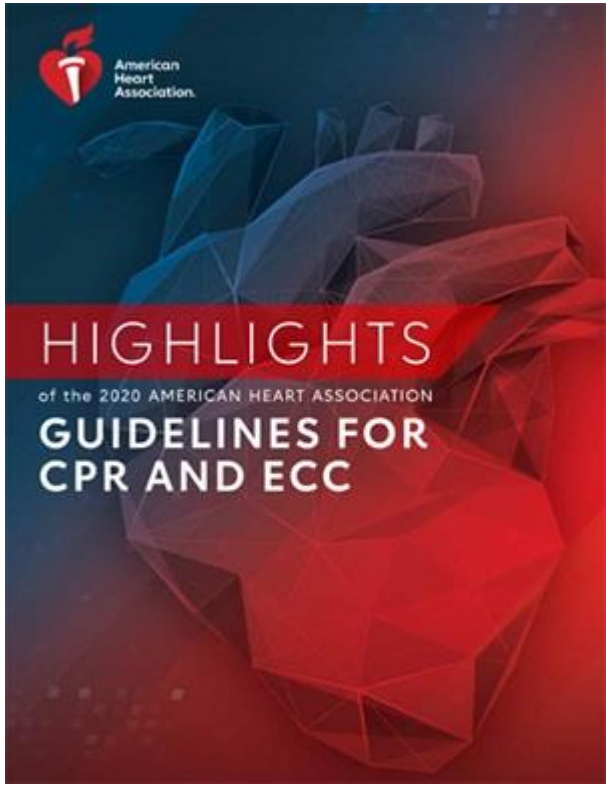
2020 AHA GUIDELINES FOR CPR & ECC

Published in Circulation and Resuscitation on October 21, 2020

- First full Guideline release since 2015, with Focused updates 2017-2019

Guideline highlights

- Updated CPR guidelines address health disparities and the management of opioid-related emergencies as well; early bystander and AED intervention remains key to survival.
- The Chain of Survival has been expanded to include a recovery link, which emphasizes physical, social, and emotional needs of patients and their caregivers after survivors leave the hospital.
- CPR training to now include guidance on responding to victims of suspected opioid overdose.
- The guidelines offer suggestions on ways to increase the use of CPR by lay-rescuers, including the use of mobile technology to recruit trained lay persons to assist with CPR rescues.



More information on 2020 AHA Guidelines for CPR and ECC and Resuscitation Science
https://cpr.heart.org/en/resuscitation-science

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ADULT CHAIN OF SURVIVAL

Survival depends on a complex system of care working

- **Prevention and preparedness**, including responder training, early recognition of cardiac arrest, and rapid response
- **Activation of the emergency response system**, either outside of or within the hospital
- **High-quality CPR**, including **early defibrillation** of ventricular fibrillation and pulseless ventricular tachycardia
- **Advanced resuscitation interventions**, including medications, advanced airway interventions, and extracorporeal CPR
- **Post–cardiac arrest care**, including critical care interventions and targeted temperature management
- **Recovery**, including effective support for physical, cognitive, emotional, and family needs

Adult OHCA Chain of Survival

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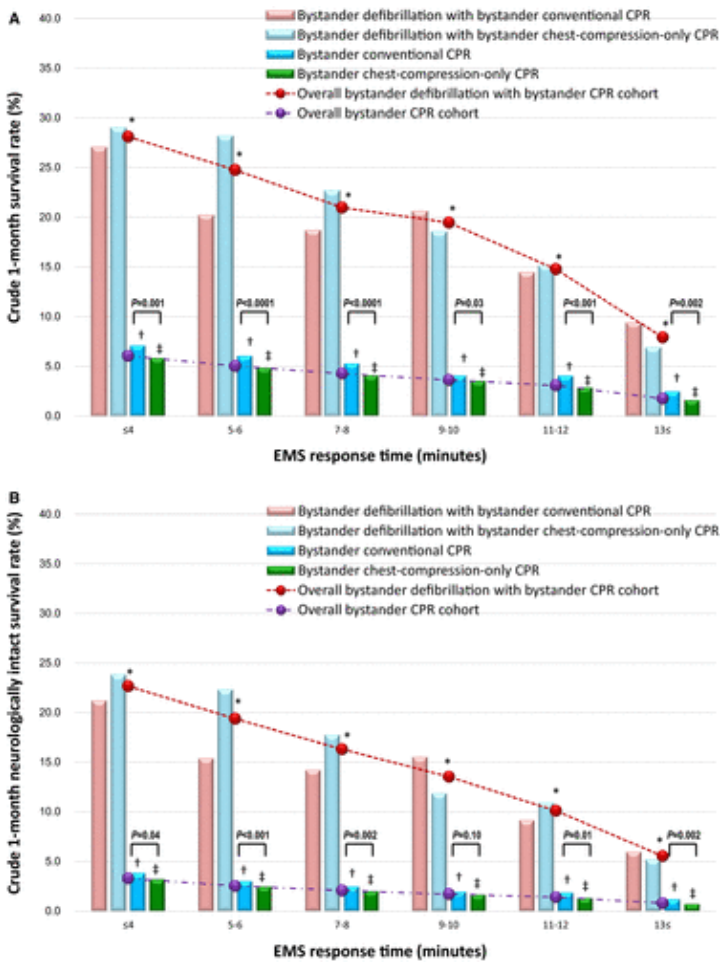
EMS RESPONSE TIME AND IMPACT ON CARDIAC ARREST OUTCOMES

