



**Cardiac  
Arrest  
Resuscitation  
System**



**HeartRescue  
PROJECT**

*Every second counts. Every action matters.*

# **Optimal Cardiac Arrest System Specification By Point Of Care Operations Manual Version 3.0**

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***[heartrescuenow.com](http://heartrescuenow.com)***

***<https://cee.dcri.duke.edu/race-cars-1>***

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# Introduction

The Regional Approach to Cardiovascular Emergencies (RACE) project is a North Carolina statewide system for providing rapid coordinated care of cardiovascular emergencies. Established in 2003, the RACE system incorporates quality improvement efforts of over 119 hospitals, 540 emergency medical agencies and thousands of health care providers working in a coordinated manner to provide timely and lifesaving care. Initially, the RACE system was developed to treat acute myocardial infarction. With an eventual goal to rapidly coordinate the treatment of all cardiovascular emergencies, our current phase called RACE CARS (Cardiac Arrest Resuscitation System) is focusing on out of hospital cardiac arrest.

As the third leading cause of death, cardiac arrest claims 300,000 Americans lives each year. If witnessed, recognized and treated with cardiopulmonary resuscitation (CPR), external defibrillation, and hospital post-arrest care, almost half of victims can survive and return to functional lives. Unfortunately, we currently fall well short of this goal in North Carolina, with only 1 in 5 victims receiving bystander CPR, and only 1 in 20 surviving to hospital discharge. Supported by the Medtronic Foundation HeartRescue Project, and hospitals and emergency medical systems throughout the state, we hope to double survival from cardiac arrest within 5 years.

## **Our approach includes three components**

- 1) community response** – mass education in compression only CPR and automatic external defibrillator (AED) use;
- 2) pre-hospital response** – rapid dispatch of first responders and defibrillators; dispatcher assisted CPR to increase by-stander CPR rates; high quality CPR and team based resuscitation.
- 3) hospital response** – coordinated post-cardiac arrest intensive care including hypothermia protocols.

The key elements of our system include regional organization and coordination, institution of the single best plan for treatment at every point of care, ongoing measurement and prompt feedback, and the establishment of teams of health professionals that span all aspects of cardiovascular emergency care.

In order to assess our progress in the project, we will use data from the North Carolina Office of Emergency Medical Services (NCOEMS). The Prehospital Medical Information System involves emergency medical service records from local agencies submitted to NCOEMS according to state statute and state and national standards including the National EMS Information System (NEMSIS) and the Center for Disease Control Cardiac Arrest Registry to Enhance Survival (CARES). These data elements specify details of the cardiac arrest episode of care including patient identifiers, dispatch time, bystander chest compressions, type of arrest, AED use, outcome of resuscitation, hospital destination, and hospital application of hypothermia, and neurologic outcome.

## ***See CARES Data Collection form, page 37 and 38.***

We will rely on these records to measure our impact on bystander CPR, application of cardiac arrest care, and patient outcomes. As the data are often incomplete, we will work with the NCOEMS and submitting providers to ensure data completeness and accuracy. Once NCOEMS identifies a cardiac arrest from periodic data review, we will check all data fields required for CARES reporting, and assist local EMS agencies in completing the data. In addition, we will have a comparison and quality check of data of cardiac arrest patients compared to other patients entered into the CARES registry.

This operations manual represents a state-wide consensus regarding the approaches to cardiac arrest treatment. The recommendations are based upon medical evidence, national guidelines, and the knowledge and experience of numerous professionals specializing in cardiac arrest care. These recommendations are designed to serve as a focal point for system development. To the extent possible, we describe the least complex approaches, allowing participating institutions to adapt these recommendations to local resources, practice patterns, and medical leadership. This manual is designed to work in concert with existing state and local protocols with particular attention to the North Carolina Office of Emergency Medical Services.

# Optimal System Specification By Point Of Care

The following basic and advanced recommendations represent features of systems of cardiac arrest care likely to increase the timeliness of treatment for cardiovascular emergencies.

## Community:

### Basic recommendations

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- Assess current facilities and plans for cardiac arrest care including training, emergency response, and automatic external defibrillator deployment.
- Support the implementation of two regulations.
  - House Bill 837
    - requires high school students to learn CPR
    - pass a test showing proficiency in order to graduate
    - Effective with the Class of 2015
  - House Bill 914
    - requires at least one AED in every state building
    - state workers must be trained to use them
- AED in every public location occupied by more than 250 adults over age 50 for 16 hours a day.

### Advanced recommendations

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- Organize community events involving civic organizations and churches to train adults in recognition of cardiovascular emergencies: cardiac arrest, myocardial infarction, stroke. These events should teach appropriate 911 dispatch and compression only CPR, and may include activities to obtain and place AEDs in the community.
- Locate all AED's in the community and report the location to the local dispatch center.

***See community training document, page 32.***

## EMS: Dispatch

### Basic recommendations

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- Emergency Medical Dispatch (EMD)
- Dispatcher queries regarding whether victim is conscious (awake and alert) and breathing normally.
- Dispatch of first responders equipped and trained in AED use.
- Dispatch and wheels rolling time according to NCOEMS standards.
- Dispatcher trained to recognize cardiac arrest and instruct in continuous chest compression only CPR and AED use.
- Review every cardiac arrest call received for the purpose of process improvement.

### Advanced recommendations

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- NCCEP Policy 13- Dispatch time according to NCOEMS standards, 90 seconds, 90% of the time for all EMD calls. Cardiac Arrest recommendations is 60 seconds or less.

## EMS: First Responder

### Basic recommendations

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- Use high quality CPR.
- Use team approach to manage resuscitation.
- Apply AED.
- Assign personnel to monitor chest compressions including, rate, depth, full recoil, and pauses.
- Limit pauses in chest compressions to extent possible including minimal pause for defibrillation.
- Breathing and airway management after 2nd shock / 2 rounds of 2 minute compressions.

- Communicate with paramedics whether cardiac arrest was witnessed, estimated duration of arrest, and if the patient received bystander CPR.
- Participate in community education efforts.

#### **Advanced recommendations**

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- Implement quality improvement effort to improve care.
- NCCEP Policy 14 – First Responders and EMS should have wheels rolling or Turn Out time in 90 seconds, 90% of the time.

## EMS: Initial Contact EMT: Basic, Intermediate, or Paramedic

#### **Basic recommendations**

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- Use high quality CPR.
- Use Team approach to manage resuscitation.
- Apply AED or monitor / defibrillator as appropriate.
- Assign personnel to monitor chest compressions including, rate, depth, full recoil, and pauses.
- Limit pauses in chest compressions to extent possible including minimal pause for defibrillation.
- Breathing and airway management after 2nd shock / 2 rounds of 2 minute compressions.
- For patients transported to the hospital: communicate with hospital regarding scene arrival time, estimated time of arrest, preceding symptoms, bystander witnessed, bystander CPR, bystander AED use, EMS resuscitation sequence, initial rhythm (VT, VF, PEA, asystole), time to return of spontaneous circulation, copy of ECG and interpretation, neurological exam after resuscitation (does the patient follow commands), and whether hypothermia was initiated. Standard EMS run sheets containing the above information are suitable.
- Obtain 12-lead ECG on all patients with return of spontaneous circulation. Institute a coronary artery reperfusion plan for all patients with a definite ST-elevation myocardial infarction by ECG.

- Consider taking selected patients without STEMI for acute angiography, such as cardiac arrest patients with VF/VT and suspicion of acute MI based on history and preceding symptoms.
- Establish and follow a pre-specified plan of care for patients with return of spontaneous circulation.
- Notify the receiving hospital during transport.
- Participate in community education efforts.
- Participate in the CARES registry.
- Provide outcome data to dispatch and first responders.
- Review every cardiac arrest call received for the purpose of process improvement.

#### **Advanced recommendations**

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- Initiate a hypothermia protocol designed to rapidly cool a patient to 32 to 34 degrees Celsius for those patients who remain comatose following resuscitation (does not follow commands).
- Divert to a post cardiac arrest care hospital if logistically and clinically feasible.
- NCCEP Policy 14 – First Responders and EMS should have wheels rolling or Turn Out time in 90 seconds, 90% of the time.

## EMS: Interfacility Transfer EMT: Basic, Intermediate, or Paramedic

#### **Basic recommendations**

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- Transfer patients with ST-elevation myocardial infarction and cardiac arrest with same priority as 911 call and trauma.
- Transfer patients with or without (STEMI) using mode of transfer capable of maintaining level of post-cardiac arrest care including hypothermia, mechanical ventilation, and intensive care regimen.
- Send initial EMS records and hospital records with patient, or fax to receiving hospital.

***See Emergency response plan, page 8.***

# Hospital

## Basic recommendations

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- Demonstrate senior management commitment to best cardiovascular emergency care by providing adequate resources to establish an optimal system.
- Establish a cardiovascular emergency team composed of emergency department, physician leaders, EMS, emergency transport, communications, quality assurance, and senior management involved in cardiovascular emergency care. Periodic meetings of team to review and revise system.
- Establish a predetermined, institution-specific written protocol for cardiac arrest care (see Post-Cardiac Arrest Care Protocol) agreed upon by all physician leaders and staff that includes:
  - Standard post-cardiac arrest care plans according to cardiac arrest type and mental status. For patients who require intensive care support, continued hypothermia, and / or urgent coronary angiography, these plans may include transfer to a regional cardiac arrest center.
  - Emergency department protocol for cardiac arrest.
  - Emergency physician directs care without the need for specialty consultation.
  - Documentation of presentation neurological status, if possible.
  - Continuation of EMS induced hypothermia for appropriate patients.
  - Arrangements for urgent coronary angiography for patients with suspected ST-elevation myocardial infarction according to history and ECG.
- Provide selected patient process and outcome data to the CARES registry and referring institution.
- Provide cardiac arrest training (not certification) to the families of all patients hospitalized with cardiovascular disease. Such training should include recognition of heart attack, stroke, cardiac arrest, activation of EMS, chest compression only CPR, and AED use.

- Provide cardiac arrest training (not certification) to all hospital employees regardless of job. Such training should include recognition of heart attack, stroke, cardiac arrest, activation of the EMS, chest compression only CPR, and AED use.
- Participate with EMS to review every cardiac arrest patient transported to the facility.
- Support efforts to broadly train the community in cardiovascular emergency recognition, response, and resuscitation.

## Cardiac Arrest Center

### Basic recommendations

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- Demonstrate senior management commitment to best cardiovascular emergency care by providing adequate resources to establish an optimal system.
- Establish a cardiovascular emergency team composed of emergency department, physician leaders, emergency transport, communications, quality assurance, and senior management involved in cardiovascular emergency care care. Periodic meetings of team to review and revise system.
- Establish a predetermined, institution-specific written protocol for cardiac arrest care (see Post-Cardiac Arrest Care Protocol) agreed upon by all physician leaders and staff that includes:
  - Standard post-cardiac arrest care plans according to cardiac arrest type and mental status.
  - Emergency department protocol for cardiac arrest.
  - Emergency physician directs care without the need for specialty consultation.
  - Documentation of admission neurological status.
  - Continuation of EMS induced hypothermia for appropriate patients.
  - Arrangements for urgent coronary angiography for patients with suspected ST-elevation myocardial infarction according to history and ECG.
- Provide selected patient process and outcome data to the CARES registry and referring institution or emergency medical service.

## INTENSIVE CARE UNIT

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- Designate physician leadership of post cardiac arrest care. Such leadership may be identified from emergency medicine, critical care medicine, hospital medicine, neurology, and/or cardiology.
- Post cardiac arrest care according to Post-Cardiac Arrest Protocol (pages 28–29).
- Perform neurologic assessment according to institutional expertise and standards when normothermia is achieved and sedating drugs have cleared from the circulation.

