

احياء قلبی و ریوی مغزی

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Reference: American Heart Association (AHA)

Importance of the Topic:

- Cardiac arrest is a leading cause of sudden death in hospitalized and out-of-hospital settings.
- Rapid identification and initial response can significantly improve survival rates.

Learning Objectives:

- Understand the causes and risk factors for cardiac arrest and sudden death.
- Master the principles of Basic and Advanced Life Support (BLS and ACLS).
- Recognize the post-resuscitation management and long-term care processes.

Etiology of Cardiac Arrest and Sudden Death

Common Causes of Cardiac Arrest:

cardiac:

- Myocardial ischemia (e.g., STEMI, NSTEMI).
- Life-threatening arrhythmias (VT, VF, Asystole).
- Cardiomyopathy
- Severe left Ventricular dysfunction

Non-cardiac:

- Pulmonary embolism.
- Hypovolemic or Hemorrhagic shock.
- Hypoxia and electrolyte imbalances (hypokalemia, hyperkalemia).

Risk Factors:

- History of heart disease.
- Diabetes, hypertension, smoking.

TABLE 11-1 Known Factors Contributing to the Likelihood of Sudden Cardiac Death

Cardiovascular pathology

- Coronary artery disease
- Severe left ventricular dysfunction
- Cardiomyopathy
 - Hypertrophic cardiomyopathy
 - Arrhythmogenic right ventricular cardiomyopathy
- Congenital heart disease, especially coronary artery anomalies
- Valvular heart disease
- Cardiac pacemaker and conducting system disease

Hereditary channelopathies

- Brugada syndrome
- Early repolarization syndrome (ERS)
- Long QT syndrome (LQTS)
- Short QT syndrome (SQTS)
- Catecholaminergic polymorphic ventricular tachycardia (CPVT)

Risk factors and triggers

- Long-term risk factor management
 - Hypertension
 - Hyperlipidemia
 - Smoking
 - Diabetes mellitus
 - Socioeconomic status
- Unstable atherosclerotic plaque
 - Psychological stress
 - Physical activity

Clinical Features of Cardiac Arrest and Sudden Death

Warning Signs:

- Chest pain or Chest discomfort
- Severe shortness of breath.
- Sudden weakness or syncope.
- Lost of Consciousness.
- Sudden Collapse.
- Palpitation

Examination Findings:

- Absence of a palpable pulse.
- Unresponsiveness to stimuli.
- Apnea or gasping respirations.

Management Approach for Cardiac Arrest and Sudden Death

01
Rapid Identification
Check for responsiveness, breathing, and pulse within 10 seconds.

02
Initiation of CPR
High-quality chest compressions.

03
Use of AED:
Apply shock immediately if available.



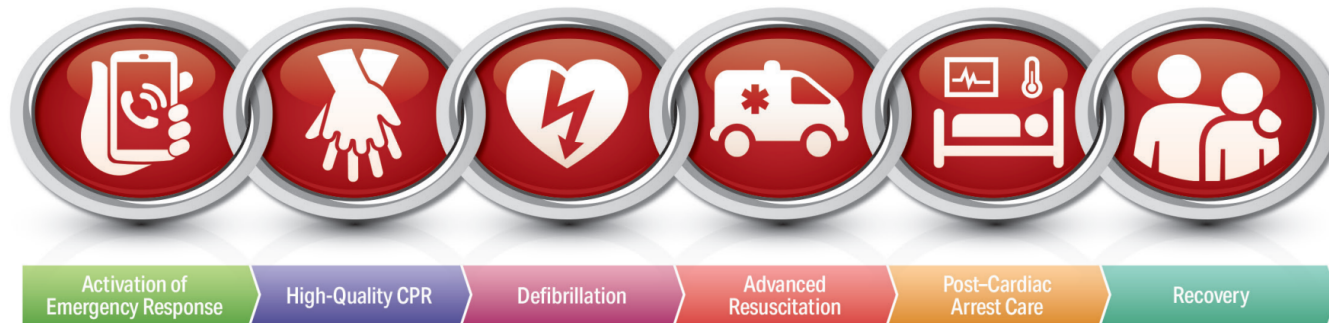
TABLE 22-1 American Heart Association Chain of Survival¹⁻⁴

