Online version at https://www.minervamedica.it

The Journal of Sports Medicine and Physical Fitness 2025 June;65(6):826-33
DOI: 10.23736/S0022-4707.25.16910-7

REVIEW

SPORT CARDIOLOGY

Italian guidelines for competitive sport eligibility (COCIS): what are the new indications in the updated 2023 version for the evaluation of athletes with arrhythmias?

Luigi SCIARRA [1], Antonio SCARÀ [1, 2] *, Alessandro BIFFI [3], Silvia CASTELLETTI [4], Domenico CORRADO [5], Antonio DELLO RUSSO [6], Franco GIADA [7], Giuseppe INAMA [8], Loira LEONI [5], Viviana MAESTRINI [9, 10], Zefferino PALAMÀ [1, 11], Peter SCHWARTZ [12], Andrea SPAMPINATO [13], Paolo ZEPPILLI [14], Alessandro ZORZI [5], Pietro DELISE [15, 16]

[1]Department of Life, Health and Environmental Sciences, University of L'Aquila, L'Aquila, Italy; [2]Unit of Cardiac Electrophysiology, San Carlo di Nancy Hospital, Rome, Italy; [3]Med-Ex Medicine and Exercise srl, Rome, Italy; [4]Department of Cardiology, IRCSS Istituto Auxologico Italiano, Milan, Italy; [5]Department of Cardiac, Thoracic and Vascular Sciences and Public Health, University of Padua, Padua, Italy; [6]Department of Biomedical Sciences and Public Health, Marche Polytechnic University, Ancona, Italy; [7]Unit of Sports Medicine and Cardiovascular Rehabilitation, Cardiovascular Department, P.F. Calvi Hospital, Venice, Italy; [8]Unit of Cardiology, Figlie di San Camillo Institute, Cremona, Italy; [9]Department of Clinical, Internal, Anesthesiology and Cardiovascular Sciences, Sapienza University, Rome, Italy; [10]Institute of Sports Medicine and Science, National Italian Olympic Committee, Rome, Italy; [11]Unit of Cardiology, Casa di Cura Villa Verde, Taranto, Italy; [12]Center for Cardiac Arrhythmias of Genetic Origin, IRCCS Istituto Auxologico Italiano, Milan, Italy; [13]Unit of Cardiology, Policlinico Casilino, Rome, Italy; [14]Unit of Sports Medicine, IRCCS A. Gemelli University Polyclinic Foundation, Rome, Italy; [15]Medical Center, Poliambulatorio di Mestre, Venice, Italy; [16]Medical Center, Poliambulatorio di Conegliano, Treviso, Italy

*Corresponding author: Antonio Scarà, Unit of Cardiac Electrophysiology, San Carlo di Nancy Hospital, 00165 Rome, Italy. E-mail: antscara@libero.it

ABSTRACT

The COCIS 2023 guidelines represent the latest update on competitive sports eligibility for athletes with heart disease, developed by the Italian Society of Sports Cardiology and associated medical societies. These updated guidelines reflect advancements in cardiology and sports medicine and introduce clear class of recommendations and levels of evidence for assessing athletes with heart disease. This document focuses on the differences between the 2023 and 2017 versions, particularly regarding athletes with arrhythmias. The guidelines integrate new scientific evidence, including modifications to criteria for specific arrhythmic conditions like Wolf-Parkinson-White (WPW) Syndrome, Brugada Syndrome, long QT syndrome (LQTS), and premature ventricular beats (PVBs). Updates on the return-to-play timing after successful catheter ablation are also included. Key updates include the revised arrhythmic risk thresholds for WPW syndrome; these guidelines also expand recommendations for asymptomatic pre-excitation cases. In Brugada Syndrome, eligibility remains dependent on the presence of malignant arrhythmias and genetic risk factors, with scoring systems to aid risk stratification. For LQTS, eligibility is reconsidered for asymptomatic individuals with a negative phenotype and a positive genotype, with beta-blocker use. Additionally, the management of PVBs is refined, with new criteria for further investigation and risk assessment. COCIS 2023 introduces a more nuanced, evidence-based approach to the eligibility of athletes with arrhythmias. The guidelines provide clinicians with detailed recommendations for managing a variety of arrhythmic conditions. As scientific research advances, these guidelines will continue to evolve, ensuring safe athletic participation for individuals with cardiovascular conditions.

(*Cite this article as:* Sciarra L, Scarà A, Biffi A, Castelletti S, Corrado D, Dello Russo A, *et al*. Italian guidelines for competitive sport eligibility (COCIS): what are the new indications in the updated 2023 version for the evaluation of athletes with arrhythmias? J Sports Med Phys Fitness 2025;65:826-33. DOI: 10.23736/S0022-4707.25.16910-7)

KEY WORDS: Cardiac arrhythmias; Athletes; Guidelines.

