CMEs Training

Presents

Advanced Cardiovascular Life Support -ACLS

Pre-Course Study Guide

2015 Guidelines

FBON: 50-12259

CMEs Training

Table of contents:

CMEs Training

This packet is intended for use as a supplement PRIOR to attending an Advanced Cardiac Life Support Course.

Welcome to CMEs Training pre-course study packet. Critical Medical Education & Training, Inc., (CMEs Training), is committed to improving the quality of healthcare by providing new skills and knowledge as it becomes available through continuing education. Whatever your goal – whether it be career enhancement, personal or re-licensure, CMEs Training will provide continuing education to the disciplines it supports through **P**rofessionalism, **R**espect, **I**ntegrity, **D**ependability and **E**valuation, (PRIDE).

CMEs Training recognizes that balancing home and career can be difficult so we have developed learning opportunities that are flexible and present themselves not only in the traditional classroom setting but as a convenient alternative, via on-line programs. Additionally, we can customize any curriculum to fit the needs of your company and bring it to you!

Critical Medical Education & Training Incorporated is a state-of-the-art educational and training institution committed to providing the highest level of instruction available for a wide variety of medical disciplines. CMEs Training offers on-line classes and satellite facilities in the following cities: Tampa, Jacksonville, Orlando and Gainesville with additional sites being added within the near future. In addition to the above facilities CMEs Training will provide instruction at medical institutions, fire training facilities and private businesses.

CMEs Training is approved by the American Heart Association, Florida Board of Nursing and Florida Department of Emergency Medicine to offer a wide variety of courses to fit almost any medical educational need.

CMEs Training instructors come to us with very diversified backgrounds within the medical and fire rescue community and have extensive experience educating medical professionals from a variety of disciplines. All are fully licensed and American Heart Association compliant, have attained a high level of respect professionally, many with twenty to over thirty years of experience in their respective disciplines and have received professional recognition and awards prior to becoming instructors at CMEs Training.

The AHA has set the GOLD STANDARDS FOR RESUSCITATION GUIDELINES AND continues to lead the field in Emergency Cardiac RESUSCITATION for all medical professionals.

The AHA recognizes only those institutions that can provide the required initial and recertification courses as mandated by the AHA.

CMEs Training provides these Gold Standards of Resuscitation guideline courses in a format that is stress-free, flexible to the needs of the student and with the latest power point and visual teaching aids. CEUs are no longer available for recertification of BLS, ACLS or PALS.

Thank you for choosing CMEs Training for your educational needs. NOW LET'S GET STARTED!

CMEs Training

ACLS Study Guide

Read Pre Course Study Material

Guidelines have recently changed and certain American Heart Association (AHA) textbooks, materials and handbooks are available now at our bookstore. Please check with your educator to library AHA textbooks or order materials by calling Channing Bete at 800-611-6083 or visit channingbete.com or Laerdal Medical at 877-523-7325 or www.laerdal.com

THE PRE-COURSE EXAM IS NOW LOCATED ON-LINE AT

www.heart.org/eccstudent

ENTER CODE: acls15 (WATCH THE NEW VIDEOS, YOU MUST SCORE 80%)

At the end of this course you must be able to demonstrate treatment of the following objectives during a simulated **VF** (Ventricular Fibrillation), **VT** (Ventricular Tachycardia) and PEA (Pulseless Electrical Activity) cardiac arrest scenario:

- Assessing a victim by the primary CAB and secondary ABCD's
- Effective adult 1 and 2 rescuer CPR
- Using an AED on an adult
- Safe defibrillation with a manual defibrillator
- Maintaining an open basic airway (BLS)
- Confirmation of effective ventilation
- Addressing vascular access (IV and IO)
- Stating rhythms, appropriate drug, route and dose
- Consideration of treatable causes of PEA arrest

What happens if I do not do well in this course?

The Course Director or Lead Instructor will "remediate" (tutor) you and upon remediation you will be permitted to continue with the course.

Any questions please contact our office at:

877-850-2702 or 954-318-6080 or online at www.cmestraining.com

ACLS Sample Initial Course Agenda

Approximately 13-16 hours

Day 1:

- Registration
- Welcome; introduction
- Video introduction:
  - ACLS Course overview/ science update
  - BLS Primary survey and secondary survey
- Dynamic lecture on science, technology and AHA standards
- Practical sessions
  - Respiratory
  - BLS
- Lunch
- Practical sessions
  - VF/Pulseless VT
  - Vascular access
  - Bradycardia
  - Tachycardia

Day 2:

- Q & A
- Lesson on ACS
- Lesson on Stroke
- Practical station
  - Putting it all together
  - Mega-code practice
- Lunch
- Mega code evaluations (testing)
- Written evaluations (testing)
- Course evaluation/remediation
- Distribution of cards

CMEs Training

What is ACLS?

ACLS is an "assess-then manage" approach for those at risk of or in cardiac arrest. This approach is outlined in algorithms within your pre-course materials. Instructor to assess learning needs of students.

Primary CAB and Secondary ABCD's

This is a methodical "assess-then-manage" approach used to treat adults in respiratory distress and failure, stable and unstable arrhythmias and pulseless cardiac arrest.

Algorithms are "menus" that guide you through recommended treatment interventions.

Know the following: **ABCD's approach** is in all ACLS case scenarios. This information is gathered during the assessment and will determine which algorithm you choose for the patient treatment.

Primary CAB and **Secondary ABCD's** refer to unconscious pulseless patients and the use of an AED/Monitor Defibrillator:

Assess patient/victim: Tap and ask "Are you OK?"

For the adult patient:

- Send someone to call 911 and bring the AED
- If alone call 911, get an AED and return to the victim

C – Chest compressions/Circulation Check a pulse

Patient	Rate	Ratio	Depth of Compression
Adult	100 compressions per minute	30:2	2 inches or 5 cm
Child	100 compressions per minute	30:2 for one rescuer (5 cycles) and 15:2 two rescuer (10 cycles)	2 inches/ 5 cm or 1/3 the circumference of the chest
Infant	At least 100 compressions per minute	30:2 for one rescuer (5 cycles) and 15:2 for two rescuer (10 cycles)	1.5 inches/ 4 cm or 1/3 the circumference of the chest

A – Airway: Basic Life Support Airway: Head-tilt/Chin lift, use of adjunctive equipment or manual jaw thrust.

B – Breathing: Assess for adequate breathing:

If adequate: provide 2 breaths over 1 second each

Each breath should cause a visible chest rise and fall

Use mouth-to-mouth or barrier device, bag-valve-mask ventilation with 2 person CPR only.

Provide 5 cycles of CPR (about 2 minutes)

2-rescuers: the compressor must pause while the 2 breaths are given

Change compressors after 5 cycles to avoid fatigue and ineffectiveness

D – Defibrillation: When an AED arrives, immediately power on unit:

Follow the voice prompts: **Use adult pads on adults or on the pediatric patient but only use pediatric pads for pediatric patients.

**For pediatric patients defibrillation will be delivered @ 2j/kg followed by 4j/kg with a maximum of 10j/kg

**For pediatric patients pads may be placed anterior/posterior

CMEs Training

ACLS Assessment/ Secondary ABCD's:

Airway: Head Tilt / Chin Lift

- Use Bag mask with 2 person CPR
- Provide each breath over 1 second each
- Compressor pauses to allow the 2 breaths
- Consider inserting an advanced airway (see advanced airway page)

Breathing: Look for visible chest rise during each breath

- Confirm advanced airway tube placement (see advanced airway page)
- Secure the airway tube
- Compressor now gives 100 continuous compressions per minute
- Ventilator gives 8-10 breaths per minute (one every 6-8 seconds)

	Adult	Pediatric	Infant
BLS Airway	1 breath every 5-6 seconds	1 breath every 3-5 seconds	1 breath every 3-5 seconds
ALS Airway in place	1 breath every 6-8 seconds max 8-10 breaths/min	1 breath every 3-5 seconds	1 breath every 3-5 seconds

Circulation:

- Obtain vascular access with an IV (Intravenous) or IO (Intraosseous) Cannulation
- Give medication as recommended per algorithm

Differential Diagnosis: "Why is this patient in this rhythm?" Look for possible causes:

6 H's	6 T's
Hypoxia Hypovolemia Hypothermia Hypo/Hyperkalemia Hydrogen Ion (acidosis)	Tamponade Tension Pneumothorax Toxins-poisons, drugs Thrombosis-coronary (AMI) –Pulmonary (PE)

CMEs Training

Medical Patient Assessment

1. **Scene size up/ scene safety** (AHA BLS Guidelines) 5 questions to ask:
    a. Do I have my BSI?
    b. Is the scene safe?
    c. Nature of incident?
    d. Number of patients?
    e. Are additional resources needed?
2. **General Assessment**
    a. Identify immediate threats
    b. Identify chief complaints
    c. Position patient for assessment
3. Initial assessment (if not in cardiac arrest)
    a. Airway (BLS Airway: Head-tilt/chin lift)
    b. Breathing (Y/N) Rate, quality, tidal volume
        i. Rate <8 assist with BVM
    c. Circulation
        i. Radial pulse, carotid pulse, skin color, temperature, capillary response
    d. Disabilities
        i. AVPU
    e. Establish priority
        i. Is the patient STABLE vs. UNSTABLE?
        ii. Stable = no serious signs or symptoms v/s stable
        iii. Unstable = hemodynamic status, B/P low, chest pain, severe SOB, decreased LOC
4. Focused History/Physical Exam
    a. Responsive patient
        i. Hx, cc, OPQRST, SAMPLER
    b. Focused medical assessment
        i. Chief complaint
        ii. Vital signs
    c. Unresponsive patient
        i. Rapid head to toe (correct all life threatening conditions)
5. On-going assessments
    a. Vital signs for unstable patients every 5 minutes
    b. Vital signs for stable patients every 15 minutes

CMEs Training

Airway Skills

During this course you will be expected to participate in manikin practice and demonstrate proficiency in the below skills:

Basic Airway: (BLS)

Oxygen: To use or not to use

- Open the airway
  - Use the head tilt – chin lift when assessing for adequate breathing
  - Use a jaw thrust for unresponsive, trauma or drowning
  - If unable to open the airway with a jaw thrust, use head tilt – chin lift
- Maintain the airway
  - Insert an oropharyngeal airway when unconscious with no cough or gag reflex
  - Insert a nasopharyngeal airway when a cough or gag reflex is present (better tolerated)
- Ventilate Give a breath over 1 second using providing enough volume to see the chest rise
  - 2 rescuer CPR: give 2 breaths during the pause following the 30 compressions
  - Rescue breathing: when a pulse, give 10-12 breath/minute 1 every 5-6 seconds **Refer back to page 7**

Advanced Airway:

Laryngeal Mask Airway (LMA) requires the least training for insertion

- Inserts blindly into the hypo pharynx
- Regurgitation and aspiration are reduced but not prevented
- Confirm placement: See chest rise and listen for breath sounds over the lung fields
- Contraindications: gastric reflux, full stomach, pregnancy, or morbid obesity

King Tube: requires more training for insertion than the LMA

- Inserts blindly into esophagus (80% of the time) or the trachea

- Ventilation can occur whether the tube is in the esophagus or the trachea
- Confirm placement: clinical exam and a confirmation device (see below)

Endotracheal Tube (ETT): requires the most training, skill and frequency to retain insertion techniques

- Insert by direct visualization of vocal cords
- Isolates the trachea, greatly reduces risk of aspiration, and provides reliable ventilation
- High risk of tube displacement or obstruction whenever patient is moved
- Confirmed placement: clinical exam and a confirmation device

**Immediately confirm tube placement by clinical assessment and a device!

Clinical Assessment:

- Look for bilateral chest rise and fall
- Listen for breath sounds over stomach and the 4 lung fields (left and right anterior chest wall and mid axillary)
- Look for water vapor in the tube (if seen this is helpful but not definitive)