Links in Chain	Comment
Recognition and activation of the emergency response system (EMS)	Early recognition of the emergency and activation of the EMS or local emergency response system are vital. Phone the local emergency medical telephone number.*
Immediate high-quality CPR	Immediate bystander CPR can double or triple the victim's chance of survival.
Rapid defibrillation	CPR plus defibrillation within 3 to 5 min of collapse can produce improved survival rates.
Basic and advanced emergency medical services	High-quality resuscitative care is provided by EMS personnel.
Advanced life support and postarrest care	High-quality, integrated post–cardiac arrest clinical care by healthcare providers.

IHCA



OHCA



Initial Response and BLS Principles

BLS (Basic Life Support)

C-A-B:

- **Circulation:** Perform chest compressions at a depth of at least 2 inches (5 cm).
- **Airway:** Open the airway.
- **Breathing:** Deliver two effective breaths after every 30 compressions.
-  Consider Naloxone
- Compression-only CPR is also acceptable.

CPR Quality:

- Compression rate: 100–120 per minute.
- Minimize interruptions during compressions.
- Apply 30 Compressions and 2 breathing
- Compression depth should be 2 to 2.5 in. (5 to 6 cm).

BLS

01

Consider your
Safty

02

Check
Vicitim's
Resposiveness

03

Shout for
Help

04

Activate EMS

05

Check
Vicitim's
Pulse

06

Start CPR

07

Use AED when

available



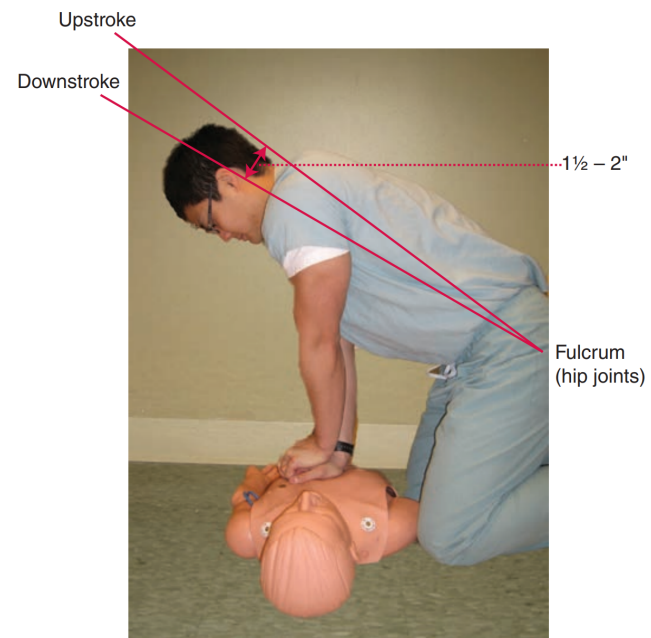
TABLE 22-2 Systematic Approach to CPR	
CPR Steps	Comments
Step 1: Recognition	Assess for responsiveness, lack of breathing, or presence of abnormal breathing/gasping.
Step 2: Activate the emergency medical response system and get an automatic external defibrillator (AED)	If possible, call for an assistant to activate EMS and obtain an AED. It is recommended that dispatchers help determine if there is presence of a cardiac arrest and help initiate dispatcher-guided CPR if indicated.
Step 3: Assess circulation (healthcare provider only)	If no pulse after 10-second maximum check, go to step 4. (Pulse checks are for healthcare providers only.)
Step 4: Begin cycle of 30 closed chest compressions	Compressions: "Push hard and fast." 100–120 compressions/min. Compress 2–2.5 in. (5–6 cm). Allow for complete chest recoil, <10-second compression interruption. Ratio of 30 compressions to 2 breaths. Alternate compressors every 2 minutes or when the compressor becomes fatigued if an assistant is available.
Step 5: Use the defibrillator when available and indicated	A defibrillator should be used as soon as available. It is recommended that while the AED is being retrieved and applied CPR is initiated and continued until the device is ready for use.
Step 6: Continue high-quality CPR	Continue CPR between rhythm checks, while the defibrillator is being applied and immediately restart compressions after defibrillation. This is to maximize compression times and decrease interruptions.
Step 7: Rescue breathing	Rescue breaths are to be initiated only by a trained lay rescuer that is able to perform rescue breaths or by a healthcare provider. Untrained lay rescuers and trained lay rescuers unable to provide rescue breaths should perform compression-only CPR. Administer 2 breaths following a cycle of 30 chest compressions. Deliver each breath over 1 second with sufficient tidal volume to see a visible chest rise. Continue cycles of 30 closed chest compressions and 2 breaths, minimizing interruptions.

