

# 26<sup>ème</sup> soirée de cardiologie du sport

## Web-Conférence



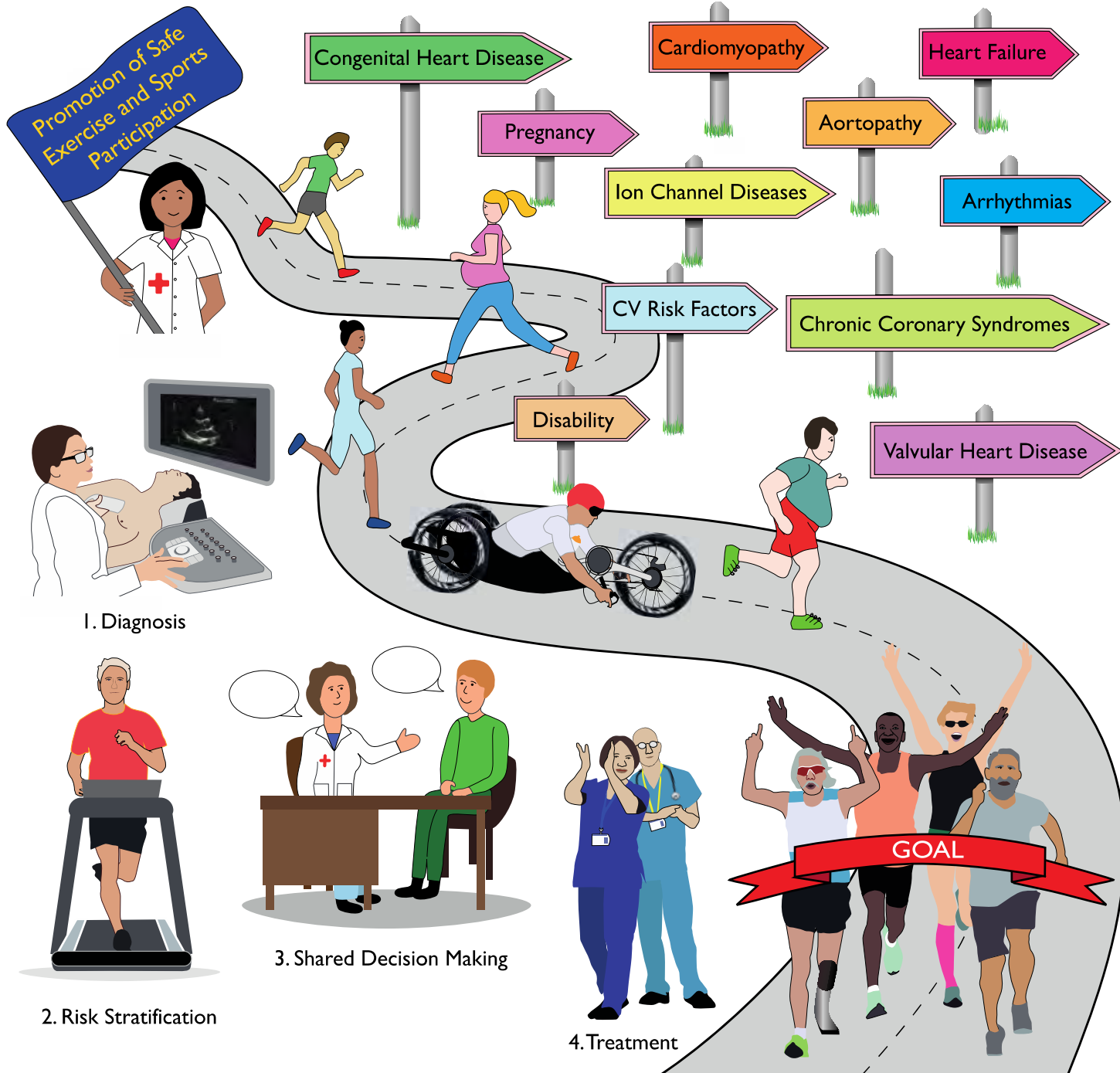
**Frédéric Cransac – Christophe Hédon  
Alexandre Duparc – Stéphane Cade  
17/12/2020**

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

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

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# Definition ESC of recreational and competitive **athletes**

- young or adult age
- amateur or professional
- engaged in regular exercise training
- participates in official sport competition

## Recreational Athletes

Pleasure/Leisure-Time







## Competitive Athletes

Emphasis on performance and winning  
Elite > 10 h/week



# Sporting discipline in relation to the predominant component and intensity of exercise

	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
MEDIUM	Shooting	(recreational)	Tennis (double)	Mid/long distance running
	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
		Weight lifting	Waterpolo	Rowing
HIGH		Wrestling	Soccer (competitive)	Canoeing
		Boxing	Basketball (competitive)	X-country skiing
			Handball (competitive)	Biathlon
				Triathlon

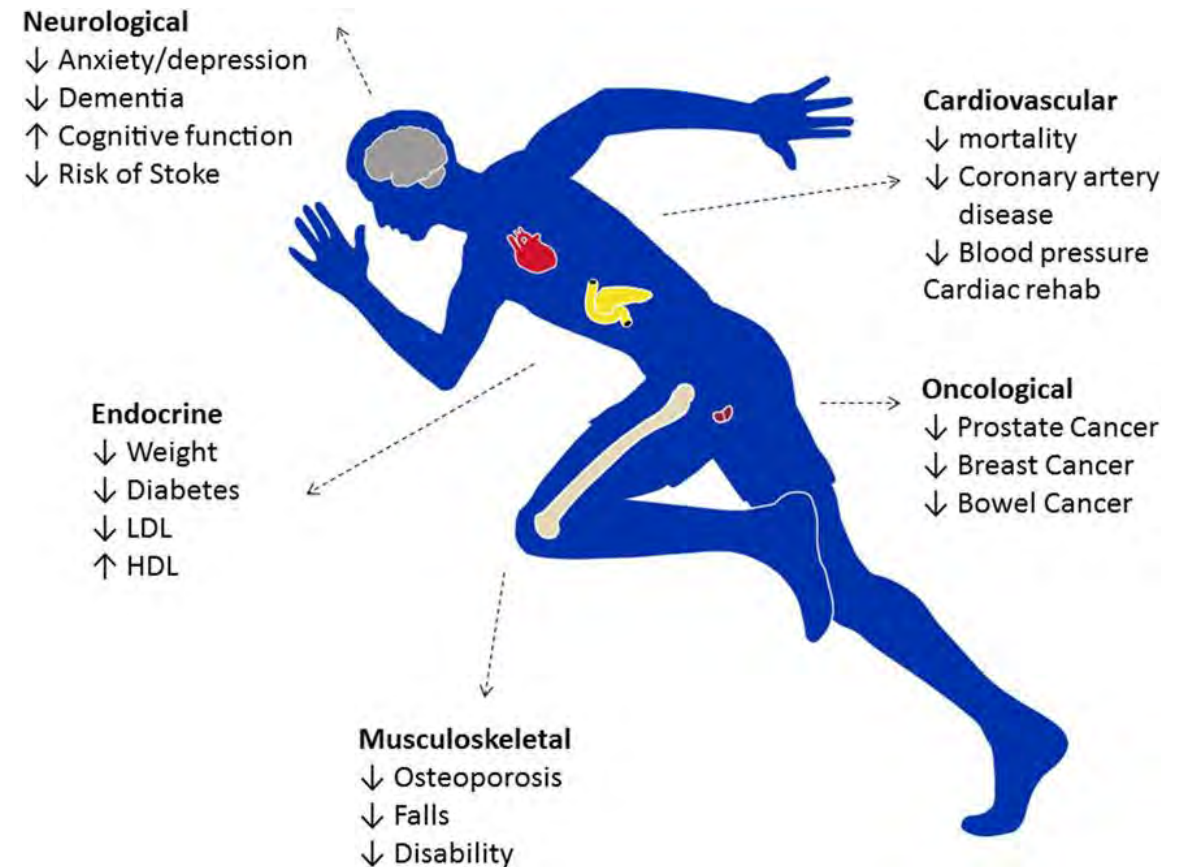
## Indices of exercise intensity for endurance sports from maximal exercise testing

