

Table 1. ESC 2020 GL on Sports. Characteristics of exercise

Frequency: • Sessions/week • Bouts of exercise
Intensity: • Endurance: %VO₂ peak or % peak HR or %HRR • Strength or Power: % 1RM or % 5RM or %peak HR or %HRR for mixed exercise
Time: • Duration of ♦ exercise programme in weeks or months ♦ training days per week ♦ training session times per day ♦ duration of training session in hours.
Type: • Endurance (running, cycling, rowing, walking, swimming) • Strength or resistance training • Speed and speed endurance • Flexibility (sit & reach, back stretch test, lateral mobility test) • Coordination and balance
Mode of exercise training: • Metabolic: <i>aerobic vs. anaerobic</i> • Muscular work: <i>isometric – isotonic</i> <i>dynamic (concentric, eccentric) vs. static</i> <i>continuous vs. interval</i> <i>large or small muscular groups</i>

HR = heart rate; HRR = heart rate reserve; RM = repetition maximum; VO₂ = oxygen consumption; VO_{2peak} = peak oxygen consumption.

	Skill 	Power 	Mixed 	Endurance 
LOW	Golf (buggy)	Shot putting	Soccer (adapted)	Jogging
	Golf (18 holes walking)	(recreational)	Basketball (adapted)	Long distance walking
	Table tennis (double)	Discus (recreational)	Handball (adapted)	Swimming (recreational)
	Table tennis (single)	Alpine skiing	Volleyball	Speed walking
	Shooting	(recreational)	Tennis (double)	Mid/long distance running
MEDIUM	Curling	Short distance running	Ice-Hockey	Style dancing
	Bowling	Shot putting	Hockey	Cycling (road)
	Sailing	Discus	Rugby	Mid/long distance swimming
	Yachting	Alpine skiing	Fencing	Long distance skating
	Equestrian	Judo/karate	Tennis (single)	Pentathlon
HIGH		Weight lifting	Waterpolo	Rowing
		Wrestling	Soccer (competitive)	Canoeing
		Boxing	Basketball (competitive)	X-country skiing
			Handball (competitive)	Biathlon
				Triathlon

 Low intensity
  Medium intensity
  High intensity

Figure 1. ESC 2020 GL on Sports. Sporting discipline in relation to the predominant component (skill, power, mixed, and endurance) and intensity of exercise. Intensity of exercise must be individualized after maximal exercise testing, field testing and/or after muscular strength testing.

Table 2. ESC 2020 GL on Sports. Indices of exercise intensity for endurance sports from maximal exercise testing and training zones

Intensity	VO ₂ max (%)	HRmax (%)	HRR (%)	RPE Scale	Training Zone
Low intensity, light exercise ^a	<40	<55	<40	10–11	Aerobic
Moderate intensity exercise ^a	40–69	55–74	40–69	12–13	Aerobic
High intensity ^a	70–85	75–90	70–85	14–16	Aerobic + lactate
Very high intense exercise ^a	>85	>90	>85	17–19	Aerobic + lactate + anaerobic

HRmax = maximum heart rate; HRR = heart rate reserve; RPE = rate of perceived exertion; VO₂max = maximum oxygen consumption.

Training zones are related to aerobic and anaerobic thresholds. Low-intensity exercise is below the aerobic threshold; moderate is above the aerobic threshold but not reaching the anaerobic zone; high intensity is close to the anaerobic zone; and very intense exercise is above the anaerobic threshold. The duration of exercise will also largely influence this division in intensity.

Table 3. ESC 2020 GL on Sports. General recommendations for exercise and sports in healthy individuals

At least 150 min/week of moderate-intensity, or 75 min/week of vigorous-intensity aerobic exercise, or an equivalent combination thereof is recommended in all healthy adults.	I A
A gradual increase in aerobic exercise to 300 min/week of moderate-intensity, or 150 min/week of vigorous-intensity aerobic exercise, or an equivalent combination for additional benefits in healthy adults.	I A
Regular assessment and counselling to promote adherence and, if necessary, to support an increase in exercise volume over time.	I B
Multiple sessions of exercise spread throughout the week, i.e. on 4–5 days a week and preferably every day of the week.	I B

Table 4. ESC 2020 GL on Sports. Recommendations for cardiovascular evaluation and regular exercise in healthy individuals aged >35 years

Among individuals with low to moderate CVD risk, participation in all recreational sports without further CV evaluation.	Ila C
Cardiac screening with family history, symptoms, physical examination, and 12-lead resting ECG for competitive athletes.	Ila C
Clinical evaluation, including maximal exercise testing, for prognostic purposes in sedentary people and individuals with high or very high CV risk who intend to engage in intensive exercise programmes or competitive sports.	Ila C
In selected individuals without known CAD who have very high CVD risk (e.g. SCORE>10%, strong family history, or familial hypercholesterolaemia) and want to engage in high- or very high-intensity exercise, risk assessment with a functional imaging test, coronary CCTA, or carotid or femoral artery ultrasound imaging.	Ilb B
CCTA = coronary computed tomography angiography; CV = cardiovascular; CVD = cardiovascular disease; SCORE = Systematic Coronary Risk Evaluation.	

Table 5. ESC 2020 GL on Sports. Special considerations for individuals with obesity, hypertension, dyslipidaemia, or diabetes

For obese individuals (BMI>_30 kg/m ² or a waist circumference or >94 cm for males) resistance training >_3 times per week, in addition to moderate or vigorous aerobic exercise (at least 30 min, 5-7 days per week), to reduce CVD risk.	I A
In individuals with well-controlled hypertension, resistance training >_3 times per week in addition to moderate or vigorous aerobic exercise (at least 30 min, 5_7 days per week) is recommended to reduce blood pressure and CVD risk.	I A
Among individuals with diabetes mellitus, resistance training >_3 times per week in addition to moderate or vigorous aerobic exercise (at least 30 min, 5_7 days per week), to improve insulin sensitivity and achieve a better CVD risk profile.	I A
Among adults with well-controlled hypertension but high risk and/or target organ damage, high-intensity resistance exercise is not recommended.	III C
In individuals with uncontrolled hypertension (SBP>160 mmHg) high-intensity exercise is not recommended until blood pressure has been controlled.	III C
CVD = cardiovascular disease; SBP = systolic blood pressure	

Table 6. ESC 2020 GL on Sports. Exercise in ageing.**Recommendations for exercise in ageing individuals**

Moderate-intensity aerobic exercise for at least 150 min/week for g adults aged 65 years or older who are fit and have no health conditions that limit their mobility A

In older adults at risk of falls, strength training exercises to improve balance and coordination on at least 2 days a week I B

A full clinical assessment including a maximal exercise test in sedentary adults aged 65 years or older who wish to participate in high-intensity activity. IIa C

Continuation of high- and very high-intensity activity, including competitive sports, in asymptomatic elderly athletes (master athletes) at low or moderate CV risk. IIb C

CV = cardiovascular.

Potential risks for older people during exercise

- Arrhythmias, increase in blood pressure, myocardial ischaemia
- Musculoskeletal injuries and fractures
- Muscle soreness or swollen joints
- Increased risk of falls and subsequent injuries

Exercise prescription in the elderly**Aerobic work**

- *Frequency:* Moderate exercise for 5 days per week or vigorous exercise for 3 days per week.
- *Intensity:* 5–6 points (for the modified 10 point Borg scale) for moderate exercise or 7–8 points for vigorous
- *Duration:* 30 minutes per day for moderate or at least 20 minutes for continuous exercise.

Strength training (all major muscle groups)

- *Frequency:* at least twice a week
- *Number of exercises:* 8–10
- *Number of repetitions:* 10–15

Exercises for flexibility and balance

- At least twice a week

Table 7. ESC 2020 GL on Sports. Exercise activities for older people according to exercise type and intensity

Age-related moderate effort activities
• walking • water aerobics • ballroom and line dancing • riding a bicycle on level ground or with few hills • doubles tennis • pushing a lawn mower • canoeing • volleyball
Age-related intense effort activities
• jogging or running • aerobics • swimming fast • riding a bicycle fast or on hills • singles tennis • football • hiking uphill • energetic dancing • martial arts
Muscle-strengthening activities
• carrying or moving heavy loads • groceries activities that involve stepping and jumping • dancing • heavy gardening, such as digging or shovelling • exercises that use your body weight for resistance, such as push-ups or sit-ups • yoga • pilates • lifting weights

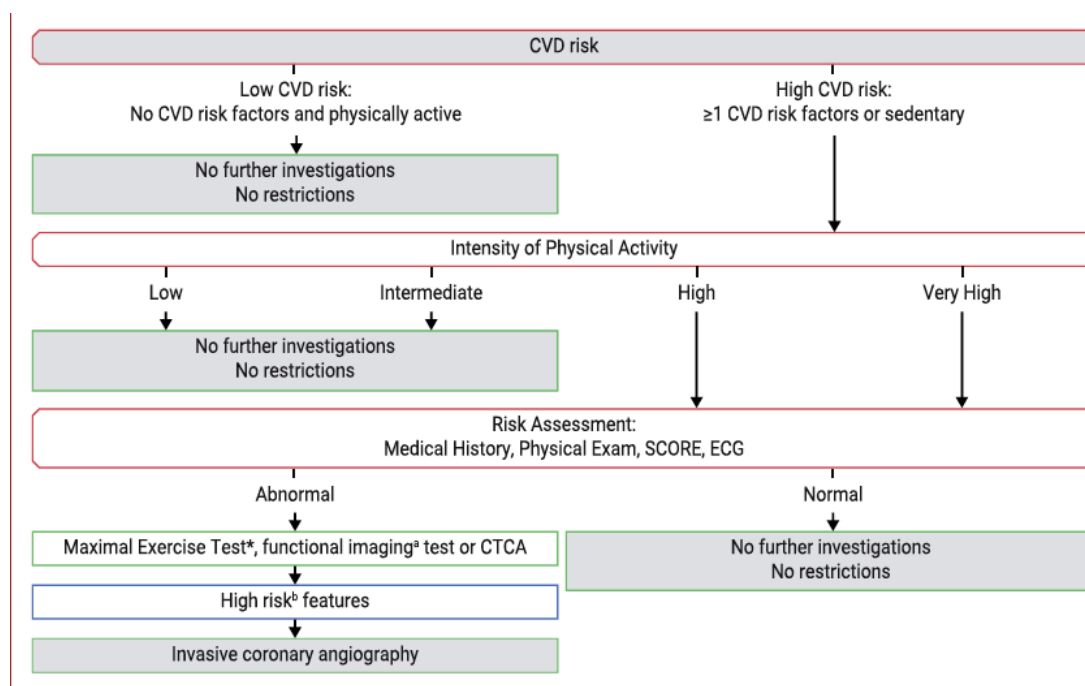


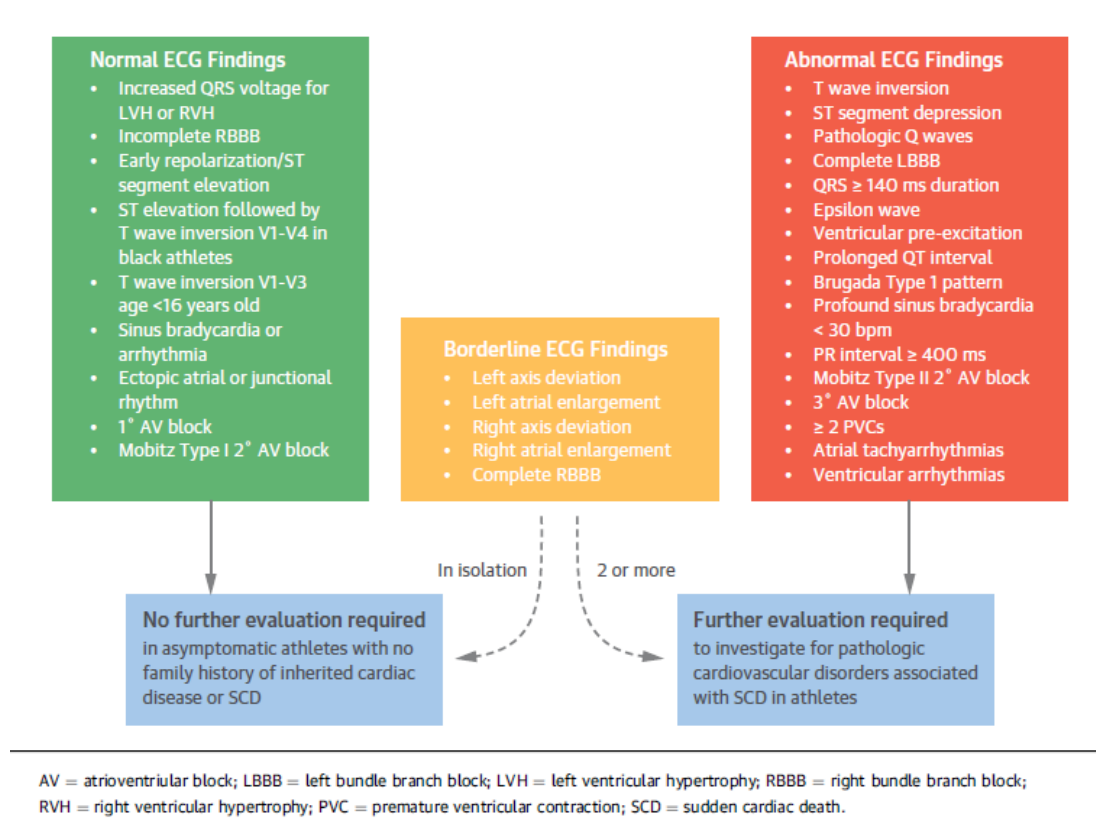
Figure 2. ESC 2020 GL on Sports. Proposed algorithm for cardiovascular assessment in asymptomatic individuals aged >35-years-old with risk factors for cardiovascular disease and possible subclinical chronic coronary syndrome before engaging in sports. *Consider functional test or CCTA if exercise stress test is equivocal or the ECG is uninterpretable.

aSee text for examples of functional imaging. bSingle-photon emission computed tomography: area of ischaemia >_10% of the left ventricular myocardium; stress echocardiography: >_3 of 16 segments with stress-induced hypokinesia or akinesia; stress cardiovascularmagnetic resonance: >_2 of 16 segments with stress perfusion defects or >_3 dobutamine-induced dysfunctional segments; coronary computed tomography angiography (CCTA): three-vessel disease with proximal stenoses; left main disease; proximal left anterior descending disease.

CVD = cardiovascular disease; ECG = electrocardiogram;
SCORE = Systematic Coronary Risk Evaluation.

Table 8. Cardiovascular conditions associated with sudden death in athletes

Coronary artery disease
 Genetic channelopathies
 HCM
 ARVC
 Myocarditis
 Congenital coronary artery anomalies
 WPW syndrome
 Marfan syndrome
 Commotio cordis
 Heat stroke

**Figure 3.** International Consensus Standards for Electrocardiographic Interpretation in Athletes

Sharma S, et al. International Recommendations for Electrocardiographic Interpretation in Athletes. *J Am Coll Cardiol* 2017;69:1057-1075

Table 9. Classification of ECG abnormalities in the athlete according to European Society of Cardiology recommendations.

Common ECG abnormalities (group 1): up to 80% of trained athletes exhibit ECG changes that are the consequence of the physiologic cardiovascular adaptation to sustained physical exertion and do not reflect the presence of an underlying cardiovascular disease; an estimate of frequency in heterogeneous cohorts of athletes is shown. Uncommon ECG abnormalities (group 2) are unrelated to athletic conditioning and should be regarded as an expression of possible underlying cardiovascular disorders, notably cardiomyopathies and cardiac ion channel diseases.

ECG findings in athletes	
Physiological adaptation <i>Do not require further reevaluation</i>	Abnormal ECG findings <i>Require further evaluation</i>
- Sinus bradycardia ($>30\text{bpm}$) -51% to 68%- - Sinus arrhythmia -20% to 23%- - Ectopic atrial rhythm -1%- - Junctional escape rhythm -0.4%- - 1st degree AV block ($PR\text{ interval} > 200\text{ ms}$) -7%- - Mobitz Type I (<i>Wenckebach</i>) 2nd degree AV block - 0.1%- - Incomplete RBBB -24% to 27%- - Isolated QRS voltage criteria for LVH -23% to 36%- - Early repolarization ($ST\text{ elevation, J-point elevation, J-waves or terminal QRS slurring}$) -37% to 72%- - Convex ('domed') ST segment elevation combined with T-wave inversion in leads V1–V4 in black/African athletes	- T-wave inversion ($>1\text{ mm V2-V6, II and aVF, I and aVL}$) - ST segment depression ($>0.5\text{ mm}$) - Pathologic Q waves ($>3\text{ mm depth}/>40\text{ ms duration}$) - Complete LBBB - Intraventricular conduction delay ($\geq 140\text{ ms}$) - Left axis deviation ($-30^\circ\text{ to }-90^\circ$) - Left atrial enlargement ($P>120\text{ ms in I or II; negative portion of P}\geq 1\text{ mm and }\geq 40\text{ ms in V1}$) - Right ventricular hypertrophy ($R-V1+S-V5>10.5\text{ mm AND right axis deviation}$) - Ventricular pre-excitation - Long QT interval ($QTc\geq 470\text{ in male; }\geq 480\text{ ms in female}$) - Short QT interval ($QTc\leq 320\text{ ms}$) - Brugada-like ECG pattern - Profound sinus bradycardia ($<30\text{bpm}$ or pauses $\geq 3\text{ s.}$) - Atrial tachyarrhythmias - Premature ventricular contractions ($\geq 2\text{ PVCs}/10\text{ s}$) - Ventricular arrhythmias (<i>couplets, triplets and NSVT</i>)

LBBB, left bundle branch block; RBBB: Right bundle branch block; LVH: Left ventricular hypertrophy.

