Figure 7. The expanded systematic approach.

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Adult Cardiac Arrest Learning Station Checklist (VF/pVT)

Adult Cardiac Arrest Algorithm (VF/pVT)

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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 $PETCO_2$ 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 $PETCO_2$ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

Adult Cardiac Arrest Learning Station Checklist (Asystole/PEA)

Adult Cardiac Arrest Algorithm (Asystole/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.
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- Quantitative waveform capnography
  - If $PETCO_2$ is low or decreasing, reassess CPR quality.

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- **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.
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Adult Bradycardia Learning Station Checklist

Adult Bradycardia Algorithm

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Adult Tachycardia With a Pulse Learning Station Checklist

Adult Tachycardia With a Pulse Algorithm

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Novant Health – Cardioversion

The AHA 2020 ACLS cardioversion guidelines to follow manufacturer recommended energy level for first cardioversion shock. Novant Health recommendation is based on safest and most effective treatment and is listed below. HVI recommendations follow what is listed in Lippincott. Novant Health classes include in ACLS courses.

- Narrow regular: 50–100 J
- Narrow irregular: 120–200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: Defibrillation
- dose (not synchronized)

The 2020 AHA ACLS tachycardia algorithm now states follow manufacturer recommended energy level to maximize first shock as far as cardioversion. Both the M and R series operator's guides do not list specific joules.

The NH Code Blue policy states to follow AHA ACLS guidelines. The following is the information Lippincott procedures:

- Set the energy level to the prescribed dose. ACLS protocols call for an initial shock of:
    - 50 to 100 joules for a patient with unstable supraventricular tachycardia
    - 120 to 200 joules for a patient with atrial fibrillation
    - 50 to 100 joules for a patient with atrial flutter
    - 100 joules for a patient with monomorphic ventricular tachycardia with a pulse

Adult Post–Cardiac Arrest Care Learning Station Checklist

Adult Post–Cardiac Arrest Care Algorithm

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 FIO_2 for SpO_2 92%-98%; start at 10 breaths/min; titrate to $PaCO_2$ 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

H's and T's

Hypovolemia
Hypoxia
Hydrogen ion (acidosis)
Hypokalemia/**h**yperkalemia
Hypothermia
Tension pneumothorax
Tamponade, cardiac
Toxins
Thrombosis, pulmonary
Thrombosis, coronary

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Adult Cardiac Arrest Learning Station Checklist (VF/pVT/Asystole/PEA)

Adult Cardiac Arrest Algorithm (VF/pVT/Asystole/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.
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- **T**ension pneumothorax
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- **T**hrombosis, coronary

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Figure 21. Adult Suspected Stroke Algorithm.

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Acute Coronary Syndromes Algorithm

Symptoms suggestive of ischemia or infarction

↓

EMS assessment and care and hospital preparation

- Assess ABCs. Be prepared to provide CPR and defibrillation
- Administer aspirin and consider oxygen, nitroglycerin, and morphine if needed
- Obtain 12-lead ECG; if ST elevation:
  - Notify receiving hospital with transmission or interpretation; note time of onset and first medical contact
- Provide prehospital notification; on arrival, transport to ED/cath lab per protocol
- Notified hospital should mobilize resources to respond to STEMI
- If considering prehospital fibrinolysis, use fibrinolytic checklist

↓

Concurrent ED/cath lab assessment (<10 minutes)

- Activate STEMI team upon EMS notification
- Assess ABCs; give oxygen if needed
- Establish IV access
- Perform brief, targeted history, physical exam
- Review/complete fibrinolytic checklist; check contraindications
- Obtain initial cardiac marker levels, complete blood counts, and coagulation studies
- Obtain portable chest x-ray (<30 minutes); do not delay transport to the cath lab

Immediate ED/cath lab general treatment

- If O_2 sat <90%, start **oxygen** at 4 L/min, titrate
- **Aspirin** 162 to 325 mg (if not given by EMS)
- **Nitroglycerin** sublingual or translingual
- **Morphine** IV if discomfort not relieved by nitroglycerin
- Consider administration of **$P2Y_{12}$ inhibitors**

↓

ECG interpretation

ST elevation or new or presumably new LBBB; strongly suspicious for injury
ST-elevation MI (STEMI)

- **Start adjunctive therapies** as indicated
- **Do not delay reperfusion**

↓

Time from onset of symptoms ≤12 hours?