Devices

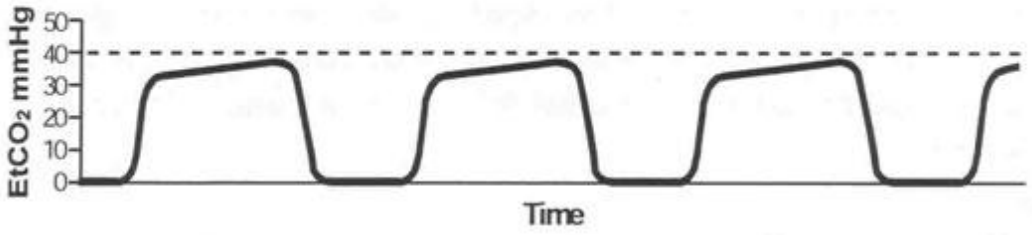
- End-tidal CO2 Detector (ETD) if weight > 2 kg
- Attaches between the ET and resuscitation bag BVM
- Litmus paper center should change color with each inhalation and each exhalation
- Original color on inhalation = Okay O2 is being inhaled: expected
- Color change on exhalation = CO2! ETT is in the trachea
- Original color on exhalation = Oh – Oh! Litmus paper is wet: replace ETD
- If tube is not in the trachea: remove ETT. Cardiac output is low during CPR

Esophageal Detector (EDD)

- Resembles a turkey baster
- Compress the bulb and attach to ETT
- Bulb inflates quickly = tube is in the trachea
- Bulb inflates poorly = tube is in the esophagus
- No recommendation for its use in cardiac arrest

Capnography

- Measures exhaled CO2 in a digital or waveform format
- Allows the provider instant feedback on respiration of your patient not just ventilation
- Standard treatment for all intubated patients
- If no or limited CO2 is being exhaled, the patient is no longer exchanging gases and/or the ETT is not in the correct place



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Electrical Therapy (Defibrillation)

During this course you will practice and then demonstrate safe, effective techniques for defibrillation including indications for use

Defibrillation

- Recommended shock dose: Biphasic = 120 – 200 joules (manufacturer)
- Recommended shock dose: Monophasic = 360 joules

Synchronized Cardioversion: Timed low energy shocks

- Timed to QRS to reduce risk of "R on T", a shock that hits the T wave may cause VF

Transcutaneous pacing: Noninvasive emergent bedside pacing

- Apply pacer pads
- Verify pacer capture

CMEs Training

Vascular Access

Peripheral IV: Preferred in arrest: Due to easy access and no interruptions in CPR

- Use a large bore IV catheter
- Attempt large veins: Antecubital, external jugular, femoral vein
- Can take 1-2 minutes for IV drugs to reach central circulation

Intraosseous (IO): Inserts into a large bone and accesses the venous plexus

- May use if unable to obtain intravascular access
- Drug delivery is similar to a central line
- Safe access for fluids, drugs, and blood samples
- Drug doses are the same as when given IV

Central Line: Not needed in most resuscitations

- Insertion requires interruption of CPR
- If a central line is already in place and patent, it can be used

Endotracheal: Level three now NOT RECOMMENDED

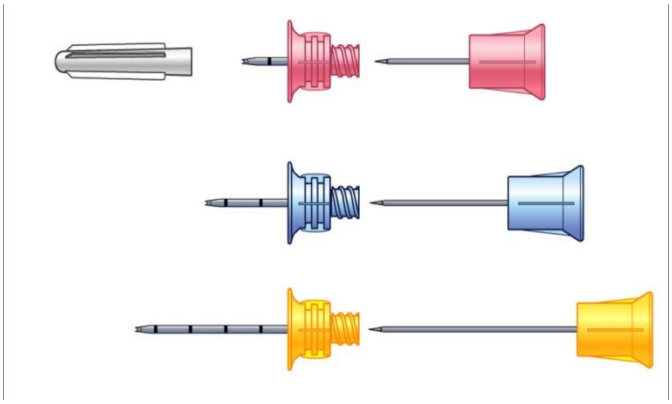
- Drug delivery is unproductive thus IV/IO delivery is preferred
- Drug – blood concentration stays lower than when given IV
- Increase dose given to 2 – 2.5 times the recommended IV dose
- Drugs that absorb via the trachea
    - Naloxone
    - Atropine
    - Vasopressin
    - Epinephrine
    - Lidocaine

CMEs Training

Vascular Access

Power Driver

- Drivers are sealed and not intended to be opened. Batteries are not replaceable.
- Follow the drivers directions for use when cleaning
- Do not use excessive force during insertion. Let the driver do the work

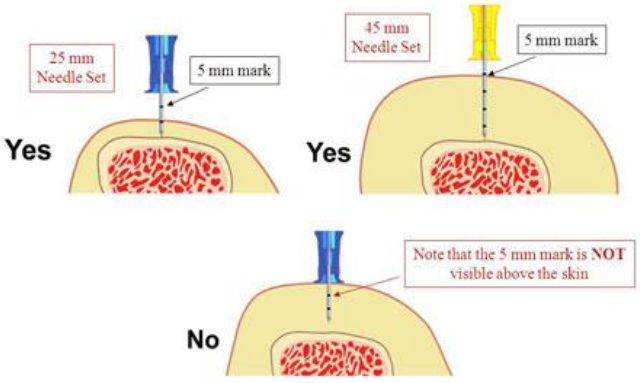


15 mm (pink) needle sets may be considered for patients 3-39 kg

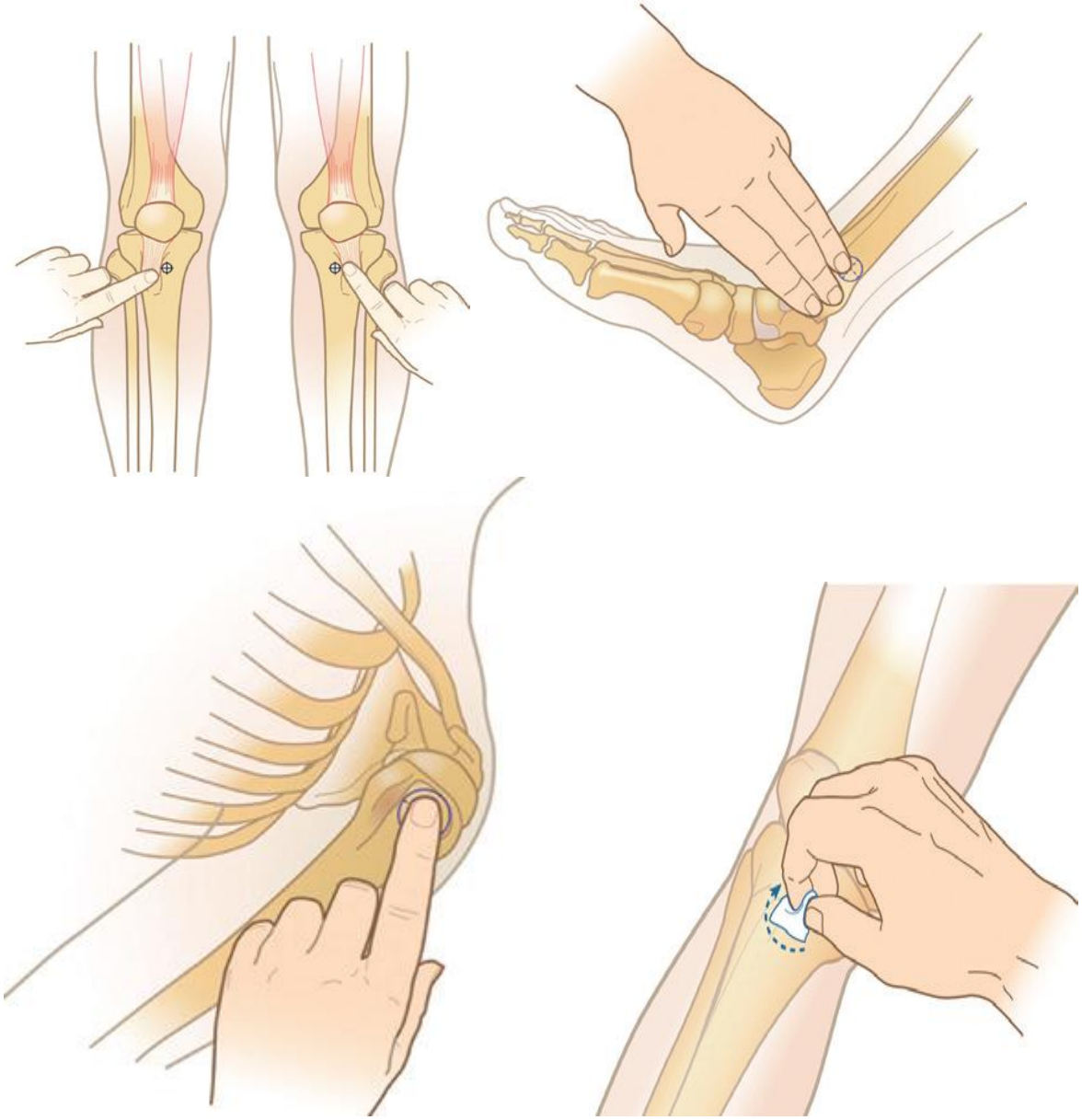
25 mm (blue) needle set may be considered for patients 40kg or greater

45mm (yellow) needle set should be considered for the proximal humerus, on patients greater than 40kg and patients with excessive tissue over other insertion sites

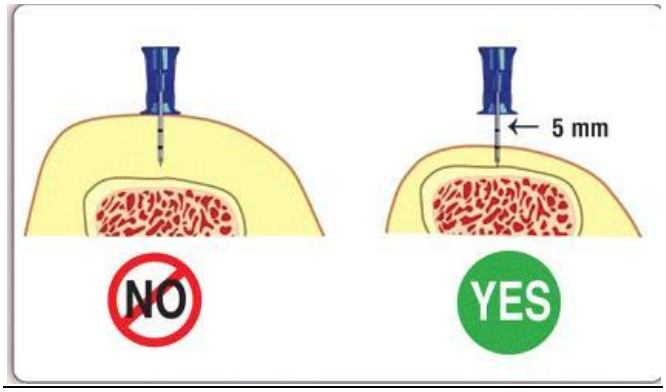
**To confirm appropriate needle selection, a black line on the needle must be visualized after insertion through the tissue.



Insertion sites

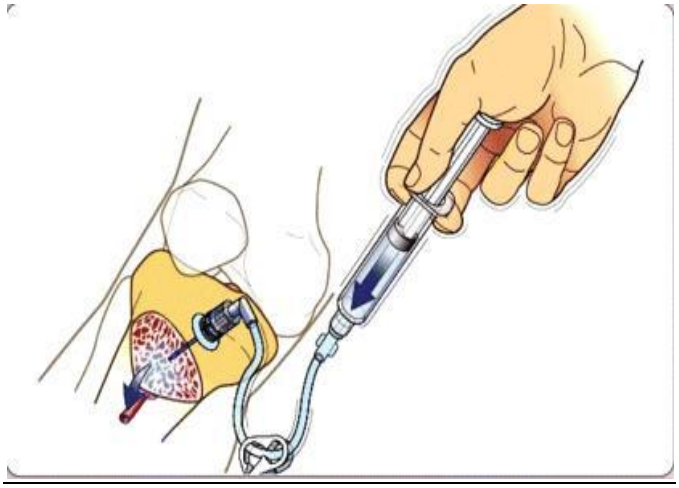


Steps



- Choose appropriate size needle. See manufacturer's recommendations depending on brand.

- Using aseptic techniques, insert needle into approved anatomical landmark by manufacturer



- Flush the site prior to infusing fluids and/or medication

Removal

- Remove within 24 hours
- Stabilize extremity
- Connect sterile luer-lock syringe
- Rotate clockwise while pulling straight up. Avoid rocking the needle on removal.
- Place removed catheter in an approved sharps container

CMEs Training

ACLS Drugs

Look up drug dosages in the ECC Handbook. You may be allowed to use it as a reference in class

- The primary focus in cardiac arrest is effective CPR and early defibrillation
- Drug administration is secondary and should NOT interrupt CPR
- Know the timing of drug administration in CPR as shown:
- The class of recommendation number denotes potential benefit vs. risk

General Statements:

Pulseless arrest: Give a vasopressor type drug – Epinephrine or Vasopressin

Vasopressors cause peripheral vasoconstriction, which shunts increased blood flow to the heart and brain.

