RUNING THE GOOD THE BAD AND THE ….FUTURE

Dr Dan Hadas

sport cardiology

SportCardiology

THE GOOD

- The benefits of exercise are well established.
- Active individuals have favorable lipid and blood pressure profiles and a 50% reduction in the risk of developing coronary artery disease (CAD).
- In addition to the cardiovascular benefits, physical activity also confers benefits in the prevention of certain malignancies, treatment of mild depression, and potential retardation of dementia.
- A meta-analysis of 27,100 participants followed for a mean duration of 12 years reported a 30% reduction in all-cause mortality in those who led a regularly active lifestyle consisting of exercise of moderate intensity

Thompson PD, Buchner D, Pina IL, et al. Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease. Circulation.16–3109:(24)107;2003
2. Agarwal SK. Cardiovascular benefits of exercise. Int J Gen Med 2012;5:541–5.
3. Nelson ME, Rejeski WJ, Blair SN, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. Circulation 2007;116(9):1094–105.

THE GOOD

- Twenty minutes of cycling (3.6 METs) per day, at 10–12mph has been proven to be beneficial for CV, and overall health 230min/ week of cycling was shown to decrease premature mortality risk by 21%

- Matthews CE, Jurj AL, Shu XO, Li HL, Yang G, Li Q, Gao YT, Zheng W. Influence of exercise, walking, cycling, and overall nonexercise physical activity on mortality in Chinese women. Am J Epidemiol 2007;165:1343–1350.

THE GOOD

- Decades of scientific investigations have fortified the protective effects of cardiorespiratory fitness , exercise training, and physical activity against the development of CVD

- *Progress in Cardiovascular Diseases 61 (2018)*

Progress in Cardiovascular Diseases 61 (2018) 484–490

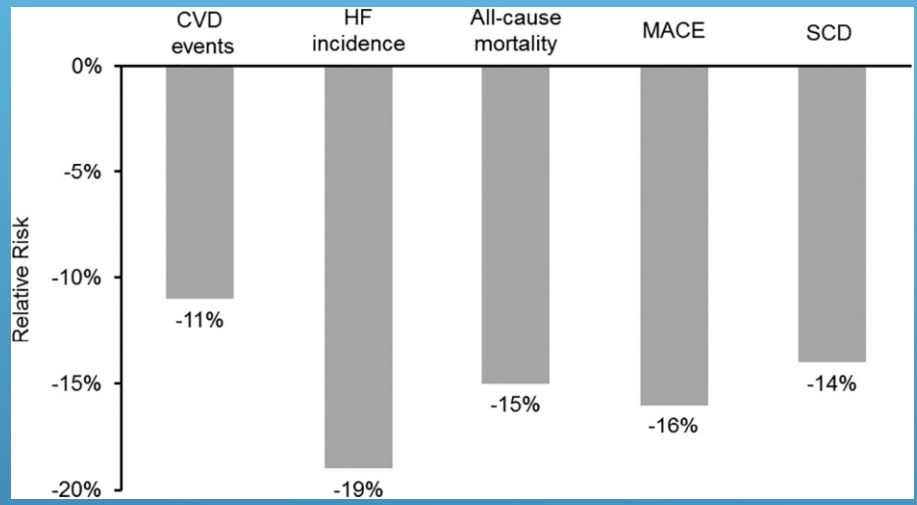
Contents lists available at ScienceDirect

Progress in Cardiovascular Diseases

journal homepage: www.onlinepcd.com

An Update on the Role of Cardiorespiratory Fitness, Structured Exercise and Lifestyle Physical Activity in Preventing Cardiovascular Disease and Health Risk☆

Cemal Ozemek [a,*], Deepika R. Laddu [a], Carl J. Lavie [b], Hannah Claeys [a], Leonard A. Kaminsky [c], Robert Ross [d,e], Ulrik Wisloff [f,g], Ross Arena [a], Steven N. Blair [h]



- PA performed at greater intensities or weekly volumes is associated with more favorable health outcomes.
- Yet, there is evidence to suggest that PA performed at extreme volumes is associated with poor clinical outcomes.
- Reports of a U or reverse J-shaped relationship between higher PA doses and CVD- and all-cause mortality have previously been evidenced in large epidemiological studies, underscoring the potential existence of an upper limit of CVD benefit beyond which survival benefits received from regular PA diminish

- In runners, longer distance, in addition to volume of PA, appears to mediate the risk of cardiac arrest and SCD in susceptible individuals who may be predisposed to CVD, by way of imposing greater physiological stress that increases the likelihood of triggering adverse CVD events.

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REVIEW

A risk-benefit analysis of maintaining an aerobic-endurance triathlon training program during pregnancy: A review

Science & Sports, Volume 33, Issue 5, October 2018

In conclusion, based on the available evidence, endurance-based swimming, cycling and running training are unlikely to pose a substantial risk to the mother or fetus and therefore cessation is not warranted. However, to protect against fetal bradycardia, intensity of sessions should be maintained below 90% of maximal MHR. Reduc-

WE ALL SAY SPORT IS GOOD FOR YOU…..IS IT?

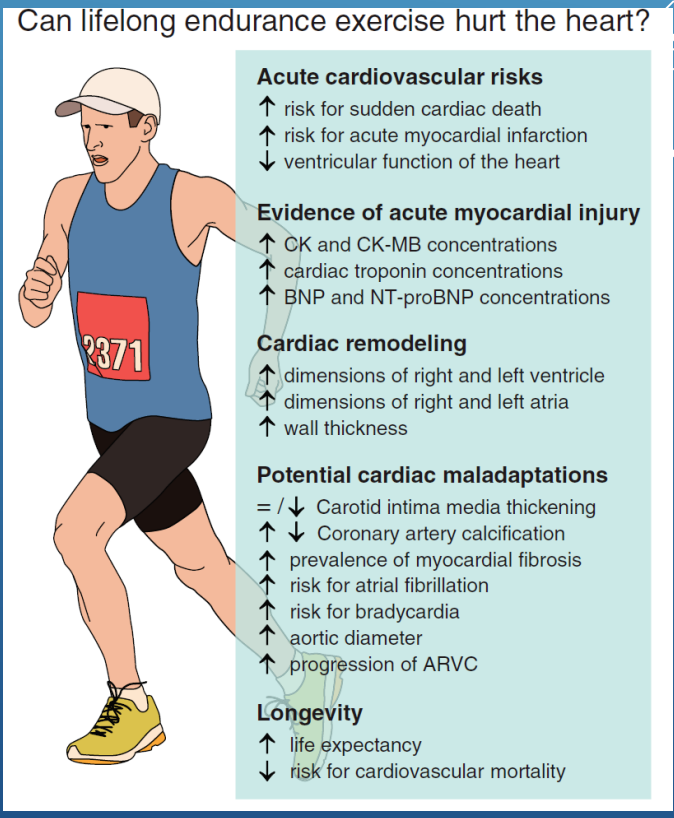
Physiol Rev 96: 99–125, 2016
Published November 25, 2015; doi:10.1152/physrev.00029.2014

ARE THERE DELETERIOUS CARDIAC EFFECTS OF ACUTE AND CHRONIC ENDURANCE EXERCISE?

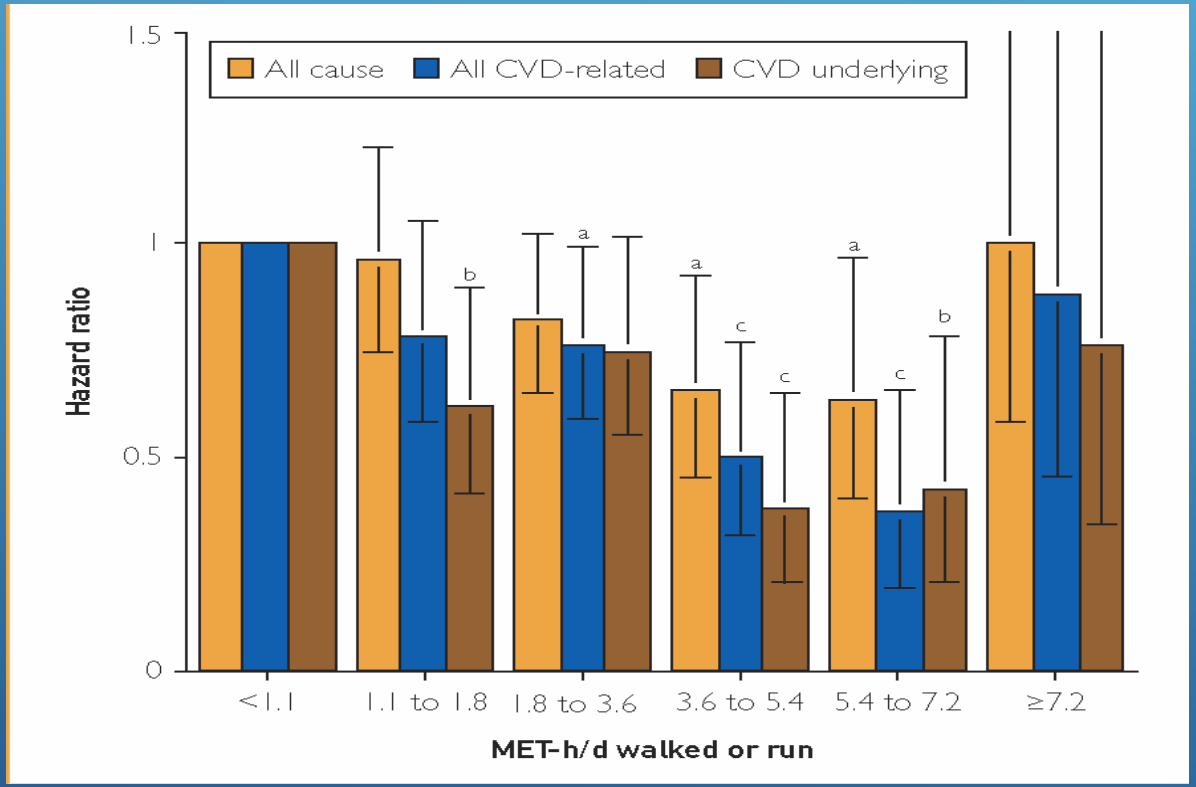
Thijs M. H. Eijsvogels, Antonio B. Fernandez, and Paul D. Thompson

American men who completed 1 marathon/ yr over the previous 25 years demonstrated larger CAC(coronary artery calcification) volumes than a sedentary control group (Increased coronary artery plaque volume among male marathon runners. *Missouri Med* 111: 85–90, 2014.**)**

- Exercise and physical activity appear to have remarkably beneficial effects for the majority of the population. The problem for most developed societies is too little and not too much exercise.



