



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS

Section: Cardiovascular

Approved: EMS Medical Directors Consortium

Effective: December 1, 2022

**CARDIAC ARREST MANAGEMENT – BLS/ALS
Incident Command for Cardiac Arrest (ICCA)**

I. PATIENT CARE GOALS

1. Return of spontaneous circulation (ROSC).
2. Preservation of neurologic function.
3. High-quality chest compressions/CPR with minimal interruption from recognition of cardiac arrest until confirmation of ROSC or field termination of care.

II. PATIENT PRESENTATION

Inclusion Criteria: Adult and pediatric patient in non-traumatic cardiac arrest

III. PATIENT MANAGEMENT

CODE TASKS

- Resuscitation must begin and continue where patient is encountered
- Provide high quality, uninterrupted chest compressions
- Provide early defibrillation for shockable rhythms
- Provide controlled ventilatory management
- Obtain IV or IO access and advanced life support drug delivery
- Monitor End Tidal CO₂ for CPR quality and ROSC

EQUIPMENT

BLS:

- Automated external defibrillator (AED)
- Adult and pediatric AED pads
- Bag Valve Mask (Adult and Pediatric BVM) with adult, child, infant, and neonatal masks
- Supraglottic Airway (I-gel)
- Oxygen

ALS:

- Manual monitor/defibrillator
- Adult and pediatric defibrillator pads
- End Tidal CO₂ monitoring equipment
- Bag Valve Mask (Adult and Pediatric BVM) with adult, child, infant, and neonatal masks
- Advanced airway (I-gel or endotracheal tube)
- Oxygen
- IV/IO equipment
- Advanced life support drugs



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS
Section: Cardiovascular
Approved: EMS Medical Directors Consortium
Effective: December 1, 2022

TREATMENT AND INTERVENTIONS

1. **Begin and continue the resuscitation of ADULT and PEDIATRIC patients where they are found.**
 - a. Patients should only be moved for scene safety concerns or to improve CPR quality.
 - b. High quality resuscitation requires at least three providers, thus additional resources should be called (an assist company or as per private EMS provider protocol).
 - c. Any delay in the initiation of resuscitation will decrease the patient's chance of survival.
 - d. The equipment listed above should be brought to the patient.

2. **Initiate high-quality uninterrupted chest compressions.**
 - a. The patient should be on a firm surface in the supine position.
 - b. Compress at a rate of 100-120 compressions per minute.
 - c. Use metronome set to the above rate when available.
 - d. Compression depth:
 - i. Adults: At least 2 inches
 - ii. Children: At least 1/3 the Anterior-Posterior (AP) diameter of the chest (usually 2 inches)
 - iii. Infants: At least 1/3 the AP diameter of the chest (usually 1.5 inches)
 - e. Allow full recoil of the chest wall, avoid leaning on the chest between compressions.
 - f. Alternate providers to avoid fatigue at least every two minutes.
 - g. Chest compressions should only be interrupted to analyze the cardiac rhythm and to deliver defibrillation. The total peri-shock pause (pre shock and post shock) should be less than 10 seconds.
 - h. For **pregnant patients** greater than 20 weeks gestation or with a visibly gravid abdomen:
 - i. Position the patient in the supine position with a second rescuer performing manual uterine displacement to the left to displace the gravid uterus to avoid aorto-caval compression and increase venous return.
 - ii. Chest compressions should be performed slightly higher on the sternum than in the non-pregnant patient to account for elevation of the diaphragm and abdominal contents.

3. **Attach cardiac monitor and assess rhythm.**
 - a. Defibrillate if ventricular fibrillation or pulseless ventricular tachycardia (or if AED advises shock).
 - i. Adult: Joules per manufacturer recommendations.
 - Stryker: 200-300-360 J
 - Zoll: 120-150-200 J
 - ii. Pediatric: 2 J/kg then 4 J/kg for all subsequent defibrillations
 - b. Defibrillation should be carried out as soon as possible, ideally within one minute of monitor application. Early defibrillation is associated with increased survival from cardiac arrest.
 - c. Immediately resume CPR after each defibrillation.
 - d. If care is initiated with an AED, transition to a manual defibrillator with ETCO₂ monitoring capability as soon as possible.
 - e. Pediatric defibrillation pad utilization:
 - i. Manual defibrillator: Utilize correct pad size as labeled by manufacturer based on patient age/weight. Pads should be positioned without touching. In small children and infants pediatric pads are necessary to achieve this goal.
 - ii. Automated External Defibrillator: For children and infants less than 8 years of age or 25 kg (55lbs) use pediatric attenuator pads.



