PALS PROVIDER
Study Guide/Handout

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PLEASE NOTE: We cannot issue participant eCards until receipt of payment (large employers may take up to 30 days to make payment) so don't expect your eCard immediately. When payment has been received, you will get an email from the AHA to claim your eCard.

*source: American Heart Association PALS Provider Manual supplementary material
http://www.heart.org/idc/groups/heart-public/@wcm/@ecc/documents/downloadable/ucm_436697.pdf

You are registered for **American Heart Association** training with **Heartland CPR**. All participants must provide a functioning email (that can be accessed from your device) and cell number upon arrival, which will be needed for both digital tests and claiming AHA course completion eCards.

You must provide a copy of current, unexpired AHA cards to take this course!

- BLS Provider is a prerequisite for *both* full & refresher ACLS and PALS classes
- ACLS Provider is a prerequisite for ACLS-R *refresher*
- PALS Provider is a prerequisite for PALS-R *refresher*

These can be uploaded through the "confirm preferences" button in your reservation or emailed to us at contact@HeartlandCPR.com prior to class; if unable to do either of those methods, you may show your valid unexpired AHA card(s) at class by emailing directly to your instructor at instructor@HearlandCPR.com, but please note that if that is invalid or unavailable, you will not be allowed to attend class per AHA rules. We strive to spot those issues in advance to rectify whenever possible so uploading/emailing in advance gives us that opportunity to assist.

Take this pretest prior to class!
Please print the completion certificate and bring it to class with you; alternately, you may email to us at contact@HeartlandCPR.com prior to your class. AHA guidelines require a score of >70% to attend the class (unlimited attempts allowed). You must be signed in to your AHA account to access and use these links without having to purchase.

- **ACLS:** https://elearning.heart.org/course/1551
- **PALS:** https://elearning.heart.org/course/1538

Bring your textbook/ebook and smart phone/device to class with you!
Written tests are now administered digitally, so make sure to maintain a charge on your phone, tablet, or laptop. Additionally, it will save you time to create your online account prior to arrival using the email you provide us at https://elearning.heart.org.

Prepare for class with our study guide
Unlike BLS training, ACLS and PALS require *significant pre-study* and success should not be expected without it. The AHA recommends at least a week with your materials and plenty of time set aside; for this reason, many choose to allocate even more time when work schedule or other commitments exist. We have created a helpful study guide to assist in your preparation, which will also be referenced and used as a visual teaching tool at class. *Please print this off and bring to class with you* as well.

- **ACLS:** https://heartlandcpr.com/wp-content/uploads/2026/02/study-guide-ACLS-2025-1.pdf
- **PALS:** https://heartlandcpr.com/wp-content/uploads/2026/02/study-guide-PALS-2025-1.pdf

Post class: You will receive a couple of automated emails with CEUs and other information from **Heartland CPR** in the days following your class. Additionally, once payment has been made (in the event we are awaiting payment from your employer), you will receive an email directly from the AHA email address eCards@Heart.org. This is a link to claim your eCard and will be available by the next business day following training and receipt of payment. Thanks for training with **Heartland CPR**!

Mandatory in class written test:

50 questions. Must be proctored. Passing score is >84% (miss no more than 8), with two attempts allowed. Skills portion must also be passed with competency. AHA has moved to an "open resource" policy in the past few years, meaning you can use your textbook and class notes for testing.

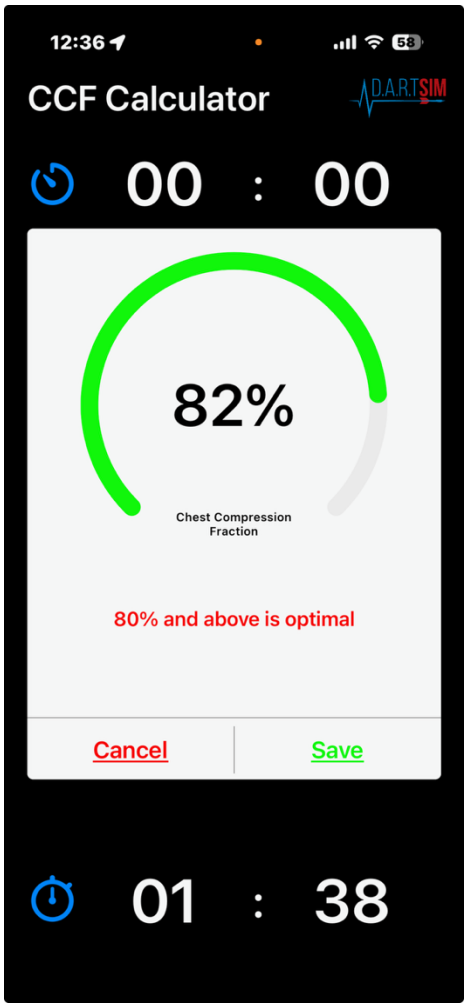
Other information:

You may note that AHA classes are being taught differently than they were years ago. With a focus on **teamwork** and supporting one another. I've attended countless 'codes,' but the one thing they did have in common was the fact that I never took on this task by myself. It would be foolish, plus, we happen to think you should 'play like you practice' and that learning, mastering, and passing the class will be fun, challenging, and not at all like what you've come to expect from a traditional PALS class.