- Only 45.7% of cardiac arrest victims get the immediate help before emergency responders arrive
- EMS response time for cardiac arrest is on average, between four and ten minutes
  - The maximum EMS response time associated with improved neurologically intact survival
    - 13 minutes when bystanders provided defibrillation (typically with cardiopulmonary resuscitation)
    - 11 minutes when bystanders provided cardiopulmonary resuscitation without defibrillation
    - Beyond these time ranges, 1-month neurologically intact survival did not improve as a result of bystander intervention.



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Source: J Am Heart Assoc. 2018;7:e007568.

ADULT CHAIN OF SURVIVAL – PROMPT PROVISION OF HIGH-QUALITY CPR

CPR is the single most important intervention

High-Quality CPR

- Minimize interruptions in chest compressions
  - No more than 10 seconds
- Provide compressions of adequate rate and depth
  - At least 2 inches at rate 100 to 120 per minute
- Avoid leaning on the chest between compressions
- Avoid excessive ventilations

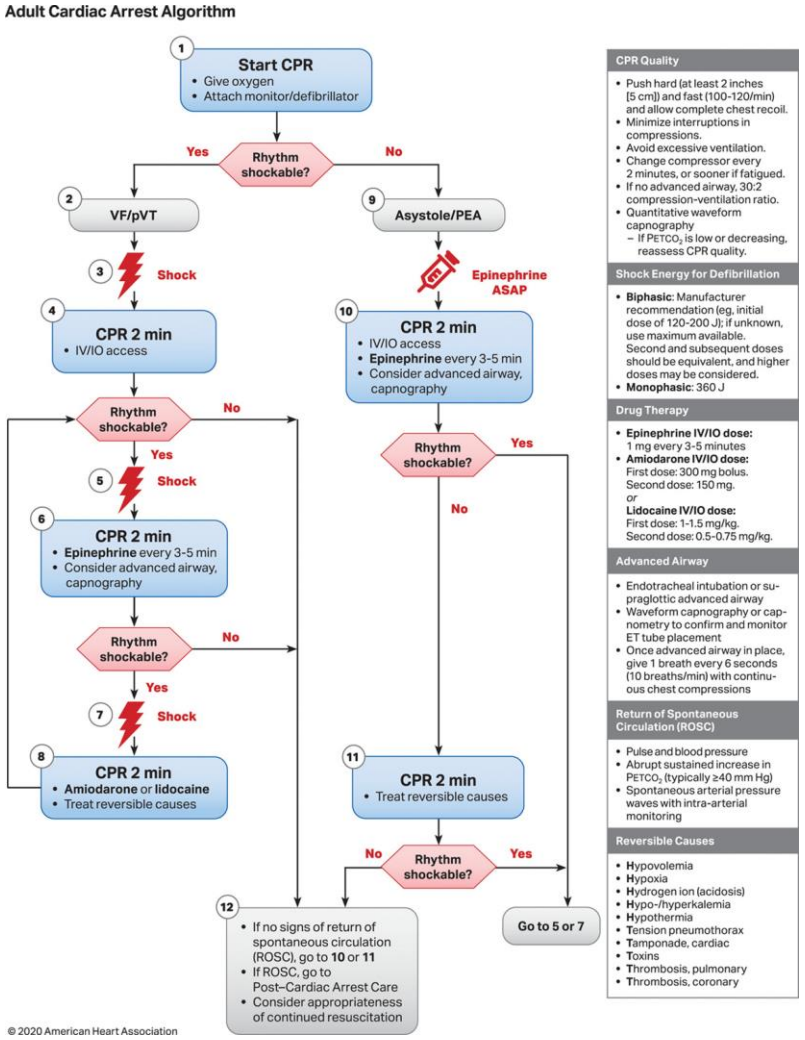
EMS strategies to improve high-quality CPR

- "Pit crew CPR," data collection, quality improvement, periodic retraining (low dose-high frequency), feedback systems, performance focused debriefing

NEW Commit to, train and conduct ongoing QI for telecommunicator CPR

- Training required KRS 15.550, July 2018

Mechanical CPR may be considered when manual ay be challenging or dangerous – routine use is not recommended



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ADULT CHAIN OF SURVIVAL – EARLY DEFIBRILLATION

Bystanders use an AED in 18.8 percent of these cases

- Greater chances of survival and being discharged from the hospital than those who did not; 66.5 percent versus 43 percent.
- Bystander had 2.62 times higher odds of survival to hospital discharge and 2.73 times more favorable outcomes for functioning compared to victims who first received an AED shock after emergency responders arrived.
- Victims who received an AED shock from a bystander (57.1 percent) using a publicly-available device instead of having to wait for emergency responders (32.7 percent) had near normal function and better outcomes.

