COUNTY OF SAN DIEGO EMERGENCY MEDICAL SERVICES
POLICY / PROCEDURE / PROTOCOL

Number S-127
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SUBJECT: TREATMENT PROTOCOL
CPR / ARRHYTHMIAS

Date 07/01/2021

BLS

- Continuous compressions of 100-120/min with ventilation rate of 10-12/min
- Use metronome or other real-time audiovisual feedback device
- Rotate compressor at least every 2 min
- Use mechanical compression device (unless contraindicated)
- O_2 and/or ventilate with BVM
- Monitor O_2 saturation
- Apply AED during CPR and analyze as soon as ready

VAD
- Perform CPR
- Contact BH for additional instructions

TAH
- Contact BH for instructions

ALS

- Apply defibrillator pads during CPR. Defibrillate immediately for VF/pulseless VT.
- IV/IO SO
- Capnography SO with waveform and value
- ET/PAA SO without interrupting compressions
- NG/OG tube PRN SO
- Provide cardiac monitor data to agency QA/QI department

Team leader priorities
- Monitor CPR quality, rate, depth, full chest recoil, and capnography value and waveform
- Minimize interruption of compressions (<5 sec) during EKG rhythm checks
- Charge monitor prior to rhythm checks. Do not interrupt CPR while charging.

VAD/TAH
- See Adjunct Cardiac Devices section

Capnography
- For $EtCO_2$ > 0 mmHg, may place ET/PAA without interrupting compressions
- If $EtCO_2$ rises rapidly during CPR, pause CPR and check for pulse

Specific protocols (see below)
- Arrhythmias
  - Unstable bradycardia
  - Supraventricular tachycardia
  - Atrial fibrillation / flutter
  - Ventricular tachycardia
  - Ventricular fibrillation / pulseless VT
  - Pulseless electrical activity / asystole
- Return of Spontaneous Circulation
- Adjunct Cardiac Devices
- Termination of Resuscitation

UNSTABLE‡ BRADYCARDIA

- Obtain 12-lead EKG
- Atropine 1 mg IV/IO SO, MR q3-5 min to max 3 mg SO
- If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO

Rhythm unresponsive to atropine

- Midazolam 1-5 mg IV/IO PRN pre-pacing SO
- External cardiac pacing* SO
- If capture occurs and SBP ≥100 mmHg, treat per Pain Management Protocol (S-141)

If SBP <90 mmHg after atropine or initiation of pacing

- 250 mL fluid bolus IV/IO SO, MR x1 SO
- Push-dose epinephrine 1:100,000 (0.01 mg/mL) 1 mL IV/IO BHO. MR q3 min, titrate to SBP ≥90 mmHg BHO.

Push-dose epinephrine mixing instructions

1. Remove 1 mL normal saline (NS) from the 10 mL NS syringe
2. Add 1 mL of epinephrine 1:10,000 (0.1 mg/mL) to 9 mL NS syringe

The mixture now has 10 mL of epinephrine at 0.01 mg/mL (10 mcg/mL) concentration.

‡SBP <90 mmHg and exhibiting signs or symptoms of inadequate perfusion, e.g.,

- Altered mental status (decreased LOC, confusion, agitation)
- Pallor
- Diaphoresis
- Significant chest pain of suspected cardiac origin
- Severe dyspnea

*External cardiac pacing

- Begin at rate 60/min
- Dial up until capture occurs, usually between 50 and 100 mA
- Increase by a small amount, usually about 10%, for ongoing pacing

SUPRAVENTRICULAR TACHYCARDIA

- Obtain 12-lead EKG

Stable (symptomatic)
- If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO
- VSM SO
- Adenosine 6 mg rapid IV/IO followed by 20 mL NS rapid IV/IO SO
- Adenosine 12 mg rapid IV/IO followed by 20 mL NS rapid IV/IO SO, MR x1 SO

Unstable‡ (or refractory to treatment)
- Consider midazolam 1-5 mg IV/IO pre-cardioversion SO
- Synchronized cardioversion at manufacturer's recommended energy dose SO, MR x2 SO, MR BHO
- After successful cardioversion
  - Check BP. If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO.
  - Obtain 12-lead EKG

‡SBP <90 mmHg and exhibiting signs or symptoms of inadequate perfusion, e.g.,
- Altered mental status (decreased LOC, confusion, agitation)
- Pallor
- Diaphoresis
- Significant chest pain of suspected cardiac origin
- Severe dyspnea

ATRIAL FIBRILLATION / FLUTTER

- Obtain 12-lead EKG
- If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO

Rate ≥180 and unstable‡

- Consider midazolam 1-5 mg IV/IO pre-cardioversion SO
- Synchronized cardioversion at manufacturer's recommended energy dose SO, MR x2 SO, MR BHO
- After successful cardioversion
  - Check BP. If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO.
  - Obtain 12-lead EKG

‡SBP <90 mmHg and exhibiting signs or symptoms of inadequate perfusion, e.g.,

- Altered mental status (decreased LOC, confusion, agitation)
- Pallor
- Diaphoresis
- Significant chest pain of suspected cardiac origin
- Severe dyspnea