COCIS 2023[1] represents the latest version of the Italian cardiological guidelines for competitive sports eligibility, presented by the Italian Society of Sports Cardiology (SIC Sport) and the Federation of Sports Medicine (FMSI), in collaboration with three other Italian cardiological scientific societies: ANCE (National Association

of Outpatient Cardiology), ANMCO (National Association of Inpatient Cardiology), and SIC (Italian Society of Cardiology). This updated version incorporates the latest advances in cardiology and sports medicine, supersedes the previous guidelines (COCIS 2017), and provides comprehensive and detailed recommendations for the participation of athletes with heart disease in sports.[1-4]

This document will analyze the main differences between the latest version (2023) and the previous one (2017) on a specific topic: indications for competitive sports eligibility of athletes with arrhythmias. However, it is important to highlight a significant novelty of the updated version: for the first time, this document includes the class of recommendation and the level of scientific evidence, facilitating the interpretation and application of the guidelines in clinical practice. The indications for sports participation are divided into three classes of recommendation as follows (Table I):

• class I: there is evidence and/or general agreement that a given competitive sport is safe, beneficial, useful, and effective. For these reasons, the athlete can participate in competitive sports;

• class II: there is conflicting evidence and/or a divergence of opinion about the usefulness/effectiveness of the given competitive sport. For these reasons, the athlete may participate in competitive sports after an individualized evaluation;

• class III: there is evidence or general agreement that the given competitive sport is potentially harmful. For these reasons, the athlete cannot participate in competitive sports.

The levels of evidence are distinguished as follows:

• level A: data derived from multiple randomized clinical trials or meta-analyses;

• level B: data derived from a single randomized clinical trial or large non-randomized studies;

• level C: consensus of experts and/or small studies, retrospective studies, and registries.

Eligibility for competitive sports in patients with arrhythmias: general criteria

In line with the previous edition, the latest version of COCIS[1] strongly emphasizes the concept that sports practice should be encouraged to promote health. The primary focus is to identify cases where heart disease, non-compatible with sport, is present and may increase the risk of complex arrhythmias or sudden death. It should be taken into account that according to the Italian law, in our country since 1982, eligibility to competitive sport practices needs to be certified by a "specialist in sport medicine."

Eligibility is determined based on several general criteria:

• the risk that an arrhythmia may cause significant hemodynamic repercussions (excessively high or low heart rate) during sporting activity, recovery, and/or at rest;

• the risk that an arrhythmia may lead to pre-syncope, syncope, and/or cardiac arrest;

• the possibility that sporting activity may adversely affect the substrate (anatomical or electrophysiological) of the arrhythmia, worsening or accelerating a potential pathology.

However, the judgment of eligibility may vary depending on the sport practiced. The different cardiovascular demands and the inherent risks of each sport remain the most important determinants. For example, in sports with inherent traumatic risks, even a benign loss of consciousness can result in serious adverse events for the athlete and/or spectators. Athletes with non-physiological arrhythmias and/or significant symptoms (such as syncope or tachycardia), where arrhythmic heart disease or an arrhythmia incompatible with sports is suspected, must be suspended from competition until the completion of investigations.[5-7]

When eligibility for competitive sport cannot be granted, it is crucial to follow the patient over time and encourage them to engage in physical activity through the safest

TABLE I.—*Key points from the COCIS 2023 guidelines, focusing on the recommendations and levels of evidence for competitive sports eligibility in athletes with heart disease.*

Class	Description	Indication
Class I	There is evidence and/or general agreement that the sport is safe, beneficial, and effective	The athlete can participate in competitive sports
Class II	There is conflicting evidence and/or divergence of opinion about the usefulness/effectiveness of the sport	The athlete may participate in competitive sports after an individualized evaluation
Class III	There is evidence or general agreement that the sport is potentially harmful	The athlete cannot participate in competitive sports
Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses	
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies	
Level of evidence C	Consensus of experts and/or small studies, retrospective studies, and registries	

program, according to the type of heart disease discovered: *i.e*., physical exercise prescription.

Building on these general indications, the latest version of COCIS 2023 incorporated new scientific evidence and modified some specific recommendations regarding eligibility for patients with suspected or documented arrhythmias. Recommendations for return to play after cardiac ablation were also revised. These changes will be discussed in the following paragraphs.

