Cardiac Arrest and Resuscitation Section 3:2

Subjective Information

History: last time seen, down time, and preceding symptoms.

Past History: diseases, recent illness or medications.

Surroundings: evidence of drug ingestion, electrocution, or crime scene.

CPR: time of initiation, effectiveness of compressions, time down prior to CPR.

Objective Information

Absence of consciousness.

Agonal or absent respirations.

Absence of carotid pulse.

Signs of trauma.

Pallor, cyanosis or lividity.

Unresponsive and fixed pupils.

Treatment

Procedure	FR/OEC EMT B	EMTB IV	EMT I	EMT P
Initiate CPR according to AHA guidelines	X	X	X	X
Airway/O2	X	X	X	X
Automatic external defibrillation (see AED procedure) for witnessed arrest	X	X	X	X
IV/IO: 1-2 large bore with normal saline TKO rate		X	X	X
Treat specific cardiac arrest algorithms (see individual protocol)			X	X

X = standing order

Special Considerations

A. For information regarding DNR/AND orders and living wills (advance directives), refer to the "Do Not Resuscitate/Allow Natural Death" protocol.
B. Per AHA standards:
C. Upon a witnessed arrest, defibrillation should be initiated immediately.
D. When the arrest has not been witnessed or bystander CPR has not been effective, approximately two minutes of CPR should be initiated prior to the first defibrillation.
E. Upcoming guidelines are anticipated to emphasize the usefulness of compressions and electrical therapy and de-emphasize the effectiveness of intubation and medications.

When CPR is not started within 10 minutes, statistics have shown that the success rate is low. However, CPR should be initiated in all arrests unless there are obvious signs of death.

Asystole

CPR
↓
Monitor (Asystole confirmed in 2 leads)
↓
Intubate / IV/IO x 2/ Oxygen
↓
Epinephrine 1 mg of 1:10,000, every 3-5 minutes
↓
Consider Pacing at 80 BPM, starting at 20 mA and increasing until capture occurs
↓
Consider termination of resuscitation effort

Special Considerations

A. In an adult, if there has not been any change in the rhythm after “twenty minutes of continuous BLS and ALS resuscitation, consider terminating efforts” (AHA, 2006).
B. Consider sodium bicarbonate in known cases of pre-existing metabolic acidosis such as aspirin overdoses or diabetic ketoacidosis.
C. Consider: Early transcutaneous pacing in non-cardiac cases of arrest

Dysrhythmias: Pulseless Electrical Activity (PEA) Section 3:3:3

Consideration of the underlying causes of PEA is critical to correct treatment.

Hyper/Hypokalemia – consider NaBicarb	Tamponade (cardiac) – rapid transport
Hypovolemia – give fluid bolus	Tablets – Narcan, D50, consider NaBicarb
Hydrogen Ion/Acidosis – ventilate with O2	Tension pneumo – chest decompression
Hypothermia – core rewarming	Thrombosis (CVA) – rapid transport
Hypoxia – ventilate with O2	Thrombosis (PE) – rapid transport

PEA with Bradycardia

CPR sufficient to generate a pulse
Assess for underlying cause
↓
Intubate / IV/IO / Oxygen
↓
Volume trial of 1000 ml
↓
Epinephrine every 3-5 minutes
1 mg 1:10,000 IV/IO or ET
↓
Pace at 80 BPM, starting at 20 mA and increasing in 5 mA increments until capture occurs
↓
No change - continue CPR

PEA with Tachycardia (HR > 100)

CPR sufficient to generate a pulse
Assess for underlying cause
↓
Intubate / IV/IO / Oxygen
↓
Volume trial of 1000 ml
↓
Consider synchronized cardioversion
↓
Pharmacology depending upon underlying cause

PEA with Normocardia

CPR sufficient to generate a pulse
Assess for underlying cause
↓
Intubate / IV/IO / Oxygen
↓
Volume trial of 1000 ml
↓
Pharmacology/electrical therapy depending upon underlying cause

Special Considerations

A. Consider two IV/IOs,
B. Consider early transcutaneous pacing if rhythm remains bradycardic.
C. Sodium Bicarbonate should be considered in known cases of pre-existing metabolic acidosis such as aspirin overdoses or known tricyclic antidepressant (TCA) overdose.