VENTRICULAR TACHYCARDIA

- Obtain 12-lead EKG

Stable

- If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO
- Amiodarone 150 mg in 100 mL of NS over 10 min IV/IO SO, MR x1 in 10 min SO
  OR
- Lidocaine 1.5 mg/kg IV/IO SO, MR at 0.5 mg/kg IV/IO q8-10 min to max 3 mg/kg SO

Unstable‡

- Consider midazolam 1-5 mg IV/IO pre-cardioversion SO
- Synchronized cardioversion at manufacturer's recommended energy dose SO, MR x2 SO, MR BHO
- After successful cardioversion
  - Check BP. If SBP <90 mmHg and rales not present, 250 mL fluid bolus IV/IO SO, MR SO.
  - Obtain 12-lead EKG

‡SBP <90 mmHg and exhibiting signs or symptoms of inadequate perfusion, e.g.,

- Altered mental status (decreased LOC, confusion, agitation)
- Pallor
- Diaphoresis
- Significant chest pain of suspected cardiac origin
- Severe dyspnea

VENTRICULAR FIBRILLATION / PULSELESS VT

- CPR
- Defibrillate as soon as monitor available/charged
- Defibrillate q2 min while VF/VT persists
- Epinephrine 1:10,000 1 mg IV/IO q3-5 min SO

Persistent VF/VT after 3 defibrillation attempts

- Amiodarone 300 mg IV/IO, MR 150 mg (max 450 mg) SO
  OR
- Lidocaine 1.5 mg/kg IV/IO SO, MR at 0.5 mg/kg IV/IO q5 min to max 3 mg/kg SO
- If VF/VT persists after 2 antiarrhythmic doses, contact BH for direction

PULSELESS ELECTRICAL ACTIVITY / ASYSTOLE

- CPR
- Epinephrine 1:10,000 1 mg IV/IO q3-5 min SO

Suspected hyperkalemia
- $CaCl_2$ 500 mg IV/IO SO
- $NaHCO_3$ 1 mEq/kg IV/IO BHO

Suspected hypovolemia
- 1 L fluid bolus IV/IO, MR x2 SO

Suspected poisoning/OD
- Contact BH
- May consider treatment per Poisoning/Overdose Protocol (S-134)

Asystole
- After ≥20 min, treat per TOR protocol

RETURN OF SPONTANEOUS CIRCULATION

- Ventilate PRN (goal of $EtCO_2$ = 40 mmHg)
- Obtain BP
- Obtain 12-lead EKG
- Transport to closest STEMI Center regardless of 12-lead EKG reading SO
- Provide cardiac monitor data to agency QA/QI department

SBP <90 mmHg

- If rales not present, 250 mL fluid bolus IV/IO SO, MR SO
- Push-dose epinephrine 1:100,000 (0.01 mg/mL) 1 mL IV/IO BHO. MR q3 min, titrate to SBP ≥90 mmHg BHO

Pulse ≥60 status post-defibrillation

- Amiodarone 150 mg in 100 mL of NS over 10 min IV/IO SO, MR x1 in 10 min SO
  OR
- Lidocaine 1.5 mg/kg IV/IO SO, MR at 0.5 mg/kg IV/IO q8-10 min to max 3 mg/kg SO

Push-dose epinephrine mixing instructions

1. Remove 1 mL normal saline (NS) from the 10 mL NS syringe
2. Add 1 mL of epinephrine 1:10,000 (0.1 mg/mL) to 9 mL NS syringe

The mixture now has 10 mL of epinephrine at 0.01 mg/mL (10 mcg/mL) concentration.

ADJUNCT CARDIAC DEVICES

- Transport equipment and any knowledgeable family/support persons to ED with patient

VAD
- Contact BH and VAD coordinator
- Follow protocols for CPR and treatment of arrhythmias, including use of cardioversion, pacing, and defibrillation PRN

TAH
- Contact BH and TAH coordinator
- Treatment per BHO

Wearable defibrillators (vest)
- If vest device is broadcasting specific verbal directions, follow device's prompts
- If device not broadcasting directions and patient requires CPR or cardiac treatment, remove vest and treat

Malfunctioning pacemakers
- Treat per applicable arrythmia protocol
- Treat pain per Pain Management Protocol (S-141) PRN

Reported/witnessed AICD firing ≥2
Pulse ≥60
- Lidocaine 1.5 mg/kg IV/IO SO, MR at 0.5 mg/kg IV/IO q8-10 min to max 3 mg/kg SO
  OR
- Amiodarone 150 mg in 100 mL of NS over 10 min IV/IO SO, MR x1 in 10 min SO

TERMINATION OF RESUSCITATION (TOR)§

Must meet all of the following criteria
- Persistent asystole (no other rhythms detected)
- Unwitnessed arrest (by bystanders or EMS)
- No bystander CPR
- No AED defibrillation
- No return of pulses

<20 min on-scene resuscitation time
- Consider TOR BHPO
- If TOR, document time and full name of physician pronouncing death

≥20 min on-scene resuscitation time
- Consider TOR SO (BH contact not required even if ALS interventions performed)
- If TOR, document time of death recognition and name of paramedic

§Applies to cardiac arrests of presumed cardiac origin. Excludes drowning, hypothermia, trauma, and electrocution.