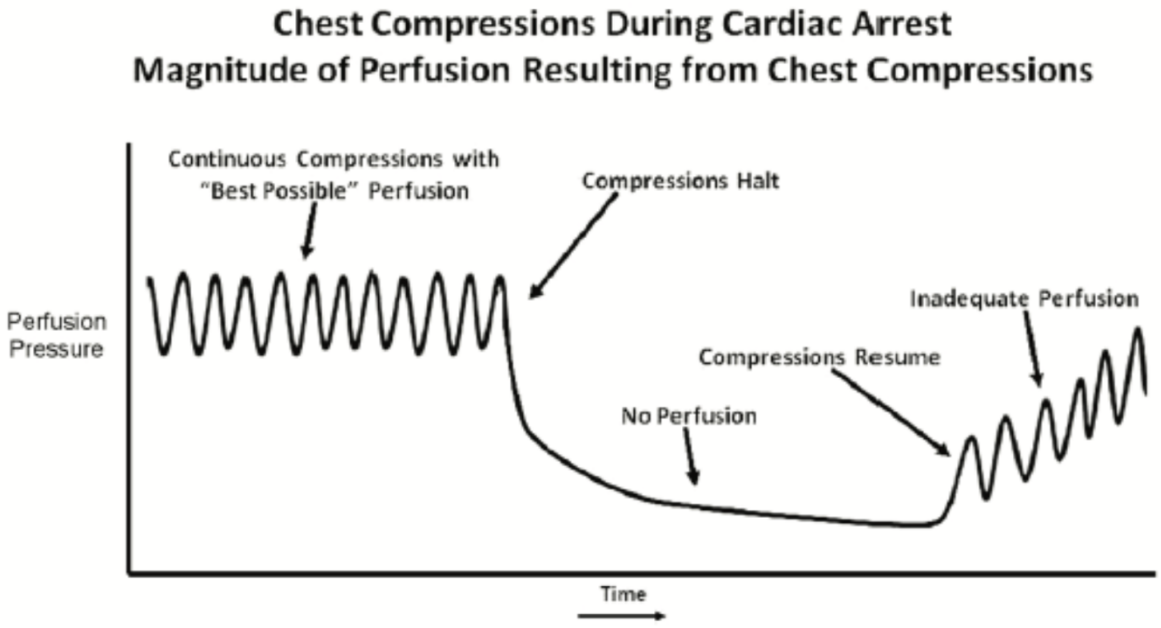
We have developed the following study guide to assist in your preparation for training. Please print it off, use to study, and bring it with you to class.

Chest Compression Fraction (CCF) explained

AHA now requires us to measure and record **CCF (chest compression fraction)** during code practice. *CCF of 80% is ideal and the expectation of high performance teams*. This requires, for example, 96 seconds of every two minute code (96/120) spent on compressions to achieve 80%. We use an app which has a two timers running concurrently with the primary timer defaulting to two minutes while the secondary one starts and stops with the beginning/ending of compression sets. The app returns a score as a percentage.

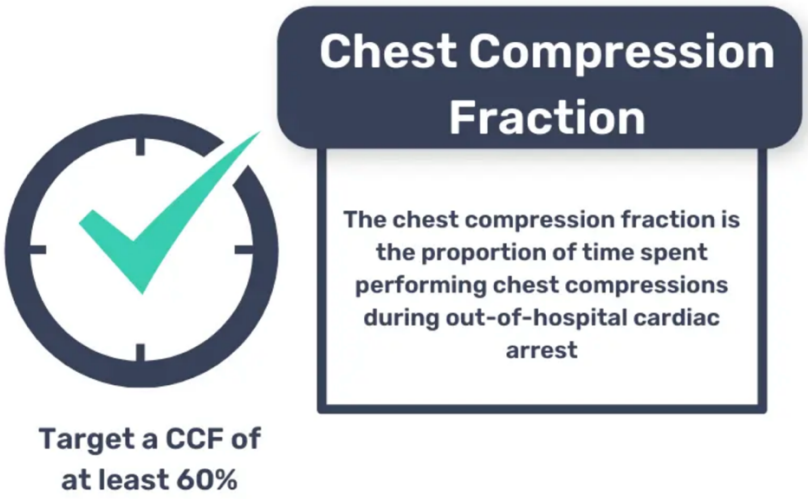


The first graphic shows a two minute countdown clock before beginning the code. As those two minutes counts down and someone is pressing the start/stop button as compressions begin and halt, the bottom times calculates how much of that two minutes was spent on compressions (in this example, 1:38 (or 98 seconds) equates to 82% CCF.



1)

It measures cpr's effectiveness during a cardiac emergency.



2)

1) Figure 1 illustrates the perfusion pressure when ongoing compressions are taking place. About 1/3 of the way through the diagram, note the compressions halt for rescuers to give breaths, perform a pulse check, or administer a shock; this hands-off times allows a drop to "no perfusion" and, even after compressions resume, it takes some time/compressions to get back to adequate perfusion.

2) Figure 2 further explains chest compression fraction (CCF), essentially the time spent perfusing the victim's heart with compressions to achieve adequate pressure/perfusion. Note that the graphic shows the minimum targe of 60%; however, 80% is ideal.

