

## Website Resources

- Sudden Death in Athletes  
<http://tinyurl.com/m2gjmvg>
- Hypertrophic Cardiomyopathy Association  
[www.4hcm.org](http://www.4hcm.org)
- American Heart Association [www.heart.org](http://www.heart.org)

## Collaborating Agencies:

### American Academy of Pediatrics New Jersey Chapter

3836 Quakerbridge Road, Suite 108  
Hamilton, NJ 08619  
(p) 609-842-0014  
(f) 609-842-0015  
[www.aapnj.org](http://www.aapnj.org)



### American Heart Association

1 Union Street, Suite 301  
Robbinsville, NJ, 08691  
(p) 609-208-0020  
[www.heart.org](http://www.heart.org)



### New Jersey Department of Education

PO Box 500  
Trenton, NJ 08625-0500  
(p) 609-292-5935  
[www.state.nj.us/education/](http://www.state.nj.us/education/)



### New Jersey Department of Health

P. O. Box 360  
Trenton, NJ 08625-0360  
(p) 609-292-7837  
[www.state.nj.us/health](http://www.state.nj.us/health)



**Lead Author:** American Academy of Pediatrics,  
New Jersey Chapter

**Written by:** Initial draft by Sushma Raman Hebbar,  
MD & Stephen G. Rice, MD PhD

**Additional Reviewers:** NJ Department of Education,  
NJ Department of Health and Senior Services,  
American Heart Association/New Jersey Chapter,  
NJ Academy of Family Practice, Pediatric Cardiologists,  
New Jersey State School Nurses

**Revised 2014:** Nancy Curry, EdM;  
Christene DeWitt-Parker, MSN, CSN, RN;  
Lakota Kruse, MD, MPH; Susan Martz, EdM;  
Stephen G. Rice, MD; Jeffrey Rosenberg, MD,  
Louis Teichholz, MD; Perry Weinstock, MD

# SUDDEN CARDIAC DEATH IN YOUNG ATHLETES

## The Basic Facts on Sudden Cardiac Death in Young Athletes



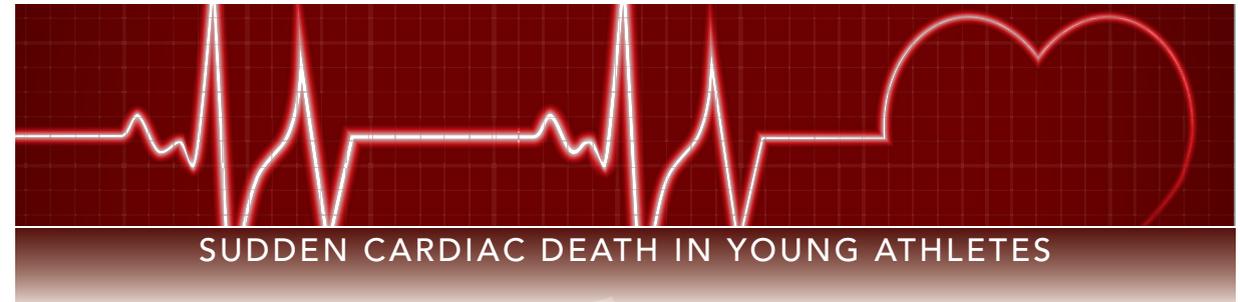
STATE OF NEW JERSEY  
DEPARTMENT OF EDUCATION

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



American Heart  
Association   
*Learn and Live*



## SUDDEN CARDIAC DEATH IN YOUNG ATHLETES

**S**udden death in young athletes between the ages of 10 and 19 is very rare. What, if anything, can be done to prevent this kind of tragedy?



### What is sudden cardiac death in the young athlete?

Sudden cardiac death is the result of an unexpected failure of proper heart function, usually (about 60% of the time) during or immediately after exercise without trauma. Since the heart stops pumping adequately, the athlete quickly collapses, loses consciousness, and ultimately dies unless normal heart rhythm is restored using an automated external defibrillator (AED).

