

Recognition and Management of Sudden Cardiac Arrest in Athletes



UW Medicine

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Disclosure Information

Editor-in-Chief

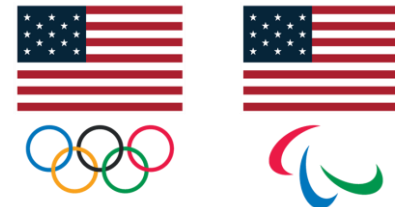
- British Journal of Sports Medicine

Volunteer Positions

- Parent Heart Watch – Medical Advisory Board
- Nick of Time Foundation – Medical Director
- Korey Stringer Institute – Scientific Advisory Committee
- USOPC – Research Steering Committee
- Seattle United FC – Chair, Medical Advisory Committee
- Who We Play For – Medical Advisory Committee
- WIAA – Sports Medicine Advisory Board

Research Funding

- NCCSIR – Division of Cardiac Injury in Sport
- AMSSM – Cardiac Outcomes Registry




WASHINGTON INTERSCHOLASTIC
ACTIVITIES ASSOCIATION



PUT THE PADS ON





Damar Hamlin Clip






 **health**
Audio Live TV Log In

Is your school equipped to save a life? Here's how you'll know

By Dr. Sanjay Gupta, CNN Chief Medical Correspondent
 Updated 12:23 PM EST, Fri February 10, 2023



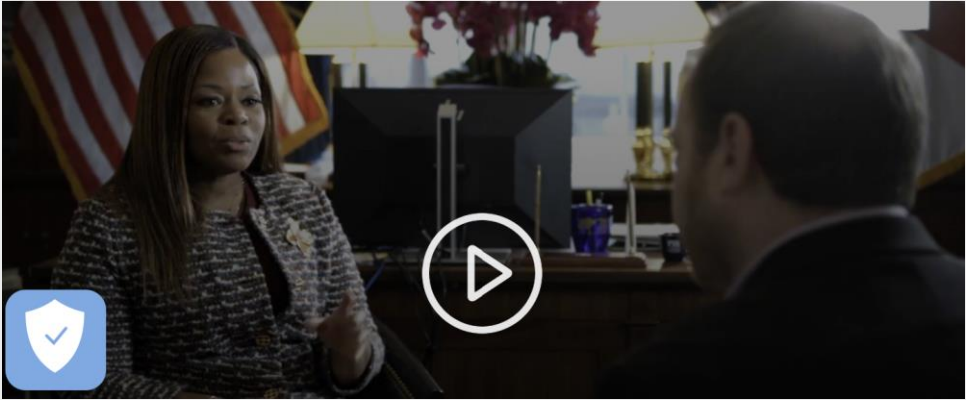


FOLLOW US     

Documentaries and Investigations

Scripps News school AED probe gets attention in Congress

Rep. Cherfilus-McCormick, a Florida Democrat, will lead a bipartisan push for more school AEDs. The NFL & American Heart Association are endorsing.






Super Bowl LVII > How Kansas City Won > See the 65-Yard Punt Return > 10 Things You May


'We're Going to Need Everybody': Recordings Captured Response to N.F.L. Crisis

When Damar Hamlin's heart stopped during a game on Monday night, medical personnel can be heard responding to the kind of emergency the league hoped it would never face.




SIGN IN GET HBOMAX

Real Sports with Bryant Gumbel

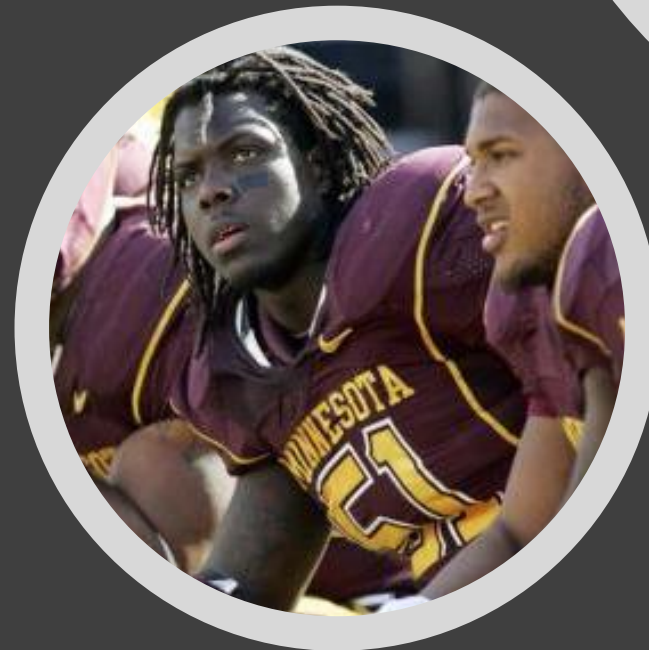


REAL SPORTS WITH BRYANT GUMBEL | SEASON 29 | EPISODE 1

Real Sports with Bryant Gumbel (January 2023)

Sudden Cardiac Arrest in Young Athletes

- Leading cause of death in young athletes during sport
- Exercise is trigger for SCA in athletes with underlying cardiac disorder





Quick Stat

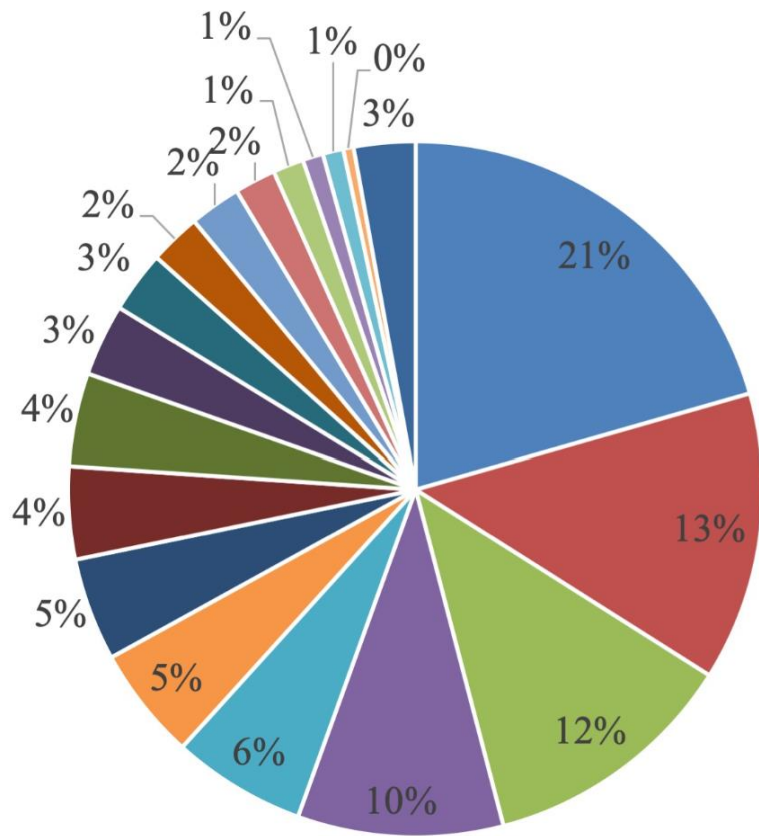
75% of all fatalities during sports are cardiovascular related

