A blurred photograph of a woman with blonde hair in a ponytail, wearing a black sports bra and leggings, running outdoors. The background shows a hilly landscape with trees under a bright sky. A large red diagonal shape is overlaid on the bottom right of the image.

An Essential Athletic Trainer's Guide to AEDs

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NATA



The National Athletic Trainers' Association (NATA), as a leader in health care for the physically active, strongly believes that the treatment of sudden cardiac arrest is a priority. An AED program should be part of an athletic trainer's emergency action plan. NATA strongly encourages athletic trainers, in every work setting, to have access to an AED. Athletic trainers are encouraged to make an AED part of their standard emergency equipment. In addition, in conjunction and coordination with local EMS, athletic trainers should take a primary role in implementing a comprehensive AED program within their work setting.¹





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The stadium was so quiet. When the unit arrived, I applied the pads and began CPR. After calling for the AED, a few parents from the stands, a police officer and a doctor, ran out to help. I performed rescue breaths while they performed CPR.



Tara Grubbs

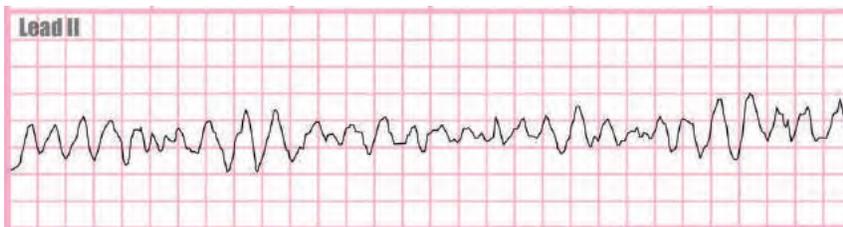
Head Athletic Trainer
Pearce High School, Richardson, Texas



Part I

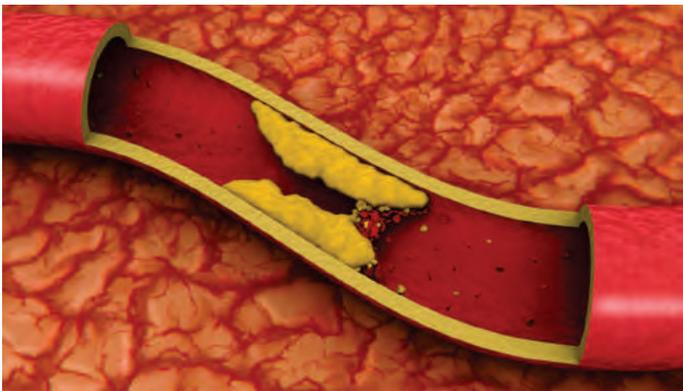
Sudden Cardiac Arrest

Sudden cardiac arrest (SCA) refers to a condition in which the heart abruptly and without warning, stops pumping blood due to a disruption in the heart's rhythm. SCA disables the flow of blood to vital organs including the brain, leading to death within minutes.



Difference From a Heart Attack

Contrary to popular belief, SCA and a heart attack are not the same. The main difference between SCA and a heart attack is the way they manifest. While SCA occurs due to a disruption in electrical signals to the heart, heart attacks are caused by blockage of an artery, denying heart muscles the nutrients and oxygen required to keep beating.