Pre-participation cardiovascular evaluation for athletic participants to prevent sudden death: Position paper from the EHRA and the EACPR, branches of the ESC. Endorsed by APHRS, HRS, and SOLAECE. *Europace*. 2017;19:139-163.

Table 10. International Consensus Standards for Electrocardiographic Interpretation in Athletes: Definitions of ECG Criteria

Abnormal ECG findings in athletes	
These ECG findings are unrelated to regular training or expected physiologic adaptation to exercise, may suggest the presence of pathologic cardiovascular disease, and require further diagnostic investigation.	
ECG abnormality	Definition
T wave inversion	≥1 mm in depth in two or more contiguous leads; excludes leads aVR, III, and V ₁
• Anterior	• V ₂ -V ₄ – excludes: black athletes with J-point elevation and convex ST-segment elevation followed by TWI in V ₂ -V ₄ ; athletes age <16 with TWI in V ₁ -V ₃ ; and biphasic T waves in only V ₃
• Lateral	• I and aVL, V ₅ and/or V ₆ (only one lead of TWI required in V ₅ or V ₆)
• Inferolateral	• II and aVF, V ₅ -V ₆ , I and aVL
• Inferior	• II and aVF
ST-segment depression	≥0.5 mm in depth in two or more contiguous leads
Pathologic Q waves	Q/R ratio ≥0.25 or ≥40 ms in duration in two or more leads (excluding III and aVR)
Complete left bundle branch block	QRS ≥120 ms, predominantly negative QRS complex in lead V ₁ (QS or rS), and upright notched or slurred R wave in leads I and V ₆
Profound nonspecific intra-ventricular conduction delay	Any QRS duration ≥140 ms
Epsilon wave	Distinct low amplitude signal (small positive deflection or notch) between the end of the QRS complex and onset of the T-wave in leads V ₁ -V ₃
Ventricular pre-excitation	PR interval <120 ms with a delta wave (slurred upstroke in the QRS complex) and wide QRS (≥120 ms)
Prolonged QT interval*	QTc ≥470 ms (male) QTc ≥480 ms (female) QTc ≥500 ms (marked QT prolongation)
Brugada Type 1 pattern	Coved pattern: initial ST-segment elevation ≥2 mm (high take-off) with downsloping ST-segment elevation followed by a negative symmetric T-wave in ≥ 1 leads in V ₁ -V ₃
Profound sinus bradycardia	<30 beats/min or sinus pauses ≥3 s
Profound 1° AV block	≥400 ms
Mobitz Type II 2° AV block	Intermittently non-conducted P waves with a fixed PR interval
3° AV block	Complete heart block
Atrial tachyarrhythmias	Supraventricular tachycardia, atrial fibrillation, atrial flutter
PVC	≥2 PVCs per 10 s tracing
Ventricular arrhythmias	Couplets, triplets, and non-sustained ventricular tachycardia
Borderline ECG findings in athletes	
These ECG findings in isolation likely do not represent pathologic cardiovascular disease in athletes, but the presence of two or more borderline findings may warrant additional investigation until further data become available.	
ECG abnormality	Definition
Left axis deviation	–30° to –90°
Left atrial enlargement	Prolonged P wave duration of >120 ms in leads I or II with negative portion of the P-wave ≥1 mm in depth and ≥40 ms in duration in lead V ₁
Right axis deviation	>120°
Right atrial enlargement	P-wave ≥2.5 mm in II, III, or aVF
Complete right bundle branch block	rSR' pattern in lead V ₁ and a S wave wider than R wave in lead V ₆ with QRS duration ≥120 ms
Normal ECG findings in athletes	
These training-related ECG alterations are physiologic adaptations to regular exercise, considered normal variants in athletes, and do not require further evaluation in asymptomatic athletes with no significant family history.	
Normal ECG finding	Definition
Increased QRS voltage	Isolated QRS voltage criteria for left (SV ₁ + RV ₅ or RV ₆ >3.5 mV) or right ventricular hypertrophy (RV ₁ + SV ₅ or SV ₆ >1.1 mV)
Incomplete RBBB	rSR' pattern in lead V ₁ and a QRS pattern in lead V ₆ with QRS duration <120 ms
Early repolarization	J-point elevation, ST-segment elevation, J waves, or terminal QRS slurring in the inferior and/or lateral leads
Black athlete repolarization variant	J-point elevation and convex ('domed') ST-segment elevation followed by T-wave inversion in leads V ₁ -V ₄ in black athletes
Juvenile T-wave pattern	T-wave inversion V ₁ -V ₃ in athletes age <16 yrs
Sinus bradycardia	≥30 beats/min
Sinus arrhythmia	Heart rate variation with respiration: rate increases during inspiration and decreases during expiration
Ectopic atrial rhythm	P waves are a different morphology compared with the sinus P-wave, such as negative P waves in the inferior leads ('low atrial rhythm')
Junctional escape rhythm	QRS rate is faster than the resting P-wave or sinus rate and typically <100 beats/min with narrow QRS complex unless the baseline QRS is conducted with aberrancy
1° AV block	PR interval 200-400 ms
Mobitz Type I (Wenckebach) 2° AV block	PR interval progressively lengthens until there is a non-conducted P-wave with no QRS complex; the first PR interval after the dropped beat is shorter than the last conducted PR interval
*The QT interval corrected for heart rate is ideally measured using Bazett's formula with heart rates between 60 and 90 beats/min; preferably performed manually in lead II or V ₅ using the teach-the-tangent method ¹ to avoid inclusion of a U-wave (please see text for more details). Consider repeating the ECG after mild aerobic activity for a heart rate <50 beats/min, or repeating the ECG after a longer resting period for a heart rate >100 beats/min, if the QTc value is borderline or abnormal. AV – atrioventricular block; ECG – electrocardiogram; PVC – premature ventricular contraction; RBBB – right bundle branch block.	

Sharma S, et al. International Recommendations for Electrocardiographic Interpretation in Athletes. *J Am Coll Cardiol* 2017;69:1057-1075

Table 11. Athlete's heart vs. arrhythmogenic right ventricular cardiomyopathy

	Athlete's heart	ARVC
Family history	No	ARVC or SCD
ECG abnormalities	Training-related ECG changes such as incomplete right bundle branch block increased in QRS voltages and early repolarization. Right precordial early repolarization variant with negative T-wave preceded by J-point/ST-segment elevation.	Right precordial T-wave inversion, e waves, right precordial QRS prolongation with delayed S-wave upstroke and terminal activation delay (>55 ms), low QRS voltages
Symptoms	No	Palpitations, syncope, cardiac arrest
RV dilation	Yes (mainly main RV body)	yes (mainly RVOT)
RV/LV dilation ratio	RV/LV <1	RV/LV >1
Global RV dysfunction	No (or mild)	Yes
Regional RV wall motion abnormalities	No	A-dyskinesia; bulging
LGE at cardiac magnetic resonance	No (or only junctional)	RV and/or LV (non-ischaemic pattern)
Ventricular arrhythmias	No	Yes

LGE, late gadolinium enhancement; LV, left ventricle; RV, right ventricle; RVOT, right ventricular outflow tract; SCD, sudden cardiac death.

Corrado D, et al. Arrhythmogenic right ventricular cardiomyopathy: evaluation of the current diagnostic criteria and differential diagnosis. *Eur Heart J*. 2020;41:1414-1429.

Table 12. ESC 2020 GL on Sport. Borderline or uninterpretable ECG findings

(i) ST depression of ≤ -0.15 mV; in one lead only
(ii) not typically ascending/down sloping ST segment
(iii) pre-existing left bundle branch block (LBBB)
(iv) ventricular pacing

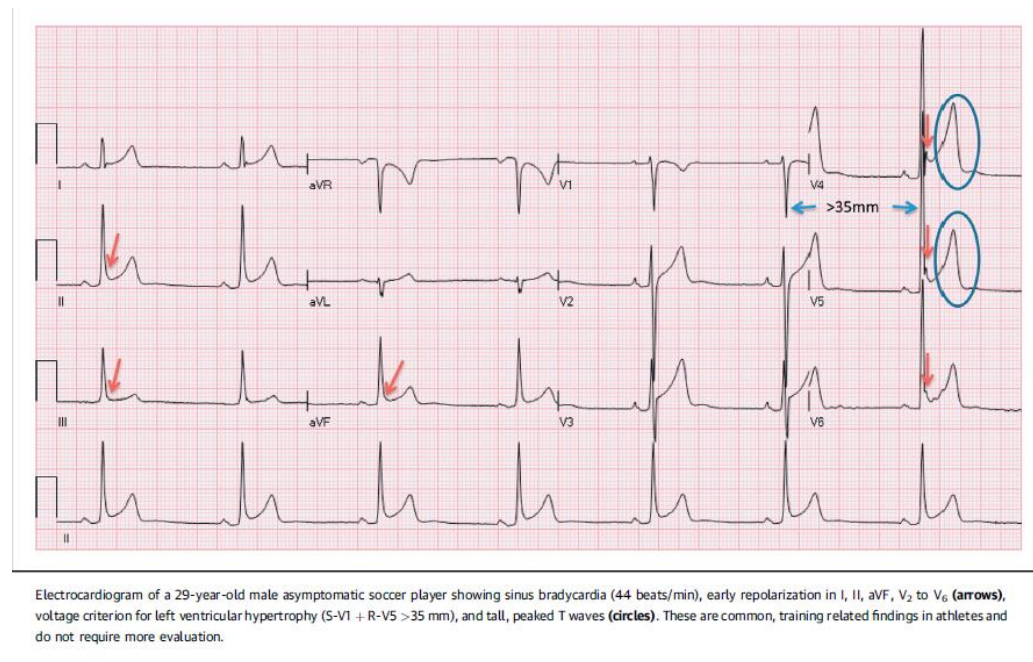


Figure 4. Early Repolarization Changes in an Athlete

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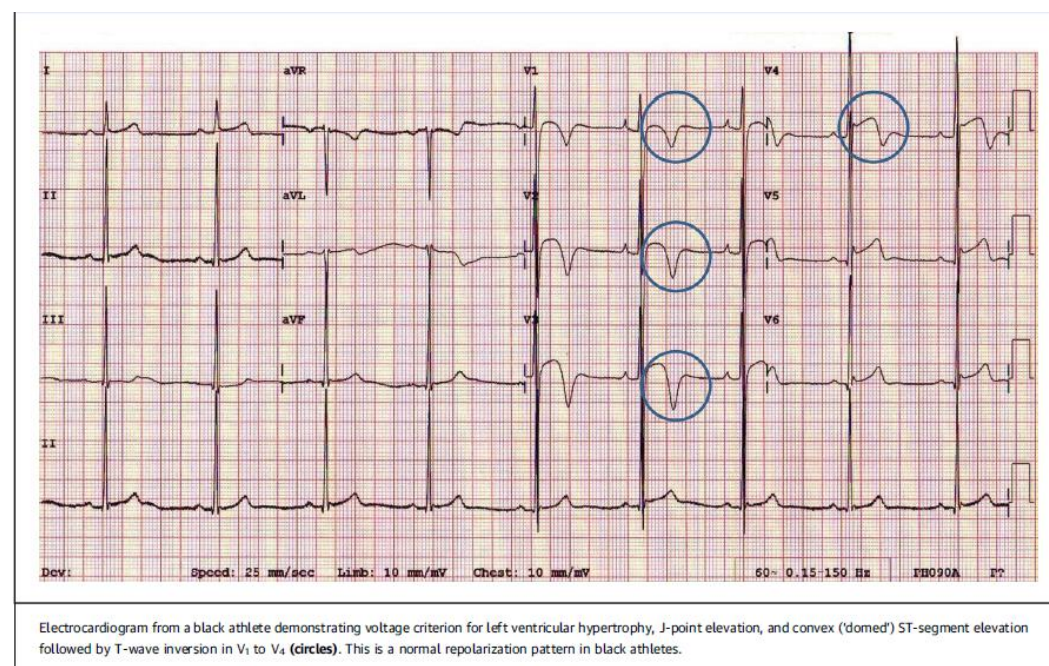


Figure 5. Anterior Repolarization Changes in a Black Athlete

Sharma S, et al. International Recommendations for Electrocardiographic Interpretation in Athletes. *J Am Coll Cardiol* 2017;69:1057-1075

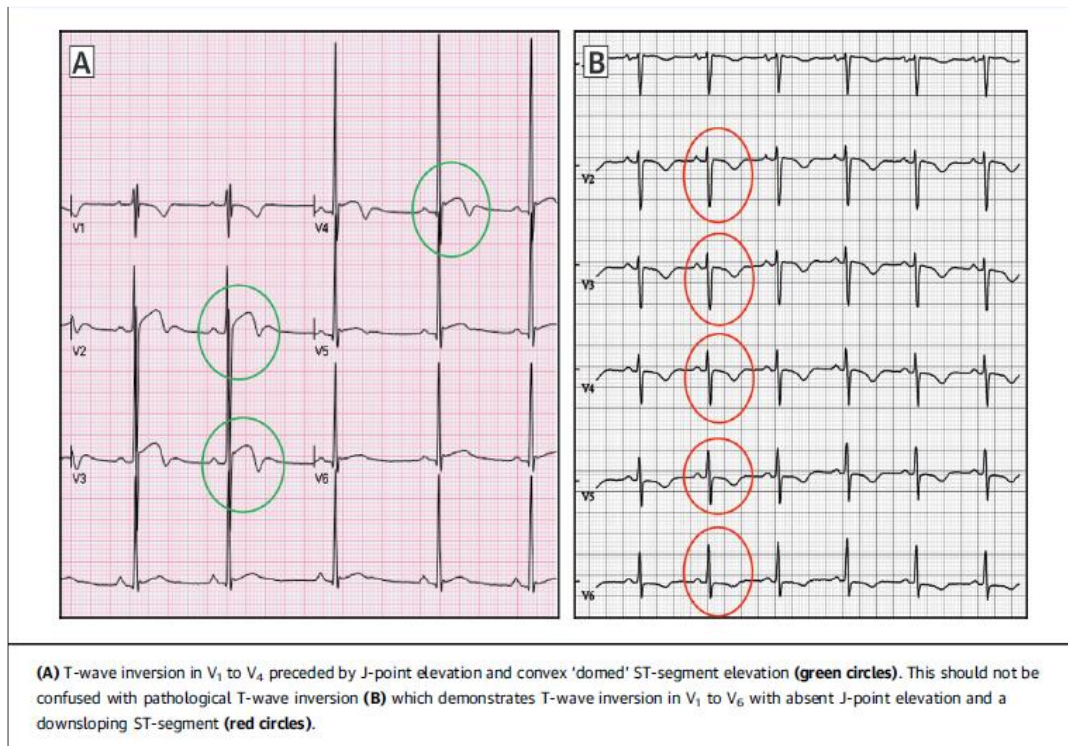


Figure 6. Examples of Physiological and Pathological T-Wave Inversion

Sharma S, et al. International Recommendations for Electrocardiographic Interpretation in Athletes. *J Am Coll Cardiol* 2017;69:1057-1075

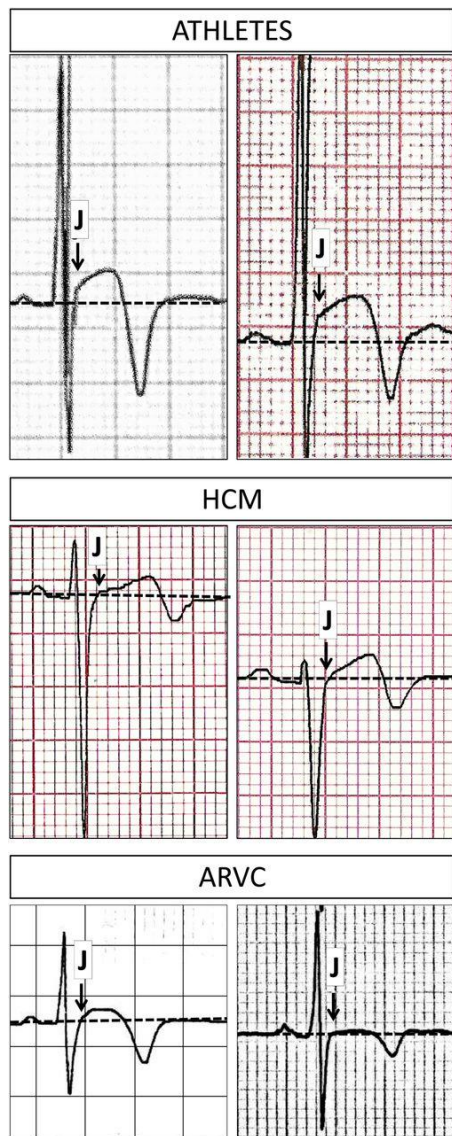


Figure 7. Close-up of lead V3 focusing on J-point from electrocardiogram tracings. Top: Note the J-point elevation preceding T-wave inversion in lead V3 (both panels from healthy athletes); Middle: Note the ST-segment elevation (without J-point elevation) preceding T-wave inversion in lead V3 (both panels from patients with hypertrophic cardiomyopathy); Bottom: Note ST-segment elevation (without J-point elevation) preceding T-wave inversion in one patient with arrhythmogenic right ventricular cardiomyopathy (left panel) and T-wave inversion without J-point or ST-segment elevation in another patient with arrhythmogenic right ventricular cardiomyopathy (right panel). Arrows indicate the J-point (i.e. the QRS–ST-segment junction).