HBO/Real
Sports Clip



Outline

1. Epidemiology of SCD in athletes
2. Survival outcomes: 2 decades in review
3. Recognition and management of SCA
4. Gaps: improving survival
5. Case studies



BJSM 2020

- Hypertrophic cardiomyopathy (43, 20.6%)
- Idiopathic left ventricular hypertrophy (28, 13.4%)
- Coronary artery anomalies (25, 12.0%)
- Autopsy negative sudden unexplained death (20, 9.6%)
- Arrhythmogenic cardiomyopathy (13, 6.2%)
- Long QT syndrome (11, 5.3%)
- Commotio cordis (10, 4.8%)
- Wolff-Parkinson-White (9, 4.3%)
- Myocarditis (9, 4.3%)
- Aortic dissection/rupture (7, 3.3%)
- Dilated cardiomyopathy (6, 2.9%)
- Valve disorder (5, 2.4%)
- Coronary atherosclerosis (5, 2.4%)
- Complications of a congenital heart defect (4, 1.9%)
- Catecholaminergic polymorphic ventricular tachycardia (3, 1.4%)
- Hypertensive heart disease (2, 1.0%)
- Left ventricular noncompaction (2, 1.0%)
- Restrictive cardiomyopathy (1, 0.5%)
- Other (6, 2.9%)

Original research

OPEN ACCESS

Aetiology and incidence of sudden cardiac arrest and death in young competitive athletes in the USA: a 4-year prospective study

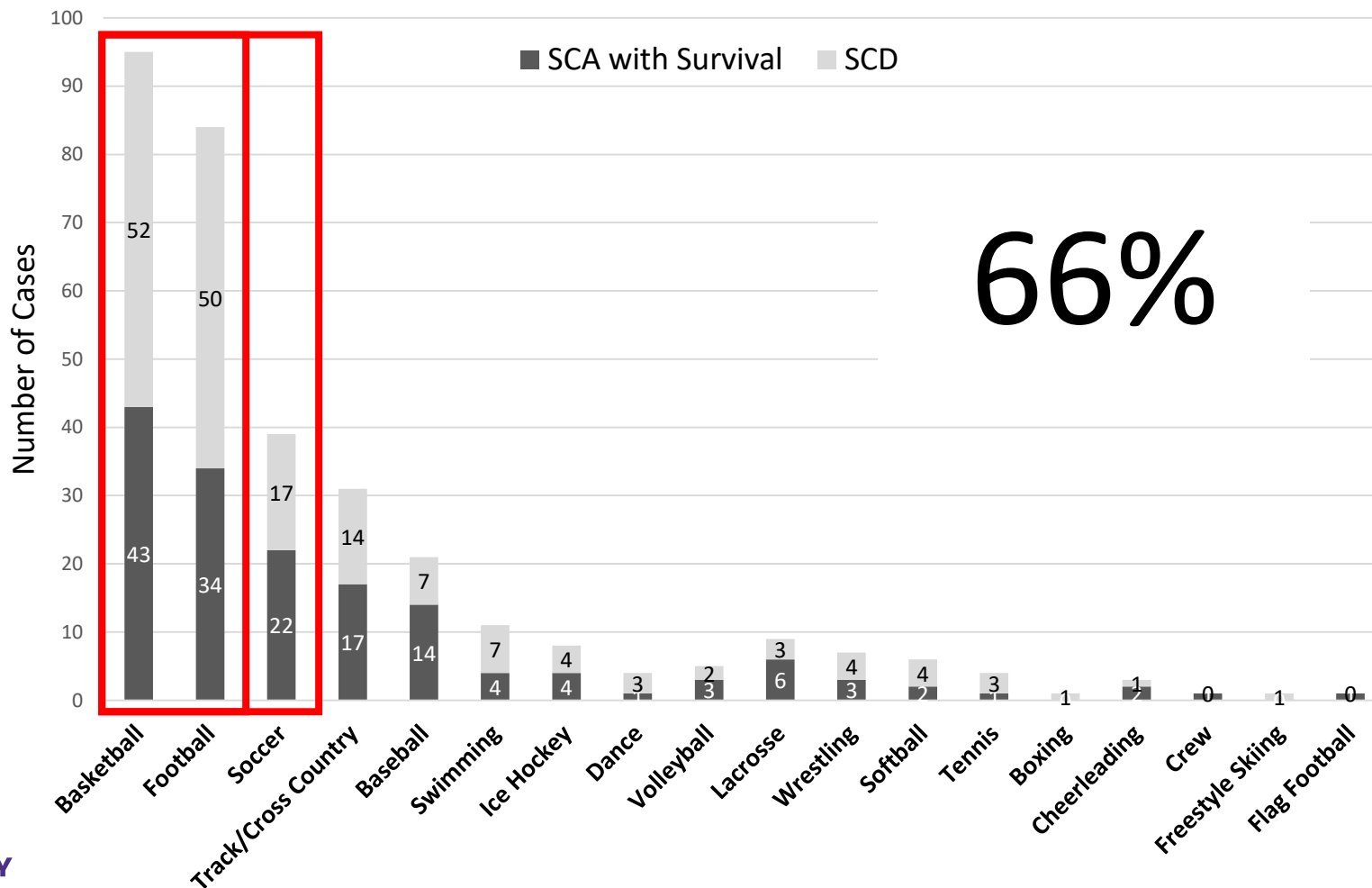
Danielle F Peterson,¹ Kristen Kucera,² Leah Cox Thomas,³ Joseph Maleszewski,⁴ David Siebert,⁵ Martha Lopez-Anderson,⁶ Monica Zigman,⁵ Jared Schattenkerk,⁷ Kimberly G Harmon,⁵ Jonathan A Drezner,⁸

Prospective surveillance
July 2014 – June 2018
331 cases of confirmed SCA/D



SCA & SCD by Sport in U.S. Competitive Athletes

July 1, 2014 – June 30, 2018 (n=331)



NCAA

Overall (n=39)
1:50,768 AY
(95% CI: 1:69,285 to 1:37,960)

Male (n=32)
1:34,906 AY
(95% CI: 1:49,173 to 1:25,385)

Female (n=7)
1:123,278 AY
(95% CI: 1:249,853 to 1:66,078)

African American (n=12)
1:18,413 AY
(95% CI: 1:31,921 to 1:11,226)

Caucasian (n=18)
1:38,641 AY
(95% CI: 1:60,802 to 1:25,554)

Basketball (n=7)
1:4,810 AY
(95% CI: 1:9,748 to 1:2,578)

Football (n=4)
1:28,061 AY
(95% CI: 1:69,137 to 1:12,802)

Basketball (n=2)
1:15,098 AY
(95% CI: 1:48,808 to 1:5,420)

Football (n=7)
1:20,410 AY
(95% CI: 1:41,367 to 1:10,940)