Dysrhythmias: Supraventricular Tachycardia (SVT) Section 3:3:4

Unstable tachycardia (greater than 150/minute)

O2, IV/IO
↓
Sedate (if possible) and Synchronize Cardiovert

Stable Tachycardia

O2/ IV/IO
↓
Consider fluid bolus of 250-300 ml
↓
Obtain 12-lead ECG
Determine if regular or irregular in pattern
↓
If Rhythm Regular
Valsalva maneuvers
Adenosine 12 mg rapid IV/IO
If unsuccessful, may repeat in 1-3 minutes
Total dose not to exceed 24 mg
↓

If Rhythm Irregular

Suspect atrial fibrillation or atrial flutter. Adenosine is not effective with either atrial fibrillation, monitor for stability and if patient becomes unstable, sedate and synchronize cardiovert.

Special Considerations

A. If at any time the patient becomes unstable, sedate and synchronize cardiovert immediately.
B. Synchronized cardioversion is most successful at 100J.
C. If 100 j is unsuccessful, escalate joule setting (200 j, 300 j) as necessary to convert the rhythm.

Pain Management Adjunct – Sedation Section 11:20

Authorization: EMT-P

Protocol: Standing Order

The appropriate management of anxiety and pain is an important component of comprehensive emergency medical care. Frequently it is necessary to combine a narcotic (analgesic) and a benzodiazepine (anxiolytic) to provide adequate pain management. The combination of a narcotic and a benzodiazepine reduces the degree of anxiety, pain or awareness a patient may experience during a painful illness or injury. The patient retains their ability to maintain a patent airway independently and continuously. They maintain their protective reflexes and their ability to respond appropriately to physical stimulation and/or verbal command and are easily aroused. Using sedation as an adjunct for pain management can only be performed by ALS providers who have met the following requirements:

Completed training in the procedure and have met competency requirements set by the medical director

Remain current through continuing education and skills check-offs as determined by the medical director.

Indications

Pain management using sedation as an adjunct is indicated for conditions that require pain and anxiety management to properly care for a sick or injured patient with significant pain.

Precautions

Patients with cardiopulmonary disorders, multiple trauma, head trauma, or who have ingested a central nervous system depressant such as alcohol are at increased risk of complications and require a high level of vigilance.

Elderly patients (>65) tend to be more sensitive and therefore should always receive the low end of the dose range. Administration should be slow and titration with additional doses should be given with extreme care.

Technique

Place patient on the ECG monitor, oxygen, capnography, and the pulse oximeter. Obtain baseline readings. Insert an IV. Make sure airway equipment, suction and reversal agents (Narcan) are available and ready.

Complete an appropriate history and physical examination.

This includes focused exam of heart, lungs and airway evaluation; vital signs including oxygen saturation, level of consciousness/mental status exam; pain scale evaluation.

Determine patient’s NPO status and determine risk/benefit.

Oral Glucose (Glutose and Insta-glucose) Section 12:28

Authorization: Per Rule 500 and Agency Medical Direction

Protocol: Standing Order for FR/OEC, EMT-B, EMT-I, EMT-P

Oral glucose is a high concentration carbohydrate.

Effects:

Oral glucose acts to increase blood glucose levels.

Indications:

Altered level of consciousness in a patient with a history of diabetes.

Hypoglycemia.