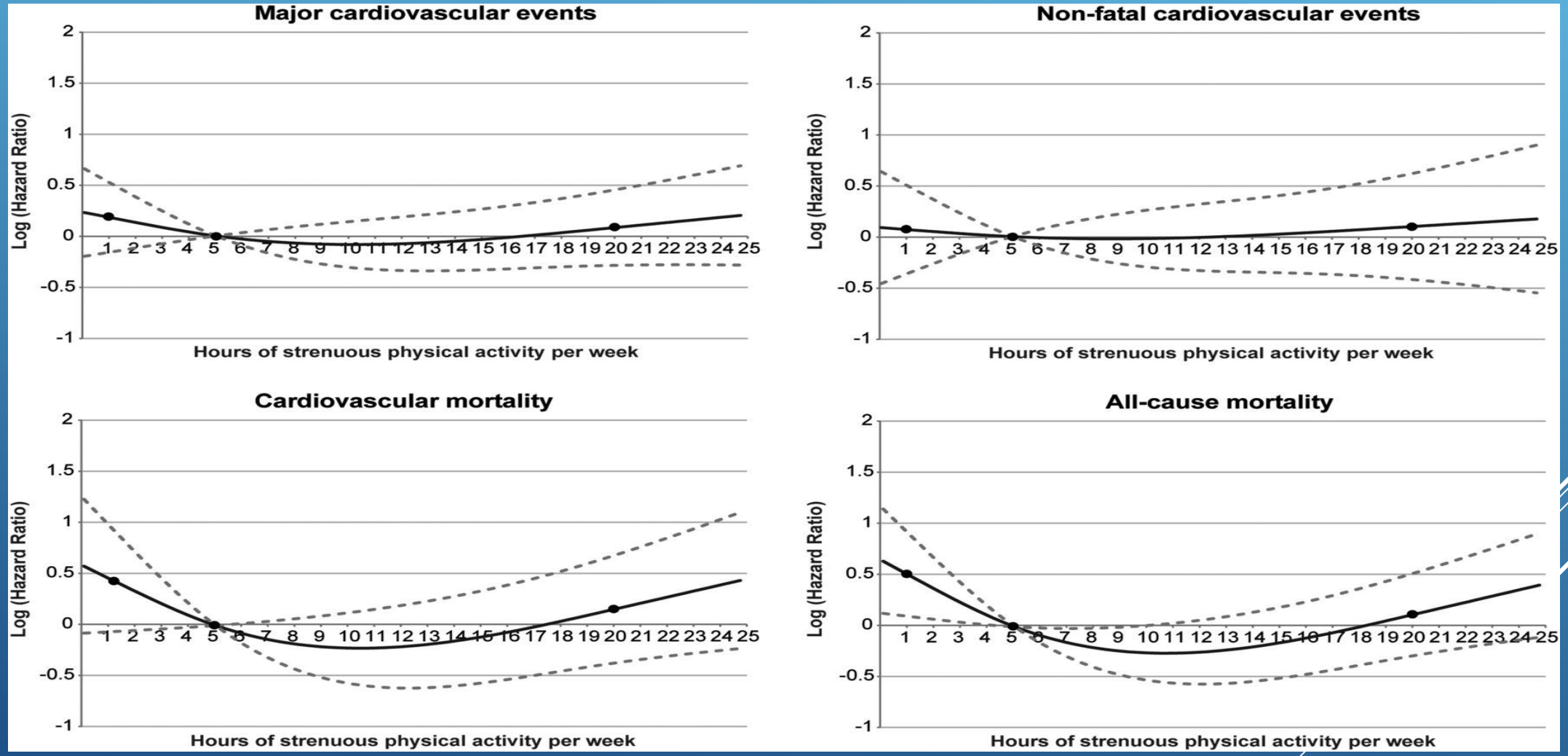
EXERCISE AND SURVIVAL: THE REVERSE J-CURVE PATTERN



Conclusion: Running or walking decreases CVD mortality risk progressively at most levels of exercise in patients after a cardiac event, but the benefit of exercise on CVD mortality and IHD deaths is attenuated at the highest levels of exercise (running: above 7.1 km/d or walking briskly: 10.7 km/d).

 ■ Mayo Clin Proc. 2014;89(9):1187-1194

Relationship between overall duration of strenuous activity in hours per week and different outcomes of prognosis.



Ute Mons et al. Heart 2014;100:1043-1049

Heart

THE BAD

- However, the survival benefits from improvements in the CRF plateau at about 10 metabolic equivalents
- with no additional survival benefit accruing from higher CRF levels.
- Clearly, 30 minutes of regular vigorous PA enhances health and well-being,
- Indeed, recent studies suggest that extreme exercise may evoke acute elevations in cardiac troponin I and B-type natriuretic peptide and evidence of transient myocardial dysfunction

(Trivax J.E., Franklin B.A., Goldstein J.A., et al: Acute cardiac effects of marathon running. J Appl Physiol 2010)

- **Athletes have an increased risk of AF compared to the general population.**

(H. Ayinde et al. / IJC Heart & Vasculature 18 (2018) 25–29)

THE FIRST REPORTED EXERCISE-RELATED DEATH IN HISTORY

Philippides was sent to Sparta to request help when the Persians landed at Marathon, Greece. He ran about 240 km in two days. He then ran the 40 km from the battlefield near Marathon to Athen…..

- The courier, brought the news of victory from Marathon (490 BC) "Joy to you, we've won" he said, and there and then he died, breathing his last breath with the words "Joy to you"

WHEN THE BAD BECOMES WORSE

- Sudden Death in Marathon Runners

Jason James, BSc, Ahmed Merghani, MBBS,

Sanjay Sharma, MD*

Card Electrophysiol Clin 5 (2013) 43–51

- Sudden cardiac death (SCD) associated with athletic activity is a rare but devastating event. Victims are usually young and apparently healthy, and while many of these deaths remain unexplained, a substantial number of victims harbour an underlying and potentially detectable cardiovascular (CV) disease (EHRA Position paper ,European Journal of Preventive Cardiology 2017)

- As an overall estimate, 1 to 2 out of 100 000 athletes between the age of 12 and 35 years die suddenly each year

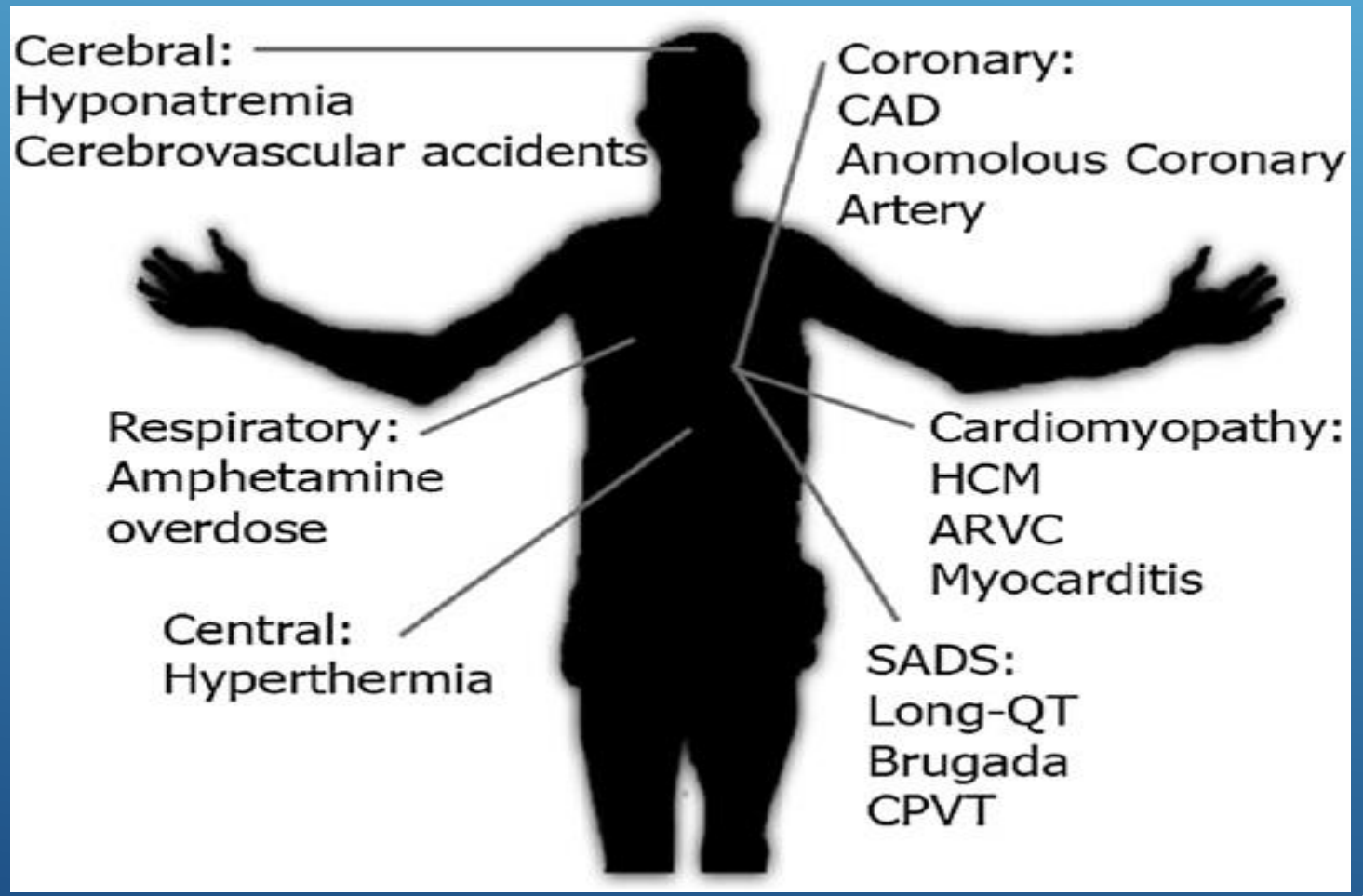
Table 1
The incidence of sudden death and cardiac arrest in the literature