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

■ Low intensity
 ■ Medium intensity
 ■ High intensity

# General recommendations for exercise and sports in healthy individuals

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
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. <sup>113–118</sup>	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 is recommended for additional benefits in healthy adults. <sup>114,116</sup>	I	A
Regular assessment and counselling to promote adherence and, if necessary, to support an increase in exercise volume over time are recommended. <sup>119</sup>	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, are recommended. <sup>113,114</sup>	I	B

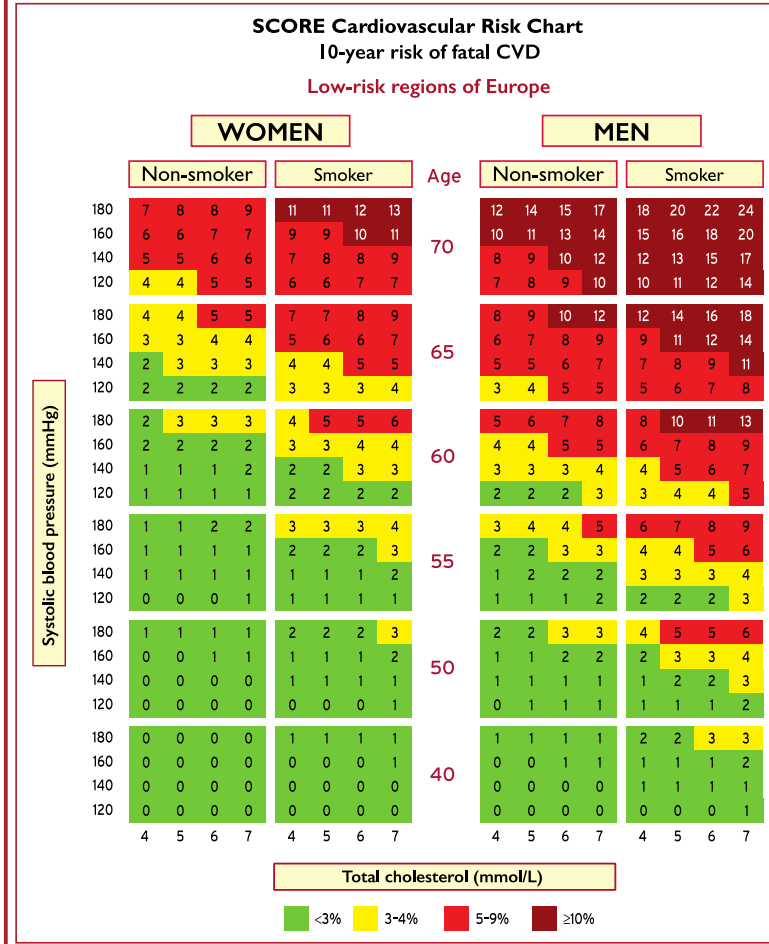
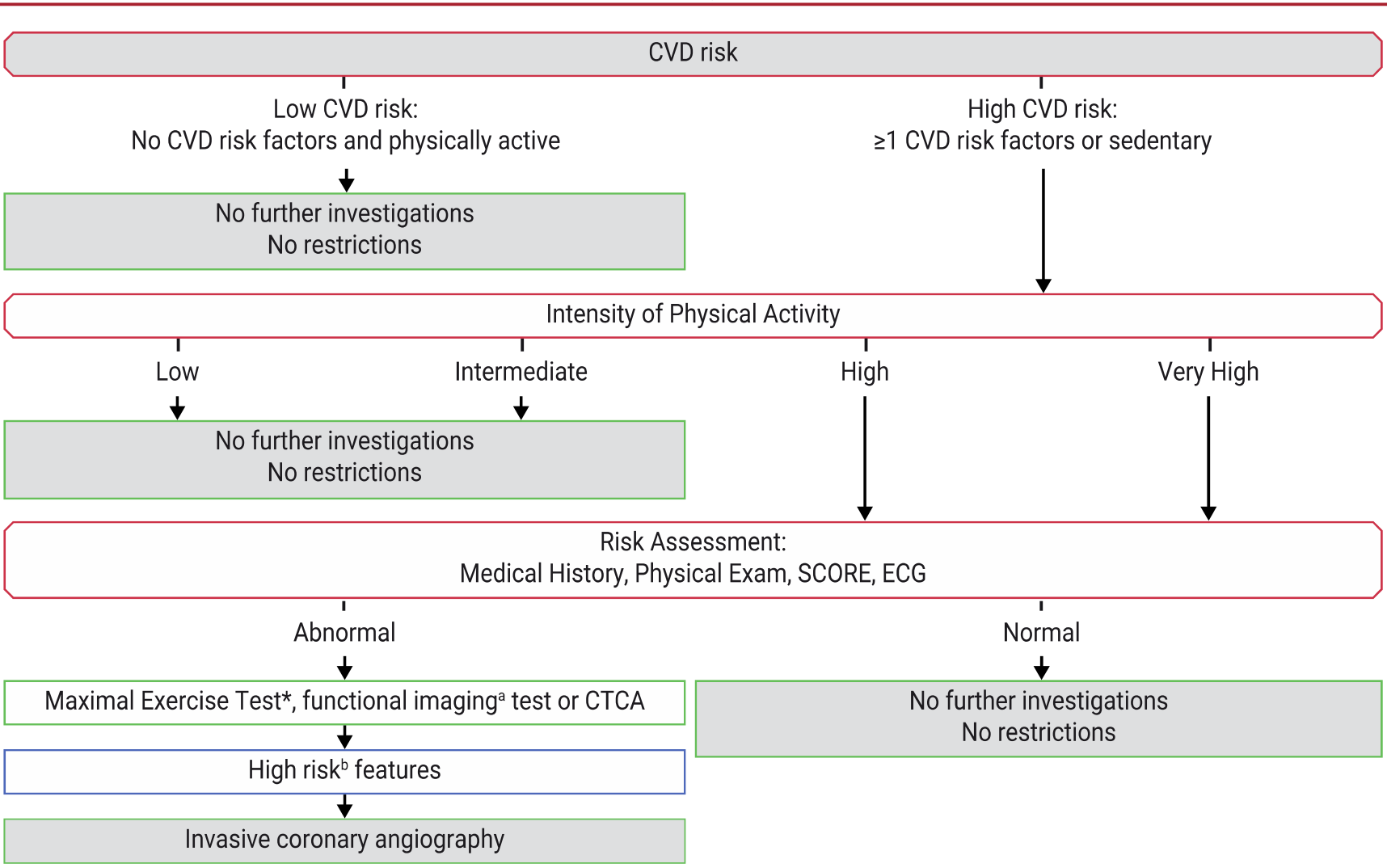