Know your BLS

- Make sure scene is safe
- Tap/shout for responsiveness
- Agonal respirations (is *not* normal breathing)
- Call for help
    - If alone and collapse is witnessed, immediately activate help
    - If alone and not witnessed, do 2 minutes of CPR before activating EMS
- Check pulse and breathing for 5-10 sec
    - PEtCO2. Needs to be > 10 mmHg or optimize compressor
    - Interruptions should be limited to <10 seconds
- Begin CPR
    - Compressions:
        - Place on a firm surface
        - Swap compressors every 2 minutes
        - Compress at least 1/3 depth of the chest
        - Rate of 100-120 beats/min (tune of “Staying Alive”)
        - Allow full chest recoil between compressions
    - Breaths:
        - Each breath should make the chest rise and fall
        - Give breath over one second
        - ½ squeeze of an appropriate BVM
    - Ratios:
        - 30:2 all single rescuer scenarios
        - 15:2 two/multi-rescuer scenarios with pediatric victim
        - ETT asynchronously every 2-3 seconds with continuous compressions

Waveform capnography

- confirmation of advanced airway, effectiveness of compressions, ROSC

OPA (unresponsive w/o a gag), **NPA** placement

- Allow for full exhalation
- Excessive ventilation decreases cardiac output

Effective Team Dynamics

- Clear roles; team lead should delegate tasks
- Know your limitations:
    - Stay in scope of practice or ask for new role if inappropriately assigned
- Constructive criticism (to be addressed immediately if concerning patient care)
- Summarizing and Re-evaluation
- Knowledge sharing
- Closed loop communication
- Mutual respect

Systemic Approach

- Initial impression
    - Rapid assessment done from the doorway
    - Child appearance, work of breath, color, position, skin, etc
- Primary Assessment
    - A, B, C, D, E
- Secondary Assessment
    - Head to toe
    - S.A.M.P.L.E.

PALS Respiratory ailments

- Respiratory emergencies are the most common pediatric emergencies
- Keep child calm to avoid exacerbation if possible, perhaps in caretakers arms
- Mild, moderate, severe; distress vs failure
- Normal SpO2
- range: 94-99%
- Normal ventilation rate for <1yr is 30/minute, >1yr is 25/minute

Upper Airway Obstruction

- i.e. FBAO, croup, anaphylaxis, trauma, epiglottitis
- Inspiratory stridor is common
- Consider nebulized Epi steroids

Lower Airway Obstruction

- i.e. Asthma, Bronchiolitis
- Expiratory wheezes are common
- Bronchodilators, steroids, IV fluids
- Consider CPAP or BiPAP

Lung Tissue Disease

- i.e. Pneumonia
- Crackles often heard
- Hypoxemia despite 02

Disordered Control of Breathing

- Common causes: DKA, Seizures, TBI, OD
- Irregular breathing pattern (patient appears to be breathing “funny”)
- Support oxygenation and ventilation
- Fix underlying problem

IV/IO access

- IV’s are preferred route except in cases of circulatory collapse (shock/cardiac arrest)
- IO’s provide best practice for rapidly achieving vascular access in hemodynamically unstable children requiring rapid fluid or medication administration

PALS Shock

- Shock emergencies are the 2nd most common pediatric emergencies
- Shock is progressive (w/o intervention, it will get worse)
- Compensated shock- ANY type of shock where B/P is acceptable
- Hypotensive shock- ANY type of shock where B/P is unacceptable
    - Acceptable systolic for 1-10 y/o is 70 to 90 + 2(age in yrs)
- With all types of shock, IV fluids alone may not solve the problem; many incidents require IV fluids and an IV pressure infusion
- Connect the dots. If something is working, keep using it unless complications arise

Hypovolemic Shock

- Most common shock worldwide
- Loss of volume due to bleeding, diarrhea, inadequate volume intake
- NS or LR bolus of 20mL/kg over 5-10 minute

Obstructive Shock

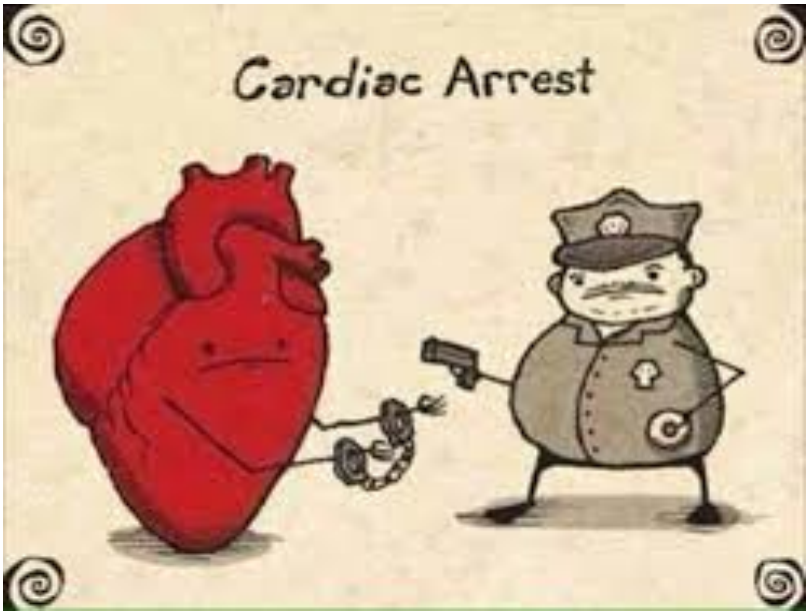
- Fix underlying cause
- i.e. tension pneumo, cardiac tamponade, heart defect

Cardiogenic Shock

- Poor myocardial function
- Edema or other signs of overload
- CPAP? PEEP?
- NS or LR 5-10 mL/kg over 10-20 minutes