Calore C, et al. Electrocardiographic anterior t-wave inversion in athletes of different ethnicities: Differential diagnosis between athlete's heart and cardiomyopathy. *Eur Heart J* . 2016;37:2515-27.

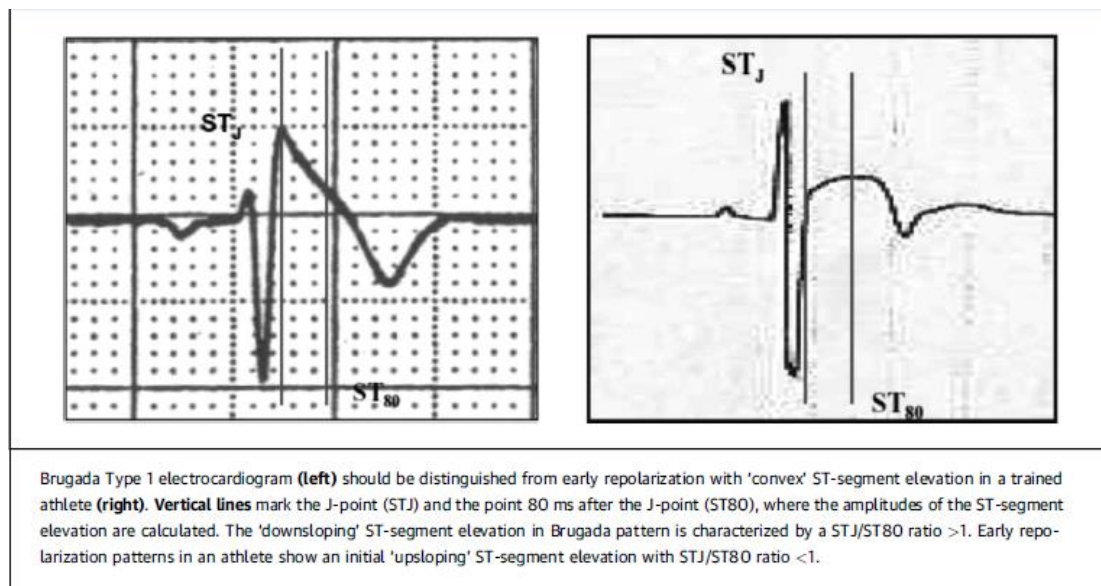


Figure 8. Differentiation Between the Brugada ECG Pattern From Early Repolarization (J Point Elevation and Convex ST Segment) in Athletes

Sharma S, et al. International Recommendations for Electrocardiographic Interpretation in Athletes. *J Am Coll Cardiol* 2017;69:1057-1075

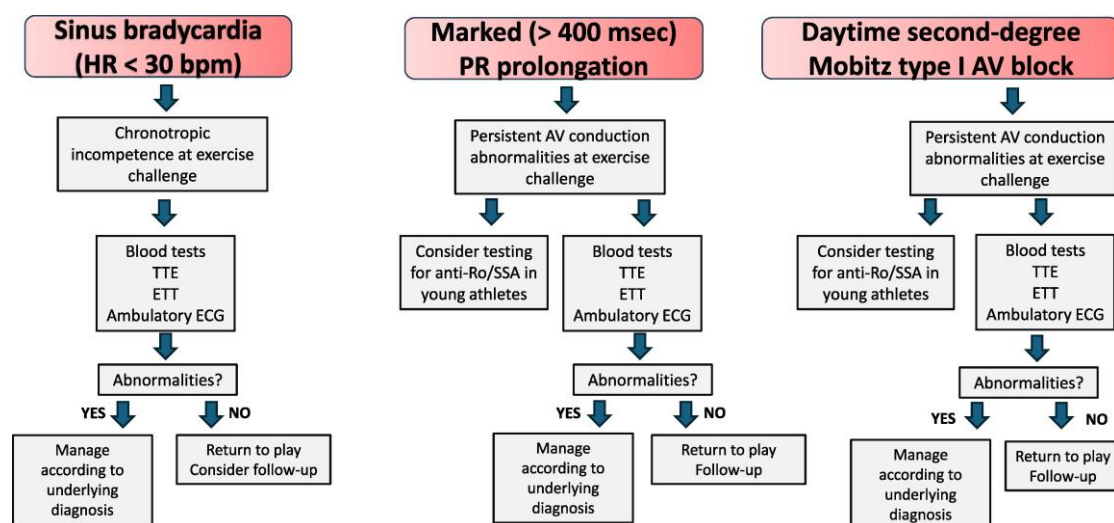


Figure 9. Management of athletes with bradyarrhythmias. It has to be noted that the recommendations on athletes with extreme bradycardia and marked PR prolongation apply to individuals in whom brisk exercise or hyperventilation does not rapidly resolve the anomaly.

ETT, exercise tolerance test; HR, heart rate; TTE, transthoracic echocardiogram

European Association of Preventive Cardiology Statement on ECG in Athletes . Abnormal electrocardiogram findings in athletes. *Eur Heart J*. 2026;47:152-169

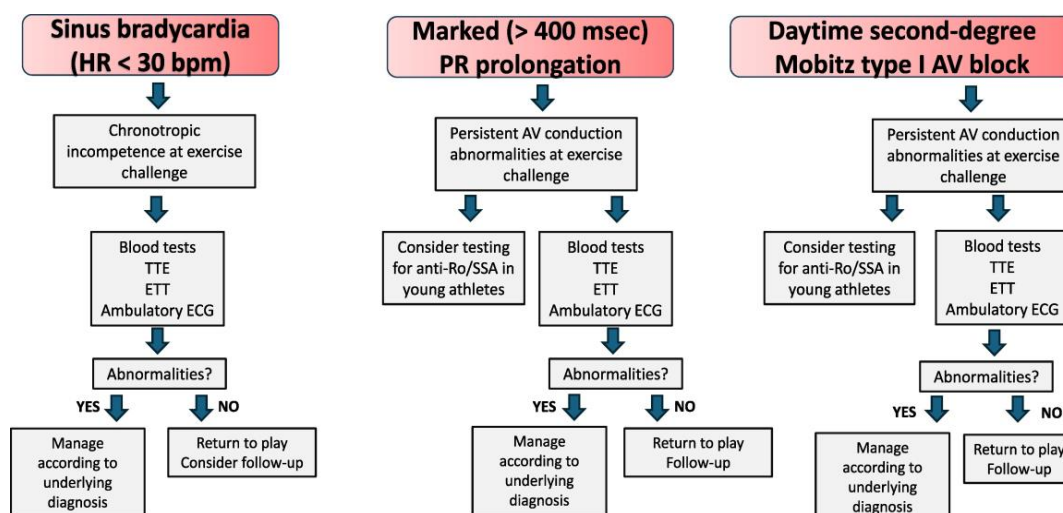


Figure 10. Management of athletes with LBBB and RBBB.

AV, atrioventricular; CAD, coronary artery disease; CMR, cardiac magnetic resonance; CTCA, computed tomography coronary angiography; EP, electrophysiological; ETT, exercise tolerance test; HD, heart disease; TTE, transthoracic echocardiogram. ETT, exercise tolerance test; HR, heart rate; TTE, transthoracic echocardiogram

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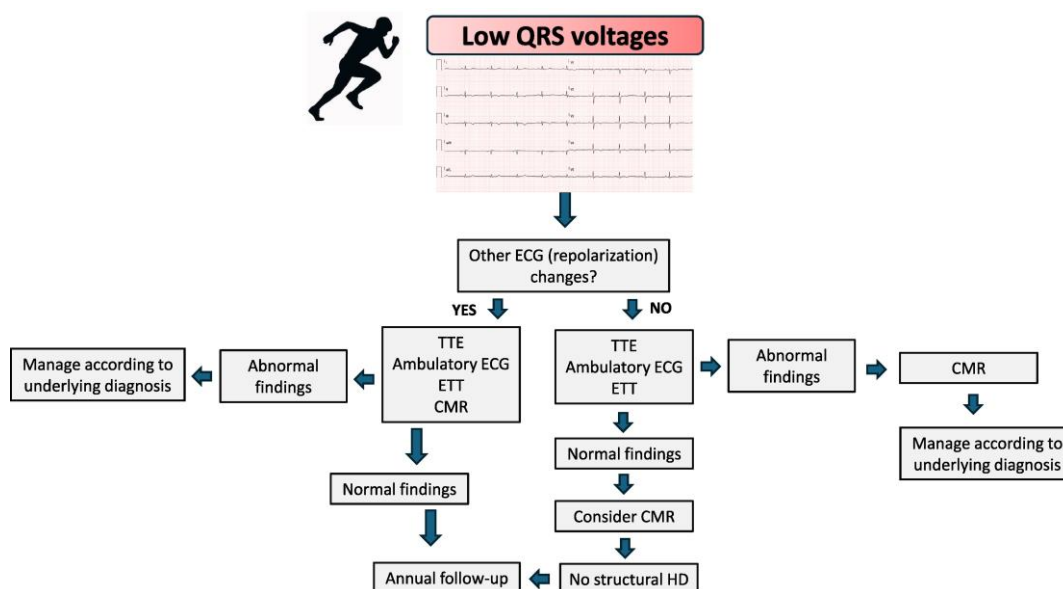


Figure 11. Management of athletes with isolated LQRSV.

CMR, cardiac magnetic resonance; ETT, exercise tolerance test; HD, heart disease; TTE, transthoracic echocardiogram

European Association of Preventive Cardiology Statement on ECG in Athletes . Abnormal electrocardiogram findings in athletes. *Eur Heart J.* 2026;47:152-169

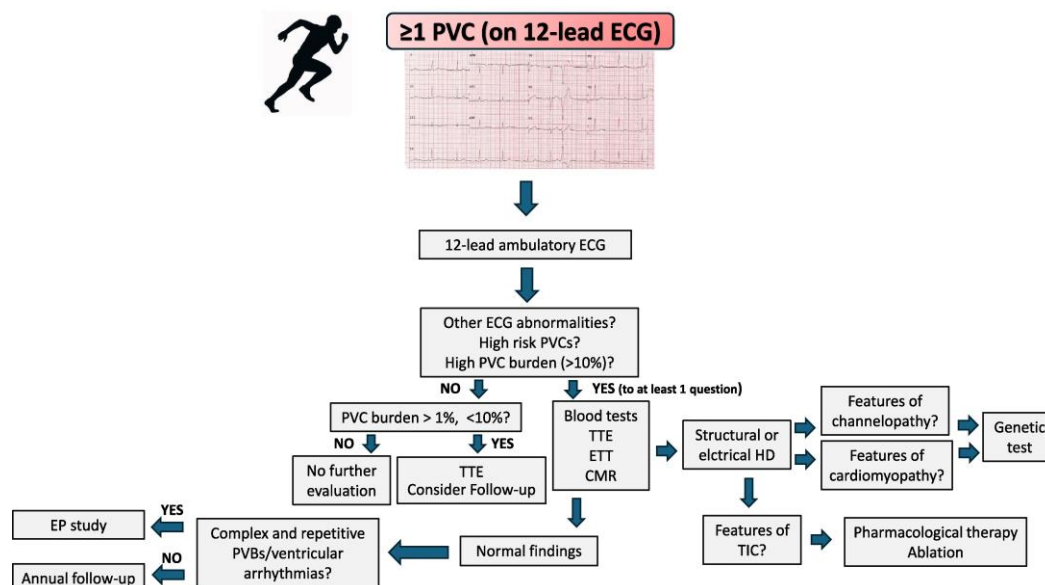


Figure 12. Management of athletes with PVCs.

CMR, cardiac magnetic resonance; CTCA, computed tomography coronary angiography; D/C, discharge; EP, electrophysiological; ETT, exercise tolerance test; HD, heart disease; TIC, tachycardia-induced cardiomyopathy; TTE, transthoracic echocardiogram

European Association of Preventive Cardiology Statement on ECG in Athletes . Abnormal electrocardiogram findings in athletes. *Eur Heart J.* 2026;47:152-169

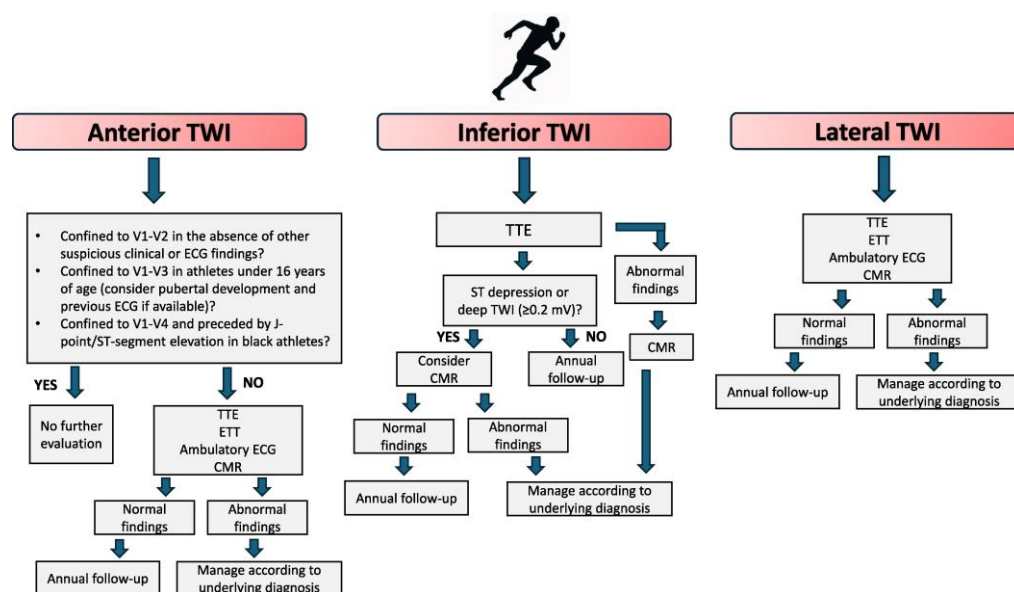


Figure 13. Management of athletes with TWI.

CMR, cardiac magnetic resonance; CTCA, computed tomography coronary angiography; D/C, discharge; ETT, exercise tolerance test; HD, heart disease; TTE, transthoracic echocardiogram

European Association of Preventive Cardiology Statement on ECG in Athletes . Abnormal electrocardiogram findings in athletes. *Eur Heart J.* 2026;47:152-169

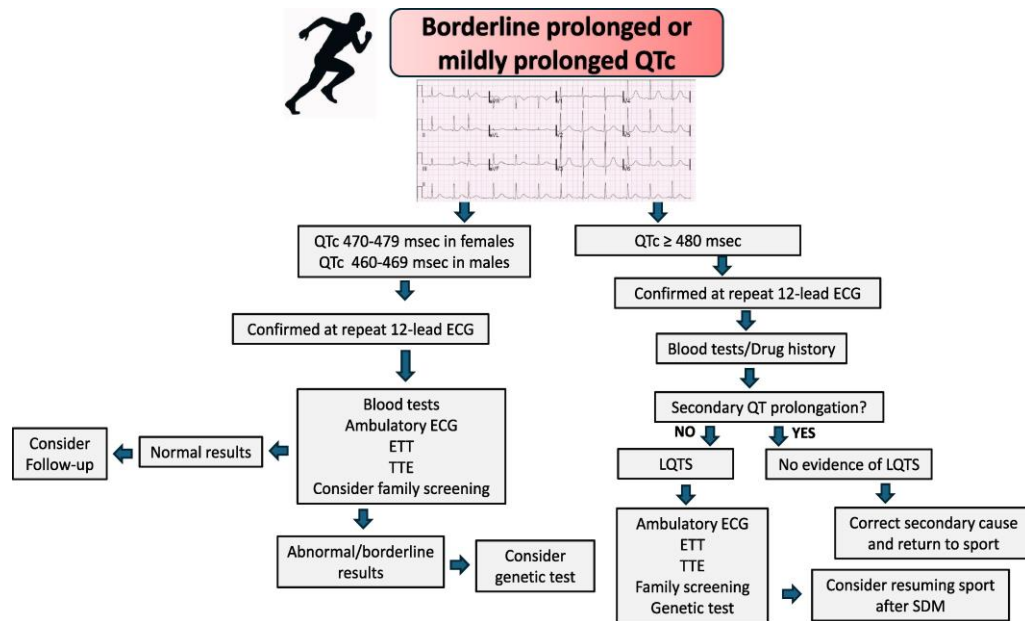


Figure 14. Management of athletes with borderline or mildly prolonged QTc interval. ETT, exercise tolerance test; LQTS, long QT syndrome; TTE, transthoracic echocardiogram; SDM, shared decision-making
European Association of Preventive Cardiology Statement on ECG in Athletes . Abnormal electrocardiogram findings in athletes. *Eur Heart J.* 2026;47:152-169

Table 13. The 14-element AHA recommendations for preparticipation cardiovascular screening of competitive athletes.