# Exercise and sports in ageing

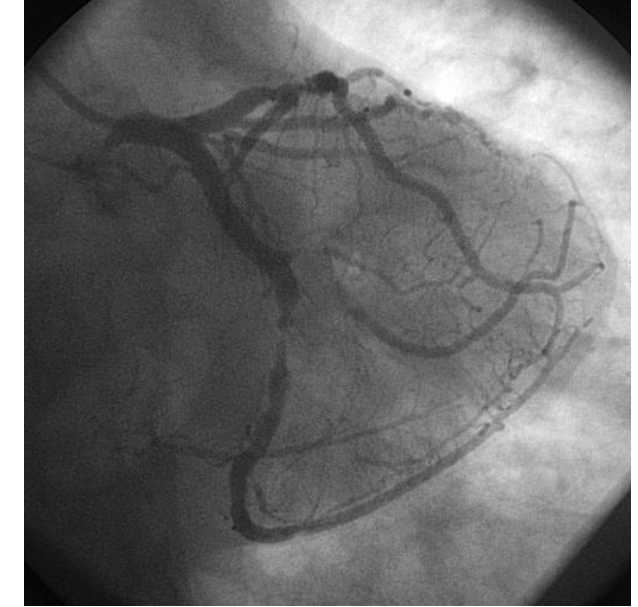
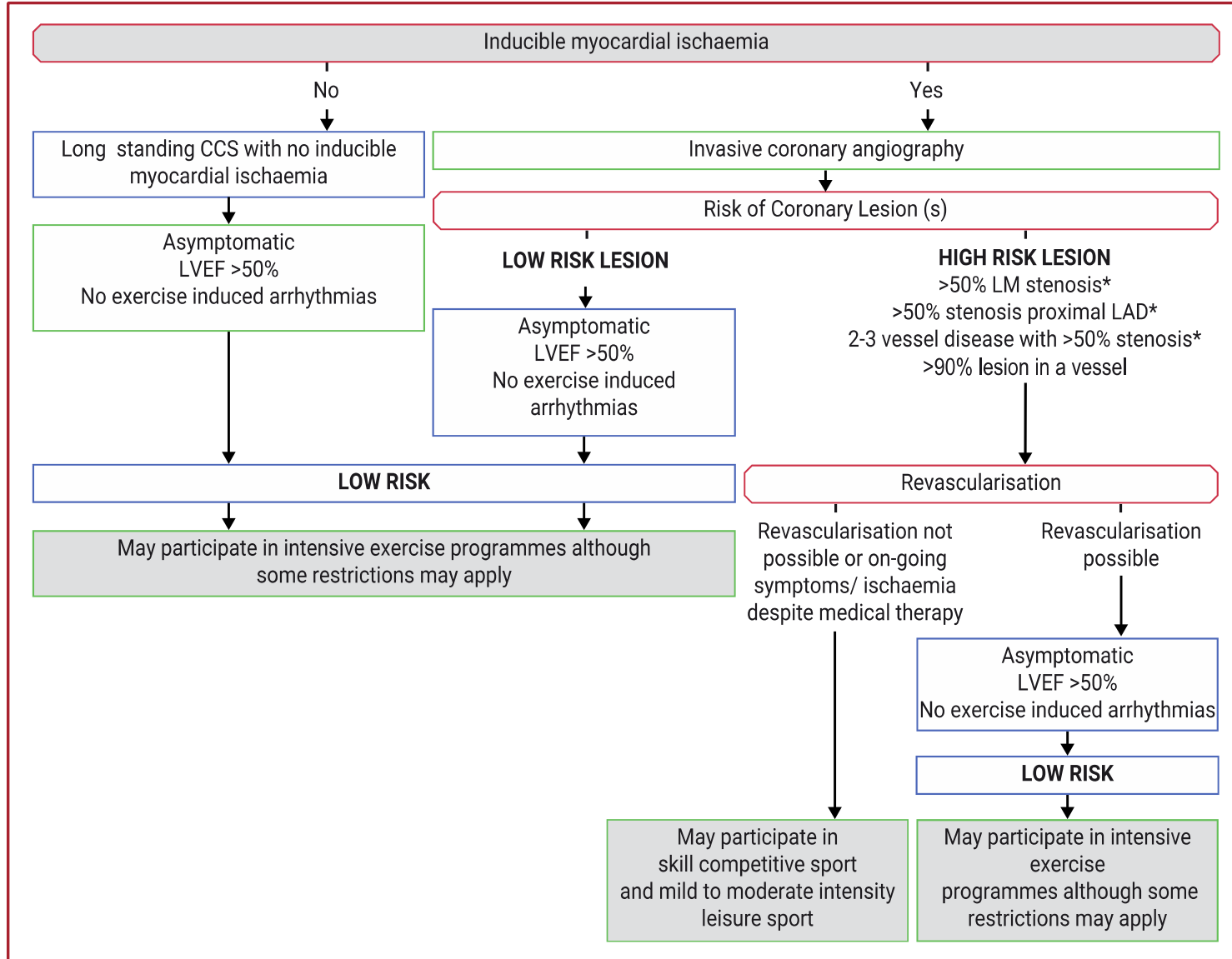
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Among adults aged 65 years or older who are fit and have no health conditions that limit their mobility, moderate-intensity aerobic exercise for at least 150 min/week is recommended. <sup>212,214,215</sup>	<b>I</b>	<b>A</b>
In older adults at risk of falls, strength training exercises to improve balance and coordination on at least 2 days a week are recommended. <sup>201,212,214,215</sup>	<b>I</b>	<b>B</b>
A full clinical assessment including a maximal exercise test should be considered in sedentary adults aged 65 years or older who wish to participate in high-intensity activity.	<b>IIa</b>	<b>C</b>
Continuation of high- and very high-intensity activity, including competitive sports, may be considered in asymptomatic elderly athletes (master athletes) at low or moderate CV risk.	<b>IIb</b>	<b>C</b>



