**The 2020 ESC Guidelines on Sport Cardiology:**

**How to prescribe safe exercise and sport participation in patients with cardiovascular diseases**

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In an era where sedentary lifestyle, obesity and associated cardiovascular (CV) risk factors are rapidly increasing, the promotion of regular exercise is of utmost priority in the management of cardiac patients. The initiative for producing the first Guidelines (GLs) on Sport Cardiology was prompted by the European Society of Cardiology (ESC) to facilitate appropriate risk stratification and safe decision making when prescribing exercise programmes and sport participation in patients with cardiovascular (CV) diseases/abnormalities. Remarkably, these GLs are the are the first of a kind by the ESC, and aspire to empower the general cardiologist as an educated specialist in promoting physical activity and providing advice pertaining to recreational or competitive sport in individuals with a diverse spectrum of CV diseases/abnormalities. In line with good clinical practice, the document encourages shared decision-making with the patient, and respects the autonomy of the individual after provision of detailed information about the impact of sport and the potential risk of complications or adverse events. In this context, exercise prescription and related discussion between the patient and the cardiologist should be documented clearly in the medical report.

The main issue for cardiologists when advising or prescribing exercise in adult or senior individuals is the identification and management of those with asymptomatic atherosclerotic coronary artery disease who may be prone to the unpredictable hazard of plaque disruption during exercise. This document adopts a pragmatic approach for identifying such individuals, which is reliant habitual physical activity, symptoms and established risk factors for atherosclerosis. Based on the preliminary evaluation individuals who are considered at risk and wish to engage in strenuous exercise require further assessment. Exercise testing (ET) is the most widely available tool and offers important prognostic information on functional capacity, arrhythmias and haemodynamic response. However, the ET has low specificity and the GLs recognize the primary diagnostic role of cardiac imaging techniques for identifying individuals with asymptomatic chronic coronary syndrome (CCS), as suggested by previous GLs on CCS [1]. Functional imaging such as stress echocardiography is more specific and should be considered in centres where it is readily available. Other imaging techniques, such as coronary computed tomography angiography (CCTA), are largely available and enable assessment of the burden and morphology of coronary plaques; however, CCTA alone does not provide information relating to the coronary flow and reserve, which is important in assessing the risk of exercise-induced ischaemia. .

The diagnostic tools suggested by the GLs stratify individuals with CCS into low-risk and. high-risk categories, which is instrumental for delivering personally-tailored advice. Patients with CCS who do not show any abnormalities on a maximal exercise test or functional imaging test, and do not have impaired LV function are considered at low risk. Such individuals may engage in systematic exercise programmes and even in competitive sports (with some restriction for older patients). Conversely, caution is required in individuals with high risk coronary features, such as inducible myocardial ischaemia, who should be treated according to the CCS guidelines and may eventually return to sport only 3–6 months after successful revascularization, pending a normal maximal exercise or functional imaging test.

There are several aspects of these GLs which are novel compared with prior position statements in sports cardiology [2] such as the newly introduced classification of sport activities. The novel scheme consists of only four categories of sport (skill, power, mixed, endurance) with specific sporting disciplines under each category in order of increasing intensity of effort required. This approach should facilitate a personally tailored exercise programme or sporting activity with respect to the functional capacity and perceived risk in each individual patient.

It is noteworthy that the current GLs occasionally diverge from previous sport recommendations [3] in several areas, especially in those where knowledge has rapidly evolved over recent years and current scientific evidence permits a more liberal approach to intensive exercise and competitive sport. One example is hypertrophic cardiomyopathy (HCM) where adults with morphologically mild disease, a low ESC risk score (i.e., <4), good functional capacity and absence of potentially serious cardiac arrhythmias during a maximal exercise test may participate in intensive exercise, including competitive sport. Although applicable to a minority of HCM individuals this change in stance, represents a remarkable turning point in the sports cardiology culture in Europe.

Conversely, prudence and caution is recommended when prescribing exercise programmes in patients with arrhythmogenic cardiomyopathy, after several studies have confirmed an acceleration of the disease phenotype in patients with established disease, or onset of severe phenotype in those who were originally genotype positive/ phenotype negative when exposed to chronic intensive exercise.

With regard to atrial fibrillation (AF), which is the most common arrhythmia encountered in the adult population, the GLs recognize that regular exercise programmes are the cornerstone for preventing AF, through modifying many of its predisposing factors. All individuals at risk of AF should be motivated to regular exercise. Conversely, AF is more prevalent in active and former male master athletes, especially those engaging in high-intensity endurance sports, suggesting a U-shaped relationship between habitual exercise and AF. Among individuals with AF the GLs recommend that participation all sports is possible (except sports associated with potential trauma in those who are anticoagulated) in the absence of structural heart disease in whom AF is well-tolerated. However, prophylactic cavo-tricuspid isthmus ablation to prevent atrial flutter with 1:1 conduction should be considered in individuals with AF who want to engage in intensive exercise and in whom class I drug therapy is initiated. Indeed, the use of class I antiarrhythmic drugs as monotherapy, without proof of adequate rate control of AF/flutter during vigorous exercise, should be avoided.

A conservative approach is maintained for patients with genetically confirmed LQTS (QTc ≥ 470 ms in men or ≥ 480 ms in women). At odds with the American guidelines, which are more liberal provided that an automatic external defibrillator (AED) is available as part of the athlete’s personal sports safety gear, the ESC GLs consider such a scenario as impractical (e.g. in winter sports, or water sports), or improper, because it places an undue responsibility on clubs or other bystanders, that is not justified by a medical recommendation. Moreover, although LQTS-related cardiac arrests are uncommon, the efficacy of AED is not guaranteed in such cases.

Patients with an implantable cardioverter defibrillator (ICD) may have greater athletic expectations. While it is stated that an ICD cannot be regarded as a treatment substitute for sports restriction, it may allow for light to moderate exercise without concerns for arrhythmia, and may help individuals to regain autonomy and overcome fears relating to unattended exercise. For individuals who desire intensive exercise or competitive sports, shared decision-making is encouraged where discussion should account for the effect of sports on the underlying cardiac 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 to third parties.

One final consideration is that Sports cardiology is a relatively novel and emerging sub-speciality, and therefore the evidence base for the natural history of CV disease progression, or risk of death during intensive exercise and competitive sport is relatively sparse. This is reflected by the fact that a large number of recommendations are reliant on the wisdom and vast experience of the consensus group rather than large prospective studies. We hope that the current GLs will serve as a useful clinical document but also an incentive for future research to challenge established wisdom.

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