Eligibility for competitive sports in patients with arrhythmias: main novelties in COCIS 2023

Wolf-Parkinson-White Syndrome

The -Parkinson-White (WPW) pattern, characterized by a short PR interval (less than 120 msec) and a typical delta wave (slurred upstroke or downstroke of the initial part of the QRS complex), results from the presence of an anomalous pathway (Kent bundle) with anterograde conduction connecting the atria to the ventricles, bypassing the atrioventricular (AV) node. Individuals with the WPW pattern may suffer from various arrhythmias (WPW syndrome): the most frequent type of arrhythmia is atrioventricular orthodromic re-entrant tachycardia (AVRT), while antidromic AVRT is very rare; pre-excited atrial fibrillation (AF) may also occur.[8] In the latter case, in the presence of a short refractory period of the Kent bundle, it may progress to ventricular fibrillation, leading to sudden death.[9]

A key difference in the latest version of COCIS[1] deals with the revised values used to define the arrhythmic risk associated with the refractory period (RP) of the Kent bundle. In the previous version, an increased arrhythmic risk was defined by: 1) presence of pre-excited AF with a minimum R-R interval <250 ms at rest and ≤210 ms during effort; 2) presence of 1:1 anterograde AV conduction through the Kent bundle <250 ms at rest and ≤210 ms during effort, during an electrophysiological study (transvenous or transesophageal); 3) presence of an effective RP of the Kent bundle <250 ms at rest and ≤210 ms during effort, during a transvenous or transesophageal electrophysiological study (EPS); 4) inducibility of AVRT at rest or during effort.

The updated COCIS 2023,[1] in line with the 2019 ESC guidelines for managing patients with supraventricular tachycardia,[10] revised these cutoff values (Table II). According to the new guidelines, if pre-excited AF is inducible at EPS with a minimum R-R interval between pre-excited beats ≤250 ms at rest and/or during effort (or isoproterenol infusion), eligibility must be denied. Conversely, if during EPS, pre-excited AF is inducible with a minimum R-R interval >250 ms at baseline and/or during effort (or isoproterenol infusion), eligibility should be granted. The same applies if 1:1 conduction through the anomalous pathway is interrupted with an atrial pacing cycle length >250 ms (at rest) and/or the effective refractory period of the anomalous pathway is >250 ms at rest and/or during effort (or isoproterenol infusion).

In summary, the cutoff of 250 ms (even for induced pre-excited AF or effective RP) has been adopted, regardless of whether the individual is at rest or under effort (or pharmacological stress with isoproterenol), to identify increased arrhythmic risk related to the presence of a Kent bundle.

A second significant novelty concerns the approach to subjects with asymptomatic pre-excitation. The first consideration is that asymptomatic individuals, particularly young individuals, are not guaranteed to remain symptom-free over time. Additionally, evidence weakening the predictive value of non-invasive tests[11] should be considered. For this reason, COCIS 2023[1] expands the indications to perform an EPS, either transesophageal or endocavitary, to achieve better risk stratification. However, the document emphasizes that catheter ablation should be reserved for those at high arrhythmic risk, based on the inducibility of re-entry arrhythmias and the evaluation of the anterograde refractory period (RP) of the Kent bundle.

Recent studies seem to further support this kind of approach. For example, the historical belief that the sudden disappearance of pre-excitation during an exercise test can be used as a non-invasive marker of low arrhythmic risk has been refuted. Additionally, recent evidence suggests

TABLE II.—*Comparison of the previous and the latest version of COCIS guidelines for arrhythmic risk related to the electrophysiological characteristics of the Kent bundle.*

At-risk Kent criteria	COCIS 2017	COCIS 2023 (following ESC 2019)
Minimum R-R interval during pre-excited AF	<250 ms at rest, ≤210 ms during effort	≤250 ms at rest/effort (or isoproterenol)
1:1 anterograde AV conduction through the Kent bundle	<250 ms at rest, ≤210 ms during effort	≤250 ms at rest/effort (or isoproterenol)
Effective RP of the Kent bundle	<250 ms at rest, ≤210 ms during effort	≤250 ms at rest/effort (or isoproterenol)

AF: atrial fibrillation; AV: atrioventricular; RP: refractory period.

that patients with an intermittent pre-excitation pattern can exhibit effective refractory periods similar to those with persistent pre-excitation.[12, 13]

Brugada Syndrome and Brugada ECG patterns

Brugada Syndrome (BrS) is a hereditary condition characterized by a typical electrocardiogram (ECG) pattern of coved ST-segment elevation with T-wave inversion in the right precordial leads (Brugada type 1), associated with an increased risk of ventricular fibrillation, typically occurring at rest, in the absence of overt signs of structural heart disease.[14] This pattern may be persistent or intermittent, and in some cases, it can appear in response to specific triggers such as certain drugs (*e.g.*, class I antiarrhythmic drugs) or during fever.[15-17]

The 2023 COCIS guidelines,[1] like the previous version, emphasize that the presence of a Brugada ECG pattern in asymptomatic individuals does not equate to a diagnosis of Brugada Syndrome. The syndrome is defined not only by the electrocardiographic pattern but also by malignant arrhythmias and/or presence of risk factors of sudden death. Furthermore, the guidelines stress that pharmacological testing is not recommended for all cases with type 2 or 3 Brugada patterns or in ambiguous cases without a family history of sudden death or syncope:[18] in fact, in those cases the risk is very low.[19-23]