# Algorithm for CV assessment in asymptomatic individuals aged > 35 y with risk factors and possible subclinical CCS before engaging in sports



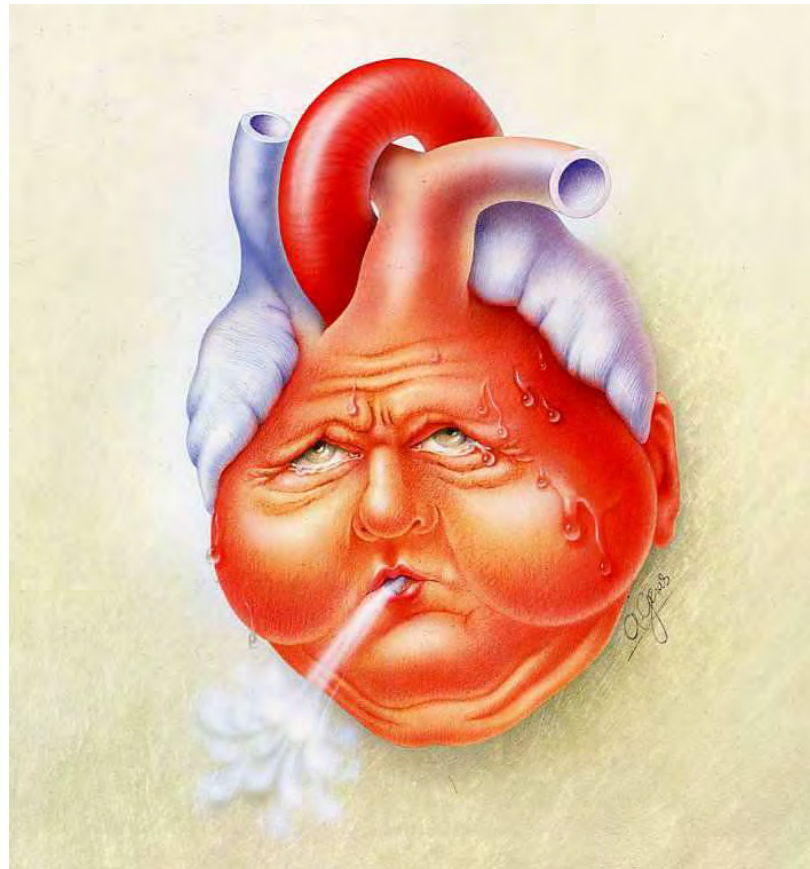
# Clinical evaluation and recommendations for sports participation in individuals with **established coronary artery disease**



# Exercise recommendations in individuals with chronic heart failure

## Exercise prescription in heart failure with reduced or mid-range EF

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Regular discussion about exercise participation and provision of an individualized exercise prescription is recommended in all individuals with heart failure. <sup>260,261,285</sup>	<b>I</b>	<b>A</b>
Exercise-based cardiac rehabilitation is recommended in all stable individuals to improve exercise capacity, quality of life, and to reduce the frequency of hospital readmission. <sup>260,261,285</sup>	<b>I</b>	<b>A</b>
Beyond annual cardiac assessment, clinical reassessment should be considered when the intensity of exercise is increased.	<b>IIa</b>	<b>C</b>
Motivational and psychological support and individualized recommendations on how to progress the amount and intensity of sports activities should be considered.	<b>IIa</b>	<b>C</b>
Low- to moderate-intensity recreational sporting activities and participation in structured exercise programmes may be considered in stable individuals.	<b>IIb</b>	<b>C</b>
High-intensity interval training programmes may be considered in low-risk patients who want to return to high-intensity aerobic and mixed endurance sports.	<b>IIb</b>	<b>C</b>



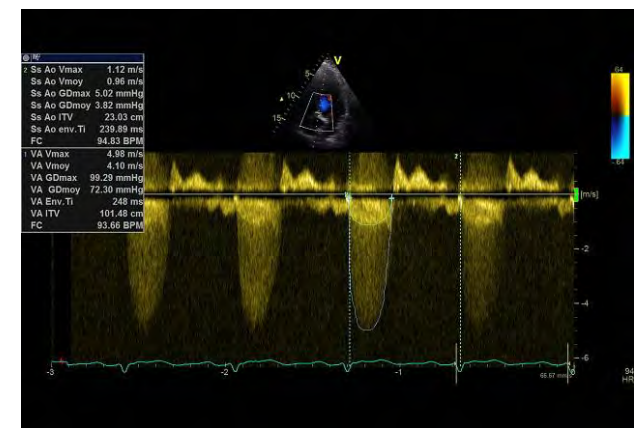
## Participation in sports in heart failure

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Before considering a sport activity, a preliminary optimization of heart failure risk factor control and therapy, including device implantation (if appropriate), is recommended.	<b>I</b>	<b>C</b>
Participation in sports activities should be considered in individuals with heart failure who are at low risk, based on a complete assessment and exclusion of all contraindications, in stable condition for at least 4 weeks, optimal treatment, and NYHA functional class I status.	<b>IIa</b>	<b>C</b>
Non-competitive (low- to moderate-intensity recreational) skill, power, mixed, or endurance sports may be considered in stable, asymptomatic, and optimally treated individuals with HFmrEF.	<b>IIb</b>	<b>C</b>
High-intensity recreational sports, adapted to the capabilities of the individual patient, may be considered in selected stable, asymptomatic, and optimally treated individuals with HFmrEF with an age-matched exercise capacity beyond average.	<b>IIb</b>	<b>C</b>

# Exercise recommendations in individuals with aortic stenosis

## Exercise and participation in recreational/leisure-time sports in asymptomatic

	Aortic stenosis <sup>c</sup>		
	Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
<b>Mild</b>	Participation in all recreational sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all recreational sports involving low to moderate intensity, if desired, should be considered in individuals with LVEF $\geq$ 50%, good functional capacity, and normal exercise test.	<b>IIa</b>	<b>C</b>
<b>Severe</b>	Participation in all recreational sports/exercise involving low intensity, if desired, may be considered in individuals with LVEF $\geq$ 50% and normal BP response during exercise.	<b>IIb</b>	<b>C</b>
	Participation in competitive or recreational sports/exercise of moderate and high intensity is not recommended.	<b>III</b>	<b>C</b>



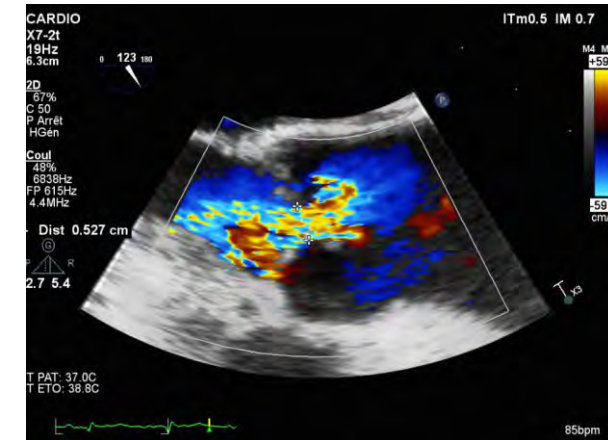
## Participation in competitive sports in asymptomatic