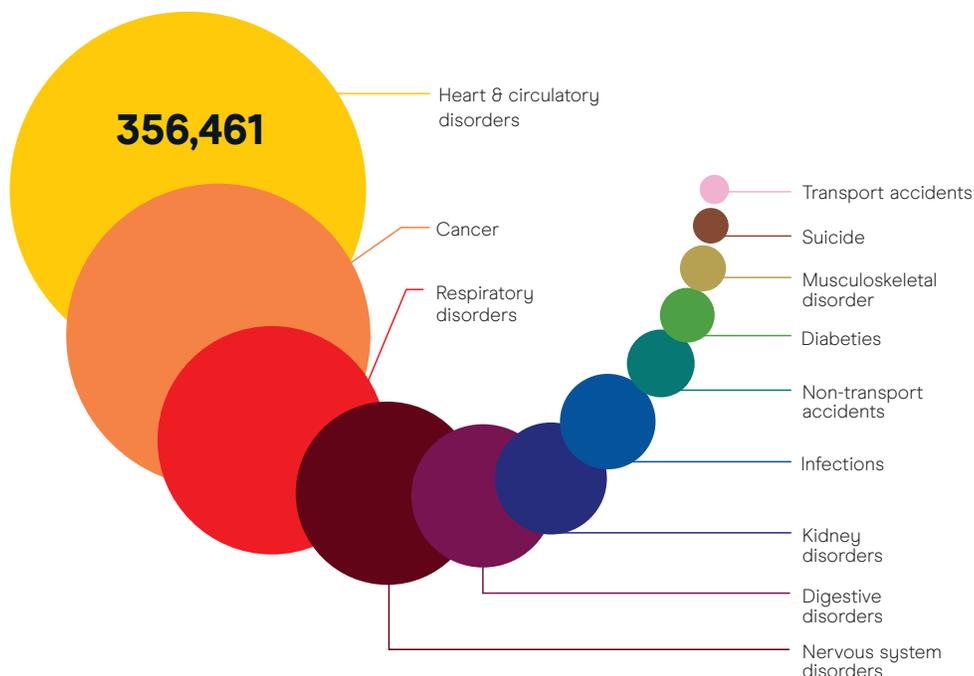
The survivability of these conditions is also disparate, with SCA being much more life-threatening. Heart attacks are often a cause of SCA, but SCA does not cause a heart attack.

Society commonly equates heart attacks with an unhealthy lifestyle – such as a poor diet, obesity, and smoking. Noting the difference between SCA and a heart attack is critical. SCA impacts victims of all ages, races, and genders, including those who are entirely healthy and have expressed no prior signs or symptoms. Unfortunately, if the general public thinks all heart problems are the same or that only those with unhealthy lifestyles are susceptible to problems, SCA may get lost in the noise and not receive the attention it deserves.



By the Numbers

According to the latest statistics from the American Heart Association (AHA), 356,461 cases of non-traumatic, out-of-hospital SCAs occurred in 2018, with over 90% of the victims succumbing to death. In the United States, sudden cardiac death is listed as the cause of death in 13.5% of death certificates.ⁱⁱ



Characteristics of and Outcomes for OHCA

	Adults	Children
Survival to hospital discharge	10.8%	10.7%
Good functional status at hospital discharge	9%	8.2%
VF/VT shockable	20.2%	7.2%
Public setting	21.1%	16.1%
Home	68.1%	83.6%
Nursing home	10.8%	0.3%

Adults

Annual Incidence of EMS-Assessed OHCA	
Any age	356,461
Adults	347,322
Children	7,037

The best chance someone has of surviving cardiac arrest is by receiving a timely and effective shock from a defibrillator to get their heart pumping by itself. The sooner the heart starts pumping by itself, the more likely the patient is to survive and have a positive and long-term outcome.



Sudden Death & Children

Why Kids Go Into SCA?

The underlying causes of SCA in children can be complex and multifactorial, but they are usually from a primary cardiac cause. Generally, something is wrong with the heart, rather than another system or organ causing SCA as a secondary result.

The underlying reason for SCA in children can be broadly grouped into two categories: electrical problems, where there is an abnormality of the conduction system that makes the heart beat. Abnormalities include, but are not limited to Long QT and Brugada Syndrome. Then there are structural problems, like Hypertrophic Cardiomyopathy (HCM) or other problems affecting the shape or structure of the heart.