TABLE 22-3 Techniques of Closed Chest Compression

Closed chest compressions	Depth: 2–2.5 in. (5–6 cm). Rate: 100–120/min. Allow complete recoil of the chest between compressions, with approximately equal compression and relaxation times. Minimize interruptions.
Ventilations	Single rescuer or 2 rescuers, nonintubated patient: give 2 breaths after every 30 compressions. Two rescuers, intubated patient: give breaths at a rate of 8–10 breaths/min. Do not pause chest compressions during ventilations.

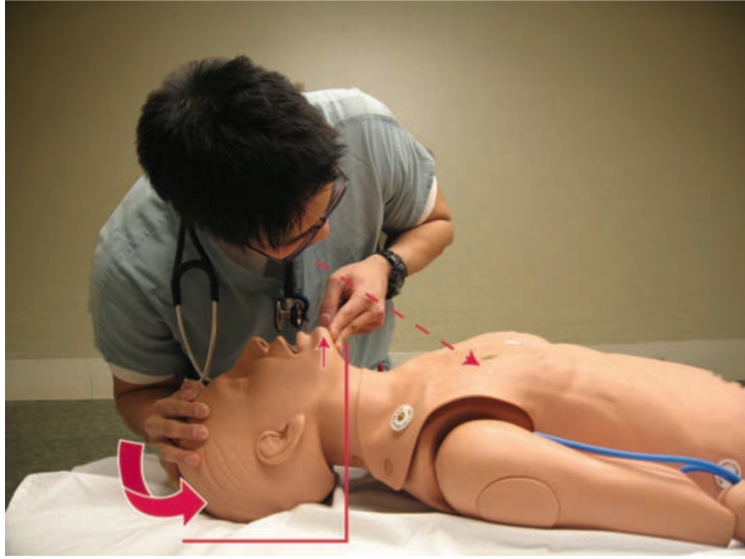


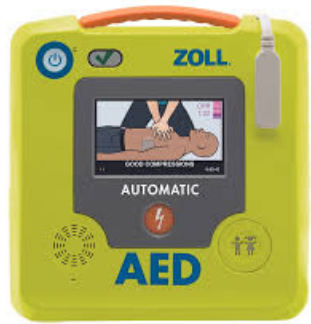
A



B



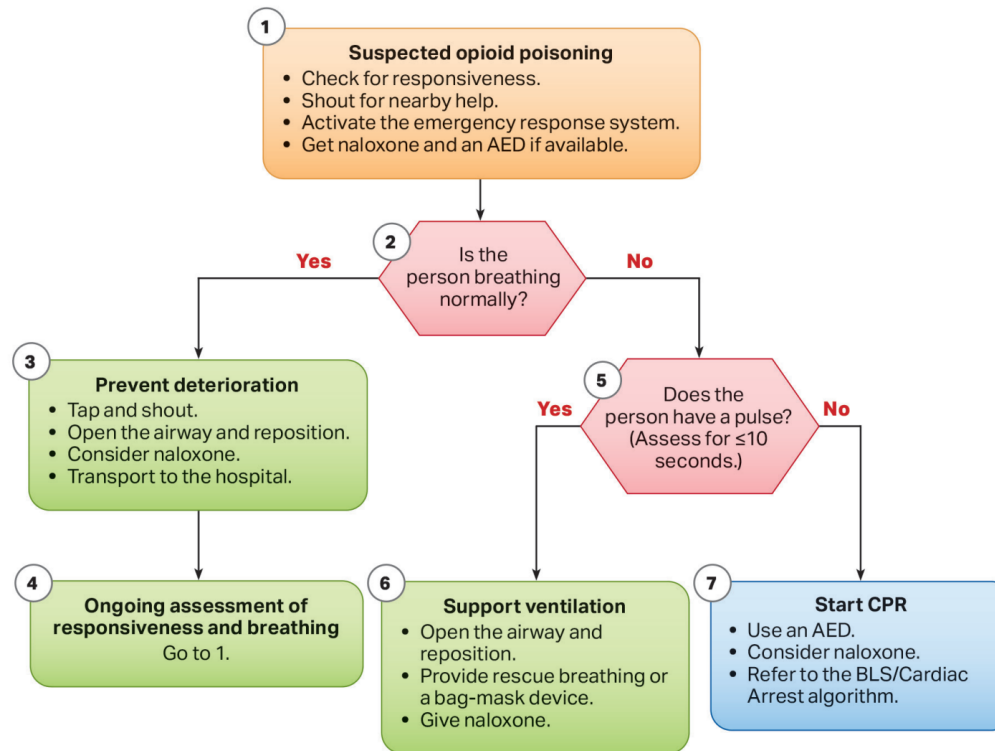




Automated external defibrillators (AED)



Figure 6. Opioid-Associated Emergency for Healthcare Providers Algorithm.



OBSTRUCTED AIRWAY (HEIMLICH) MANEUVER

The Heimlich maneuver is a first-aid technique used to clear the airway of a person choking on a foreign object. By delivering upward abdominal thrusts, it generates pressure to expel the obstruction. This life-saving method is essential in emergencies and is commonly taught in basic life support training.





ACLS (Advanced Cardiac Life Support)

Principles

Key Medications in

ACLS:

- Epinephrine: Every 3–5 minutes in VF/VT without a pulse.
- Amiodarone: 300 mg as the initial dose. Or :
- Lidocaine : 1-1.5 mg/Kg as the initial dose

ACLS Algorithms:

- Defibrillation for VF/VT.
- Arrhythmia assessment using ECG Monitoring.
- Advanced airway management (intubation).