>12 hours → **Troponin elevated or high-risk patient**
Consider early invasive strategy if:

- Refractory ischemic chest discomfort
- Recurrent/persistent ST deviation
- Ventricular tachycardia
- Hemodynamic instability
- Signs of heart failure

Start adjunctive therapies (eg, nitroglycerin, heparin) as indicated

See AHA/ACC NSTE-ACS Guidelines

≤12 hours ↓

Reperfusion goals:
Therapy defined by patient and center criteria

- **FMC–to–balloon inflation (PCI) goal of ≤90 minutes**
- **Door-to-needle (fibrinolysis) goal of 30 minutes**

Non–ST-elevation ACS (NSTE-ACS)
Determine risk using validated score (ie, TIMI or GRACE)

ST depression or dynamic T-wave inversion, transient ST elevation; strongly suspicious for ischemia and/or high-risk score
High-risk NSTE-ACS

↓

Troponin elevated or high-risk patient
Consider early invasive strategy if:

- Refractory ischemic chest discomfort
- Recurrent/persistent ST deviation
- Ventricular tachycardia
- Hemodynamic instability
- Signs of heart failure

Start adjunctive therapies (eg, nitroglycerin, heparin) as indicated

See AHA/ACC NSTE-ACS Guidelines

Normal ECG or nondiagnostic changes in ST segment or T wave; low-risk score
Low-/intermediate-risk NSTE-ACS

↓

Consider admission to ED chest pain unit or to appropriate bed for further monitoring and possible intervention

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2020 ACLS Pharmacology Summary Table

This table provides information about common drugs used in ACLS.

Drug	Indications	Precautions and contraindications	Adult dosage
Adenosine	• First drug for most forms of stable narrow-complex SVT; effective in terminating those due to reentry involving AV node or sinus node • May consider for unstable narrow-complex reentry tachycardia while preparations are made for cardioversion • Regular and monomorphic wide-complex tachycardia, thought to be or previously defined to be reentry SVT • Does not convert atrial fibrillation, atrial flutter, or VT • Diagnostic maneuver: stable narrow-complex SVT	• Contraindicated in poison/drug-induced tachycardia or second- or third-degree heart block • Transient side effects include flushing, chest pain or tightness, brief periods of asystole or bradycardia, ventricular ectopy • Less effective (larger doses may be required) in patients taking theophylline or caffeine • Reduce initial dose to 3 mg in patients receiving dipyridamole or carbamazepine, in heart transplant patients, or if given by central venous access • If administered for irregular, polymorphic wide-complex tachycardia/VT, may cause deterioration (including hypotension) • Transient periods of sinus bradycardia and ventricular ectopy are common after termination of SVT • Safe and effective in pregnancy	**IV Rapid Push** • Place patient in mild reverse Trendelenburg position before administration of drug • Initial bolus of 6 mg given rapidly over 1 to 3 seconds followed by NS bolus of 20 mL; then elevate the extremity • A second dose (12 mg) can be given in 1 to 2 minutes if needed **Injection Technique** • Record rhythm strip during administration • Draw up adenosine dose in one syringe and flush in another; attach both syringes to the same or immediately adjacent IV injection ports nearest patient, with adenosine closest to patient; clamp IV tubing above injection port • Push IV adenosine as quickly as possible (1 to 3 seconds) • While maintaining pressure on adenosine plunger, push NS flush as rapidly as possible after adenosine • Unclamp IV tubing
Amiodarone	Because its use is associated with toxicity, amiodarone is indicated for use in patients with life-threatening arrhythmias when administered with appropriate monitoring: • VF/pVT unresponsive to shock delivery, CPR, and a vasopressor • Recurrent, hemodynamically unstable VT With expert consultation, amiodarone may be used for treatment of some atrial and ventricular arrhythmias. ***Caution*: Multiple complex drug interactions**	• Rapid infusion may lead to hypotension • With multiple dosing, cumulative doses >2.2 g over 24 hours are associated with significant hypotension in clinical trials • Do not administer with other drugs that prolong QT interval (eg, procainamide) • Terminal elimination is extremely long (half-life lasts up to 40 days)	**VF/pVT Cardiac Arrest Unresponsive to CPR, Shock, and Vasopressor** • First dose: 300 mg IV/IO push • Second dose (if needed): 150 mg IV/IO push **Life-Threatening Arrhythmias** **Maximum cumulative dose:** 2.2 g IV over 24 hours. May be administered as follows: • **Rapid infusion:** 150 mg IV over first 10 minutes (15 mg/min). May repeat rapid infusion (150 mg IV) every 10 minutes as needed • **Slow infusion:** 360 mg IV over 6 hours (1 mg/min) • **Maintenance infusion:** 540 mg IV over 18 hours (0.5 mg/min)

(continued)