	Aortic stenosis <sup>c</sup>		
	Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
<b>Mild</b>	Participation in all competitive sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all competitive sports involving low to moderate effort, if desired, may be considered in individuals with LVEF $\geq$ 50%, good functional capacity, and normal BP response during exercise.	<b>IIb</b>	<b>C</b>
<b>Severe</b>	Participation in low-intensity skill sports may be considered in a select group of individuals with LVEF $\geq$ 50%.	<b>IIb</b>	<b>C</b>
	Participation in sports or exercise of moderate or high intensity is not recommended.	<b>III</b>	<b>C</b>

# Exercise recommendations in individuals with aortic regurgitation

## Participation in recreational/leisure-time sports in asymptomatic individuals

	Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
<b>Mild</b>	Participation in all recreational sports, if desired, is recommended.	I	C
<b>Moderate</b>	Participation in all recreational sports, if desired, should be considered in asymptomatic individuals with a non-dilated LV with LVEF>50% and normal exercise stress test.	IIa	C
<b>Severe</b>	Participation in all recreational sports involving low and moderate intensity, if desired, may be considered with a mild or moderately dilated LV with LVEF>50% and normal exercise stress test.	IIb	C
	Participation in any moderate- or high-intensity recreational exercise is not recommended with LVEF≤50% and/or exercise-induced arrhythmias.	III	C



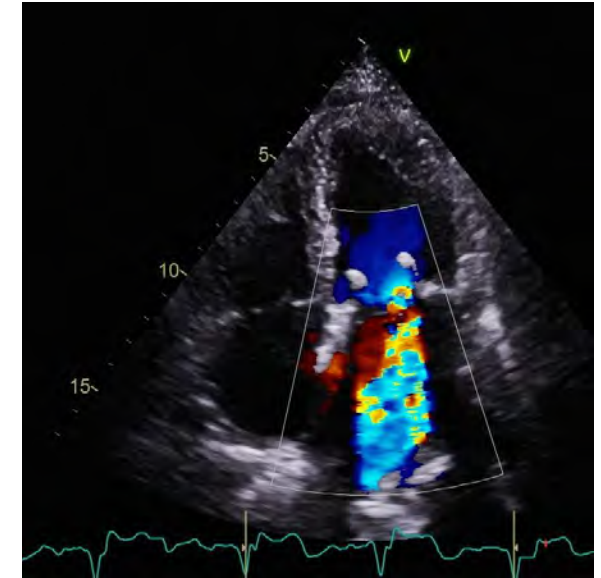
## Participation in competitive sports in asymptomatic individuals

<b>Mild</b>	Participation in all recreational sports, if desired, is recommended.	I	C
<b>Moderate</b>	Participation in all recreational sports, if desired, should be considered in asymptomatic individuals with a non-dilated LV with LVEF>50% and normal exercise stress test.	IIa	C
<b>Severe</b>	Participation in all recreational sports involving low and moderate intensity, if desired, may be considered with a mild or moderately dilated LV with LVEF>50% and normal exercise stress test.	IIb	C
	Participation in any moderate- or high-intensity recreational exercise is not recommended with LVEF≤50% and/or exercise-induced arrhythmias.	III	C

# Exercise recommendations in individuals with mitral regurgitation

## Participation in recreational/leisure-time sports in asymptomatic individuals

	Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
<b>Mild</b>	Participation in all sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all recreational sports, if desired, should be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt; 60 mm<sup>327</sup> or &lt; 35.3 mm/m<sup>2</sup> in men and &lt; 40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥ 60%</li> <li>• Resting sPAP &lt; 50 mmHg</li> <li>• Normal exercise test</li> </ul>	<b>IIa</b>	<b>C</b>
<b>Severe</b>	Participation in all recreational sports involving low and moderate intensity, if desired, may be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt; 60 mm<sup>327</sup> or &lt; 35.3 mm/m<sup>2</sup> in men and &lt; 40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥ 60%</li> <li>• Resting sPAP &lt; 50 mmHg</li> <li>• Normal exercise test</li> </ul>	<b>IIb</b>	<b>C</b>



## Participation in competitive sports in asymptomatic individuals



	Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
<b>Mild</b>	Participation in all competitive sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all competitive sports, if desired, should be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt; 60 mm<sup>327</sup> or &lt; 35.3 mm/m<sup>2</sup> in men and &lt; 40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥ 60%</li> <li>• Resting sPAP &lt; 50 mmHg</li> <li>• Normal exercise test</li> </ul>	<b>IIa</b>	<b>C</b>
<b>Severe</b>	Participation in competitive sports involving low exercise intensity, if desired, may be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt; 60 mm<sup>327</sup> or &lt; 35.3 mm/m<sup>2</sup> in men and &lt; 40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥ 60%</li> <li>• Resting sPAP &lt; 50 mmHg</li> <li>• Normal exercise test</li> </ul>	<b>IIb</b>	<b>C</b>
	Participation in competitive sports is not recommended in individuals with a LVEF < 60%	<b>III</b>	<b>C</b>