Distributive Shock

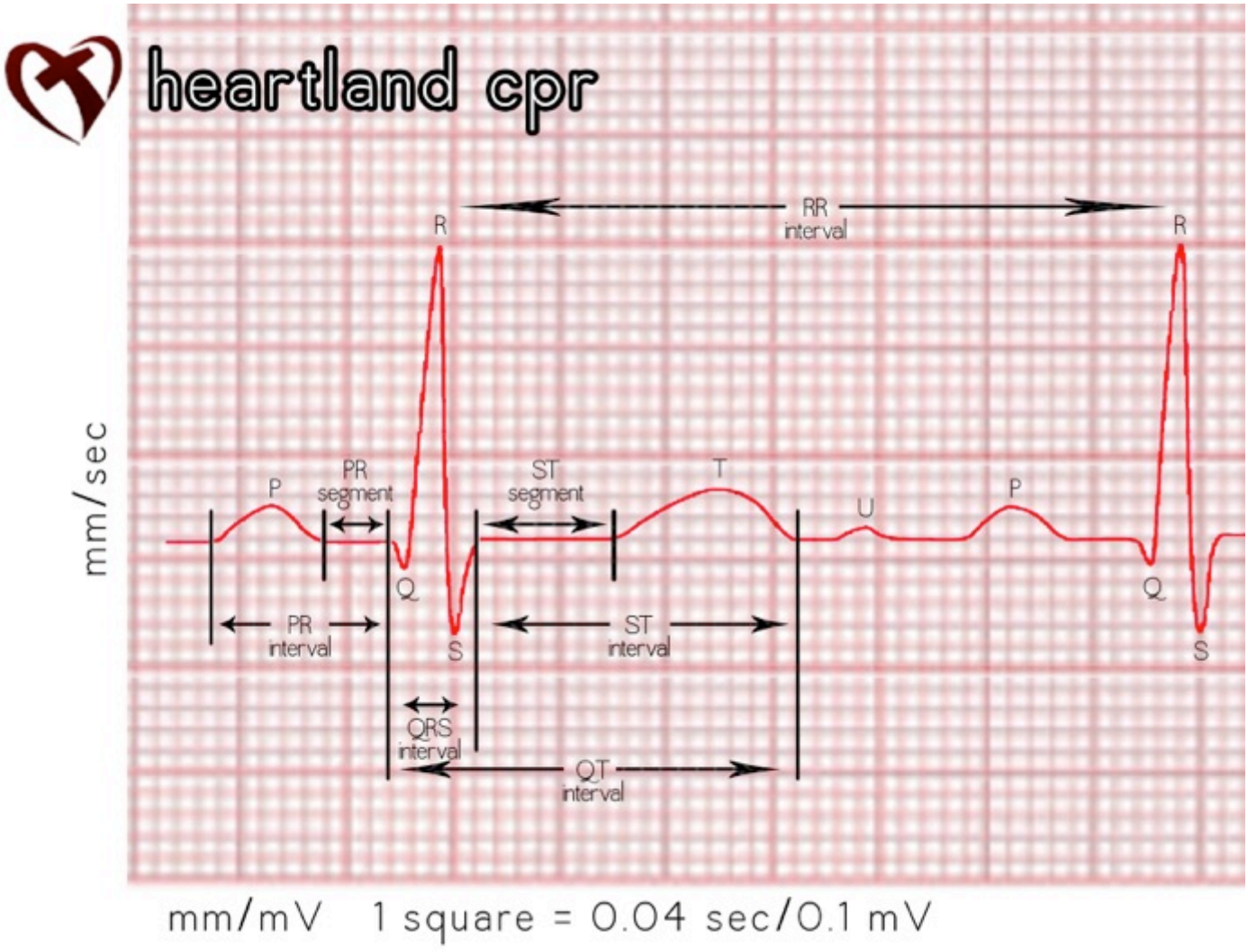
- Anaphylaxis and sepsis
- Fluid “distributes” from intravascular to extracellular
- **Antibiotics in < 1 hr for sepsis**
- NS or LR 20 mL/kg over 5-20 minutes
- Anaphylaxis has a respiratory component
- Angioedema and urticaria



Cardiac Arrest

Reversible Causes

- Hypovolemia
- Hypothermia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo/hyperglycemia
- Hypo/hyperkalemia
- Tension hemo/pneumo
- Tamponade (cardiac)
- Thrombosis (pulmonary or coronary)
- Toxins



PR interval: Measures from the beginning of the P wave to the beginning of the QRS complex
Normal: 0.12 - 0.20 sec

QRS complex: Measures from the beginning of the Q wave to the end of the S wave
Normal: <0.12 sec

QT interval: Measures from the beginning of the Q wave to the end of the T wave
Normal: Needs to be corrected for heart rate – usually 0.44 to 0.32 sec
(heart rate of 60 – 100 bpm for both men and women)

Intrinsic Rates:

SA Node 60 – 100

AV Node 40 – 60

Method for estimating heart rate

To estimate heart rate, memorize the rate intervals: 300, 150, 100, 75, 60, 50, 40, and 30. This method estimates heart rate. Although there are other methods and tools available, this method does not require a 3-second or 6-second strip and it can be used easily at the bedside.

1. Pick a complex that falls on a heavy line
2. Estimate the rate by counting heavy boxes
3. Using 300, 150, 100, 75, 60, 50, 40, 30

Other heart rate measurements that can be used:

- Count the number of QRS complexes (R waves) on a 6-second strip and multiply by 10
- Divide 300 by the number of large boxes between 2 consecutive QRS complexes (R waves)
- Divide 1500 by the number of tiny boxes between 2 consecutive QRS complexes (R waves)

For atrial rate measurements, use the methods indicated above with P waves substituted for QRS complexes (R waves).