Kentucky Laws/Legislation

- KRS 158.162 - requires schools, gymnasiums, swimming pools to have an AED and 3 people trained
- HB 383 - requires AEDs to be onsite for HS athletic activities and sporting events
- KRS 311.667 - requires a person or entity who acquires an AED to be trained, to maintain AED, have medical oversight, activate EMS immediately and notify EMS and dispatch center of existence, location and type.
- 201 KAR: 8:550e – requires dentist that provide conscious sedation and anesthesia to have AED

Tools to increase defibrillation

- Find your current AEDs and put into CAD
- Increase community knowledge on how to use and where they are located
- Determine optimal location for PAD programs (e.g., high incidence, not currently close to defibrillation, etc.)
- Find funding for more AEDs(e.g., local foundations, etc.)
- Work with local fire departments and law enforcement
- Drone technology is coming

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INCREASING RATE OF BYSTANDER CPR AND AED UTILIZATION

TRAIN! TRAIN! TRAIN

- CPR in schools
  - Graduation requirement for high school in Kentucky

Mass Media Campaigns (TV, radio, social, etc.)

- CPR and AED Awareness Week – first week in June
- Sudden Cardiac Arrest Awareness Month – October
- Restart a Heart Day – October

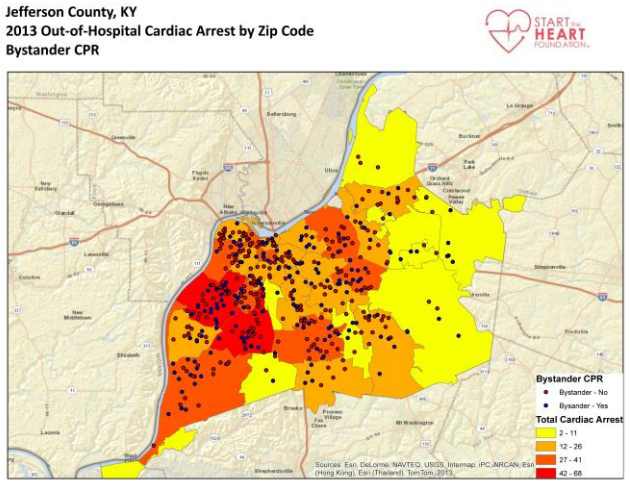
Celebrate lives saved

- Patient/care-giver reunion events

Know your region

- Map CPR events (with and without CPR), AEDs, location of first responders – target high risk areas

NEW - Use of mobile phone technology by dispatch to alert bystanders



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CASE 1

- 65 YO male with onset of severe chest pain while driving with his wife in the car. Patient states to his wife that he felt nauseous and was going to pass out. Patient stated he had severe crushing chest pain.
- Prior to being able to stop the vehicle on a two-lane road the patient goes unresponsive and wrecks his vehicle. Patient was restrained.
- The patient and his wife go off the two-lane road and strike several parked cars in a citizen's driveway. Moderate damage to the patient's car. Accident is witnessed by the citizen of the parked vehicles.

CASE 1

- The patient is unconscious, not breathing. Passenger(wife) is semi-conscious and breathing.
- Citizen on-scene immediately comes to the aid of the individuals. He notices the driver is unconscious and not breathing. Calls 911.
- The citizen pulls the patient out of the vehicle and immediately begins CPR. Patient provides hands only CPR. The citizen took a hands only CPR class one year prior sponsored by the locate hospital.
- Police arrive on scene within 3 minutes of the 911 call with an AED that the officers have been trained and certified on for the past 5 years.
- Police took over chest compressions from the citizen, apply AED and begin bag valve mask ventilations.

CASE 1

- The police deliver 1 shock using the AED device and resume CPR
- Fire/ems crews arrive within 6 1/2 minutes of 911 call
- On scene fire/ems crews begin immediate high-performance CPR
- Patient is placed on cardiac monitor with adult defibrillation pads
- EMS ECG reading - pulse electrical activity
- Mechanical CPR device placed on patient and activated. 30:2 ratio
- Bag valve mask ventilations continued
- IV established right-antecubital 18g catheter, 1000 ml of normal saline
- 1mg (1:10,000) epinephrine administered IV
- Airway established- I-Gel # 4
- Pulse recheck after 2 minutes of CPR

CASE 1

- Patient regained a mechanical pulse. Patient remained unresponsive on scene
- Sinus tachycardia on cardiac monitor with mechanical pulse
- ROSC is obtained. 12 lead EKG - elevation in leads V3 and V4
- BP-166/98 heart rate - 122, respirations assisted by BVA, $ETCO_2$ = 29
- Patient transported to locate hospital, er and cardiac cath lab notified per Pulsara app