# Exercise recommendations in individuals with mitral valve prolapse

Specific markers of increased risk of SCD with MVP



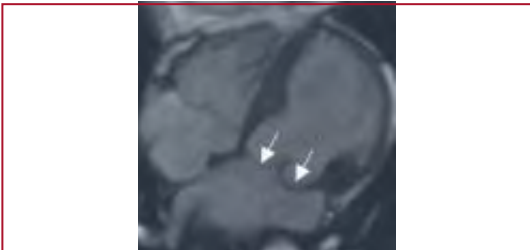
T-wave Inversion in Inferior Leads



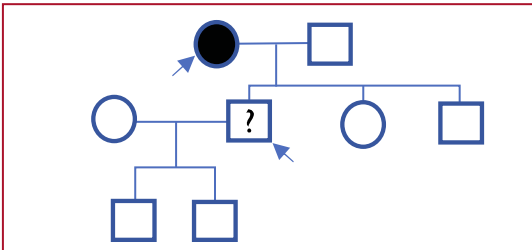
Long QT



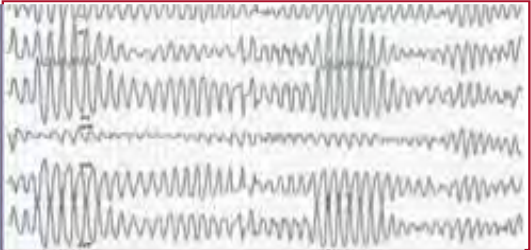
Bi-leaflet MV prolapse



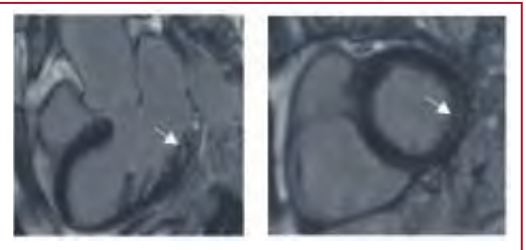
Family History of SCD



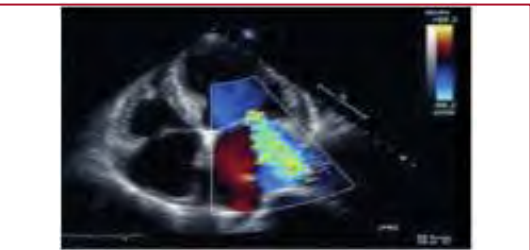
Documented Arrhythmias



Basal inferolateral wall fibrosis



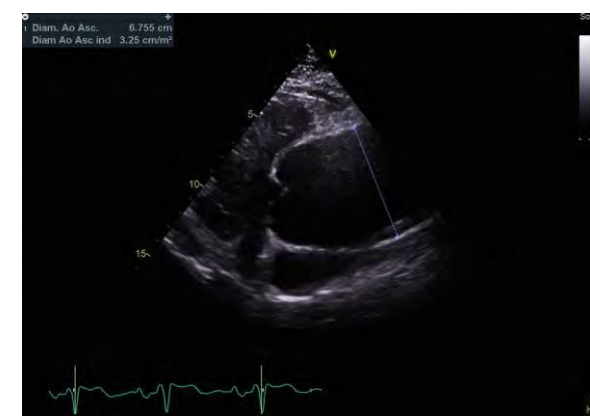
Severe MR



Severe LV Dysfunction



# Exercise recommendations in individuals with aortopathy



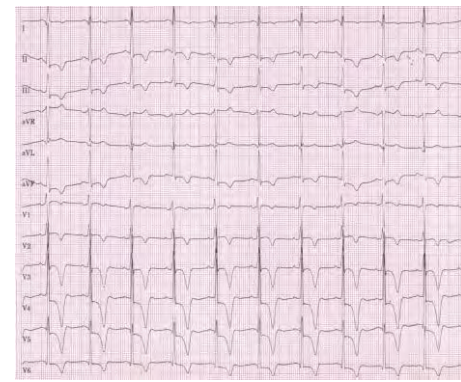
## Classification of risk to perform sports in patients with aortic pathology

	Low risk	Low-intermediate risk	Intermediate risk	High risk
Diagnosis	<ul style="list-style-type: none"> <li>Aorta &lt;40 mm in BAV or tricuspid valve</li> <li>Turner syndrome without aortic dilatation</li> </ul>	<ul style="list-style-type: none"> <li>MFS or other HTAD syndrome without aortic dilatation</li> <li>Aorta 40–45 mm in BAV or tricuspid valve</li> <li>After successful thoracic aorta surgery for BAV or other low risk situation</li> </ul>	<ul style="list-style-type: none"> <li>Moderate aortic dilatation (40–45 mm in MFS or other HTAD; 45–50 mm in BAV or tricuspid valve, Turner syndrome ASI 20–25 mm/m<sup>2</sup>, tetralogy of Fallot &lt;50 mm)</li> <li>After successful thoracic aorta surgery for MFS or HTAD</li> </ul>	<ul style="list-style-type: none"> <li>Severe aortic dilatation (&gt;45 mm in MFS or other HTAD, &gt;50 mm in BAV or tricuspid valve, Turner syndrome ASI &gt;25 mm/m<sup>2</sup>, tetralogy of Fallot &gt;50 mm)</li> <li>After surgery with sequelae</li> </ul>
Advice	<ul style="list-style-type: none"> <li>All sports permitted with preference for endurance over power sports</li> </ul>	<ul style="list-style-type: none"> <li>Avoid high and very high intensity exercise, contact, and power-sports.</li> <li>Preference for endurance over power sports</li> </ul>	<ul style="list-style-type: none"> <li>Only skill sports or mixed or endurance sports at low intensity</li> </ul>	<ul style="list-style-type: none"> <li>Sports are (temporarily) contra-indicated</li> </ul>
Follow-up	Every 2–3 years	Every 1–2 years	Every 6 months to 1 year	Re-evaluation after treatment



# Hypertrophic cardiomyopathy

## Exercise and sports participation in individuals with HCM



### Exercise recommendations

Participation in high-intensity exercise/competitive sports, if desired (with the exception of those where occurrence of syncope may be associated with harm or death), may be considered for individuals who do not have any markers of increased risk<sup>c</sup> following expert assessment.

**IIb**

**C**

Participation in low- or moderate-intensity recreational exercise, if desired, may be considered for individuals who have any markers of increased risk<sup>c</sup> following expert assessment .

**IIb**

**C**

Participation in all competitive sports, if desired, may be considered for individuals who are gene positive for HCM but phenotype negative.

**IIb**

**C**

Participation in high-intensity exercise (including recreational and competitive sports) is not recommended for individuals who have ANY markers of increased risk<sup>c</sup>.

**III**

**C**

### Markers of increased risk :

- **cardiac symptoms**
- **history of cardiac arrest or unexplained syncope**
- **moderate ESC risk score (>4%) at 5 years**
- **LVOT gradient at rest >30 mmHg**
- **abnormal BP response to exercise**
- **exercise-induced arrhythmias**

### Follow-up and further considerations relating to risk

Annual follow-up is recommended for individuals who exercise on a regular basis.

**I**

**C**

Six-monthly follow-up should be considered in adolescent individuals and young adults who are more vulnerable to exercise-related SCD.

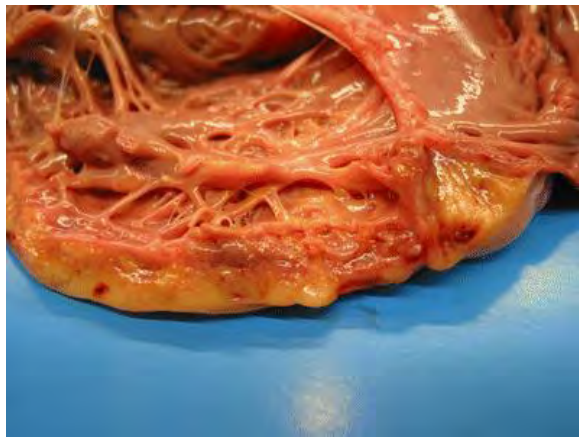
**IIa**

**C**

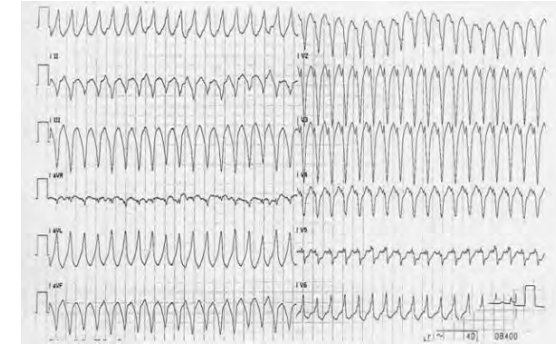
Annual assessment should be considered for genotype-positive/phenotype-negative individuals for phenotypic features and risk stratification purposes.