Pulseless ventricular rhythms: consider antiarrythmics – Amiodarone, Lidocaine, or Magnesium Sulfate

May make myocardium easier to defibrillate and/or more difficult for it to again fibrillate and convert.

Bradycardia: Give a "speed up" drug atropine

Atropine blocks vagal input and stimulates the SA node, which can increase heart rate. Consider: Dopamine and Epinephrine may increase heart rate but also increase myocardial oxygen demand.

Tachycardia, reentry SVT: Give a drug to interrupt the rhythm – Adenosine. Adenosine blocks the AV node for a few seconds, which may break re-entry pattern

Tachycardia, A-fib, or A-flutter: to convert rhythm: Amiodarone, slow rate – Beat Blocker

Tachycardia VT: Stable – to convert rhythm Amiodarone or Adenosine, synchronized cardioversion.

Acute Coronary Syndromes: First line treatment is "MONA": ECC

Morphine decreases pain not relieved by nitroglycerin; also dilates peripheral vessels decreasing resistance against which the heart has to pump.
Oxygen increases the oxygen available to the ischemic or injured heart muscle.
Nitroglycerin dilates coronary arteries so more oxygenated blood can reach the heart muscle and decrease pain: also dilates peripheral vessels decreasing the resistance the heart has to pump against
Aspirin decreases platelet clumping, the first step in forming a new clot!

** If allergic to aspirin (ASA), give Clopidogrel – affects platelet clumping similar to aspirin.

CMEs Training

Medication Review

Medication	Condition
Activated Charcoal Antidote (Toxicological Agent)	Ingested poison and drug overdose
Adenosine Troposphere (Antidysrhythmic) Prototype Procainamide	Narrow complex paroxysmal PSVT refractory to vagal maneuvers Restores normal sinus rhythm
Albuterol (sympathomimetic bronchodilator)	Bronchospasm, asthma, COPD, smooth muscle relaxant
Amrinone (Name changed in 2000 to Inamarinone Lactate Cardiac inotrope, vasodilator	Cardiac output in CHF, children in septic shock, myocardial dysfunction, afterload and preload by relaxant effect on vascular smooth muscle
Aspirin (Anti-inflammatory)	Chest pain suggestive of an AMI, inflammation, fever, anti-platelet
Atropine Sulfate (parasympatholytic)	Bradycardia, Antidote for certain poisonings
Calcium Chloride (Electrolyte Prototype) Calcium Gluconate	Hyperkalemia, hypocalcemia, hypermagnesemia, an effective cardiac stabilizer of hyperkalemia or resuscitation
Dextrose D50W (Carbohydrate)	Hypoglycemia
Diazepam (Antianxiety/ Hypnotic) Anti-convulsant, Sedative	Seizures, Premedication for cardioversion, facilitate intubation, muscle tremors
Diltiazem (Calcium channel blocker)	Atrial fibrillation/flutter, PSVT, coronary artery perfusion in angina, slows SA and AV node conduction without affecting normal arterial potential
Diphenhydramine (Antihistamine)	Allergic reaction, anaphylaxis, dystonic reactions
Dopamine Hydrochloride (sympathomimetic) Prototype: Epinephrine	Non-hypovolemic hypotension, cardiogenic shock, decreased cardiac output, decrease in systolic or pulse pressure

CMEs Training

Medication Review Continued

Medication	Condition
Epinephrine 1:1,000 – 1:10,000 (Hydrochloride sympathomimetic)	Restore rhythm, VF, Pulseless VT, PEA, strengthens myocardial contraction, increases cardiac rate and cardiac output
Etomidate (Hypnotic sedative)	Induce sedation for Rapid Sequence Intubation (RSI)
Furosemide (Diuretic anti-hypertensive)	CHF, pulmonary edema, its vasodilating effects decrease venous return and cardiac workload
Glucagon (Hormone anti-hypoglycemic)	Hypoglycemia without IV access, reverse beta blocker overdose, diabetic patient unconscious or unable to swallow
Haloperidol (Antipsychotic)	Acute psychotic episodes
Ipratropium Bromide (Anticholinergic) Prototype: Atropine (Bronchodilator)	Bronchospasm in asthma, emphysema, COPD, chronic bronchitis, pneumonia
Ketorolac Tromethamine (Anti-pyretic, anti-inflammatory NSAID) Prototype: Ibuprofen	Mild to moderate pain from post operative care
Labetalol Hydrochloride (Beta-Blocker anti-hypertensive agent) Prototype: Propranolol	Acute hypertensive crisis, alpha/beta blockade results in vasodilatation and decreased peripheral resistance
Lidocaine (Anti-arrhythmic, local anesthetic)	VF, Pulseless VT, VT with a pulse suppresses automaticity in HIS-purkinje system, electrical stimulation threshold of ventricle during diastole
Lorazepam (Anti-anxiety, hypnotic, sedative)	Cardioversion, status epilepticus
Magnesium Sulfate (Electrolyte replacement agent) Prototype: Hydroxide	Refractory VF, Pulseless VT, Torsades de Pointes, smooth muscle relaxant in cardiac disorders
Methylprednisolone (Hormones, synthetic substance anti-inflammatory) Prototype: Prednisone	Spinal cord injury, asthma, COPD, severe anaphylaxis
Midazolam Hydrochloride (Hypnotic sedative, anticonvulsant)	Prior to cardioversion, intubation, calms patient and relaxes skeletal muscles

CMEs Training

Medication Review Continued

Medication	Condition
Morphine Sulfate (Narcotic analgesic, sedative)	Pain management, AMI, reduce venous return in pulmonary edema, CNS depression and myocardial oxygen demand
Naloxone Hydrochloride (Narcotic antagonist)	Narcotic overdose, coma of unknown origin, reverses the effects of opiates, results in RR depression, sedation, and hypotension
Nitroglycerin (Nitrate vasodilator)	Chest Pain, AMI, acute pulmonary edema, angina pectoris, dilation of venous/arterial blood vessels, peripheral resistance venous return to the heart
Nitrous Oxide (Analgesic gas)	Musculoskeletal burn, ischemic chest pain, severe anxiety including hyperventilation
Oral Glucose (Gel)	Hypoglycemia, AMS
Oxygen (Oxidizing agent gas)	Hypoxia, medical/trauma patient to improve RR efficiency
Procainamide Hydrochloride (Antiarrythmics)	VF, Pulseless VT, slows the speed of conduction in the atria and ventricles thereby effectively slowing the heart rate
Sodium Bicarbonate (Alkalizing agent)	Tricyclic anti-depressant overdose, barbiturate overdose, refractory acidosis, hyperkalemia rapidly neutralizes gastric acid or systemic acidosis
Succinycholine (Depolarizing neuromuscular blocker)	Facilitate ET intubation, skeletal muscle relaxant
Thiamine (Vitamin B1 hydrochloride)	Coma of unknown origin, chronic alcoholism associated with coma, delirium tremors to correct anorexia
Vasopressin(Hormone vasopressor antidiuretic)	Increase PVR in cardiac arrest, control bleeding in esophageal varices, increase heart rate and cardiac output, increase pulmonary arterial pressure and BP

CMEs Training

ACLS Scenarios

Study the algorithms and drugs in the ECC Handbook.

The following are "typical scenarios within the ACLS Course

1. Respiratory arrest case
    a. The skills listed within the study guide will be practices in most case scenarios.
2. VF treated with CPR and AED case scenarios
    a. Assess:
        i. Tap, ask: "are you ok?"
        ii. No movement or response, call 911 and get an AED! Or if a second rescuer is present, send them to call 911 and get an AED
    b. Primary CAB
        i. Begin CPR if a pulse is not detected within 5-10 seconds
        ii. Push fast: 100 compressions per minute
        iii. Allow the chest wall to completely recoil (take weight off hands)
        iv. 30 compressions; 2 ventilations = 1 cycle
        v. Push hard: 2 inches deep
        vi. Minimize interruptions no more than 10 seconds
    c. Recheck pulse after 5 cycles of CPR (approximately 2 minutes)
    d. 2-rescuer CPR, basic airway, pause compressions to ventilate
    e. Secondary ABCD Survey:
        i. Airway: Open and hold (head-tilt / Chin-lift or jaw thrust), look, listen and feel
            1. Avoid rapid or forceful breaths
        ii. Breathing: Give 2 breaths (1 second each) that makes the chest rise
            1. Avoid rapid or forceful breaths
        iii. Circulation: Check carotid pulse – at least 5 seconds but no longer than 10 seconds
            1. Recheck pulse after 5 cycles of CPR (approximately 2 minutes)

2. 2 rescuer CPR, basic airway, pause compressions to ventilate

iv. Differential Diagnosis

6 H's	6 T's
Hypoxia Hypovolemia Hypothermia Hypo/Hyperkalemia Hydrogen Ion (acidosis)	Tamponade Tension Pneumothorax Toxins-poisons, drugs Thrombosis-coronary (AMI) –Pulmonary (PE)

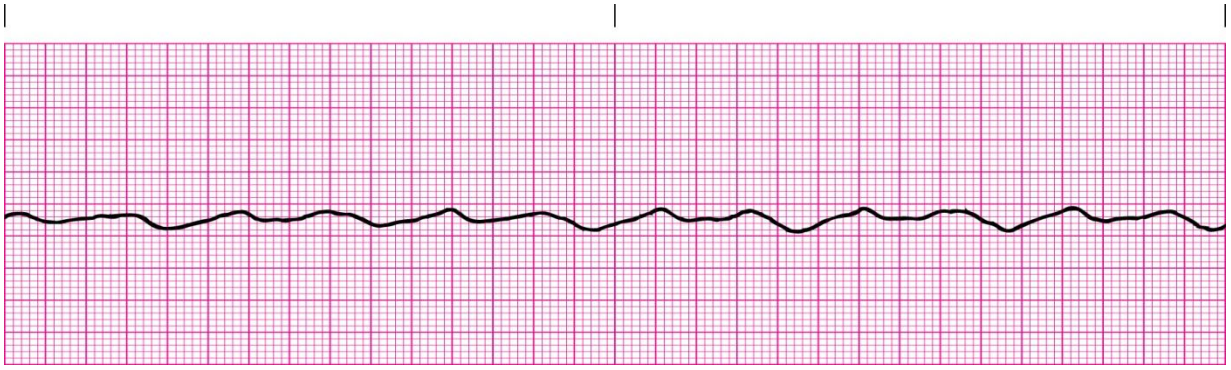
Unacceptable actions:

1. Did not provide effective CPR
2. Did not follow AED commands
3. Did not clear patient before shock (unsafe defibrillation)

CMEs Training

Case 1

You respond to a patient's monitor alarm, to find the patient is unresponsive. You call for help and begin CPR (CAB). A team member arrives with the crash cart, which has a manual defibrillator and advanced airway equipment. The patient is attached to the monitor and you identify the following rhythm:



Primary D: Defibrillation – Shock #1

- After verifying the rhythm, resume CPR while the defibrillator is charging
- Once charged: "CLEAR" ensure no one is touching the patient or bed
- Give 1 shock: Biphasic defibrillation = Mfg recommendation, if unknown 200j
  Monophasic defibrillators = 360j
- Immediately resume CPR for 5 cycles
- After 5 cycles: check rhythm (shockable?) check a pulse 5-10 seconds

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Secondary ABCD's survey: conducted between 1st and 2nd shock is ongoing

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Airway

- BLS Airway as long as good chest rise and fall
- Consider advanced airway placement: LMA, King tube or ETT

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Breathing

- Check for visible chest rise with BVM
- Confirm advanced airway placement by exam and confirmation device
- Secure advanced airway in place with tape or commercial device
- Give 8-10 breaths/min and continuous compressions at 100 per minute

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Circulation

- Establish vascular access via IV or IO
- Do not interrupt CPR for access

⇩

Differential Diagnosis – Use the H's and T's mnemonic

Defibrillation: Shock #2

- After 5 cycles of CPR: check rhythm (shockable) check pulse 5-10 seconds
- Resume CPR while defibrillator is charging
- Once charged: "CLEAR" ensure no one is touching the patient or bed
- Give 1 shock: Biphasic defibrillation = Mfg recommendation, if unknown 200j
  Monophasic defibrillators = 360j
- Immediately resume CPR for 5 cycles

⇩

Medications:

- Administer either; Given during CPR only
- Epinephrine 1 mg IV/IO (every 3-5 minutes) or
- Vasopressin 40 units IV/IO to replace first or second dose of epinephrine

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Defibrillation: Shock #3

- After 5 cycles of CPR, check rhythm (shockable?) check pulse, (5-10 seconds) once charged, "CLEAR" ensure that no one is touching the patient or bed
- Resume CPR for 2 minutes

⇩

Defibrillation: Shock #4

- Biphasic defibrillators = Mfg recommendation, if unknown 200j, monophasic defibrillators = 360j
- Immediately resume CPR for 2 minutes

⇩

Medications:

- Consider antiarrythmic: give during CPR
  - Amiodarone 300mg IV/IO once, then consider 150 mg IV/IO once
  - Magnesium Sulfate 1-2 g IV/IO loading dose for Torsades de Pointes

Unacceptable Actions

- Did not provide effective CPR
- Did not clear before shock
- Did not confirm advanced airway placement
- Did not give a vasopressor

YOU JUST TREATED VENTRICULAR FIBRILLLATION!!!