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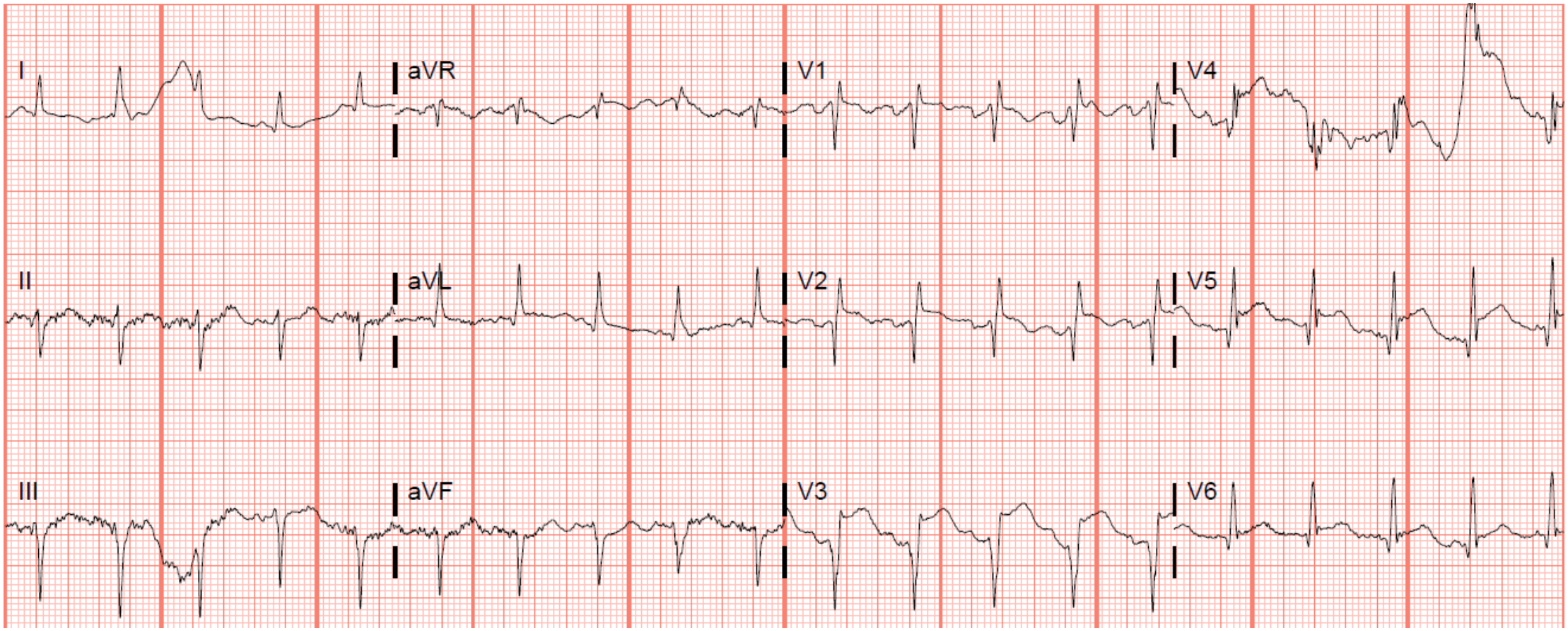
CASE 1

- Upon arrival to ER patient sent directly to cardiac cath lab
- Patient had a mid left anterior descending artery 100% occlusion
- PCI performed with a drug eluting stent with no residual stenosis after procedure
- Patient transferred to ICU for 5 days
- Patient extubated and transferred to transitional care unit
- Patient discharged from hospital 13 days after incident

CASE 1



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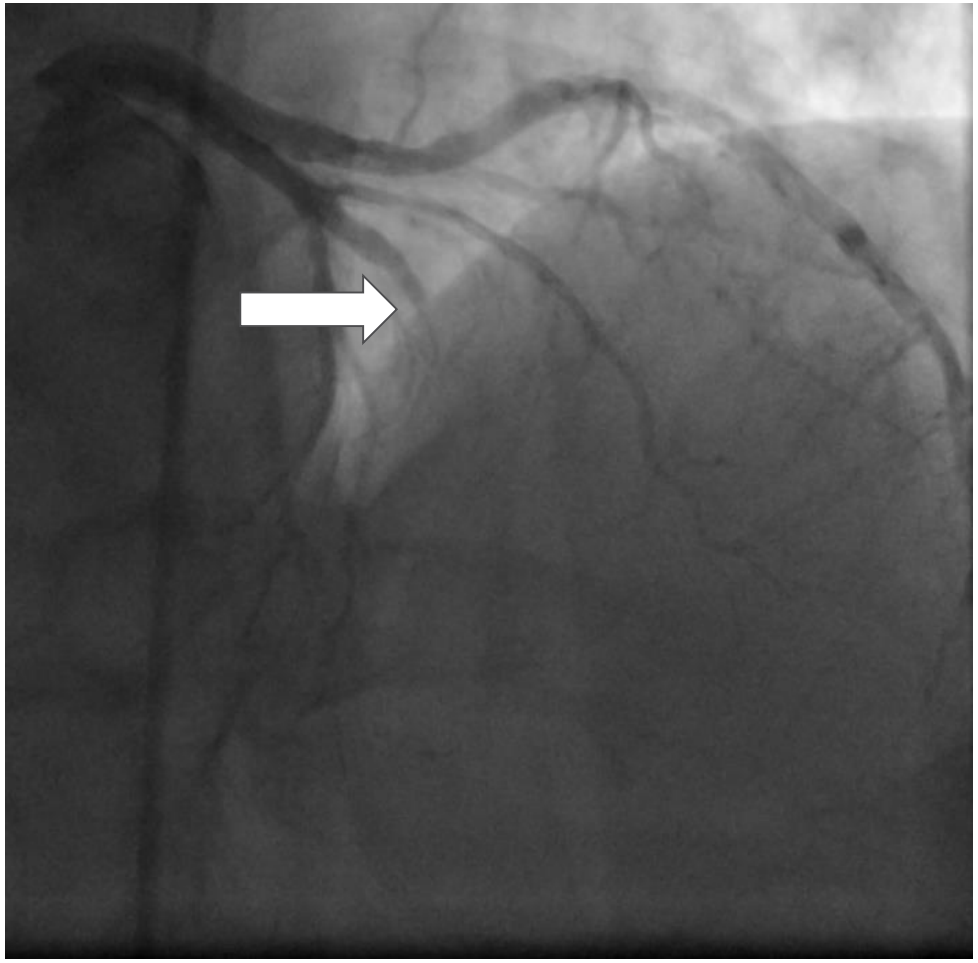