## CATHETERIZATION LABORATORY

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- Perform coronary arteriography and intervention according to national benchmark times for patients with suspected ST-segment elevation myocardial infarction according to history and ECG.
- Follow hypothermia protocol for appropriate patients:
  - Maintain hypothermia for those patients induced prior to catheterization laboratory arrival during the procedure.
  - Induce hypothermia at the earliest time possible for all other appropriate patients.

## ELECTROPHYSIOLOGY

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- Evaluate all neurologically intact survivors of out-of-hospital cardiac arrest by cardiology or electrophysiology for implantable cardioverter defibrillator (ICD) placement according to established national guidelines. According to these guidelines, survivors of sudden cardiac arrest due to ventricular fibrillation have a Class IA indication for ICD implantation after evaluation to define the cause of the event and to exclude any transient or reversible cause. For patients awaiting reassessment for ICD 40 to 90 days post discharge, consider wearable defibrillator.

## HOSPITAL

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- Provide cardiac arrest training (not certification) to the families of all patients hospitalized with cardiovascular disease. Such training should include recognition of heart attack, stroke, cardiac arrest, activation of EMS, chest compression only CPR, and AED use.
- Provide cardiac arrest training (not certification) to all hospital employees regardless of job function. Such training should include recognition of heart attack, stroke, cardiac arrest, activation of EMS, chest compression only CPR, and AED use.
- Support efforts to broadly train the community in cardiovascular emergency recognition, response, and resuscitation. Such efforts may include conducting cardiovascular resuscitation classes to community trainers and providing hospital training facilities to community groups.

## Advanced recommendations

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- Consider advanced data collection such as the INTCAR data registry (see page 39)

## Law Enforcement

Providing law enforcement officers with basic cardiopulmonary resuscitation (CPR) skills and training in the use of an AED can potentially increase survival rates from cardiac arrest. Experience from a handful of communities – most notably Rochester MN – has provided strong impetus for a beneficial role of police defibrillation. In many areas, police have the ability to reach a victim of sudden cardiac arrest more quickly than EMS personnel. The chances of survival decrease by about 5% for every additional minute delay in resuscitation efforts.

## Advanced recommendations

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- Engage Law Enforcement agencies to participate in cardiac arrest response and defibrillation.

## Government: Local (including EMS providers)

### Basic recommendations

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- Make EMS run sheets immediately available to receiving hospitals. Approaches include providing of adequate time for EMS crews to complete run sheets before hospital departure and provide paper or electronic format that is readily accessible to hospital personnel. Essential run sheet data should include EMS unit identification, dispatch time, scene arrival time, estimated time of arrest, preceding symptoms, bystander witnessed, bystander CPR, bystander AED use, EMS resuscitation sequence, initial rhythm, time to return of spontaneous circulation, copy of ECG and interpretation, neurological exam after resuscitation, and whether hypothermia was initiated.
- Transfer patients across county lines to the nearest facility for post-cardiac arrest care or primary angioplasty if these services are not available in the incident county.
- If vehicle transfer to remote counties is not feasible, consider developing transfer agreements with regional medical centers.
- Helicopter transport protocols should include EMS and ED protocols capable of launching helicopters to medical scenes and establishment of helicopter landing zones (LZ). Patients transported to LZs adjacent to hospitals should not require medical evaluation by that hospital unless deemed necessary by the EMS crew.
- Support continuing education programs in basic and advanced cardiac life support.

### Advanced recommendations

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- Provide all first responders with AEDs.
- Support efforts to broadly train the community in cardiovascular emergency recognition, response, and resuscitation.

## Government: State and Federal

### State

#### Basic recommendations

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- Support linkage of EMS, hospital and vital status data to inform providers of emergency cardiovascular care.
- Maintain existing educational standards regarding prevention, recognition, and treatment of cardiovascular disease.

#### Advanced recommendations

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- Fund existing educational standards.

### Federal

#### Basic recommendations

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- Remove out-of-hospital cardiac arrest patients from publically reported hospital mortality figures so as not to discourage institutions from providing care to these patients.

#### Advanced recommendations

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- Establish and support universal standards of care for all cardiac emergencies.



# Pre-Hospital



**Cardiac  
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## Emergency Response Plan

**Goal: To improve survival from cardiac arrest by 50%**

<b>9-1-1</b>		<b>First Responders:</b>		<b>EMS Personnel:</b>	
<input type="checkbox"/>	9-1-1 Dispatches asks: is the patient able to talk and are they are breathing normally (gaspings is not normal)	<input type="checkbox"/>	Assess victim for decision to attempt resuscitation or not attempt resuscitation	<input type="checkbox"/>	If first on scene: assess victim for decision to attempt resuscitation or not attempt resuscitation
<input type="checkbox"/>	Dispatcher recognizes cardiac arrest	<input type="checkbox"/>	Initiate High Quality CPR with focus on: 1. rate 2. depth 3. recoil 4. limiting time off of chest 5. Switch compressors every 2 minutes	<input type="checkbox"/>	If taking over or make decision to attempt resuscitation: Initiate high quality CPR with focus on: 1. rate 2. depth 3. recoil 4. limiting time off of chest 5. Switch compressors every 2 minutes
<input type="checkbox"/>	Dispatcher sends appropriate units to scene	<input type="checkbox"/>	Attach AED: follow instructions	<input type="checkbox"/>	Attach defibrillator
<input type="checkbox"/>	Dispatcher gives bystander instructions for hands only chest compressions and to get an AED if available:  1. Place heel of hand in center of chest, over breast bone 2. Place other hand on top of that first hand 3. Push hard 4. Push fast  *If AED location is known by dispatcher, can send bystander/s to get AED	<input type="checkbox"/>	Consider compressions while AED is charging or resume CPR if no shock is recommended	<input type="checkbox"/>	Consider compressions while defibrillator is charging or resume CPR if no shock is needed
<input type="checkbox"/>	Attach AED if available, follow instructions	<input type="checkbox"/>	Add breathing and airway management after 2 <sup>nd</sup> shock and 2 rounds of 2 min CPR	<input type="checkbox"/>	Standard and well executed ACLS protocols including adding breathing and airway management after 2nd shock and 2 rounds of 2 min CPR
<input type="checkbox"/>	Dispatcher stays on phone until responders arrive	<input type="checkbox"/>	If ROSC, follow standard and well executed protocols	<input type="checkbox"/>	Continue efforts until ROSC or until resuscitation is stopped
				<input type="checkbox"/>	If ROSC, evaluate victim for hypothermia protocol
				<input type="checkbox"/>	Transport to appropriate Resuscitation Capable Hospital or Cardiac Arrest Center



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## Characteristics of High Quality CPR

1. EMTs own CPR [CPR is a BLS skill that should be the responsibility of BLS / first responders.]
2. Minimize interruptions in CPR at all times. Goal is compression fraction > 95%
3. Ensure proper depth of compressions (>2 inches)
4. Ensure full chest recoil / decompression
5. Ensure proper chest compression rate (100-120/ minute)
6. Rotate compressors every 2 minutes
7. Minimize peri-shock pause by:
  - a. Hovering hands over the chest during shock administration
  - b. Charging defibrillator while compressions continue
  - c. Resume compression immediately after shock delivered
8. Intubate or place advanced airway with ongoing CPR
9. Place IV or IO with ongoing CPR
10. Coordination and teamwork between EMTs and paramedics.  
(This list is based upon the High Performance CPR Toolkit by The Resuscitation Academy)

### Definitions:

#### 1. Peri-Shock Pause

Interruption in chest compressions before and after defibrillatory shock

Optimal pre-shock Pause: < 5 seconds, max of 10 seconds

(Cheskes, et al. Peri-shock Pause An Independent Predictor of Survival from Out of Hospital Cardiac Shockable Cardiac Arrest).

#### 2. Compression fraction:

The percentage of time that chest compressions are performed during resuscitation.

Computed using the formula: 
$$\frac{\text{Resuscitation Time} - \text{Pauses}}{\text{Resuscitation Time}}$$

### Typically time is measured in seconds

Example: during an arrest with a time to ROSC of 8minute 30 seconds and a total amount of pauses = 69 seconds  $510 - 69 / 510 = 86\%$

(Christenson, et. al. Chest Compression Fraction Determines Survival in patients with Out of Hospital VF).



## Cardiac Arrest Resuscitation System

### Pit Crew Resuscitation

AHA 2010 Guideline recommend a team approach during resuscitations. Resuscitation interventions are performed simultaneously, and rescuers must be able to work collaboratively to minimize interruptions in chest compressions. The "Pit Crew" methodology is designed to meet this objective.

Objective: to maximize the effectiveness of available resuscitation resources and through the use of predefined roles.

#### Key Principles:

1. The generation of high quality CPR is key to resuscitation effectiveness and the primary task of the resuscitation Pit Crew.
2. Unless safety or physical space issues exist, resuscitations are most effectively performed at the location the patient is initially found.
3. The quality of compressions is the responsibility of every member of the team.
4. Rhythm assessment every two minutes with defibrillation as indicated with a maximum of a 10 second pause in compressions.
5. The ALS component builds upon a strong BLS component maintaining an emphasis on minimum interruptions of compression.
6. The use of a resuscitation checklist is highly desirable as a means to ensure completeness and repeatability of resuscitation tasks.
7. The model is meant to be flexible and each agency should tailor the roles to the resources that they have available.
8. Team work requires practice. Agencies wishing to implement Pit Crew resuscitations must commit to realistic practice involving first responders, transport resources and ALS providers. Practice should include feedback to the participants on the rate and depth of compressions, duration of pauses and include a calculation of compression fraction.

#### Example Checklist:

- Pit Crew Positions Identified
- Continuous compression being performed
- Rhythm check every 2 minutes
  - Charge defibrillator at 1 minute 45 seconds
- Compressor rotated every two minutes or 200 compressions
- BVM is attached to oxygen and flowing
- ITD (impedance threshold device) in place w/light activated (if applicable)
- Monitor visible and in paddles mode
- Code Commander is identified and positioned at the monitor
- Advanced airway inserted without interruption of compressions
- IV/IO access obtained
- ETCO2 waveform present and monitored
- Gastric distention considered / addressed
- Family is receiving care and included in resuscitation process
- Consider Hs and Ts
  - Hypovolemic
  - Hypoxia
  - Hydrogen Ions ( acidosis)
  - Hypothermia
  - Hyper/hypokalemia
  - Hypoglycemia
  - Tablets / Toxins
  - Tamponade
  - Tension Pneumothorax
  - Thrombosis ( MI)
  - Thrombosis ( PE)
  - Trauma