**Same algorithm would apply for pulseless Ventricular Tachycardia

CMEs Training

Case 2

You find a patient is unresponsive. You call for help and begin CPR (primary ABC/CAB survey). A team member arrives with the crash cart, which has a manual defibrillator and advanced equipment. The patient is attached to the monitor and you see the following

Primary CAB
Defibrillation: No shock advised
Secondary ABCD Survey: Ongoing

⇩

Airway

- BVM with 100% O2
- Consider advanced airway placement: LMA, combi-tube. Or ETT

⇩

Breathing

- Confirm for visible chest rise with BVM
- Confirm advanced airway placement by exam and confirmation device
- Secure advanced airway in place with tape or a commercial device
- Provide 8-10 breaths/minute and continuous compression at 100 per minute

⇩

Circulation

- Establish vascular access via IV or IO
- Do not interrupt CPR for access

⇩

Medication

- Give a vasopressor
  - Epinephrine 1 mg IV/IO (repeat every 3-5 minutes)
  - Vasopressin 40 units IV/IO can replace first or second dose of epinephrine

⇩

Check Rhythm

- Check pulse after 2 minutes of CPR (5 cycles)

⇩

Differential Diagnosis – Use the H's and T's mnemonic

6 H's	6 T's
Hypoxia Hypovolemia Hypothermia Hypo/Hyperkalemia Hydrogen Ion (acidosis)	Tamponade Tension Pneumothorax Toxins-poisons, drugs Thrombosis-coronary (AMI) –Pulmonary (PE)

Unacceptable actions:

1. Did not provide effective CPR
2. Did not confirm advanced airway placement
3. Did not provide a vasopressor
4. Did not look for possible causes to treat
5. Attempted defibrillation
6. Attempted transcutaneous pacing

YOU JUST TREATED PEA!!

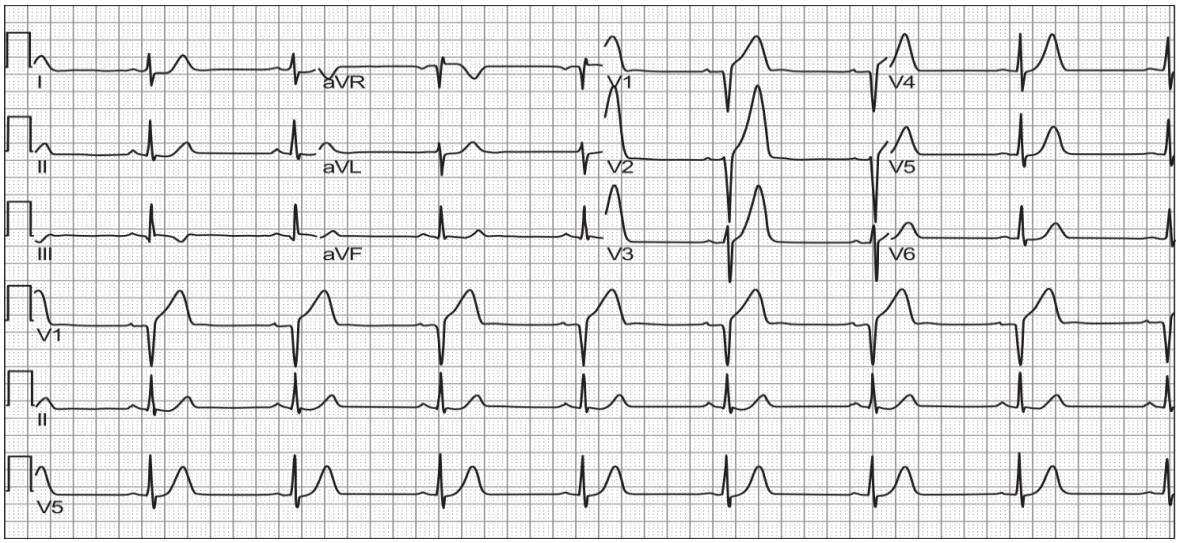
CMEs Training

Acute Coronary Syndromes (ACS) Case

Your neighbor calls and is complaining of feeling weak and dizzy. He is sweaty, short of breath and is nauseated. You are worried that he may be experiencing an AMI and you call 911. While waiting for fire rescue to arrive, you ask him if he can take aspirin, he says yes he can and you have him chew 2-4 baby aspirin 81 mg each.

Fire Rescue/EMS arrival:

- Attach monitor
- Start IV
- Start MONA
- Obtain 12-lead ECG



- Notify Hospital (STEMI ALERT)
- Transport
- Begin Fibrinolytic checklist
- Arrival at Emergency Department

12 lead Assessments

ST Segment Elevation (STEMI)	ST Segment Depression (Non-STEMI or NSTEMI)	ST Segment – T Wave Normal
Injury/Diagnostic	**Ischemia**	**Non Ischemic**
Drug Therapy ❖ Beta Blocker ❖ Clopidogrel (decreases platelet clumping ❖ Heparin (no new clot formation)	**Drug Therapy** ❖ NTG decreases work load ❖ Beta Blockers ❖ Copidogrel ❖ Heparin ❖ IIb/IIa inhibitors	**Consider admit** ❖ Serial enzymes + ❖ Troponin ❖ ECC handbook page 37 ❖ Repeat ECG ❖ Monitor ST segment ❖ Consider Stress Test
Goal is reperfusion by: ❖ Fibrinolytic: lyses fibrin ❖ If <12 hours from onset, if no contraindications ED door to drug >= 30 min PCI Percutaneous Interventional Angioplasty and/or Stint ❖ If > 12 hours from onset after reperfusion give ACE Inhibitor/Statin	**Goal is revascularization** ❖ PCI or possible surgery After Revascularization: ❖ Resume above drugs as needed ❖ ACE Inhibitor/Statin	**Admit to hospital if:** ❖ Troponin + ❖ ST segment deviates ❖ Refractory chest pain ❖ Ventricular Tachycardia Discharge if: ✦ No ischemia or injury evolves

CMEs Training

Stroke

Identify signs or possible stroke

- Critical EMS assessments and actions
- Support ABC's (provide oxygen if needed)
- Perform pre-hospital stroke assessment
- Cincinnati pre-hospital stroke scale
    - Facial droop (smile show teeth)
    - Arm drift (patient closes eyes and extends both arms with palms up and holds for 10 sec
    - Abnormal speech

Also consider the Los Angeles pre hospital stroke scale

- Establish onset of symptom time frame
- Transport – consider stroke center
- Notify receiving hospital
- Check glucose

ED arrival: Immediate general assessment and stabilization <10 minutes

- Assess ABC's vital signs
- Provide oxygen if hypoxemic
- Obtain IV access and blood samples
- Check glucose: treat if indicated
- Perform neurological screening assessment
- Activate stroke team
- Order emergent non-contrast CT scan of the brain
- Obtain 12-lead ECG

ED arrival: Immediate neurological assessment by stroke team < 25 minutes

- Review patient history
- Establish symptom onset
- Perform neurological examination (NIH Stroke Scale)

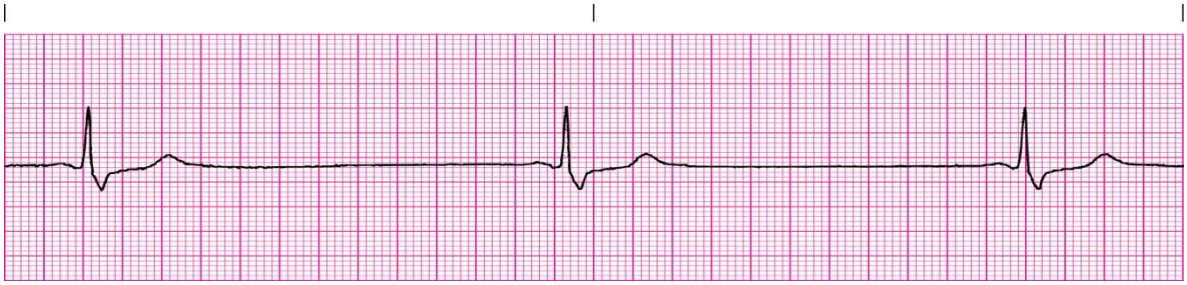
Does CT scan show any hemorrhage? <45 minutes

- Hemorrhage – consult neurosurgeon, consider transfer
- No hemorrhage
- Probable acute ischemic stroke, consider fibrinolytic therapy
- Check for fibrinolytic exclusions ECC handbook p. 20
- Repeat neurological exam, are deficits rapidly improving
- Patient remains candidate for fibrinolytic therapy
- Not a candidate
- Administer aspirin
- Candidate < 60 minutes
- Review risks/benefit with patient and family
- If acceptable – give TPA
- No anticoagulants or antiplatelet treatment for 24 hours

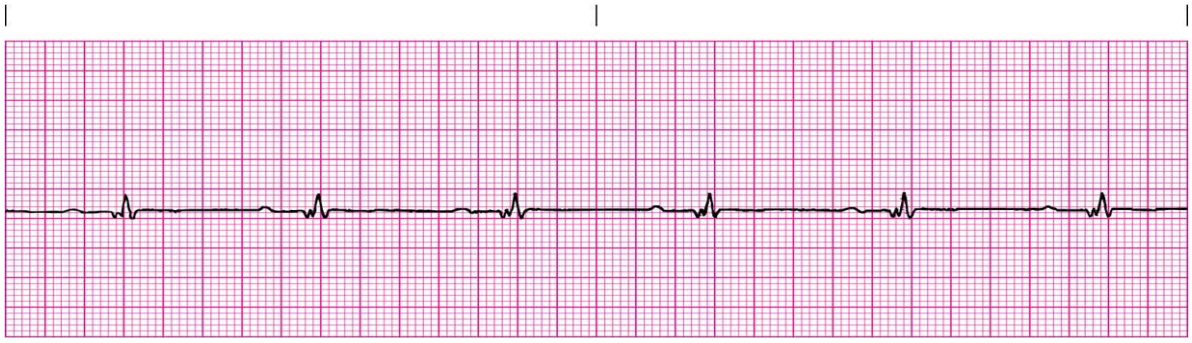
CMEs Training

ECG BASICS

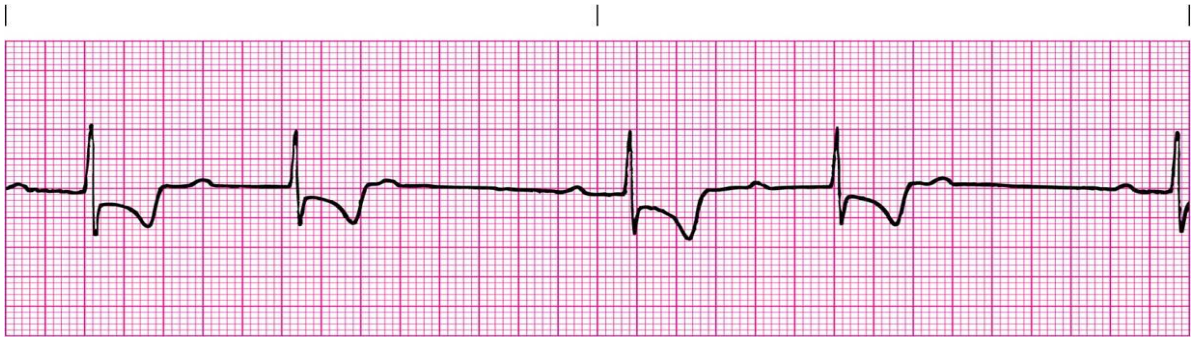
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Normal Sinus Rhythm	Upright P wave, narrow QRS complex, rate of 60-100 bpm	N/A Treat the patient	IV, O2, reassess, Treat the symptoms	N/A