The incidence of SCA in children is much lower than in adults, however, in 2018, 7,037 of the EMS-assessed SCAs occurred in children with over 6,000 dying as a result. SCA in children typically has a hereditary link, with a two-fold increase in likelihood of getting the condition if a family member has it.ⁱⁱⁱ

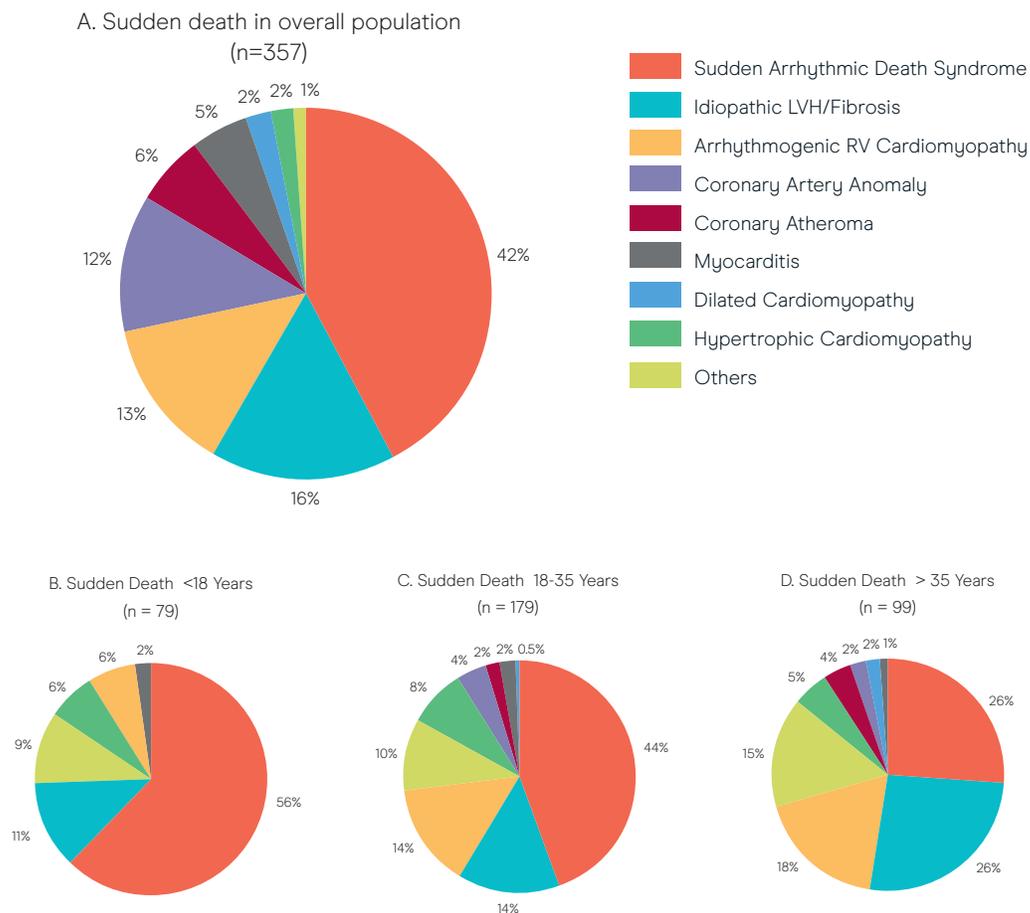




Leading Cause of Death Amongst Athletes

SCA is the leading cause of death among young athletes and accounts for 75% of all cases of sudden cardiac death.^{iv} The incidence of SCA, although hard to pinpoint accurately, is estimated to be 2.5 times higher among athletes than non-athletes of a similar age.