The updated COCIS version[1] reaffirms the eligibility criteria adopted in the 2017 version without significant modifications. However, to enhance the accuracy of risk stratification and avoid overdiagnosis, it now recommends considering one of two scoring systems: the Sieira score or the Shanghai score. Both scores incorporate factors such as ECG pattern, family history, symptoms, etc., to classify patients into different risk categories (low, high, and doubtful). However, there are some differences between the two scores. For instance, the Sieira score includes results from electrophysiological studies (*e.g.*, 2 points for ventricular vulnerability), whereas the Shanghai score places more emphasis on detailed family history and assigns minimal points for positive genetic tests.[24, 25]

Long QT syndrome

Long QT syndrome (LQTS) is a genetic disorder that leads to abnormal QTc interval prolongation. The most common forms are LQT1, LQT2, and LQT3, which are associated with dysfunctions in the IKs, IKr, and INa channels, respectively. These three subtypes account for approximately 90% of LQTS cases. The risk of malignant ventricular arrhythmias may increase in different situations: for example, cardiac arrest can be triggered by stress in LQT1, emotional stimuli in LQT2, or sinus bradycardia in LQT3. The diagnosis of LQTS requires either a QTc duration of 480 milliseconds or more (regardless of symptoms) or a Schwartz score of 3.5 or higher.[26]

The latest COCIS guidelines,[1] following the principles of the previous version, stress that participation in competitive sports is contraindicated for individuals diagnosed with LQTS, even in the absence of documented ventricular arrhythmias.[27] However, the new guidelines offer recommendations for individuals with a diagnostic genotype for LQTS but a negative phenotype (Table III). In these cases, eligibility for sports participation may be considered (Class II indication, Level B evidence) for asymptomatic individuals receiving beta-blockers. The eligibility assessment should also take into account the type of sport, the specific genetic defect (LQT1, LQT2, or LQT3), family history, and QTc values at rest and during/after physical

TABLE III.—*this table shows a comparison of COCIS 2017 and 2023 about eligibility for competitive sports in subjects affected by long QT (LQT) syndrome.*

COCIS 2017	COCIS 2023 (with CoR and LoE)
All subject diagnosed with LTQ syndrome (cQT ≥480 ms or cQT ≥460 ms and arrhythmic syncope or Schwartz score ≥3.5) must be disqualified	Class III B: all subjects diagnosed with LQT syndrome, whether due to positive genetic testing or the accumulation of clinical parameters must be disqualified, except in the specific cases listed below. This restriction also applies to individuals diagnosed with short QT syndrome. It is important to note that the disqualification does not directly represent an indication for an ICD implantation, nor should an ICD be implanted solely to obtain sports eligibility
N.A.	Class II C: eligibility may be considered in subjects with mutations in genes associated with asymptomatic LQT syndrome who have a negative or borderline phenotype while on beta-blocker therapy. The evaluation process should begin with a detailed analysis of the type of sport and considerations related to the current pharmacological treatment, particularly beta blockers. The decision must be highly individualized, considering the specific type of LQTS (LQT1, LQT2, LQT3, etc.), family history, cQT values at rest, during recovery after maximal EST and findings from ECG monitoring. Eligibility decisions should be made by centers with great expertise in LQTS)

CoR: class of recommendation; LoE: level of evidence; cQT: corrected QT; EST: exercise stress test.

exertion (*e.g.*, using stress tests or 12-lead Holter monitoring). The document emphasizes that such evaluations should be conducted in high-quality centers.

Premature ventricular beats

Sporadic premature ventricular beats (PVBs) occurring within 24 hours are relatively common both in general and athletic population, whereas frequent PVBs are less common. The latest COCIS version,[1] in line with the previous releases, underscores that the prognosis of athletes with PVBs is not determined by their frequency, except in cases of "tachycardiomyopathy." The key factor in prognosis is the presence or absence of heart disease.[28, 29] In cases of underlying heart disease, the arrhythmic risk strongly depends on the type of disease involved.

The new COCIS guidelines[1] confirm the concepts from the previous version and remind us that primary cardiomyopathies and myocarditis are the most common conditions found in athletes, particularly those under 35 years of age with PVBs. Athletes with PVBs detected incidentally during baseline ECG or exercise stress testing (EST) require Level II diagnostic investigations, including echocardiography, maximal exercise testing, and ambulatory ECG monitoring. Level III tests, such as cardiac magnetic resonance (CMR) or coronary CT scans, should be reserved for selected cases.