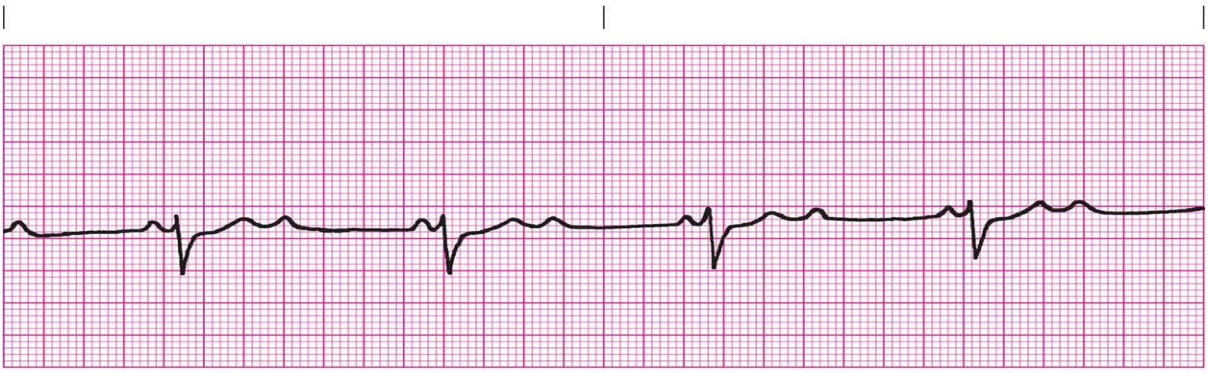
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Sinus Bradycardia	Upright P wave, narrow QRS complex, rate is < 60bpm	Bradycardia Treat the patient	Atropine	Pacing



Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
1st degree Heart Block	Prolonged P-R interval (>.20 seconds), rate usually less than 60 bpm	Bradycardia	Atropine	Pacing

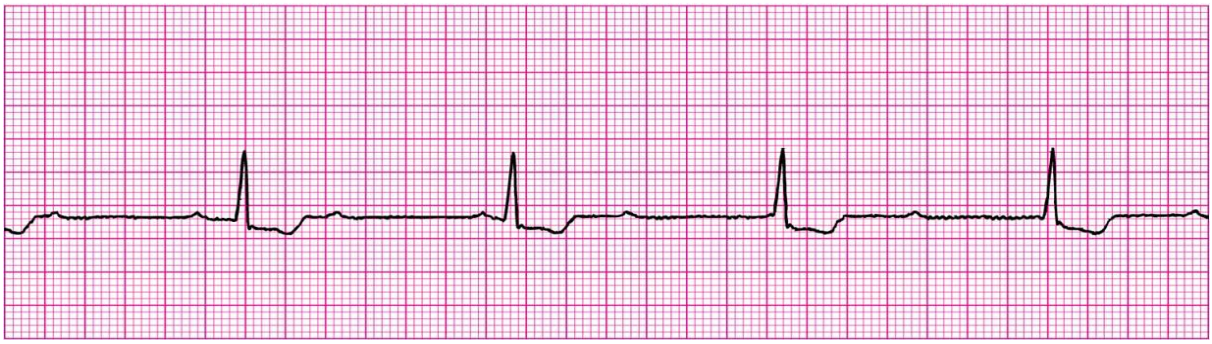


Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
2nd degree Type 1Heart Block (Wenckebach)	Lengthening of P-R interval followed by a dropped QRS (longer, longer, longer drop), rate <60 bpm	Bradycardia		Pacing

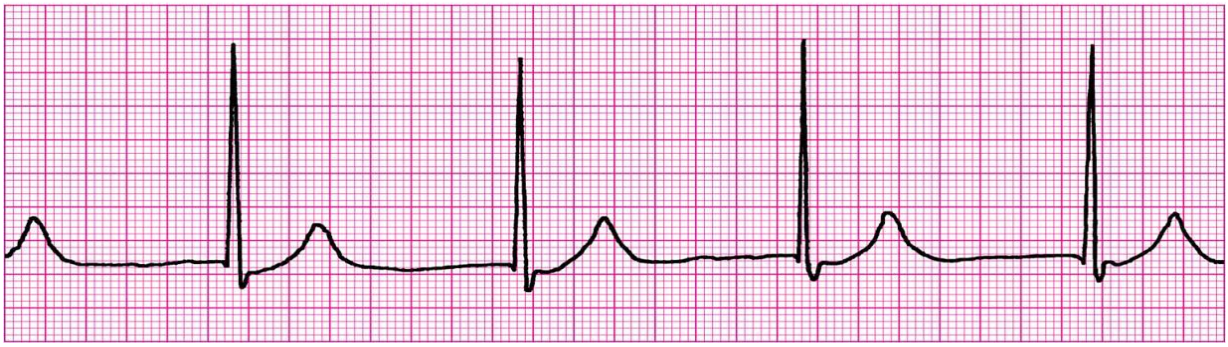


Type II Second Degree Heart Block

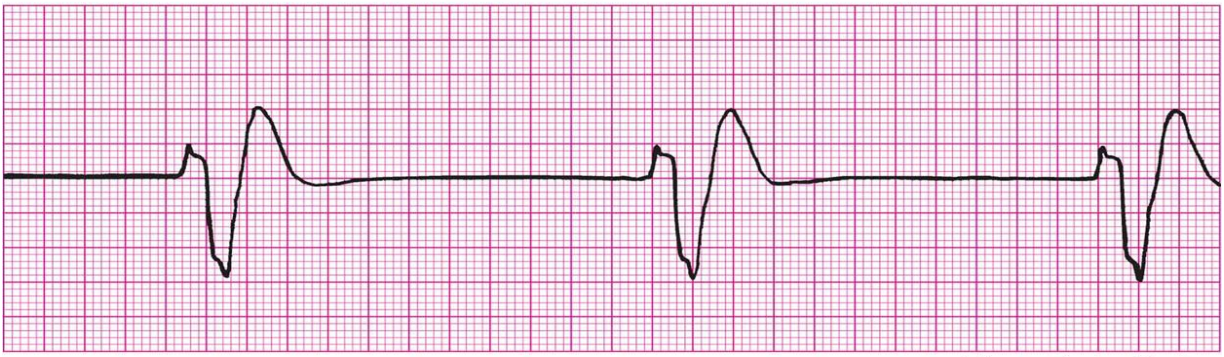
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
2nd degree Type 2Heart Block	P-R intervals do not change, but not every P wave has a corresponding QRS, rate < 60bpm	Bradycardia	Pace, Dopamine	Pacing



Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
3rd Degree	P waves and QRS complexes are not associated with each other, rate < 60bpm	Bradycardia	Pace, Dopamine	Pacing

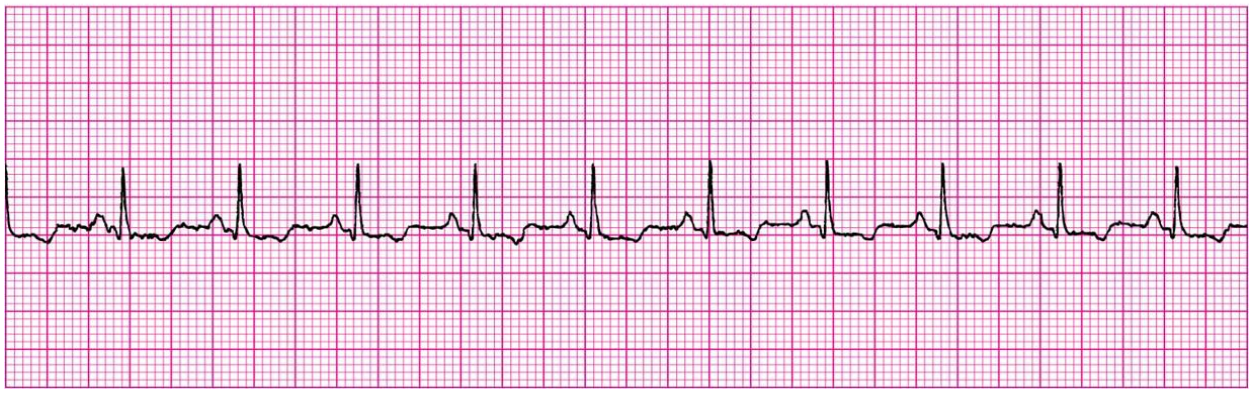


Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Junctional Rhythm	Inverted or absent P waves , rate 40-60 bpm	Bradycardia	Pacemaker	Pacing

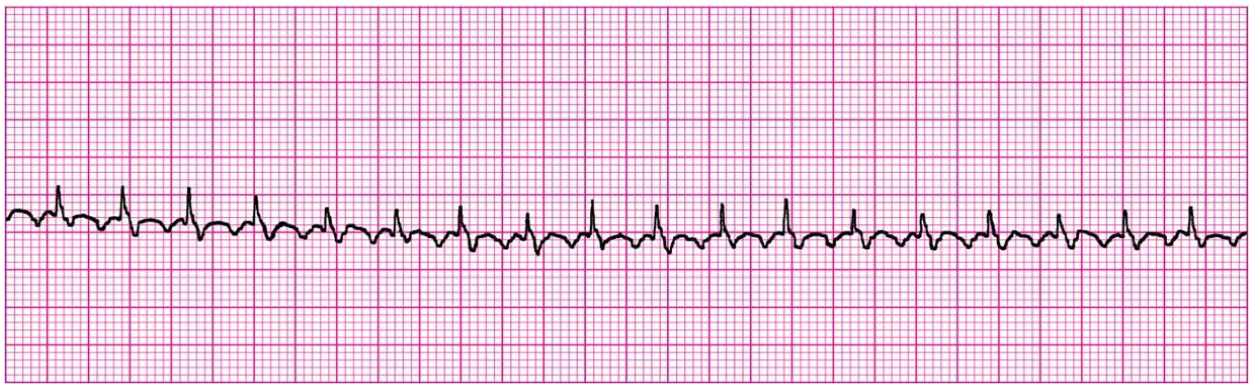


Idioventricular Rhythm

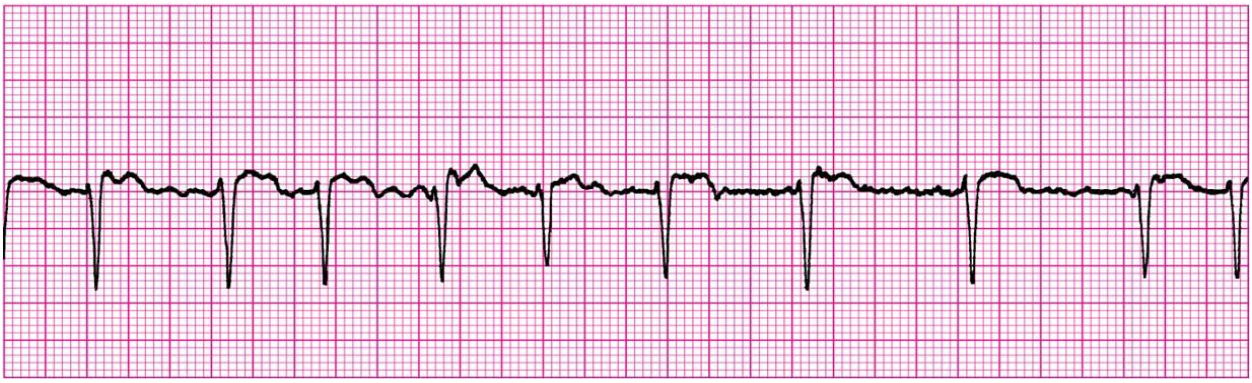
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Idioventricular	Wide QRS complex rate 20-40 bpm	Bradycardia	Pacemaker	Pacing