Medical history*	
Personal history	
1. Chest pain/discomfort/tightness/pressure related to exertion	
2. Unexplained syncope/near-syncope†	
3. Excessive and unexplained dyspnoea/fatigue or palpitations, associated with exercise	
4. Prior recognition of a heart murmur	
5. Elevated systemic blood pressure	
6. Prior restriction from participation in sports	
7. Prior testing for the heart, ordered by a physician	
Family history	
8. Premature death (sudden and unexpected, or otherwise) before 50y of age attributable to heart disease in ≥1 relative	
9. Disability from heart disease in close relative <50y of age	
10. Hypertrophic or dilated cardiomyopathy, long-QT syndrome, or other ion channelopathies, Marfan syndrome, or clinically significant arrhythmias; specific knowledge of genetic cardiac conditions in family members	
Physical examination	
11. Heart murmur‡	
12. Femoral pulses to exclude aortic coarctation	
13. Physical stigmata of Marfan syndrome	
14. Brachial artery blood pressure (sitting positions) §	
*Parental verification is recommended for high school and middle school athletes. †Judged not to be of neurocardiogenic (vasovagal) origin; of particular concern when occurring during or after physical exertion. ‡Refers to heart murmurs judged likely to be organic and unlikely to be innocent; auscultation should be performed with the patient in both the supine and standing positions (or with Valsalva manoeuvre), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction. §Preferably taken in both arms. Assessment of the 12-lead ECG as a screening test for detection of cardiovascular disease in healthy general populations of young people (12–25 years of age): A scientific statement from the American Heart Association and the American College of Cardiology. <i>Circulation</i>. 2014;130:1303–34 with permission from Wolters Kluwer.	

Table 14. AHA recommendations for screening of healthy people

The AHA 14-point screening guidelines and those of other societies, such as the Preparticipation Physical Evaluation monograph should be used by examiners as part of a comprehensive history-taking and physical examination to detect or raise suspicion of genetic/congenital and other cardiovascular abnormalities.	I-C
Standardization of the questionnaire forms used as guides for examiners of high school and college athletes in the United States should be pursued	I-C
Screening with 12-lead ECGs (or echocardiograms) in association with comprehensive history-taking and physical examination to identify or raise suspicion of genetic/congenital and other cardiovascular abnormalities may be considered in relatively small cohorts of young healthy people 12 to 25 years of age, not necessarily limited to athletes (e.g., in high schools, colleges/universities, or local communities), provided that close physician involvement and sufficient quality control can be achieved. If undertaken, such initiatives should recognize the known and anticipated limitations of the 12-lead ECG as a population screening test, including the expected frequency of false-positive and false-negative test results, as well as the cost required to support these initiatives over time	IIb-C
Mandatory and universal mass screening with 12-lead ECGs in large general populations of young healthy people 12 to 25 years of age to identify genetic/congenital (including on a national basis in the United States) and other cardiovascular abnormalities is not recommended for athletes and nonathletes alike	III-C (no benefit)
Consideration for large-scale, general population, and universal cardiovascular screening in the age group 12 to 25 years with history-taking and physical examination alone is not recommended (including on a national basis in the United States)	III-C (no benefit)
Assessment of the 12-lead ECG as a screening test for detection of cardiovascular disease in healthy general populations of young people (12–25 years of age): a scientific statement from the American Heart Association and the American College of Cardiology. <i>Circulation</i>. 2014;130:1303–34 with permission from Wolters Kluwer.	

Table 15. ESC 2022 GL on VA and SCD. Recommendations for risk stratification and prevention of sudden cardiac death in athletes

In athletes with positive medical history, abnormal physical examination, or ECG alterations, further investigations including echocardiography and/or CMR to confirm (or exclude) an underlying disease are recommended	I C
Athletes diagnosed with a cardiovascular disease associated with SCD are managed according to current guidelines for sports eligibility.	I C
Staff at sporting facilities are trained in CPR and in the use of AED	I C
Pre-participation cardiovascular evaluation of competitive athletes should be Considered	IIa c
Cardiovascular evaluation of young (<35 years) competitive athletes includes history, physical examination, and 12-lead ECG	IIa C
The cardiovascular risk of middle-aged and elderly individuals should be evaluated before engaging in strenuous sports through established scores such as the SCORE2 risk chart.	IIa C
AED, automated external defibrillator; CMR, cardiac magnetic resonance; CPR, cardiopulmonary resuscitation; ECG, electrocardiogram; SCD, sudden cardiac death.	

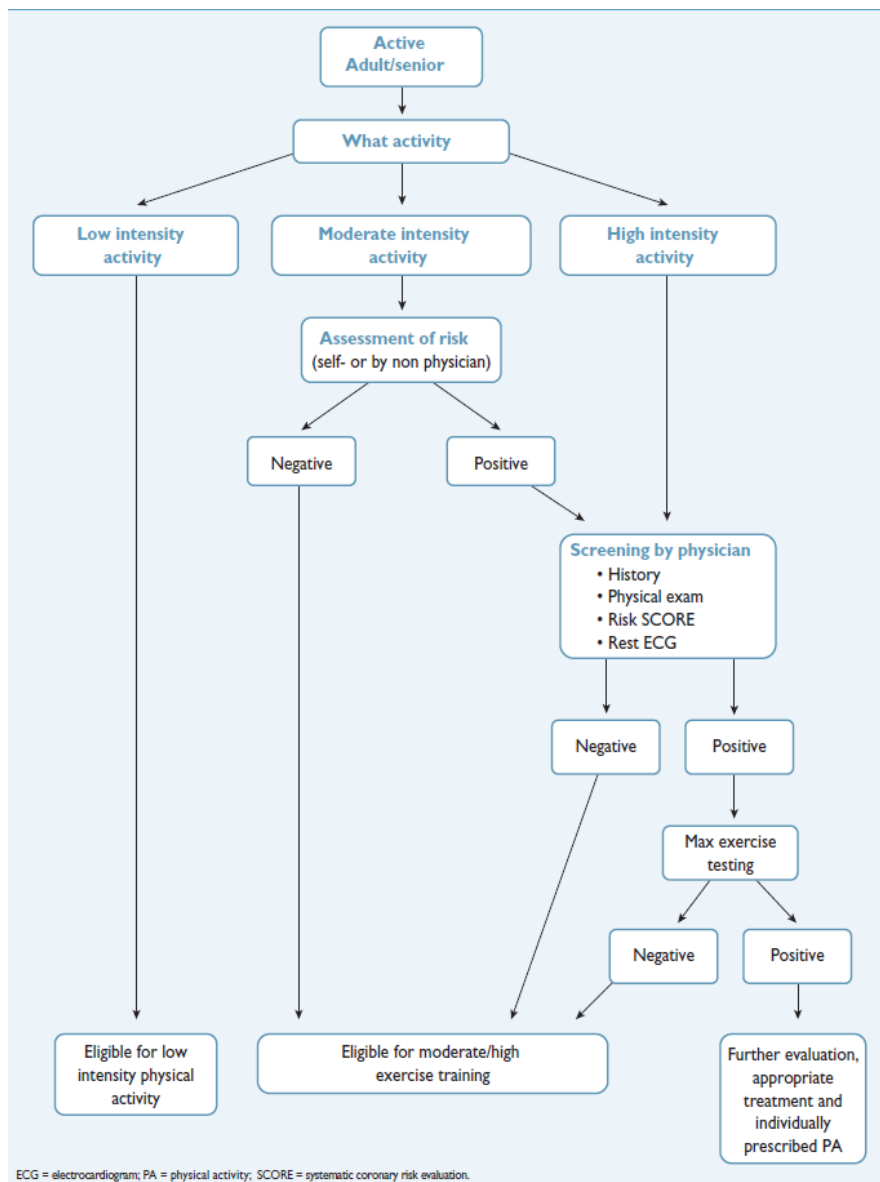


Figure 14. ESC 2015 GL on SCD. Proposed pre-participation evaluation protocol for asymptomatic active adult or senior individuals.

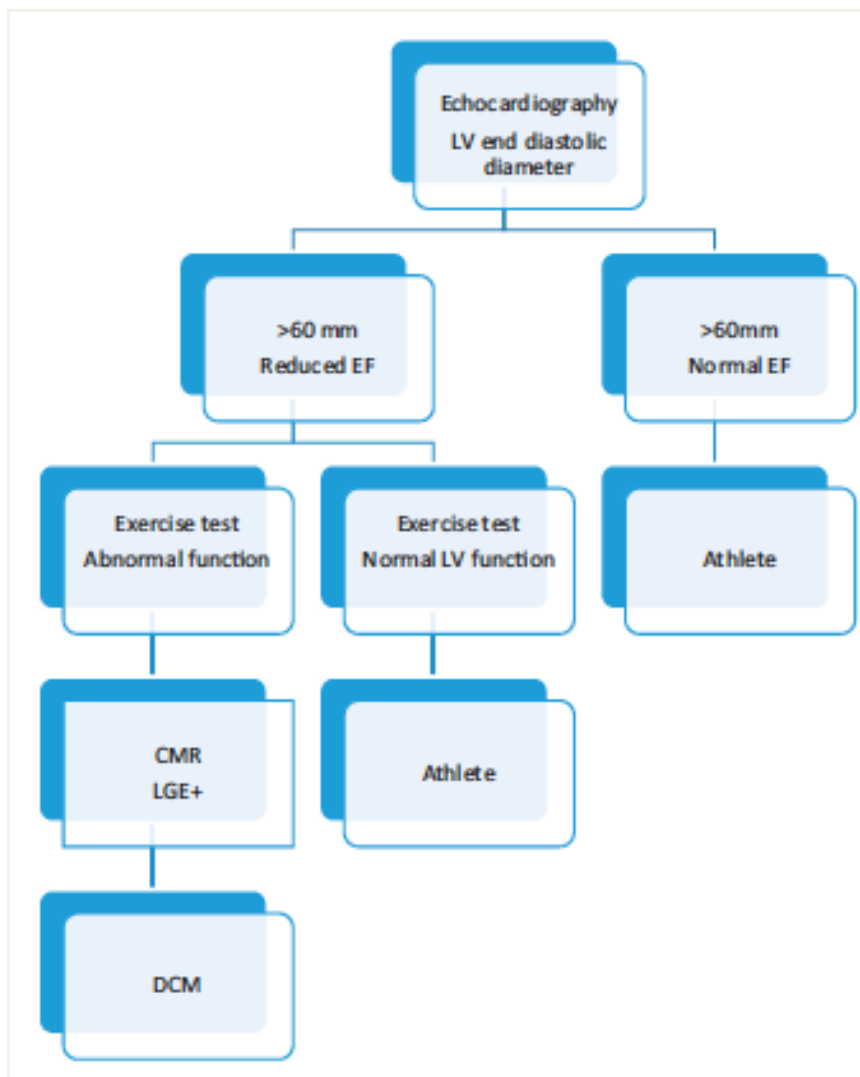


Figure 15. EAPC and EACVI 2017 joint position statement. Proposed diagnostic algorithm for the differential diagnosis between physiological left ventricular cavity dilation in athletes and dilated cardiomyopathy.

CMR, cardiac magnetic resonance; DCM, dilated cardiomyopathy; EF, ejection fraction; LGE, late gadolinium enhancement; LV, left ventricle.

European Association of Preventive Cardiology (EAPC) and European Association of Cardiovascular Imaging (EACVI) joint position statement: recommendations for the indication and interpretation of cardiovascular imaging in the evaluation of the athlete's heart. *Eur Heart J.* 2017.

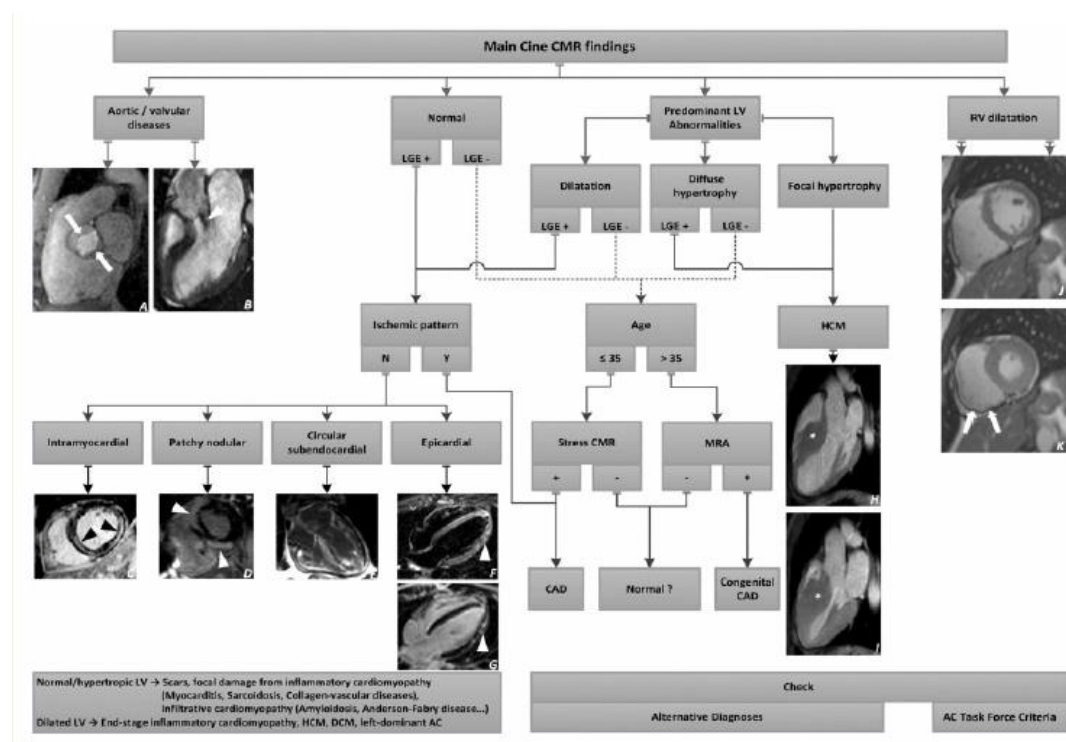


Figure 16. EAPC and EACVI 2017 joint position statement. Stepwise diagnostic algorithm involving Cardiac Magnetic Resonance (CMR) with inserts illustrating common diseases at risk for Sudden Cardiac Death (SCD).

CMR is usually performed as a second level cardiovascular examination. The first step examines cine images in order to demonstrate/exclude aortic valve and root diseases (A and B are respectively end-diastolic transverse aortic and 3-chamber views displaying bicuspid aortic (arrows) valve with regurgitation (arrowhead) and eccentric left ventricular (LV) hypertrophy, right ventricular (RV) dilatation and predominantly LV abnormalities. In case of RV dilatation, task force CMR criteria for the diagnosis of Arrhythmogenic Cardiomyopathy (AC) should be checked (J and K inserts are respectively end-diastolic and end-systolic short-axis cine views of a patient with recent onset of tachyarrhythmia, showing enlarged RV (end-diastolic volume = 115 ml/m²) and dyskinetic segments in the inferior wall (arrows). The diagnosis of hypertrophic cardiomyopathy (HCM) is usually straightforward with focal LV hypertrophy (H and I inserts respectively represent end-diastolic and end-systolic 3-chamber cine views, showing septal LV hypertrophy (asterisks). Late gadolinium enhancement (LGE) images are the next clue to the diagnosis in the remaining cases (C-G inserts represent typical patterns of non-ischemic LGE on short-axis and 4-chamber views (arrowheads). These patterns are associated to either disease-related focal myocardial damage or scar in normal-shaped LV, whereas they represent diffuse damage or end-stage cardiomyopathies when the LV is dilated. When both cine CMR and LGE patterns are normal, coronary artery disease (CAD) can be excluded using Magnetic Resonance Angiography (MRA) or stress CMR with respect to the patient age. AC, arrhythmogenic cardiomyopathy; CAD, coronary artery disease; CMR, cardiac magnetic resonance; HCM, hypertrophic cardiomyopathy; LGE, late gadolinium enhancement; LV, left ventricle; MRA, magnetic resonance angiography; N, No; RV, right ventricle; Y, Yes.

Table 16. AHA 2015 Statement. Sports according to risk of impact and educational background

Impact expected	American football Ice hockey Lacrosse Wrestling Karate/judo Fencing Boxing	American football Soccer Ice hockey Lacrosse Basketball Wrestling Karate/judo Downhill skiing Squash Fencing Boxing
Impact may occur	Soccer Basketball Field hockey Downhill skiing Equestrian Squash Cycling	Field hockey Equestrian Cycling Baseball/softball Gymnastics Figure skating
Impact not expected	Baseball/softball Cricket Golf Riflery Gymnastics Volleyball Swimming Track and field Tennis Figure skating Cross-country skiing Rowing Sailing Archery Weightlifting Badminton	Cricket Golf Riflery Volleyball Swimming Track and field Tennis Cross-country skiing Rowing Sailing Archery Weightlifting Badminton

Recommendations

Athletes receiving vitamin K antagonists or direct thrombin or factor Xa inhibitors
antagonists or direct thrombin or factor Xa inhibitors should avoid sports
in which impacts may occur I Ib-C

Athletes taking vitamin K antagonists or direct thrombin or factor Xa inhibitors
should not participate in sports with impact expected III-C

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities:
Task Force 1: Classification of Sports: Dynamic, Static, and Impact: A Scientific Statement From the American
Heart Association and American College of Cardiology. J Am Coll Cardiol. 2015;132:e262-6

Table 17. AHA 2026 Statement for the Care of Athletes. Tactical Athlete Task-Specific Risks and Participation Considerations Related to Anticoagulation and Bodily Collision,* Bodily Impact,† and Projectile Impact‡

Low Risk: Tasks Where Bodily Collision,* Bodily Impact,† or Projectile Impact‡ Is Not Expected or Low Probability	Moderate Risk: Tasks Where Risk of Bodily Collision,* Bodily Impact,† or Projectile Impact‡ Can Occur Unpredictably and Is Mitigated by Safety Measures	High Risk: Tasks With High Risk of Bodily Collision,* Bodily Impact,† or Projectile Impact‡
- Tactical athletes receiving full anticoagulation,§ dual antiplatelet therapy, or single antiplatelet therapy can perform these tasks.	- May be reasonable for tactical athletes receiving full anticoagulation§ or dual antiplatelet therapy to participate in these tasks assuming all appropriate safety measures and precautions are exercised. - Tactical athletes receiving single antiplatelet therapy can perform these tasks.	- Risk associated with these tasks for the tactical athlete receiving full anticoagulation§ or dual antiplatelet therapy is prohibitive because of personal risk to the tactical athlete and risk to colleagues, public, or both because of increased risk of incapacitation. - Tactical athletes receiving single antiplatelet therapy can perform these tasks.
- Physical fitness testing - Maneuvering while wearing PPE - SCUBA operations - Microgravity - Flying commercial airline or low performance aircraft - Routine traffic stop - Performing CPR - Walking over uneven ground	- Breaching door with manual techniques - Operating (including climbing) and stowing ladders and hoses - Carry and place ordnance of explosives - Team-based heavy equipment operation - Land- or water-based search and rescue - Digging foxhole or placing barricades - Creating a fire line, sawing, or clearing - Supervising apprehended suspect	- Combat operations (weapons and hand to hand) - Riot and crowd control - Serving a high-risk warrant - Pursuit or apprehension of suspect of foot - Pursuit of suspect in vehicle

*Collisions are defined as contact between ≥ 2 individuals during tactical task performance.