A notable addition in the COCIS 2023[1] is that, for the first time, the guidelines specifically address characteristics suggesting a higher likelihood of underlying heart disease, thus warranting Level III investigations (Table IV). Certain features increase the risk of heart disease,[30] such as a family history of sudden cardiac death or cardiomyopathy and the occurrence of syncope or presyncope. ECG analysis plays a crucial role in the diagnostic process: a detailed examination should focus on identifying the origin of the PVBs and detecting anomalies indicative of heart disease. For example, PVBs with an intermediate axis or higher, especially with a right bundle branch block (RBBB) pattern in V1 and a wider QRS duration (>130 ms), or PVBs with multiple origins, suggest a higher probability of heart disease. Conversely, a thorough analysis of the native QRS and T-wave morphology is essential. For example, PVBs with a left bundle branch block and intermediate axis, along with a negative T-wave in V1-V3 leads, raise suspicion for right arrhythmogenic cardiomyopathy. A recent study supports this analytic approach in predicting left ventricular scar when RBBB PVBs are found in athletes.[31]

An increase (or persistence) of PVBs during a maximal ECG test, along with their reproducibility, is another marker of greater heart disease risk.[29] Additional predictive factors include the complexity of the arrhythmic burden, such as non-sustained ventricular tachycardia (NSVT), short-coupled beats, or R/T phenomena, which further elevate the likelihood of underlying cardiac disease.

Lastly, the 2023 COCIS[1] introduces a flowchart to simplify the diagnostic workflow for evaluating athletes with PVBs (Figure 1). This chart highlights the enhanced role of anamnesis, physical examination, blood tests, echocardiography, 24-hour ambulatory ECG, and maximal exercise stress tests as first-line evaluation tools. Additional tests, such as CMR, coronary CT scan, endocardial voltage mapping (EVM)[32, 33] and genetic testing, are indicated when heart disease is suspected or PVBs exhibit high-risk features. Eligibility for competitive sports can be granted once cardiac disease is ruled out and/or complex arrhythmias (*e.g.*, R/T phenomena, numerous or rapid NSVT, short R-R interval couplets) are excluded.

Return to play after a successful catheter ablation

The latest COCIS[1] version revises the timing and criteria for returning to play after a successful ablation for cardiac

TABLE IV.—*Characteristics of premature ventricular beats that increase or decrease the probability of an underlying heart disease (modified from COCIS 2023).*[1]

Characteristics	Increased risk of heart disease	Decreased risk of heart disease
Family history	+	-
History of syncope/pre-syncope	+	-
ECG abnormalities	+	-
PVB's morphology	Intermediate axis or higher (especially with RBBB pattern in V1 and QRS duration >130 ms)	Lower axis (especially with LBBB pattern in V1)
Morphology numbers	>1	1
Ergometric test	Increased/persistence of PVBs	Reduction of PVBs
Complexity (close couples, NSVT, "R on T"	+	-
Maximum ergometric test reproducibility/repeated Holter ECGs	+	-

PVBs: premature ventricular beats; NSVT: non sustained ventricular tachycardia; RBBB: right bundle branch block; LBBB: left bundle branch block.

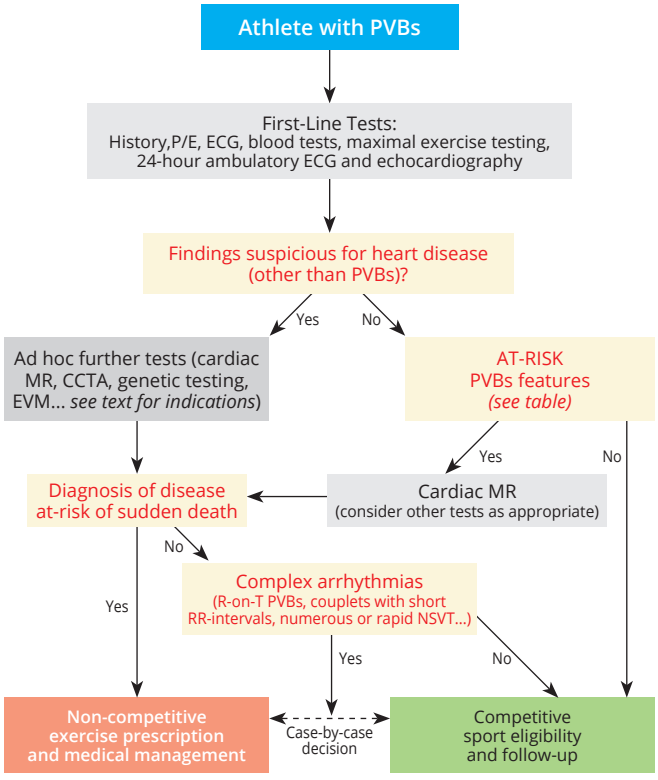

Figure 1.—Diagnostic flow chart for evaluating an athlete with premature ventricular beats (from COCIS 2023).[1]
PVBs: premature ventricular beats; P/E: physical examination; MR: magnetic resonance; CCTA: coronary computed tomography angiography; EVM: endocardial voltage mapping.