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS
Section: Cardiovascular
Approved: EMS Medical Directors Consortium
Effective: December 1, 2022

4. Initiate BASIC AIRWAY management with bag valve mask ventilation.

- a. Use appropriately sized BVM:
 - i. Adult size bag (1200 ml reservoir): Patients > 40 kg
 - ii. Pediatric size bag (600 ml reservoir): Patients < 40 kg
- b. Ensure proper seal with appropriately sized adult, child, infant or neonatal mask.
- c. Deliver ventilations at correct rate avoiding hyperventilation.
 - i. Adults: 10 breaths per minute (1 breath every 6 seconds)
 - ii. Children: 15:2 compression to ventilation cycle
 - iii. Infants: 15:2 compression to ventilation cycle
- d. Assess breath sounds and chest wall rise to ensure adequate ventilation.

5. Ensure TWO MINUTE cycles of CPR.

- a. The code commander MUST track the timing of CPR cycles.
- b. The rhythm should be analyzed and pulse checked **EVERY TWO MINUTES**.
- c. Delays in rhythm analysis and defibrillation decrease the chance of successful defibrillation.
- d. The defibrillator should be pre-charged prior to the two-minute rhythm check to allow for a single pause for rhythm analysis and defibrillation.
- e. Chest compressors should switch at this two-minute interval while the rhythm is being assessed.
- f. The total peri-shock pause (pre shock and post shock) should be less than 10 seconds.

6. Obtain IV/IO access and administer ACLS drugs.

- a. Attempt IV access. If unable to obtain IV access place an IO.
- b. Administer Epinephrine (adult and pediatric) as soon as possible during the resuscitation.
 - i. For patients with non-shockable rhythms prioritize early administration of epinephrine within 5 minutes from the start of chest compressions.
 - ii. For patients with shockable rhythms administer epinephrine after the second defibrillation (usually within 5 minutes from the start of CPR).
 - iii. Administer repeat doses of epinephrine every 5 minutes after the first dose.
 - Adults: 1 mg IV/IO
 - Pediatrics: 0.01 mg/kg IV/IO
- c. Administer antiarrhythmic drugs (adult and pediatric) for patients with refractory shockable rhythms.
 - i. Administer **first dose** of Amiodarone after 3rd defibrillation
 - Adults: 300 mg IV/IO
 - Pediatrics: 5 mg/kg IV/IO
 - ii. If the patient remains in a shockable rhythm administer **second dose** of Amiodarone after 4th defibrillation.
 - Adults: 150mg IV/IO
 - Pediatrics: 5 mg IV/IO
 - iii. For pediatric patients that remain in a shockable rhythm after two 5 mg/kg doses of amiodarone, a third 5 mg/kg dose may be administered after the next defibrillation for a total dose of 15 mg/kg (max total dose 450 mg).



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS
Section: Cardiovascular
Approved: EMS Medical Directors Consortium
Effective: December 1, 2022

7. Place an Advanced Airway.

- a. Place a supraglottic airway (I-gel). Supraglottic airways are the preferred advanced airway in cardiac arrest.
- b. For Infants and children, bag mask ventilation is an acceptable alternative to the supraglottic airway.
- c. Endotracheal intubation may be performed as a backup airway if unable to ventilate/oxygenate with the supraglottic airway or bag mask ventilation.
- d. Do not interrupt chest compressions during the placement of an advanced airway.
- e. Deliver ventilations with an advanced airway at correct rate avoiding hyperventilation.
 - i. Adults: 10 breaths per minute (1 breath every 6 seconds)
 - ii. Children: 12 breaths per minute (1 breath every 5 seconds)
 - iii. Infants: 20 breaths per minute (1 breath every 3 seconds)

8. Apply End Tidal CO₂ and monitor waveform and numerical value to assess:

- a. Correct advanced airway position
 - i. Presence of normal capnography waveform.
 - ii. Corresponding ETCO₂ numerical value.
- b. Quality of CPR
 - i. Goal ETCO₂ greater than 10 mmHg. A lower value indicates poor quality CPR.
 - ii. Ideally high-quality chest compression should have a value above 20 mmHg.
- c. Return of Spontaneous Circulation (ROSC)
 - i. A sudden increase in ETCO₂ to near normal values (35-45 mmHg) may indicate ROSC.
 - ii. An increase of 10 mmHg above baseline value may also indicate ROSC.