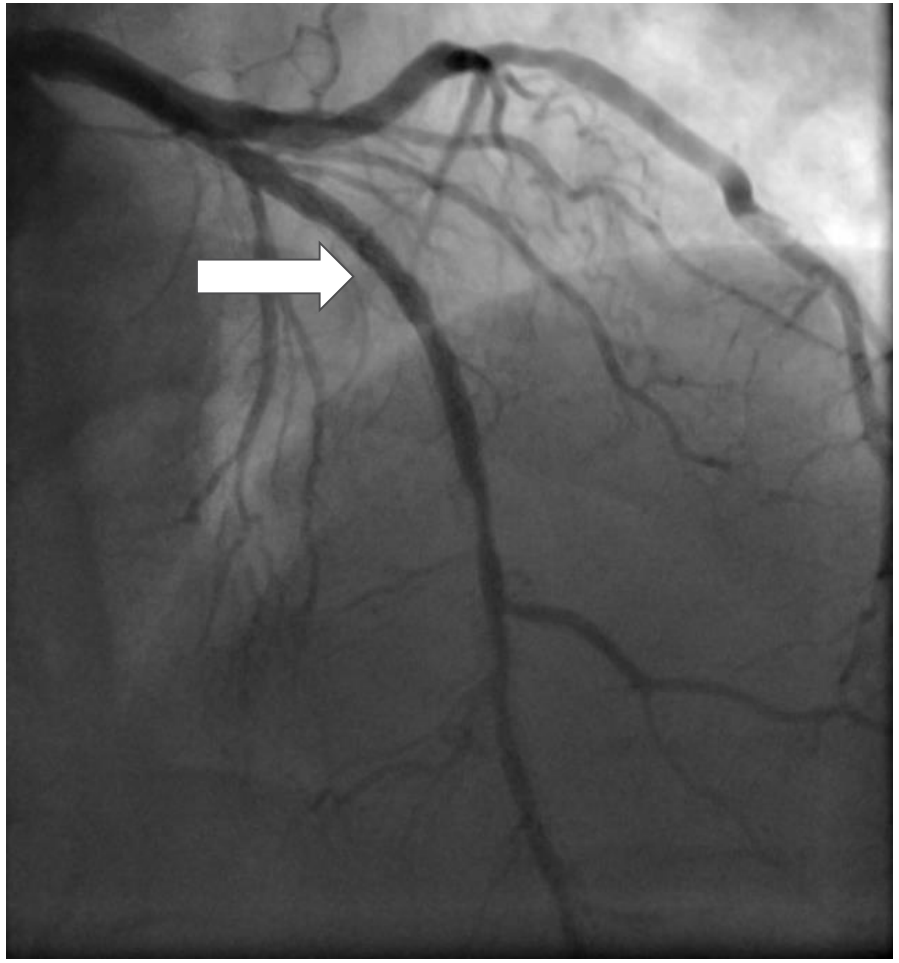

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CASE 2

- 52YO female grocery shopping in a large food chain store states to her daughter that she felt weak and felt a sharp pain in her chest
- Pain described as sharp and located at in the center of her chest
- Patient's skin color turns pale, sweaty and patient collapses and is not breathing
- The daughter yells for help and calls 911 on her cell phone
- A bystander shopper comes to the aid of patient, checks for a pulse and immediately begins CPR

CASE 2

- Two store employees show up to assist, one has brought an AED that was located near the front of the store.
- The AED is attached, and it indicates to deliver a shock.
- A shock was delivered and the second employee resumes CPR for the bystander.
- After 2 minutes of CPR the AED advises to deliver a 2nd shock.

CASE 2

- The 2nd shock is delivered, and CPR is resume as Fire/EMS personnel are arriving to the patient with in 5 minutes of 911 being called.
- Fire/EMS begin high performance CPR. Place patient on cardiac ECG monitor.
- Patient is in ventricular fibrillation.
- After completing 2 minutes of CPR patient is defibrillated at 200 joules per protocol.
- Patient converts to a normal sinus rhythm with a positive mechanical pulse.
- Patient attempts to regain respirations. Fire/EMS personnel continue with assisting ventilations per bag valve mask on high flow O_2.
- Patient abruptly becomes conscious and responsive. Central pulses present with respirations at 10 times a minute.