Contraindications:

Decreased mentation leading to an inability to maintain airway

Patients unable to swallow

Side Effects and Special Notes:

A. There are no side effects when administered properly.

B. Due to the gel thickness, there is a potential for airway obstruction or aspiration.

C. Have suction equipment available when administering oral glucose.

Special Considerations

A. Penetrating trauma alone does not mandate immobilization. The situation and assessment should dictate immobilization procedures. Do NOT delay rapid transport or immediate life-saving procedures for immobilization.
B. If spinal immobilization is going to be done, use of a plastic scoop preferred. Check circulation, sensory and motor of all extremities both pre and post immobilization and document.
C. Use of a backboard for wilderness evacuations is to be avoided if at all possible. When compared to a backboard, the vacuum mattress provides better stabilization of the injuries, is less likely to result in skin injury, is more comfortable and will help keep the patient warm.
D. Be prepared to tip the entire immobilization device to the side if the patient begins to vomit.
E. Respiratory problems are common, especially if the patient has sustained a high level cord injury. Try to avoid manipulating the neck. If oral intubation needs to be done, maintain in-line traction to minimize movement of the cervical spine.
F. Patients can be ambulatory and asymptomatic yet still have an unstable spinal fracture. Your assessment should include the mechanism of injury in conjunction with assessment findings. (See Section II: General Supportive Care for specific neurologic assessments.)
G. When immobilized, the pregnant patient must be secured to the device and the device tilted to the left (approximately 20°). See Section 8, Protocol 8:3 Trauma in Pregnancy.
H. Posterior rib pain is often described as "back pain." Assess if the pain originates from the spine or posterior ribs.
I. There are some landmarks for vertebra that are useful in assessments:

    C1 - Against base of skull
    T1 - Clavicle level
    T4 - Nipple line
    T10 - Umbilicus
    L1 - Iliac crest (spinal cord ends between L1 and L2)

Arrest: Pediatric Resuscitation Guidelines Section 9:2

1. Airway, O2, IV/IO, Monitor
    a. OPA/NPA as necessary,
        i. OPA may be unnecessary in neonate/infant
        ii. NPA is contraindicated in a neonate/infant
    b. Administer O2 via blow-by, NRM or BVM
        i. BVM ventilation is often superior to intubation in those under 8 y/o
        ii. Capnography should be used to monitor ventilatory status
            1. Treat bronchospastic waveform with bronchodilators
    c. Ventilate at a rate that is age appropriate
        i. Ensure good chest rise/fall
        ii. Greater survival occurs when capnography values are > 25 mmHg
    d. Establish peripheral venous access
        i. Consider IO in children younger than 6 y/o
        ii. Administer NS at 20 ml/kg and repeat to a total of 60 ml/kg
        iii. Check blood glucose level
            1. Administer 25% Dextrose if BGL < 60 mg/dl
2. Treat Dysrhythmias
    a. Electrical therapy as indicated by presence of
        i. v-fib/pulseless VT at 2-4 joules/kg
        ii. bradycardia – pace, starting at rate appropriate for age
            1. If altered mental status and HR < 60 for child 6 y/o or younger, start chest compressions
    b. Pharmacologic agents
        i. According to PALS and AHA guidelines
        ii. Oxygen with ventilations to increase bradycardia
        iii. *Epinephrine for all bradycardias unresponsive to oxygen/ventilations

* Requires Physician Contact

Special Considerations:

A. Mainstay of treatment is stabilizing the airway and supporting ventilation.
B. Pharmacologic agents are usually oxygen and epinephrine.
C. Pediatric arrests are almost always respiratory in nature. Concentrate on airway management.
D. Almost any pediatric dysrhythmia may spontaneously convert with good airway management.
E. Consider CNS injury/disease if rhythm returns but spontaneous ventilations do not.
F. Hypoglycemia is common in younger children, always check BGL in child with altered mental status (AMS).
G. Use of Broselow ™ Tape is highly accurate and shall be routinely used with the pediatric patient.