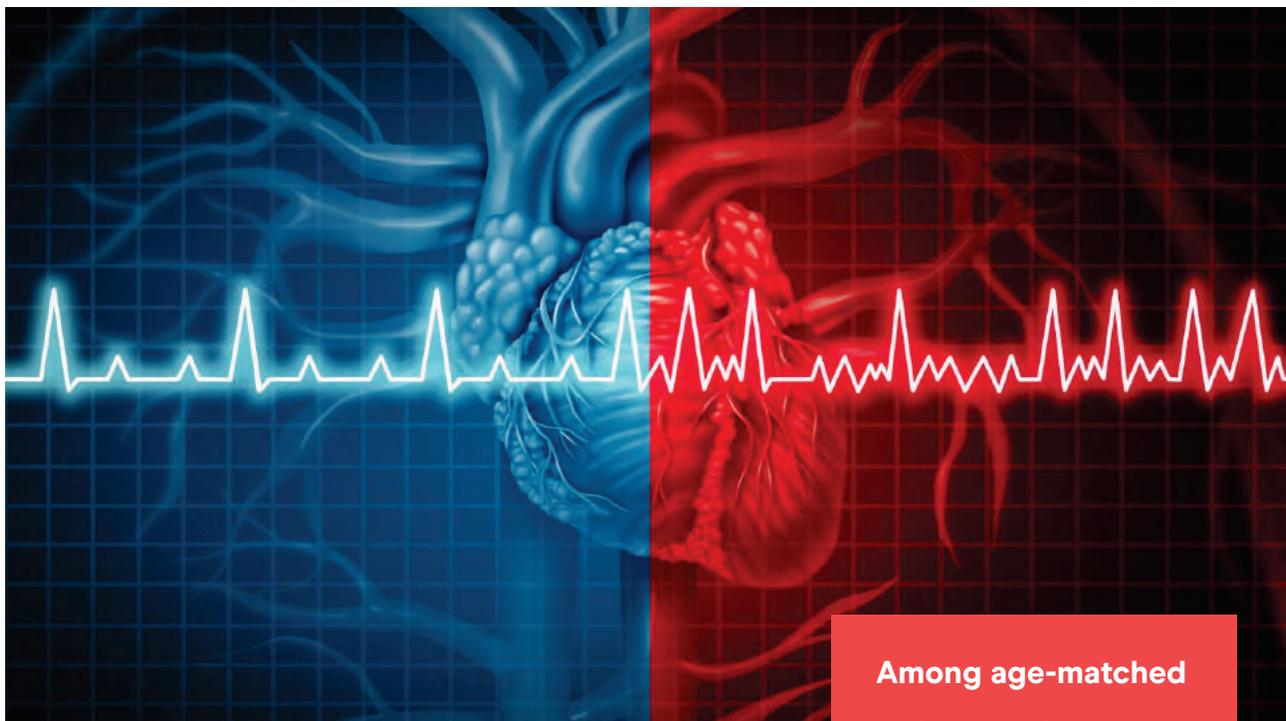
Sudden Death in Athletes: Causes of Sudden Cardiac Death



The US Sudden Death in Youth Athletes Registry estimates that SCA kills over 100 athletes in the US every year, a rate of 1 case every three days.^{iv} There is also a notable susceptibility among male athletes and black athletes.

A comparison of athlete and recruit deaths across the MSHSL, the NCAA, and the military.

	Deaths per 100,000 athletes
MSHSL	0.24
NCAA Division I	3.45
NCAA Division II	2.38
NCAA Division III	1.05
Military	13



Among age-matched cohorts, athletes are disproportionately affected by SCA.

Why are Athletes More Susceptible to SCA?

SCA in athletes is associated with underlying structural heart anomalies, which is then exacerbated because of vigorous exercise. In athletes with these underlying heart diseases, vigorous exercise causes ventricular arrhythmias.

The AHA associated the following conditions with SCA in youth athletes:

- Hypertrophic cardiomyopathy (36%)
- Coronary artery abnormalities (19%)
- Myocarditis (7%)
- Arrhythmogenic right ventricular cardiomyopathy (5%)
- Coronary artery disease (4%)
- Commotio cordis (3%)



Part II

Therapy

The chances of surviving a SCA are highly dependent on the immediacy of intervention. The survival rate drops 7-10% for every minute that the victim has to wait for defibrillation.^v

The sequences of actions needed to successfully manage an out-of-hospital cardiac arrest are well documented, and training is easy to access.