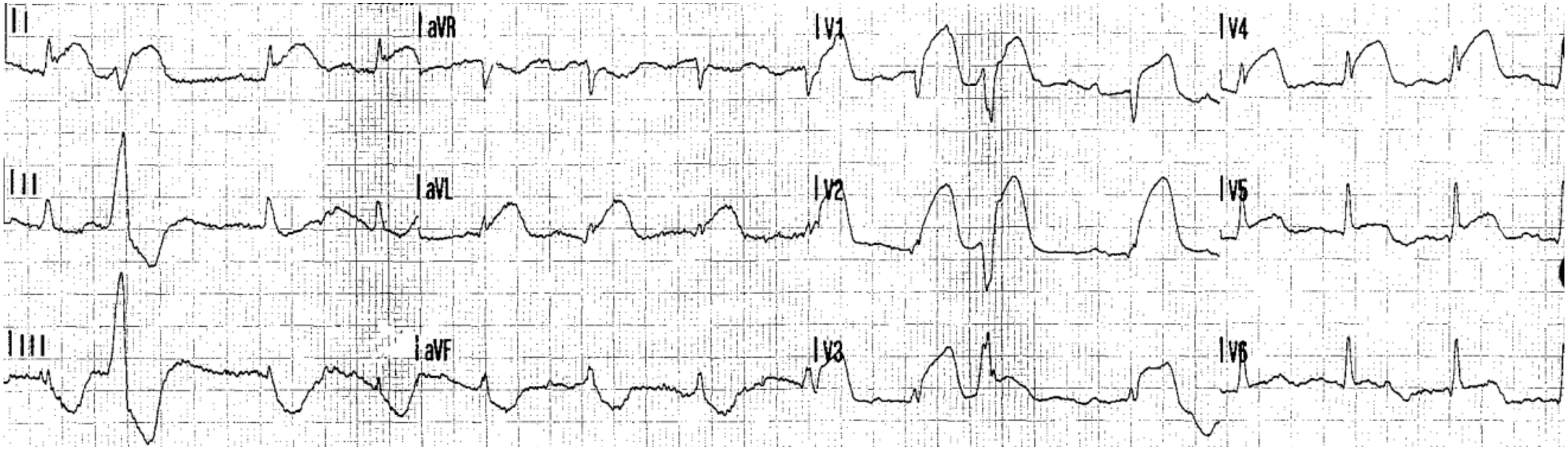
CASE 2

- Patient awakes to being confused for approximately 1 minute then states “what is happening”? ROSC is obtained.
- Fire/EMS personnel complete a patient assessment and set of vitals.
- Blood pressure = 126/52, heart rate = 84, respiratory rate = 16, $ETCO_2$ of 38
- 12 lead ECG = elevation in V1, V2, V3, V4 possible anterior infarct
- The ER and cardiac cath lab are notified while still on scene of ECG finding through PULSARA app.
- Patient awake , alert to person, place, time and events leading up to incident.
- Patient transported to locate hospital.
- During transport patient stated her chest pain was still present and rated the pain at 10/10.

CASE 2

- Patient treated en-route to the hospital by fire/EMS paramedic per the department cardiac chest pain protocol. Upon arrival to ER patient transported directly to cardiac cath lab. Patient is awake and alert upon arrival to cardiac cath lab.
- Patient had a mid left anterior descending artery 100% occlusion, right posterior descending artery 90% occluded.
- PCI performed with a drug eluting stent with no residual stenosis after procedure.
- Patient was discharged from the hospital 2 days after this event.

CASE 2



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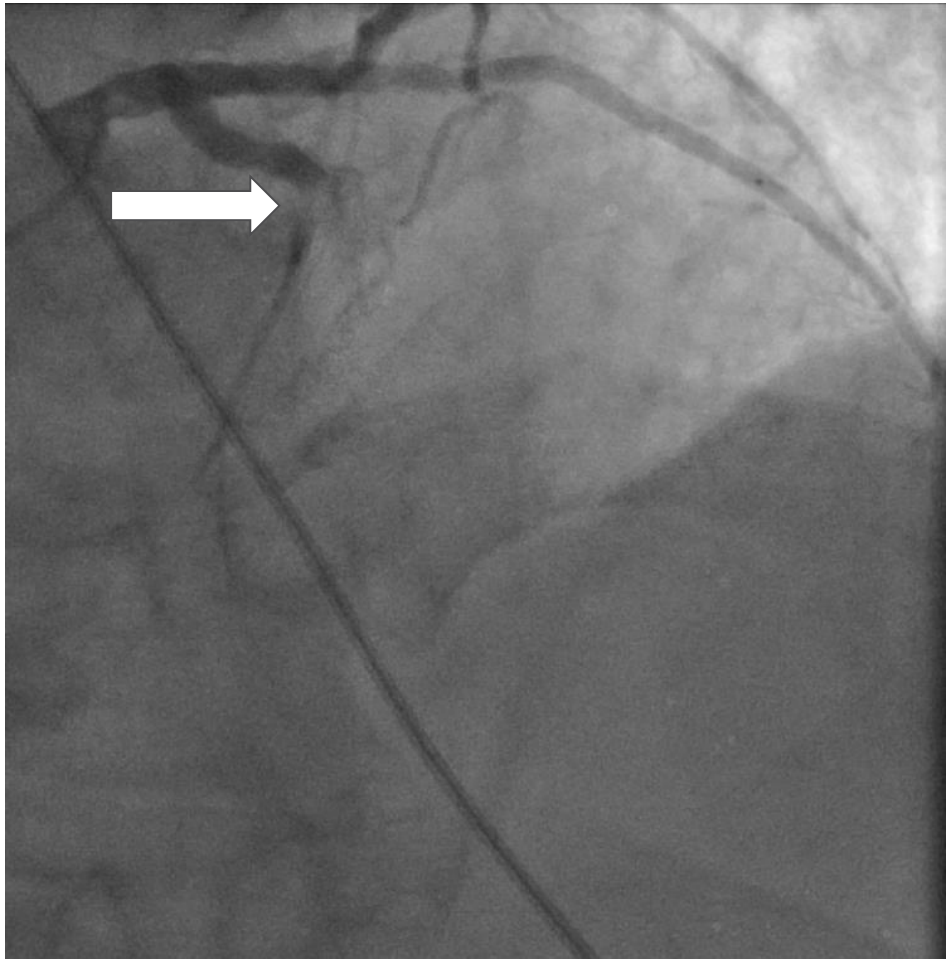