Drug	Indications	Precautions and contraindications	Adult dosage
Atropine sulfate Can be given via endotracheal tube	• First drug for symptomatic sinus bradycardia • May be beneficial in presence of AV nodal block; **not likely to be effective for type II second-degree or third-degree AV block or a block in non-nodal tissue** • Routine use during PEA or asystole is unlikely to have a therapeutic benefit • Organophosphate (eg, nerve agent) poisoning: extremely large doses may be needed	• Use with caution in presence of myocardial ischemia and hypoxia. Increases myocardial oxygen demand • Unlikely to be effective for hypothermic bradycardia • May not be effective for infranodal (type II) AV block and new third-degree block with wide QRS complexes (in these patients may cause paradoxical slowing; be prepared to pace or give catecholamines)	**Bradycardia (With or Without ACS)** • 1 mg IV every 3 to 5 minutes as needed, not to exceed total dose of 0.04 mg/kg (total 3 mg) **Organophosphate Poisoning** Extremely large doses (2 to 4 mg or higher) may be needed
Dopamine IV infusion	• Second-line drug for symptomatic bradycardia (after atropine) • Use for hypotension (systolic blood pressure ≤70-100 mm Hg) with signs and symptoms of shock	• Correct hypovolemia with volume replacement before initiating dopamine • Use with caution in cardiogenic shock with accompanying CHF • May cause tachyarrhythmias, excessive vasoconstriction • Do not mix with sodium bicarbonate	**IV Administration** Usual infusion rate is 5-20 mcg/kg per minute. Titrate to patient response; taper slowly
Epinephrine Can be given via endotracheal tube Available in 1:10 000 and 1:1000 concentrations	• **Cardiac arrest:** VF, pulseless VT, asystole, PEA • **Symptomatic bradycardia:** Can be considered after atropine as an alternative infusion to dopamine • **Severe hypotension:** Can be used when pacing and atropine fail, when hypotension accompanies bradycardia, or with phosphodiesterase enzyme inhibitor • **Anaphylaxis, severe allergic reactions:** Combine with large fluid volume, corticosteroids, antihistamines	• Raising blood pressure and increasing heart rate may cause myocardial ischemia, angina, and increased myocardial oxygen demand • High doses do not improve survival or neurologic outcome and may contribute to postresuscitation myocardial dysfunction • Higher doses *may* be required to treat poison/drug-induced shock	**Cardiac Arrest** • **IV/IO dose:** 1 mg (10 mL of 0.1 mg/mL solution) administered every 3-5 minutes during resuscitation; follow each dose with 20 mL flush, elevate arm for 10-20 seconds after dose • **Higher dose:** Higher doses (up to 0.2 mg/kg) may be used for specific indications (β-blocker or calcium channel blocker overdose) • **Continuous infusion:** Initial rate: 0.1-0.5 mcg/kg per minute (for 70-kg patient: 7-35 mcg/min); titrate to response • **Endotracheal route:** 2-2.5 mg diluted in 10 mL NS **Profound Bradycardia or Hypotension** 2-10 mcg/min infusion; titrate to patient response

(continued)

Drug	Indications	Precautions and contraindications	Adult dosage
Lidocaine Can be given via endotracheal tube	• Alternative to amiodarone in cardiac arrest from VF/pVT • Stable monomorphic VT with preserved ventricular function • Stable polymorphic VT with normal baseline QT interval and preserved LV function when ischemia is treated and electrolyte balance is corrected • Can be used for stable polymorphic VT with baseline QT-interval prolongation if torsades suspected	• Contraindication: Prophylactic use in AMI is contraindicated • Reduce maintenance dose (not loading dose) in presence of impaired liver function or LV dysfunction • Discontinue infusion immediately if signs of toxicity develop	**Cardiac Arrest From VF/pVT** • Initial dose: 1-1.5 mg/kg IV/IO • For refractory VF, may give additional 0.5-0.75 mg/kg IV push and repeat in 5-10 minutes; maximum 3 doses or total of 3 mg/kg **Perfusing Arrhythmia** For stable VT, wide-complex tachycardia of uncertain type, significant ectopy: • Doses ranging from 0.5-0.75 mg/kg and up to 1-1.5 mg/kg may be used • Repeat 0.5-0.75 mg/kg every 5-10 minutes; maximum total dose: 3 mg/kg **Maintenance Infusion** 1-4 mg/min (30-50 mcg/kg per minute)
Magnesium sulfate	• Recommended for use in cardiac arrest only if torsades de pointes or suspected hypomagnesemia is present • Life-threatening ventricular arrhythmias due to digitalis toxicity • Routine administration in hospitalized patients with AMI is not recommended	• Occasional fall in blood pressure with rapid administration • Use with caution if renal failure is present	**Cardiac Arrest (Due to Hypomagnesemia or Torsades de Pointes)** 1-2 g (2-4 mL of a 50% solution diluted in 10 mL [eg, D_5W, normal saline] given IV/IO) **Torsades de Pointes With a Pulse or AMI With Hypomagnesemia** • Loading dose of 1-2 g mixed in 50-100 mL of diluent (eg, D_5W, normal saline) over 5-60 minutes IV • Follow with 0.5-1 g per hour IV (titrate to control torsades)