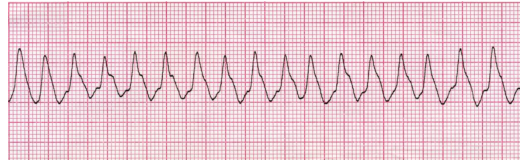
Shockable Rhythms

VF



VF

VT



VT

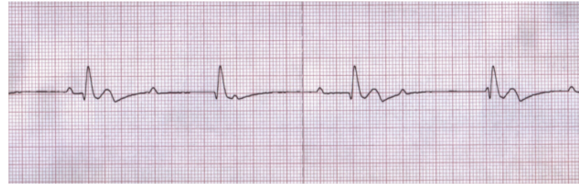
Non-Shockable Rhythms

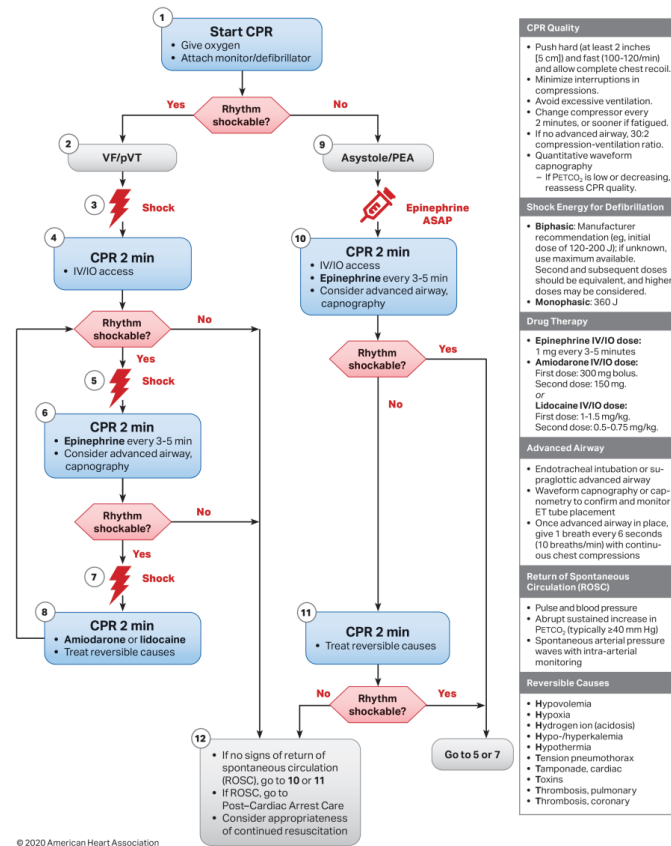
Asystole



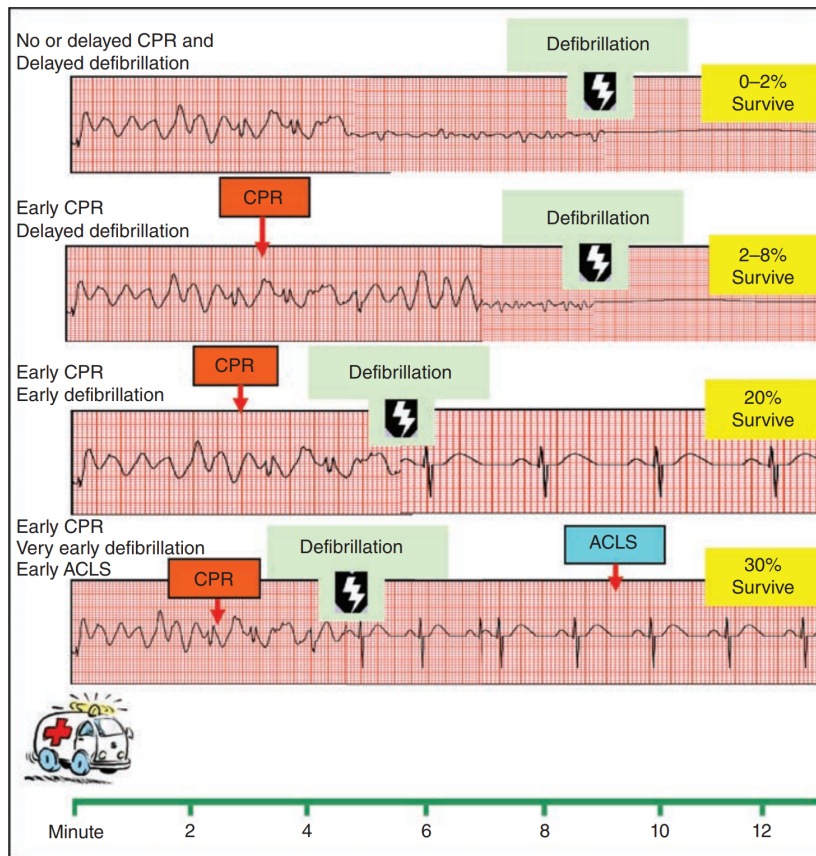
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PEA





CPR Quality
- Push hard (at least 2 inches [5 cm] and fast (100-120/min) and allow complete chest recoil. - Minimize interruptions in compressions. - Avoid excessive ventilation. - Change compressor every 2 minutes, or sooner if fatigued. - If no advanced airway, 30:2 compression-ventilation ratio. - Quantitative waveform capnography - If PETCO₂ is low or decreasing, reassess CPR quality.
Shock Energy for Defibrillation
Biphasic: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered. Monophasic: 360 J
Drug Therapy
Epinephrine IV/IO dose: 1 mg every 3-5 minutes Amiodarone IV/IO dose: First dose: 300 mg bolus. Second dose: 150 mg. - or Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.
Advanced Airway
- Endotracheal intubation or supraglottic advanced airway - Waveform capnography or capnometry to confirm and monitor ET tube placement - Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions
Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure - Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg) - Spontaneous arterial pressure waves with intra-arterial monitoring
Reversible Causes
- Hypovolemia - Hypoxia - Hydrogen ion (acidosis) - Hypo-/hyperkalemia - Hypothermia - Tension pneumothorax - Tamponade, cardiac - Toxins - Thrombosis, pulmonary - Thrombosis, coronary