†Impacts are defined as contact between a tactical athlete and a fixed or stationary object during tactical task performance.

‡Denotes tasks where injury from high-velocity projectiles (ie, bullets, shrapnel, debris) may pose risk of serious bleeding independent of bodily collision or impact.

§Full anticoagulation is defined as a medical regimen including warfarin, direct thrombin inhibitors, or Factor Xa inhibitors.

CPR indicates cardiopulmonary resuscitation; PPE, personal protective equipment; SCUBA, self-contained underwater breathing apparatus.

Table 18. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for Tactical Athletes With Genetic Cardiomyopathies

General Clinical Considerations	
1.	Tactical athletes diagnosed with cardiomyopathy or with known genetic risk should be evaluated and managed by clinician(s) with disease-specific expertise to confirm the diagnosis, risk stratify, and optimize therapy. Patients should be referred to multidisciplinary clinics with expertise in genetic heart disease, including knowledge of athletic adaptation.
2.	Diagnostic evaluation should distinguish physiologic exercise-induced cardiac remodeling from pathology, such as HCM, DCM, and ACM, given that overlap in the findings may be observed.
3.	Ongoing longitudinal evaluation, including reassessment of the risks associated with genetic cardiomyopathies and refined clinical management in consideration of planned tactical tasks, is required as genetic cardiomyopathies are progressive and have age-related penetrance.
4.	Pathogenicity of variants should be confirmed according to up-to-date variant classification guidelines. VUS should be reviewed periodically because some can be demoted to benign variants while others can be promoted to P/LP variants.
5.	Potential risks associated with endurance- and strength-based tactical tasks commonly performed by tactical athletes vary by diagnosis, clinical severity, and underlying genotype. TCM should incorporate these factors combined with the specific demands of relevant tactical tasks. Both genetic cardiomyopathy experts and physicians familiar with the physical activity requirements of the tactical athlete's role should be engaged in the TCM discussion.
6.	In tactical athletes diagnosed with a genetic cardiomyopathy, consideration for ICD placement (Section 8) should be based on contemporary clinical practice guideline criteria and not for the sole purpose of returning to tactical tasks.
7.	If treatment of a tactical athlete includes an ICD, timeline for return to tactical tasks should be guided by the anticipated tactical tasks. At a minimum, tactical athletes should follow clinical considerations for competitive athletes to return to tactical tasks after ICD implant. See Section 8 for further tactical considerations.
HCM	
Specific Clinical Considerations	
1.	Evaluation and TCM of an asymptomatic tactical athlete with a known P/LP variant in an HCM-associated gene* or a possible HCM diagnosis should follow contemporary HCM guidelines. In contrast to general HCM guidelines, longitudinal follow-up should be more frequent, every 1–2 y, and include cardiovascular evaluation with an ECG and imaging irrespective of age. Tactical athletes who are first-degree relatives of a patient with HCM should follow a similar evaluation and management plan unless genetic testing has excluded inheritance of a P/LP familial variant.
2.	Tactical athletes with a positive genetic test for HCM but normal cardiovascular evaluation (genotype positive/phenotype negative) can participate in tactical tasks with ongoing expert surveillance.
3.	For asymptomatic tactical athletes diagnosed with HCM without LV outflow tract obstruction, arrhythmias, or other high-risk features,† it is reasonable to consider participating in tactical tasks with ongoing expert care, irrespective of underlying genotype. TCM should take into consideration the occupational role and typical tasks encountered, the importance of hydration, and electrolyte replacement.
4.	Tactical athletes with HCM with untreated LV outflow tract obstruction, arrhythmias, or symptoms should be optimally managed according to GDMT by an expert clinician before return to tactical activities is considered. Even after optimization, risks may outweigh benefits for activities involving exposure to moderate or high cardiovascular strain amplifiers (particularly involving exposure to prolonged and extreme heat), volume depletion, or excessive G-forces.
DCM	
Specific Clinical Considerations	
1.	Evaluation and TCM of an asymptomatic tactical athlete with a P/LP variant in a DCM-associated gene* or a possible DCM diagnosis should follow contemporary guidelines. Longitudinal follow-up should include annual cardiovascular evaluation including ECG and imaging irrespective of age.
2.	It is reasonable for tactical athletes with a positive genetic test for DCM* but normal cardiovascular evaluation (genotype positive/phenotype negative) to participate in tactical tasks with ongoing expert surveillance.
3.	For asymptomatic tactical athletes diagnosed with DCM who have a mildly reduced ejection fraction and neither high-risk clinical features such as arrhythmias or significant LGE on CMR imaging nor a high-risk genotype,‡ it is reasonable to consider participation in tactical tasks after expert assessment and management. This includes patients with DCM with no known genetic cause of their disease.
4.	Risks of most tactical tasks likely outweigh benefits for tactical athletes diagnosed with DCM who are symptomatic or have severely reduced systolic function. Fit for full duty should be reevaluated after establishing GDMT, especially if potential for exposure to moderate or high cardiovascular strain amplifiers can occur.
ACM	
Specific Clinical Considerations	
1.	Evaluation and TCM of an asymptomatic tactical athlete with a P/LP variant in an ACM-associated gene* or possible ACM diagnosis should follow contemporary gene and disease-specific guidelines. Longitudinal follow-up should include annual cardiovascular evaluation including ambulatory arrhythmia monitoring and imaging irrespective of age. Tactical athletes who are first-degree relatives of patients with ACM should follow this evaluation and management plan unless genetic testing has excluded inheritance of a P/LP familial variant.
2.	TCM for ACM should be individualized by genotype and clinical characteristics because both the strength and quantity of evidence of the risks of frequent or high-intensity exercise varies.§
3.	It is reasonable to consider that a tactical athlete with a positive genetic test for ACM but normal cardiovascular evaluation (genotype positive/phenotype negative) participates in most tactical tasks under expert care. The TCM of genotype positive/phenotype negative tactical athlete with <i>PKP2</i> P/LP variants should recognize that this genotype confers increased risk of disease expression in those engaging regularly in high-intensity endurance activities, and the risks may outweigh benefits for most tactical tasks
4.	Men with P/LP <i>TMEM43</i> variants have lifetime penetrance rate approaching 100% in young adulthood and a high sudden death risk. Tactical tasks with higher-intensity components (II-IIIb&c) or deployment to isolated, austere settings have risks that may outweigh benefits. Indeed, the risks may outweigh benefits for most tactical tasks.

5. Risks likely outweigh benefits for tactical athletes with PKP2-ACM to participate in higher-intensity (II-III B&C) tactical tasks, similar to the competitive athlete, or if potential for exposure to moderate or high cardiovascular strain amplifiers can occur. The risks may outweigh benefits for most tactical tasks.
6. For tactical athletes with non-PKP2-ACM, risks may outweigh benefits to participate in higher-intensity (II-III B&C) tactical tasks or if potential for exposure to moderate or high cardiovascular strain amplifiers can occur.
7. Asymptomatic patients with ACM and preserved biventricular function and neither high-risk clinical features (including history of arrhythmias, frequent PVCs, moderate RV or LV dysfunction, significant LGE on CMR imaging) nor a high-risk genotype[‡] can consider participation in tactical tasks with ongoing expert management on case-by-case basis.
8. A high proportion of patients with ACM receive ICDs. ICD implantation should follow disease and genotype-specific contemporary guidelines. Section 8 discusses device-related TCM.

LV Hypertrabeculation

Specific Clinical Considerations

1. Tactical athletes with incidentally discovered hypertrabeculation with normal ECG, otherwise normal echocardiogram, and normal additional testing (ie, CMR imaging and rhythm monitoring as clinically indicated) can be expected to fulfill all tactical tasks. No longitudinal evaluation is required.
2. For tactical athletes with LV hypertrabeculation and LV hypertrophy that is inconsistent with exercise-induced cardiac remodeling, TCM should incorporate guidance for HCM, similar to the approach taken for competitive athletes.
3. For tactical athletes with LV hypertrabeculation and reduced LV systolic function that is inconsistent with exercise-induced cardiac remodeling, TCM should incorporate guidance for DCM, similar to the approach taken for competitive athletes.

*Genes with moderate, strong, or definitive evidence for association with HCM, ARVC, and DCM as adjudicated by ClinGen.^{85,91,92} Note, several ACM genes are included in the DCM article and should be considered ACM for the purposes of TCM (*DSP*, *DES*, *FLNC*, *LMNA*, *PLN*, *RBM20*, *BAG3*, *SCN5A*).

†High-risk features and risk factors for sudden death risk stratification in setting of HCM are based on the “2024 AHA/ACC/AMSSM/HRS/PACES/SCMR Guideline for the Management of Hypertrophic Cardiomyopathy”: family history of sudden death from HCM, massive LV hypertrophy, unexplained syncope, HCM with LV systolic dysfunction, LV apical aneurysm, extensive LGE on CMR imaging, nonsustained VT on ambulatory monitor.⁷⁷

‡Evidence of the strength of the association of exercise with ventricular arrhythmias and worse disease outcomes varies by genotype. Some evidence shows that exercise is associated with ventricular arrhythmias and worse structural disease in patients with these genotypes: *PKP2*, *DSG2*, *TMEM43*, *LMNA*, and genotype-negative ARVC (genotype negative/phenotype positive).

ACC indicates American College of Cardiology; ACM, arrhythmogenic cardiomyopathy; AHA, American Heart Association; AMSSM, American Medical Society for Sports Medicine; ARVC, arrhythmogenic right ventricular cardiomyopathy; CMR, cardiac magnetic resonance; DCM, dilated cardiomyopathy; DES, desmin; DSP, desmoplakin; ECG, electrocardiogram; FLNC, filamin C; GDMT, guideline-directed medical therapy; HCM, hypertrophic cardiomyopathy; HRS, Heart Rhythm Society; ICD, implantable cardioverter-defibrillator; LGE, late gadolinium enhancement; *LMNA*, lamin A/C gene; LV, left ventricle; PACES, Pediatric & Congenital Electrophysiology Society; P/LP, pathogenic/likely pathogenic; PLN, phospholamban; PVC, premature ventricular contraction; *RBM20*, RNA-binding motif protein 20; RV, right ventricle; SCMR, Society for Cardiovascular Magnetic Resonance; *SCN5A*, sodium voltage-gated channel alpha subunit 5; TCM, tactical clinical management; VT, ventricular tachycardia; and VUS, variants of uncertain significance.

Table 19. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for Tactical Athletes With Myocarditis and Other Acquired Cardiac Conditions

Myocarditis
Specific Clinical Considerations
1. Tactical athletes with suspected myocarditis by symptoms, abnormal 12-lead electrocardiographic findings, or biomarkers (indicating inflammation and non-ischemic myocardial injury) should undergo CMR imaging to evaluate for myocardial scar and edema. When CMR imaging is unavailable, tactical athletes should be restricted from tactical tasks pending referral to a center with available resources to rule-out myocardial inflammation.
2. Tactical athletes with reduced LV function at the time of diagnosis can return to tactical tasks on a case-by-case basis if all of these criteria are met: a. LV systolic function has returned to normal range. b. Resolution of inflammation or edema by CMR imaging (T_2 signal) or serum biomarkers (inflammation). c. Clinically relevant arrhythmias, such as frequent or complex forms of ventricular arrhythmias, are absent on electrocardiographic monitoring and exercise testing. d. Normal functional capacity.
3. Independent of LV function, tactical athletes with myocarditis should not return to tactical tasks until both symptoms and active inflammation or edema (T_2 on CMR imaging, elevated troponin levels, or both) have resolved if participating in tactical tasks higher than IA without high occupational risk or if potential exists for exposure to moderate or high cardiovascular strain amplifiers.
4. It is reasonable for asymptomatic tactical athletes with persistent LGE suggestive of previous myocarditis to return to tactical tasks if all of these criteria are met: a. LV systolic function is within the normal range. b. Clinically relevant arrhythmias, such as frequent or complex forms of ventricular arrhythmias, are absent on ambulatory electrocardiographic monitoring and exercise testing. c. Exercise capacity is commensurate with anticipated tactical tasks.
Pericarditis
Specific Clinical Considerations
1. Tactical athletes with acute pericarditis should be managed according to the standard of care, which includes nonsteroidal anti-inflammatory medications for 2–4 wk and 3 mo of colchicine. Steroids should be avoided in most cases to reduce the risk of recurrent pericarditis.
2. Tactical athletes with active pericarditis should not participate in tactical tasks because of the increased risk of exacerbating an inflammatory response, especially if participating in tactical tasks higher than IA or if potential exists for exposure to moderate or high cardiovascular strain amplifiers. Among individuals with recurrent disease or symptoms that are refractory to treatment, additional evaluation can be considered to rule-out presence of concomitant myocarditis.
3. It is reasonable for tactical athletes to return to all tactical tasks when no signs and symptoms of active disease (ie, absence of chest pain, pericardial effusion, or elevation of inflammatory biomarkers) are observed.
4. Tactical athletes with acute pericarditis and a complicated presentation (ie, acute pericarditis requiring hospitalization, development of pericardial effusions [especially if bacterial or purulent], symptoms refractory to initial treatment or all of these) are at increased risk of recurrence or progression to pericardial restriction and should have longitudinal clinical surveillance.
Upper Respiratory Tract Infections Including Acute SARS-CoV-2 (COVID) Infection
Specific Clinical Considerations
1. For tactical athletes who have recovered from an acute viral upper respiratory tract infection, including SARS-CoV-2, who are asymptomatic or have noncardiopulmonary symptoms, cardiac testing should not be performed before a return to tactical tasks.
2. For tactical athletes with a history of acute viral upper respiratory tract infection, including SARS-CoV-2, who have persistent cardiopulmonary symptoms, further cardiac testing (ie, triple screen: cardiac biomarkers [ie, high sensitivity troponin], ECG, and echocardiogram) should be performed to evaluate for myocardial involvement. If results from the triple screen are concerning for myocarditis, CMR imaging should be performed for diagnostic and prognostic purposes.
Long COVID
Specific Clinical Considerations
1. Tactical athletes with symptoms suggestive of long COVID ^a should be referred to a long COVID clinic for multidisciplinary assessment. Cardiac testing should follow existing guidelines.
2. Exercise training, guided by a clinician familiar with the demands of the athlete's anticipated tactical tasks, should be part of the management plan to facilitate improvement in functional capacity and a return to tactical tasks.
COVID Vaccination
Specific Clinical Considerations
1. Cardiac testing should be performed after COVID vaccination if symptoms concerning for myocarditis develop within 1 week of receiving the vaccine.
Incidental Myocardial Fibrosis
Specific Clinical Considerations
1. Asymptomatic tactical athletes with myocardial fibrosis, indicated by LGE on CMR imaging, and in a pattern other than RV insertion point LGE, should undergo appropriate risk stratification and longitudinal assessment.
VHD
General Considerations
1. Tactical athletes presenting with symptomatic VHD should be managed in accordance with contemporary guidelines informed by TCM.