### How common is sudden death in young athletes?

Sudden cardiac death in young athletes is very rare. About 100 such deaths are reported in the United States per year. The chance of sudden death occurring to any individual high school athlete is about one in 200,000 per year.

Sudden cardiac death is more common: in males than in females; in football and basketball than in other sports; and in African-Americans than in other races and ethnic groups.



### What are the most common causes?

Research suggests that the main cause is a loss of proper heart rhythm, causing the heart to quiver instead of pumping blood to the brain and body. This is called ventricular fibrillation (ven-TRICK-you-lar fib-roo-LAY-shun). The problem is usually caused by one of several cardiovascular abnormalities and electrical diseases of the heart that go unnoticed in healthy-appearing athletes.

The most common cause of sudden death in an athlete is hypertrophic cardiomyopathy (hi-per-TRO-fic CAR-dee-oh-my-OP-a-thee) also called HCM. HCM is a disease of the heart, with abnormal thickening of the heart muscle, which can cause serious heart rhythm problems and blockages to blood flow. This genetic disease runs in families and usually develops gradually over many years.

The second most likely cause is congenital (con-JEN-it-al) (i.e., present from birth) abnormalities of the coronary arteries. This means that these blood vessels are connected to the main blood vessel of the heart in an abnormal way. This differs from blockages that may occur when people get older (commonly called "coronary artery disease," which may lead to a heart attack).

## SUDDEN CARDIAC DEATH IN YOUNG ATHLETES

Other diseases of the heart that can lead to sudden death in young people include:

- Myocarditis (my-oh-car-DIE-tis), an acute inflammation of the heart muscle (usually due to a virus).
- Dilated cardiomyopathy, an enlargement of the heart for unknown reasons.
- Long QT syndrome and other electrical abnormalities of the heart which cause abnormal fast heart rhythms that can also run in families.
- Marfan syndrome, an inherited disorder that affects heart valves, walls of major arteries, eyes and the skeleton. It is generally seen in unusually tall athletes, especially if being tall is not common in other family members.

### Are there warning signs to watch for?

In more than a third of these sudden cardiac deaths, there were warning signs that were not reported or taken seriously. Warning signs are:

- Fainting, a seizure or convulsions during physical activity;
- Fainting or a seizure from emotional excitement, emotional distress or being startled;
- Dizziness or lightheadedness, especially during exertion;
- Chest pains, at rest or during exertion;
- Palpitations - awareness of the heart beating unusually (skipping, irregular or extra beats) during athletics or during cool down periods after athletic participation;
- Fatigue or tiring more quickly than peers; or
- Being unable to keep up with friends due to shortness of breath (labored breathing).

### What are the current recommendations for screening young athletes?

New Jersey requires all school athletes to be examined by their primary care physician ("medical home") or school physician at least once per year. The New Jersey Department of Education requires use of the specific Preparticipation Physical Examination Form (PPE).

This process begins with the parents and student-athletes answering questions about symptoms during exercise (such as chest pain, dizziness, fainting, palpitations or shortness of breath); and questions about family health history.

The primary healthcare provider needs to know if any family member died suddenly during physical activity or during a seizure. They also need to know if anyone in the family under the age of 50 had an unexplained sudden death such as drowning or car accidents. This information must be provided annually for each exam because it is so essential to identify those at risk for sudden cardiac death.

The required physical exam includes measurement of blood pressure and a careful listening examination of the heart, especially for murmurs and rhythm abnormalities. If there are no warning signs reported on the health history and no abnormalities discovered on exam, no further evaluation or testing is recommended.

### Are there options privately available to screen for cardiac conditions?

Technology-based screening programs including a 12-lead electrocardiogram (ECG) and echocardiogram (ECHO) are noninvasive and painless options parents may consider in addition to the required

PPE. However, these procedures may be expensive and are not currently advised by the American Academy of Pediatrics and the American College of Cardiology unless the PPE reveals an indication for these tests. In addition to the expense, other limitations of technology-based tests include the possibility of "false positives" which leads to unnecessary stress for the student and parent or guardian as well as unnecessary restriction from athletic participation.

The United States Department of Health and Human Services offers risk assessment options under the Surgeon General's Family History Initiative available at <http://www.hhs.gov/familyhistory/index.html>.