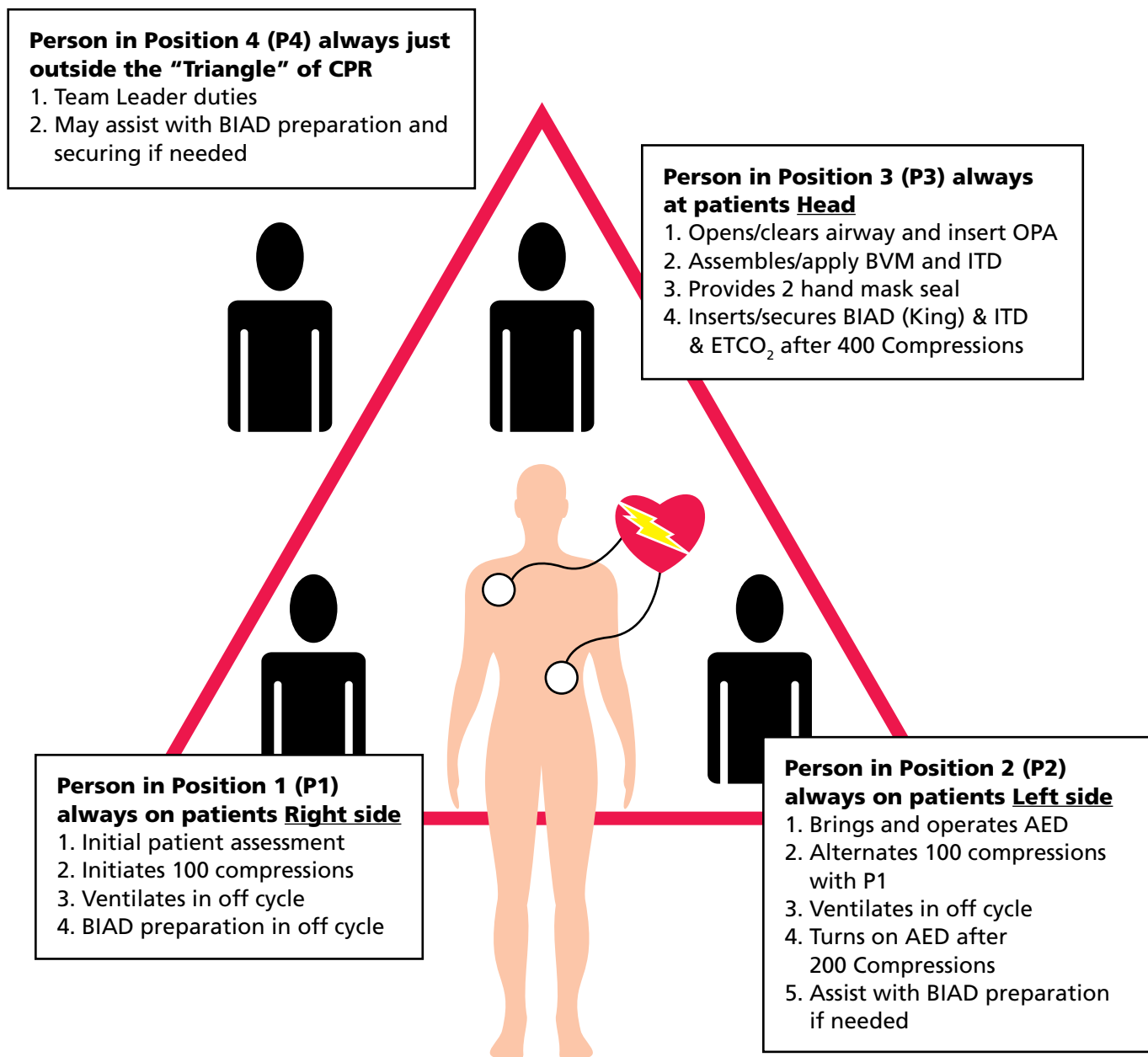


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## Team Approach

AHA 2010 Guideline recommend a team approach during resuscitations. Resuscitation interventions are performed simultaneously, and rescuers must be able to work collaboratively to minimize interruptions in chest compressions. Below are examples of team roles during resuscitation.