Cause of Cardiac Arrest

5H's

- Hypovolemia
- Hypoxia
- Hydrogen ion (Acidosis)
- Hypokalemia/Hyperkalemia
- Hypothermia
- + Hypoglycemia

5T's

- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

New AHA Updates

01

Epinephrine

Initiate epinephrine as soon as possible in non-shockable Rhythms

02

Vasopressin

Removal of vasopressin from the algorithm

03

Airway management management

Airway management is not included in the current algorithm compared to the previous one.

04

Lidocaine

Lidocaine can also be used as an alternative to amiodarone.

05

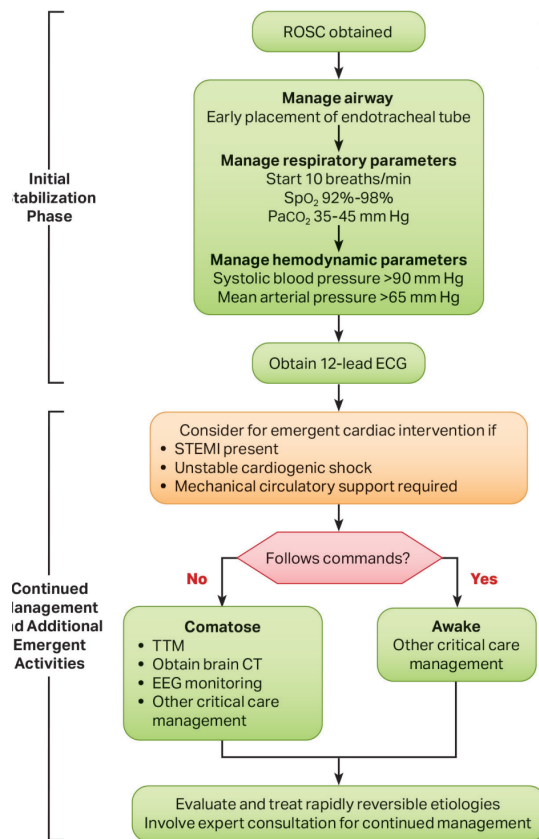
Double sequential defibrillation

Refractory VF (Fibrillation)

Post-Resuscitation Care (ROSC)

Management of ROSC (Return of Spontaneous Circulation)

- Stabilizing the patient's hemodynamics.
- A 12-lead ECG should be obtained immediately after ROSC.
- Targeted temperature management to prevent brain injury in Comatose Patients.
- Identifying the underlying cause of cardiac arrest (e.g., coronary angiography).
- Oxygenation and Ventilation
- Treat Seizures
- Consider Sedation



Initial Stabilization Phase

Resuscitation is ongoing during the post-ROSC phase, and many of these activities can occur concurrently. However, if prioritization is necessary, follow these steps:

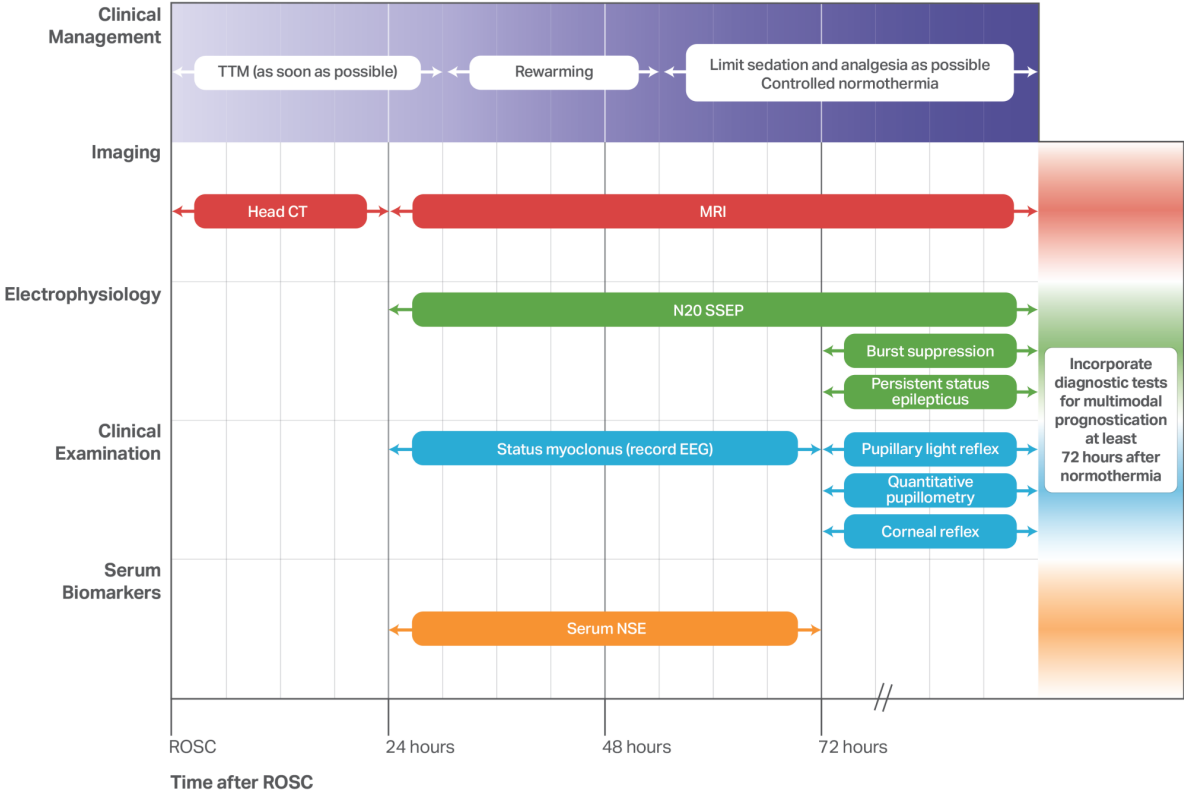
- **Airway management:** Waveform capnography or capnometry to confirm and monitor endotracheal tube placement
- **Manage respiratory parameters:** Titrate FIO₂ for SpO₂ 92%-98%; start at 10 breaths/min; titrate to PaCO₂ of 35-45 mm Hg
- **Manage hemodynamic parameters:** Administer crystalloid and/or vasopressor or inotrope for goal systolic blood pressure >90 mm Hg or mean arterial pressure >65 mm Hg

Continued Management and Additional Emergent Activities

These evaluations should be done concurrently so that decisions on targeted temperature management (TTM) receive high priority as cardiac interventions.

- **Emergent cardiac intervention:** Early evaluation of 12-lead electrocardiogram (ECG); consider hemodynamics for decision on cardiac intervention
- **TTM:** If patient is not following commands, start TTM as soon as possible; begin at 32-36°C for 24 hours by using a cooling device with feedback loop
- **Other critical care management**
 - Continuously monitor core temperature (esophageal, rectal, bladder)
 - Maintain normoxia, normocapnia, euglycemia
 - Provide continuous or intermittent electroencephalogram (EEG) monitoring
 - Provide lung-protective ventilation

Figure 8. Recommended approach to multimodal neuroprognostication in adult patients after cardiac arrest.