arrhythmias. The minimum waiting period after a successful procedure for most arrhythmias has been reduced from 1 month to 2 weeks, provided there are no complications or relapse of symptoms/arrhythmias. Furthermore, following a successful atrial fibrillation (AF) ablation, the recommended resting period has been reduced from 3 months to 8 weeks for athletes with a CHA2DS2VASC score of 0 (or 1 in females), after discontinuing antiarrhythmic and anticoagulation medications. Regarding this last point, it is important to emphasize that the likelihood of an effective AF ablation largely depends on proper patient selection and an approach as tailored as possible.[34-38]

The previous document suggested a case-by-case approach for athletes with a CHA2DS2VASC score >1 (or >2 in females), considering the potential consequences of long-term anticoagulation therapy and the type of sport. The new COCIS guidelines[1] confirm these recommendations, including athletes with a CHA2DS2VASC score >0 (or >1 in females). In this perspective, recent evidence suggests the possibility of using anticoagulants with a shorter half-life, allowing for the practice of sports within a "therapeutic window" where the plasma concentration of the drug is lower.[39] However, further studies or registries that include athletes receiving anticoagulation therapy are needed to evaluate the incidence of bleeding and embolic events and draw conclusions about the risk/benefit ratio in these borderline categories.

Conclusions

The updated COCIS 2023 document reflects significant advances in the understanding of cardiovascular risks in athletes with arrhythmias, offering a more nuanced approach to sports eligibility. The introduction, for the first time, of clear class recommendations and levels of evidence enhances the practical application of these guidelines, providing clinicians with a comprehensive framework for evaluating athletes with heart conditions. Notably, the revisions in the management of some arrhythmic conditions like WPW Syndrome and Brugada Syndrome emphasize a more individualized risk stratification and the importance of electrophysiological studies, in some cases, for more accurate assessment. The document also incorporates the latest evidence on long QT syndrome, suggesting potential eligibility for individuals with a positive genotype but a negative phenotype, under specific conditions. Furthermore, COCIS 2023 specifically addresses characteristics suggesting a higher likelihood of underlying heart disease in subject with premature ventricular beats. Finally, the recovery times for "returning to play" after ablation have been slightly reduced, while ensuring the athletes' safety. While encouraging physical activity, the guidelines continue to prioritize identifying when heart disease poses a significant risk to athletic participation.

As scientific knowledge progresses, these guidelines will undoubtedly evolve further, but COCIS 2023 provides a crucial resource for clinicians, ensuring that athletes can safely pursue their sport activity while minimizing the risk of adverse cardiac events.

References

1. Zeppilli P, Biffi A, Cammarano M, Castelletti S, Cavarretta E, Cecchi F, *et al.* Italian Cardiological Guidelines (COCIS) for Competitive Sport Eligibility in athletes with heart disease: update 2024. Minerva Med 2024;115:533–64.

2. Biffi A, Delise P, Zeppilli P, Giada F, Pelliccia A, Penco M, *et al.*; Italian Society of Sports Cardiology and Italian Sports Medicine Federation. Italian cardiological guidelines for sports eligibility in athletes with heart disease: part 1. J Cardiovasc Med (Hagerstown) 2013;14:477–99.

3. Biffi A, Delise P, Zeppilli P, Giada F, Pelliccia A, Penco M, *et al.*; Italian Society of Sports Cardiology and Italian Sports Medicine Federation. Italian cardiological guidelines for sports eligibility in athletes with heart disease: part 2. J Cardiovasc Med (Hagerstown) 2013;14:500–15.

4. Delise P, Mos L, Sciarra L, Basso C, Biffi A, Cecchi F, *et al.* Italian Cardiological Guidelines (COCIS) for Competitive Sport Eligibility in athletes with heart disease: update 2020. J Cardiovasc Med (Hagerstown) 2021;22:874–91.

5. Sciarra L, Cavarretta E, Siciliani S, Sette A, Scarà A, Grieco D, *et al.* Managing athletes with palpitations of unknown origin with an external loop recorder: a cohort study. J Sports Med Phys Fitness 2022;62:554–9.

6. Cavarretta E, D'Ascenzi F, Bianco M, Castelletti S, Cavigli L, Cecchi F, *et al.* The role of echocardiography in sports cardiology: an expert opinion statement of the Italian Society of Sports Cardiology (SIC sport). Int J Cardiol 2024;410:132230.

7. Robles AG, Palamà Z, Nesti M, Tunzi RM, Delise P, Cavarretta E, *et al.* Sport Related Sudden Death: The Importance of Primary and Secondary Prevention. J Clin Med 2022;11:4683.