Author	Year of Study	Sample Size	Events (n)	Death (D) Arrest (A)	Incidence/100,000
Maron et al,[10] 1996	1976–1994	215,413	4	D	2
Redelmeier and Greenwald,[11] 2007	1975–2005	3,292,268	26	D	0.8
Tunstall-Pedoe,[12] 2007	1981–2006	650,000	8	D	1.25
			14	A	2.15
Webner et al,[13] 2012	1976–2009	1,710,052	10	D	0.58
			30	A	1.75
Mathews et al,[14] 2012	2000–2009	3,718,336	28	D	0.75
Kim et al,[15] 2012	2000–2010	10,871,000	42	D	0.39
			59	A	0.54

Table 2
Cardiovascular marathon events by age

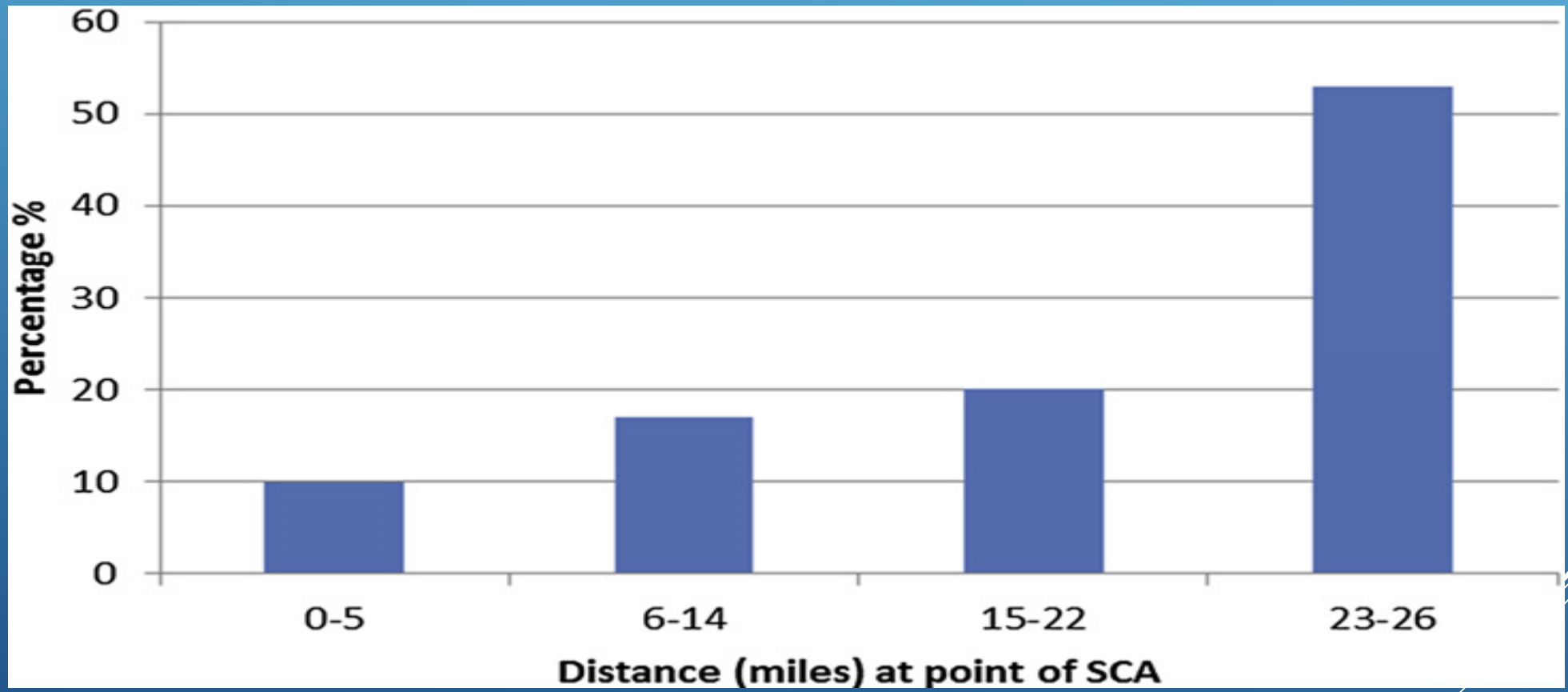
	Sudden Death		Survivor of Sudden Cardiac Arrest	
Publication	**N**	**Average Age**	**N**	**Average Age**
Kim et al,[15] 2012	42	39	17	49
Mathews et al,[14] 2012	28	42[a]	N/A	N/A
Redelmeier and Greenwald,[11] 2007	21	41[b]	N/A	N/A
Tunstall-Pedoe,[12] 2007	8	48	6	48
Roberts et al,[16] 2012	7	44	7	48
Maron et al,[10] 1996	4	37	N/A	N/A
Cohen and Ellis,[17] 2012	2	53	1	63

CAUSE OF SUDDEN DEATH IN MARATHON RUNNERS



Sudden Death in Marathon Runners
Jason James, BSc, Ahmed Merghani, MBBS,
Sanjay Sharma, MD*

Relationship between distance run and percentage of SCAs in marathons



(Data from Webner D, Duprey KM, Drezner JA, et al. Sudden cardiac arrest and death in United States marathons. Med Sci Sports Exerc 2012;

- The athletes at greatest risk of SD are those with underlying cardiac disease that may be quiescent and manifest for the first time with SCA during exercise. Most runners (>80%) who have suffered an SCA have **not previously reported** cardiac symptoms.

TUNSTALL-PEDOE DS. MARATHON CARDIAC DEATHS: THE LONDON EXPERIENCE. SPORTS MED 2007;37:448–50

- The key findings of this study suggest that HCM is the leading cause of death in marathon running, accounting for approximately 65% of all deaths.
- Furthermore, CAD was not a main diagnosis in any of the fatalities in the study, but was featured in 63% of those who survived an SCA.
- **Contribution of CAD to the actual death is difficult to exclude**

KIM JH, MALHOTRA R, CHIAMPAS G, ET AL. CARDIACARREST DURING LONG-DISTANCE RUNNING RACES. N ENGL J MED 2012;366(2):130–40

Heart, Lung and Circulation (2019) 28, 155–163
1443-9506/04/$36.00
https://doi.org/10.1016/j.hlc.2018.10.004

REVIEW

Sudden Death and Ventricular Arrhythmias in Athletes: Screening, De-Training and the Role of Catheter Ablation

M. Darragh Flannery, MBBS [a,b], André La Gerche, MBBS, PhD [a,b,c*]

WHY DO ATHLETES EXPERIENCE SUDDEN CARDIAC DEATH?

- In younger athletes, SCD is most frequently due to cardiomyopathies such as hypertrophic cardiomyopathy (HCM), arrhythmogenic right ventricular cardiomyopathy (ARVC) or dilated cardiomyopathy (DCM).
- Channelopathies such as long QT Syndrome, Brugada syndrome and catecholaminergic polymorphic ventricular tachycardia (VT) are less common causes.
- With increasing age, coronary artery disease becomes an increasingly common cause and is one of the most common causes of death in middle-aged adults. In more advanced ages, SCD becomes less common due to competing causes of death
- Heart, Lung and Circulation Volume 28, Issue 1, January 2019

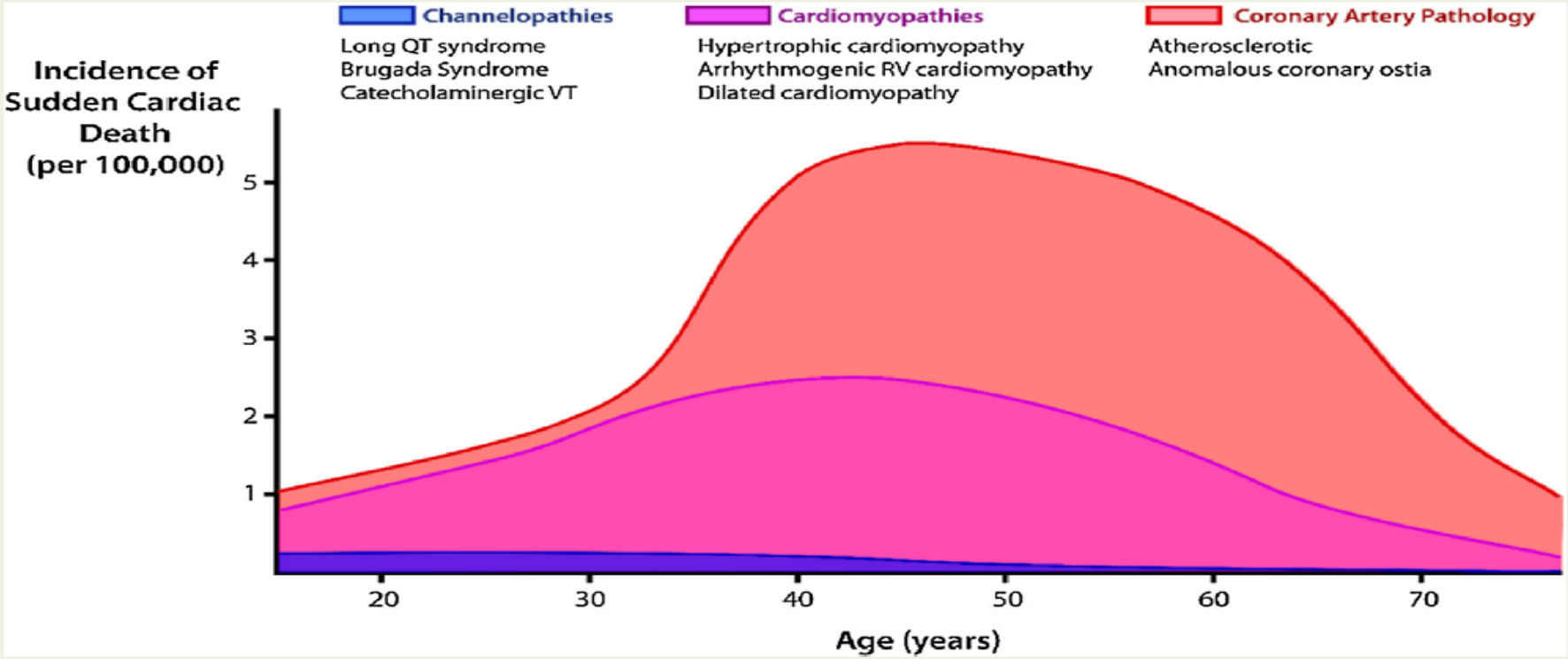


Figure 1 Age-dependent changes in incidence and aetiology of sudden cardiac death.
This figure represents an interpretation of the combined experience from studies which have assessed the causes of sudden cardiac death in athletes. Whilst the majority of deaths may be attributed to inherited cardiomyopathies and channelopathies in those aged less than 30 years, there is no absolute cut-off. Thus athletes aged in their 30s and 40s (the median age in many competitive sports) are at greatest risk of sudden cardiac death caused by inherited and acquired causes (reproduced with permission from La Gerche et al. *JACC Cardiovasc Imaging 2013* [26]).

International Journal of Cardiology 267 (2018) 133–138

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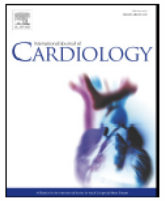


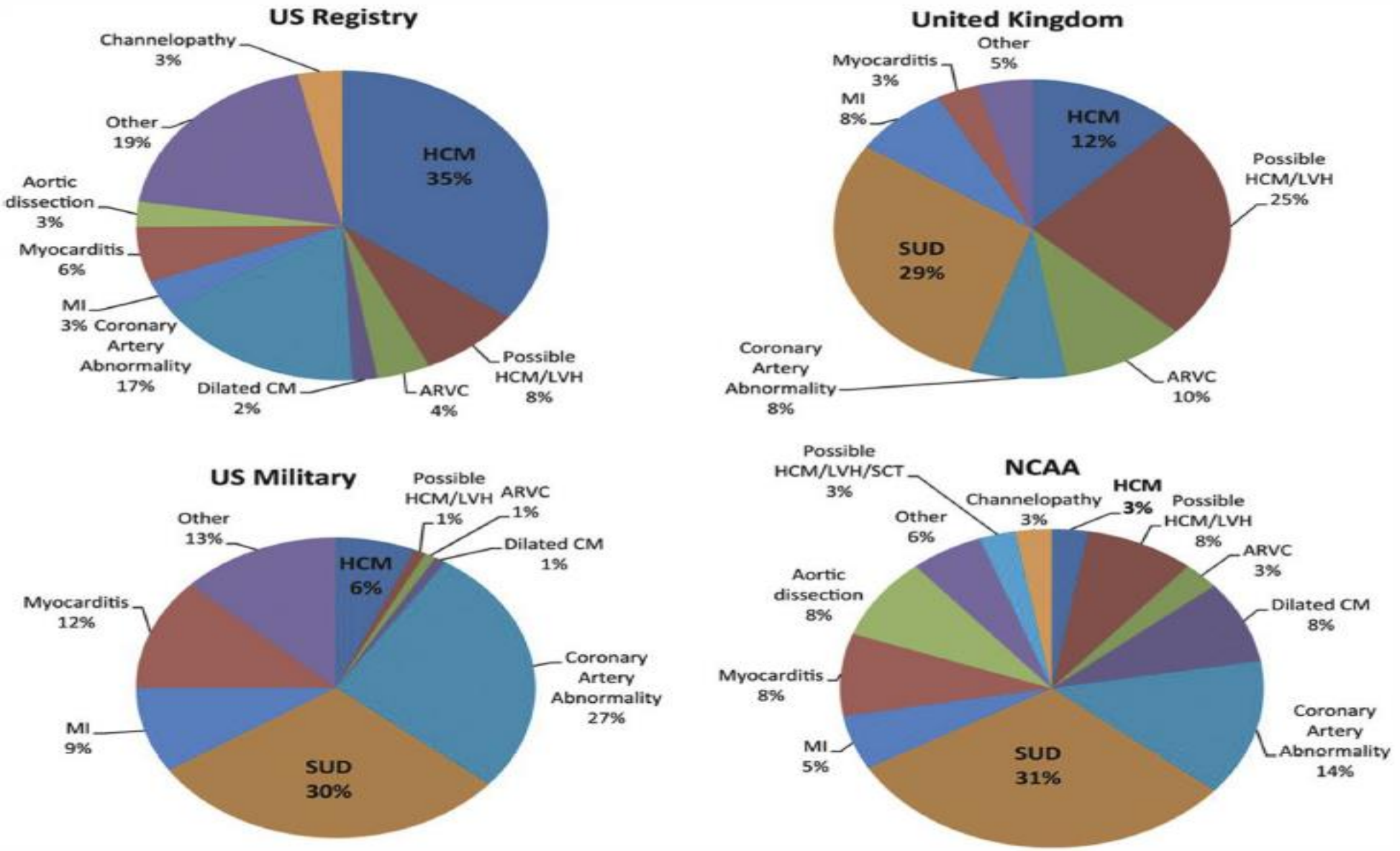
Age at start of endurance training is associated with patterns of left ventricular hypertrophy in middle-aged runners

Christoph P. Ryffel, Prisca Eser, Lukas D. Trachsel, Nicolas Brugger, Matthias Wilhelm *

Department of Cardiology, Inselspital, Bern University Hospital, University of Bern, CH-3010 Bern, Switzerland

- In this cohort of non-elite middle-aged runners, eccentric LVH was found only in athletes with an early start of endurance training. In case of a mature starting age, endurance training may, contrary to what is commonly assumed, also lead to concentric LVH. The consideration of endurance training starting age may lead to a better understanding of morphological adaptations of the heart.

FIGURE 2 Comparison of Pathogenesis of Sudden Cardiac Deaths in Athletic Populations



ARVC = arrhythmogenic cardiomyopathy; CM = cardiomyopathy; HCM = hypertrophic cardiomyopathy; LVH = left ventricular hypertrophy; MI = myocardial infarction; NCAA = National Collegiate Athletic Association; SCT = sickle cell trait; SUD = sudden unexplained death. Reproduced with permission from Harmon et al. (43).

ESC European Society of Cardiology

European Heart Journal (2018) **39**, 2346–2355
doi:10.1093/eurheartj/ehx686

CLINICAL REVIEW
Prevention and epidemiology

Personalized exercise dose prescription

Petra Zubin Maslov[1], Alexa Schulman[2], Carl J. Lavie[3], and Jagat Narula[4]*

[1]Department of Internal Medicine, Mount Sinai St Luke's Hospital and Mount Sinai West Hospital, 1111 Amsterdam Avenue, New York, 10025 NY, USA; [2]Icahn School of

- Extreme endurance and competitive sports involve a much higher level of exercise than current guidelines recommend with questionable additional health benefits.
- Professional athletes often expend 200–300 MET-h/week while training for and competing in these extreme sporting events.
- This level of energy expenditure is 10-fold greater than the current recommended dose of exercise

JACC: HEART FAILURE
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VOL. 3, NO. 9, 2015
ISSN 2213-1779/$36.00
http://dx.doi.org/10.1016/j.jchf.2015.05.006

Physical Activity and Heart Failure Risk in a Prospective Study of Men

Iffat Rahman, PhD, Andrea Bellavia, MSc, Alicja Wolk, DrMedSci, Nicola Orsini, PhD

- In COSM study total PA of more than 46 MET-h/day was associated with increased incidence of heart failure

Research

Original Investigation

Leisure Time Physical Activity and Mortality
A Detailed Pooled Analysis of the Dose-Response Relationship

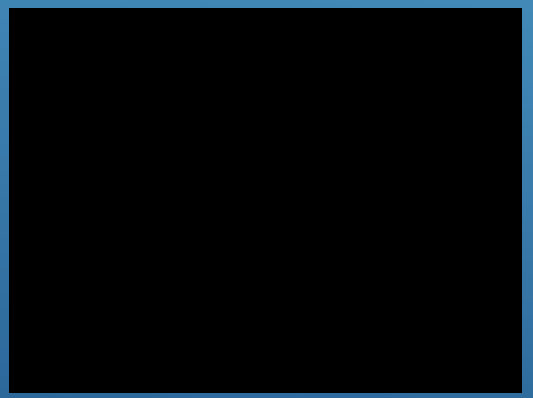
Hannah Arem, MHS, PhD; Steven C. Moore, PhD; Alpa Patel, PhD; Patricia Hartge, ScD; Amy Berrington de Gonzalez, DPhil; Kala Visvanathan, MBBS, MPH; Peter T. Campbell, PhD; Michal Freedman, JD, PhD; Elisabete Weiderpass, MD, MSc, PhD; Hans Olov Adami, MD, PhD; Martha S. Linet, MD; I.-Min Lee, MBBS, ScD; Charles E. Matthews, PhD

Arem et al.(JAMA Intern Med. 2015) showed performing 10 or more times the recommended minimum of >_75 MET-h/week had no elevated mortality risk,
but had a lower risk reduction in all-cause mortality when compared to individuals engaged in a moderate amount of PA.

- The longevity benefit threshold was approximately three to five times the recommended PA minimum (22.5 to <_40 MET-h/week), beyond which there was no additional benefit

In terms of frequency of exercise, 6 days a week of 1-h sessions of vigorous exercise would probably be an upper limit for exercise-related health benefits.[13]

EXERCISE-RELATED DEATH ?



Neth Heart J (2018) 26:21–25
https://doi.org/10.1007/s12471-017-1061-5

ORIGINAL ARTICLE

Early recognition of sudden cardiac arrest in athletes during sports activity

N. M. Panhuyzen-Goedkoop[1,2,3] · H. J. Wellens[4] · J. J. Piek[1]

NON-TRAUMATIC SYNCOPE AND SCA IN ATHLETES CAN BE RECOGNIZED BY AN UNEXPECTED SUDDEN DIZZINESS FOLLOWED BY LOSS OF THE UPRIGHT POSITION, LOSS OF NORMAL BREATHING AND EYES WIDE OPEN WITH FIXED PUPILS,

Madrid midfielder De la Red retires at 25

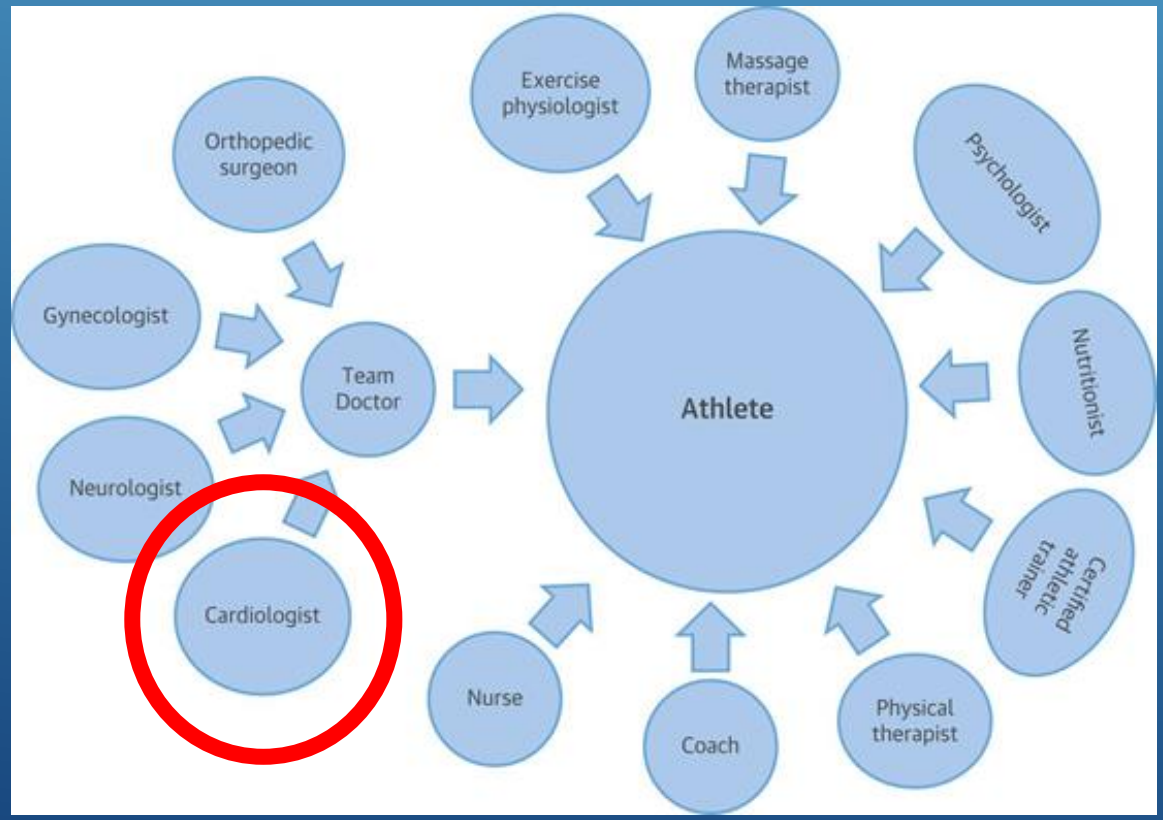
Real Madrid CF midfielder Rubén de la Red has accepted medical advice and retired from football aged 25 due to a heart problem, but he will remain with the club as a coach.

THE END IS SELDOM BRIGHT

THE EMERGENCE OF SPORTS CARDIOLOGY AS A SPECIALTY

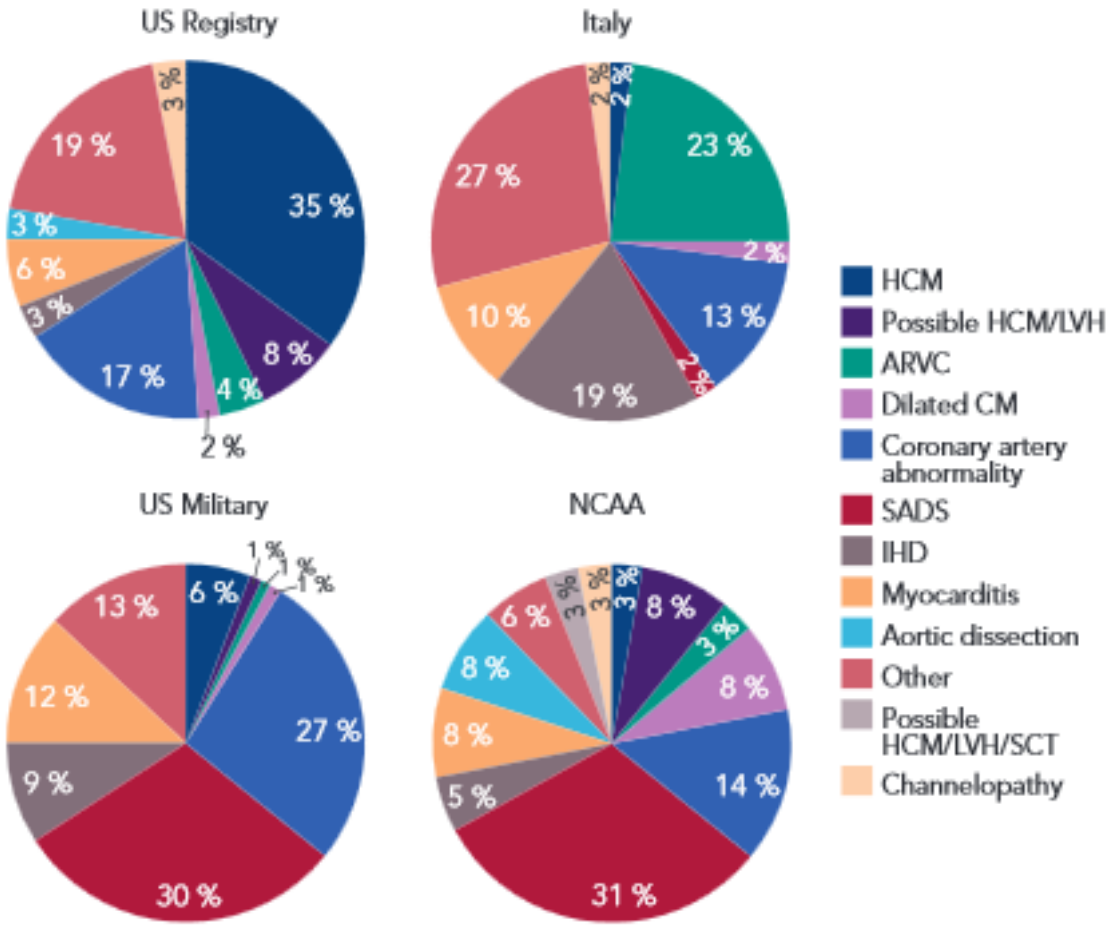
JACC
JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY

March 2017

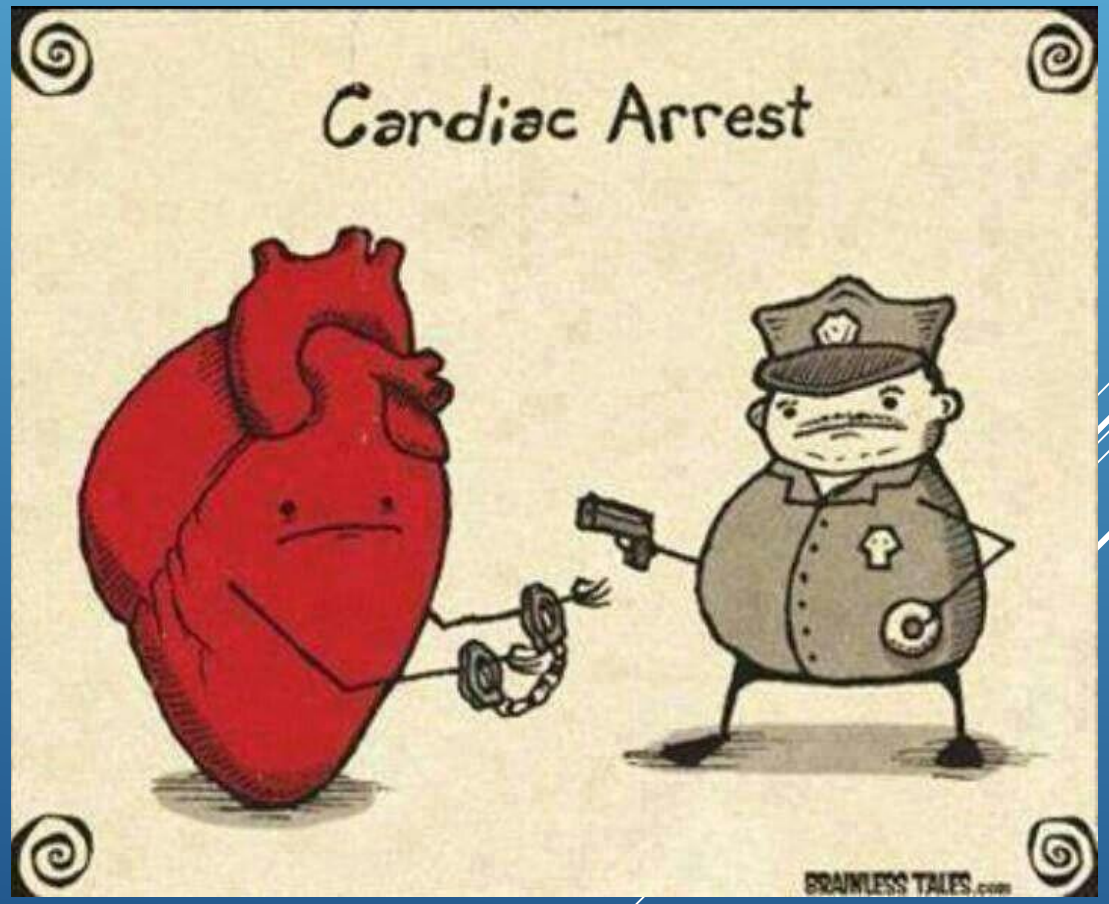


WHAT ARE WE LOOKING FOR?

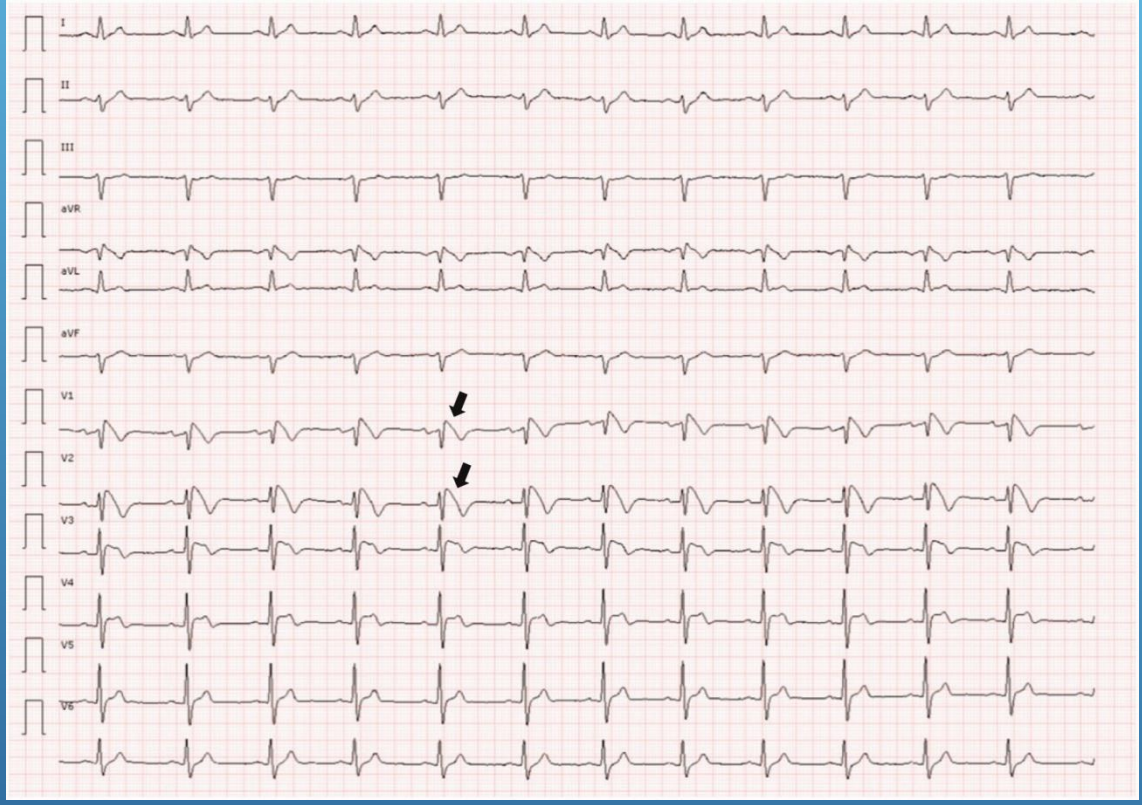
Figure 1: Comparison of Causes of Sudden Cardiac Death



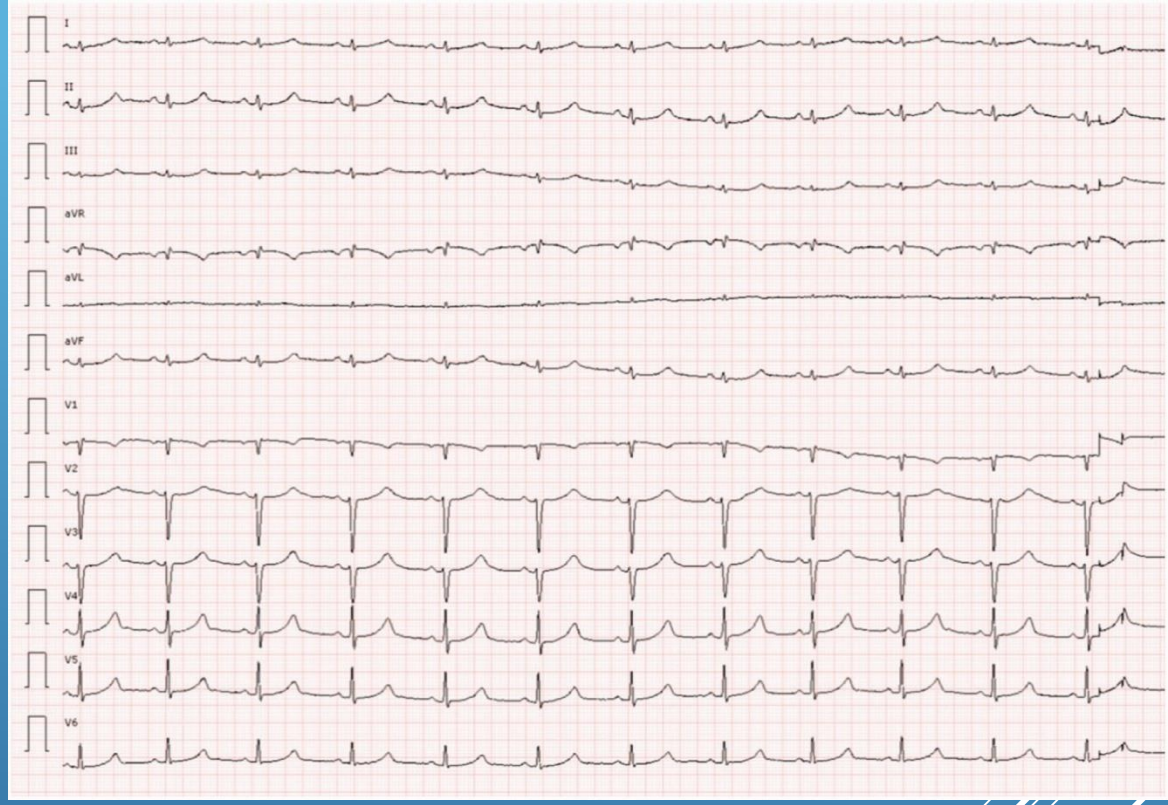
ARVC = arrhythmogenic cardiomyopathy; CM = cardiomyopathy; HCM = hypertrophic cardiomyopathy; IHD = ischaemic heart disease; LVH = left ventricular hypertrophy; NCAA = National Collegiate Athletic Association; SADS = sudden arrhythmic death syndrome; SCT = sickle cell trait. Reproduced with permission from Harmon et al.[13] with data taken from Corrado et al.[7]