CPR and the Role of an AED

If someone witnesses a cardiac arrest, or finds an unresponsive person suspected to be in cardiac arrest, making sure help is on its way, and delivering good quality chest compressions can buy the victim time. Chest compressions are essential in maintaining blood supply to the organs, drastically increasing the patient's chances of life after cardiac arrest.

The best chance someone has of surviving cardiac arrest is by receiving an effective shock from a defibrillator to get the heart pumping by itself. The sooner the heart starts pumping by itself, the more likely the patient is to survive.

A delay in defibrillating a “shockable” heart rhythm can mean death, or significant damage to the brain and other organs, which could be avoided if an AED, is just a few minutes (at most) away.

To improve survival rates, many athletic communities and schools have sought to make CPR and AEDs more accessible through training and proper equipping of sports venues. In institutions where there is an AED policy, survival rates tend to rise as much as 70% with proper implementation of CPR and defibrillation.^{vi}



AEDs are a must have piece of equipment for any AT to have at all events. They're an investment that has to be made.



Tara Grubbs
Head Athletic Trainer,
Pearce High School, Richardson,
Texas



Part III

Preventative Approaches

EKG Screening Programs

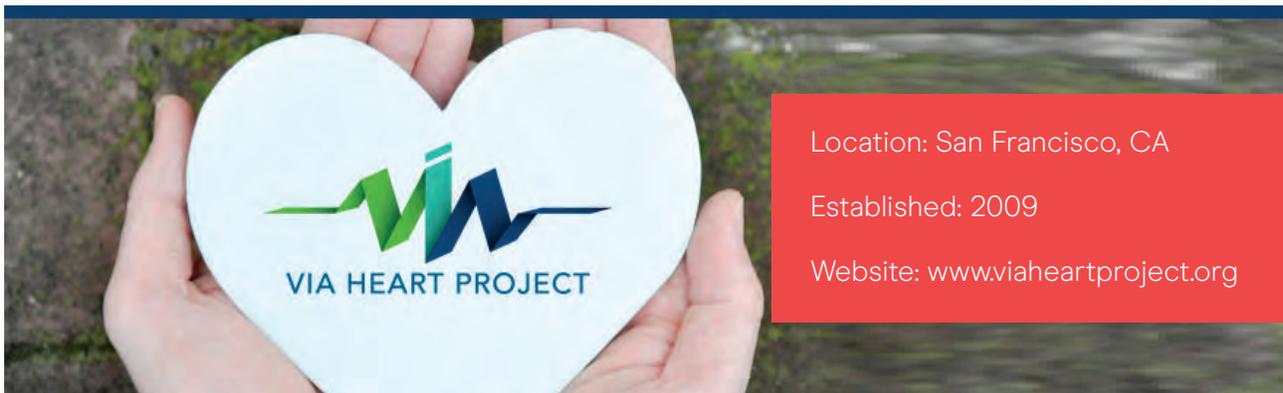
There are several possible reasons for SCA, and some of them can't be easily anticipated. Some risk factors, however, can be identified with simple non-invasive cardiac imaging called an echocardiogram (a cardiac ultrasound) and an echocardiogram(EKG).

Some groups are campaigning for these types of tests to be included in routine child health checks, or for screening programs in schools to identify children and athletes at risk of SCA and certainly other conditions.



Case Study

Via Heart Project



Via Heart Project is a non-profit organization dedicated to saving lives in schools, communities, and organizations across the globe. Via seeks to increase the survival rate from sudden cardiac arrest by implementing comprehensive AED programs, offering CPR training, and conducting youth heart screenings.



Saving Lives, One ECG at a Time! Via has...