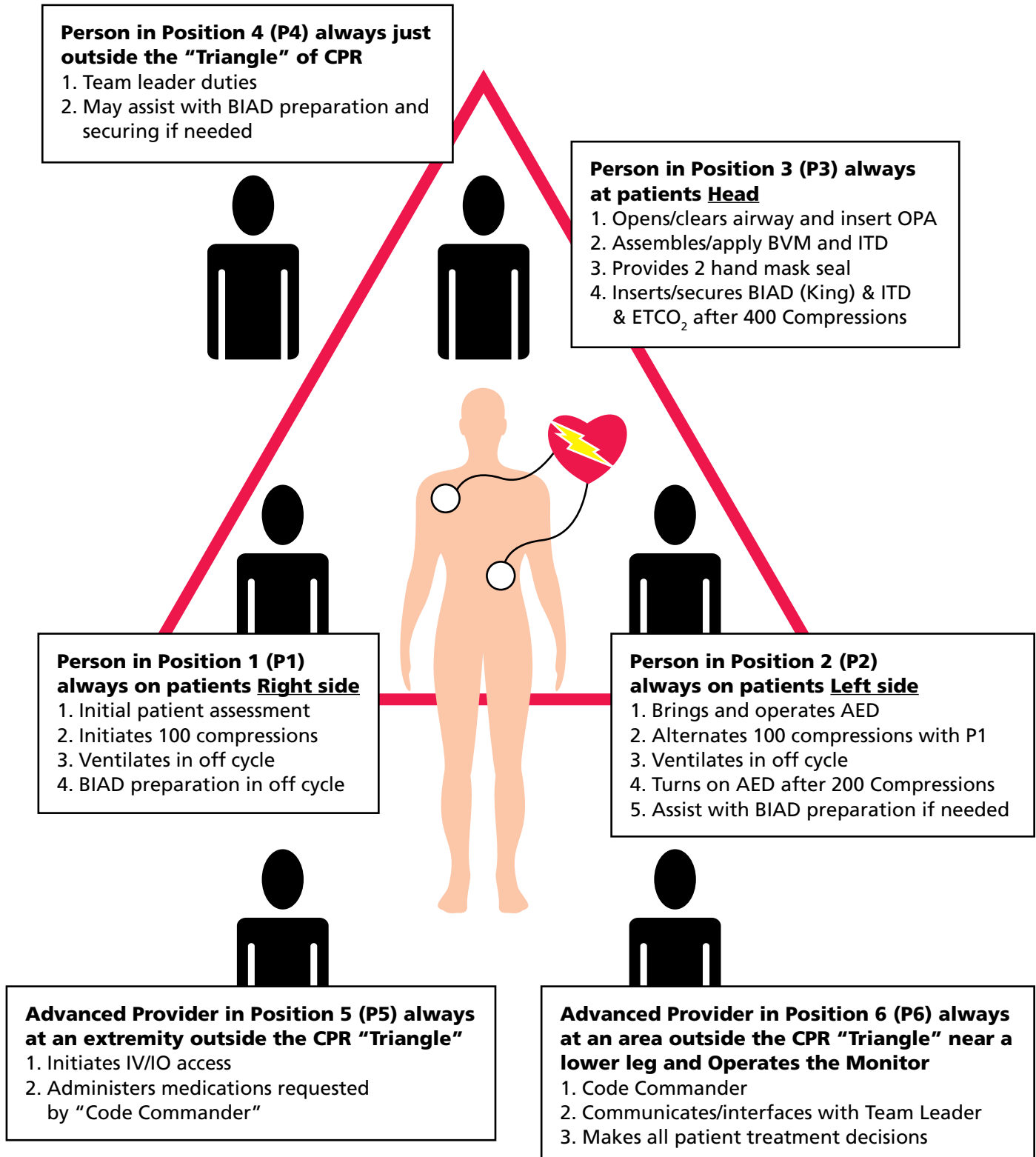
### 4-Person Resuscitation





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## 6-Person Resuscitation

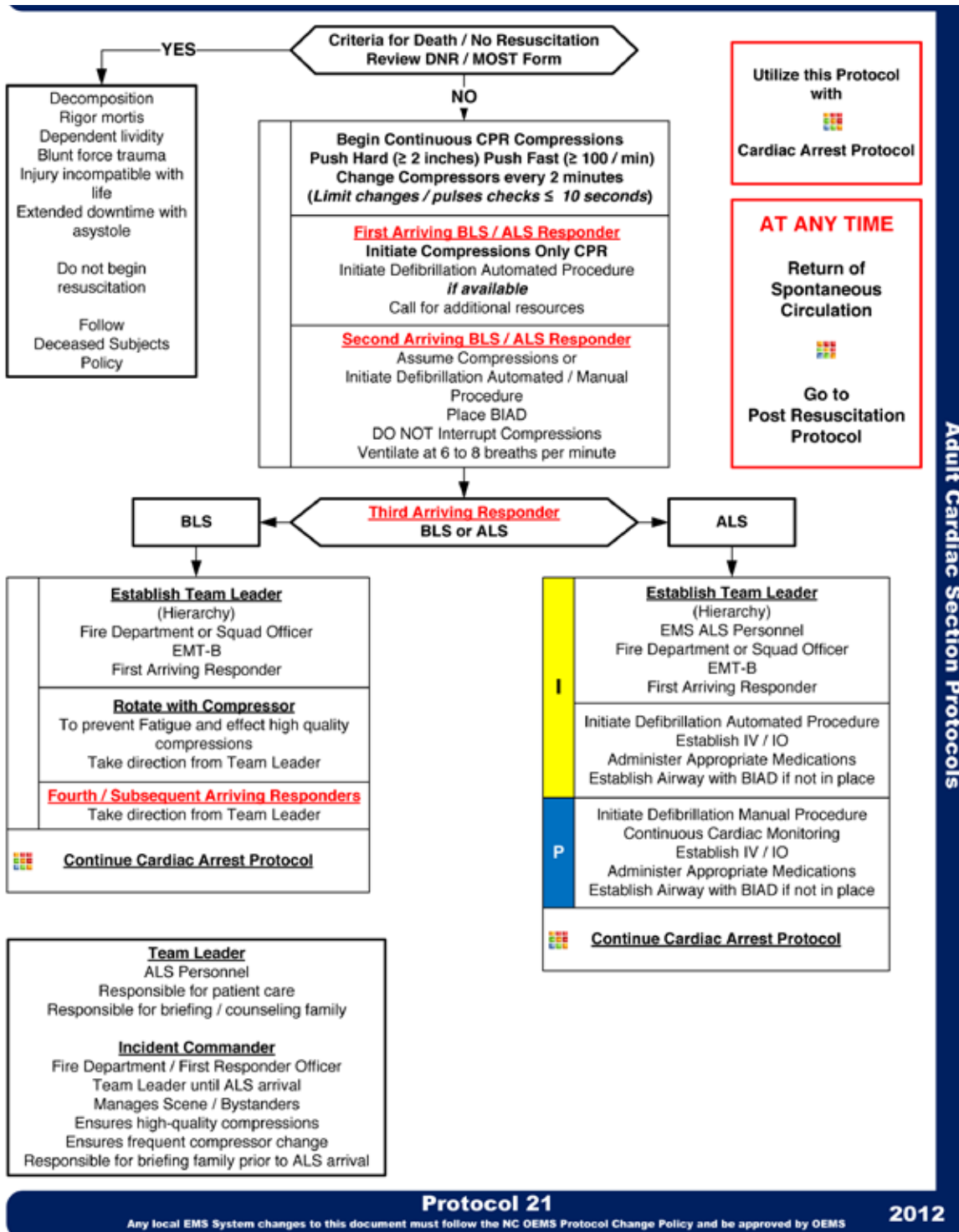


# EMS Protocols



# Cardiac Arrest Resuscitation System

## Team focused CPR

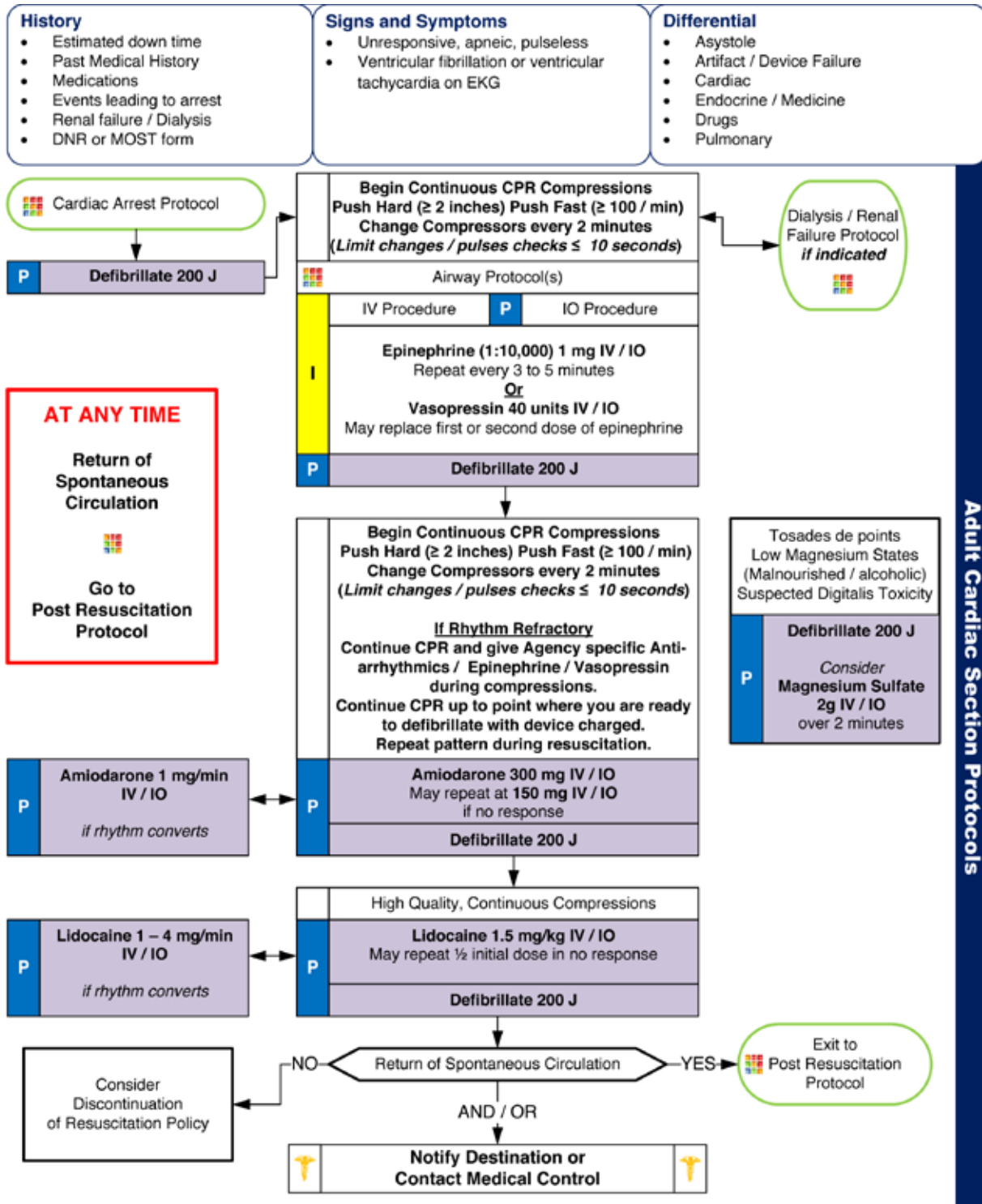






# Cardiac Arrest Resuscitation System

## VF pulseless VT



Adult Cardiac Section Protocols

### Protocol 18

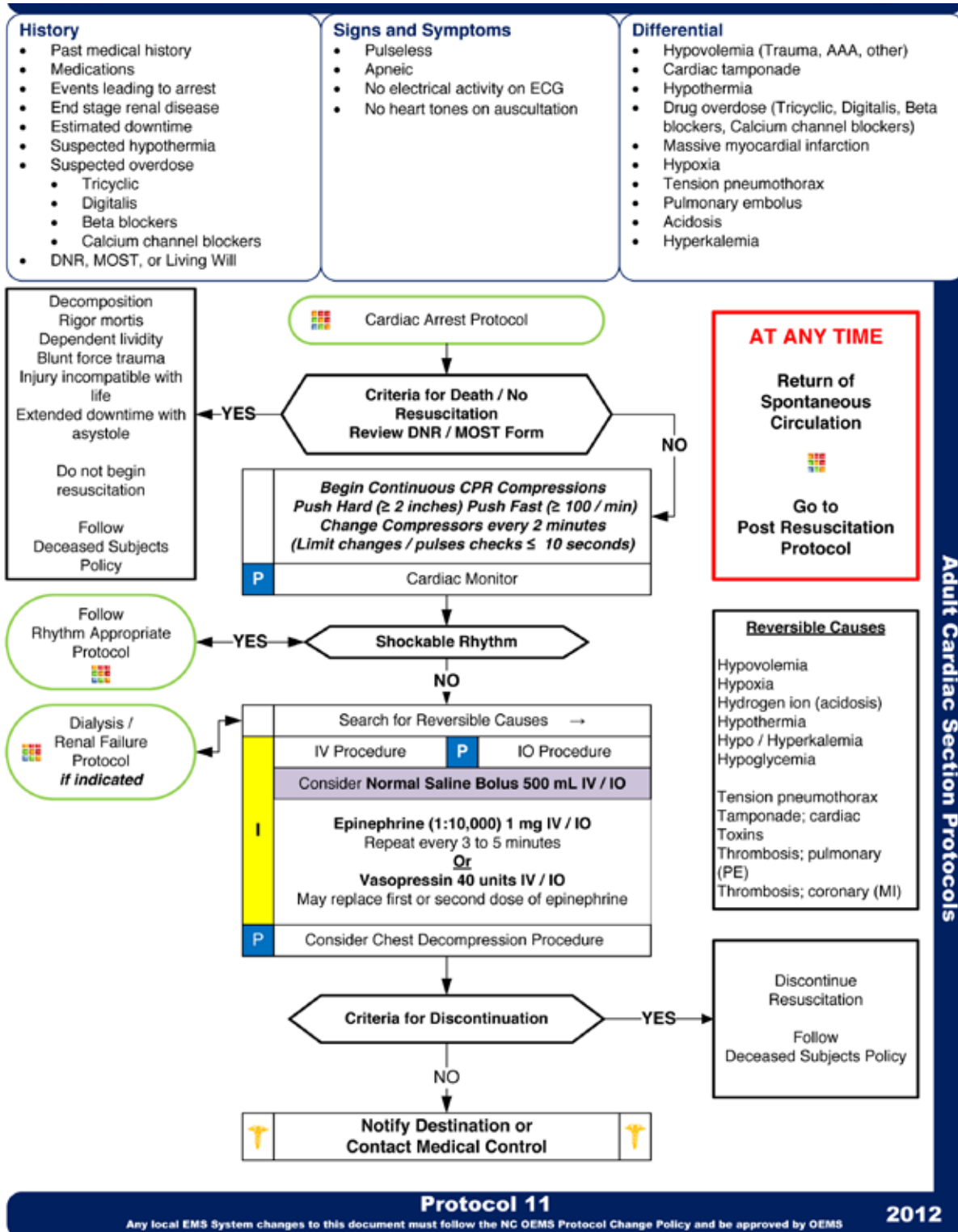
Any local EMS System changes to this document must follow the NC OEMS Protocol Change Policy and be approved by OEMS

2012



# Cardiac Arrest Resuscitation System

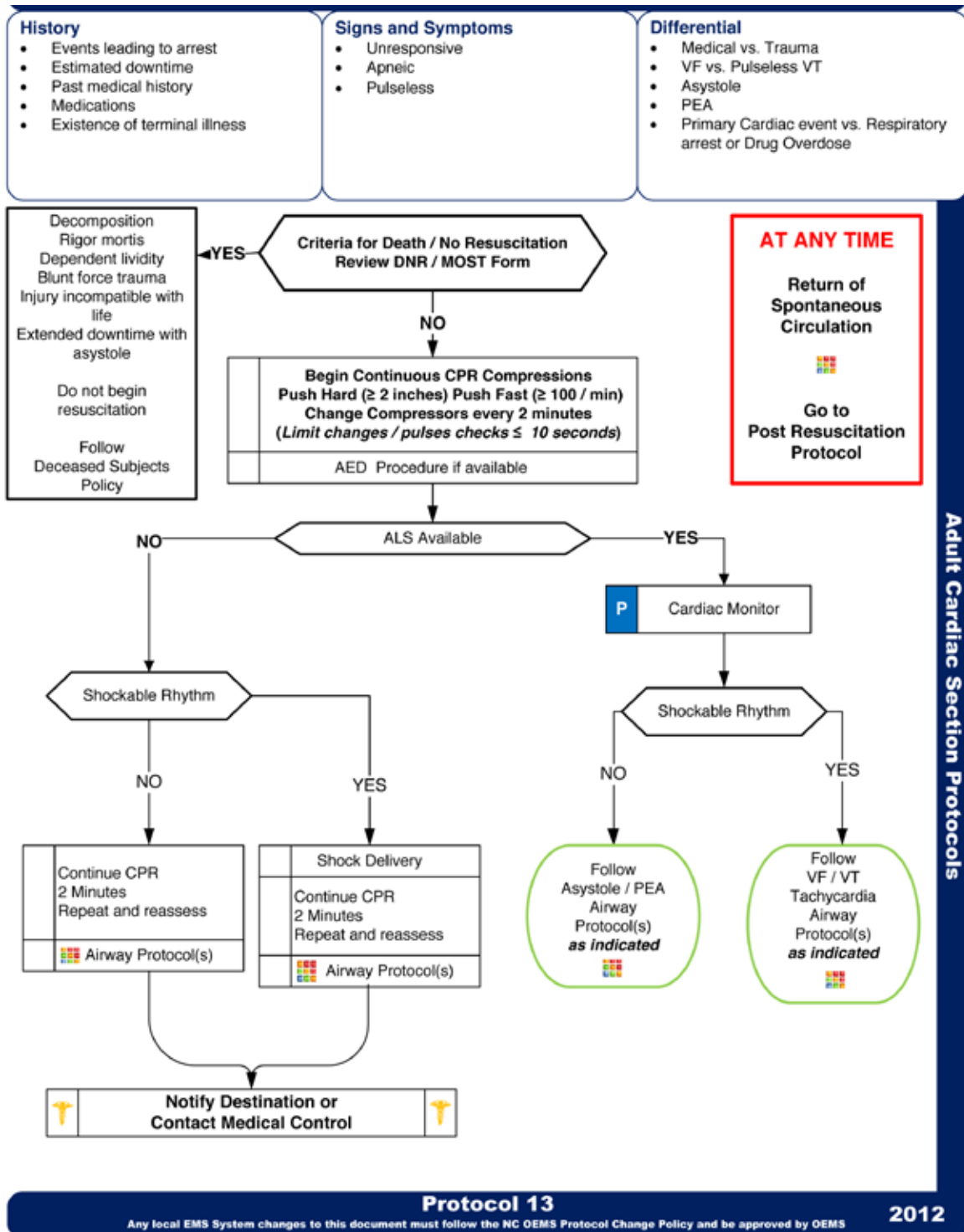
## Adult Asystole/Pulseless Electrical Activity