Procedure

1. Treat underlying condition according to the appropriate protocol
2. Document breath sounds to ensure absence of a pneumothorax
3. Document vital signs
4. Ensure following monitoring devices in place
    i. ECG
    ii. SaO2
    iii. EtCO2 (if available)
5. Place patient in a sitting position
6. Assess vital signs q5 min
7. If BP <90 systolic contact Medical Control prior to beginning CPAP
8. Use 5cmH2O - 10cmH20 pressure by pressure monitor
9. Explain the procedure to the patient:
    i. Patient requires “verbal sedation” to be used effectively.
        a. Example: “You are going to feel some pressure from the mask but this will help you breath easier.”
    ii. Place delivery device over mouth and nose.
    iii. Instruct patient to breath in through their nose slowly and exhale through their mouth as long as possible (count slowly and aloud to four then instruct to inhale slowly).
10. Check for air leaks
11. Treatment should be given continuously throughout transport to ED.
12. Continue to coach patient to keep mask in place and readjust as needed
13. If respiratory status / level of consciousness deteriorate, remove device and consider bag valve mask ventilation and/or endotracheal intubation
14. Documentation on the patient care record should include:
    i. CPAP level →(10cmH2O)
    ii. ECG
    iii. SpO2 q5 minutes
    iv. Vital Sign q5 minutes
    v. Capnography q 5 minutes
    vi. Response to treatment
    vii. Any adverse reactions

Complications and Special Notes

If patient worsens, remove CPAP device

In-line nebulizer can be used with CPAP

Success is dependent on patient tolerance and the paramedic’s ability to coach

Advise receiving hospital as soon as possible so they can prepare for the patient’s arrival

If treatment successful, do not remove CPAP until hospital therapy is ready to be placed on the patient

Monitor patient for gastric distension which may lead to vomiting

Deterioration of patient while on CPAP requires mechanical ventilation/intubation, including the following:

Deterioration of mental status

Increase of EtCO2

Decline of SaO2

Progressive fatigue

Glucometer Section 11:15

Authorization: FR/OEC*, EMT-B IV, EMT-I, EMT-P

Protocol: Standing Order

Indications

In patients with suspected hypoglycemia.

In patients that are unconscious and unresponsive.

In patients with altered LOC of unknown cause.

In patients who appear to be intoxicated.

Precautions

Be careful not to contaminate the blood sample that is being used, it can alter the results of the test.

Technique

Clean off the site using an alcohol prep and allow alcohol to evaporate.

Assemble the glucometer with the test strip, do not contaminate the test strip.

Using a small needle or lancet, puncture the skin and squeeze the surrounding tissue to draw blood out.

Dispose of the needle or lancet.

Place a blood sample on the test strip.

Allow the glucometer to measure the blood glucose level.

Bandage the puncture site on the patient.

Complications and Special Notes

The accuracy of the glucometer can vary. Do not rely solely on the glucometer for treatment options. Treat your patient, not the glucometer.

In patients with extremely low or high blood glucose levels, the glucometer may not give an accurate number or a number at all, it may simply indicate that the blood glucose level is high or low. Individual models may vary, refer to the instruction manual for your unit. Regular calibration is recommended. Refer to your instruction manual for your unit.

*** Use of glucometer by FR/OEC requires specialized training, regular competency evaluation and a QA process. Therefore an agency must request a waiver to the agency medical director before use of a glucometer is allowed in Boulder County.**

Post Resuscitation Therapeutic Induced Hypothermia Section 3:2:1

Overview:

Research published in the New England Journal of Medicine in 2002 as well as the ILCOR statement in 2003 and 2010 now show strong statistical evidence that therapeutic cooling of medical patients of non-hemorrhagic cardiac arrest is beneficial increasing neurologically intact patient survival rates by 16-23%.

Indications

1. Cardiac arrest secondary to known or presumed V-Fib/V-Tach with no evidence of traumatic or hemorrhagic causes.
2. Age >17
3. Initial temperature >34c.
4. ROSC
5. Unresponsive to verbal commands

Contraindications

1. Traumatic or hemorrhagic arrest
2. Pregnancy
3. Lack of an advanced airway
4. Preexisting Terminal Condition
5. Recent Major Surgery within past 14 days

Treatment

Procedure	FR/OEC EMT B	EMTB IV	EMT I	EMT P
Secure airway if not previously done (ET or King with EtCO2)			X	X
Establish 2 IVs or IOs		X	X	X
Obtain temperature	X	X	X	X
Infuse cooled saline at 30 ml/kg, rapid IV push (80 kg pt = 2400 ml)				X
Midazolam at 5 min intervals to control shivering				X
Maintain hemodynamic stability: Consider dopamine/epi drips Consider amiodarone				X

X = standing order

Special Considerations

A. **When TIH initiated, patient MUST be transported to hospital that supports continuation of TIH**. Studies suggest that to be helpful, TIH must continue 12-24 hours post arrest.