- Held 12 screenings at 10 different school locations where several schools are served during each event
- Screened 4,370 young hearts, each receiving an EKG
 - 1700 students received a focused echocardiogram referred for follow-up care
 - 43 students had a potentially serious issue
- Had over 1,714 volunteers help with their events

Via's screening process:

Each person who attends a free Via Heart Project heart screening follows these steps:

1. Complete a health history questionnaire
2. Measure height and weight
3. Take blood pressure
4. Medical volunteers review the health history, height/weight, and BP, ask follow-up questions, and highlight anything they want to be sure the cardiologist sees
5. Learn hands-only CPR and AED skills
6. A 12-lead EKG is recorded
7. Each person meets with one of our volunteer cardiologists to review the health history and EKG
8. Most also receive a focused echocardiogram



Part IV

The Role of an Athletic Trainer

Given their skill set, background, training, and proximity to those in need, athletic trainers (AT) are commonly the first to provide aid to SCA victims.

ATs are highly qualified, multi-skilled health care professionals who collaborate with physicians to provide preventative services, emergency care, clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and medical ^{vii}

“

While we're seeing more AEDs at road games, we call ahead to make sure that they have one. If they don't have one or if we're not sure, we bring ours.

”

Tara Grubbs
Head Athletic Trainer,
Pearce High School, Richardson, Texas

It's important that ATs are not just trained in CPR and emergency cardiac response, but that they're equipped with an AED.





AED Requirements for Athletic Trainers

Given the diversity of environments ATs encounter and the transitory nature of their profession, ATs face a unique set of AED use cases.

- **AED Portability** - Commonly, AT's work indoors, in a fixed location such as a gym or rehab facility, but they also observe and care for athletes on the field, away from their office or fixed location. Given that ATs must carry other gear, such as tape, wraps, and ice, the size and weight of the AED are important. If their AED is too heavy or bulky, it runs the risk of being left behind.



For Athletic Trainers, portability is vital. We're always carrying so much gear; it's another piece of equipment that we have to lug around. It'd be nice if they were smaller and lighter so that we could keep them in our normal bags.

Robbie Bowers
Head Athletic Trainer,
Rancho Bernardo High School, San Diego, California



- **AED Durability** – ATs are spread thinly, required to observe many athletes, and travel quickly to-and-from one location to the next. To make sure they're where they're needed the most, ATs must grab their gear and go! This means that AED units get tossed in gear bags, in vehicles, or backpacks. Fragile AEDs are likely to break, and, if ATs have to worry about the durability of their AED, the AED runs the risk of being left behind for fear of being broken.
- **Maintenance** – All AED units need to be maintained and checked regularly to ensure that they're in proper working order. The easier the unit is to maintain, the more likely it'll be ready in the case of an emergency.
- **Total Cost of Ownership** – It's hard to find an AT who doesn't face budgetary pressure. The lower the initial cost of the AED and the future costs they'll incur to replace items like pads and batteries, the more AED units ATs can acquire, allowing for broad placement in the areas where they're needed the most.



Case Study

It's Not Just About Protecting the Athletes

Robbie Bowers
Head Athletic Trainer
Rancho Bernardo High School

Location: San Diego, California
Enrollment: 2,300
Number of AEDs: 3

AED Crusader

Robbie Bowers wasn't handed an automated external defibrillator (AED) program from his school board. He wasn't asked to buy a life-saving unit and make it available during his school's events – actually, quite the opposite. Mr. Bowers built his AED program from the ground up when AED units were rare, typically only seen at airports.



During some of our events, we can have 8,000 people in one location – we're essentially a small city.



Robbie Bowers
Head Athletic Trainer,
Rancho Bernardo High School

At the time, his school board didn't think AEDs were needed, and, worse, they felt that they posed a new liability. Supported by his principal, Mr. Bowers brought his personal AED to campus and made it available during events.

Advocacy Leads to Life-Saving Action

Sudden cardiac arrest doesn't just happen to the athletes," he shares, "it's spectators, referees, and the athletes."

Two-and-a-half years ago, long since winning the fight for AED deployment and broadly training his team, a well-known spectator collapsed in the stands.

"We had practiced our ERP one week prior for a wrestling event and again that day. I don't remember exactly why, but my wife said something, and I whipped off my jacket and headed for the stands," he shares. "I knew the victim. He was in agonal breathing and cyanotic, and so I began performing CPR. I turned, and before I could call for the AED, my college intern was running into the stands toward me with the AED! I didn't need to holler for it since it was already on the way."