# Cardiac Arrest Resuscitation System

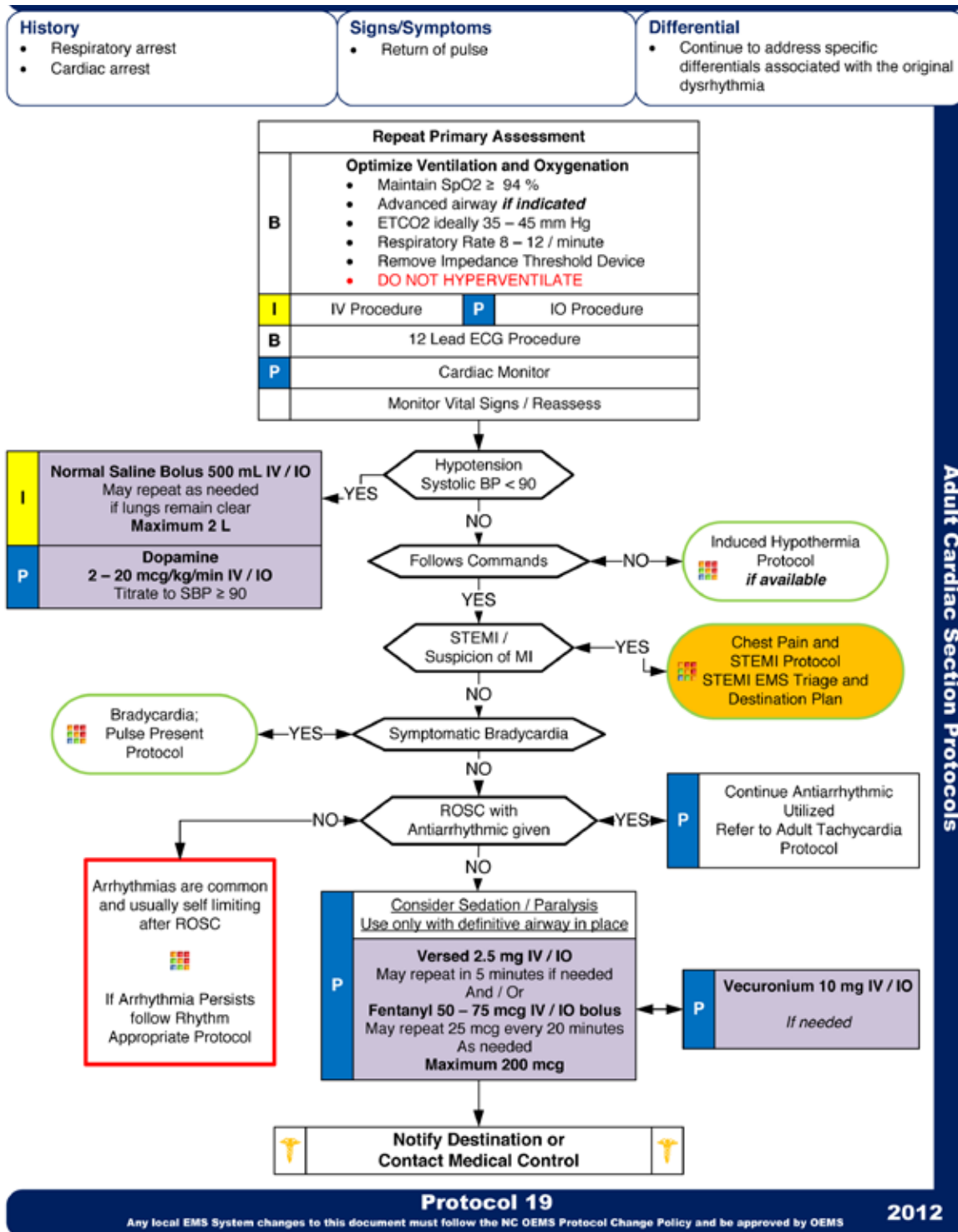
## Cardiac Arrest; Adult





# Cardiac Arrest Resuscitation System

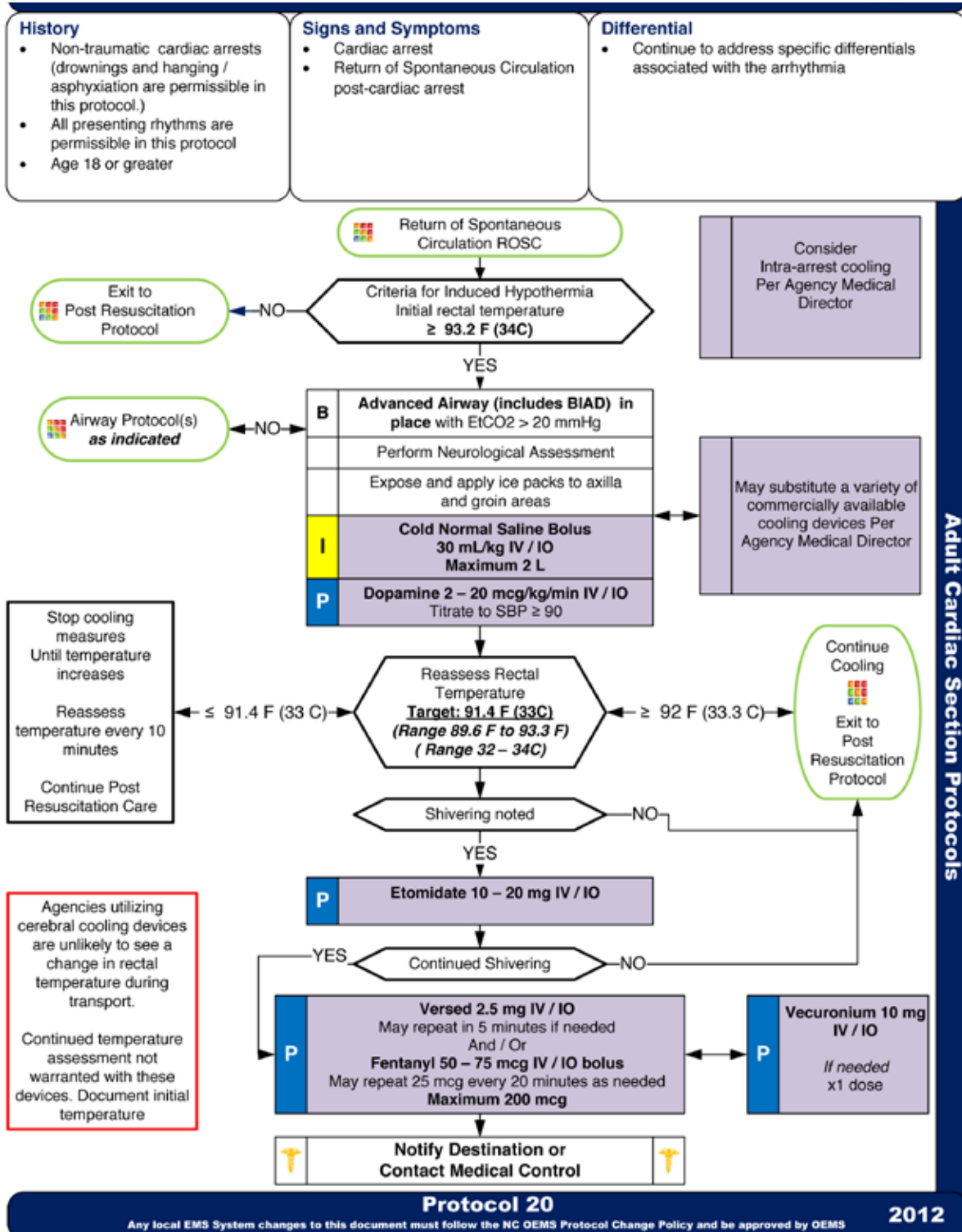
## Post Resuscitation





# Cardiac Arrest Resuscitation System

## Induced Hypothermia (Optional)

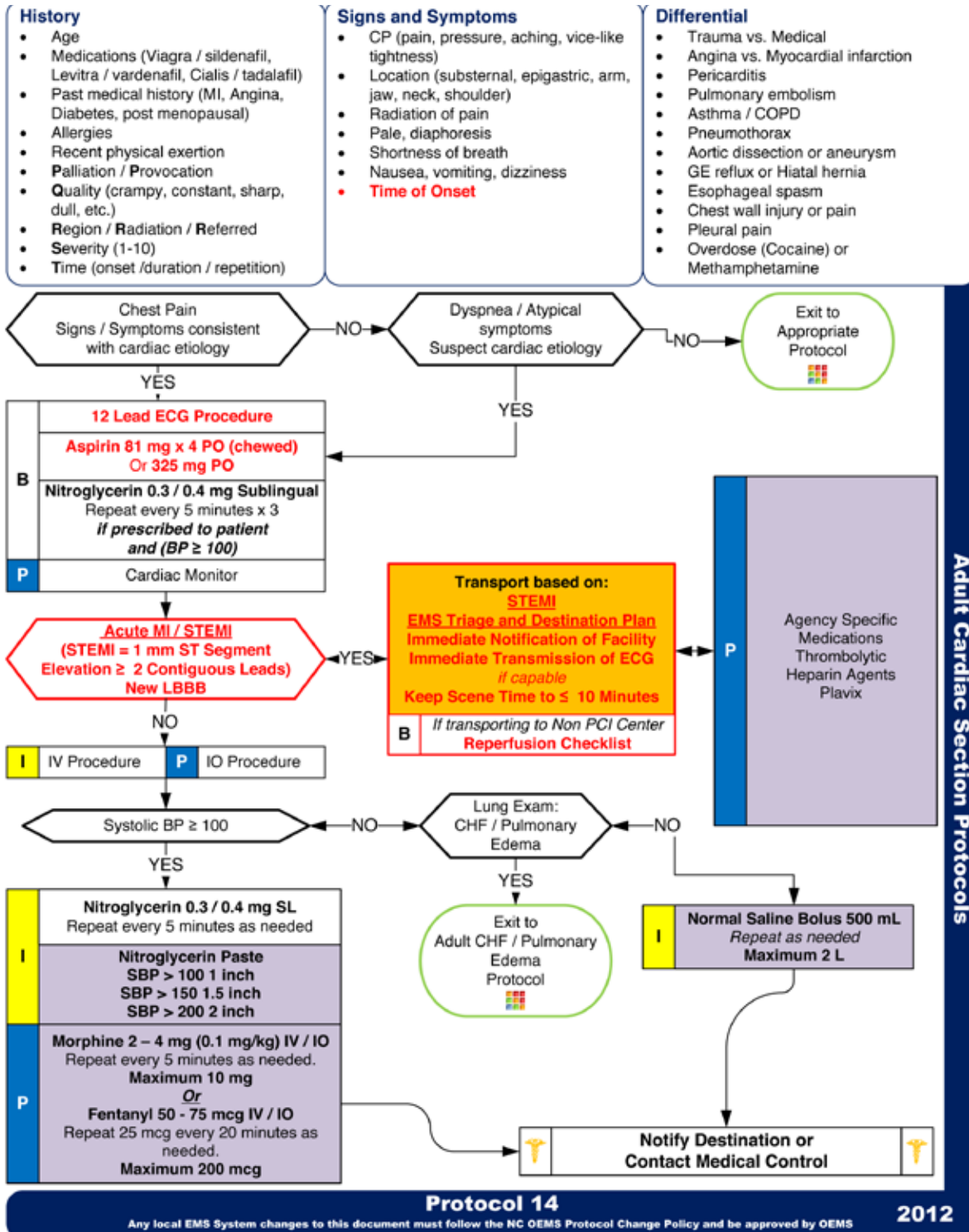






# Cardiac Arrest Resuscitation System

## Chest Pain and STEMI



# Hospital



**Cardiac  
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## Cardiac Arrest Center

**Goal: To improve the survival from cardiac arrest by 50%**

<input type="checkbox"/>	Standard and well executed ACLS protocols
<input type="checkbox"/>	Baseline neurologic examination
<input type="checkbox"/>	2 large bore IV's
<input type="checkbox"/>	ECG: STEMI to cath lab
<input type="checkbox"/>	Optimize BP to MAP>65mmHG
<input type="checkbox"/>	Titrate EtCO2 for 35–40
<input type="checkbox"/>	Consider CT of brain, do not delay cooling for scan or extensive testing before transfer unless clinically indicated
<input type="checkbox"/>	Pressure infuse 2L of cold saline if candidate for hypothermia (If EMS started cooling do not stop)-continue cooling in transport
<input type="checkbox"/>	Continue therapeutic hypothermia for 24 hours
<input type="checkbox"/>	Sedation and possibly paralysis
<input type="checkbox"/>	On-going neurological assessment and care
<input type="checkbox"/>	24/7 Cath lab availability for STEMI
<input type="checkbox"/>	Early coronary angiography if not a STEMI
<input type="checkbox"/>	ICD Evaluation
<input type="checkbox"/>	Rehabilitation plan
<input type="checkbox"/>	Train family in recognition of cardiac emergency and compression only CPR prior to patient discharge
<input type="checkbox"/>	Family and staff support
<input type="checkbox"/>	Data measurement and feedback