Normal atrial rate: 60 – 100
Normal ventricular rate: 60 – 100

Normal Blood Pressures in Children by Age

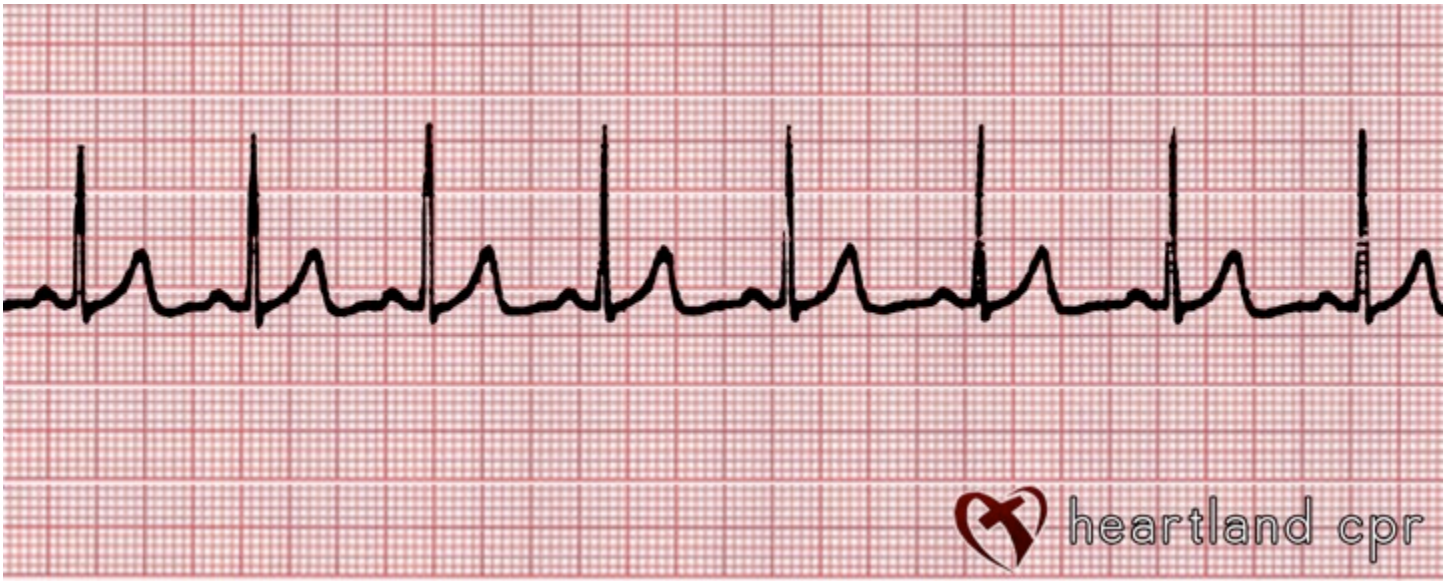
Age	Systolic Blood Pressure (mm Hg)		Diastolic Blood Pressure (mm Hg)	
	Female	Male	Female	Male
Neonate (1 day)	60 to 76	60 to 74	31 to 45	30 to 44
Neonate (4 days)	67 to 83	68 to 84	37 to 53	35 to 53
Infant (1 month)	73 to 91	74 to 94	36 to 56	37 to 55
Infant (3 months)	78 to 100	81 to 103	44 to 64	45 to 65
Infant (6 months)	82 to 10	87 to 105	46 to 66	48 t0 68
Infant (1 year)	~~68 to 104~~ 86 to 104	~~67 to 103~~ 85 to 103	~~22 to 60~~ 40 to 58	~~20 to 58~~ 37 to 56
Child (2 years)	~~71 to 105~~ 88 to 105	~~70 to 106~~ 88 to 106	~~27 to 65~~ 45 to 63	~~25 to 63~~ 42 to 61
Child (7 years)	~~79 to 113~~ 96 to 113	~~79 to 115~~ 97 to 115	~~39 to 77~~ 57 to 75	~~38 to 78~~ 57 to 76
Adolescent (15 years)	~~93 to 127~~ 110 to 127	~~95 to 131~~ 113 to 131	~~47 to 85~~ 65 to 83	~~45 to 85~~ 64 to 83

Blood pressure ranges for neonate and infant (1 to 6months) are from Gemelli M, Manganaro R, Mami C, De Luca F. Longitudinal study of blood pressure during the 1st year of life. Eur J Pediatr. 1990; 149:318-320.

Blood pressure ranges for infant (1 year), child, and adolescent are from National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents. The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents. Bethesda, MD: National Heart, Lung and Blood Institute; 2005. NIH Publication 05-5267

1. _____

Atrial rhythm/rate:	Regular; P to P is regular, 60 – 100 bpm
Ventricular rhythm/rate:	Regular; R to R is regular, 60 – 100 bpm
P waves:	P wave before every QRS complex
QRS:	remains unchanged unless aberrant conduction or rate change
Intervals:	PRI: 0.12 - 0.20 sec
	QRS: <0.12 sec