### When should a student athlete see a heart specialist?

If the primary healthcare provider or school physician has concerns, a referral to a child heart specialist, a pediatric cardiologist, is recommended. This specialist will perform a more thorough evaluation, including an electrocardiogram (ECG), which is a graph of the electrical activity of the heart. An echocardiogram, which is an ultrasound test to allow for direct visualization of the heart structure, will likely also be done. The specialist may also order a treadmill exercise test and a monitor to enable a longer recording of the heart rhythm. None of the testing is invasive or uncomfortable.

### Can sudden cardiac death be prevented just through proper screening?

A proper evaluation should find most, but not all, conditions that would cause sudden death in the athlete. This is because some diseases are difficult to uncover and may only develop later in life. Others can develop following a

normal screening evaluation, such as an infection of the heart muscle from a virus.

This is why screening evaluations and a review of the family health history need to be performed on a yearly basis by the athlete's primary healthcare provider. With proper screening and evaluation, most cases can be identified and prevented.

### Why have an AED on site during sporting events?

The only effective treatment for ventricular fibrillation is immediate use of an automated external defibrillator (AED). An AED can restore the heart back into a normal rhythm. An AED is also life-saving for ventricular fibrillation caused by a blow to the chest over the heart (commotio cordis).

N.J.S.A. 18A:40-41a through c, known as "Janet's Law," requires that at any school-sponsored athletic event or team practice in New Jersey public and nonpublic schools including any of grades K through 12, the following must be available:

- An AED in an unlocked location on school property within a reasonable proximity to the athletic field or gymnasium; and
- A team coach, licensed athletic trainer, or other designated staff member if there is no coach or licensed athletic trainer present, certified in cardiopulmonary resuscitation (CPR) and the use of the AED; or
- A State-certified emergency services provider or other certified first responder.

The American Academy of Pediatrics recommends the AED should be placed in central location that is accessible and ideally no more than a 1 to 1½ minute walk from any location and that a call is made to activate 911 emergency system while the AED is being retrieved.

**Sudden Cardiac Death Pamphlet**  
**Sign-Off Sheet**

Name of School District: \_\_\_\_\_

Name of Local School: \_\_\_\_\_

I/We acknowledge that we received and reviewed the Sudden Cardiac Death in Young Athletes pamphlet.

Student Signature: \_\_\_\_\_

Parent or Guardian  
Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**ATTENTION PARENT/GUARDIAN:** The preparticipation physical examination (page 3) must be completed by a health care provider who has completed the Student-Athlete Cardiac Assessment Professional Development Module.

# PREPARTICIPATION PHYSICAL EVALUATION HISTORY FORM

*(Note: This form is to be filled out by the patient and parent prior to seeing the physician. The physician should keep a copy of this form in the chart.)*

Date of Exam \_\_\_\_\_  
 Name \_\_\_\_\_ Date of birth \_\_\_\_\_  
 Sex \_\_\_\_\_ Age \_\_\_\_\_ Grade \_\_\_\_\_ School \_\_\_\_\_ Sport(s) \_\_\_\_\_

**Medicines and Allergies:** Please list all of the prescription and over-the-counter medicines and supplements (herbal and nutritional) that you are currently taking

\_\_\_\_\_

\_\_\_\_\_

Do you have any allergies?  Yes  No If yes, please identify specific allergy below.

Medicines  Pollens  Food  Stinging Insects

Explain "Yes" answers below. Circle questions you don't know the answers to.