8. Palamà Z, Robles AG, Paoletti M, Nesti M, De Ruvo E, Scarà A, *et al.* Long-Term Follow-Up In Paroxysmal Atrial Fibrillation Patients With Documented Isolated Trigger. Front Cardiovasc Med 2023;10:1115328.

9. Obeyesekere MN, Leong-Sit P, Massel D, Manlucu J, Modi S, Krahn AD, *et al.* Risk of arrhythmia and sudden death in patients with asymptomatic preexcitation: a meta-analysis. Circulation 2012;125:2308–15.

10. Brugada J, Katritsis DG, Arbelo E, Arribas F, Bax JJ, Blomström-Lundqvist C, *et al.*; ESC Scientific Document Group. 2019 ESC Guidelines for the management of patients with supraventricular tachycardiaThe Task Force for the management of patients with supraventricular tachycardia of the European Society of Cardiology (ESC). Eur Heart J 2020;41:655–720.

11. Jemtrén A, Bergfeldt L, Insulander P, Rubulis A, Tapanainen J, Jensen-Urstad M. Accessory pathway properties are similar in symptomatic and asymptomatic preexcitation. J Interv Card Electrophysiol 2022;65:193–9.

12. Robles AG, Palamà Z, Pernat A, Gianfrancesco D, Bartolomucci F, Scarà A, *et al.* Intermittent ventricular pre-excitation in symptomatic adults: always a marker of low risk? Pacing Clin Electrophysiol 2023;46:1049–55.

13. Yammine ML, Tamborrino PP, Flore F, Di Mambro C, Pazzano V, Di Marzio S, *et al.* Intermittent ventricular preexcitation in children: not always a low-risk condition. Europace 2024;26:euae250.

14. Krahn AD, Behr ER, Hamilton R, Probst V, Laksman Z, Han HC. Brugada Syndrome. JACC Clin Electrophysiol 2022;8:386–405.

15. Brugada J, Brugada R, Brugada P. Right bundle-branch block and ST-segment elevation in leads V1 through V3: a marker for sudden death in patients without demonstrable structural heart disease. Circulation 1998;97:457–60.

16. Brugada J, Brugada R, Antzelevitch C, Towbin J, Nademanee K, Brugada P. Long-term follow-up of individuals with the electrocardiographic pattern of right bundle-branch block and ST-segment elevation in precordial leads V1 to V3. Circulation 2002;105:73–8.

17. Chevallier S, Forclaz A, Tenkorang J, Ahmad Y, Faouzi M, Graf D, *et al.* New electrocardiographic criteria for discriminating between Brugada types 2 and 3 patterns and incomplete right bundle branch block. J Am Coll Cardiol 2011;58:2290–8.

18. Sciarra L, Moriya M, Robles AG, Sarubbi B. Type 2 Brugada pattern: more doubts than certainties. Minerva Cardiol Angiol 2021;69:426–8.

19. Delise P, Probst V, Allocca G, Sitta N, Sciarra L, Brugada J, *et al.* Clinical outcome of patients with the Brugada type 1 electrocardiogram without prophylactic implantable cardioverter defibrillator in primary prevention: a cumulative analysis of seven large prospective studies. Europace 2018;20(FI1):f77–85.

20. Delise P, Sciarra L. Sudden Cardiac Death in Patients with Ventricular Preexcitation. Card Electrophysiol Clin 2020;12:519–25.

21. Mascia G, Brugada J, Barca L, Benenati S, Della Bona R, Scarà A, *et al.* Prognostic significance of electrophysiological study in drug-induced type-1 Brugada syndrome: a brief systematic review. J Cardiovasc Med (Hagerstown) 2024;25:775–80.

22. Russo V, Caturano A, Migliore F, Guerra F, Francia P, Nesti M, *et al.*; IBRYD Study Group. Long-term clinical outcomes of patients with drug-induced type 1 Brugada electrocardiographic pattern: A nationwide cohort registry study. Heart Rhythm 2024;21:555–61.

23. Delise P, Sciarra L. Asymptomatic Wolff-Parkinson-White: what to do. Extensive ablation or not? J Cardiovasc Med (Hagerstown) 2007;8:668–74.

24. Sieira J, Conte G, Ciconte G, Chierchia GB, Casado-Arroyo R, Baltogiannis G, *et al.* A score model to predict risk of events in patients with Brugada Syndrome. Eur Heart J 2017;38:1756–63.

25. Kawada S, Morita H, Antzelevitch C, Morimoto Y, Nakagawa K, Watanabe A, *et al.* Shanghai Score System for Diagnosis of Brugada Syndrome: Validation of the Score System and System and Reclassification of the Patients. JACC Clin Electrophysiol 2018;4:724–30.