**IIa**

**C**



# Arrhythmogenic right ventricular cardiomyopathy



## Exercise and sports participation in individuals with ARVC

Exercise recommendations		
Participation in 150 min of low-intensity exercise per week should be considered for all individuals.	<b>IIa</b>	<b>C</b>
Participation in low- to moderate-intensity recreational exercise/sports, if desired, may be considered for individuals with no history of cardiac arrest/VA, unexplained syncope, minimal structural cardiac abnormalities, <500 PVCs/24 h and no evidence of exercise-induced complex VAs.	<b>IIb</b>	<b>C</b>
Participation in high-intensity recreational exercise/sports or any competitive sports is not recommended in individuals with ACM, including those who are gene positive but phenotype negative. <sup>384,386</sup>	<b>III</b>	<b>B</b>

Annual follow-up is recommended for individuals who exercise on a regular basis.	<b>I</b>	<b>C</b>
Six-monthly follow-up should be considered in adolescent individuals and young adults who are more vulnerable to exercise-related SCD.	<b>IIa</b>	<b>C</b>
Annual assessment should be considered for genotype-positive/phenotype-negative individuals for phenotypic features and risk stratification purposes.	<b>IIa</b>	<b>C</b>
Six-monthly follow-up should also be considered in individuals with high arrhythmic risk genotypes such as DSP, TMEM43, and carriers of multiple pathogenic variants.	<b>IIa</b>	<b>C</b>

# Left ventricular non-compaction and dilated cardiomyopathy

## LVNC

Recommendation for diagnosis	Class <sup>a</sup>	Level <sup>b</sup>
A diagnosis of LVNC in athletic individuals should be considered if they fulfil imaging criteria, in association with cardiac symptoms, family history of	I	C



any of the following: symptoms, LVEF < 40% and/or frequent and/or complex VAs on ambulatory Holter monitoring or exercise testing.

IIa	C
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## DC

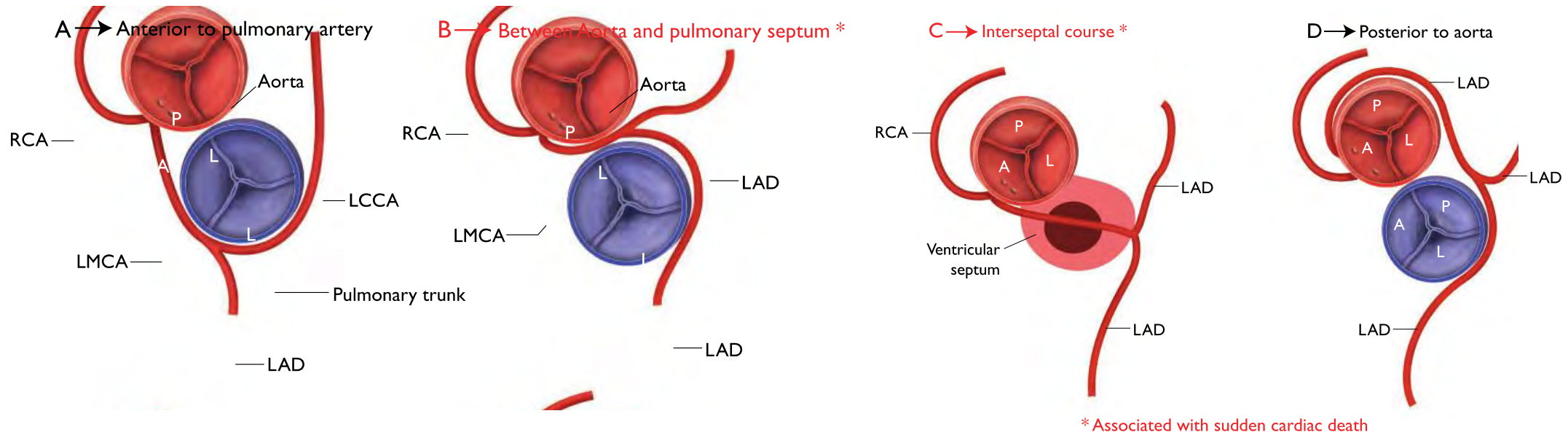
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Participation in low- to moderate-intensity recreational exercise should be considered in all individuals with DCM, regardless of the EF, in the absence	IIa	C



Holter monitoring or exercise testing; (iv) extensive LGE (>20%) on CMR; or (v) high-risk genotype (lamin A/C or filamin C).

IIa	C
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# Recommendations for exercise in young individuals/athletes with anomalous origins of coronary arteries



Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
When considering sports activities, evaluation with imaging tests to identify high-risk patterns and an exercise stress test to check for ischaemia should be considered in individuals with AOCA.	IIa	C
In asymptomatic individuals with an anomalous coronary artery that does not course between the large vessels, does not have a slit-like orifice with reduced lumen and/or intramural course, competition may be considered, after adequate counselling on the risks, provided there is absence of inducible ischaemia.	IIb	C
After surgical repair of an AOCA, participation in all sports may be considered, at the earliest 3 months after surgery, if they are asymptomatic and there is no evidence of inducible myocardial ischaemia or complex cardiac arrhythmias during maximal exercise stress test.	IIb	C
Participation in most competitive sports with a moderate and high cardiovascular demand among individuals with AOCA with an acutely angled take-off or an anomalous course between the large vessels is not recommended. <sup>c</sup>	III	C

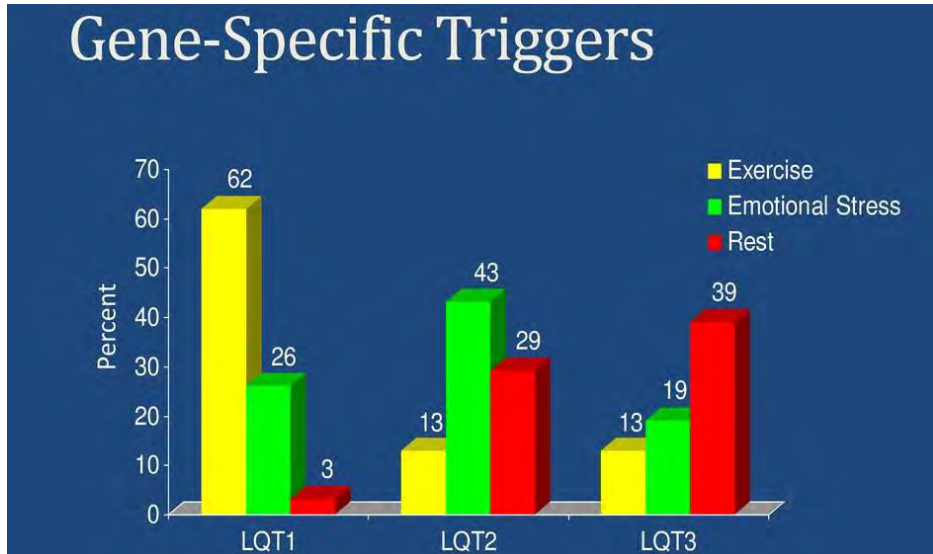
# Exercise recommendations in individuals with myocarditis and pericarditis