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

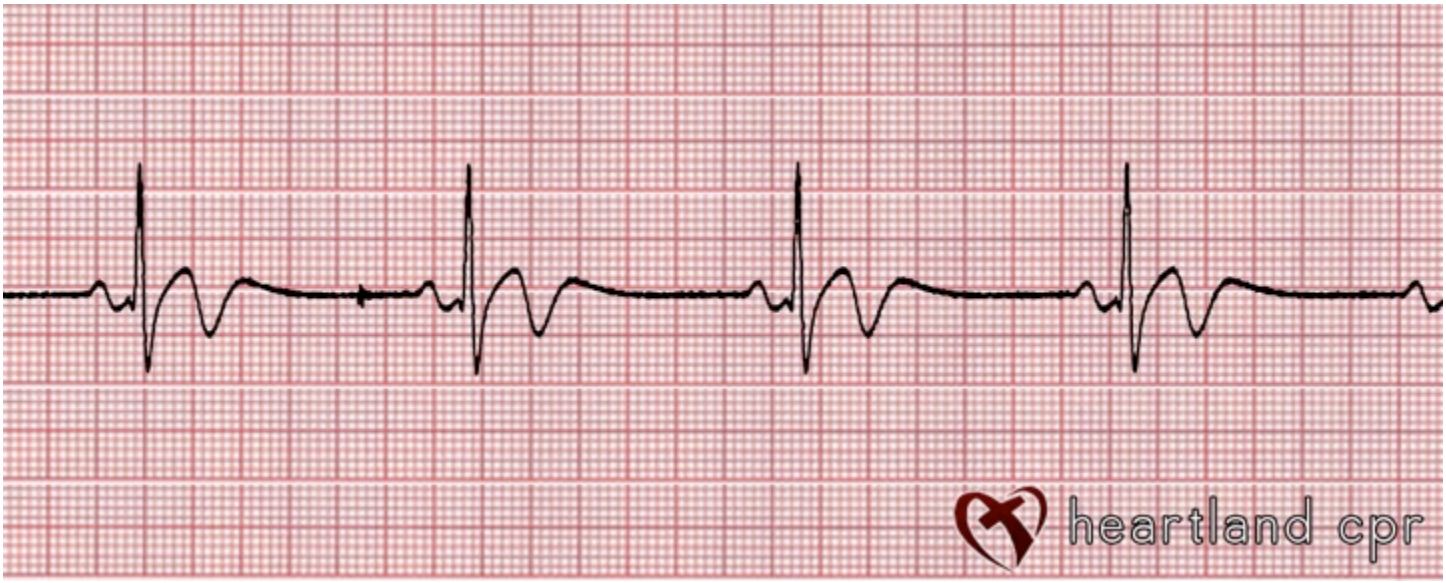
PR interval: _____

QRS interval: _____

Notes:

2. _____

Atrial rhythm/rate:	Regular; P to P is regular, <60 bpm
Ventricular rhythm/rate:	Regular; R to R is regular, <60 bpm
P waves:	P wave before every QRS complex
QRS:	remains unchanged unless aberrant conduction or rate change
Intervals:	PRI: 0.12 - 0.20 sec
	QRS: <0.12 sec



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

PR interval: _____

QRS interval: _____

Notes:

3. _____

Atrial rhythm/rate:	Regular; P to P is regular, >100 bpm
Ventricular rhythm/rate:	Regular; R to R is regular, >100 bpm
P waves:	P wave before every QRS complex
QRS:	remains unchanged unless aberrant conduction or rate change
Intervals:	PRI: 0.12 - 0.20 sec
	QRS: <0.12 sec

Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

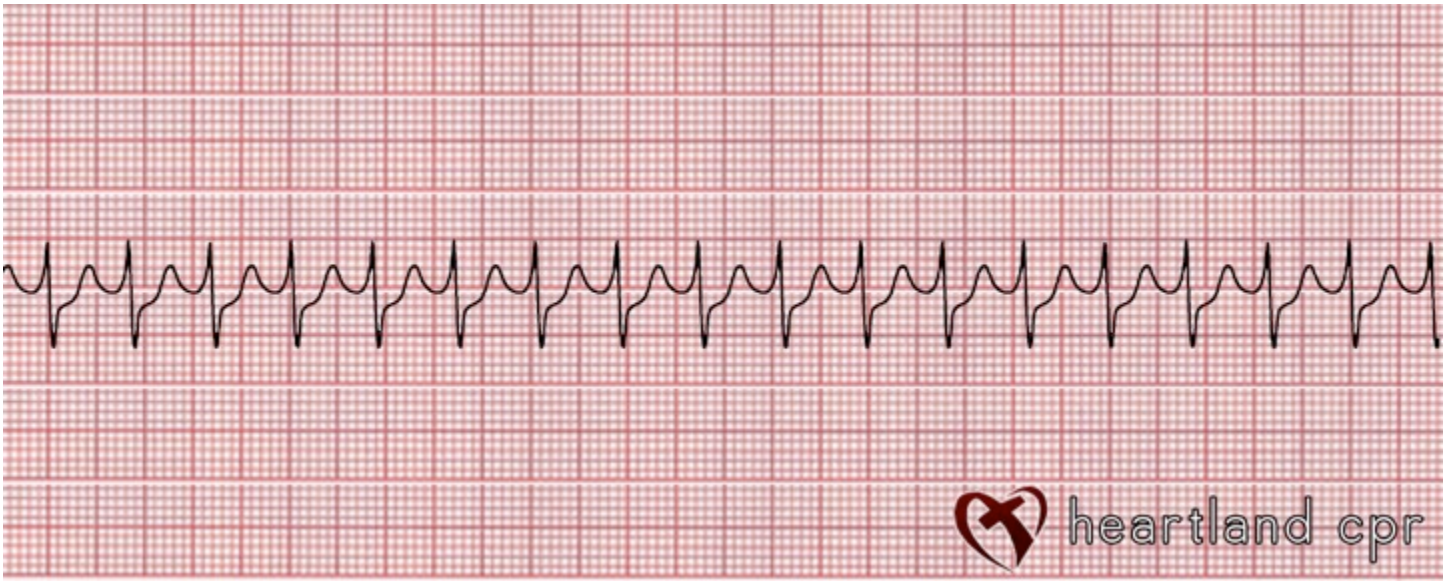
PR interval: _____

QRS interval: _____

Notes:

4. _____

Atrial rhythm/rate:	Regular; P to P is regular if P waves can be dentified, 150 – 250 bpm
Ventricular rhythm/rate:	Regular; R to R intervals are regular, 150 - 250 bpm
P waves:	If present, difficult to detect or hidden because of the fast heart rate
QRS:	remains unchanged unless aberrant conduction or rate change
Intervals:	PRI: not measureable
	QRS: <0.12 sec



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

PR interval: _____

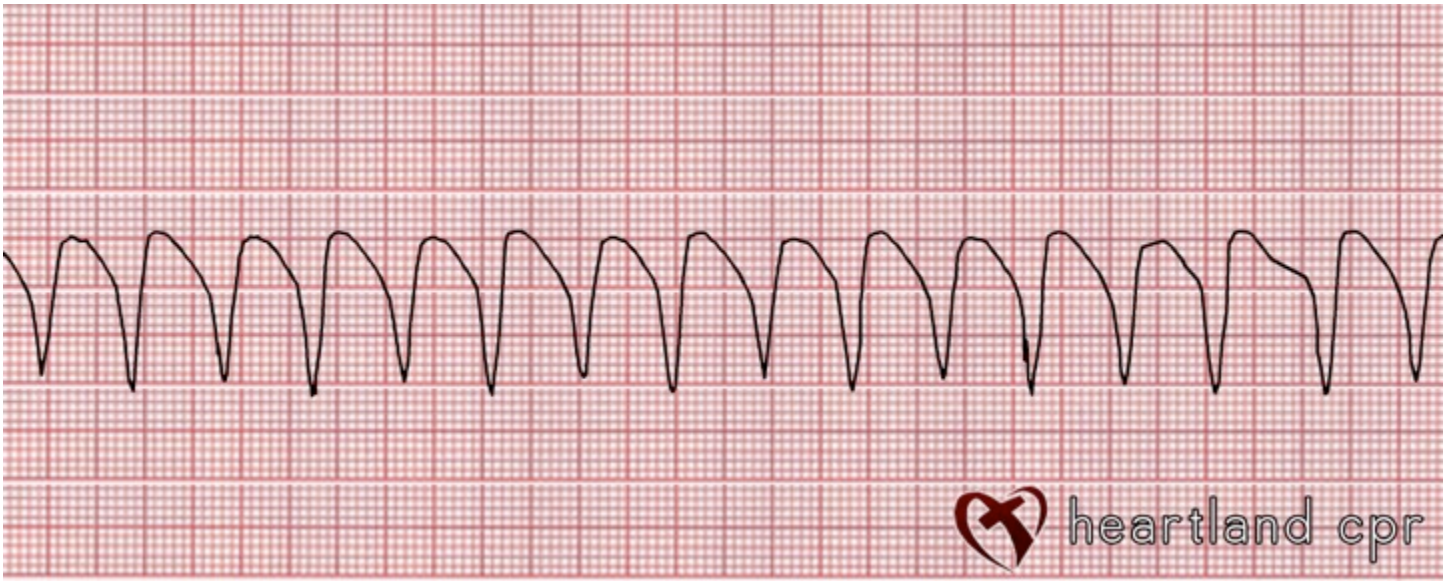
QRS interval: _____

Notes:

5. _____

Atrial rhythm/rate:	Obscured (see discussion below)
Ventricular rhythm/rate:	Regular; R to R intervals are regular, >150 bpm
P waves:	Obscured (see discussion below)
QRS:	Wide and bizarre; remains unchanged unless aberrant conduction or rate change
Intervals:	PRI: absent* QRS: ≥0.12 sec

*Learn More-Advanced ECG. The rhythm strip here emphasizes the regular wide complex tachycardia (WCT) aspect of VT. In most patients a WCT will be ventricular tachycardia, especially with older age and history of cardiac disease or acute chest discomfort. In these settings, presume and treat as VT. With advanced rhythm training, you will learn that WCTs may be abnormally conducted supraventricular rhythms and "look like" VT. Careful examination of a rhythm strip attempts to identify atrioventricular dissociation (not shown here). The atria in VT continue to contract in most instances, and the atrial and ventricular impulses are dissociated. This leads to the "footprints" identifying VT on rhythm strips. These are (1) AV dissociation observed as P waves "marching" through the wide complexes and occasional fusion or Dressler's beats. Fusion beats occur when the atrial contraction by chance conducts part of the QRS complex. This also is an indication of independent atrial depolarization and AV dissociation.