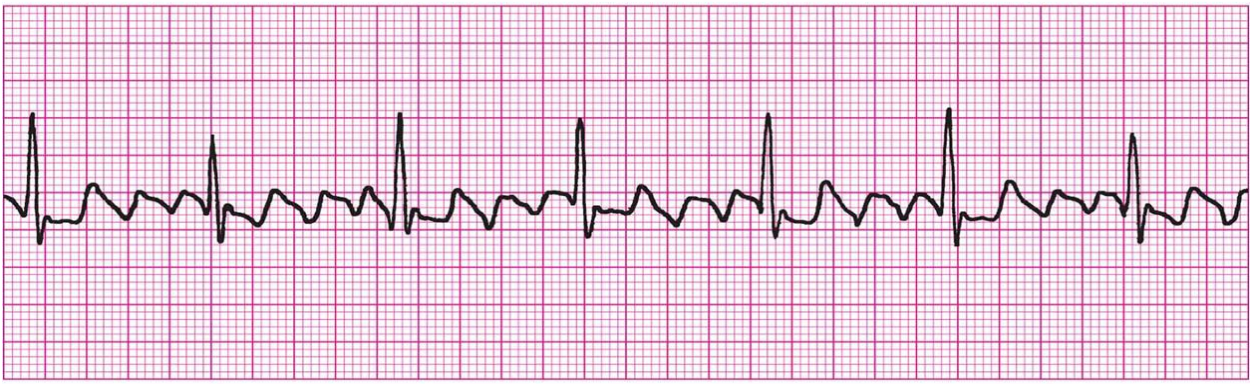
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Sinus Tachycardia	Upright P waves, narrow QRS complex, Rate is 101-149 bpm	Narrow Complex Tachycardia	IV, O2, Reassess, Transport. Treat the symptoms	N/A



Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Atrial tachycardia SVT	Rate usually 150-250 bpm, very narrow QRS, P waves are present but embedded in previous complex	Narrow Complex Tachycardia	Vagal maneuver, Adenosine, Diltiazem, Amiodarone	Synchronized Cardioversion

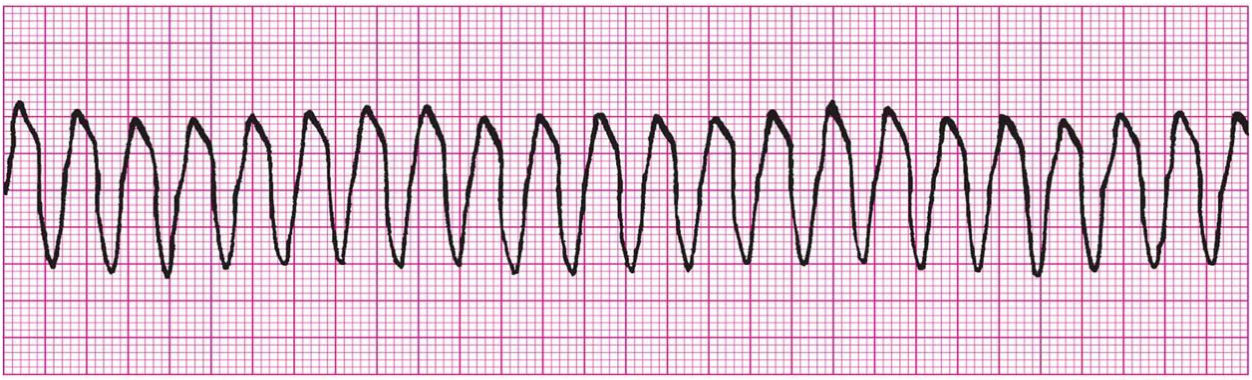


Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Atrial Fibrillation	Irregularly, Irregular, rate can be > 150 bpm	Narrow Complex Tachycardia	Diltiazem, Amiodarone, Beta-Blocker, Adenosine	Synchronized Cardioversion



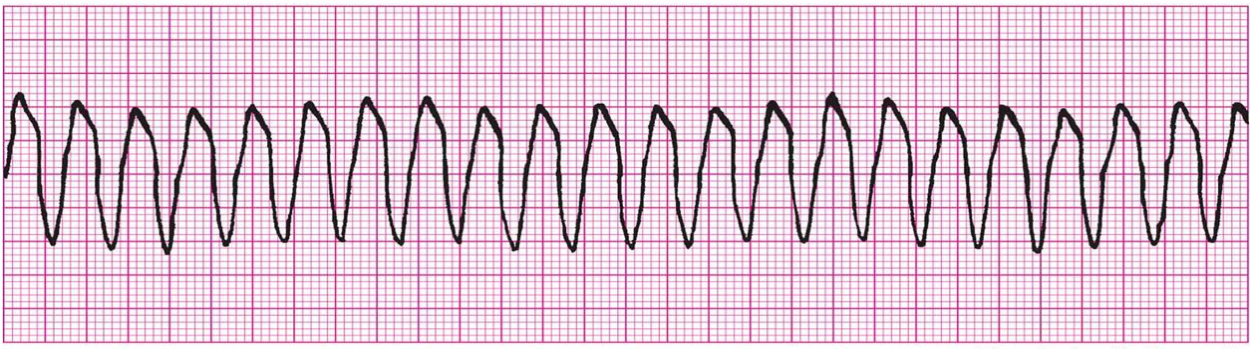
Atrial Flutter

Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Atrial Flutter	Identified by saw-tooth baseline, rate can be > 150 bpm	Narrow Complex Tachycardia	Diltiazem, Amiodarone, Beta-Blocker,	Synchronized Cardioversion



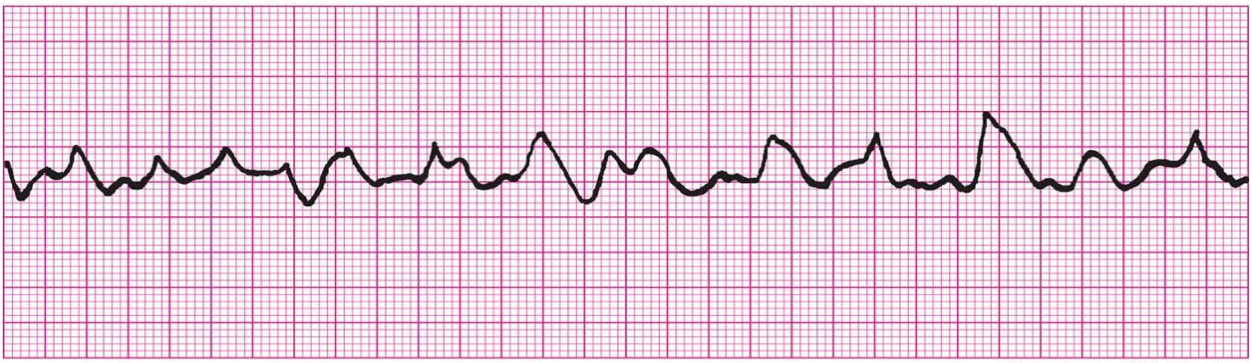
Ventricular Tachycardia

Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Ventricular Tachycardia W/ pulse	Wide QRS complex, rate is fast > 150 bpm	Wide Complex Tachycardia	Amiodarone, Lidocaine, magnesium Sulfate Procainamide (PALM)	Synchronized Cardioversion



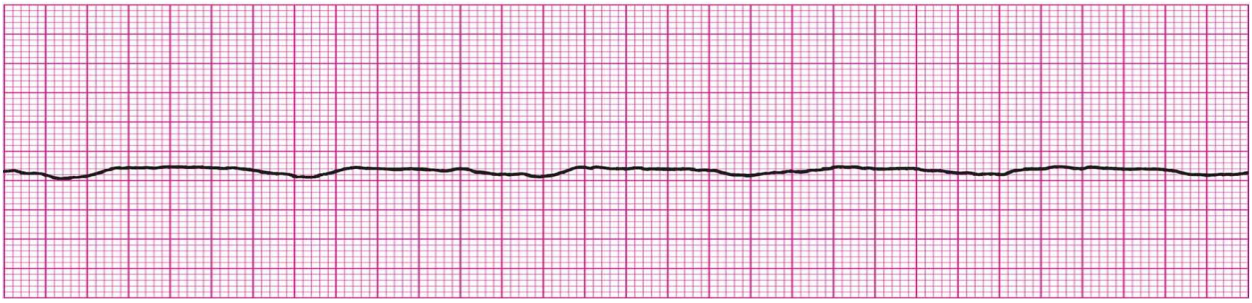
Ventricular Tachycardia

Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Ventricular Tachycardia pulseless	Wide QRS complex, rate is fast > 150 bpm, no pulse	Ventricular Fibrillation/ Pulseless V-Tach	Epi 1:10,000 or vasopressin then (PALM), consider sodium bicarb, D50, calcium chloride, narcan etc	CPR/ Defibrillation



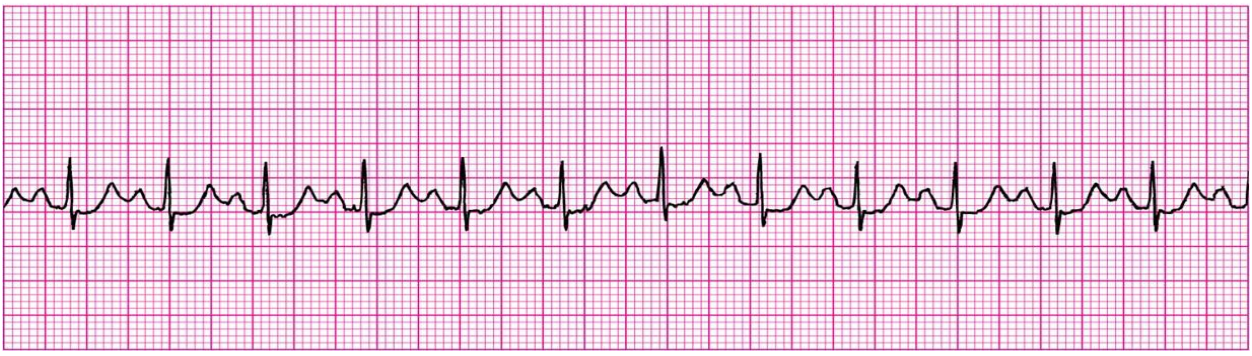
Ventricular Fibrillation

Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Ventricular Fibrillation	Chaotic in nature, height of rhythm > 3mm, no rhyme or reason	Ventricular Fibrillation/ Pulseless V-Tach	Epi 1:10,000 or vasopressin then (PALM), consider sodium bicarb, D50, calcium chloride, narcan etc	CPR/ Defibrillation