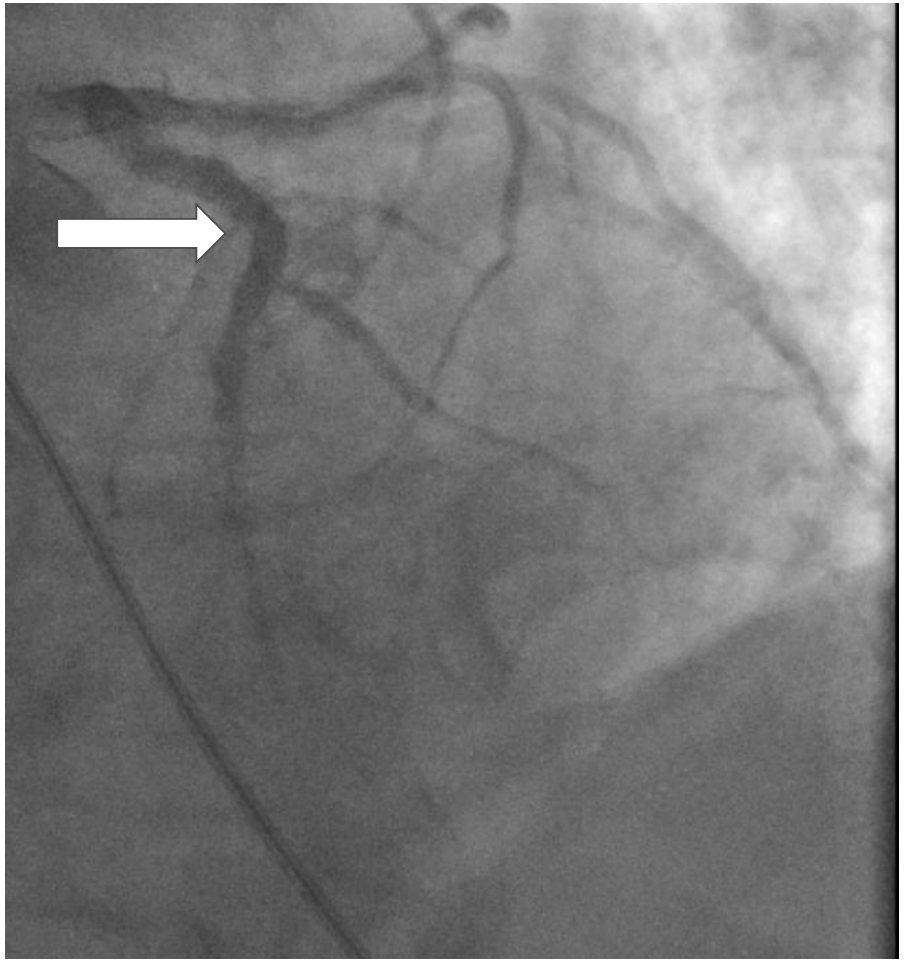

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CASE 3

- 17 YO female attending a school event collapses and begins having a full body seizure lasting several minutes. Mother present with patient when the event occurs.
- Patient has a past medical history of seizure disorder and hypoplastic left heart syndrome. Mother does carry an intranasal midazolam (versed with her and the patient at all times.
- Mother calls for help to nearby faculty and 911 is activated by school staff.
- Mother administers 2 mg versed via nasal route.

CASE 3

- Patient stops breathing with no pulse present.
- Another family member begins CPR for two minutes.
- School staff arrives with an AED located within the gym.
- Pulses reassess after 2 minutes and the AED advises to shock.
- 1 shock is delivered by school staff personnel and CPR is resumed.