By the time the ambulance arrived, Mr. Bowers had delivered one shock and "thirty-seconds into my next round of CPR, after the shock was delivered, he started to regain signs of life, and was breathing on his own," shares Bowers. The two – victim and his rescuer – were communicating when the ambulance arrived, 11 minutes after collapse.



Case Study



Portable AEDs Save More Lives

Tara Grubbs
Head Athletic Trainer
Pearce High School

Location: Richardson, Texas
Enrollment: 2,300
Number of AEDs: 5

General AED Info:

- High School has had AEDs for over 12 years.
- The program has expanded since it started, and older models have been replaced over time.
- AEDs are spread across the campus. A mobile AED is placed in a golf cart, and ATs bring one to all outdoor events.
- The school nurse oversees the campus program; department owners perform day-to-day maintenance.

What makes AT AED ownership unique?

- They're very mobile. "We carry them to all events, including out to the soccer and baseball fields."
- AEDs have to be durable. "We have ours in a backpack. We toss it in the back of the golf cart and go! It has to be ready for the elements, like the rain, because we take it everywhere."



Case Study

Portable AEDs Save More Lives

Tips:

- Maintain your AED. “Not only do you need an AED, you need to maintain your AED.” Check the battery, readiness status, and expiration date of the electrode pads.
- Call ahead to see if the game venue has an AED. “While we’re seeing more AEDs at road games, we call ahead to make sure that they have one. If they don’t have one or if we’re not sure, we bring ours.”

AEDs Work & They're Necessary:

In February of 2018, while working at a soccer game, Tara sprung into action, saving the life of an opposing player.

“The game was really close and there were only about two minutes left,” says Tara, “and a player on the other team collapsed. At first, we all thought he did it to slow the game, so our response was ‘get up.’ Then, when we ran out to see him, we thought that he had had a concussion, but the players near him said that he didn’t knock into anyone, he just fell. I looked at him and his eyes were open, but he wasn’t responsive. Then, he started taking these big gasps and I knew something bigger was wrong with him.” Tara’s CPR training kicked in, recognizing that these gasps weren’t “real breathing” and she sent a player to grab the AED from her mobile golf cart.

“The stadium was so quiet, you could hear a pin drop. When the unit arrived, I applied the pads and began CPR. After calling for the AED, a few parents from the stands, a police officer and a doctor, ran out to help. I performed rescue breaths while they performed CPR.”

After a “shock” and two minutes of CPR, the AED analyzed and delivered a second “shock” of energy. “By the second shock, I could see a difference in him and at that time the ambulance had arrived.” While Tara felt like the ordeal took an eternity, her time-to-defibrillation was only 1-2 minutes from the victim’s collapse!



Endnotes

- i <https://www.nata.org/sites/default/files/automatedexternaldefibrillators.pdf>
- ii Benjamin, E., et al. (2018). Heart Disease and Stroke Statistics—2018 Update: A Report From the American Heart Association. *Circulation*, 137(12). doi: 10.1161/cir.0000000000000558
- iii Benjamin, E., et al. (2018). Heart Disease and Stroke Statistics—2018 Update: A Report From the American Heart Association
- iv Benjamin, E., et al. (2018). Heart Disease and Stroke Statistics—2018 Update: A Report From the American Heart Association
- v American Heart Association, "Part 4: The Automated External Defibrillator: Key Link In The Chain Of Survival", *Circulation* 102, no. 1 (2000): I-60-I-76, doi:10.1161/01.cir.102.suppl_1.i-60.
- vi Rothmier, J., & Drezner, J. (2009). The Role of Automated External Defibrillators in Athletics. *Sports Health: A Multidisciplinary Approach*, 1(1), 16-20. doi: 10.1177/1941738108326979
- vii <https://www.nata.org/about/athletic-training>