GENERAL QUESTIONS	Yes	No	MEDICAL QUESTIONS	Yes	No
1. Has a doctor ever denied or restricted your participation in sports for any reason?			26. Do you cough, wheeze, or have difficulty breathing during or after exercise?		
2. Do you have any ongoing medical conditions? If so, please identify below: <input type="checkbox"/> Asthma <input type="checkbox"/> Anemia <input type="checkbox"/> Diabetes <input type="checkbox"/> Infections Other: _____			27. Have you ever used an inhaler or taken asthma medicine?		
3. Have you ever spent the night in the hospital?			28. Is there anyone in your family who has asthma?		
4. Have you ever had surgery?			29. Were you born without or are you missing a kidney, an eye, a testicle (males), your spleen, or any other organ?		
HEART HEALTH QUESTIONS ABOUT YOU	Yes	No	30. Do you have groin pain or a painful bulge or hernia in the groin area?		
5. Have you ever passed out or nearly passed out DURING or AFTER exercise?			31. Have you had infectious mononucleosis (mono) within the last month?		
6. Have you ever had discomfort, pain, tightness, or pressure in your chest during exercise?			32. Do you have any rashes, pressure sores, or other skin problems?		
7. Does your heart ever race or skip beats (irregular beats) during exercise?			33. Have you had a herpes or MRSA skin infection?		
8. Has a doctor ever told you that you have any heart problems? If so, check all that apply: <input type="checkbox"/> High blood pressure <input type="checkbox"/> A heart murmur <input type="checkbox"/> High cholesterol <input type="checkbox"/> A heart infection <input type="checkbox"/> Kawasaki disease Other: _____			34. Have you ever had a head injury or concussion?		
9. Has a doctor ever ordered a test for your heart? (For example, ECG/EKG, echocardiogram)			35. Have you ever had a hit or blow to the head that caused confusion, prolonged headache, or memory problems?		
10. Do you get lightheaded or feel more short of breath than expected during exercise?			36. Do you have a history of seizure disorder?		
11. Have you ever had an unexplained seizure?			37. Do you have headaches with exercise?		
12. Do you get more tired or short of breath more quickly than your friends during exercise?			38. Have you ever had numbness, tingling, or weakness in your arms or legs after being hit or falling?		
HEART HEALTH QUESTIONS ABOUT YOUR FAMILY	Yes	No	39. Have you ever been unable to move your arms or legs after being hit or falling?		
13. Has any family member or relative died of heart problems or had an unexpected or unexplained sudden death before age 50 (including drowning, unexplained car accident, or sudden infant death syndrome)?			40. Have you ever become ill while exercising in the heat?		
14. Does anyone in your family have hypertrophic cardiomyopathy, Marfan syndrome, arrhythmogenic right ventricular cardiomyopathy, long QT syndrome, short QT syndrome, Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia?			41. Do you get frequent muscle cramps when exercising?		
15. Does anyone in your family have a heart problem, pacemaker, or implanted defibrillator?			42. Do you or someone in your family have sickle cell trait or disease?		
16. Has anyone in your family had unexplained fainting, unexplained seizures, or near drowning?			43. Have you had any problems with your eyes or vision?		
BONE AND JOINT QUESTIONS	Yes	No	44. Have you had any eye injuries?		
17. Have you ever had an injury to a bone, muscle, ligament, or tendon that caused you to miss a practice or a game?			45. Do you wear glasses or contact lenses?		
18. Have you ever had any broken or fractured bones or dislocated joints?			46. Do you wear protective eyewear, such as goggles or a face shield?		
19. Have you ever had an injury that required x-rays, MRI, CT scan, injections, therapy, a brace, a cast, or crutches?			47. Do you worry about your weight?		
20. Have you ever had a stress fracture?			48. Are you trying to or has anyone recommended that you gain or lose weight?		
21. Have you ever been told that you have or have you had an x-ray for neck instability or atlantoaxial instability? (Down syndrome or dwarfism)			49. Are you on a special diet or do you avoid certain types of foods?		
22. Do you regularly use a brace, orthotics, or other assistive device?			50. Have you ever had an eating disorder?		
23. Do you have a bone, muscle, or joint injury that bothers you?			51. Do you have any concerns that you would like to discuss with a doctor?		
24. Do any of your joints become painful, swollen, feel warm, or look red?			FEMALES ONLY		
25. Do you have any history of juvenile arthritis or connective tissue disease?			52. Have you ever had a menstrual period?		
			53. How old were you when you had your first menstrual period?		
			54. How many periods have you had in the last 12 months?		

Explain "yes" answers here

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

I hereby state that, to the best of my knowledge, my answers to the above questions are complete and correct.