CASE 3

- Patient regains pulse after 2 minutes CPR
- Patient begins to breathe upon arrival of Fire/EMS personnel
- EMS assessment completed
- Patient placed on cardiac ECG monitor and vitals completed
- Patient unresponsive with carotid pulses. Respirations shallow at a rate of 4 a minute
- ECG rhythm = normal sinus rhythm = 74, respiratory rate 4-6 a minute

CASE 3

- Patient intubated, 7.0 endotracheal tube. Successful intubation
- Ventilations assisted per EMS ventilator per department protocols
- $ETCO_2$ = 40 blood pressure 158/89
- Defibrillation pads applied, IV established
- 12 lead ECG completed, normal sinus rhythm rate of 82 bpm
- Patient report called to local hospital
- Patient transported to local pediatric hospital
- Upon arrival to ER patient remained unresponsive

CASE 3

- Patient placed in pediatric ICU for 4 days and was transferred to a transitional care unit for 3 days
- Patient discharged 7 days after event occurred with a diagnosis of complications due to preexisting seizure disorder and hypoplastic left heart syndrome
- Patient is currently to attending classes and is leading a normal lifestyle

AMERICAN HEART ASSOCIATION RESOURCES

- **Digital resuscitation portfolio** includes AHA's Heartcode®, HeartCodeComplete, and Resuscitation Quality Improvement® (RQI®) programs for basic (BLS), advanced (ACLS/ALS), and pediatric (PALS) healthcare education and quality improvement.
- **Get With The Guidelines** is an in-hospital program for improving heart attack and cardiac arrest care by promoting consistent adherence to the latest scientific treatment.
- **Mission: Lifeline** is national initiative to advance the SYSTEM OF CARE for patients with acute, high-risk time sensitive life and/or quality of life-threatening disease states, such as ST elevate myocardial infarction, non-ST elevated myocardial infarction, stroke and out of hospital cardiac arrest.
- **Don't Die of Doubt** is an initiative to educate public on the importance of calling 911 for an emergency.
- Adult CPR Anytime and Infant CPR Anytime®
- CPR in Schools Training Kits
- CPR Kiosk
- Heartsaver Hero Award
- Opioid Education
- Oxygenation and Ventilation of COVID-19 Patients Education
- Guidelines, statements, meetings and other resources

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Mission:Lifeline®

American Heart Association.
Get With The Guidelines.
Coronary Artery Disease

American Heart Association.
Get With The Guidelines.
Resuscitation

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OTHER USEFUL RESOURCES AND WAYS TO HELP

Kentucky Board of EMS Cardiac and Stroke Care Subcommittee

Kentucky Heart Disease and Stroke Prevention Take Force Acute Cardiac Subcommittee

Resuscitation Academy

- Attend local Resuscitation Academy
- Attend Leadership Program in Seattle
- Review 10 Steps for Improving Survival from Cardiac Arrest
- Complete Cardiac Arrest System Assessment
- Toolkits
  - Community CPR, Community PAD, T-CPR, etc.

The Cardiac Arrest Registry to Enhance Survival

HEARTSafe Community

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HEART SAFE community

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ABOUT THE KENTUCKY OFFICE OF RURAL HEALTH

- The mission of the KORH is to support the health and well-being of Kentuckians by promoting access to rural health services.
- Housed within the UK Center of Excellence in Rural Health in Hazard, KY.
- Operates 4 federal grant programs
  - State Office of Rural Health (SORH)
  - State Loan Repayment Program (SLRP)/NHSC promotion
  - Medicare Rural Hospital Flexibility Program (flex)
  - Small rural hospital improvement program (SHIP)

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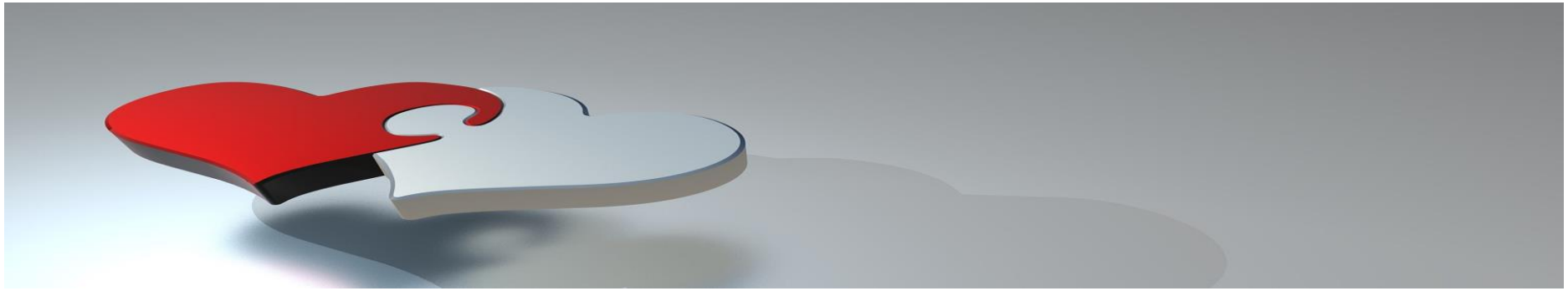
OPTIMIZING HEART ATTACK AND CARDIAC ARREST SYSTEMS OF CARE WITH DR. WILLIAM DILLON
TENTATIVE – DECEMBER 8 @ 11AM ET

MEDICARE RURAL HOSPITAL FLEXIBILITY PROGRAM EMERGENCY MEDICAL SERVICES SUPPLEMENT: COMMITMENT TO THE HEART INITIATIVE

JANUARY 3RD 2020



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