**Cardiac  
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## Resuscitation Capable Hospital

**Goal: To improve survival from cardiac arrest by 50%**

<input type="checkbox"/>	Standard and well executed ACLS protocols
<input type="checkbox"/>	Baseline neurologic examination
<input type="checkbox"/>	2 large bore IV's
<input type="checkbox"/>	ECG: If new LBBB or STEMI : Activate STEMI Plan
<input type="checkbox"/>	Early notification of the receiving hospital
<input type="checkbox"/>	Early activation of the transport plan
<input type="checkbox"/>	Implement treatment protocols for STEMI and cardiac arrest
<input type="checkbox"/>	Send medical records including EMS information, ECG, record of treatment with times, and EMTALA form (can fax records if need time to complete, EMTALA forms must go with patient)
<input type="checkbox"/>	Optimize BP to MAP>65mmHG
<input type="checkbox"/>	Titrate EtCO <sub>2</sub> for 35–40
<input type="checkbox"/>	Consider CT of brain, do not delay cooling for scan or extensive testing before transfer unless clinically indicated
<input type="checkbox"/>	Pressure infuse 2L of cold saline if candidate for hypothermia (If EMS started cooling do not stop)-continue cooling in transport
<input type="checkbox"/>	Sedation and possibly paralysis
<input type="checkbox"/>	Train family in recognition of cardiac emergency and compression only CPR prior to patient discharge
<input type="checkbox"/>	Family and staff support
<input type="checkbox"/>	Data measurement and feedback



**Cardiac  
Arrest  
Resuscitation  
System**

## CARES Post Cardiac Arrest Hypothermia Order Set

Date/Time	Orders (check all appropriate boxes)
	<b>Pre-Cooling</b>
	<input type="checkbox"/> Inclusion and Exclusion Criteria Reviewed
	<input type="checkbox"/> Code Status Documented
	<input type="checkbox"/> Neurologic Exam Performed and Documented
	<input type="checkbox"/> Consider pre-hypothermia CT head to exclude intra-cranial abnormalities if clinically appropriate
	<input type="checkbox"/> Activate hypothermia protocol response team. (Members may include ICU, critical care nursing, neurology, cardiology, pharmacy, and / or pastoral care)
	<b>Cooling (if core temperature &gt;34°C)</b>
	<input type="checkbox"/> Infuse 30cc/kg cold saline (4°C) saline over 30 minutes if no evidence of heart failure
	<input type="checkbox"/> Place ice packs in patients axilla, groin, side of neck
	<input type="checkbox"/> Disrobe patient
	<input type="checkbox"/> Apply external cooling pads/system
	<input type="checkbox"/> For Institutions with Intravascular Cooling Catheters. Insert catheter and set temperature at 33°C
	<input type="checkbox"/> Lower room temperature (if possible)
	<b>Sedation (Use routine sedation for a mechanically ventilated patient according to hospital protocols and manufacturers recommendations).</b>
	<input type="checkbox"/> Sedation target _____. (Suggest Richmond Assessment Scale -4)
	<input type="checkbox"/> Midazolam loading dose _____mg IV (Usual 0.01 - 0.1 mg/kg) q 5min prn until sedation target reached then start maintenance _____ mg/kg/hr IV (Usual 0.03 - 0.25 mg/kg/h).
	<input type="checkbox"/> Fentanyl loading dose _____mcg IV (Usual 1 - 2 mcg/kg) q 5min prn until sedation target reached then start maintenance _____ mcg/kg/hr IV (Usual 0.5 -5.0 mcg/kg/h).
	<input type="checkbox"/> Dexmedetomidine loading dose _____mcg IV (Usual 1 mcg/kg) then start maintenance _____ mcg/kg/hr IV (Usual 0.2 -1.0 mcg/kg/h).
	<input type="checkbox"/> Propofol _____ mg/kg/hr (Usual 1.0-5.0 mg/kg/hr)
	<input type="checkbox"/> Other:



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## CARES Post Cardiac Arrest Hypothermia Order Set

Date/Time	Orders (check all appropriate boxes)
	<b>Shivering Control (Use paralytic agents according to hospital protocols and manufacturers recommendations)</b>
<input type="checkbox"/>	Pancuronium_____ (0.06-0.1 mg/kg q 1-3 h prn). Avoid if renal insufficiency.
<input type="checkbox"/>	Other Paralytic Agent* best used during induction phase, but rarely necessary during maintenance.
<input type="checkbox"/>	Monitor level of paralysis with nerve stimulator (ie., Train of Four). Target 1 of 4.
	<b>Monitoring</b>
<input type="checkbox"/>	Baseline CBC, Cr, BUN, electrolytes, glucose, Mg, ionized calcium, ABG, Lactate, troponin, CK, AST, ALT, ALP, bilirubin, INR, PTT, Chest XR, ECG • Repeat above daily
<input type="checkbox"/>	Electrolytes, Glucose, Lactate q 4h • Target K 4.0-5.0 and target Glucose range _____mg/dl
<input type="checkbox"/>	Repeat troponin, CK, ECG in 6 hours
<input type="checkbox"/>	ABG q4h + prn
<input type="checkbox"/>	Toxicology Screen (if clinically appropriate)
<input type="checkbox"/>	Insert arterial line. • Continuous arterial blood pressure monitoring
<input type="checkbox"/>	Insert internal jugular or subclavian central venous catheter. • CVP monitoring q _____ hours
<input type="checkbox"/>	Insert esophageal, bladder or rectal temperature probe. Continuous temperature monitoring
<input type="checkbox"/>	Continuous EEG monitoring (if available and if clinically appropriate)
	<b>Maintenance</b>
<input type="checkbox"/>	Maintain core body temperature 32-34°C for 24 hours. Once target temperate achieved, remove ice packs
<input type="checkbox"/>	NPO
<input type="checkbox"/>	NG/OG to low suction
<input type="checkbox"/>	Target MAP _____mmHg (Usual range 65–80mmHg)
<input type="checkbox"/>	For fluid refractory (CVP>8) hypotension: _____ (Consider Norepinephrine 0.01–0.2 mcg/kg/min Dopamine 2.5–20 mcg/kg/min)
<input type="checkbox"/>	For Hypertension: These medications are rarely necessary, as long as MAP < 100. Avoid antihypertensive drugs during cooling.
<input type="checkbox"/>	IV Fluid:



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## CARES Post Cardiac Arrest Hypothermia Order Set

Date/Time	Orders (check all appropriate boxes)
	<b>Ventilator Management and Pneumonia Prevention</b>
	<input type="checkbox"/> Target SaO <sub>2</sub> > 94% with minimal FIO <sub>2</sub> achievable. Avoid hypoxia & hyperoxia
	<input type="checkbox"/> Target pH 7.35-7.45
	<input type="checkbox"/> Head of bed >30°
	<input type="checkbox"/> Attach endotracheal tube to suction
	<input type="checkbox"/> Chlorhexidine mouthwash BID
	<b>Rewarming</b>
	<input type="checkbox"/> Begin rewarming 24 hours after hypothermia target temperature achieved
	<input type="checkbox"/> For cooling devices (blanket or intravascular) – set device to rewarm to target temperature 36.5°C (0.25-0.35°C/hr)
	<input type="checkbox"/> Re-set room temperature and re-cloth patient as appropriate
	<input type="checkbox"/> Do not discontinue sedation until body temperature > 35°C and train of four (for paralyzed patients) 4 of 4
	<input type="checkbox"/> Continue to monitor electrolytes and glucose q 4 h
	<b>Medications</b>
	<input type="checkbox"/> Stress Ulcer Prophylaxis:
	<input type="checkbox"/> DVT prophylaxis:
	<input type="checkbox"/> Anti-arrhythmic:
	<input type="checkbox"/> Anti-seizure:
	<input type="checkbox"/> ASA: _____ mg ng/og/po/pr (circle one) daily
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>



**Cardiac  
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## CARES Post-Cardiac Arrest Hypothermia Initiation Orders for Transferring Hospitals

Date/Time	Orders (check all appropriate boxes)	
	<b>Pre-Cooling</b>	
	<input type="checkbox"/>	Inclusion and Exclusion Criteria Reviewed
	<input type="checkbox"/>	ECG Performed
	<input type="checkbox"/>	Neurologic Exam Performed and Documented (GCS, corneal/pupillary/gag reflexes, tone, reflexes)
	<b>Cooling (if core temperature &gt;34°C)</b>	
	<input type="checkbox"/>	Infuse 30cc/kg cold saline (4°C) saline over 30 minutes if no evidence of heart failure
	<input type="checkbox"/>	Place ice packs in patients axilla, groin, side of neck
	<input type="checkbox"/>	Disrobe patient and open ambulance windows during transfer
	<b>Sedation</b>	
	<input type="checkbox"/>	Midazolam loading dose _____mg IV (Usual 0.01–0.1 mg/kg) q 5min prn.
	<input type="checkbox"/>	Fentanyl loading dose _____mcg IV (Usual 1–2 mcg/kg) q 5min prn
	<b>Investigations</b>	
	<input type="checkbox"/>	Baseline CBC, Cr, BUN, electrolytes, glucose, Mg, ionized calcium, ABG, Lactate, troponin, CK, AST, ALT, ALP, bilirubin, INR, PTT, CXR
	<input type="checkbox"/>	Consider pre-hypothermia CT head to exclude intra-cranial abnormalities if clinically appropriate



## Cardiac Arrest Resuscitation System

# Post-Cardiac Arrest Protocol

### THERAPEUTIC HYPOTHERMIA

After cardiac arrest due to ventricular tachycardia or ventricular fibrillation, all intubated patients should receive therapeutic hypothermia unless:

- The patient can follow verbal commands.
- More than 8 hours have elapsed since ROSC (flexible).
- There is life-threatening bleeding or infection.
- Cardiopulmonary collapse is imminent, despite vasopressor support.
- Refractory hemodynamically significant arrhythmias.
- Aggressive care not warranted.

Also consider therapeutic hypothermia following cardiac arrest due to pulseless electrical activity or asystole.

Start cooling as early as possible for maximum effectiveness. Initiate therapy in the ED when possible and continue treatment in the cath. lab and ICU.

### INDUCTION

- Activate hypothermia protocol rapid response team. Members may include intensivist, critical care nursing, neurology, cardiology, pharmacy, and / or pastoral care.
- Physician performs and documents the neurologic exam. If seizure activity is suspected, treat seizure activity and consider neurology consultation.
- If core temperature is greater than 34°C, infuse refrigerated (4°C) normal saline over 30 minutes (approximately 30 cc / kg: 2 liters < 60kg, 3 liters 60-95 kg, 4 liters >95 kg).
- Institutions with water circulating blankets (Arctic Sun, Cincinnati Sub Zero, Polar Air) Place external defibrillation pads. Insert esophageal temperature probe and initiate cooling with device set to 33°C. A bladder probe may be substituted if urine output > 30cc/hr. A bladder probe may be substituted. New bladder probes measure bladder wall temperature and are not reliant on urine output.

- Institutions with intravascular cooling catheters (Coolgard, Innercool) Insert intravascular catheter and initiate cooling with device set to 33°C.
- Sedation  
Use routine sedation for a mechanically ventilated patient according to hospital protocols and manufacturers recommendations.

### Possible agents include:

	Loading dose	Maintenance dose	Notes
Midazolam	0.01–0.1 mg/kg	0.03–0.25 mg/kg/h	
Fentanyl	1–2 mcg/kg	0.5–2 mcg/kg/h	
Propofol	0.5–2.0 mg/kg	1.0–5.0 mg/kg/h	
Dexmedetomidine	1 mcg/kg	0.2–1.0 mcg/kg/hour	

- Shivering control  
Adequately sedate patient and set ventilator to a back-up rate.

Shivering may stop when patient reaches target temperature.

Use paralytic agents according to hospital protocols and manufacturers recommendations.

### Possible agents include:

	Loading dose	Intermittent dose	Notes
Vecuronium		0.1 mg/kg every hour PRN shivering	
Pancuronium		0.06 to 0.1 mg/kg every 1 to 3 hours PRN shivering	Avoid with renal insufficiency
Cisatracurium	0.15–0.2 mg/kg	0.03 mg/kg IV every 20 to 30 minutes PRN shivering	Alternative option: continuous infusion 0.5 to 3 mcg/kg/min

**\* Paralytics are best used during the induction phase but rarely are necessary during the maintenance phase.**

# Post-Cardiac Arrest Protocol

## 8) Monitoring

Arterial lines and central venous lines should be placed per intensive care unit protocols.