# Exercice recommandations for arrhythmias



# In long QT syndrome « return to play »



Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
It is recommended that all exercising individuals with LQTS with prior symptoms or prolonged QTc be on therapy with beta-blockers at target dose. <sup>529</sup>	I	B
It is recommended that exercising individuals with LQTS should avoid QT prolonging drugs ( <a href="http://www.crediblemeds.org">www.crediblemeds.org</a> ) and electrolyte imbalance such as hypokalaemia and hypomagnesaemia. <sup>529</sup>	I	B
Shared decision making should be considered regarding sports participation in patients with genotype-positive/phenotype-negative LQTS (i.e. <470/480 ms in men/women). Type and setting of sports (individual vs. team), type of mutation, and extent of precautionary measures should be considered in this context.	IIa	C
Participation in high-intensity recreational and competitive sports, even when on beta-blockers, is not recommended in individuals with a QTc>500 ms or a genetically confirmed LQTS with a QTc≥470 ms in men or ≥480 ms in women.	III	B
Participation in competitive sports (with or without ICD) is not recommended in individuals with LQTS and prior cardiac arrest or arrhythmic syncope.	III	C

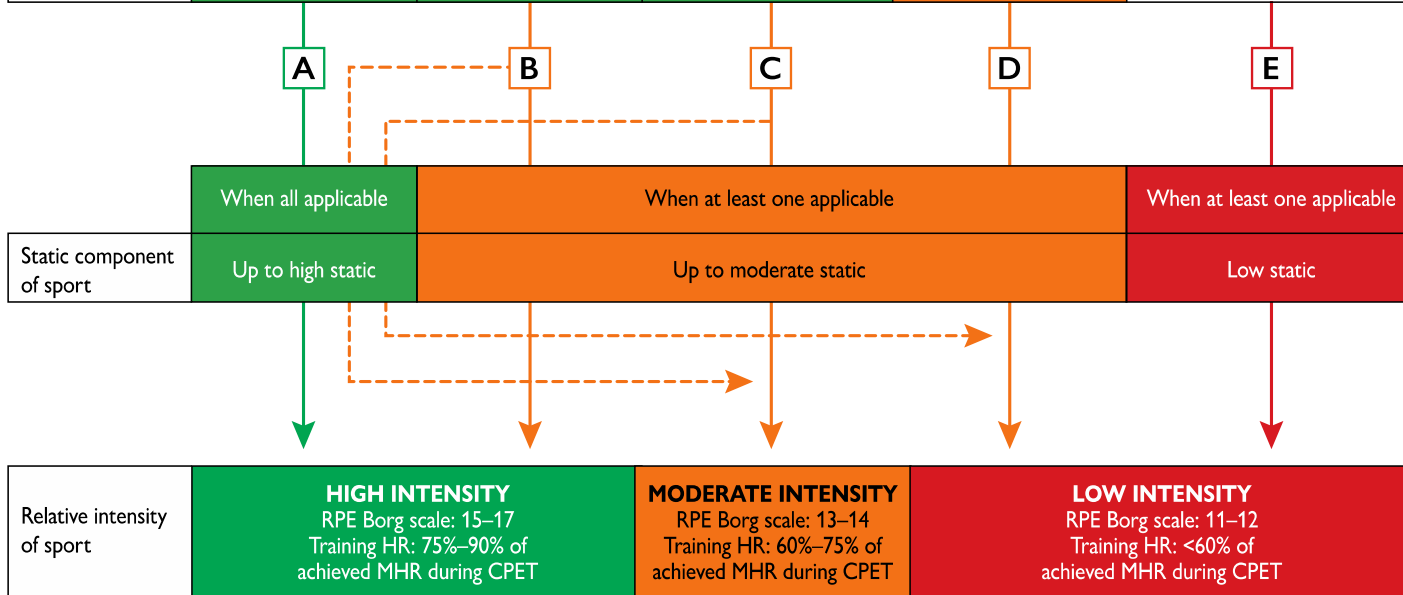
# Recommendations for exercise in individuals with PMK and ICD



Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
It is recommended that individuals with implanted devices with/without resynchronization and underlying disease follow the recommendations pertaining to the underlying disease. <sup>384,425</sup>	I	B
Participation in sports and exercise (except collision sports) should be considered in individuals with pacemaker therapy who do not have pathological substrates for fatal arrhythmias.	IIa	C
Prevention of direct impact to the implanted device by adapting the site of lead and/or device implantation, padding, or restricting direct impact sports should be considered.	IIa	C
Holter recordings and device interrogation during and after resuming sports should be considered to allow appropriate tailoring of rate-responsive pacing parameters, exclusion of myopotential or electromagnetic inhibition, and detection of VAs.	IIa	C
Shared decision making should be considered during decisions relating to continuation of intensive or competitive sports participation in individuals with an ICD, taking into account the effect of sports on the underlying substrate, the fact that intensive sports will trigger more appropriate and inappropriate shocks, the psychological impact of shocks on the athlete/patient, and the potential risk for third parties.	IIa	C
An ICD is not recommended as a substitute for disease-related recommendations when these mandate sports restrictions.	III	C

# Individuals with adult congenital heart disease

1. Ventricles	No systolic dysfunction No hypertrophy No pressure load No volume load	No systolic dysfunction No hypertrophy Mild pressure load Mild volume I	Mild systolic dysfunction Mild hypertrophy Single ventricle physiology Systemic right ventricle	Moderate systolic dysfunction Moderate hypertrophy Moderate pressure load	Severe systolic dysfunction Severe hypertrophy Severe pressure load Moderate/severe volume load
2. Pulmonary artery pressure	Low pulmonary artery pressure	Low pulmonary artery pressure	Mildly elevated pulmonary artery pressure		Moderately/severely elevated pulmonary artery pressure
3. Aorta	No/mild dilatation	Moderate dilatation	Severe dilatation	Dilatation approaching indication for repair	
4. Arrhythmia	No arrhythmia	No arrhythmia	Mild arrhythmic burden Non-malignant arrhythmia		Significant arrhythmic burden Malignant arrhythmia
5. Saturation at rest/during exercise	No central cyanosis	No central cyanosis	No central cyanosis	Central cyanosis	



Solid lines indicate recommendation; if option for sports with high static component, reduce intensity (dotted lines).