Signature of athlete \_\_\_\_\_ Signature of parent/guardian \_\_\_\_\_ Date \_\_\_\_\_

© 2010 American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine. Permission is granted to reprint for noncommercial, educational purposes with acknowledgment.

# ■ PREPARTICIPATION PHYSICAL EVALUATION

## THE ATHLETE WITH SPECIAL NEEDS: SUPPLEMENTAL HISTORY FORM

Date of Exam \_\_\_\_\_

Name \_\_\_\_\_ Date of birth \_\_\_\_\_

Sex \_\_\_\_\_ Age \_\_\_\_\_ Grade \_\_\_\_\_ School \_\_\_\_\_ Sport(s) \_\_\_\_\_

1. Type of disability		
2. Date of disability		
3. Classification (if available)		
4. Cause of disability (birth, disease, accident/trauma, other)		
5. List the sports you are interested in playing		
	<b>Yes</b>	<b>No</b>
6. Do you regularly use a brace, assistive device, or prosthetic?		
7. Do you use any special brace or assistive device for sports?		
8. Do you have any rashes, pressure sores, or any other skin problems?		
9. Do you have a hearing loss? Do you use a hearing aid?		
10. Do you have a visual impairment?		
11. Do you use any special devices for bowel or bladder function?		
12. Do you have burning or discomfort when urinating?		
13. Have you had autonomic dysreflexia?		
14. Have you ever been diagnosed with a heat-related (hyperthermia) or cold-related (hypothermia) illness?		
15. Do you have muscle spasticity?		
16. Do you have frequent seizures that cannot be controlled by medication?		

**Explain "yes" answers here**

---



---



---



---



---

**Please indicate if you have ever had any of the following.**

	<b>Yes</b>	<b>No</b>
Atlantoaxial instability		
X-ray evaluation for atlantoaxial instability		
Dislocated joints (more than one)		
Easy bleeding		
Enlarged spleen		
Hepatitis		
Osteopenia or osteoporosis		
Difficulty controlling bowel		
Difficulty controlling bladder		
Numbness or tingling in arms or hands		
Numbness or tingling in legs or feet		
Weakness in arms or hands		
Weakness in legs or feet		
Recent change in coordination		
Recent change in ability to walk		
Spina bifida		
Latex allergy		

**Explain "yes" answers here**

---



---



---



---

**I hereby state that, to the best of my knowledge, my answers to the above questions are complete and correct.**

Signature of athlete \_\_\_\_\_ Signature of parent/guardian \_\_\_\_\_ Date \_\_\_\_\_

© 2010 American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine. Permission is granted to reprint for noncommercial, educational purposes with acknowledgment.

New Jersey Department of Education 2014; Pursuant to P.L.2013, c. 71

**NOTE:** The preparticipation physical examination must be conducted by a health care provider who 1) is a licensed physician, advanced practitioner nurse, or physician assistant; and 2) completed the Student-Athlete Cardiac Assessment Professional Development Module.

# PREPARTICIPATION PHYSICAL EVALUATION PHYSICAL EXAMINATION FORM

Name \_\_\_\_\_ Date of birth \_\_\_\_\_

## PHYSICIAN REMINDERS

- Consider additional questions on more sensitive issues
  - Do you feel stressed out or under a lot of pressure?
  - Do you ever feel sad, hopeless, depressed, or anxious?
  - Do you feel safe at your home or residence?
  - Have you ever tried cigarettes, chewing tobacco, snuff, or dip?
  - During the past 30 days, did you use chewing tobacco, snuff, or dip?
  - Do you drink alcohol or use any other drugs?
  - Have you ever taken anabolic steroids or used any other performance supplement?
  - Have you ever taken any supplements to help you gain or lose weight or improve your performance?
  - Do you wear a seat belt, use a helmet, and use condoms?
- Consider reviewing questions on cardiovascular symptoms (questions 5–14).