Maintain mean arterial pressure above 65 mmHg or systolic pressure above 90.

- Maintenance fluids.
- Norepinephrine 5 mcg / minute, titrate as needed.
- Other pressors including Dopamine may also be considered.
- Consider echocardiography in patients with hemodynamic instability.

## MAINTENANCE

- 1) Achieve goal temperature of 33°C and maintain for 24 hours.
- 2) Maintain mean arterial pressure above 65 mmHg or systolic pressure above 90.  
Treat cardiogenic or septic shock if suspected.
- 3) Ventilator support
  - Target oxygen saturation greater than 94%, pH 7.4, and PCO<sub>2</sub> 35-45.
  - Avoid hyperoxia.
- 4) Electrolytes
  - Hypothermia commonly causes hypokalemia. When patients are rewarmed hyperkalemia may occur.
  - Check electrolytes including potassium every 4 hours. Potassium values below 3.5 mEq/L should be treated while the patient is being cooled. Potassium administration should be stopped once rewarming begins.
- 5) Aspiration pneumonia
  - Aspiration commonly occurs during cardiac arrest resuscitation.
  - Possible aspiration should be documented in the medical record.
  - Treat suspected aspiration pneumonia as appropriate.
- 6) Seizures
  - Monitor and treat for seizures.
  - Consider electroencephalogram monitoring.
  - Consider neurology consultation.

## REWARMING

- 1) Controlled rewarming – set device to reach a goal of 36.5°C over 12 hours (0.25 to 0.35°C per hour).
- 2) Monitor patient for hypotension and hyperkalemia induced by rewarming.
- 3) Maintain sedation until 35°C.
- 4) Formal neurologic assessment should be performed when normothermia is achieved and sedating drugs have cleared from the circulation. Accurate neurological prognostication may be delayed after therapeutic hypothermia beyond 72 hours from arrest.

## URGENT CORONARY ANGIOGRAPHY

After cardiac arrest due to ventricular tachycardia or ventricular fibrillation, patients with preceding symptoms or ECG suggestive of acute myocardial infarction should undergo urgent coronary angiography. Coronary angiography should not delay induction of hypothermia.

Consider urgent coronary angiography for all ventricular tachycardia or ventricular fibrillation cardiac arrest patients.

- Patients whose primary PCI is delayed longer than 90 minutes post hospital arrival due to required need for CPR, are excluded from the Centers for Medicare & Medicaid Services / The Joint Commission measure of “primary PCI received within 90 minutes of hospital arrival.”
- For Centers for Medicare & Medicaid Services 30-Day AMI Mortality, only patients with acute myocardial infarction (ICD-9 code 410.x0 and 410.x1) as a principal discharge diagnosis are included. Principal diagnosis is defined as that condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care.

## IMPLANTABLE CARADIOVERTER DEFIBRILLATOR

An implantable cardioverter defibrillator is indicated for all neurologically intact survivors of cardiac arrest due to ventricular fibrillation or hemodynamically unstable sustained VT after evaluation to define the cause of the event and to exclude any completely reversible causes.\*

*\* ACC/AHA/HRS 2008 guidelines for device-based therapy of cardiac rhythm abnormalities: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines. Circulation. 2008; 117: 2820–2840.*



**Cardiac  
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## Resuscitation Capable Hospital Pre-Transfer Guidelines

### **Inclusion Criteria**

- Adults (age  $\geq 18$  years)
- Return of Spontaneous Circulation (ROSC) within 60 minutes of arrest
- Persistent Coma: Inability to follow commands and/or GCS  $< 9$

### **Exclusion Criteria**

- Severe or terminal illness with anticipated non-aggressive care
- Active hemorrhage
- Systemic infection/sepsis
- Severe refractory shock

### **Resuscitation Priorities**

- Airway: Intubation
- Breathing
  - Avoid hyperventilation (goal PaCO<sub>2</sub> of 38 – 42mmHg)
  - Avoid hyperoxia (rapidly decrease FiO<sub>2</sub> to maintain SpO<sub>2</sub>>95%)
- Circulation
  - Goal MAP>65
  - Anticipate and avoid hypotension
  - Norepinephrine is the preferred vasopressor
  - ECG screen for STEMI

### **Cooling Induction**

- Initiate cooling as soon as possible after ROSC
- Refrigerated (4°C) NS 30 cc/kg IV bolus as tolerated
- Ice packs to groin, axilla and neck
- Shivering control with Propofol 10 mcg/kg/min
- Paralyze patient with Vecuronium 0.1mg/kg q1hr

*Courtesy of David Pearson, MD, Carolinas Medical Center Code Cool*



# Community



**Cardiac  
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## Community Training

**Objective: To improve the rate of bystander CPR**

### Education

- ☐ Identify leaders and interested community members to join your team. This should also include local hospitals, EMS agencies, fire, police, and community colleges
- ☐ Survey the community to understand what education exists around cardiac emergencies including CPR training, health fairs, hospital offerings, other health agency offerings
- ☐ Seek funding from local businesses, find grant opportunities on line, or partner with existing offerings
- ☐ Use RACE CARS material and/or AHA materials
- ☐ Train the Trainer – identify volunteers who are willing to teach community offerings and train them how to run a community education offering
- ☐ Participate in existing offerings or schedule your own – YMCA's, churches, Rotatory, Kiwanis, sporting events, events at the local stadiums/coliseums, schools-be creative
- ☐ Advertise: send emails, ask to post signs, talk to local TV/radio stations, be creative
- ☐ Count how many are trained at each event:  
Use this link to provide your event information:  
**[https://duke.qualtrics.com/SE/?SID=SV\\_e4FROMWMPQ8DqNC](https://duke.qualtrics.com/SE/?SID=SV_e4FROMWMPQ8DqNC)**  
This information includes: event name, location, numbers trained, and type of training
- ☐ We will be tracking bystander CPR rates and survival rates in every community across NC

### Public Access Defibrillation Program

- ☐ Identify leaders and interested community members to join your team. This should also include local hospitals, EMS agencies, fire, police, and community colleges
- ☐ Survey the community to identify locations of AED's.
- ☐ Obtain contact information for the responsible party for each AED
- ☐ Work with local EMS to get the AED locations into their 911 system (ability to track AED info – when pads expire, battery expiration, etc)
- ☐ Seek funding from local businesses or find grant opportunities to fund AED's for locations with >250 people

### American Heart Association and American Red Cross CPR Training

- ☐ Identify AHA and ARC classes for communities



**Cardiac  
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## Compression Only - “Hands Only” CPR

### The 3 “C’s” of seeing when you should call 911

#### **STEPS:**

##### **1. CHECK**

- To see if the victim will respond to you
  - this includes moving, speaking, blinking, and answering your questions
- If they are not responding to you, check to see if their breathing is normal
  - gasping is not normal

##### **2. CALL**

- Emergency Medical Services -911 quickly
  - If someone is there to help you, have them call 911 and get an AED if available
  - If you are alone, you must call yourself and get an AED if available

An AED is a box that has a computer in it that will tell you if the patient needs to be shocked

##### **3. COMPRESSION only CPR – Hands Only**

- If the victim is not responding and does not have normal breathing
  - Make sure the area is safe
  - Place the victim on their back on a hard surface
  - Remove clothing over the chest of victim
  - Place heel of one hand in center of the victim’s chest, place heel of other hand on top of the first hand
  - Push hard –at least 2 inches down
  - Let the chest come back to the normal position after pushing down
  - Push fast – to the beat of the song “ Stayin Alive - If there is someone else there to help you, switch every 2 minutes, move quickly to limit the time off of the chest
  - Continue until help arrives



**Cardiac  
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## Cardiovascular Emergencies: Myocardial Infarction

Cardiovascular Emergencies involve problems with the heart and blood vessels that need immediate medical attention. These include myocardial infarction, stroke, and cardiac arrest.

### **Definition**

A myocardial infarction is the sudden loss of blood flow to the heart due to blockage of a heart artery. A myocardial infarction is diagnosed by symptoms and an EKG that is not normal.

The blocked coronary artery needs to be opened quickly (ideally within 1 to 2 hours) to allow blood to flow again to that area of the heart. There are two ways to open the artery, using a small balloon to push the blockage back or giving a drug to dissolve the clot.

Other conditions that may resemble myocardial infarction include indigestion and chest, neck or arm pain from other causes.

### **Symptoms**

- Chest discomfort (pressure, squeezing, fullness, or pain)
- Discomfort in other areas of the upper body (neck, arm, jaw)
- Shortness of breath
- Sweating
- Nausea
- Light headedness
- Older patients, diabetics, and women are less likely to experience typical symptoms.

### **What to do**

Call 911 for Emergency Medical Services immediately.

You may give victims an aspirin if they are not allergic to it. If they have been prescribed nitroglycerin, this may also be administered.

Wait with the victim until EMS personnel arrive. Report information about symptoms so an appropriate treatment may be chosen.

Do **not** drive victim to the hospital as they may go into cardiac arrest and die in your car. Ambulances have trained personnel and equipment to treat cardiac arrest and safely transport patients.



**Cardiac  
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## Cardiovascular Emergencies: Stroke

Cardiovascular Emergencies involve problems with the heart and blood vessels that needs immediate medical attention. These include myocardial infarction, stroke, and cardiac arrest.

### **Definition**

A stroke is the sudden loss of blood flow to the brain due to a blockage of a brain artery or bleeding into the brain. Victims of a stroke develop symptoms of brain damage.

Stroke is diagnosed by a physician exam and a computed tomography (CT) scan. If the stroke is due to a blocked brain artery, opening the artery quickly (ideally within 3 hours) by blood dissolving medications or devices will minimize brain damage.

Other conditions that may resemble stroke include severely low blood sugar.

### **Symptoms (FAST)**

- Sudden weakness of the face **(F)**
  - Ask the person to smile. Does one side of the face droop?
- Sudden numbness of arm **(A)**
  - Ask the person to raise both arms. Does one arm drift downward?
- Difficult speech **(S)**
  - Ask the person to repeat a simple phrase. Is their speech slurred or strange?
- Sudden confusion
- Difficulty seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden, severe headache with no known cause

### **What to do**

Call 911 for Emergency Medical Services immediately. Time **(T)** is important.

Wait with the patient until EMS personnel arrive. Report the time that symptoms started so an appropriate treatment may be chosen.



**Cardiac  
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## Cardiovascular Emergencies: Cardiac Arrest

Cardiovascular Emergencies involve problems with the heart and blood vessels that needs immediate medical attention. These include Heart Attack, Stroke, and Cardiac Arrest.

### **What:**

Cardiac arrest is the sudden loss of adequate blood flow to the brain due to a heart rhythm problem. Victims become unresponsive and limp. Other conditions that may resemble cardiac arrest include severely low blood sugar, brain seizures, respiratory arrest, or anaphylactic shock. Cardiac arrest is more common in adults and older children who do not have lung disease.

### **Call Emergency Medical Services-911:**

#### **Symptoms:**

- Unresponsive, limp
- Standing patients may fall to the floor
- Sitting patients may slump over in their chair
- During cardiac arrest, victims may gasp for air

#### **Treatment:**

Treatment should begin immediately as above includes calling 911, calling for an automatic external defibrillator, applying hands only cardiopulmonary resuscitation, and applying an automatic external defibrillator.

If victims receive immediate bystander chest compressions and early defibrillation (within 9 minutes), they are much more likely to survive.

CARES created the first database to contain integrated information from EMS dispatch to hospital discharge for victims of OOHCA. The information system is driven by EMS agencies entering data into the system regarding dispatch, pre-arrival care, procedures performed and outcome from EMS care.