MVP
Specific Clinical Considerations
1. Asymptomatic tactical athletes without high-risk features [‡] by history, ECG, or echocardiogram related to MVP do not require further evaluation and should not be restricted from participation in all tactical tasks. If mitral regurgitation is present, refer to the previously mentioned mitral regurgitation considerations.
2. Tactical athletes with MVP and high-risk features [‡] should undergo additional risk stratification with maximal effort exercise testing, ambulatory rhythm monitoring, and CMR imaging, because untreated malignant MVP may increase the risk of ventricular arrhythmias and SCA. Using TCM for some athletes, the risks of unrestricted participation in tactical tasks may outweigh the benefits.
3. Tactical athletes with arrhythmic MVP should undergo comprehensive expert assessment for management of arrhythmias and risk stratification for an ICD.
4. For tactical athletes with asymptomatic MVP and inferolateral LV LGE without complex ventricular arrhythmias, it is reasonable to participate in unrestricted tactical tasks with longitudinal clinical surveillance for disease progression or development of ventricular arrhythmias.
5. Tactical athletes with mitral annular disjunction should undergo additional risk stratification with CMR imaging. The risk of participation in unrestricted tactical tasks may outweigh the benefits for tactical athletes with any of these criteria: - Reduction in LV systolic function. - CMR imaging basal-inferolateral papillary muscle LGE. - Ventricular arrhythmias present on ambulatory rhythm monitoring.
Kawasaki Disease
General Considerations
1. Tactical athletes with a history of uncomplicated Kawasaki disease in childhood with no coronary abnormalities should not be restricted from any tactical task.
2. For tactical athletes requiring dual antiplatelet therapy [§] or anticoagulation, TCM should incorporate tactical task-specific risks of bleeding (Section 1).
3. In general, antiplatelet therapy or anticoagulation should not be withheld to allow for unrestricted participation in tactical tasks. Refer to Table 13, Antithrombotic Therapy, for further considerations.
Coronary Artery Involvement: Ectasia, Small Aneurysms
Specific Clinical Considerations
1. Tactical athletes with Kawasaki disease and inducible myocardial ischemia or exercise-induced arrhythmias should be restricted to tactical tasks with intensities below the ischemic threshold. The ischemic threshold is determined based on the maximal effort exercise test.
2. Tactical athletes with coronary artery involvement should undergo longitudinal clinical surveillance in accordance with published guidelines, including an assessment for inducible myocardial ischemia every 1–3 y, or sooner if concern is warranted for ischemia or evidence of ventricular dysfunction. Additional imaging with coronary angiography can be considered every 2–5 y.
Coronary Artery Involvement: Medium, Large, or Giant Aneurysms
Specific Clinical Considerations
1. Tactical athletes with medium, large, or giant aneurysms should undergo comprehensive evaluation for inducible myocardial ischemia or ventricular arrhythmias with maximal effort exercise stress testing.
2. For tactical athletes with medium, large, or giant aneurysms and inducible ischemia or ventricular arrhythmias, the risks of unrestricted participation in tactical tasks likely outweigh the benefits.
3. Tactical athletes with medium, large, or giant aneurysms and no inducible ischemia or ventricular arrhythmias can consider unrestricted participation in all tactical tasks.
Infiltrative Cardiomyopathies
Specific Clinical Considerations
1. Tactical athletes with a family history, or who are genotype positive/phenotype negative for infiltrative cardiomyopathies, and who are asymptomatic, should not be restricted from participation in tactical tasks.
2. For tactical athletes with clinical expression and high-risk features (ie, heart failure, ventricular arrhythmias, or reduced LV systolic function) of an infiltrative cardiomyopathy, the risks of unrestricted participation in tactical tasks likely outweigh the benefits.
3. Tactical athletes with clinical expression of an infiltrative cardiomyopathy, but who are treated and clinically stable with normal LV systolic function, can consider participation in tactical tasks with TCM and longitudinal clinical surveillance.

*Long COVID is defined as symptoms that persist >12 wks after SARS-CoV-2 infection.

†Subclinical LV systolic dysfunction or myocardial fibrosis.

‡High-risk features associated with MVP include but are not limited to: ECG demonstrating T-wave inversions in inferior leads or a prolonged QT interval; echocardiogram demonstrating mitral annular disjunction, severe reduction in LV systolic function, severe MR; family history of SCD; history of ventricular arrhythmias.

§Dual antiplatelet therapy refers to the use of aspirin and a P2Y₁₂ inhibitor such as clopidogrel.

||Aneurysm size as defined by published guidelines¹¹⁰: Small: Dilation with an internal diameter ≤1.5 times that of an adjacent segment; Medium: Dilation with an internal diameter that is 1.5–4 times that of an adjacent segment; Large: Internal diameter that is >4 times that of an adjacent segment.

AF indicates atrial fibrillation; CMR, cardiac magnetic resonance; COVID, coronavirus; ECG electrocardiogram; ICD, implantable cardioverter-defibrillator; LGE, late gadolinium enhancement; LV, left ventricle; MR, mitral regurgitation; MVP, mitral valve prolapse; RV, right ventricle; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; SCA, sudden cardiac arrest; SCD, sudden cardiac death; TCM, tactical clinical management; and VHD, valvular heart disease.

Table 20. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for the Tactical Athlete With Thoracic Aortic Disease or Concern for Aortopathy

General Clinical Considerations	
1.	TCM for tactical athletes with TAD should use guideline-recommended imaging techniques (ie, echocardiogram, cardiac computed tomography angiogram, cardiac magnetic resonance angiography, or all of them) for aortic measurements and normative values.
2.	When observing aortic diameters over time, as feasible, images should be compared side-by-side using the same imaging modalities.
3.	After initial diagnosis of an aortic condition, the subsequent interval for aortic imaging should be individualized depending on the underlying condition and the degree of aortic dilation. An initial 6- to 12-mo interval is usually suggested, with subsequent imaging interval based on aortic size, underlying condition, clinical features, and stability of aortic diameter over time.
4.	Heritable TAD evaluation, including a multigenerational family history and genetic evaluation, should be performed in tactical athletes with: a. Thoracic aortic dilation (z-score ≥ 3); or b. Family history of thoracic aortic disease, peripheral or cerebral arterial aneurysm, or unexplained sudden death at a relatively young age; or c. Clinical features suggesting a connective tissue disorder (Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers-Danlos syndrome) or other genetic and heritable aortopathy.
5.	Unexplained aortic dilation (aortic z-score ≥ 3) is established after performing a comprehensive evaluation that includes a multigenerational family history, imaging screening of first-degree relatives (as appropriate), and genetic evaluation yielding no significant findings. Notably, such tactical athletes with aortic dilation may represent a de novo variant in a new gene, and further evaluation with expert consultation should be considered.
6.	It is rare for young individuals (<40 y of age) with a tricuspid aortic valve to have aortic diameters >42 mm in men or >40 mm in women. Unexplained aortic dilation of this magnitude may represent a pathologic aortopathy rather than a normal variant. Age, sex, and body size should all be considered in the risk stratification process.
Heritable TAD (Syndromic and Nonsyndromic, Gene-Positive and Gene-Negative)	
Specific Clinical Considerations	
1.	Heritable TAD comprises various conditions (ie, syndromic : Marfan syndrome, Loeys-Dietz syndrome, vascular Ehlers-Danlos syndrome; nonsyndromic : attributable to various genes) with a variable risk of aortic dissection, branch vessel complications and extra-aortic manifestations. Thus, tactical athletes with heritable TAD should be evaluated by experts in aortopathy and medical genetics.
2.	Through TCM, tactical athletes with heritable TAD can be considered to perform low-strength, low-endurance tasks (ie, limit to IA) based on their underlying diagnosis, degree of aortopathy or vasculopathy, specific occupation, and consultation with an aortopathy expert.
3.	Tactical athletes with most forms of heritable TAD are at elevated risk of aortic and vascular events and should not participate in tactical athlete fields with moderate or high-strength, high-endurance tasks (ie, limit to IA). Through TCM and expert consultation, some individuals with heritable TAD with normal aorta size can be considered for participation in certain tactical tasks with more than low strength or more than low-endurance requirements, while considering the potential impact of cardiovascular strain amplifiers.
Unexplained Thoracic Aortic Dilation (Without Heritable TAD or Familial Aortopathy)	
Specific Clinical Considerations	
1.	Tactical athletes with unexplained mild thoracic aortic dilation (<42 mm) can generally perform all tactical tasks without restrictions. Risk stratification should consider the degree of dilation relative to body size and sex.
2.	After expert consultation, younger tactical athletes (age <40 y of age) with unexplained moderate thoracic aortic dilation (42–44 mm) can be considered for unrestricted participation in all tactical tasks.
3.	For younger tactical athletes (age <40 y of age) with unexplained moderate and severe thoracic aortic dilation (≥ 45 mm), the risks likely outweigh benefits of moderate and high-strength or high-endurance tasks, and tactical tasks or occupational restrictions should be considered (ie, limit to IA-B).
4.	See Section 10 for considerations for the older tactical athlete (age ≥ 40 y of age) with moderate thoracic aortic dilation and aneurysms.
BAV Aortopathy	
Specific Clinical Considerations	
1.	Features that increase risk of aortic dissection (ie, rapid aortic growth of ≥ 3 mm/y, untreated significant aortic coarctation, root phenotype aortopathy, family history of aortic dissection, or features suggesting an underlying heritable TAD) should be incorporated in the risk assessment of tactical athletes with BAV and aortopathy.
2.	Tactical athletes with a BAV and features concerning for an underlying heritable TAD or with isolated root phenotype aortopathy should have consultation with an aortopathy specialist or medical geneticist.
3.	For tactical athletes with a BAV, tactical tasks or occupational considerations should be based on the aortic valve function and aortopathy characteristics.
4.	Tactical athletes with an isolated BAV with normal valve function and thoracic aortic diameter <40 mm can participate in all tactical tasks.
5.	For tactical athletes with an isolated BAV and mild-to-moderate thoracic aortic dilation (40–44 mm), it is reasonable to participate in all tactical tasks. The presence of features that increase risk for aortic dissection (see #1 above) should be considered in making tactical tasks recommendations.
6.	Through TCM and expert consultation, tactical athletes with an isolated BAV and moderate-to-severe thoracic aortic dilation (45–49 mm) can be considered for participation in some tactical tasks with more than low-strength, low-endurance tasks depending on occupational requirements and cardiovascular strain amplifiers.
7.	Tactical athletes with an isolated BAV and severe thoracic aortic dilation ≥ 50 mm, should not perform tactical tasks.
8.	For tactical athletes with BAV and aortic valve regurgitation or stenosis, refer to considerations for aortic valve regurgitation or stenosis in Section 5 (Table 8).

SCAD
Specific Clinical Considerations
1. Tactical athletes with a history of SCAD can perform low-strength, low-endurance activities (ie, limit to IA).
2. For tactical athletes with a history of SCAD, the risks may outweigh benefits to perform tactical tasks above IA or with exposure to moderate or high cardiovascular strain amplifiers, guided by TCM.
Postaortic Dissection, Surgical Repair, or Both
Specific Clinical Considerations
1. For tactical athletes with a history of aortic dissection, risks likely outweigh benefits of performing activities with moderate- or high-strength or moderate- or high-endurance components, and tactical tasks or occupational restrictions should be considered (ie, limit to IA).
2. For tactical athletes who have undergone thoracic aorta repair for BAV aortopathy and have stable findings on imaging, it is reasonable to consider returning to tactical tasks without restrictions.
3. For tactical athletes with previous thoracic aorta repair for heritable TAD, risks likely outweigh benefits of performing activities with moderate- or high-strength or moderate- or high-endurance components (ie, limit to IA), or with exposure to moderate or high cardiovascular strain amplifiers, guided by TCM. Using TCM, the underlying condition, residual aortic disease, and the effect of cardiovascular strain amplifiers all inform tactical tasks considerations.
4. For tactical athletes who have undergone thoracic aorta repair for unexplained thoracic aortic dilation, risks may outweigh benefits of performing activities with moderate- or high-strength or moderate- or high-endurance components (ie, limit to IA). Using TCM, the underlying condition, residual aortic disease, and the effect of cardiovascular strain amplifiers all inform tactical tasks considerations.

BAV indicates bicuspid aortic valve; IA, low strength, low endurance; SCAD, spontaneous coronary artery dissection; TAD, thoracic aortic disease; and TCM, tactical clinical management.

Table 21. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for the Tactical Athlete With Syncope, SCA, Arrhythmias, and Devices

General Clinical Considerations
1. In addition to a thorough cardiovascular evaluation, clinicians should obtain a comprehensive medication and supplement history among tactical athletes with arrhythmias to ensure potential precipitating agents (ie, PED/S, including stimulants) are addressed.
2. Remote transmission from cardiac devices (ie, ILR, PPM, ICD, and mobile cardiac telemetry) may not be possible among some tactical athletes who are deployed or in extreme environmental conditions. This limitation should be included in TCM regarding timing for return to tactical tasks and surveillance planning.
3. Among tactical athletes who undergo maximal effort exercise testing as part of their clinical care, customized exercise protocols to recreate the unique demands of specific tactical athlete duties should be performed if possible.
Tactical Athletes With Syncope
Specific Clinical Considerations
1. For tactical athletes with exertional syncope concerning for an underlying cardiac condition, initial workup should include a resting ECG, echocardiogram, ambulatory rhythm monitor, and a maximal effort exercise test. Further advanced cardiac imaging can be considered, as needed, depending on the clinical scenario. If initial testing suggests a possible genetic arrhythmia syndrome, genetic counseling should be offered. If comprehensive cardiovascular testing is normal, it is reasonable to return to tactical tasks unless unheralded syncope or if the tactical athlete participates in tasks with increased risk for devastating consequences with sudden incapacitation (see consideration #2 directly below).
2. Even with a normal initial cardiac evaluation, for tactical athletes presenting with an unheralded syncope or if the tactical athlete participates in tasks with increased risk for devastating consequences with sudden incapacitation (ie, single seat pilot), further diagnostic testing, such as an ILR, is reasonable to increase the likelihood of capturing a suspected arrhythmia. An electrophysiology study can be considered on an individual basis depending on clinical suspicion and pretest probability for arrhythmia.
3. In cases of exertional syncope, return to tactical tasks is reasonable if a benign cause, reversible cause, or both was identified and treated, and no recurrent syncope over a period of time (ie, 4 wk) is noted.
4. For tactical athletes with nonexertional syncope (ie, orthostatic hypotension or neurally mediated syncope) or postexertional syncope (ie, likely noncardiac), it is reasonable to return to tactical tasks after treatment and no recurrent syncope over a period of time (ie, 4 wk).
5. In cases of recurrent nonexertional or postexertional syncope, concerning family history or high clinical suspicion for cardiac cause, it is reasonable to proceed with further cardiovascular testing (ie, echocardiogram, maximal effort exercise test, ambulatory rhythm monitor, or all of them).
Tactical Athletes With Ventricular Arrhythmias
After Initial Diagnosis
Specific Clinical Considerations
1. Among tactical athletes with PVCs (≥ 2 typical or ≥ 1 atypical PVC on a 12-lead ECG; Table 11), an initial workup including cardiac imaging (ie, echocardiogram, CMR imaging, or both depending on the clinical scenario), an ambulatory rhythm monitor, and maximal effort exercise test should be performed.
2. In the asymptomatic tactical athlete with a high burden of PVCs ($>10\%$ burden) in the absence of structural heart disease, active monitoring for PVC-induced cardiomyopathy with serial imaging and ambulatory monitoring is reasonable.
3. Tactical athletes with high-risk PVCs (Table 11) should be restricted from tactical tasks during the initial diagnostic workup and expert evaluation. Resumption of tactical tasks is reasonable if significant cardiac disease is ruled out, or if identified, risk-stratified and appropriately managed (with or without catheter ablation, if clinically indicated), using TCM.
Benign or Low-Risk PVCs
1. Among tactical athletes with low-risk PVCs (Table 11), continued participation is reasonable during the initial cardiovascular workup, especially if the tactical athlete is asymptomatic. If the cardiovascular workup is benign, then tactical task participation can resume.
2. For tactical athletes, postcatheter ablation of low-risk symptomatic PVCs, a return to tactical tasks should be performed in a graded manner after access site wound healing (typically 10–14 d for venous access).
High-Risk PVCs
1. Return to tactical tasks can be considered with expert guidance after catheter ablation of high-risk symptomatic PVCs (Table 11) in the absence of any significant ventricular arrhythmias on follow-up ambulatory rhythm monitoring and exercise testing and normalized LVEF in the setting of PVC cardiomyopathy.
2. If the tactical athlete has high-risk PVCs associated with another pathologic condition (ie, HCM, ARVC), participation in tactical tasks should be based on disease-specific recommendations.
3. A return to tactical tasks should be performed in a gradual manner after access site wound healing (typically 10–14 d for venous access) and appropriate ambulatory rhythm monitoring and exercise testing and disease-specific follow-up.
Malignant VT/VF
Specific Clinical Considerations
1. It is reasonable to participate in tactical tasks after malignant VT/VF or resuscitated SCA secondary to a reversible cause and appropriate cardiac risk stratification guided by an expert disease-specific clinician.
2. Tactical athletes with SCA attributable to nonreversible causes should receive an ICD (see following section Tactical Athletes With Pacemakers, ICDs, or Both).
3. Tactical athletes with unexplained SCD should undergo cardiac autopsy with toxicology, postmortem genetic testing, and postmortem implantable device interrogation as applicable. Policies to facilitate postmortem genetic testing after any unexplained SCD should be established.