9. Contact online medical control from the scene (BEFORE MOVING THE PATIENT) to discuss the following options:

- a. **Transport** of adult patients **with ROSC** to the closest STEMI center (see Adult and Pediatric Post-ROSC Care Protocol - ALS). Pediatric patients with ROSC should be transported to the closest EDAP hospital. Our goal is to transport only after ROSC is achieved. Transport of patients without ROSC should only be undertaken after consultation with online medical control.
- b. **Continue field resuscitation** for a defined period/task achievement and re-contact medical control.
- c. **Transport patient with ongoing resuscitation** to the closest STEMI center. This may be appropriate for patients with prolonged field resuscitation with refractory shockable rhythms. Transport should only be undertaken after consultation with online medical control.
- d. **Termination of resuscitative efforts** (see Termination of Resuscitation Policy).
 - i. Field termination of resuscitation does not apply to pediatric patients.
- e. For **pregnant patients** greater than 20 weeks gestation or with a visibly gravid abdomen:
 - i. Complete the following resuscitation tasks on scene: High quality CPR, defibrillation when indicated, IV or IO access with ACLS drug administration and advanced airway placement with ETCO₂ monitoring.
 - ii. Contact online medical control after code tasks are completed to plan for expedited hospital transport with ongoing resuscitation.
 - iii. These patients should be rapidly transported to the closest STEMI center that is also a Level III Perinatal hospital.



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS
Section: Cardiovascular
Approved: EMS Medical Directors Consortium
Effective: December 1, 2022

10. Cardiac Arrest Patient Transport

- a. ADULT: If decision is made to transport the destination MUST BE A STEMI CENTER.
- b. PEDIATRIC: must be transported to the closest EDAP hospital.
- c. OBSTETRIC PATIENT: greater than 20 weeks gestation should be rapidly transported to a Level III Perinatal center
- d. VAD (ventricular assist device) patients must be transported to a VAD CENTER

11. Mandatory Documentation

- a. “Cardiac Arrest” should be listed for paramedic impression for all non-traumatic cardiac arrest victims.
- b. All information from the beginning of EMS care through the end of the event must be documented in an electronic patient care report (ePCR), including all procedures performed and medications administered. Note: Procedures performed and medications administered must be documented in the appropriate section of the PCR and not only the narrative section. For EMS provider agencies where multiple transport and non-transport apparatus are on scene, providers on each responding apparatus must document all care they performed.
- c. All mandatory cardiac arrest questions in the ePCR must be completed before the record is closed.
- d. End-Tidal CO2 number and waveform should be documented in the patient care record.
- e. For all Chicago Fire Department cardiac arrest cases the full event should be uploaded to CodeSTAT and attached to the PCR.
 - i. Press transmit button
 - ii. Select REPORT = ALL (Do not select code summary, trend summary vital signs or 12 lead)
 - iii. Select SITE = CODESTAT

IV. NOTES/EDUCATIONAL PEARLS

ICCA ROLES AND RESPONSIBILITIES

Cardiac arrest is a shared ALS and BLS response. Successful resuscitation requires a coordinated effort. Upon arrival, resuscitation roles should be clearly delegated by the highest-ranking EMS provider on scene, so that primary **code tasks** are carried out quickly and efficiently.

1. Code Commander

- Highest ranking EMS provider on scene
- Oversees all operations
- Responsible for timing of CPR cycles and defibrillation
- Requests additional manpower/resources
- Completes and/or delegates **code tasks**
- Communicates with OLMC

2. Compressor-1

- Performs high quality uninterrupted chest compressions
- Assume compressor 2’s role when relieved



**REGION 11
CHICAGO EMS SYSTEM
PROTOCOL**

Title: Cardiac Arrest Management / ICCA – BLS/ALS

Section: Cardiovascular

Approved: EMS Medical Directors Consortium

Effective: December 1, 2022

3. Compressor-2

- Monitors the effectiveness of compressor 1's compressions (monitors ETCO2 for compression quality feedback)
- Assists with seal during bag valve mask ventilation
- Relieves compressor 1 after 2 minutes or when compression quality decreases

4. Procedures (may include code commander and other paramedic level providers on scene)

- Apply cardiac monitor/analyze rhythm
- Defibrillate
- Obtain IV/IO access
- Administer medications as per Ventricular Fibrillation / Pulseless Ventricular Tachycardia Protocol - ALS and Pulseless Electrical Activity / Asystole Protocol - ALS.
- Basic and advanced airway management
- Apply and monitor End Tidal CO2

5. Logistics

- Oversee distribution of equipment
- Set up IV/IO equipment
- Assemble medications/assist with drug delivery
- Prepares for transport
- Relief for other tasks

6. Liaison/Safety

- Control the scene and provide for the safety of the resuscitation team
- Data collection/documentation: Patient demographics, medications, medical history, events
- Communicates and assists with family/bystanders