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

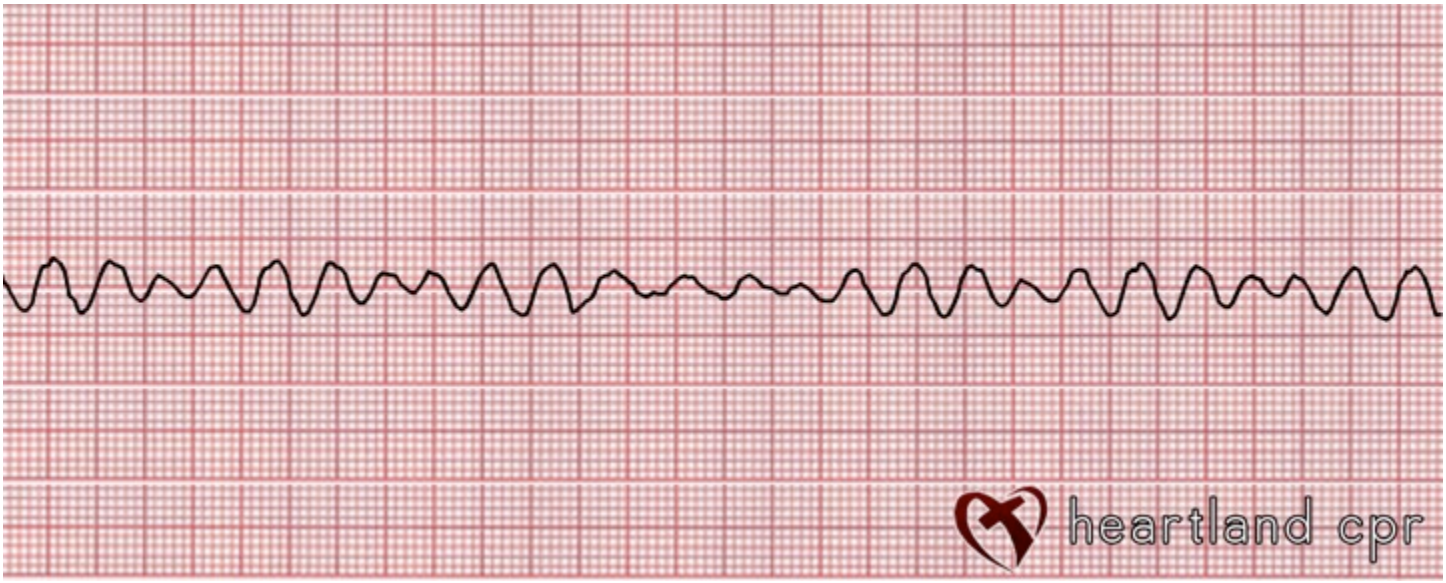
PR interval: _____

QRS interval: _____

Notes:

6. _____

Atrial rhythm/rate:	Absent
Ventricular rhythm/rate:	Absent
P waves:	Absent
QRS:	Absent
Intervals:	PRI: absent
	QRS: absent



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

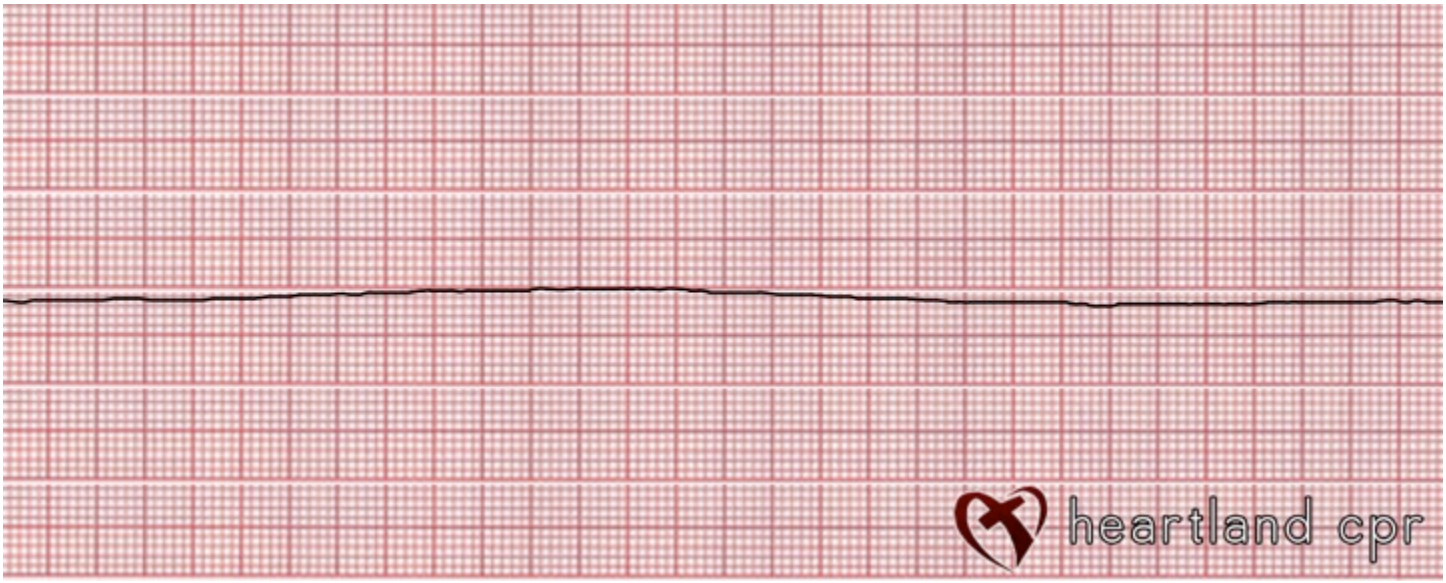
PR interval: _____

QRS interval: _____

Notes:

7. _____

Atrial rhythm/rate:	Absent
Ventricular rhythm/rate:	Absent
P waves:	Absent
QRS:	Absent
Intervals:	PRI: absent
	QRS: absent



Regular or irregular: _____

P waves present: _____

Atrial rate: _____

Ventricular rate: _____

PR interval: _____

QRS interval: _____

Notes: