The Italian Cardiological Protocols (COCIS) in Sudden Cardiac Death Prevention

Introduction & Ventricular Tachyarrhythmias

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Italian Perspective

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PER L'IDONEITÀ ALLO SPORT AGONISTICO
FMSI - SIC SPORT - ANCE - ANMCO - SIC

Protocolli cardiologici per il giudizio di idoneità allo sport agonistico (COCIS) 2023

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**alla memoria*

Minerva Medica 2024 mese;115(0):000–000
DOI: 10.23736/S0026-4806.24.09519-3

GUIDELINES

Italian Cardiological Guidelines (COCIS) for Competitive Sport Eligibility in athletes with heart disease: update 2024

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[1]Unit of Sports Medicine, IRCCS A. Gemelli University Polyclinic Foundation, Rome, Italy; [2]Med Ex, Medicina

HISTORICAL BACKGROUND

- The law introduced for the first time in the world the idea of a mandatory **pre-participation cardiovascular screening** with the use of the electrocardiogram (ECG).
- This model of screening **(Italian model)** has been progressively exported to many other countries, particularly in Europe, and scientifically shared by prestigious researchers and institutions, such as the IOC (International Olympic Committee) and ESC.

Publish-Ahead-of-Print published February 2, 2005

European Heart Journal
doi: 10.1093/eurheartj/ehi108

ESC Report

Cardiovascular pre-participation screening of young competitive athletes for prevention of sudden death: proposal for a common European protocol

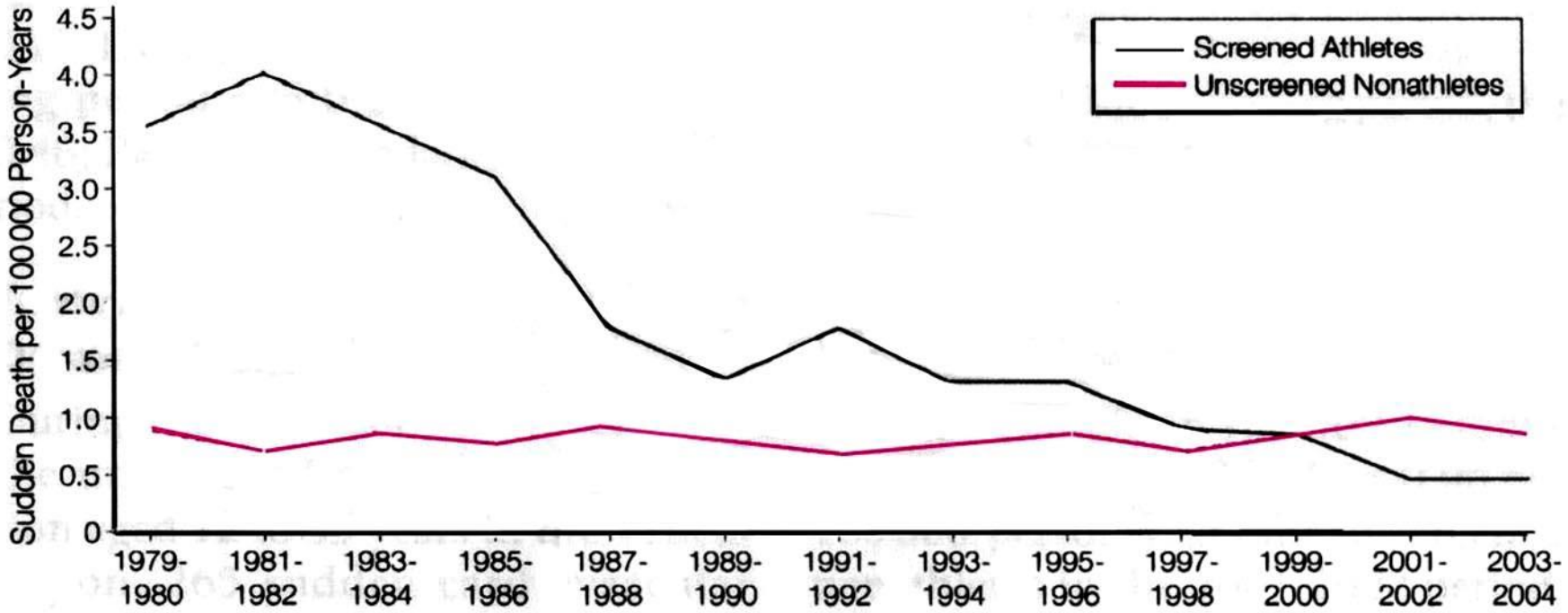
Consensus Statement of the Study Group of Sport Cardiology of the Working Group of Cardiac Rehabilitation and Exercise Physiology and the Working Group of Myocardial and Pericardial Diseases of the European Society of Cardiology

Domenico Corrado[1*], Antonio Pelliccia[2], Hans Halvor Bjørnstad[3], Luc Vanhees[4], Alessandro Biffi[2], Mats Borjesson[5], Nicole Panhuyzen-Goedkoop[6], Asterios Deligiannis[7], Erik Solberg[8], Dorian Dugmore[9], Klaus P. Mellwig[10], Deodato Assanelli[11], Pietro Delise[12], Frank van-Buuren[10], Aris Anastasakis[13], Hein Heidbuchel[4], Ellen Hoffmann[14], Robert Fagard[4], Silvia G. Priori[15], Cristina Basso[19], Eloisa Arbustini[16], Carina Blomstrom-Lundqvist[17], William J. McKenna[18], and Gaetano Thiene[19]

Trends in Sudden Cardiovascular Death in Young Competitive Athletes After Implementation of a Preparticipation Screening Program

D. Corrado et al.

Figure. Annual Incidence Rates of Sudden Cardiovascular Death in Screened Competitive Athletes and Unscreened Nonathletes Aged 12 to 35 Years in the Veneto Region of Italy (1979-2004)



During the study period, the annual incidence of sudden cardiovascular death decreased by 89% in screened athletes (*P* for trend <.001). In contrast, the incidence rate of sudden cardiovascular death did not demonstrate consistent changes over time in unscreened nonathletes.

Sudden Cardiovascular Death in Sport

LAUSANNE RECOMMENDATIONS

Under the umbrella IOC Medical Commission
10 December 2004

PREPARTICIPATION CARDIOVASCULAR SCREENING

"Sudden death" in sport has to be fully appreciated. The leading cause (more than 90%) of non-traumatic sudden death in athletes is related to pre-existing cardiac abnormality.

For the purpose of this recommendation, sudden cardiovascular death is defined as:

Death occurring within one hour of the onset of symptoms in a person without a previously recognised cardiovascular condition that would appear fatal: this excludes cerebrovascular, respiratory, traumatic and drug related causes.

The purpose of this recommendation is to identify, as accurately as possible, athletes at risk in order to advise them accordingly.

2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease

The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC)

Authors/Task Force Members: Antonio Pelliccia* (Chairperson) (Italy), Sanjay Sharma* (Chairperson) (United Kingdom), Sabiha Gati (United Kingdom), Maria Bäck (Sweden), Mats Börjesson (Sweden), Stefano Caselli (Switzerland), Jean-Philippe Collet (France), Domenico Corrado (Italy), Jonathan A. Drezner (United States of America), Martin Halle (Germany), Dominique Hansen (Belgium), Hein Heidbuchel (Belgium), Jonathan Myers (United States of America), Josef Niebauer (Austria), Michael Papadakis (United Kingdom), Massimo Francesco Piepoli (Italy), Eva Prescott (Denmark), Jolien W. Roos-Hesselink (Netherlands), A. Graham Stuart (United Kingdom), Rod S. Taylor (United Kingdom), Paul D. Thompson (United States of America), Monica Tiberi (Italy), Luc Vanhees (Belgium), Matthias Wilhelm (Switzerland)

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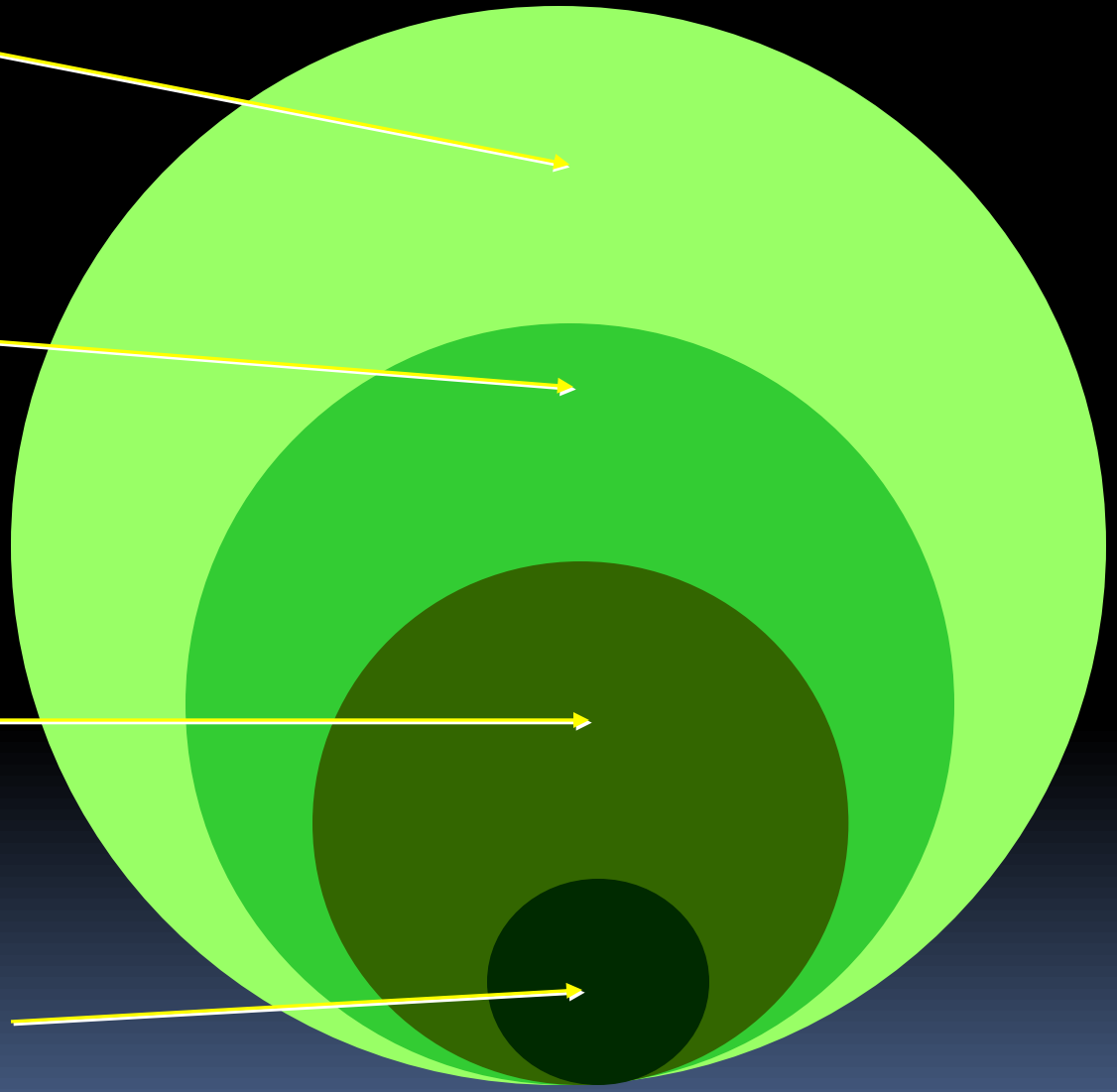
60 Million
Italians

25 Million
Leisure-activity

11 Million
Competitive sports

~ 2.000
Top Level Athletes



Italian Olympic Committee-ISTAT 2022

The definitions are important - 1

- One of the most important and confounding points is what "sports activity" or "athletes" or "eligibility" means in the different countries and what is the difference between competitive and recreational sports.
- The term "competitive" should be restricted only to the individuals /athletes (generally young), who take part in official and systematic training and competitions to achieve athletic excellence. In Italy they need certificate of competitive sports eligibility.

The definitions are important - 2

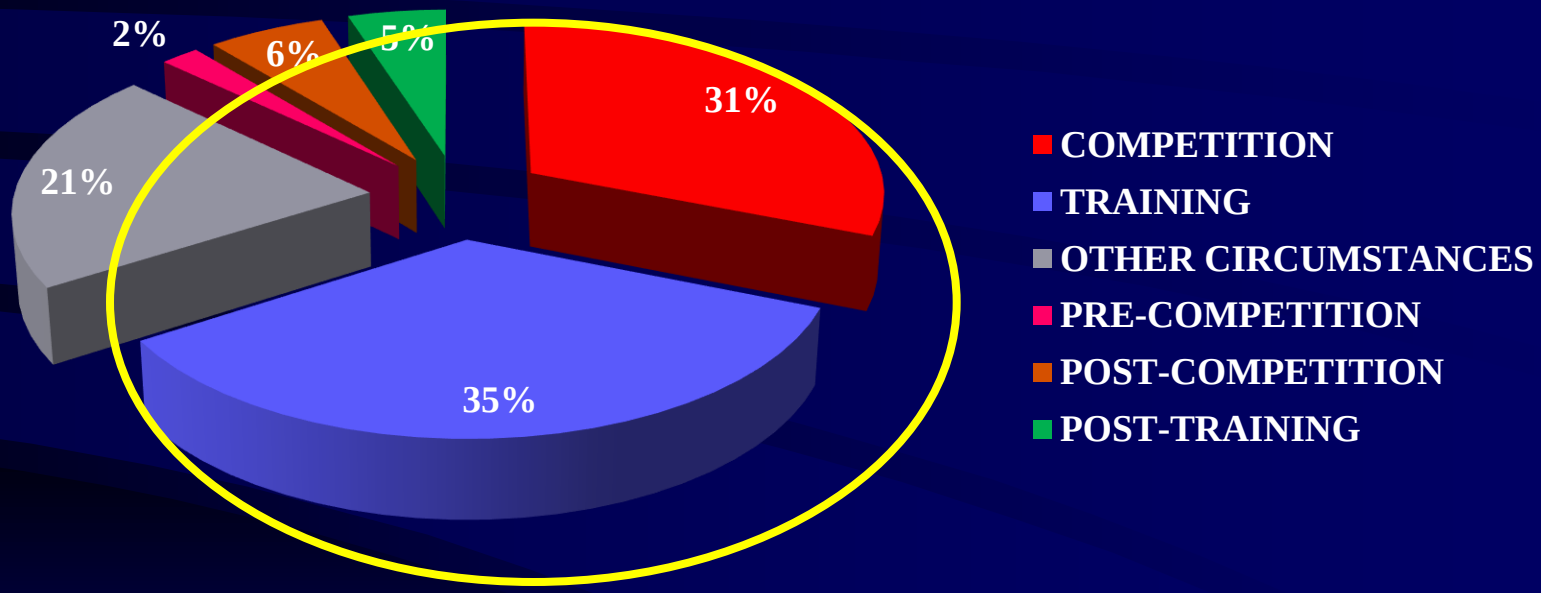
- All the remaining activities should be included in recreational and leisure-time sport activities.
- These activities are completely different from competitive sports, are usually of low/moderate intensity, practiced for 150 minutes/wk and do not have any relation with athletic performance or sports eligibility (certificate)
- This regular physical activity is beneficial for the patients with heart disease and the recommendations should be less restricted than for competitive sports

Cardiovascular Effects of Physical Exercise the Dark Side of the Moon

- *Benefits – leisure activity*
- Primary and Secondary prevention of cardiovascular disease

- *Risks – competitive sports*
- In asymptomatic subjects with underlying disease

Circustamces in which SCD occurred



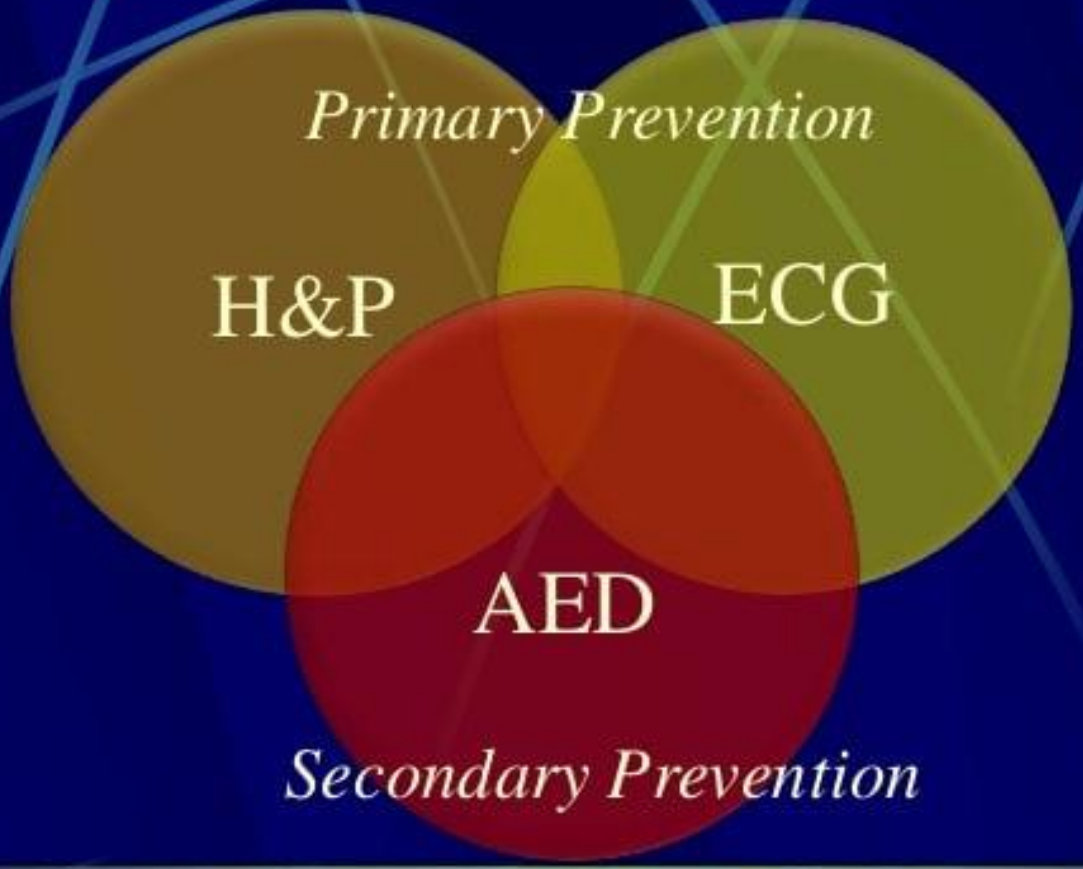
Questions in competitive sports

May some causes of cardiac arrest in top level athletes **remain clinically concealed**?

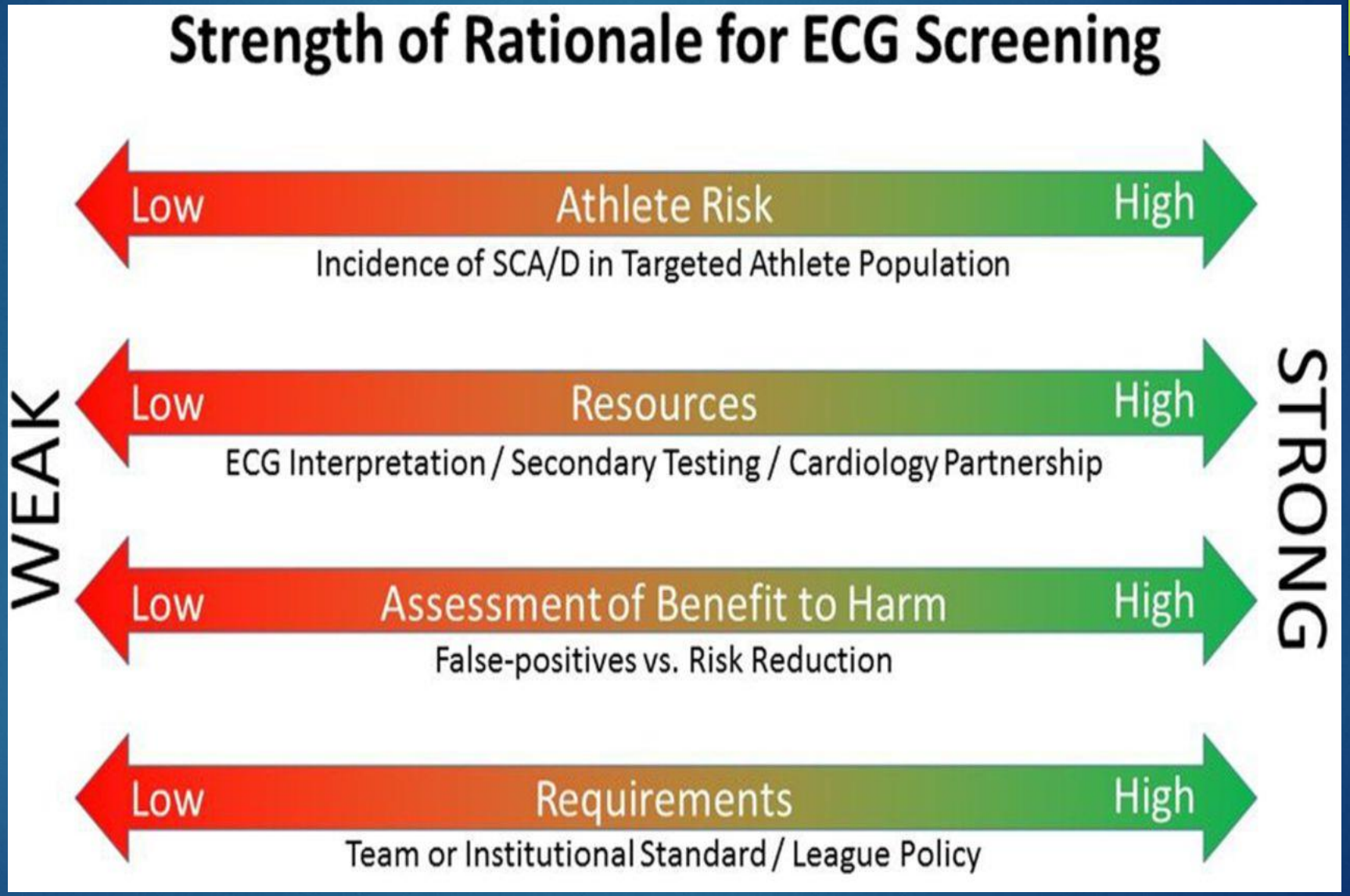
Is cardiovascular screening before participation in sports of **limited efficacy** for identification of athletes with at-risk cardiovascular disorders?

How can we reduce the risk of fatalities among competitive athletes ?

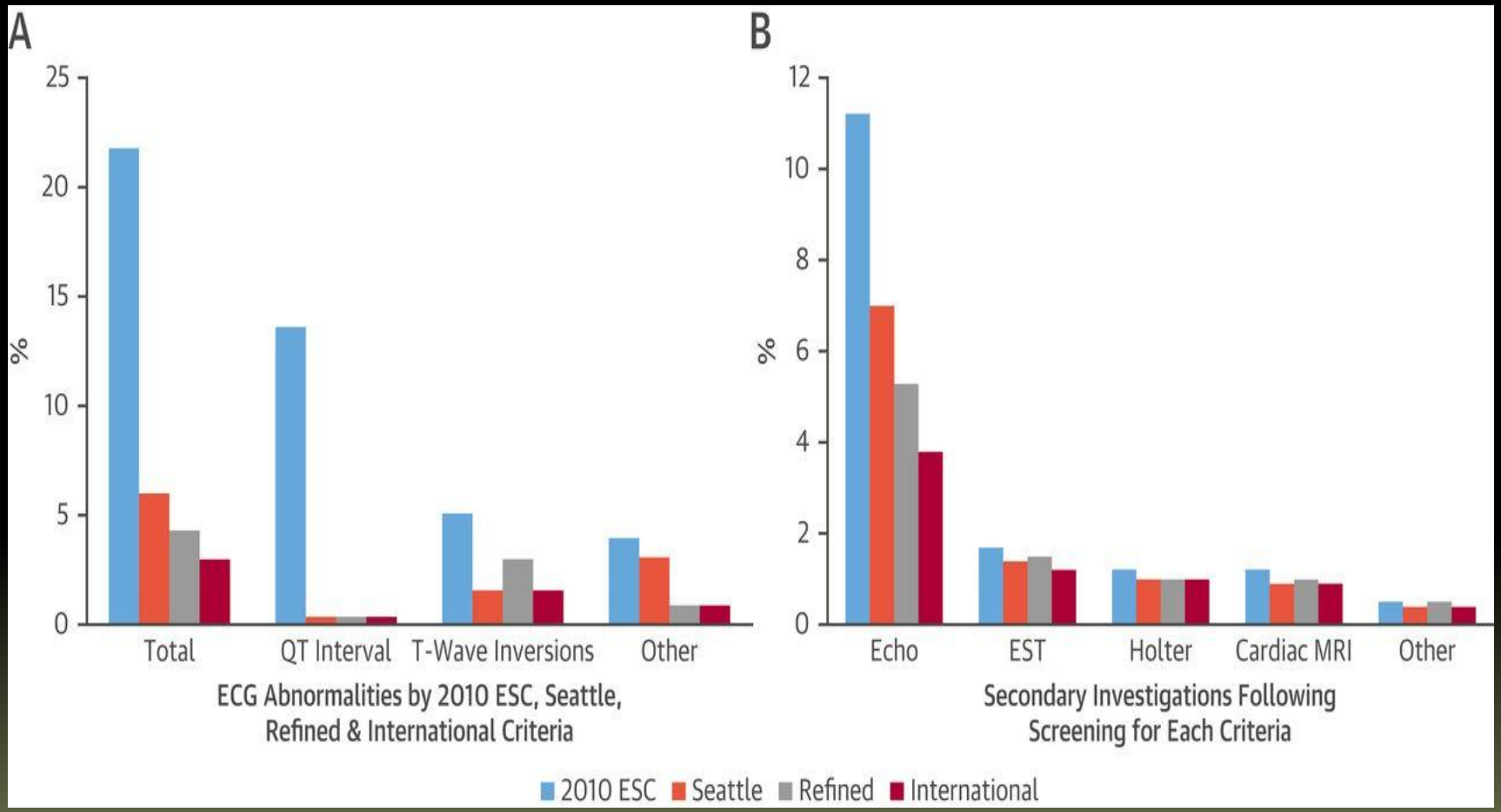
Strategies for Prevention of SCD



Complementary Strategies

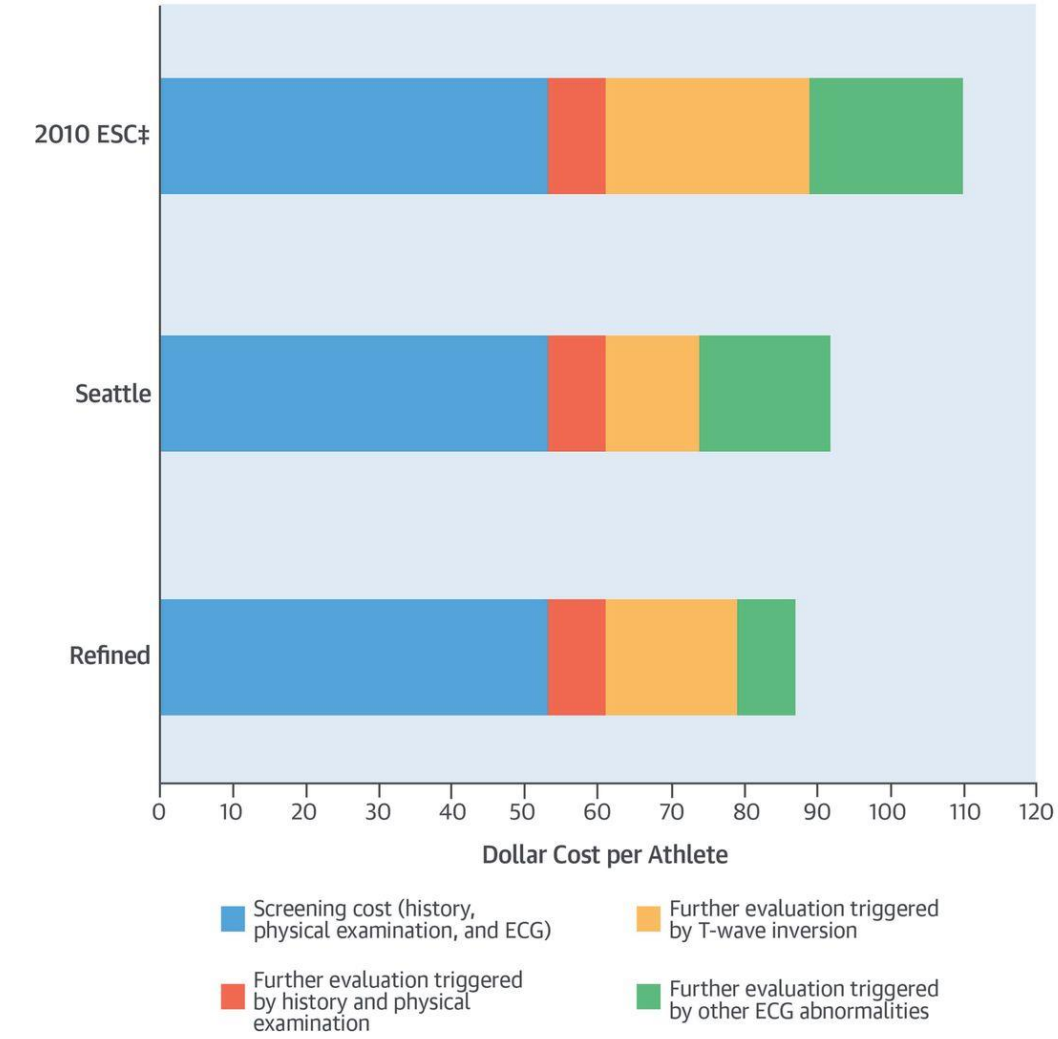

Strength of Rationale for ECG Screening
WEAK
STRONG
Low
Athlete Risk
High
Incidence of SCA/D in Targeted Athlete Population
Low
Resources
High
ECG Interpretation / Secondary Testing / Cardiology Partnership
Low
Assessment of Benefit to Harm
High
False-positives vs. Risk Reduction
Low
Requirements
High
Team or Institutional Standard / League Policy

False Positive Results



Cost efficacy of the screening

CENTRAL ILLUSTRATION: Costs of ECG Screening in Athletes: Comparison of the 2010 ESC Recommendations and Seattle and Refined Criteria Per Athlete



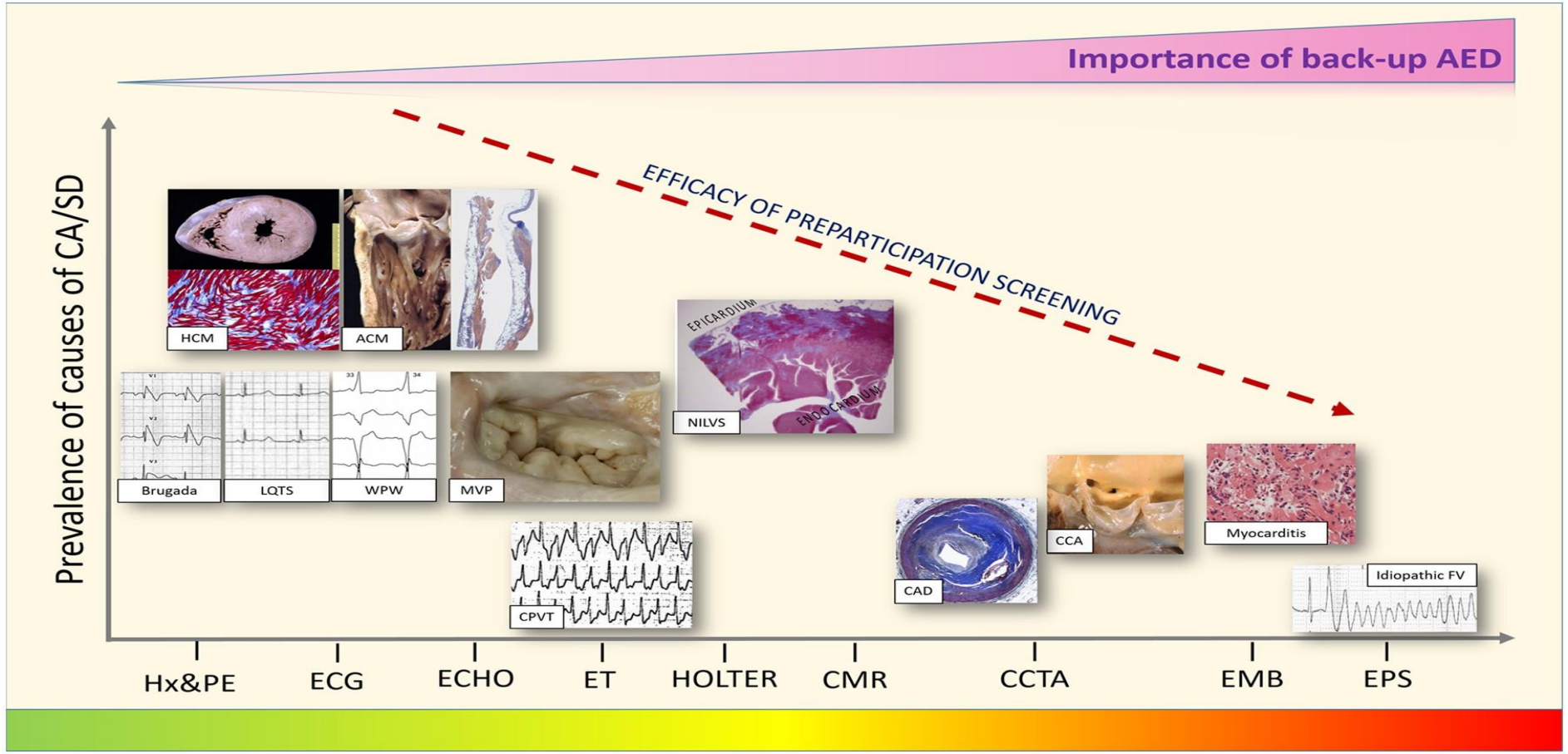
Dhutia, H. et al. J Am Coll Cardiol. 2016;68(7):702-11.

Cultural Background +

Expertise +

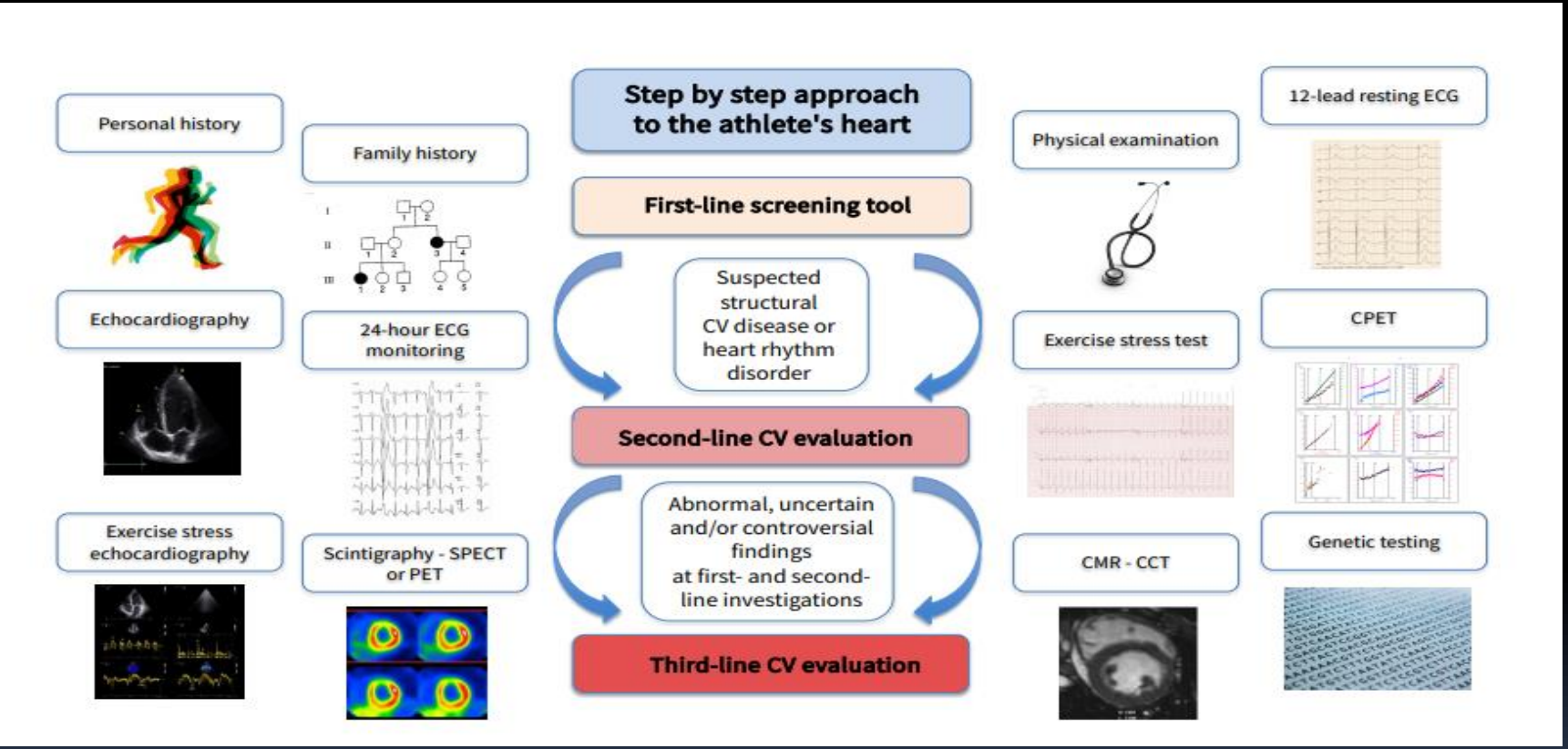
Correct interpretation of the medical examination (False Positives)

Decreasing efficacy of screening in relation to the complexity of diagnostic tests



Corrado D et al. Eur Heart J 2022

DIAGNOSTIC WORK-UP FOR THE ATHLETE'S HEART



Palermi S et al. EJPC 2024

ARTFICIAL INTELLIGENCE?

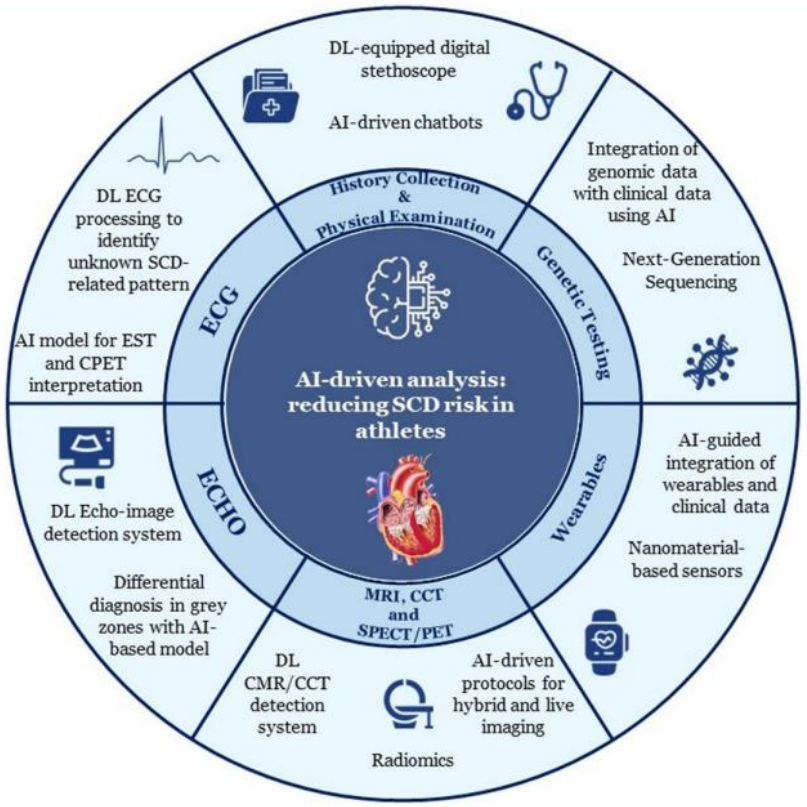
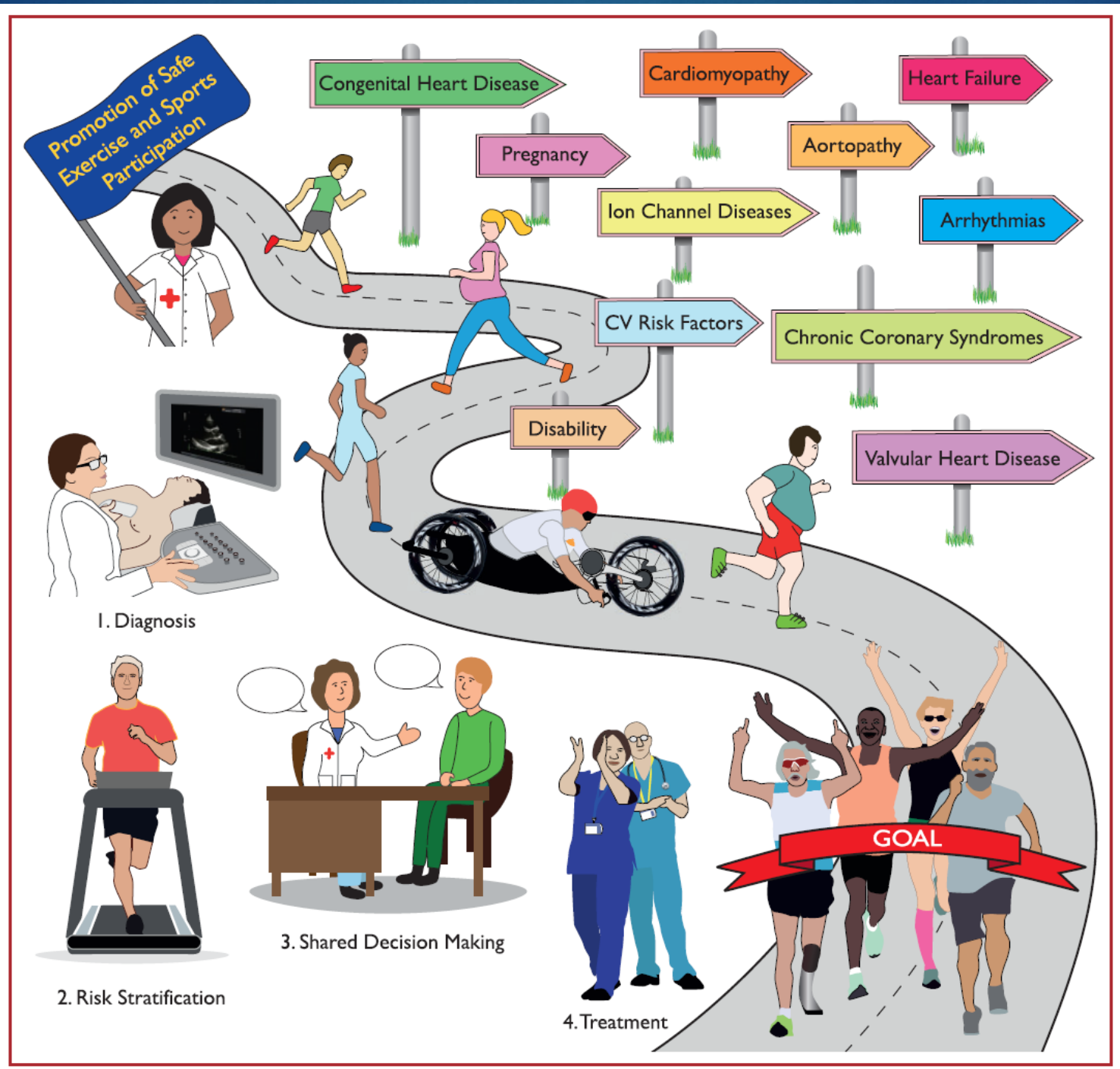
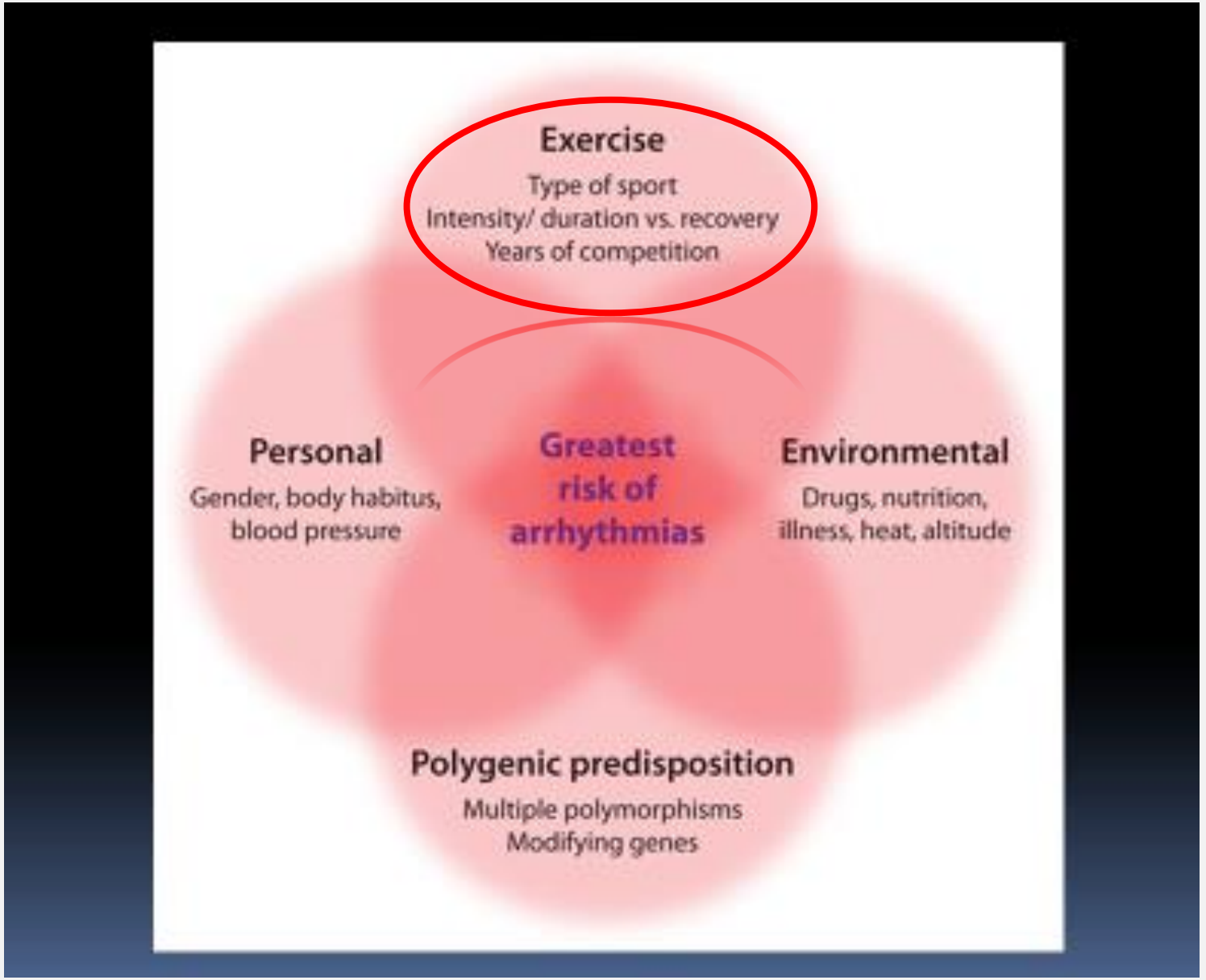


Figure 4 The potential use of AI in sports cardiology. CV, cardiovascular; DL, deep learning; CMR, cardiac magnetic resonance; CCT, computed coronary tomography; SCD, sudden cardiac death; AI, artificial intelligence; EST, exercise stress test; ECG, electrocardiography; PPS, pre-participation screening; ECHO, echocardiography.


Promotion of Safe Exercise and Sports Participation
Congenital Heart Disease
Cardiomyopathy
Heart Failure
Pregnancy
Aortopathy
Ion Channel Diseases
Arrhythmias
CV Risk Factors
Chronic Coronary Syndromes
Disability
Valvular Heart Disease
1. Diagnosis
2. Risk Stratification
3. Shared Decision Making
4. Treatment
GOAL
©ESC 2020

THE EXAMPLE OF VENTRICULAR ARRHYTHMIAS IN ATHLETES: THE LONG-TERM ITALIAN EXPERIENCE.....


Exercise
Type of sport
Intensity/ duration vs. recovery
Years of competition
Personal
Gender, body habitus,
blood pressure
Greatest
risk of
arrhythmias
Environmental
Drugs, nutrition,
illness, heat, altitude
Polygenic predisposition
Multiple polymorphisms
Modifying genes

ARRHYTHMIC PANDEMIC???

2002

Journal of the American College of Cardiology
© 2002 by the American College of Cardiology Foundation
Published by Elsevier Science Inc.

Vol. 40, No. 3, 2002
ISSN 0735-1097/02/$22.00
PII S0735-1097(02)01977-0

Long-Term Clinical Significance of Frequent and Complex Ventricular Tachyarrhythmias in Trained Athletes

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Rome, Italy, and Minneapolis, Minnesota

OBJECTIVES The aim of this study was to clarify the clinical relevance of ventricular tachyarrhythmias assessed by 24-h ambulatory electrocardiograms (ECG) in a large, unique, and prospectively evaluated athletic population.

BACKGROUND For athletes with ventricular tachyarrhythmias, the risk of sudden cardiac death associated with participation in competitive sports is unresolved.

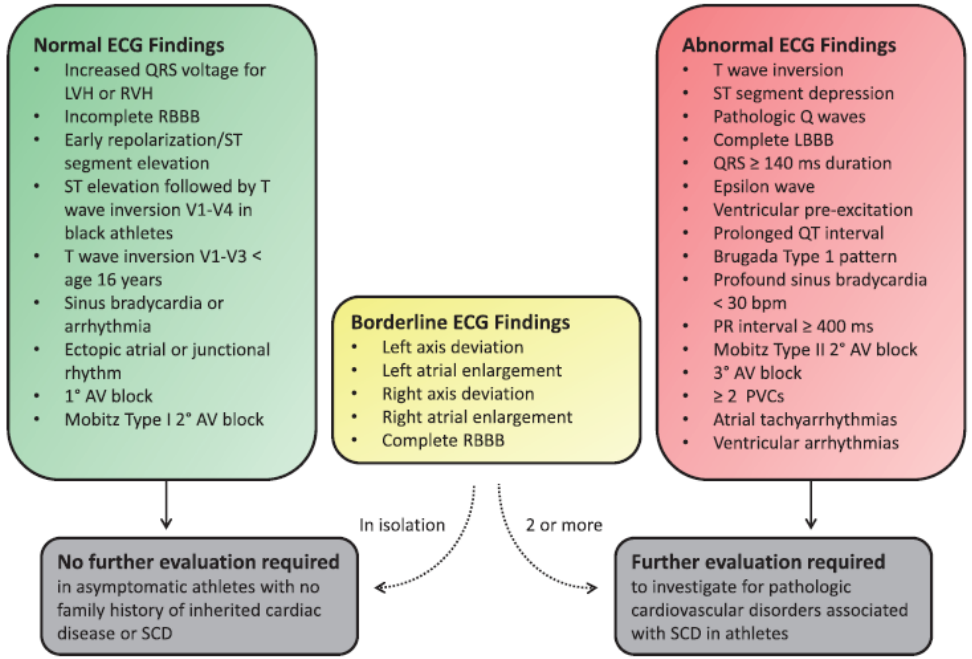
METHODS We assessed 355 competitive athletes with ventricular arrhythmias (VAs) on a 24-h ambulatory (Holter) ECG that was obtained because of either palpitations, the presence of ≥3 premature ventricular depolarizations (PVDs) on resting 12-lead ECG, or both.

RESULTS Athletes were segregated into three groups: Group A with ≥2,000 PVDs/24 h (n = 71); Group B with ≥100 <2,000 PVDs/24 h (n = 153); and Group C with only <100 PVDs/24 h (n = 131). Cardiac abnormalities were detected in 26 of the 355 study subjects (7%) and were significantly more common in Group A (21/71, 30%) than in Group B (5/153, 3%) or Group C athletes (0/131, 0% p < 0.001). Only the 71 athletes in Group A were excluded from competition. During follow-up (mean, 8 years), 70 of 71 athletes in Group A and each of the 284 athletes in Groups B and C have survived without cardiovascular events. The remaining Group A athlete died suddenly of arrhythmogenic right ventricular cardiomyopathy while participating in a field hockey game against medical advice.

CONCLUSIONS Frequent and complex ventricular tachyarrhythmias are common in trained athletes and are usually unassociated with underlying cardiovascular abnormalities. Such VAs (when unassociated with cardiovascular abnormalities) do not convey adverse clinical significance, appear to be an expression of "athlete's heart syndrome," and probably do not per se justify a disqualification from competitive sports. (J Am Coll Cardiol 2002;40:446–52) © 2002 by the American College of Cardiology Foundation

"... ventricular tachyarrhytmias are common in trained athletes and are usually unassociated with underlying cardiovascular abnormalities ... do not convey adverse clinical significance, appear to be an expression of athlete's heart syndrome".

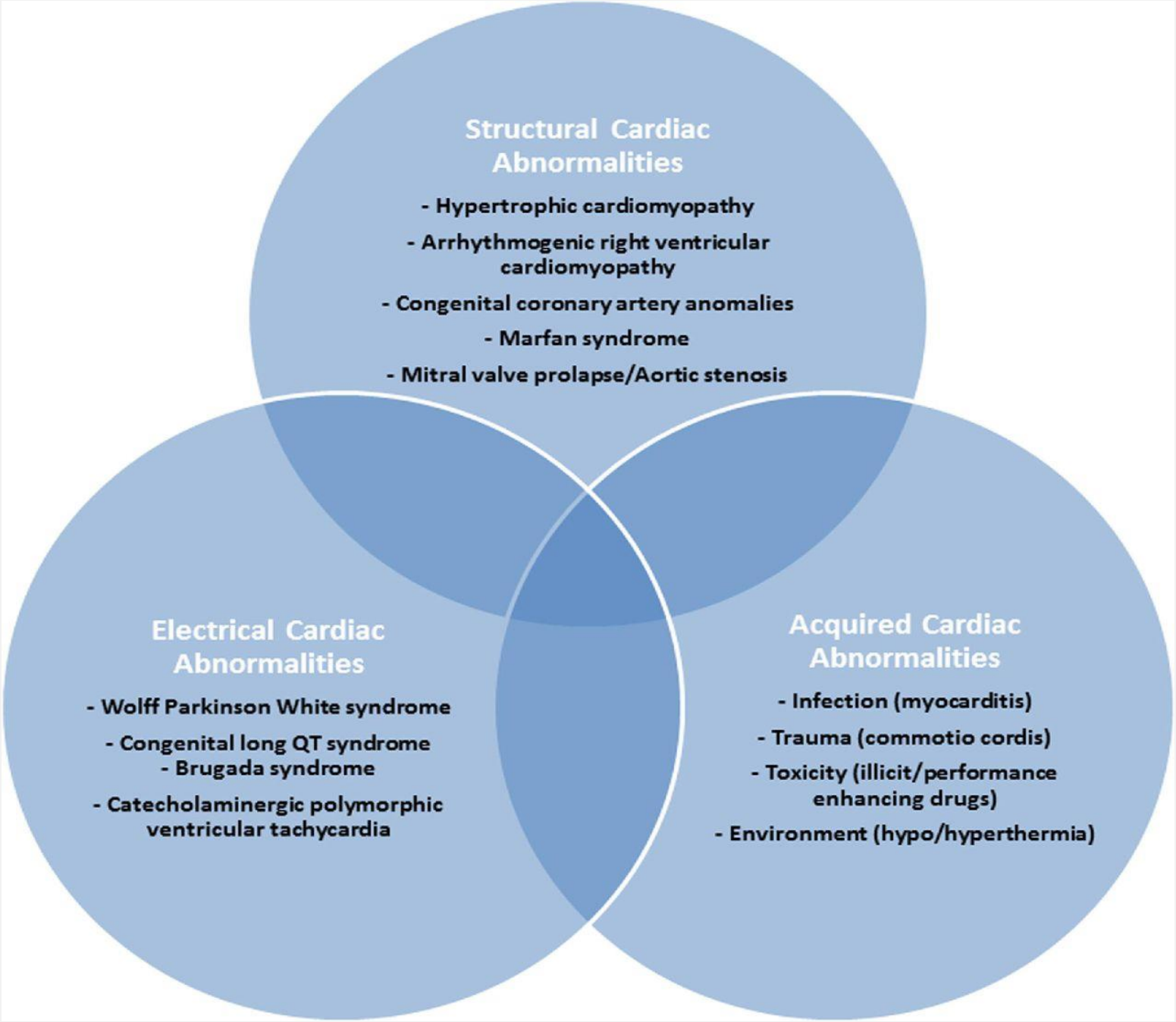
Biffi et al.



ESC European Society of Cardiology
European Heart Journal (2018) **39**, 1466–1480
doi:10.1093/eurheartj/ehw631

CURRENT OPINION
Coronary artery disease

International recommendations for electrocardiographic interpretation in athletes


Structural Cardiac Abnormalities
- Hypertrophic cardiomyopathy
- Arrhythmogenic right ventricular cardiomyopathy
- Congenital coronary artery anomalies
- Marfan syndrome
- Mitral valve prolapse/Aortic stenosis
Electrical Cardiac Abnormalities
- Wolff Parkinson White syndrome
- Congenital long QT syndrome
- Brugada syndrome
- Catecholaminergic polymorphic ventricular tachycardia
Acquired Cardiac Abnormalities
- Infection (myocarditis)
- Trauma (commotio cordis)
- Toxicity (illicit/performance enhancing drugs)
- Environment (hypo/hyperthermia)

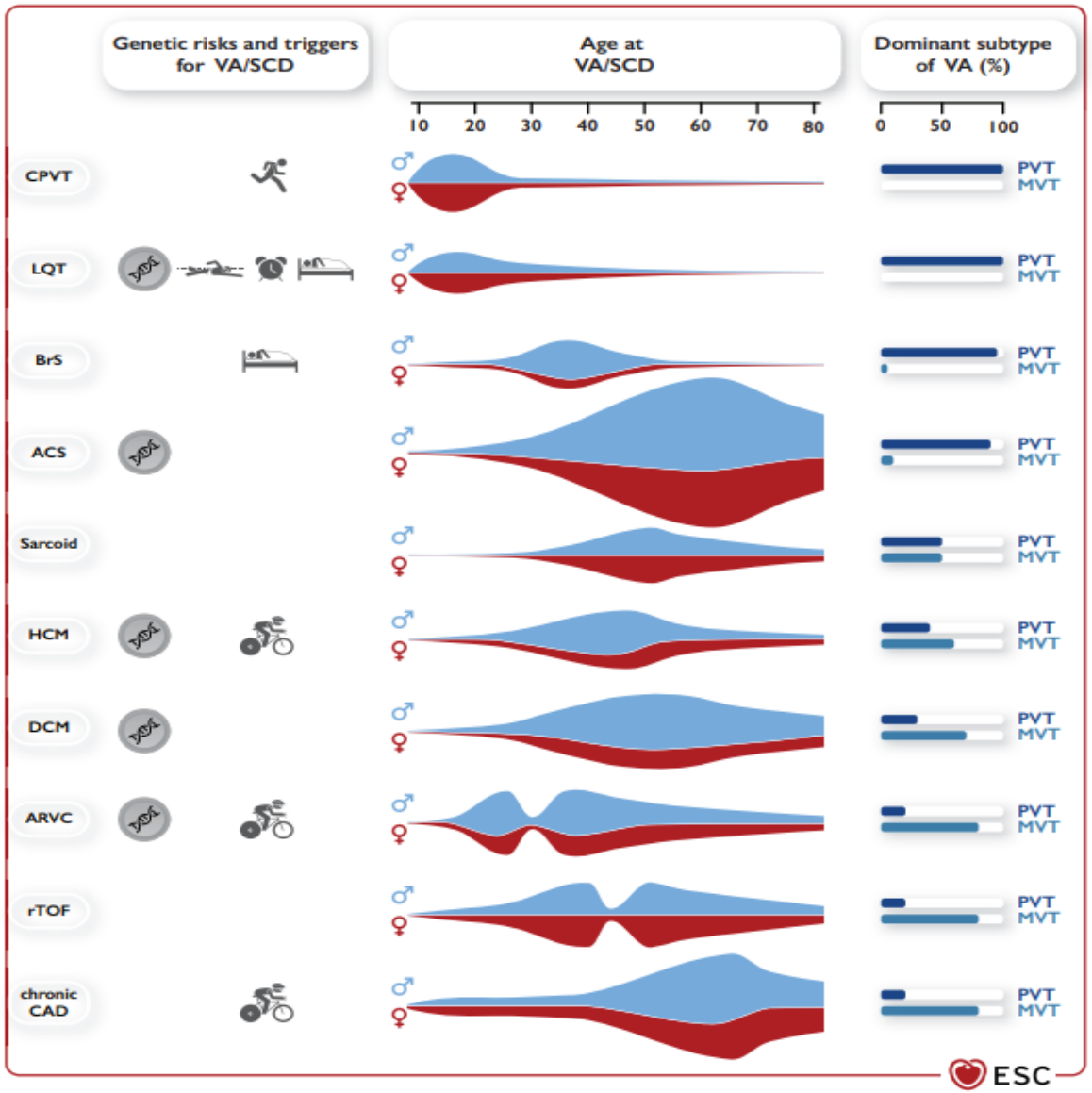
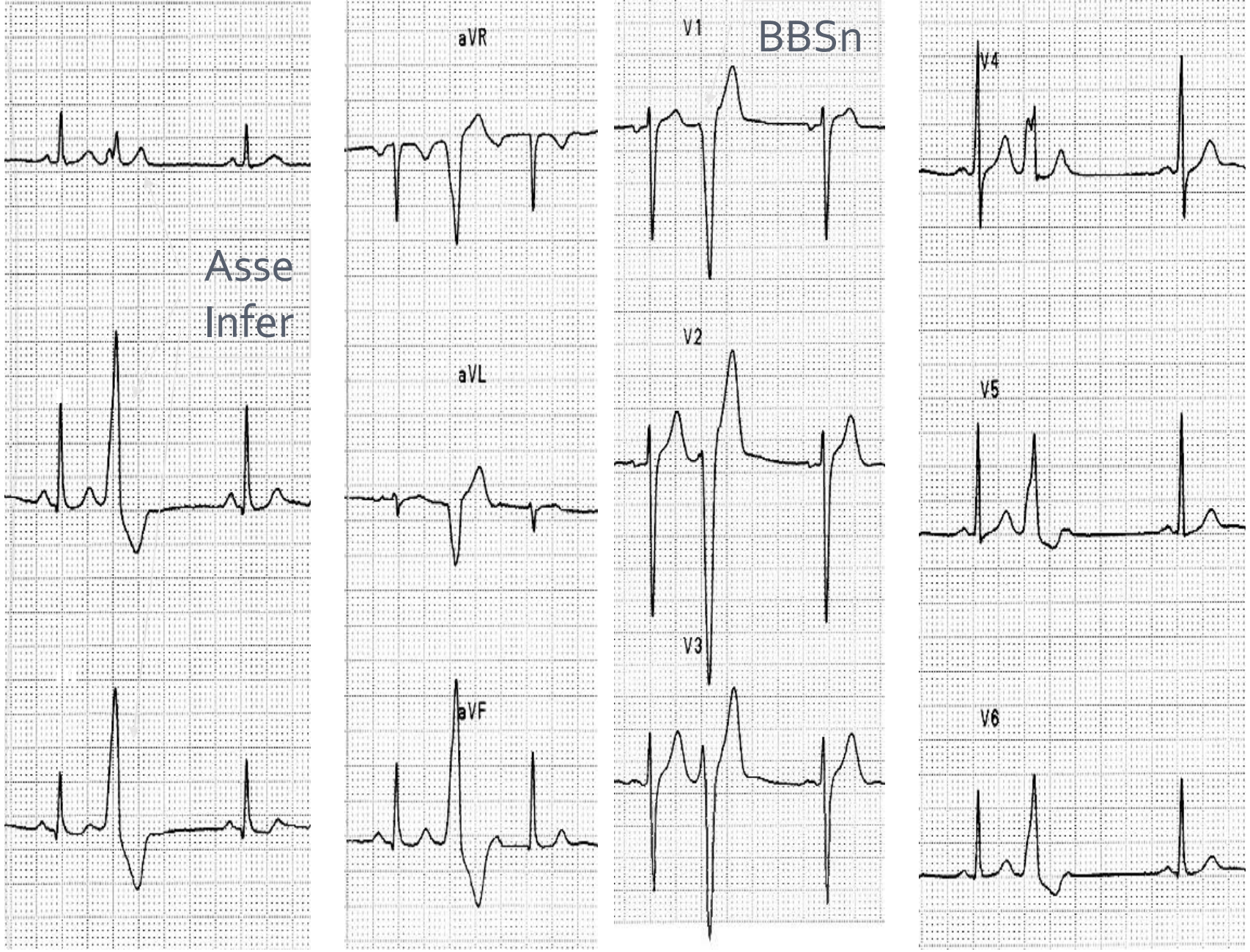
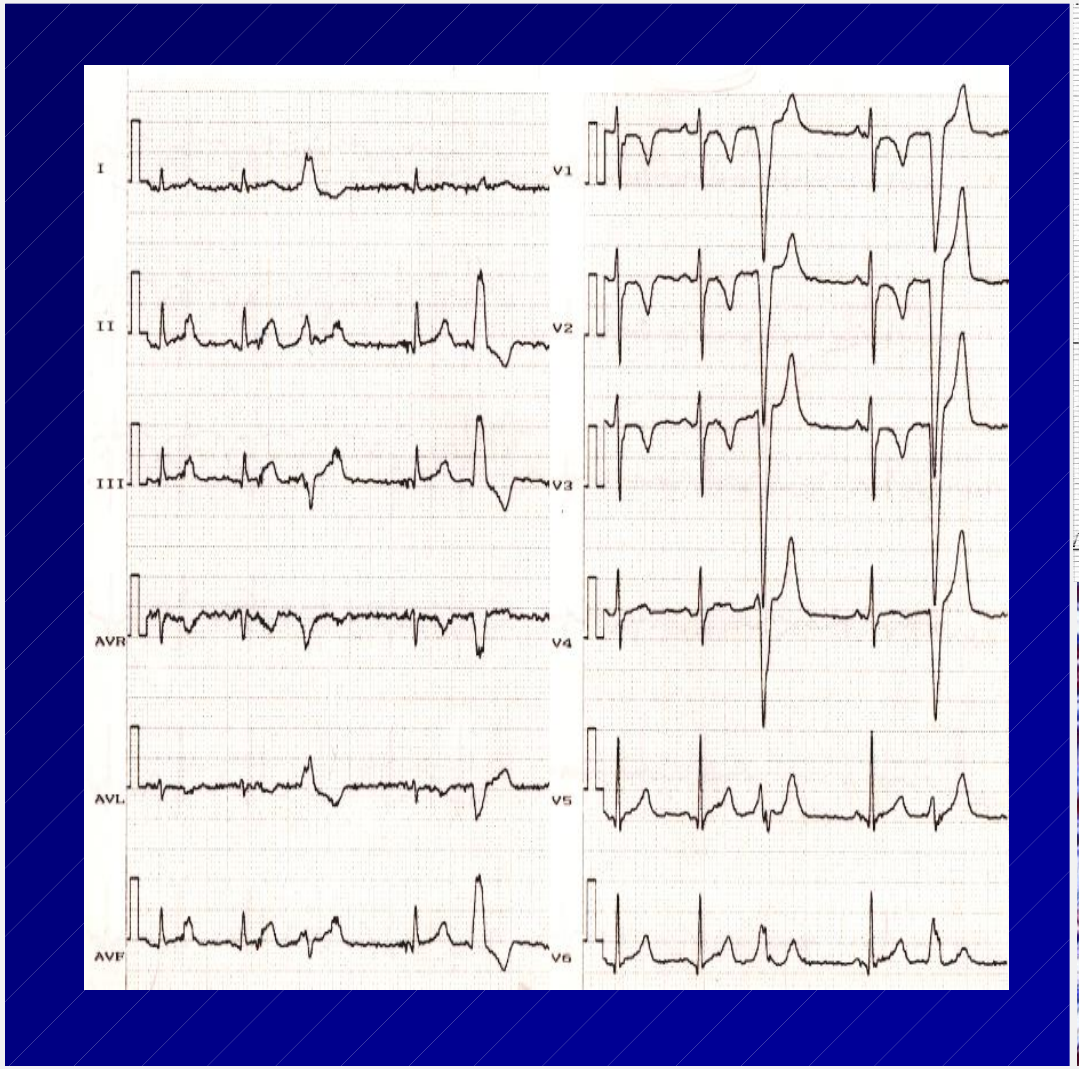


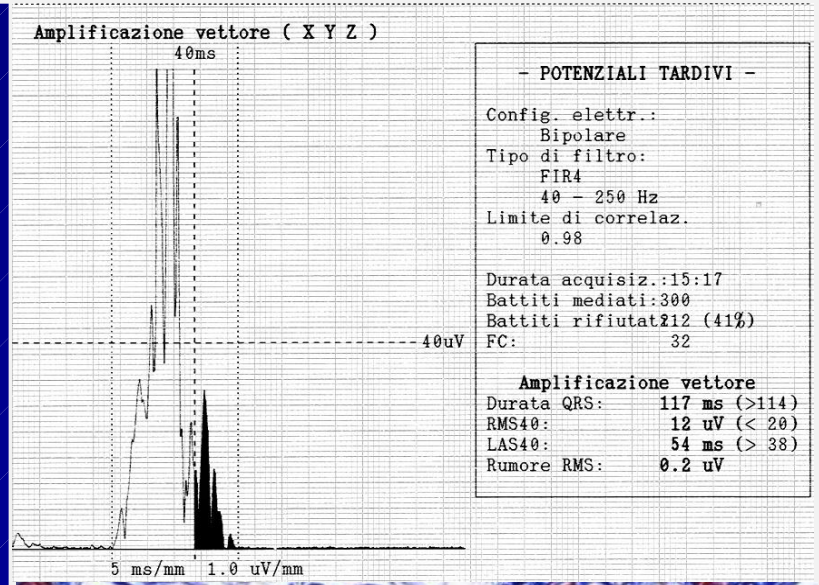
Figure 1 Central figure. Genetic risk for VA/SCD, typical triggers for VA/SCD, age at presentation with VA/SCD, sex predominance, and typical VA (PVT/VF vs. MVT) in different diseases associated with VA/SCD. ACS, acute coronary syndrome; ARVC, arrhythmogenic right ventricular cardiomyopathy; BrS, Brugada syndrome; CAD, coronary artery disease; CPVT, catecholaminergic polymorphic ventricular tachycardia; DCM, dilated cardiomyopathy; HCM, hypertrophic cardiomyopathy; LQT, long QT syndrome; MVT, monomorphic ventricular tachycardia; PVT, polymorphic ventricular tachycardia; rTOF, repaired tetralogy of Fallot; SCD, sudden cardiac death; VA, ventricular arrhythmia; VF, ventricular fibrillation.

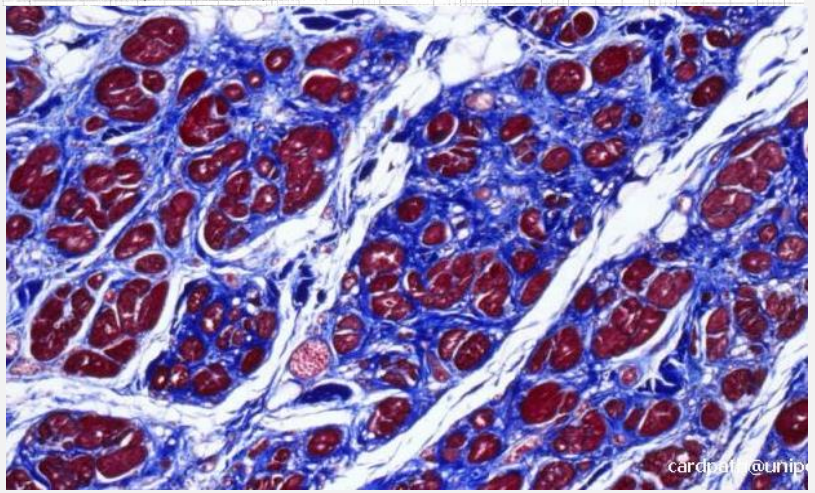


Tipica aritmia ventricolare idiopatica/benigna ad origine dal tratto d'efflusso del ventricolo destro (BBSn + Asse Inferiore)

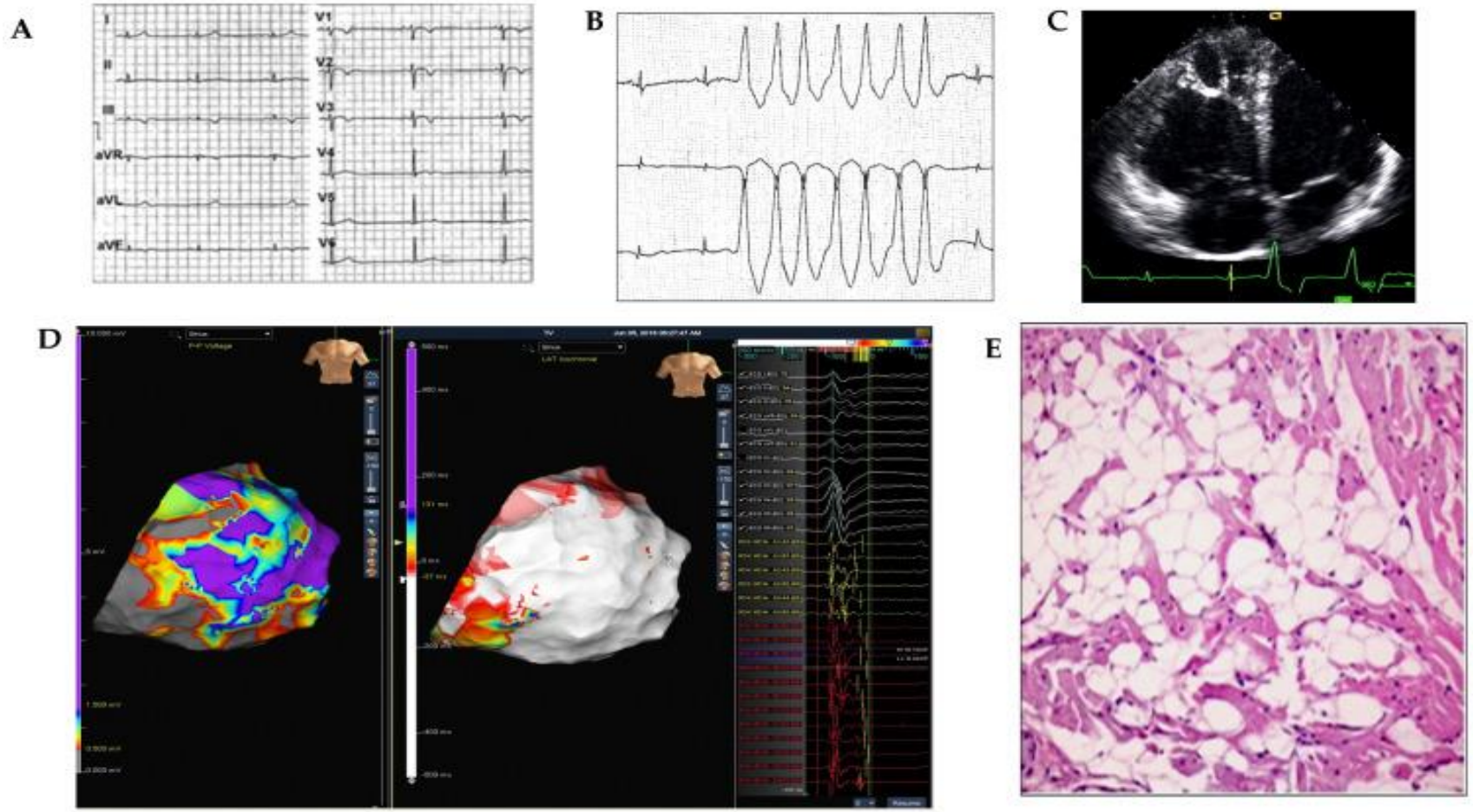
Canoeist, male, 24 yrs, with ARVD







Diagnostic Work-Up in a Young Athlete with Palpitations and NSVT



Narducci ML at al. Medicina 2021

Symptoms related SCA

- Syncope/presyncope (in particular during exercise), palpitations, lightheadedness, exertional fatigue must be regarded with great attention when they occur in an athlete, for the possibility that such symptoms may represent the clinical expression of a malignant arrhythmia.


RETURN-TO-PLAY

ESC European Society of Cardiology

European Journal of Preventive Cardiology (2024) **00**, 1–3
https://doi.org/10.1093/eurjpc/zwae002

INVITED EDITORIAL

The heart of the matter: understanding the implications of detraining on cardiac health

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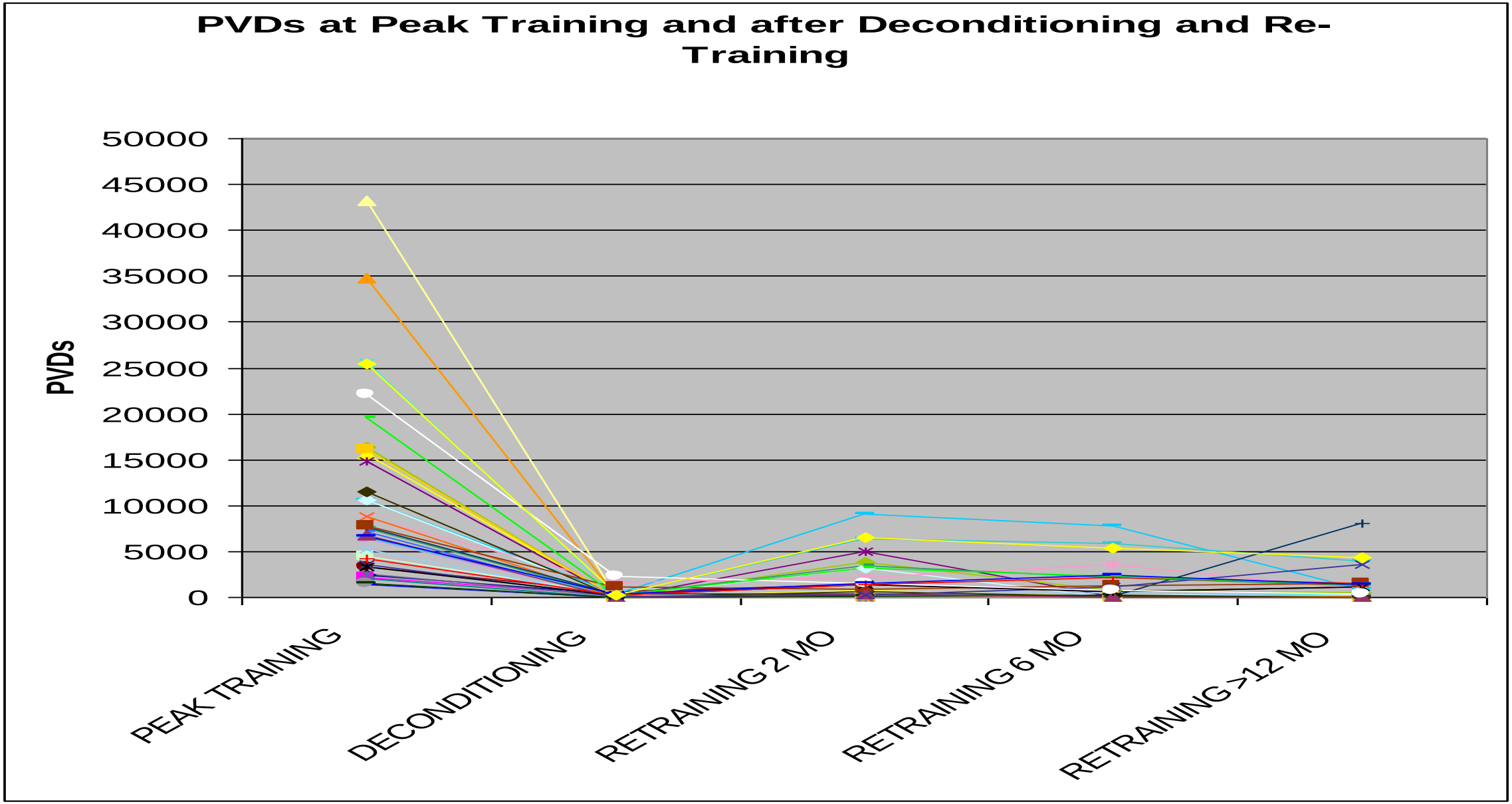
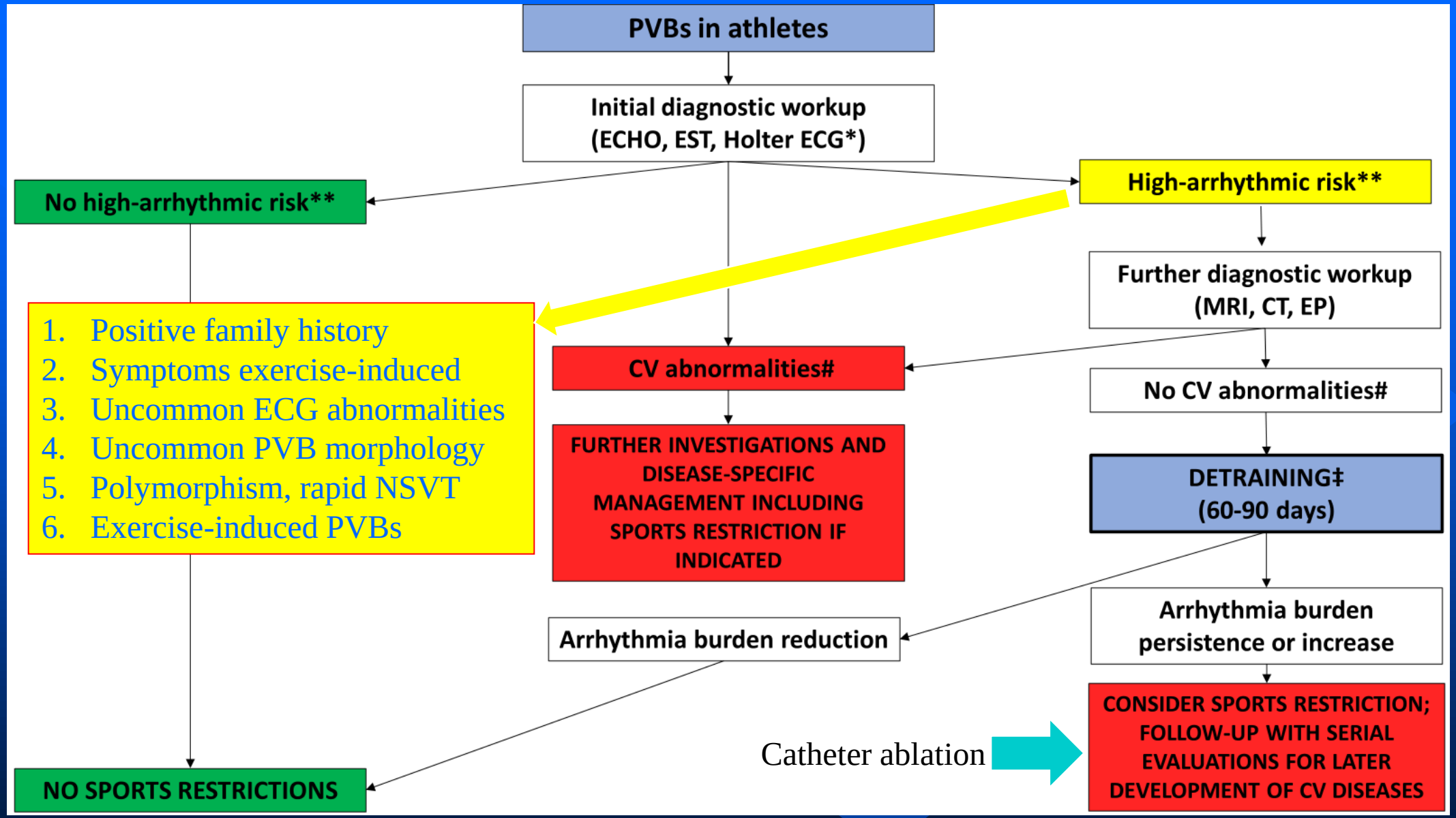
Online publish-ahead-of-print 3 January 2024



Biffi A et al: Am J Cardiol 2011



Biffi A, Palermi S, D'Ascenzi F, Bonifazi M, Zorzi A, Corrado D British Journal of Sports Medicine 2024

SUMMARY

- Sudden cardiac death associated with athletic activity is a rare but devastating event. Victims can be young and apparently healthy, and while many of these deaths are unexplained, a substantial number harbor underlying undiagnosed cardiovascular disease.
- The incidence of SCD among young athletes is actually quite low, estimated to be between 1:50,000 and 1:100,000 young athletes per year. This rate is notably higher in older adults, closer to 1:7000 healthy adult athletes per year.
- Due to the devastating nature of SCD and the potential to detect many of the associated disorders with noninvasive testing, there is a strong incentive to screen athletes for these disorders prior to athletic participation. However, there are a number of obstacles to widespread screening, including the large numbers of competitive athletes, low prevalence of congenital heart disease, and the impact of uncertain or false-positive results, as well as logistic inadequacies and legal considerations.

Italian Perspective Final Conclusions

- It should be reiterated that the assumptions underlying the **Italian protocols (COCIS 6th Edition)**, in the past and in the future, are not only of scientific nature, but respond to the **mandatory medico-legal requirements** deriving from the application, unique in the world, of the 1982 law on the protection of competitive sporting activity in Italy.

- Therefore, the peculiarity of the Italian guidelines is further reaffirmed here and **differentiated from the other guidelines**, both for the aforementioned cultural substratum of medico-legal nature, and for the **peerless forty years of scientific experience** and **territorial health screening organization (FMSI).**

Thanks !

Nearly 35 years after its initial publication in 1989, the Italian Federation of Sports Medicine (FMSI), in collaboration with other leading Italian Cardiological Scientific Associations, presented the 2023 version of the Cardiological Guidelines for Competitive Sports Eligibility. (COCIS) This update supersedes the previous guidelines published in 2020, offering a comprehensive and detailed guide for the participation of athletes with heart disease in sports participation.[1–3]

This edition incorporates the latest advances in cardiology and sports medicine, providing current information and recommendations. It addresses various topics, including contraindications and recommendations for athletes with various heart conditions and screening strategies.

For the first time, these guidelines have been recorded in the Italian Guidelines Registry of the Italian Minister of Health, underscoring the guidelines' quality and dependability. A notable feature of this update is the inclusion of the class of recommendation and level of scientific evidence, facilitating the guidelines' interpretation and application in clinical practice by healthcare providers. Overall, this revised version of the Cardiological Guidelines for Competitive Sports Eligibility stands as a crucial resource for sports medicine professionals, cardiologists, and healthcare providers, marked by its completeness, reliability, and scientific thoroughness. It is an indispensable tool for those involved in the care and management of athletes with heart conditions.