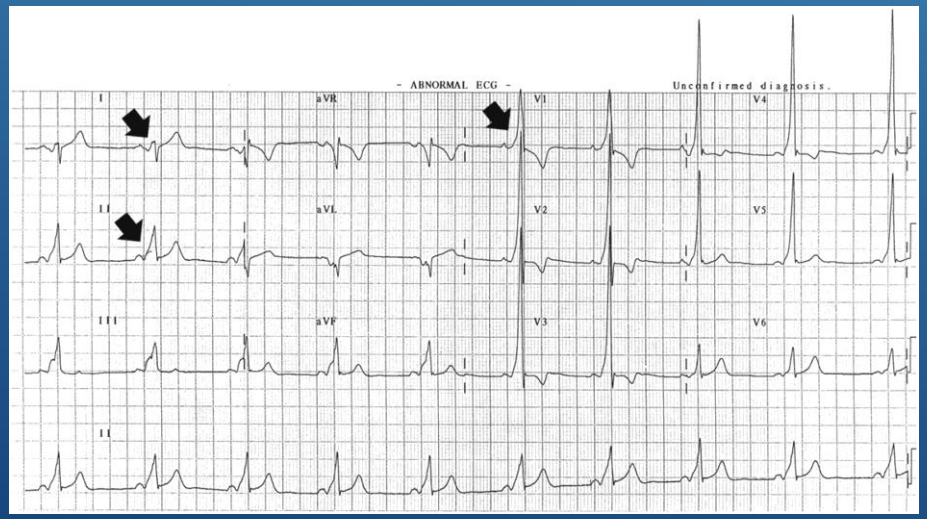
WHAT CAN WE DO TO TRY AND PREVENT SCD



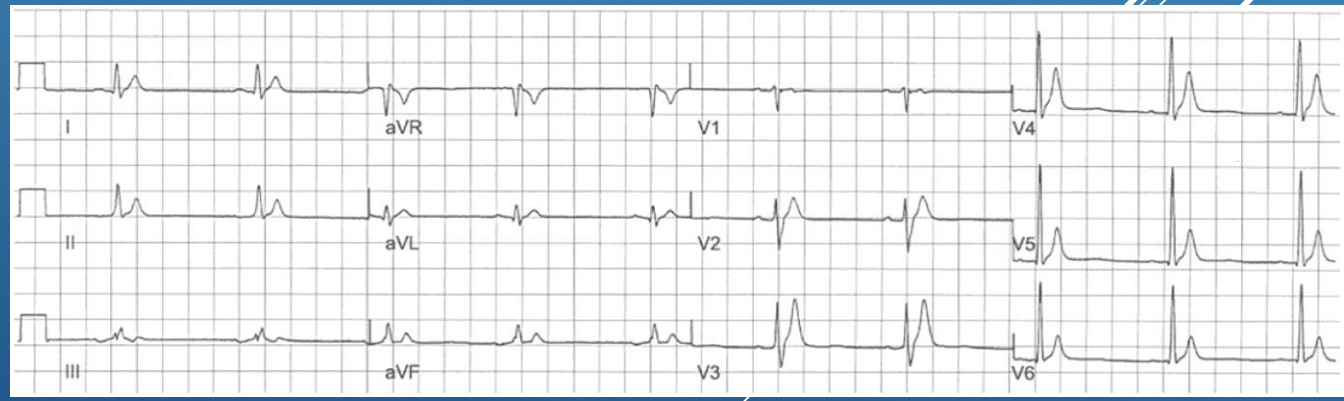
Brugada syndrome



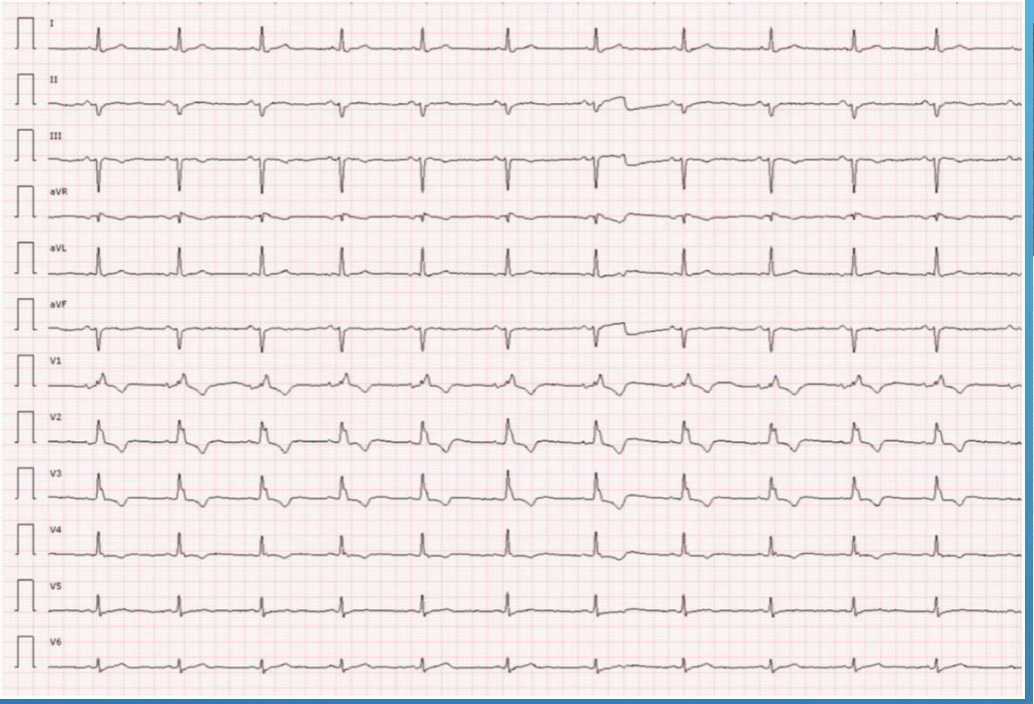
LQTS



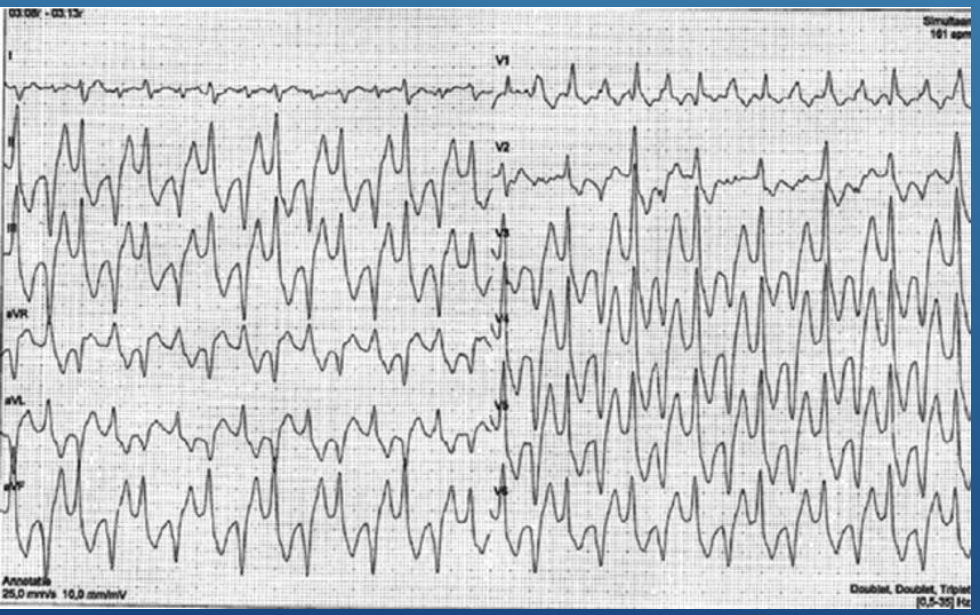
pre-excitation syndrome



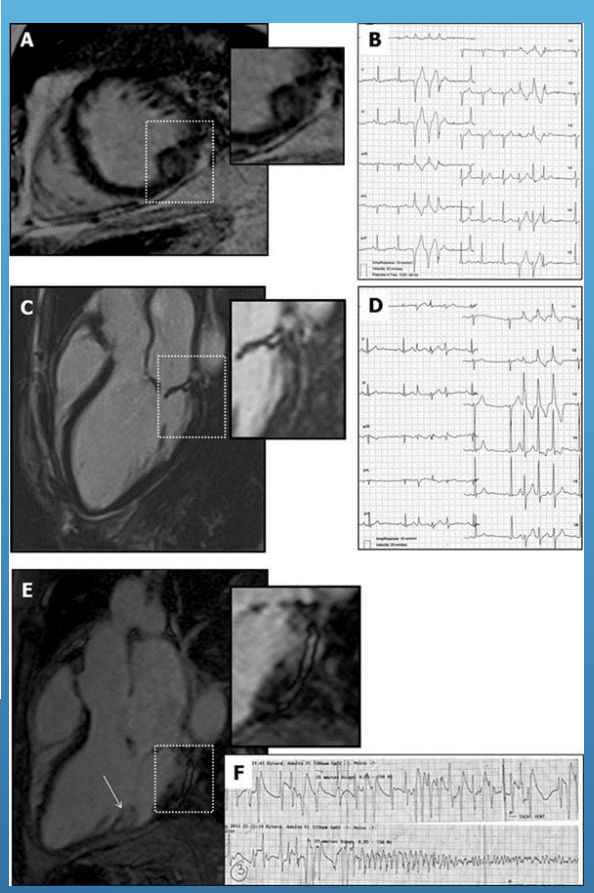
SQTS



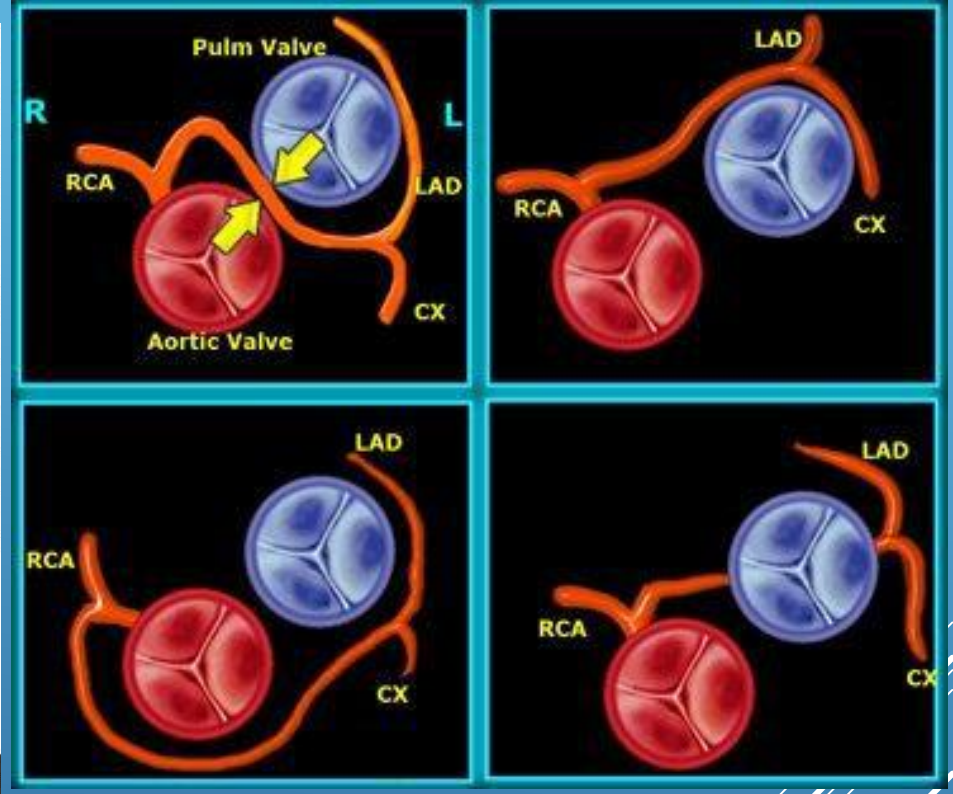
ARVC



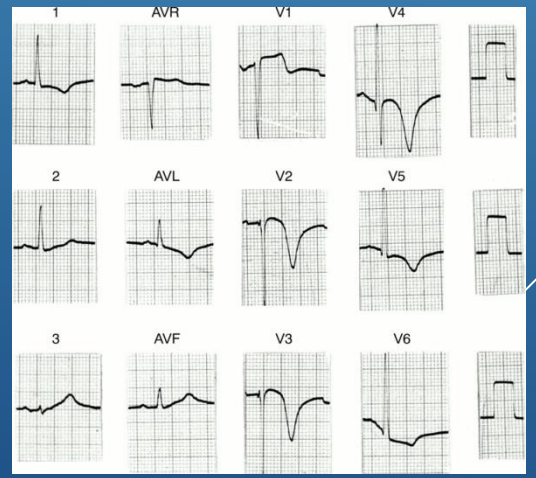
Catecholaminergic polymorphic ventricular tachycardia