POST-RESUSCITATION CARE

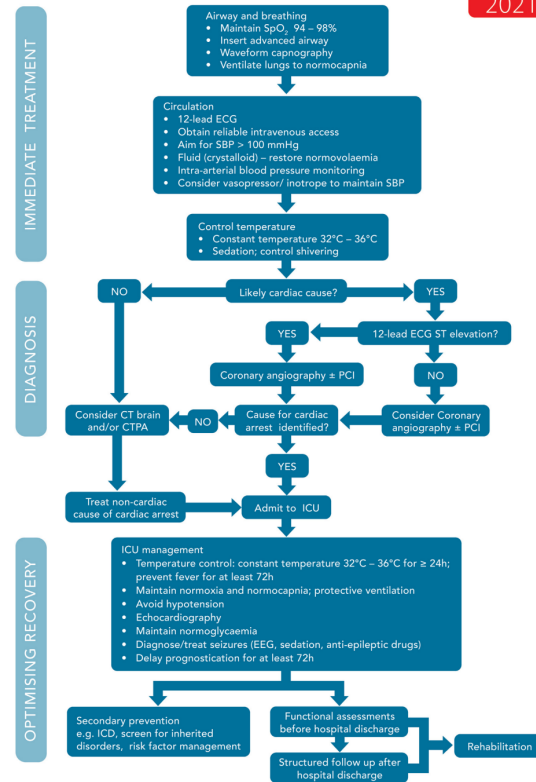


Fig. 11 – Post resuscitation care algorithm.

Continuing Care and Long-Term Management

Post-Resuscitation Care

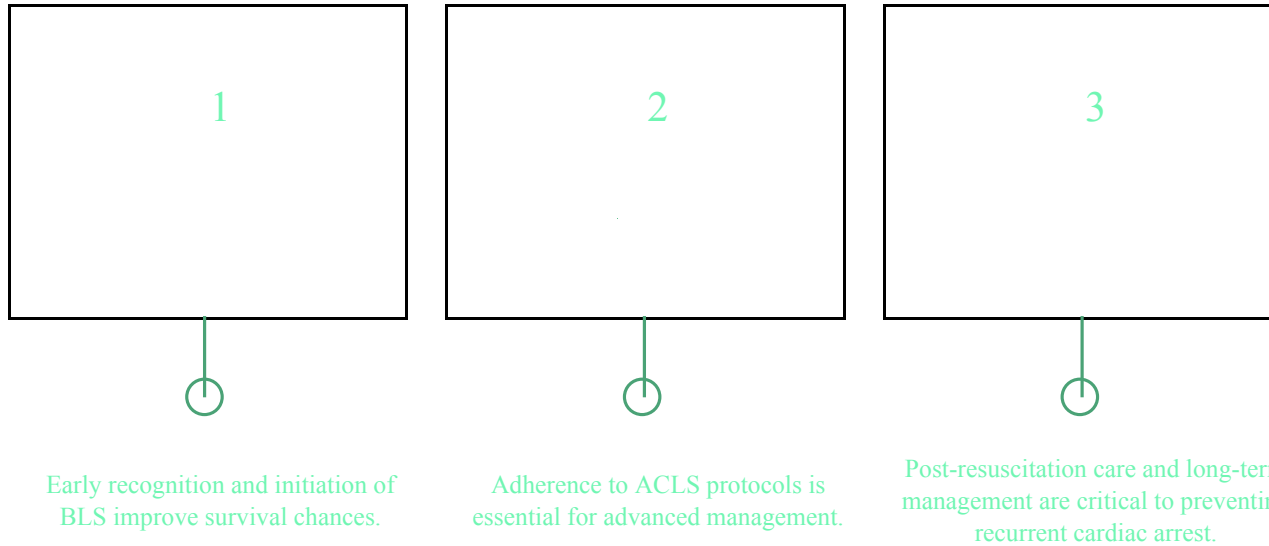
Neurological assessment for brain injury.

Cardiac rehabilitation and promotion of physical activity.

Prevention of recurrence:

- ICD (Implantable Cardioverter-Defibrillator): For patients at high risk of recurrent arrhythmias.
- Medical therapy (beta-blockers, ACE inhibitors).

Summary and Key Takeaways



Scientific Reference

01 AHA 2020 Guidelines for CPR and ECC
Highlights of 2020 AHA guidelines For CPR & ECC

02 Tintinalli's Emergency Medicine

03 European Resuscitation Council Guidelines

Thanks

Do you have any
questions?

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