Tactical Athletes With WPW
Specific Clinical Considerations
1. For WPW pattern, a thorough history and physical examination should be performed. Cardiac imaging should be performed to rule out underlying cardiovascular structural pathology (ie, HCM, Ebstein anomaly).
2. It is reasonable to perform an electrophysiology study for risk assessment and consideration of ablation among tactical athletes with asymptomatic WPW pattern, if the tactical athletes are involved in tasks with increased risk for devastating consequences if sudden incapacitation (ie, single seat pilot).
3. Tactical athletes with WPW syndrome should undergo an electrophysiology study for further evaluation and treatment.
4. Continuation of tactical tasks is reasonable among asymptomatic tactical athletes undergoing further cardiovascular workup for WPW pattern if they are performing tactical tasks without risk of devastating consequences if sudden incapacitation.
5. After electrophysiology study and ablation, return to tactical tasks should take into consideration the healing of the venous access site(s), risk assessment of the pathway, and success of the procedure (ie, confirmation of loss of preexcitation in follow-up).
6. Return to tactical tasks among tactical athletes without loss of ventricular preexcitation is reasonable to consider if the EP study demonstrates low-risk properties (ie, absence of inducible SVT, SPERRI >250 ms, accessory pathway ERP >240 ms, and absence of multiple accessory pathways), the tactical athlete is asymptomatic, and no arrhythmias are observed. Annual surveillance, including a maximal effort exercise stress test and ambulatory rhythm monitor, is reasonable to consider.
Tactical Athletes With SVT and AF
Specific Clinical Considerations
1. Tactical athletes diagnosed with AF should be managed in accordance with guidelines for the general and competitive athlete populations, including addressing risk factors such as hypertension, obstructive sleep apnea, hyperthyroidism, and alcohol intake.
2. Continuation of tactical tasks during the initial evaluation is reasonable among tactical athletes with SVT, including AF, who are asymptomatic on presentation and clinically stable.
3. Initial assessment for SVT, including AF, should include an ECG, echocardiogram, and ambulatory rhythm monitoring. Maximal exertion exercise testing, tailored to tactical tasks, is reasonable to include in the evaluation to assist with symptom assessment.
4. If tasks were restricted because of symptoms or clinical instability, then return to tactical tasks is reasonable once the tactical athlete is asymptomatic and clinically stable, such as after lifestyle modifications, initiation of pharmacologic therapies, or both, as appropriate.
5. Symptoms, quality of life, and ability to tolerate pharmacologic therapy should be incorporated into treatment decisions for possible ablation among tactical athletes with SVT including AF.
6. Among tactical athletes with symptomatic AF unresponsive to lifestyle changes (ie, alcohol cessation, weight loss) or if antiarrhythmic drugs are contraindicated or poorly tolerated, catheter ablation should be first-line therapy.
7. After successful catheter ablation for AF or SVT in the tactical athlete, graduated return to tactical tasks should be performed after access site wound healing (typically 10–14 d for venous access). TCM decisions on return to tactical tasks should incorporate the possible increased risk of recurrence of AF in the short term after an ablation procedure (ie, 3 mo).
8. Anticoagulation should be administered to reduce stroke risk based on AF guidelines for the general population. Tactical athletes requiring anticoagulation should not return to tactical tasks that have a high risk of bodily collision and injury or penetrating trauma (Section 1). When in an austere location without direct access to emergency medical care, bleeding risk should be incorporated in TCM. Possible management would include extracting the tactical athlete from the environment to ensure safe continuance of the clinically indicated anticoagulation.
9. LAO is reasonable among tactical athletes with an elevated stroke risk and contraindication to long-term anticoagulation (ie, high bleeding risk). For tactical athletes who undergo LAO and are able to successfully discontinue oral anticoagulation per standard practice after the procedure, it is reasonable to return to all tactical tasks.
Tactical Athletes With Pacemakers, ICDs, or Both
1. The decision on location and type of CIED (ie, transvenous versus subcutaneous ICD, or transvenous versus leadless PPM) should weigh the risks of trauma to the device based on the anticipated tactical tasks and the potential need for pacing capabilities based on the underlying pathologic substrate. Return to tactical tasks can be considered 4–8 wk after placement of a CIED and 2 wk after a generator change.
2. If a tactical athlete has a PPM, regardless of PPM dependence, then return to tactical tasks considerations should include assessment of the risk of trauma to transvenous lead systems and potential risk to the tactical athlete, others in their team, and the mission if they should have a device malfunction.
3. For tactical athletes with ICDs, it is reasonable to consider performing vigorous activities that are not considered high risk for trauma to the device or leads. Considerations impacting return to tactical tasks should weigh the risks versus benefits for occupations where brief incapacitation or ICD shocks may have devastating consequences (ie, single seat pilot), occupations where there may be a high risk of collision or bodily injury (Section 1), or remote locations without nearby access to medical care.
4. Unique exposures that may lead to electromagnetic interference should be incorporated in TCM among all tactical athletes with CIEDs (ie, PPM, ICD), because this may impair device functionality during duties.

AF indicates atrial fibrillation; ARVC, arrhythmogenic right ventricular cardiomyopathy; CIED, cardiac implantable electronic device; CMR, cardiac magnetic resonance; ECG, electrocardiogram; HCM, hypertrophic cardiomyopathy; ICD, implantable cardioverter-defibrillator; ILR, implantable loop recorder; LAO, left atrial appendage occlusion; LVEF, left ventricular ejection fraction; PED/S, performance-enhancing drugs and supplements; PPM, permanent pacemaker; PVC, premature ventricular contraction; SCA, sudden cardiac arrest; SCD, sudden cardiac death; SVT, supraventricular tachycardia; TCM, tactical clinical management; VT/VF, ventricular tachycardia/ventricular fibrillation; and WPW, Wolff-Parkinson-White.

Table 22. AHA 2026 Statement for the Care of Athletes. Distinguishing Between Low- and High-Risk Ventricular Arrhythmias

Low-Risk Features	High-Risk Features
Clinical Characteristics	
Asymptomatic	Presyncope, syncope, dyspnea, or sudden onset exercise intolerance
Infrequent palpitations	Sustained or frequent rapid palpitations
No history suggestive of inherited heart disease	Family history of collapse, syncope, SCD, or cardiomyopathy
Electrophysiologic Characteristics	
Typical morphology consistent with: Outflow tract: LBBB pattern, inferior axis, transition $<V_4$ favors LV outflow tract and $\geq V_4$ favors RV outflow tract Fascicular morphology: RBBB pattern, QRS duration typically <130 ms, inferior axis (anterior fascicle), superior axis (posterior fascicle).	Atypical morphology consistent with: RV free wall or moderator band: LBBB with intermediate or superior axis LV cardiomyopathy: RBBB with wide QRS (>130 ms) Papillary muscles: RBBB, QRS >130 ms, midprecordial transition, inferior axis (anterolateral papillary muscle), superior axis (posteromedial papillary muscle)
Monomorphic PVCs or short runs of NSVT at subphysiologic maximum heart rate	Polymorphic, repetitive, short coupling interval (<360 ms)
Normal ECG	Abnormal ECG (other than PVCs), including low voltages
Low burden of PVCs	High burden of PVCs ($>10\%$ burden)
Exercise Testing Findings	
Suppression of PVCs with exercise	Nonsuppression, new emergence of PVCs with exercise, or increased burden of PVCs during exercise
No symptoms and normal hemodynamics	Symptoms of sudden onset exercise intolerance associated with emergence of arrhythmias
Echocardiographic Findings	
Normal cardiac structure and function for an athlete (includes exercise-induced cardiac remodeling)	Pathologic wall thickness or ventricular dilation, wall segmental abnormalities; reduced LV systolic function
Clear augmentation of biventricular function with exercise	Reduced contractile reserve (limited or absent augmentation of ventricular function with exercise) of LV, RV, or both
CMR Imaging Findings	
Normal cardiac structure and function for an athlete (includes exercise-induced cardiac remodeling)	Pathologic wall thickness or ventricular dilation, wall segmental abnormalities
No evidence of postcontrast enhancement (excluding the RV insertion point), normal parametric mapping (T_1 , T_2 , ECV)	LGE, particularly mid-wall or epicardial enhancement, abnormal parametric mapping (increased T_1 , T_2 , ECV, or all of them)
Invasive Electrophysiologic Characteristics	
Focal arrhythmogenic site	Multiple inducible arrhythmias
Catecholamine triggering of focal site	Catecholamine triggering of rapid polymorphic arrhythmias
Normal electro-anatomical mapping	Low-voltage regions (can be associated with arrhythmogenic epicardial pathology in endurance athletes)

Adapted with permission from the “2024 HRS Expert Consensus Statement on Arrhythmias in the Athlete: Evaluation, Treatment, and Return to Play.”

ECG indicates electrocardiogram; ECV, extracellular volume, HRS, Heart Rhythm Society; LBBB, left bundle branch block; LGE, late gadolinium enhancement; LV, left ventricle; NSVT, nonsustained ventricular tachycardia; PVC, premature ventricular contraction; RBBB, right bundle branch block; RV, right ventricle; and SCD, sudden cardiac death.

Table 23. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for Tactical Athletes With a Cardiac Channelopathy

General Clinical Considerations
1. Tactical athletes with a cardiac channelopathy, including LQTS, CPVT, and Brugada syndrome, should be assessed by a cardiologist, heart rhythm specialist, a genetic cardiologist with expertise in cardiac channelopathies, or all of them to confirm the diagnosis, assess risk, optimize medical therapy, and follow longitudinally.
2. Fit for full duty assessments should include a channelopathy expert and a physician familiar with the requirements of the specific tasks needed to fulfill the duties, because the details unique to a task and associated cardiovascular strain amplifiers (ie, austere environment, including access to medications and hydration status) may augment the risk in tactical athletes with a channelopathy.
3. TCM should integrate the severity of the channelopathy, tactical task-specific considerations, and the risk of a potential arrhythmia for a catastrophic outcome on the tactical team and mission.
4. In tactical athletes diagnosed with a cardiac channelopathy, an ICD should not be implanted for the sole purpose of returning to tactical tasks.
5. Ongoing surveillance, education, and reassessment should be performed at least annually for tactical athletes with cardiac channelopathies under the care of an expert.
6. If the treatment plan for a tactical athlete includes an ICD, refer to Section 8 for related considerations.
LQTS
Specific Clinical Considerations
1. Tactical athletes with LQTS should be educated about the importance of hydration, electrolyte replacement, and avoidance of medications known to prolong the QT interval.
2. For tactical athletes with a positive genetic test for LQTS and a resting QTc <460 ms (ie, genotype positive/phenotype negative), it is reasonable to return to all tactical tasks after stabilization on GDMT.
3. In asymptomatic tactical athletes with LQTS, irrespective of genotype status, who are phenotype positive but with a resting QTc <500 ms (ie, 460-499 ms), [*] a return to tactical tasks is reasonable using TCM framework after risk stratification and implementation of GDMT.
4. In tactical athletes with LQTS, irrespective of genotype status, who are phenotype positive with a resting QTc ≥500 ms, [*] risks may outweigh benefits for strenuous tasks with moderate or high-endurance effort (ie, avoid I-IIIB&C) or tactical tasks that expose the athlete to any cardiovascular strain amplifiers.
5. In previously symptomatic (presumed arrhythmic syncope) tactical athletes with LQTS and a resting QTc <500 ms, return to tactical tasks can be considered through TCM after initiation of GDMT and no recurrent events for 3 mo.
6. Tactical athletes with LQT1 and a resting QTc ≥460 ms should not participate in tasks that require swimming or diving.
CPVT
Specific Clinical Considerations
1. Intense, burst-like tactical tasks and anticipated cardiovascular strain amplifiers should be reviewed through TCM for any tactical athletes with CPVT.
2. For asymptomatic tactical athletes with a positive genetic test for CPVT but no exercise-induced ventricular ectopy on exercise stress testing [†] (ie, genotype positive/phenotype negative), it is reasonable to return to tactical tasks after consideration of prophylactic CPVT-directed medical therapy and under surveillance of an expert.
3. In asymptomatic tactical athletes with CPVT who have evidence of exercise-induced ventricular arrhythmias (including ventricular bigeminy or nonsustained VT) on stress testing but experience normalization of the stress test [‡] after initiation and optimization of GDMT, a return to tactical tasks can be considered through TCM.
4. In tactical athletes with previously symptomatic CPVT (arrhythmic syncope), a return to tactical tasks can be considered after optimization of CPVT therapies, normalization of the stress test, [‡] and no events for 3 mo after GDMT initiation. Combination therapy with beta blocker and flecainide, and the addition of LCSD can be considered.
5. In tactical athletes with CPVT and ongoing evidence of exercise-induced ventricular arrhythmias, risks outweigh benefits for participation in tactical tasks that require more than low-endurance, low-strength effort (ie, limit to IA).
6. Tactical athletes with CPVT should not participate in tactical tasks that require swimming or diving, regardless of treatment effect.
Brugada syndrome
Specific Clinical Considerations
1. Tactical athletes with Brugada syndrome should be educated about the importance of antipyretic use during a fever, avoiding medications that increase the risk of ventricular arrhythmias, and avoiding cocaine, cannabis, and excessive alcohol use.
2. For tactical athletes with any genetic or ECG manifestation of Brugada, regardless of symptoms, the risks likely outweigh the benefits for tactical tasks that could lead to sustained increases in core body temperature (ie, avoid sustained higher-intensity endurance tasks, extreme heat environments and high cardiovascular strain amplifiers).
3. For asymptomatic tactical athletes with any genetic or ECG manifestation of Brugada, it is reasonable to return to tactical tasks which do not carry risk of overheating.
4. In tactical athletes with previously symptomatic Brugada syndrome (ie, arrhythmic syncope, ventricular arrhythmias and/or aborted/resuscitated cardiac arrest), a return to tactical tasks without risk of overheating can be considered after implementation of appropriate precautionary measures, disease-specific treatment, and the tactical athlete has been asymptomatic with no events for at least 3 months.

^{*}With sinus bradycardia (heart rate <60 bpm), standard QTc correction with Bazett's formula may underestimate the actual QTc. Based on clinical suspicion and the measured QTc with sinus bradycardia, maneuvers to increase heart rate (ie, leg lifts, brisk walk) should be considered to accurately reassess the QTc with Bazett's formula.

[†]Stress testing should be symptom limited, maximal effort, or both and attempt to reproduce real-world efforts that may include sprints or other maneuvers (ie, carrying weighted backpack). The Bruce protocol

and terminating a stress test based on predetermined maximal heart rate have limited use in this population.

‡Complete normalization of the stress test ideally encompasses complete absence of ectopy. bpm indicates beats per minute; CPVT, indicates catecholaminergic polymorphic ventricular tachycardia; ECG, electrocardiogram; GDMT, guideline-directed medical therapy; ICD, implantable cardioverter-defibrillator; LCSD, left cardiac sympathetic denervation; LQTS, long QT syndrome; LQT1, long QT syndrome type 1; TCM, tactical clinical management; and VT, ventricular tachycardia.

Table 24. AHA 2026 Statement for the Care of Athletes. Clinical Considerations for the Older Tactical Athlete With CVD

General Clinical Considerations
1. The term older tactical athlete (≥ 40 y of age) is used instead of Masters athlete to emphasize the age and professional context of these individuals, rather than a primary focus on competitive sports.
2. In all tactical athletes, consistent physical training should be encouraged to maintain a high level of cardiorespiratory fitness, which reduces the risks associated with activity-associated coronary events.
3. It is reasonable to use established cardiovascular risk scores ^a as a general guide to risk stratify tactical athletes for coronary artery disease. Scores incorporating imaging assessments, such as CAC scoring, are reasonable for more precise evaluations.
4. Eligibility decisions concerning disease in older tactical athletes should include the ability to mitigate and manage the attendant risk, guided by TCM.
Subclinical Coronary Artery Disease
Specific Clinical Considerations
1. Older tactical athletes with low occupational risk (ie, to the mission and team) and low cardiovascular risk do not require additional risk stratification. Careful consideration should be made to thoroughly evaluate for risk-enhancing factors. [†] The frequency of risk reassessment should be at least every 3–5 y.
2. Clinicians can consider additional risk evaluation for older tactical athletes with low cardiac risk but high occupational risk to the mission or team (ie, single seat pilot).
3. Tactical athletes with atherosclerotic coronary artery disease should be counseled on appropriate guideline-based lifestyle modifications (ie, smoking cessation, diet, alcohol reduction), treated with GDMT, and counseled on symptoms that may indicate underlying ischemic heart disease.
4. For older tactical athletes deemed to be at an intermediate or high cardiovascular risk or anticipated to perform sustained, peak exertion, or higher-intensity tactical tasks where results would inform fit for full duty assessment including possible task reassignment, clinicians should consider further risk stratification. Risk stratification could include CAC scoring, maximal-effort exercise stress tests that mimic the tasks required for the specific tactical athlete, functional stress imaging during peak exercise, coronary computed tomography angiography, or another established noninvasive study to accurately reclassify cardiovascular risk.
Chronic Stable Coronary Artery Disease
Specific Clinical Considerations
1. Similar to competitive athletes, it is reasonable for older tactical athletes, who are asymptomatic with chronic stable coronary artery disease and are optimized on GDMT, to participate in unrestricted activity if they have normal LV systolic function, no inducible ventricular arrhythmias, no regional wall motion abnormalities, and no signs of ischemia during maximal-effort exercise stress testing. Unlike competitive athletes, tactical athletes must also ensure that their cardiovascular stability aligns with the unpredictable, often unscheduled, and high-intensity demands of their profession.
2. For those with chronic stable coronary artery disease who exhibit high-risk features, [‡] clinicians should limit tactical tasks to individualized intensities that do not provoke signs or symptoms of ischemia. For individuals participating in high-risk tactical tasks (ie, single seat pilot), it is reasonable to further restrict participation because of the elevated risk of critical or catastrophic outcomes.
3. For those showing signs of obstructive coronary artery disease (ie, ischemia or cardiac symptoms), revascularization is reasonable to consider, along with lifestyle changes and medical treatment, through TCM.
4. After revascularization, older tactical athletes should complete a cardiac rehabilitation program. Periodic reassessment can be considered in these tactical athletes to exclude residual ischemia and ensure clinical stability and, if performed, maximal-effort exercise stress testing should confirm the absence of inducible ventricular arrhythmias, regional wall motion abnormalities, and ischemia.
ACS and Revascularization
Specific Clinical Considerations
1. Older tactical athletes should undertake a structured cardiac rehabilitation exercise program after ACS.
2. Similar to competitive athletes, resumption of tactical tasks is reasonable for those who have completed cardiac rehabilitation and are adhering to GDMT with normal LV systolic function, no inducible complex ventricular arrhythmias, no regional wall motion abnormalities, and no ischemic electrocardiographic changes or symptoms of ischemia during maximal-effort exercise stress testing. Because of the diversity of tactical tasks, stress testing should simulate the demands of the tactical environment and should be performed on therapy.
3. Return to tactical tasks is reasonable after a 3- to 6-mo period after ACS, but this timeframe may vary depending on the promptness of revascularization and the type of intervention. For athletes who demonstrate higher-risk features (ie, extensive or completed myocardial infarction), a longer timeframe can be considered.
4. After ACS, if high-risk features, [‡] risks may outweigh benefits to participate in higher-risk tactical tasks (ie, single seat pilot, tasks in austere environments, or other high cardiovascular strain amplifiers). Additional customized testing that simulates the demands of the tactical task for further risk stratification is reasonable.
Antithrombotic Therapy
Specific Clinical Considerations
1. In situations where short-duration deployments are necessary, a temporary halt in the use of anticoagulants and antiplatelet agents can be considered if the clinical risk of stopping these medications is deemed low. However, this decision is complex and should take into account factors such as the duration and unpredictability of the deployment, the underlying indication for these medications, and the individual's overall health status. The decision should be made collaboratively, involving all stakeholders, with careful consideration of the risk of potential injury and the clinical implications of discontinuing therapy.
2. For older tactical athletes on antiplatelet monotherapy, engagement in tactical activities is reasonable. However, the decision should be highly individualized, considering the specific tactical tasks and associated operational risk.
3. In those without established atherosclerosis, primary prevention aspirin should not be prescribed, because the bleeding risks may outweigh uncertain cardiovascular benefits.