For those patients that survive to the hospital the receiving facility is asked to input patient procedures and outcome data. In some patient this requires tracking to a tertiary hospital for final outcome information. Using the Utstein style of statistics for OOHCA, CARES is capable of identifying and tracking all cases of cardiac arrest in a defined geographic area.

The ultimate goals of CARES is to help local EMS administrators and medical directors identify who is affected, when and where cardiac arrest events occur, which elements of the system are functioning properly and which elements are not, and how changes can be made to improve cardiac arrest outcomes. There is no cost to join the CARES registry. Data entry time is as quick as 10 minutes for EMS and 5 minutes for hospitals per case once a reviewer becomes familiar with the screens.

## CARES Data Form: page 1

Cardiac Arrest Registry									
<b>Part A : Demographic Information</b>									
1 - Street Address (Where Arrest Occurred)									
2 - City									
3 - State									
4 - Zip Code									
5 - First Name									
6 - Last Name									
7 - Age									
8 - Date of Birth									
9 - Gender									
10 - Race/Ethnicity									
11 - Medical history									
12 - Run Information									
13 - Date of Arrest									
14 - Incident #									
First Responding Agency									
15 - Fire/First Responder									
16 - Destination Hospital									
<b>Part C: Arrest Information</b>									
17 - Location Type									
18 - Arrest Witnessed									
19 - Arrest After Arrival of 911 Responder									
20 - Presumed Cardiac Arrest Etiology									
Resuscitation Information									
21 - Resuscitation attempted by 911 Responder									
22 - Who Initiated CPR									
23 - Type of Bystander CPR Provided									
24 - Were Dispatcher CPR instructions provided:									
25 - Was an AED applied prior to EMS arrival									
26 - Who First Applied the AED									
27 - Who First Defibrillated the Patient									
28 - Did 911 Responder perform CPR:									
First Cardiac Arrest Rhythm of Patient and ROSC Information									
29 - First Arrest Rhythm of Patient									
30 - Sustained ROSC (20 consecutive minutes)									
31 - Was hypothermia care provided in the field									
32 - End of Event									
33 - When did ROSC first occur:									
34 - Estimated time of arrest									
35 - Time of 1st defibrillatory shock									
36 - Time of 1st CPR									

# CARES Data Form: page 2

9860072888

## Part D: EMS Interventions (check all that apply)

### 38 - Mechanical CPR device used:

☐ Yes ☐ No

If 'Yes', please specify:

☐ Load-Distributing Band (AutoPulse)

☐ Active Compression Decompression (LUCAS Device)™

☐ Mechanical Piston

☐ Other

### 41 - ITD used:

☐ Yes ☐ No

If 'Yes', select how:

☐ Bag valve mask ☐ Endotracheal tube ☐ Combitube

☐ King Airway ☐ LMA ☐ Oral/Nasal ET

☐ Other

### 43 - Vascular access:

☐ No IV ☐ IV ☐ IO

### 44 - 12 Lead:

☐ Yes ☐ No

### 39 - Automated CPR feedback device used:

☐ Yes ☐ No

### 40 - Advanced airway successfully placed in the field:

☐ Yes ☐ No

If 'Yes', please specify:

☐ Combitube ☐ King Airway ☐ LMA

☐ Oral/Nasal ET ☐ Other

### 42 - Were drugs administered:

☐ Yes ☐ No

If 'Yes', select drugs given:

☐ Epinephrine ☐ Atropine ☐ Amiodarone

☐ Bicarbonate ☐ Dextrose ☐ Lidocaine

☐ Vasopressin ☐ Other

### 45 - STEMI:

☐ Yes ☐ No ☐ Unknown

If 'Yes', select location:

☐ Anterior ☐ Inferior

## Part E: Hospital Section

### 46 - ER Outcome

☐ Resuscitation terminated in ED

☐ Admitted to hospital

☐ Transferred to another acute care facility from the ED

### 47 - Was hypothermia care initiated or continued in the hospital

☐ Yes

☐ No

### 48 - Hospital Outcome

☐ Died in the hospital

☐ Discharged alive

☐ Patient made DNR

If yes, choose one of the following:

☐ Died in the hospital

☐ Discharged alive

☐ Transferred to another acute care hospital

☐ Not yet determined

☐ Transferred to another acute care hospital

☐ Not yet determined

### 49 - Discharge from the Hospital

☐ Home/Residence

☐ Rehabilitation Facility

☐ Skilled Nursing Facility/Hospice

### 50 - Neurological Outcome At Discharge From Hospital

☐ Good Cerebral Performance (CPC 1)

☐ Moderate Cerebral Disability (CPC 2)

☐ Severe Cerebral Disability (CPC 3)

☐ Coma, Vegetative State (CPC 4)

51 - Was the final diagnosis acute myocardial infarction: ☐ Yes ☐ No

## Hospital Procedures

52 - Coronary Angiography Performed: ☐ Yes ☐ No ☐ Unknown

If 'Yes', provide date and time:

/  /  :  :  :   
 Hour Minute

53 - Was a cardiac stent placed: ☐ Yes ☐ No ☐ Unknown

54 - CABG performed: ☐ Yes ☐ No ☐ Unknown

55 - Was an ICD placed and/or scheduled: ☐ Yes ☐ No ☐ Unknown

## Response and Treatment Times

	Hour	Minute	Second	
57 - Time call received at dispatch center	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> 56 - No First Responder dispatched
58 - Time First Responder dispatched	<input type="text"/>	<input type="text"/>	<input type="text"/>	
59 - Time of First Responder en route	<input type="text"/>	<input type="text"/>	<input type="text"/>	
60 - Time Ambulance dispatched	<input type="text"/>	<input type="text"/>	<input type="text"/>	
61 - Time for Ambulance en route	<input type="text"/>	<input type="text"/>	<input type="text"/>	
62 - Time First Responder arrived at scene	<input type="text"/>	<input type="text"/>	<input type="text"/>	
63 - Time Ambulance arrived at scene	<input type="text"/>	<input type="text"/>	<input type="text"/>	
64 - Time EMS arrived at patient side	<input type="text"/>	<input type="text"/>	<input type="text"/>	
65 - Time Ambulance left scene	<input type="text"/>	<input type="text"/>	<input type="text"/>	
66 - Time Ambulance arrived at ED	<input type="text"/>	<input type="text"/>	<input type="text"/>	

## General Comments





Cardiac  
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## INTCAR Data Registry

1

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### **INTCAR:**

- International Registry for Cardiac Arrest
- <http://www.intcar.org/>
- is a joint venture of hospitals, research societies and individuals dedicated to improving post-resuscitation care for cardiac arrest survivors.
- allows members to participate in research groups of their own design and choosing

2

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### **Core Set:**

- 108 data elements
- 2 hours to abstract and enter
- Clinical abstractor
- Subset Example:
  - The Cardiology group was developed to evaluate the relationship between cardiac features of cardiac arrest and outcome, and was founded in 2009.

3

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### **Primary Function of the Registry:**

- Collect data
  - How and on whom is hypothermia being performed after Cardiac Arrest
  - Characteristics of the patients
  - Utilization of PCI, EEG, MRI, etc
  - Outcomes
- Return reports to member institutions for internal QI purposes, compare outcomes and practices to norms within the registry

4

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### **Secondary Functions:**

- Research within the registry
  - Requires approval and cooperation of the steering committees
- “Networking” function to connect centers
  - Research groups
  - Provide support for new sites

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### **INTCAR Commitment**

- Identify a principle investigator and data coordinator
- Report ALL unconscious patients admitted to your ICU, ICU group, or hospital with a primary diagnosis of cardiac arrest\*
  - Even if not treated with hypothermia
- PI should maintain contact with INTCAR administrator, and must take responsibility for high quality data entry

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### **Registration**

- Go to the INTCAR or the Neurocritical Care Society website and follow registration instructions
- Seek exemption from local IRB to enter fully de-identified patient data
- Administrator will contact you by email, conduct a brief telephone interview, and provide you with a logon and password
- Review the “test patient” field
- Discuss data questions with administrator
- Begin entering patient data for ALL comatose survivors of cardiac arrest admitted to your institution

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### **Database Management**

- Submit to INTCAR
- Develop a standing database to pull data back locally
- Develop reports to be generated for Quality Improvement
- Research questions addressed by query
- May add fields locally

# Glossary of Terms

**Asystole:**

cardiac standstill manifested by a “flat line” ECG rhythm and absence of a pulse.

**Automatic External Defibrillator (AED):**

a device that can be used by anyone with a minimal amount of training to defibrillate someone whose heart has stopped.

**Cardiac Arrest****(also known as cardiopulmonary arrest):**

the cessation of normal circulation of the blood due to failure of the heart to contract effectively.

**Cardiac Arrest Registry to Enhance Survival (CARES) Registry:**

a national registry of cardiac arrest care and outcome supported by the Centers for Disease Control and Prevention and maintained at Emory University.  
<http://www.cdc.gov/dhdsp/cares.htm>

**Cardiopulmonary Resuscitation (CPR):**

an emergency procedure involving manual compression only of the heart from above the sternum and forced air into the lungs. The most recent guidelines recommend that bystanders perform chest compression alone at a rate of 100 times per minute with at least 2 inches of chest compression.

**Catheterization:**

Inserting a small curved plastic tube into the arterial system for the purpose of injecting an iodine-based fluid and illuminating the arteries by x-ray.

**Coronary angiography:**

X-ray pictures of the vessels that supply blood to the heart. Blockage of the vessels often causes cardiac arrest.

**Electrocardiogram (ECG):**

a recorded tracing of the electrical activity of the heart.

**Emergency Medical Service (EMS):**

a system of health care professionals, facilities and equipment providing pre-hospital emergency care.

**Emergency Medical Technician (EMT):**

an emergency responder trained to provide pre-hospital emergency medical services (EMS) to the critically ill and injured. There are multiple levels of training ranging from basic to intermediate to paramedic.

**First Responder:**

first medically trained responder to arrive on scene including police, fire, or EMS.

**Hypothermia:**

Cooling a patient to 32 – 34 degrees Celsius (90 – 93 degrees Fahrenheit). After cardiac arrest, this process reduces swelling and inflammation and has been shown to improve brain recovery.

**Normothermia:**

Maintaining a patient at normal body temperature, approximately 37.0 degrees Celsius or 98.6 degrees Fahrenheit.

**Myocardial infarction (MI):**

the sudden loss of blood flow to the heart due to blockage of a heart artery.

**Public Safety Answering Point (PSAP):**

is a call center responsible for answering calls to an emergency telephone number for police, fire, and ambulance.

**Percutaneous Coronary Intervention:**

The use of balloon tipped catheter to treat a narrowed or blocked coronary artery.

**Pulseless Electrical Activity (PEA):**

any heart rhythm observed by ECG that should be producing a pulse with the absence of a pulse.

**ST-Elevation Myocardial Infarction (STEMI):**

a myocardial infarction for which the ECG shows ST-segment elevation, usually associated with a recently closed coronary artery. Patients suffering this type of myocardial infarction are more likely to survive if their coronary artery is opened within 12 hours of onset.

**Return of Spontaneous Circulation (ROSC):**

the return of a pulse following resuscitation.

**Stroke:**

the sudden loss of blood flow to the brain due to a blockage of a brain artery or bleeding into the brain.

**Therapeutic or Induced Hypothermia:**

a medical treatment that lowers a patient's body temperature in order to help reduce the risk of the ischemic injury to tissue following a period of insufficient blood flow.

**Ventricular Fibrillation (VF):**

pulseless, chaotic activity of the heart muscle manifested by a disorganized and erratic ECG rhythm.

**Ventricular Tachycardia (VT):**

depolarization of the heart that originates in the ventricle manifested by a wide and regular ECG rhythm faster than 120 beats per minute.

**REFERENCES**

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## Notes

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## Notes

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