26. Mazzanti A, Kanthan A, Monteforte N, Memmi M, Bloise R, Novelli V, *et al.* Novel insight into the natural history of short QT syndrome. J Am Coll Cardiol 2014;63:1300–8.

27. Priori SG, Wilde AA, Horie M, Cho Y, Behr ER, Berul C, *et al.*; Document Reviewers; Heart Rhythm Society; European Heart Rhythm Association; Asia Pacific Heart Rhythm Society. Executive summary: HRS/EHRA/APHRS expert consensus statement on the diagnosis and management of patients with inherited primary arrhythmia syndromes. Europace 2013;15:1389–406.

28. D'Ascenzi F, Zorzi A, Alvino F, Bonifazi M, Corrado D, Mondillo S. The prevalence and clinical significance of premature ventricular beats in the athlete. Scand J Med Sci Sports 2017;27:140–51.

29. Zorzi A, D'Ascenzi F, Andreini D, Castelletti S, Casella M, Cavarretta E, *et al.* Interpretation and management of premature ventricular beats in athletes: an expert opinion document of the Italian Society of Sports Cardiology (SICSPORT). Int J Cardiol 2023;391:131220.

30. Delise P, Sitta N, Lanari E, Berton G, Centa M, Allocca G, *et al.* Long-term effect of continuing sports activity in competitive athletes with frequent ventricular premature complexes and apparently normal heart. Am J Cardiol 2013;112:1396–402.

31. Sciarra L, Golia P, Scarà A, Robles AG, De Maio M, Palamà Z, *et al.* Electrocardiographic predictors of left ventricular scar in athletes with right bundle branch block premature ventricular beats. Eur J Prev Cardiol 2024;31:486–95.

32. Dello Russo A, Compagnucci P, Zorzi A, Cavarretta E, Castelletti S, Contursi M, *et al.* Electroanatomic mapping in athletes: why and when. An expert opinion paper from the Italian Society of Sports Cardiology. Int J Cardiol 2023;383:166–74.

33. Sciarra L, Palamà Z, Nesti M, Lanzillo C, Di Roma M, De Ruvo E, *et al.* Contact-force monitoring increases accuracy of right ventricular voltage mapping avoiding "false scar" detection in patients with no evidence of structural heart disease. Indian Pacing Electrophysiol J 2020;20:243–9.

34. Robles AG, Palamà Z, Scarà A, Borrelli A, Gianfrancesco D, Bartolomucci F, *et al.* Ablation of Paroxysmal Atrial Fibrillation: between Present and Future. Rev Cardiovasc Med 2024;25:140.

35. Petrungaro M, Fusco L, Cavarretta E, Scarà A, Borrelli A, Romano S, *et al.* Long-Term Sports Practice and Atrial Fibrillation: An Updated Review of a Complex Relationship. J Cardiovasc Dev Dis 2023;10:218.

36. Padeletti L, Curnis A, Tondo C, Lunati M, Porcellini S, Verlato R, *et al.* Pulmonary Vein Isolation with the Cryoballoon Technique: Feasibility, Procedural Outcomes, and Adoption in the Real World: Data from One Shot Technologies TO Pulmonary Vein Isolation (1STOP) Project. Pacing Clin Electrophysiol 2017;40:46–56.

37. Sciarra L, Iacopino S, Arena G, Tondo C, Pieragnoli P, Molon G, *et al.* Safety and Efficacy of Cryoballoon Ablation of Atrial Fibrillation in relation to the Patients' Age: Results from a Large Real-World Multicenter Observational Project. Cardiol Res Pract 2021;2021:9996047.

38. Sciarra L, Rebecchi M, De Ruvo E, De Luca L, Zuccaro LM, Fagagnini A, *et al.* How many atrial fibrillation ablation candidates have an underlying supraventricular tachycardia previously unknown? Efficacy of isolated triggering arrhythmia ablation. Europace 2010;12:1707–12.

39. Minardi S, Sciarra L, Robles AG, Scara A, Sciarra F, De Masi De Luca G, *et al.* Thromboembolic prevention in athletes: management of anticoagulation in sports players affected by atrial fibrillation. Front Pharmacol 2024;15:1384213.

Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions

Luigi Sciarra and Antonio Scarà contributed equally to conceptualization and writing of manuscript and should be considered as joint first authors. Alessandro Biffi, Silvia Castelletti, Domenico Corrado, Antonio Dello Russo, Franco Giada, Giuseppe Inama, Loira Leoni, Viviana Maestrini, Zefferino Palamà, Peter Schwartz, Andrea Spampinato, Paolo Zeppilli, Alessandro Zorzi, Pietro Delise contributed to revision of manuscript. All authors read and approved the final version of the manuscript.

History

Article first published online: March 21, 2025. - Manuscript accepted: February 28, 2025. - Manuscript received: December 30, 2024.