NCAA Division I (n=6)
1:2,087 AY
(95% CI: 1:4,450 to 1:1,073)

NCAA Division I (n=3)
1:18,031 AY
(95% CI: 1:49,634 to 1:7,487)

NCAA Division II (n=1)
1:35,725 AY
(95% CI: 1:147,496 to 1:9,685)

NCAA Division I (n=1)
1:5,416 AY
(95% CI: 1:22,361 to 1:1,468)

NCAA Division II (n=1)
1:7,380 AY
(95% CI: 1:30,470 to 1:2,001)

NCAA Division I (n=1)
1:44,151 AY
(95% CI: 1:182,284 to 1:11,969)

NCAA Division II (n=4)
1:8,096 AY
(95% CI: 1:19,948 to 1:3,694)

NCAA Division III (n=2)
1:33,169 AY
(95% CI: 1:107,225 to 1:11,906)

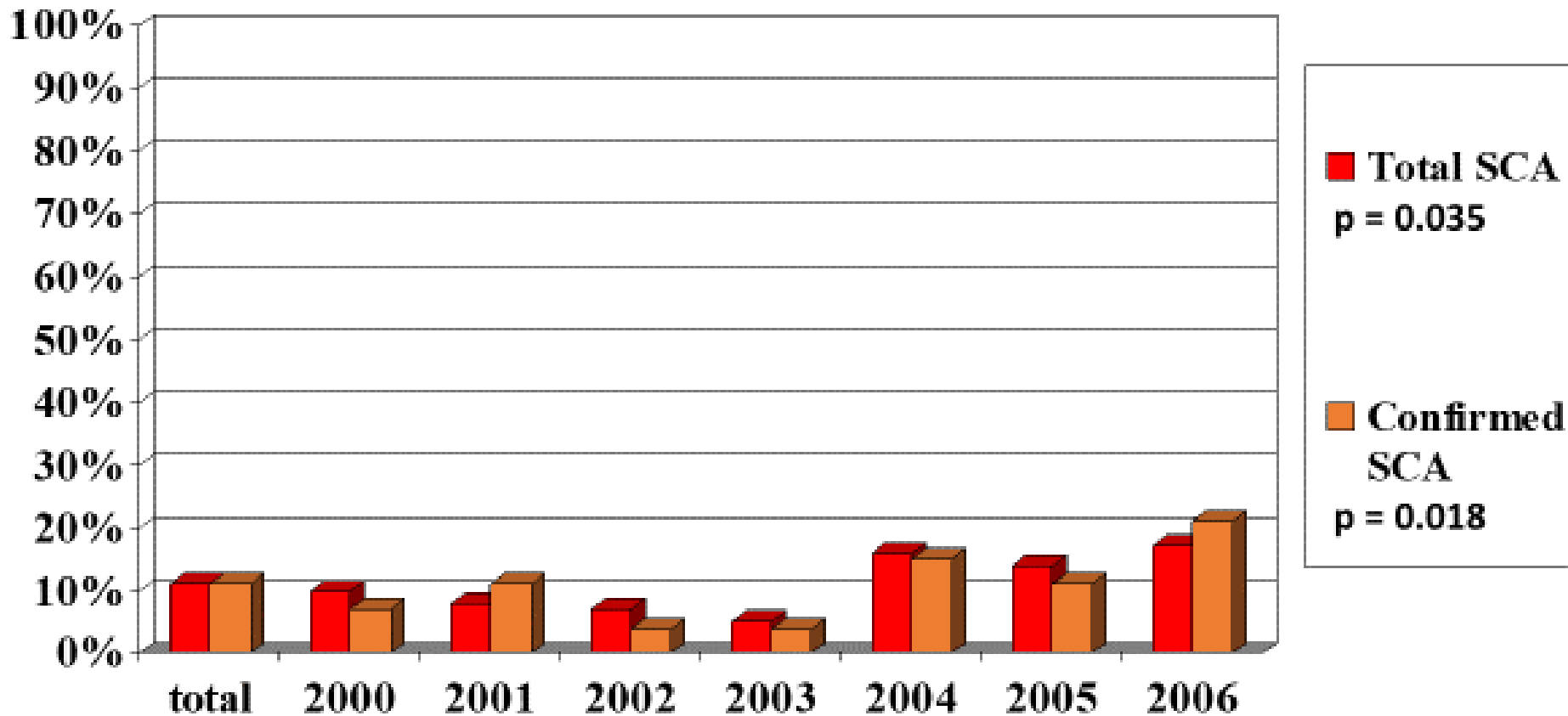


Survival from SCA in
athletes:

2 decades in review

Survival trends in the U.S. following exercise-related SCA in the youth: 2000-2006

[N=486; average survival 11%; range 4-21% per year]



Suspect SCA in any Collapsed & Unresponsive Athlete

Inter-Association Task Force Recommendations on Emergency Preparedness and Management of Sudden Cardiac Arrest in High School and College Athletic Programs: A Consensus Statement

Jonathan A. Drezner, MD, Ron W. Courson, ATC, PT,† William O. Roberts, MD,‡
Vincent N. Mosesso, Jr MD,§ Mark S. Link, MD,¶ and Barry J. Maron, MD||*