B. Avoid any action that will increase body temperature such as excessive ambulance temperature, heavy blankets, etc. A sheet is adequate to cover the patient during transport.
C. Target patient temperature is 32-34° C (89.6^{o}–93.2^{o} F)
D. Document inclusion criteria

Midazolam (Versed) Section 12:22

Authorization: Per Rule 500 and Agency Medical Direction
Protocol: Standing Order

Midazolam is a water soluble, short acting benzodiazepine.

Effects:

Short acting central nervous system depressant.

Time to onset of action is 2 - 5 minutes.

Duration can last for 15 to 90 minutes.

Indications:

When sedation is required as pain management adjunct, used with fentanyl or morphine

Chemical restraint/sedation

Status epilepticus (second line therapy to diazepam)

Contraindications:

Known hypersensitivity to Midazolam or Benzodiazepines.

Hypotension < 90 mmHg

Precautions:

Pulse oximetry, capnography and cardiac monitoring should be used when midazolam has been administered.

Immediate ventilatory assistance with 100% O2 and Bag-valve-mask may be necessary to maintain oxygenation.

Use caution when administering midazolam to the patient when alcohol has been ingested.

Headache, variation in blood pressure including hypotension, variations in pulse rate, and decreased respiratory rate are all potential side effects.

Consider lower initial dose for elderly patients.

Administration:

Adult:

Sedation/chemical restraint: 2-5 mg IV, IM, Intranasal. May be repeated to a maximum dose of 5 mg. Contact medical control for additional doses.

Sedation as pain management adjunct: 1-2 mg IV after fentanyl or morphine

Seizures: 2-5 mg IV, IM, Intranasal and repeat as needed.

Shivering: 2 mg IV/IO and repeat every 5 min to control shivering (TIH)

Pediatric:

Sedation, or seizures: 0.10 mg/kg IV/IO/IM/Intranasal to a maximum single dose of 2 mg. Repeat as needed.

Therapeutic Induced Hypothermia (TIH) Procedure 11.24

Authorization: EMT-P

Protocol: Standing Order

Indications

1. Cardiac arrest secondary to known or presumed V-Fib/V-Tach with no evidence of traumatic or hemorrhagic causes.
2. Age >17
3. Initial temperature >34c.
4. ROSC
5. Unresponsive to verbal commands

Contraindications

6. Traumatic or hemorrhagic arrest
7. Pregnancy
8. Lack of an advanced airway
9. Preexisting Terminal Condition
10. Recent Major Surgery within past 14 days

Procedure

1. Patients who meet criteria should receive all traditional treatments as per existing cardiac arrest protocols & AHA guidelines. Implementation of TIH should not delay other therapies.
2. Assure and verify advanced airway (King Airway or ET Tube)
3. Establish two large bore IV's or IO's
4. Remove clothing
5. Obtain temperature if possible
6. Upon ROSC
    a. Infuse cooled 2-4deg. Celcius saline 30ml/kg rapid IV push with Infuser if available as soon as inclusion criteria are met. (80 kg patient = 2400ml's)
        i. Target pt. temperature is 32-34° C
    b. Midazolam 2mg prn, q. 5minute intervals to control any shivering
    c. Maintain hemodynamic stability per current protocols
        i. Consider Dopamine/Epi drips
        ii. Consider amiodarone
7. **Transport to nearest medical facility that supports continuation of TIH** and interventional cardiology.
8. Document meeting criteria in PCR