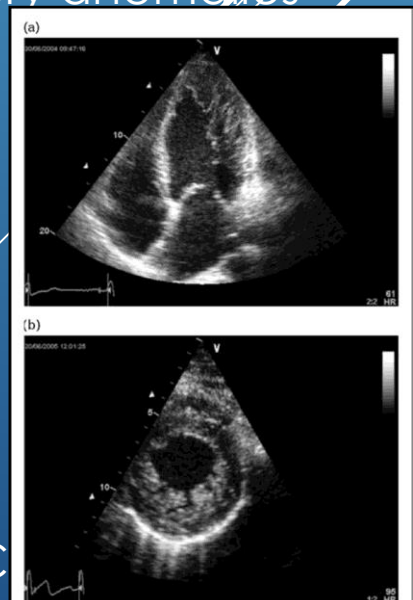
malignant MVP



Coronary artery anomalies



HCM



LVNC

THE FUTERE

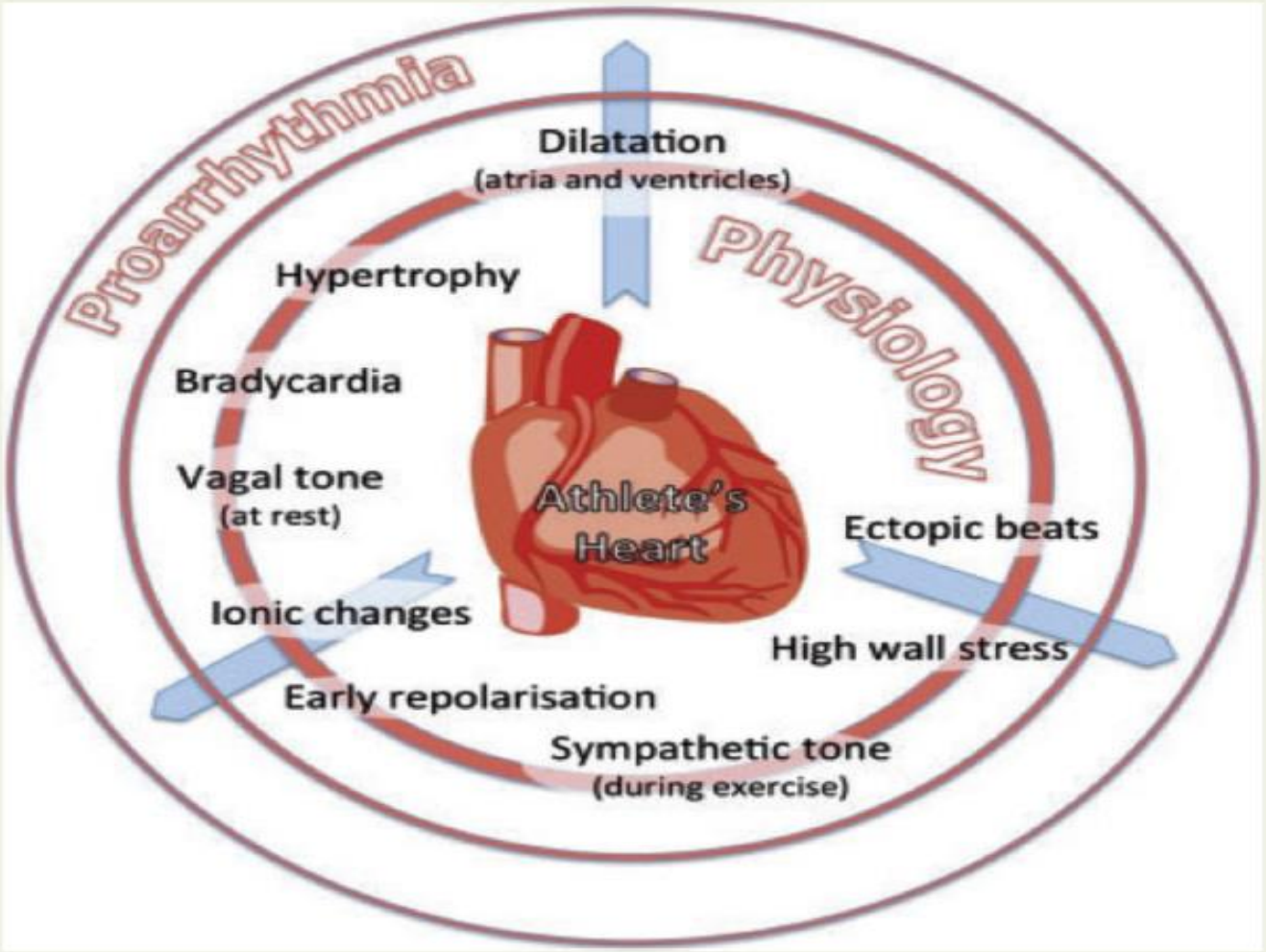
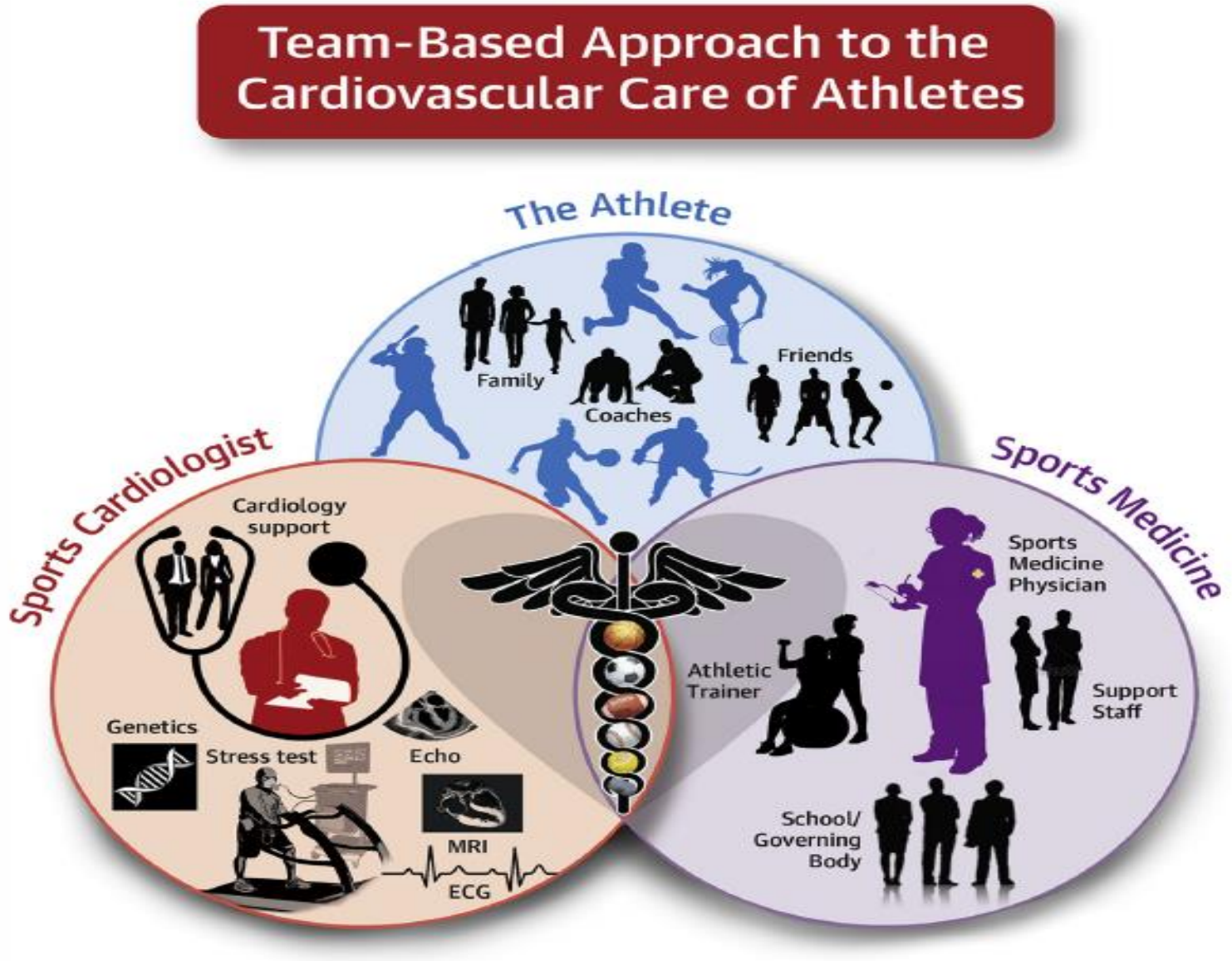


Figure 1 The concept of how the athlete's heart is also a proarrhythmic heart. Many changes of the athlete's heart parallel changes that are known to be proarrhythmic in general. There is no clear boundary on when physiological adaptation, which can be extreme in highly trained athletes (especially endurance athletes), starts contributing to arrhythmogenesis, or becomes clearly pathologic (reproduced with permission from Heidbuchel *Europace* 2017 [10]).

CENTRAL ILLUSTRATION Multidisciplinary Care of Athletes



Emery, M.S. et al. J Am Coll Cardiol HF. 2018;6(1):30–40.

Multidisciplinary care of athletes focused on athlete-centered care ("Athlete Care Team") in the evaluation and management of athletes at risk of sudden cardiac death.

SO…..WHAT IS THE BOTTOM LINE

- 1.SPORT IS GREAT AT ANY AGE
- 2.ENDURANCE ATHLETES LIVE LONGER THAN COUCH POTATOS
- 3.PPE HELPS US PREVENT THE LIGHTNING STRIKE

THANK YOU FOR YOUR ATTENTION

www.Sportcardiology.co.il