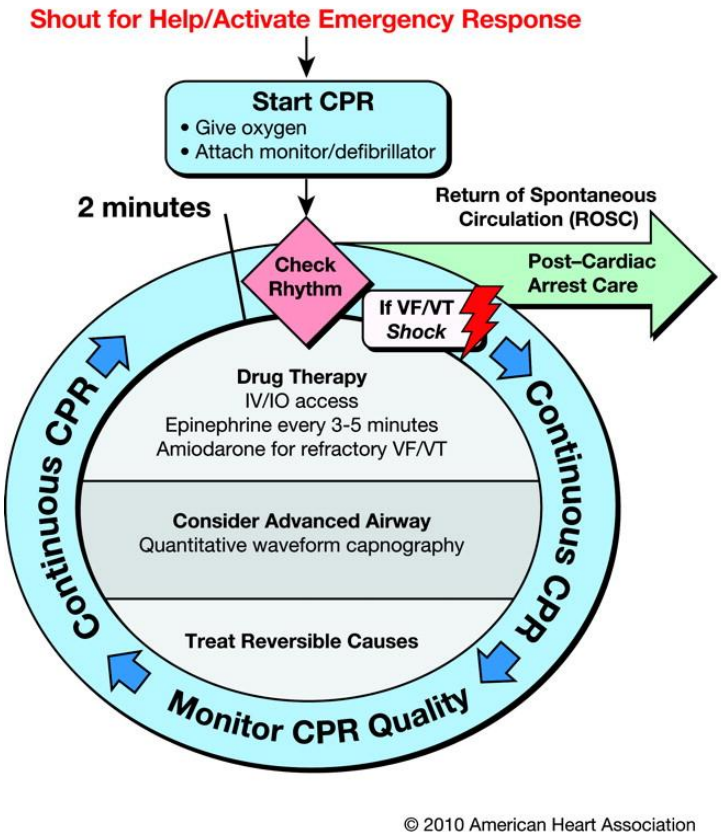
Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
Asystole	Flat rhythm, confirm in 2 leads	Asystole	Epi 1:10,000	CPR

Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
PEA (slow)	Rate < 60 bpm, shows electrical activity on monitor but Pt. has no pulse	PEA	Epi 1:10,000, Narcan, D50, Sodium Bicarbonate	CPR



Rhythm	Properties	Algorithm	Treatment	Electrical Therapy
PEA (fast)	Rate < 60 bpm, shows electrical activity on monitor but Pt. has no pulse	PEA	Epi 1:10,000, Narcan, D50, Sodium Bicarbonate	CPR

Adult Cardiac Arrest



CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

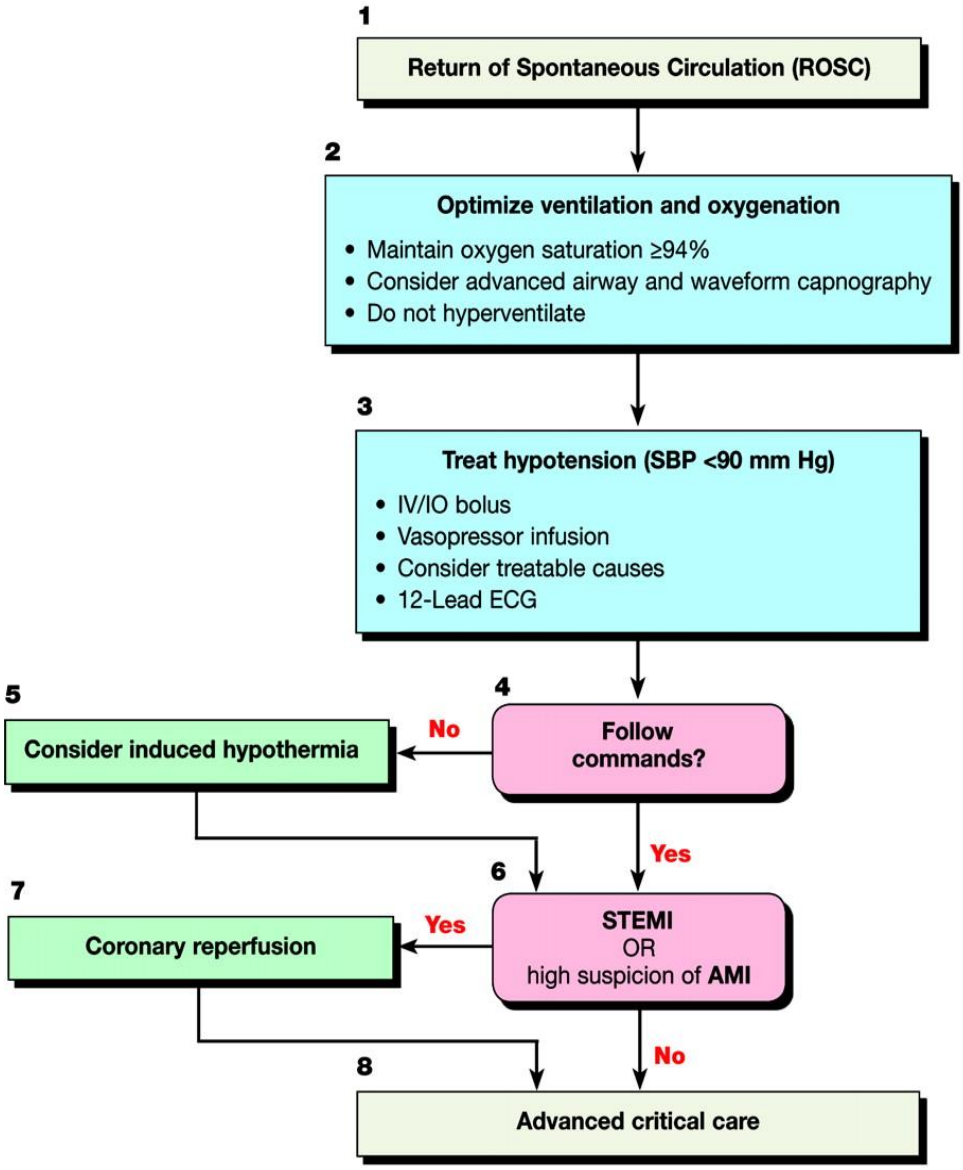
Shock Energy
- **Biphasic:** Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy
- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

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 Immediate Post–Cardiac Arrest Care



Doses/Details

Ventilation/Oxygenation
Avoid excessive ventilation. Start at 10-12 breaths/min and titrate to target P_{ETCO_2} of 35-40 mm Hg.
When feasible, titrate F_{IO_2} to minimum necessary to achieve Sp_{O_2} ≥94%.

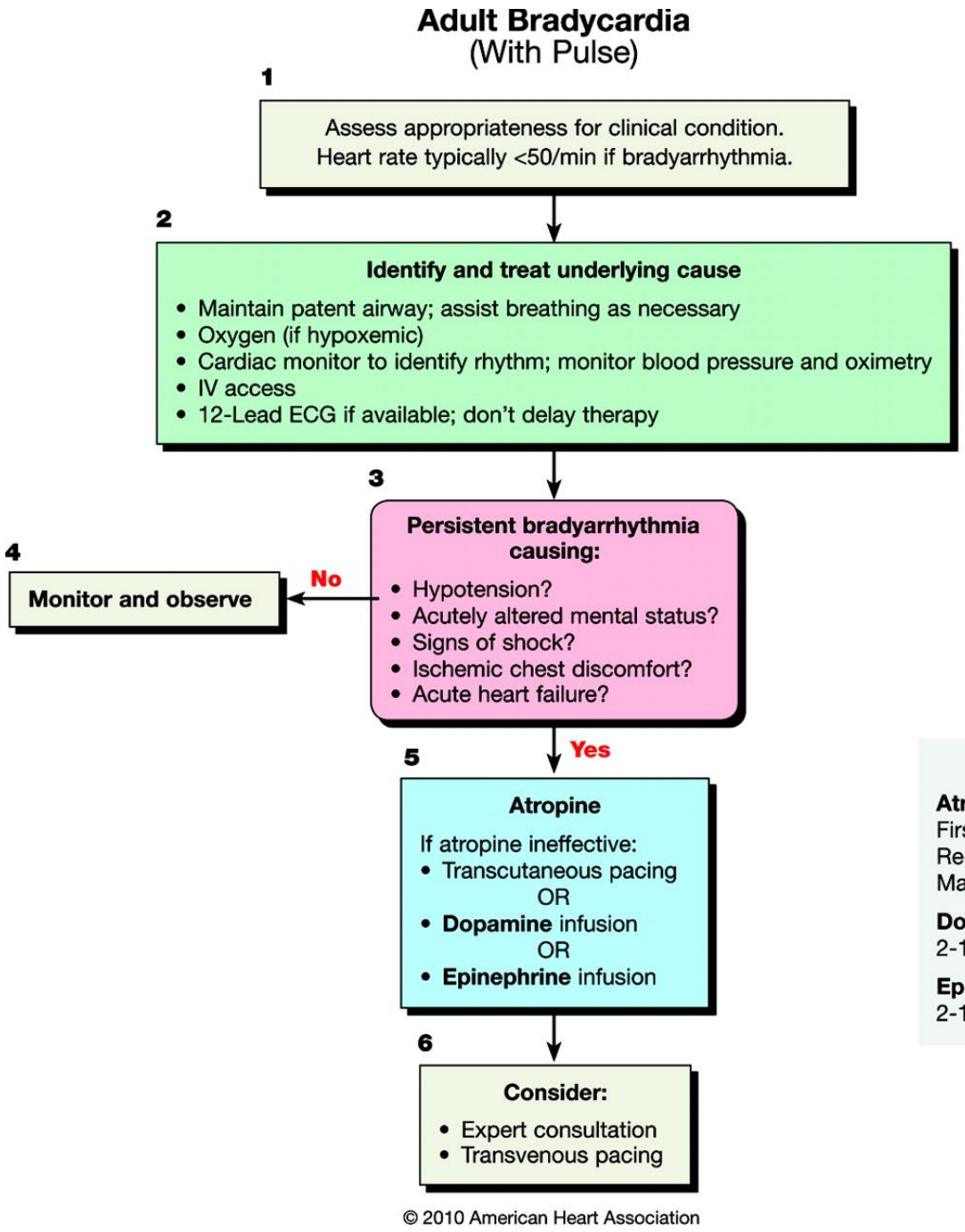
IV Bolus
1-2 L normal saline or lactated Ringer's.
If inducing hypothermia, may use 4°C fluid.

Epinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV Infusion:
5-10 mcg/kg per minute

Norepinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

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

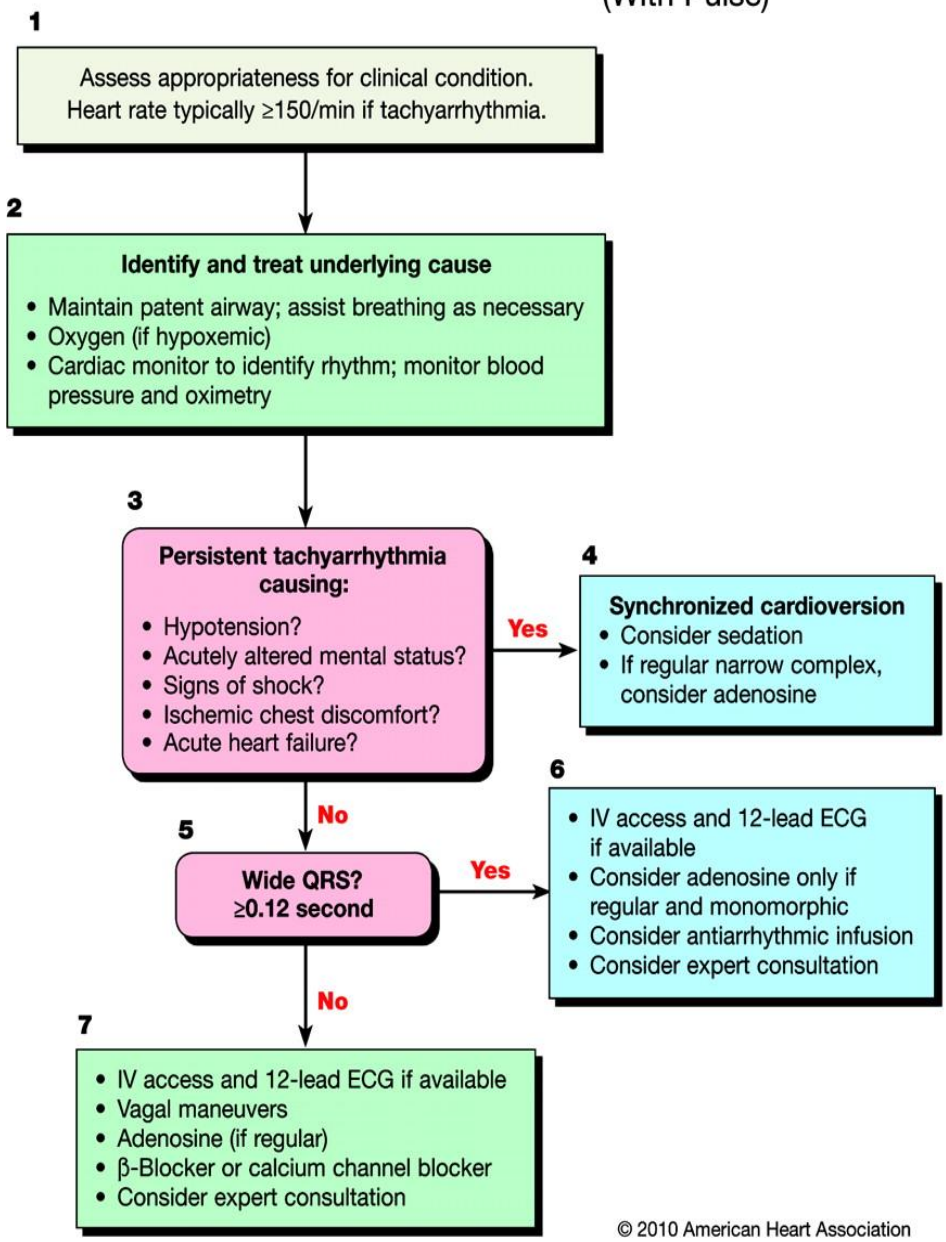


Doses/Details

Atropine IV Dose:
First dose: 0.5 mg bolus
Repeat every 3-5 minutes
Maximum: 3 mg

Dopamine IV Infusion:
2-10 mcg/kg per minute

Epinephrine IV Infusion:
2-10 mcg per minute



Doses/Details

Synchronized Cardioversion
Initial recommended doses:
- 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)

Adenosine IV Dose:
First dose: 6 mg rapid IV push; follow with NS flush.
Second dose: 12 mg if required.

Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

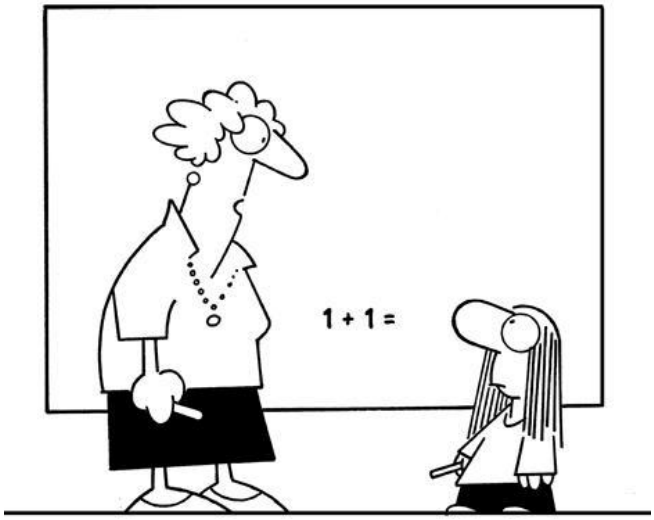
Procainamide IV Dose:
20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given. Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

Amiodarone IV Dose:
First dose: 150 mg over 10 minutes. Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min for first 6 hours.

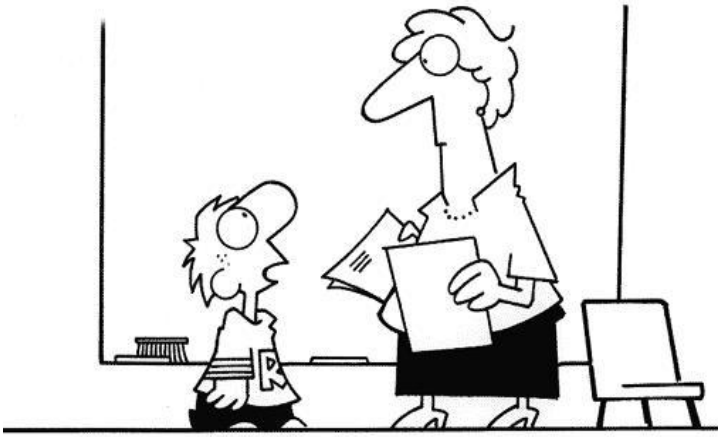
Sotalol IV Dose:
100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

CMEs Training

OH NO!!! HERE COMES THE MATH!!



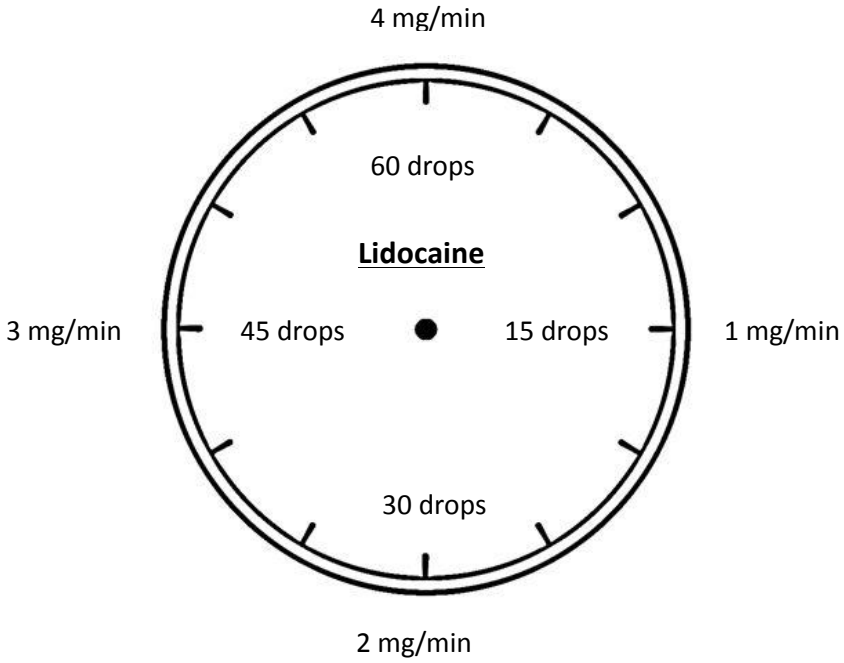
"Yes, this will be useful to you later in life."



"I couldn't do my homework because my computer has a virus and so do all my pencils and pens."

CMEs Training

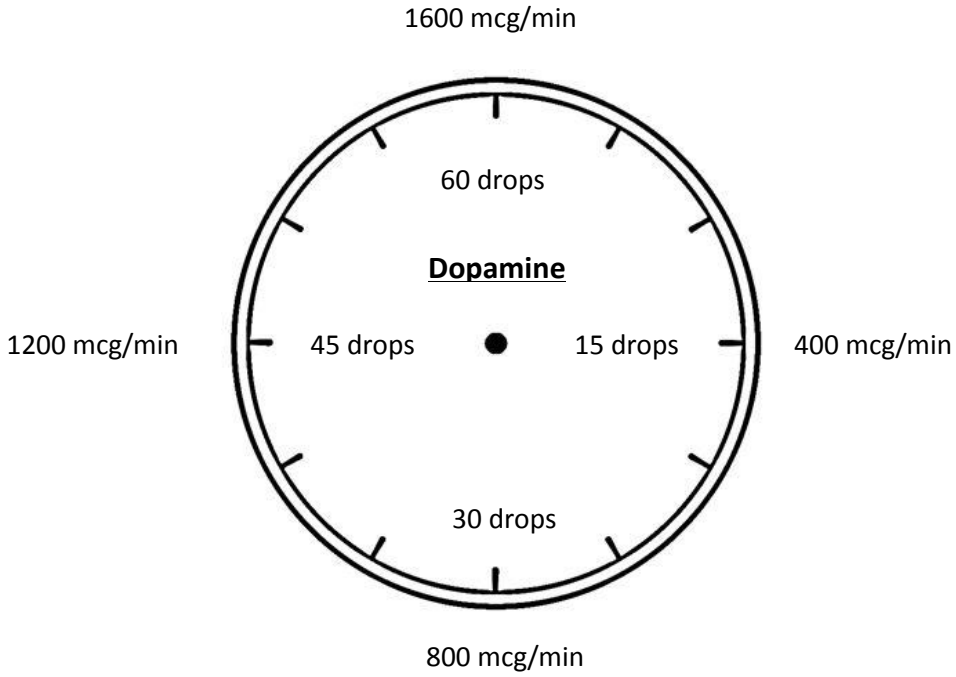
Common Cardiac IV Infusions



Mix 2 grams in 500 cc of saline

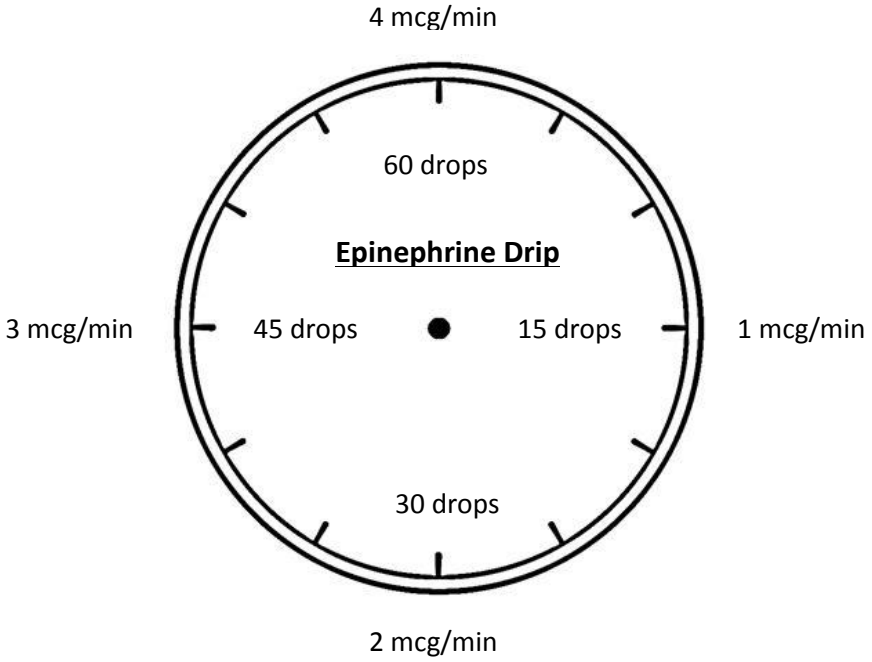
Concentration will be 4mg/ml

1 mg/min = 15gtts/min
2 mg/min = 30gtts/min
3 mg/min = 45gtts/min
4 mg/min = 60gtts/min



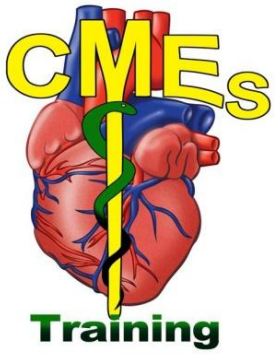
Mix 800 mg in 500 cc of saline
Concentration will be 1600 mcg/ml

400 mcg/min = 15gtts/min
800 mcg/min = 30gtts/min
1200 mcg/min = 45gtts/min
1600 mcg/min = 60gtts/min



Mix 2 mg in 500 cc of saline
Concentration will be 4mcg/ml

1 mcg/min = 15gtts/min
2 mcg/min = 30gtts/min
3 mcg/min = 45gtts/min
4 mcg/min = 60gtts/min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IV Drip Calculations

1. Calculating a primary line drip rate – NOT on an IV pump

$$\frac{V \times T}{T} = \frac{\text{Volume to be infused (not on hand) X drip rate of tubing}}{\text{Time (in minutes) to be infused}}$$

$$= \text{Gtt/minute}$$

2. Calculating a piggy back secondary line drip rate – NOT on an IV pump

$$\frac{V \times T \times Kg \times gtt}{C} = \text{Gtts/min}$$

$$\frac{\text{Volume on hand (not to be infused) X Dose ordered (gm, mg, mcg) X Kilograms (convert lbs) X Drip rate of tubing}}{\text{Concentration of drug on hand}}$$

   a. Converting pounds to kilograms
      a. Divide by 2.2 or 184 lbs / 2 = 92 subtract 10% = 83
      b. Make sure all drug equivalents are similar (Kg….gm….mg….mcg)