AF**Specific Clinical Considerations**

1. It is reasonable to continue tactical tasks during clinical evaluation of AF if asymptomatic and clinically stable.
2. Older tactical athletes with a history of endurance activity may be at an increased risk of AF and other atrial arrhythmias. Therefore, clinicians should maintain a high index of suspicion for AF and other atrial arrhythmias in older tactical athletes with a history of endurance activity, particularly when evaluating symptoms like palpitations, fatigue, or decreased exercise tolerance.
3. When feasible, older tactical athletes with a history of paroxysmal AF or other atrial arrhythmia should allow adequate time for environmental adaptation and proactively manage volume depletion when operating in austere environments with extreme temperatures, altitude, or hydration challenges, because these factors can exacerbate AF or trigger arrhythmias.
4. In older tactical athletes with stroke risk factors (ie, hypertension, vascular disease), it is reasonable to consider formal ambulatory rhythm monitoring in response to abnormal data from consumer-based wearable devices, particularly to confirm the presence or absence of paroxysmal AF in individuals with asymptomatic, minimal, or ill-defined symptoms where an AF diagnosis would warrant an evaluation for anticoagulation.

Thoracic Aortic Dilation and Aneurysm**General Clinical Considerations**

1. Older tactical athletes with a history of endurance activities may present with thoracic aortic dimensions that exceed expected normative values.
2. Athletes with thoracic aortic dilation or aneurysms should undergo monitoring for hypertension and appropriate treatment as indicated by established guidelines.
3. Clinicians should use longitudinal imaging to monitor aortic growth and measure absolute aortic dimensions for all older tactical athletes with enlarged aortas. The tactical athlete's age, sex, body size, aortic diameter, and aortic growth rate should be considered when making tactical task recommendations.
4. Older tactical athletes with unexplained thoracic aortic dilation should undergo evaluation for underlying aortopathy or heritable TAD. For evaluation of thoracic aortic dilation and aneurysm, refer to Section 7.
5. Older tactical athletes with unexplained moderate thoracic aortic dilation (42–44 mm) can perform tactical tasks without restrictions.
5. Through TCM and expert consultation, older tactical athletes with unexplained moderate to severe thoracic aortic dilation (45–49 mm) can consider participation in tactical tasks that do not have high-strength components (ie, avoid IIIA-C) or high cardiovascular strain amplifiers.
6. For older tactical athletes with unexplained severe thoracic aortic dilation (≥ 50 mm), risks likely outweigh benefits for participation in moderate- or high-strength tactical tasks (ie, avoid II-III A-C) or tasks with moderate or high cardiovascular strain amplifiers.

Chronic Mitral and Aortic Valve Disease**Specific Clinical Considerations**

1. For older tactical athletes with chronic VHD, including aortic valve regurgitation, aortic valve stenosis, mitral valve regurgitation, or mitral valve stenosis, careful management and monitoring of these conditions should be performed. Clinicians should follow established guidelines for the management of patients with VHD. Refer to Section 5 for additional guidance.
2. For older tactical athletes requiring heart valve replacement, the choice of prosthetic valve should be grounded in TCM. This discussion should carefully consider the athlete's values, preferences, and the risks and benefits of anticoagulant therapy or potential valve reintervention. However, the athlete's occupational organization will ultimately determine postsurgical occupational eligibility and long-term career implications.
3. Unrestricted tactical tasks can be resumed by older tactical athletes with a well-functioning aortic or mitral bioprosthetic valve or after mitral valve repair, once complete sternal healing has occurred and after the confirmation of a well-functioning valve prosthesis.

*CVD risk assessments (% risk per decade) have not yet been validated for older tactical athletes but are reasonable to apply to the tactical athlete population. In the general population, the risk categories are defined as follows:

- Low Risk: <3% according to the PREVENT trial, <5% according to the ASCVD pooled cohort and Astro-CHARM trial, and <1% according to SCORE.
- Intermediate Risk: 7.5%–20% according to ASCVD pooled cohort, 5%–10% according to PREVENT, 5%–7.5% according to the Astro-CHARM trial, or SCORE between 1% and <5%.
- High Risk: >20% according to ASCVD pooled cohort, $\geq 10\%$ according to PREVENT, $\geq 7.5\%$ according to the Astro-CHARM trial, or $\geq 5\%$ according to SCORE.

Additionally, a family history of early coronary artery disease is considered a high-risk factor.

†Risk-enhancing factors have been established in the “2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease” and the “2021 ESC Guidelines on Cardiovascular Disease Prevention in Clinical Practice.”^{20,199}

‡High-risk ischemic features extend to include: reduced LV systolic function, complex ventricular arrhythmias at rest or with exercise, regional wall motion abnormalities, signs of ischemia on ECG during exercise, or significant ischemic scars on imaging.

ACC indicates American College of Cardiology; ACS, acute coronary syndrome; AF, atrial fibrillation; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; ASTRO-CHARM, Astronaut Cardiovascular Health and Risk Modification; CAC, coronary artery calcium; CVD, cardiovascular disease; ESC, European Society of Cardiology; GDMT, guideline-directed medical therapy; LV, left ventricular; PREVENT, Predicting Risk of Cardiovascular Disease EVENTS; SCORE, Systemic Coronary Risk Evaluation; TAD, thoracic aortic disease; TCM, tactical clinical management; and VHD, valvular heart disease.

Table 25. AHA 2026 Statement for the Care of Athletes. Environmental Exposures, PED/S, and Additional Cardiac Conditions and Considerations

Hypertension
Specific Clinical Considerations
1. The evaluation, diagnosis, and management of hypertension should be consistent with current guidelines, including routine follow-up. Secondary causes, including obstructive sleep apnea or sleep disturbances with shift work, psychological stress, alcohol, other lifestyle factors, or all of these, should be considered.
2. Lifestyle interventions should be implemented for tactical athletes with hypertension. However, because these may not be practical in austere environments, lower thresholds for pharmacologic interventions can be considered.
3. Tactical tasks can continue with elevated BP (ie, SBP 120–129 mmHg and DBP <80 mmHg)
4. It is reasonable for tactical athletes with Stage 1 hypertension (SBP 130–139 mmHg or DBP 80–89 mmHg) and Stage 2 hypertension (SBP ≥140 mmHg or DBP ≥90 mmHg) to continue all tactical tasks. Contemporary hypertension guidelines should be followed.
5. If uncontrolled hypertension and acute target-organ damage is identified with risk of deterioration, risks likely outweigh benefits to work in austere locations or environmental extremes until cardiovascular risk is optimized.
6. Given the risks associated with target-organ damage, screening ECG should be performed in all tactical athletes with hypertension to assess for adverse cardiac remodeling such as left ventricular hypertrophy. It is reasonable to consider screening echocardiogram if Stage 2 hypertension or higher is present. In Stage 1 hypertension, screening ECG can be considered if additional cardiovascular risk factors are present.
7. Tactical athletes with hypertensive emergency (SBP >180 mmHg or DBP >110 mmHg in the presence of acute target-organ dysfunction) should not engage in tactical tasks until controlled. It is reasonable to consider reintroduction to tactical tasks, including austere environments or environmental extremes, once BP remains controlled for a period of time (ie, ≥4 wk, based on expert opinion). Medical evacuation should be conducted for tactical athletes with hypertensive emergency and may be considered for selected cases of elevated BP if in austere environments, environmental extremes, or both.
8. If a medication or supplement is prohibited by the employer but is deemed medically necessary by a clinician, then risks and benefits with and without the medication or supplement should be considered through TCM.
Orthostatic Hypotension
Specific Clinical Considerations
1. Limitations in tactical tasks can be considered in tactical athletes with orthostatic hypotension or impaired autonomic regulation especially if there is potential for exposure to moderate or high cardiovascular strain amplifiers. Risks may outweigh benefits for tactical tasks that include exposure to extreme heat, volume depletion, or excessive gravitational forces.
2. Tilt table testing should not be used routinely for evaluation especially with use of trinitro glycerol because of insufficient evidence to support diagnostic accuracy. Routine bedside assessment of orthostatic vital signs, both supine and after ≥5 min of standing, should be performed.
VTE
Specific Clinical Considerations
1. Tactical athletes with VTE, including deep venous thrombosis or pulmonary embolus, should undergo comprehensive evaluation and treatment in accordance with contemporary guidelines. Clinicians can consider tactical task modifications to ensure safe and adequate treatment.
2. History of VTE, risk of recurrence (ie, history of unprovoked VTE or VTE without identified modifiable risk factors), and indications for ongoing therapeutic anticoagulation should be reviewed at periodic examinations.
3. Risk of bleeding likely outweighs benefits for participation in tactical tasks with increased risk of collision and projectile impact (Section 1) or deployment to austere environments for those requiring therapeutic anticoagulation.
4. Clinicians should not routinely interrupt or prematurely discontinue therapeutic anticoagulation for the sole purpose of facilitating earlier participation in tactical tasks. If long-term anticoagulation is indicated after completion of therapy for an acute VTE, then temporary cessation in therapy, such as for short-duration deployments, can be considered if the risk of stopping anticoagulation is deemed low.
5. If concerns about right heart strain or pulmonary hypertension based on symptoms, physical examination, or both arise, additional imaging should be performed.
PED/S
Specific Clinical Considerations
1. Tactical athletes should be counseled on the potential toxicities and risks of PED/S.
2. Select PED/S, such as stimulants, may be recommended situationally by commands for sustained operations that are outside of normal operating conditions and, in those instances, the clinician and tactical athlete should discuss risks and benefits. Any underlying CVD should be optimized before consideration of PED/S.
3. Electrocardiographic screening should not be performed for the sole purpose of using PED/S.
4. Many herbal and other supplements have cardiovascular adverse effects and risks are unknown; tactical athletes should be counseled on these limitations.
5. Tactical athletes should be aware of drug testing protocols and regulations specific to their department and occupation, including understanding banned substances.
Extreme Environments
Specific Clinical Considerations
1. Clinicians caring for tactical athletes should understand the normal cardiovascular physiologic responses to different environments. Table 15 lists acute and chronic cardiovascular adaptations and physiologic stressors that should be integrated into the overall risk assessment. CVD should be optimized before consideration of training in extreme environments.
2. Clinicians can consider additional cardiovascular risk stratification, such as maximal-effort exercise stress testing, before extreme environmental exposure if intermediate or higher risk for CVD based on initial evaluation or if exercise capacity is unknown.

3. Clinicians should be aware of the potential limitations for pharmacologic medication availability in austere environments and incorporate this into fit for full duty decision-making.
4. Presence of pulmonary hypertension (PVR >3 W), unstable angina, decompensated heart failure, uncontrolled arrhythmia, or concerning cardiopulmonary symptoms are examples of cardiovascular conditions where tactical athletes should not enter extreme environmental environments without further evaluation and management.
5. TCM for tactical athletes with CVD should include a personalized EAP, especially when traveling to austere locations with environmental exposures.
6. Routine screening for patent foramen ovale should not be performed in asymptomatic tactical athletes. Routine closure for the sake of participating in decompression activities should not be performed.
7. Clinicians should not routinely evaluate for shunt in symptomatic athletes who have exertional hypoxia (because of concern for incidentally identified atrial septal defect and patent foramen ovale of uncertain clinical significance). However, screening for shunt can be considered if recurrent decompression illness when diving.
SCT
Specific Clinical Considerations
1. Clinicians should be aware that individuals with SCT have an increased relative risk of exertional rhabdomyolysis and exertional collapse, particularly under extreme physical stress, although the absolute risk of exertional sudden death is rare. Asymptomatic tactical athletes with SCT may fully participate in all tasks.
2. Universal preventive strategies, which may benefit all athletes, including attention to graduated exercise and environmental acclimatization, and the provision of adequate hydration, should be used for those with known SCT.
3. EAP should include preparations for a collapse associated with SCT, with particular caution exercised when tactical athletes are participating or training in high environmental temperatures or at high or extreme altitude.

BP indicates blood pressure; CVD, cardiovascular disease; DBP, diastolic blood pressure; EAP, emergency action plan; ECG, electrocardiogram; PED/S, performance-enhancing drugs and supplements; PVR, pulmonary vascular resistance; SBP, systolic blood pressure; SCT, sickle cell trait; TCM, tactical care management; and VTE, venous thromboembolism.

Table 26. AHA 2026 Statement for the Care of Athletes. Cardiovascular Physiology and Exacerbations With Different Environmental Exposures and Preventive Measures

Environment	Cardiovascular Physiologic Response (Acute Exposure)	Cardiovascular Physiologic Response (Chronic Exposure)	Cardiovascular Conditions Exacerbated	Physiologic Stressors	Preventive Measures
Altitude*	Increased heart rate Increased cardiac output Decreased BP and peripheral resistance Diuresis Increased ventilation	Increased BP and peripheral resistance Decreased cardiac output and stroke volume Decreased heart rate Increased hemoglobin and hematocrit (because of EPO) Increased pulmonary artery pressure Increased ventilation	Pulmonary hypertension Heart failure Unstable coronary artery disease Hypertension	Dehydration Resting hypoxia Disturbed sleep	Behavioral Acclimatization Sauna training and plasma volume expansion Supplemental oxygen Avoid alcohol Hypoxic preconditioning Staged ascent (sleeping low) Pharmacologic Low-dose dexamethasone Acetazolamide Nifedipine
Diving	Increased preload and afterload Increased cardiac output		Heart failure Hypertension LQT1		Avoid tight wet suit Avoid overhydration Avoid salt loading or salt tablets
Heat	Increased heart rate Increased cardiac output Increased mean arterial pressure Peripheral vasodilation Decreased venous return Acute mental status change (exertional heat stroke)		Orthostatic intolerance Conditions exacerbated by dehydration/electrolyte disturbance (ie, Brugada syndrome)	Dehydration/hypovolemia	Improve baseline Vo_2max Exertional and environmental acclimatization Consider sauna training and plasma volume expansion
Cold	Vasoconstriction Decreased heart rate	Paradoxical sense of warmth or urge to remove layers during severe hypothermia	Hypertension Raynaud's syndrome	Dehydration Inadequate sleep Moisture	Moisture-wicking underlayers Cover exposed skin as much as possible Avoid wind Avoid wetness Hydration Frequent breaks to rewarm
Microgravity (ie, space flight)	~Hours to few weeks Dehydration Decreased peripheral vascular resistance (compared with upright position but increased compared with supine position) Cardiovascular impact of vomiting from motion sickness	~1–6 mo Cardiac atrophy (assuming no countermeasures) Small reduction in aerobic power SANS Venous redistribution and less venous pressure variability with possible thrombosis Decreased peak aerobic exercise capacity Atrial dilation Months to years Indeterminate	Orthostatic intolerance on return to Earth	Microgravity fluid shifts Isolation Confinement Radiation (situationally dependent on spacecraft/habitat design and location) Loss of sleep Deconditioning	Regular exercise regimen in space for exercise capacity and vascular remodeling Countermeasures Salt and water loading before reentry (no salt tablets) Compression garments for orthostasis Avoid QT prolonging medications Restore venous pressure dynamics, (eg nighttime LBNP for ocular changes)
Increased gravitational load (ie, high accelerations for some pilots)	Decreased preload, drop in cardiac output		Tachyarrhythmia Aortic aneurysm Ischemia in the setting of coronary artery disease Valvular regurgitation and stenosis		G-suit (pressurized suit) Testing and training in centrifuge (anti-G straining maneuver)

BP indicates blood pressure; EPO, erythropoietin; LBNP, lower body negative pressure; LQT1, long QT syndrome type 1; SANS, spaceflight associated neuro-ocular syndrome; and Vo_2max , maximal oxygen uptake.

*Altitude definitions: low 500-2 000 m; moderate 2 000-3 000 m; high 3 000-5 500 m; extreme >5 500 m.