2007

1 Recognition

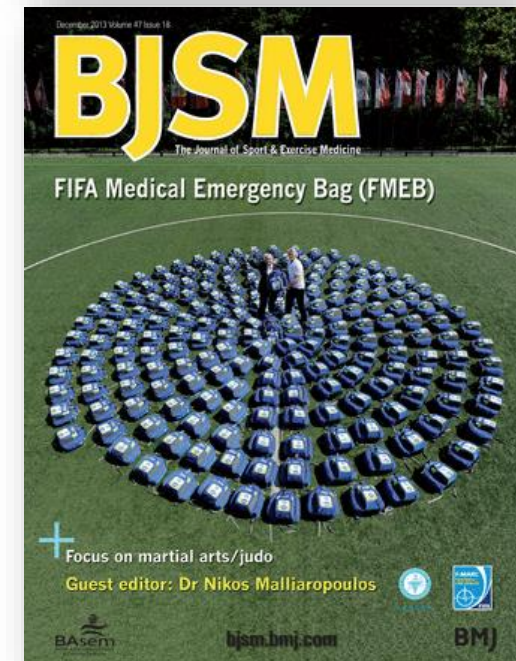
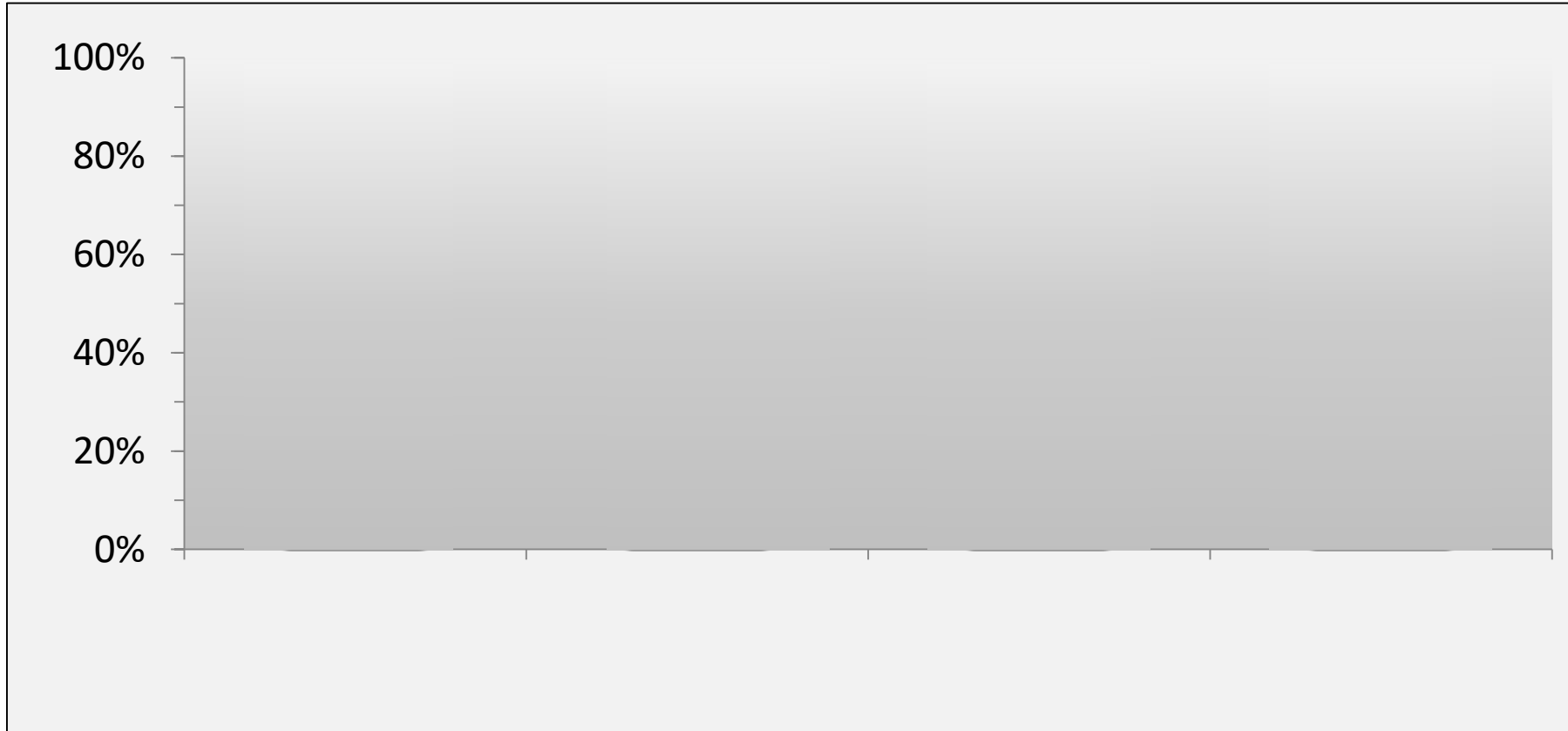
2 Chest compressions

3 AED

Outcomes from sudden cardiac arrest in US high schools: a 2-year prospective study from the National Registry for AED Use in Sports

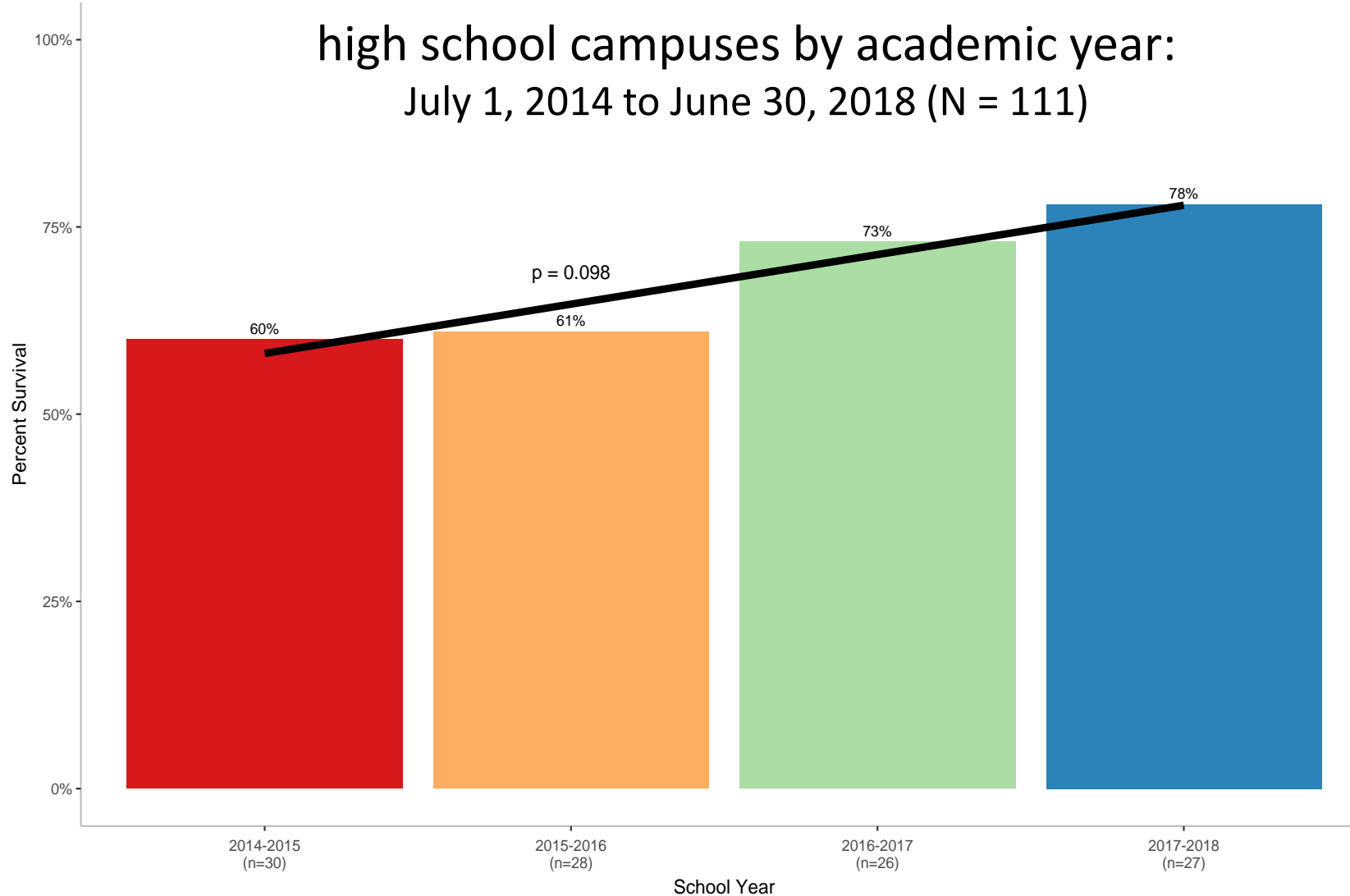
Jonathan A Drezner,¹ Brett G Toresdahl,¹ Ashwin L Rao,¹ Ella Huszti,² Kimberly G Harmon¹

- 2-year prospective observational study
- 2,149 high schools
- 87% with AED program




2013


Survival for exercise-related SCA in student-athletes on high school campuses by academic year: July 1, 2014 to June 30, 2018 (N = 111)



Original research

 OPEN ACCESS

Socioeconomic factors and outcomes from exercise-related sudden cardiac arrest in high school student-athletes in the USA

Jared Schattengerk,¹ Kristen Kucera,² Danielle F Peterson,³ Robert A Huggins,⁴ Jonathan A Drezner ⁵

68% overall survival
83% if on-site ATC
85% if on-site AED used



CORRESPONDENCE

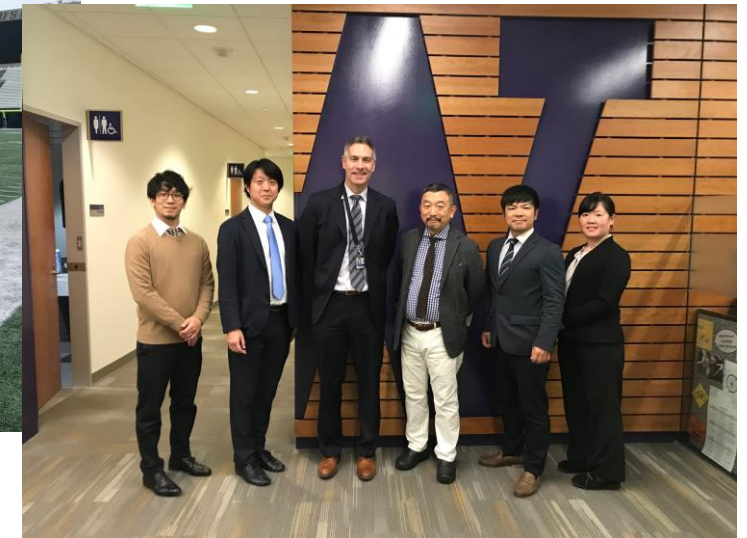


Mobile Automated External Defibrillator Response System
during Road Races

NEJM 2018

28 runners with witnessed SCA
Gaspings noted in 89%
Mean time to CPR 0.8 min
Mean time to AED shock 2.2 min
86% in V-fib
100% survival

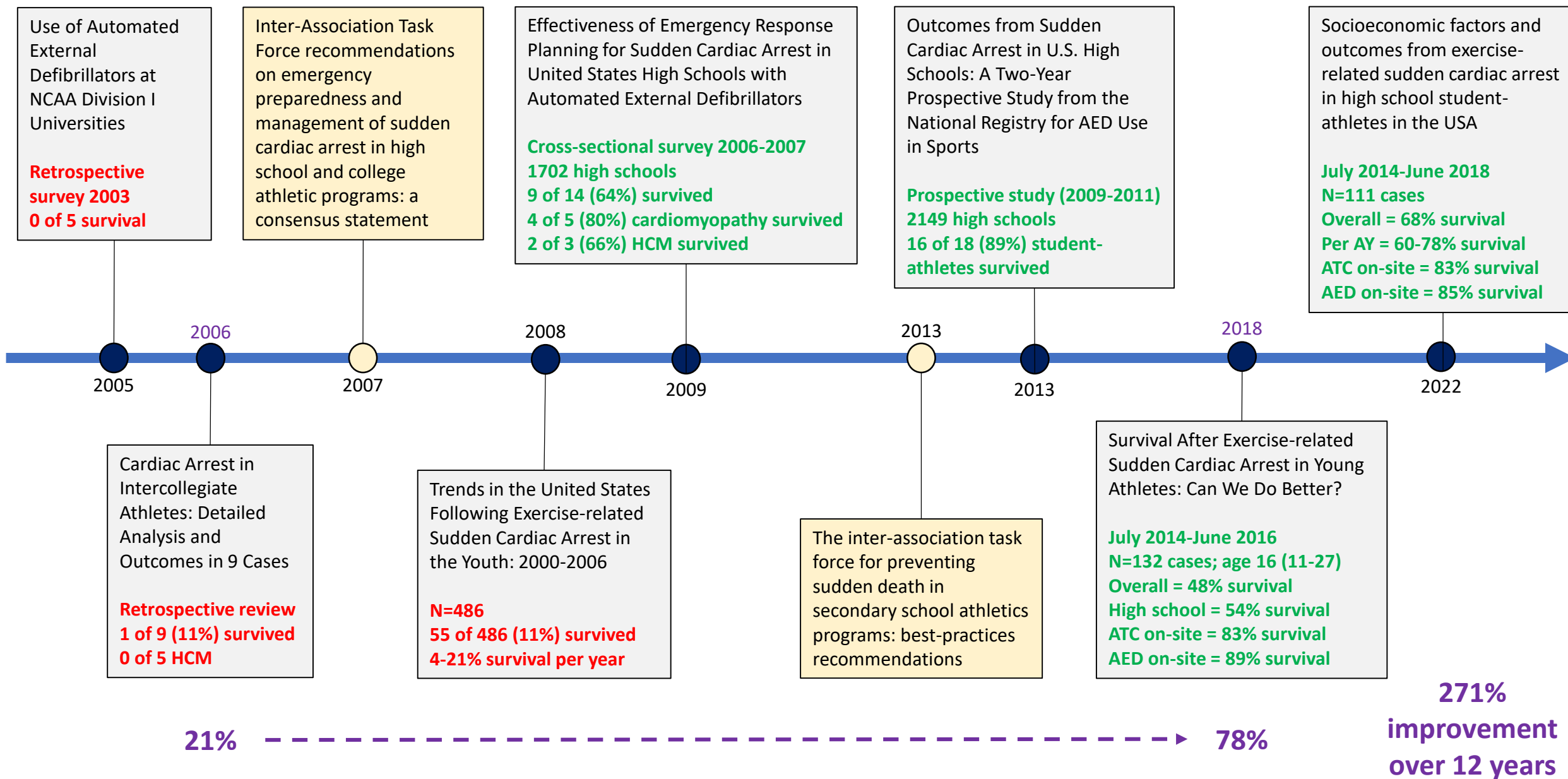
Tomoya Kinoshi, M.S.Sc.
Shota Tanaka, B.S.
Ryo Sagisaka, Ph.D.
Takahiro Hara, Ph.D.
Toru Shirakawa, M.E.M.
Etsuko Sone, M.E.M.
Hiroyuki Takahashi, Ph.D.
Masaru Sakurai, M.D., Ph.D.
Akira Maki, M.D., Ph.D.
Hiroshi Takyu, Ph.D.
Hideharu Tanaka, M.D., Ph.D.



SCA in athletes is largely a **survivable event** through prompt treatment and access to an AED



Evolution of Evidence Supporting AEDs in Schools and Improved Survival from Sudden Cardiac Arrest in Young Athletes





Preparing for SCA in Sport

It's NOT just about AEDs...

EMERGENCY PREPAREDNESS

Defibrillation

Sudden Cardiac Arrest and Defibrillation

Sudden cardiac arrest (SCA) is when the heart stops pumping blood to the body. Most often SCA is the result of a disturbance in the heart's electrical system. The electrical impulses normally referred to as **synchronous fibrillation (VF)** cause the heart muscles to quiver instead of contracting rhythmically. A person with SCA will lose consciousness and stop breathing, and no heart will flow to the body.

Defibrillation is an electric shock to the heart that can correct VF, allowing the heart to begin beating rhythmically again.

What is an Automated External Defibrillator (AED)?

An automated external defibrillator (AED) is an emergency medical device that can analyze the rhythm of a cardiac arrest victim. AEDs use both visual and sound instructions to guide the rescuer to the proper operation of the AED. During an event, an AED analyzes the heart rhythm of a person experiencing cardiac arrest. Within seconds, it determines if the heart's electrical system is malfunctioning and if a response is necessary. If a defibrillation is necessary, the AED automatically charges and instructs the rescuer to press the shock button. By pressing the shock button, defibrillation energy is delivered to the victim as an attempt to restart the heart's rhythm.

Signs of SCA

- Unconscious
- No breathing
- No circulation (no pulse)

How It Works

The only way to restart certain abnormal rhythms of the heart such as **synchronous fibrillation** is with an electrical shock from a defibrillator. Unlike other defibrillators (AEDs) can be found in airports, sports centers, and many other locations. AEDs are not shock defibrillators designed for use by lay rescuers.

Only use a defibrillator on a person who is unconscious, not breathing, and has no circulation.

Life-Saving Steps:

1. **Phone for help and get the AED.**
2. **Start CPR.**
3. **Early defibrillation.**
4. **Paramedics arrive.**

Act Fast!

Early defibrillation is the key to increasing the chances of survival. Survival rates for SCA are highest when defibrillation occurs within the first few minutes after the victim has collapsed. For each minute that defibrillation is delayed, the survival rate drops by about 7-10 percent.

Importance of CPR

Immediately performing CPR after giving an automatic external defibrillator (AED) will double the chances for survival. CPR defibrillation occurs. It is critical to perform CPR. CPR will circulate blood and oxygen to the heart and brain giving the body 1 better chance to respond to defibrillation therapy.

AEDs Are Safe

AEDs will only shock a victim who requires it. Although they are simple to operate, AEDs should be used only by trained CPR/AED operators. Although CPR/AED training can be obtained through many certified training centers, they should still give a person the best chance of survival. Call 911 for CPR and use an AED to save a life.

SAVE LIVES

Notice where AEDs are located.

STAND CLEAR

CALL 911

In an emergency CALL 911

- ✓ Written Emergency Action Plan for SCA
- ✓ EAP coordinator
- ✓ All staff awareness of AED locations
- ✓ Trained responders in CPR/AED
- ✓ Emergency communication
- ✓ Immediate access to AED (<3 min collapse to shock)
- ✓ Venue-specific transportation routes for EMS
- ✓ Review and rehearsal of the EAP at least annually
- ✓ Integration of AEDs into local EMS system
- ✓ Maintenance of AEDs (battery and lead replacement)

Practical management of sudden cardiac arrest on the football field

Efraim Benjamin Kramer,¹ Martin Botha,¹ Jonathan Drezner,² Yasser Abdelrahman,³ Jiri Dvorak⁴
BJSM 2012

Box 1 Key recommendations for emergency planning for sudden cardiac arrest on the football field

- ▶ Every team and venue hosting football training or competition should have a written emergency response plan for SCA.
- ▶ Potential responders to SCA on the field (ie, coaches, referees, physiotherapists, athletic trainers, and other medical staff) should be regularly trained in CPR and AED use, and demonstrate skills proficiency in this regard.
- ▶ An AED should be immediately available on the pitch during competitions.
- ▶ Both teams should review prior to the match the location of the AED and details of the emergency response plan.

AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; SCA, sudden cardiac arrest.

Chaos...Uncertainty...Fear...



[LINK TO YOUTUBE CLIP](#)

April 14, 2012



**Recognition and
Management of SCA
in Athletes**

Witnessed Collapse and Unresponsive During Exercise = SCA

RECOGNITION

- Sudden collapse
- Unresponsive
- Eyes open and rolled back
- Gasping/respiratory movements
- Seizure/shaking/twitching



RESPONSE

- Call for help
- Chest compressions
- AED



Keyontae Johnson

December 12, 2020



GMA YOUTUBE CLIP

CLIP

The “face” of sudden cardiac arrest

Marc-Vivien Foé
2003

CLIP

Fabrice Muamba
2012

Abdelhak Nouri

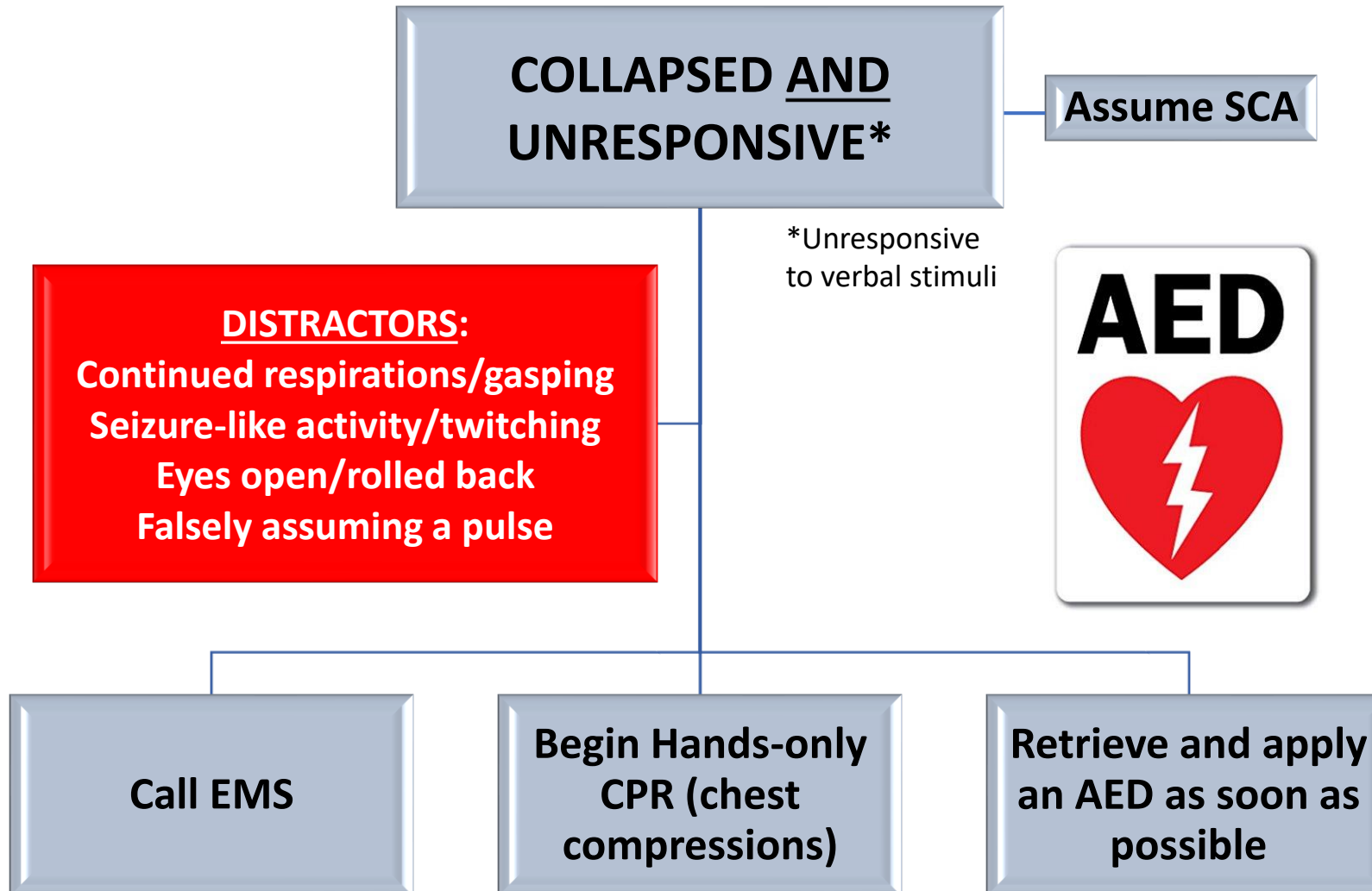
July 8 , 2017



CLIP

☑ Emergency Action Plan for SCA

Universal Response to the Collapsed Athlete



Improving survival for
SCA in sport:

Where are the gaps?

May 8, 2018
Rafeal Perry
17 yo
AAU



May 21, 2018
Darrell Rogers
16 yo
AAU practice

May 17, 2018
Javon Craddock
16 yo
Boys & Girls Club
AAU



May 27, 2018
James Hampton
17 yo
Nike's EYBL

#1 Gap:

Emergency Preparedness
in Non-School Sports

RESEARCH LETTER

Differences in Survival Outcomes in Adolescent Male Basketball Players at School-Sponsored Versus Select Club-Sponsored Events and Implications for Racial Disparities

Ashley V. Austin, MD; Randi N. DeLong, MPH; Kristen L. Kucera, PhD, MSPH, ATC; Jared Schattenkerk, BS; Jonathan A. Drezner, MD



	High School (n=34)	AAU (n=13)	
Survival	70.6%	38.5%	p=0.043
Bystander CPR	91.2%	53.9%	p=0.004
AED use	79.4%	30.8%	p=0.002

1. SUDDEN CARDIAC ARREST

UNRESPONSIVE

Sudden Collapse, Seizure, Gasping,
Eyes Open

2. EXERTIONAL HEAT ILLNESS

CONFUSED

Dizzy, Headache, Slurred Speech,
Altered MS, LOC, Seizure

COLLAPSED ATHLETE

3. SICKLE CELL TRAIT

DISTRESS

Leg, Back, or Chest Pain, Muscle
Cramps, Fatigue, SOB

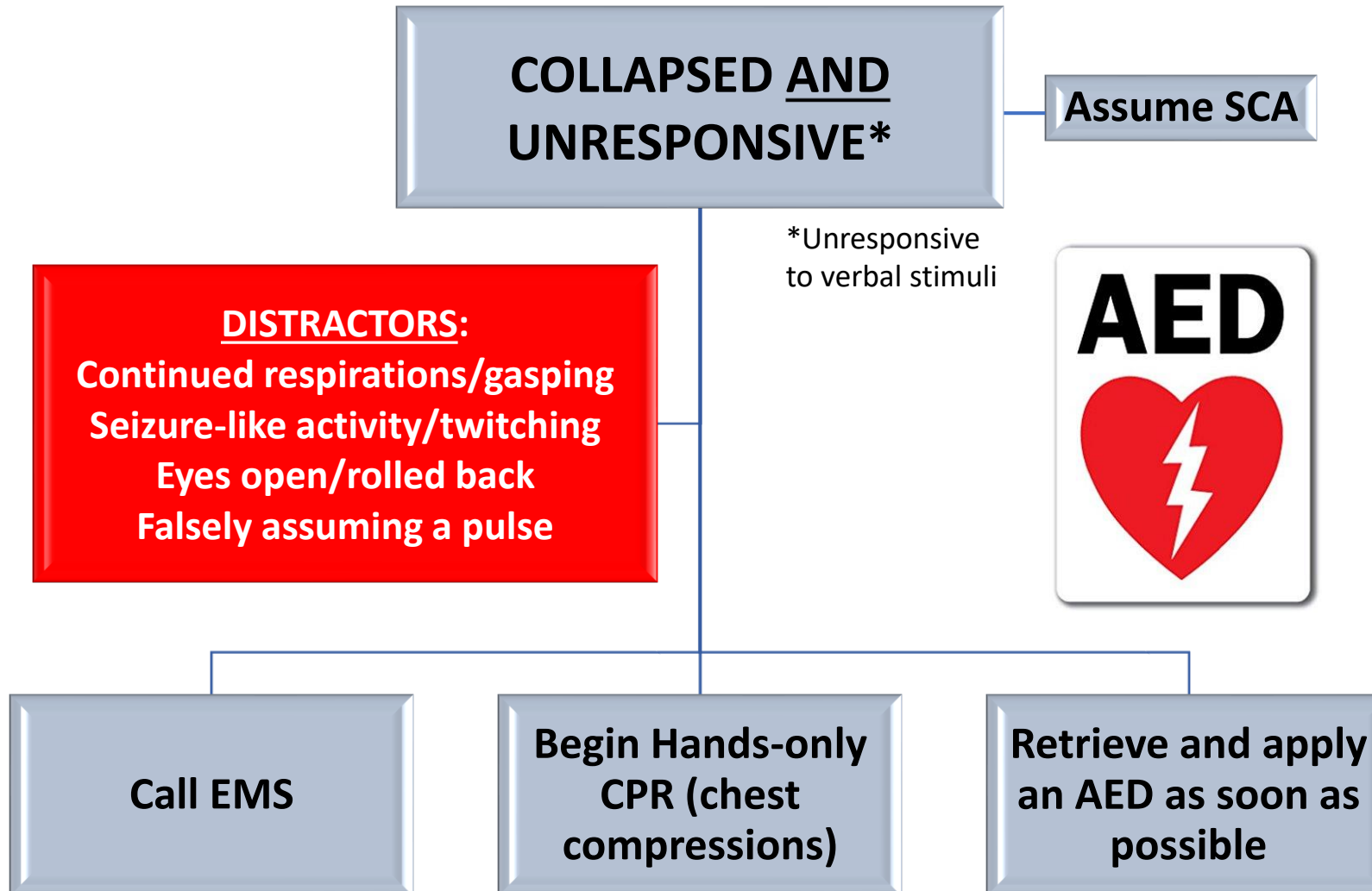
4. HEAD/NECK

TRAUMATIC

Concussion, Neck Pain, Cervical Cord
Neuropraxia, Impact Seizure

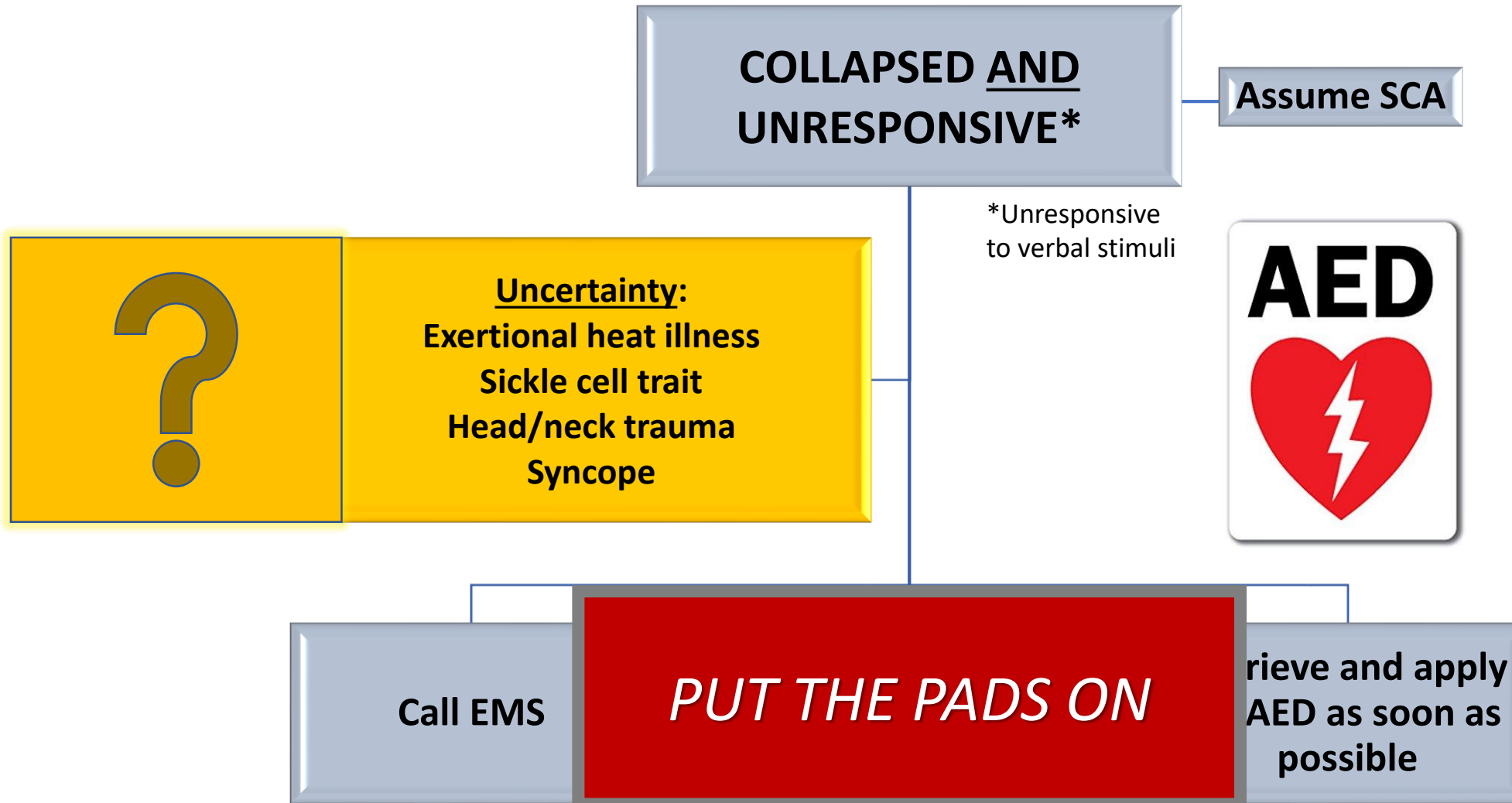
✓ Emergency Action Plan for SCA

Universal Response to the Collapsed Athlete



✓ Emergency Action Plan for SCA

Universal Response to the Collapsed Athlete

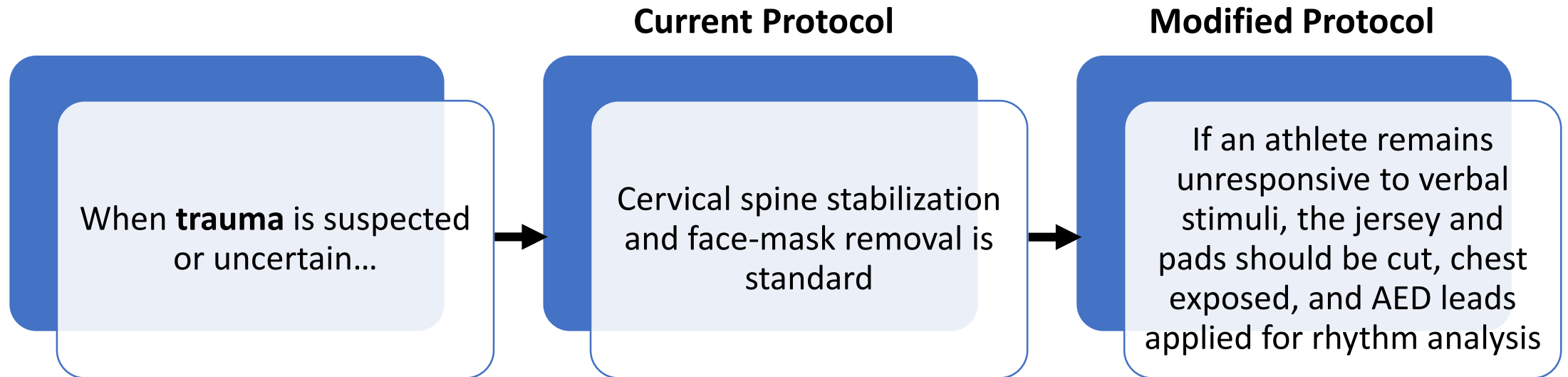




Protocol Update?

Management of the
collapsed football
player

Unresponsive: On-Field Rescue



PUT THE PADS ON



Christian Eriksen – June 12, 2021

Video Clip Slide 43

UNIVERSAL RESPONSE

Cardiac Emergency Response Plan

SCA

Sudden Cardiac Arrest

Sudden Collapse Athlete

RECOGNIZE

Sudden collapse
Unresponsive
Eyes open
Gasp
Seizure

REACT

Call 9-1-1
Retrieve AED
Expose chest
Access airway
Clear area

RESCUE

Start CPR
Apply AED
Rhythm analysis
Shock
Resume CPR



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Thank You

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