EXAMINATION		
Height	Weight	<input type="checkbox"/> Male <input type="checkbox"/> Female
BP / ( / )	Pulse	Vision R 20/ L 20/ Corrected <input type="checkbox"/> Y <input type="checkbox"/> N
MEDICAL	NORMAL	ABNORMAL FINDINGS
Appearance <ul style="list-style-type: none"> <li>Marfan stigmata (kyphoscoliosis, high-arched palate, pectus excavatum, arachnodactyly, arm span &gt; height, hyperlaxity, myopia, MVP, aortic insufficiency)</li> </ul>		
Eyes/ears/nose/throat <ul style="list-style-type: none"> <li>Pupils equal</li> <li>Hearing</li> </ul>		
Lymph nodes		
Heart <sup>a</sup> <ul style="list-style-type: none"> <li>Murmurs (auscultation standing, supine, +/- Valsalva)</li> <li>Location of point of maximal impulse (PMI)</li> </ul>		
Pulses <ul style="list-style-type: none"> <li>Simultaneous femoral and radial pulses</li> </ul>		
Lungs		
Abdomen		
Genitourinary (males only) <sup>b</sup>		
Skin <ul style="list-style-type: none"> <li>HSV, lesions suggestive of MRSA, tinea corporis</li> </ul>		
Neurologic <sup>c</sup>		
MUSCULOSKELETAL		
Neck		
Back		
Shoulder/arm		
Elbow/forearm		
Wrist/hand/fingers		
Hip/thigh		
Knee		
Leg/ankle		
Foot/toes		
Functional <ul style="list-style-type: none"> <li>Duck-walk, single leg hop</li> </ul>		

<sup>a</sup>Consider ECG, echocardiogram, and referral to cardiology for abnormal cardiac history or exam.

<sup>b</sup>Consider GU exam if in private setting. Having third party present is recommended.

<sup>c</sup>Consider cognitive evaluation or baseline neuropsychiatric testing if a history of significant concussion.

- Cleared for all sports without restriction
- Cleared for all sports without restriction with recommendations for further evaluation or treatment for \_\_\_\_\_
- Not cleared
- Pending further evaluation
  - For any sports
  - For certain sports \_\_\_\_\_
- Reason \_\_\_\_\_

Recommendations \_\_\_\_\_

**I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions arise after the athlete has been cleared for participation, a physician may rescind the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parents/guardians).**

Name of physician, advanced practice nurse (APN), physician assistant (PA) (print/type) \_\_\_\_\_ Date \_\_\_\_\_

Address \_\_\_\_\_ Phone \_\_\_\_\_

Signature of physician, APN, PA \_\_\_\_\_

# ■ PREPARTICIPATION PHYSICAL EVALUATION CLEARANCE FORM

Name \_\_\_\_\_ Sex  M  F Age \_\_\_\_\_ Date of birth \_\_\_\_\_

- Cleared for all sports without restriction
- Cleared for all sports without restriction with recommendations for further evaluation or treatment for \_\_\_\_\_

- Not cleared
- Pending further evaluation
  - For any sports
  - For certain sports \_\_\_\_\_
- Reason \_\_\_\_\_

Recommendations \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## EMERGENCY INFORMATION

Allergies \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Other information \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## HCP OFFICE STAMP

## SCHOOL PHYSICIAN:

Reviewed on \_\_\_\_\_  
(Date)

Approved \_\_\_\_\_ Not Approved \_\_\_\_\_

Signature: \_\_\_\_\_

**I have examined the above-named student and completed the preparticipation physical evaluation. The athlete does not present apparent clinical contraindications to practice and participate in the sport(s) as outlined above. A copy of the physical exam is on record in my office and can be made available to the school at the request of the parents. If conditions arise after the athlete has been cleared for participation, the physician may rescind the clearance until the problem is resolved and the potential consequences are completely explained to the athlete (and parents/guardians).**

Name of physician, advanced practice nurse (APN), physician assistant (PA) \_\_\_\_\_ Date \_\_\_\_\_

Address \_\_\_\_\_ Phone \_\_\_\_\_

Signature of physician, APN, PA \_\_\_\_\_

## Completed Cardiac Assessment Professional Development Module

Date \_\_\_\_\_ Signature \_\_\_\_\_