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Targeted cardiac screening of athletes

PERSPECTIVES

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The Norwegian Society of Cardiology recommends a gradual introduction of cardiac screening for certain groups of athletes in Norway.

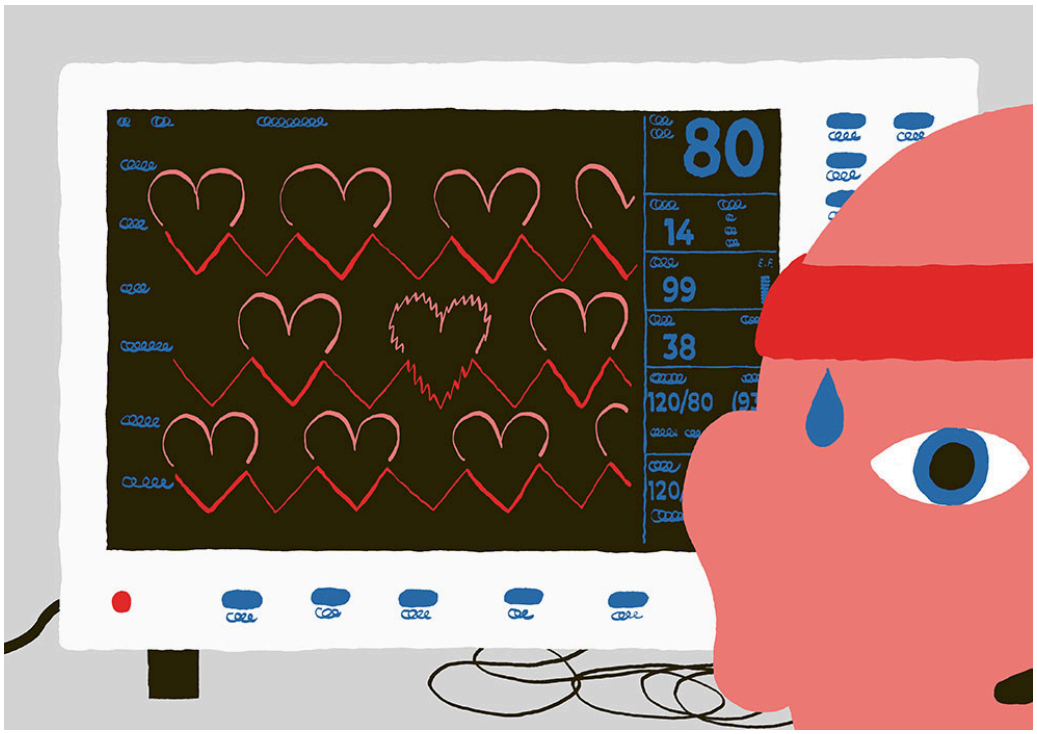

Illustration: Espen Friberg

Most countries in Europe have introduced cardiac screening in sports, with varying levels of implementation. Norway, however, has yet to take a clear position on the issue, despite several decades of tragic, heart-related deaths in sports that have attracted considerable attention. The Norwegian Society of Cardiology therefore appointed a working group in 2021 to develop, for the first time, recommendations on how cardiologists in Norway should approach cardiac screening in sports.

Physical activity is good for everyone and has many proven health benefits that help improve public health. However, a small minority should avoid high-intensity interval training. A key argument for introducing cardiac screening in sports is that people with underlying cardiovascular diseases, such as genetic disorders or undiagnosed arrhythmias, are at increased risk of cardiac arrest during exercise (1). Screening can help identify these conditions early, allowing for the implementation of necessary risk-reducing measures.

What do we know about cardiac arrest in sports?

Several articles indicate that approximately 1 in 300 people have an underlying condition that may be associated with an increased risk of sudden death in sports (2). The studies with the most reliable methodologies report an incidence of sudden death among athletes of about 1 in 50,000 (3). American and British studies show that more young people die during sports activities than in traffic accidents (4, 5). The variation in reported incidence rates can partly be attributed to the use of different, and often inadequate, methodologies, as well as geographic differences in baseline risk.

«Approximately 1 in 300 people have an underlying condition that may be associated with an increased risk of sudden death in sports»

Few studies have investigated cases of cardiac arrest with a positive outcome. One study showed a 48 % survival rate for cardiac arrests in sports (6), which is significantly higher than for other types of cardiac arrest.

There is also a substantial gender gap when it comes to cardiac arrest in sports: the incidence is six times higher in men than in women (7).

The most common cause of cardiac arrest in the under 35s is inherited cardiovascular diseases, such as cardiomyopathies and conduction disorders. Frequent and intense training can hasten the progression of certain cardiomyopathies, such as arrhythmogenic right ventricular cardiomyopathy and other genetic cardiomyopathies.

In children aged 1–18 years, the incidence of sudden cardiac arrest ranges between 1 and 3 events per 100,000 (8), and those affected often appear to have no known heart condition. A study examining sudden cardiac deaths in the age group 10–18 years found that 14 % of deaths occurred during moderate to high-intensity exercise. In the age group 10–13 years, the figure was 25 %. Among active athletes, the proportion was much higher, with 67 % of cardiac arrests occurring in connection with training or competitions.

The clear leading cause of sudden cardiac death in the over 35s is coronary artery disease.

Data from the Norwegian Cardiac Arrest Registry (NorCAR) show that about 27 cases of cardiac arrest at 'sports or recreational venues' were registered annually in the period 2019 - 21. Including incidents closely related to training, approximately 110 cases of sports-related cardiac arrest are registered every year (personal communication, December 2022, I. Tjelmeland, NorCAR). Published data from NorCAR for the period 2015–17 showed a low incidence of exercise-related cardiac arrest of 0.8 per 100,000 person-years. This is ten times lower than for non-exercise-related cardiac arrest among young people in Norway (9). A significant methodological weakness of the study is the low response rate of just 38 %.

So how can the undisputed health benefits of sports be reconciled with the slightly increased risk of cardiac arrest?

One of the goals of screening should be to increase safety at sports venues and to raise awareness about this issue. The aim should not be for athletes to be disqualified from participating, but to promote proper and safe training. Screening must be voluntary, except in professional sports where clubs can refuse to sign athletes without approved screening. Some international sports organisations, such as UEFA (Union of European Football Associations) and UCI (International Cycling Union), already require approved screening for participation in international competitions.

«Screening can help more athletes safely continue participating in sports through individualised adaptations»

Benefits of cardiac screening

Screening can uncover underlying and potentially dangerous heart conditions, genetic predispositions and risk factors before symptoms appear. Early diagnosis enables timely preventive treatment or training modifications to reduce the risk of serious events. Screening can therefore help more athletes safely continue participating in sports through individualised adaptations. Internationally, there has been a significant decline in the number of sudden cardiac deaths related to sports in recent years (10). Sports cardiology should be regarded as an integral part of both sports medicine and cardiology. Advancements in screening knowledge and practice lead to a better understanding of the relationship between heart health and sports. Additionally, screening raises awareness among athletes, coaches and healthcare personnel about symptoms that call for further investigation, and leads to better medical preparedness at sports venues. Such measures will strengthen the standard and safety of both athletic performance and medical practice.

Disadvantages of cardiac screening

An important objection to the introduction of screening is the insufficient documentation of its effectiveness. The very low incidence of events makes such documentation extremely challenging, and it is unlikely that randomised studies with sufficient statistical power will ever be conducted. Although screening likely reduces the incidence of sports-related cardiac arrest, it does not eliminate the risk. A British study showed that screening failed to identify the majority of those who subsequently died from cardiac arrest after screening (5). The potential resource use, costs, the need for specialised expertise, the stress screening can cause athletes, and false positive results have all been the topic of debate. Screening has been criticised for its high proportion of false positive ECG results, but recent data show that this is now around 2 % (11), which in a clinical context can be considered low. Research has demonstrated that screening does not make athletes feel stressed (12), and that those with true positive results should also be referred to a psychologist. Ethical implications and the general consequences of screening are insufficiently explored. Whether some of the methodologically strongest studies conducted on Italian and American athletes are directly transferable to the Norwegian context is open to debate, but Nordic and North European data are considered highly relevant.

Screening young athletes

Adolescents experience rapid physical and psychological changes. Various genetic cardiovascular diseases can manifest during childhood and adolescence, with sudden death being the most serious outcome. Monitoring family members and identifying individuals at risk of genetic cardiovascular disease are essential for initiating preventive treatment and providing tailored advice on exercise. The absence of obvious structural heart disease does not necessarily indicate a low risk of life-threatening arrhythmia.

Screening older athletes

Statistically, cardiac arrest in sports is most common among those who are middle aged. There are currently no Norwegian recommendations on which symptoms or conditions indicate that older athletes (> 35–40 years) should consult a doctor before engaging in high-intensity training or training of long duration. However, European and American guidelines suggest the use of simple, self-administered pre-screening questionnaires to reduce the risk of sudden cardiac death among middle-aged and older athletes. The effectiveness of such measures in preventing sudden death remains unclear, but there is growing interest in evaluating the usefulness of questionnaires and risk scores. A Norwegian study showed that a pre-screening tool had a high negative predictive value (90 %) for excluding individuals without symptoms and with a low risk of heart disease (measured by NORRISK 2) from further screening (13). Screening revealed that nearly 25 % of participants with symptoms or high risk scores had findings warranting further follow-up. International data suggest that between 62 % and 90 % of older athletes have positive results from screening and comprehensive examinations. However, the practical implications of this remain unclear. Recommending screening for all older athletes involved in intensive training and competitions is not appropriate, either from a financial or ethical perspective. Instead, a simple pre-screening tool may be a useful and practical measure for raising awareness and identifying those who need further follow-up.

Given the increased risk of sports-related cardiac arrest, an athlete's own desire for a heart examination can be a sufficient indication, regardless of symptoms, hereditary risk or age.

Official recommendations in other countries

The leading European cardiac organisations, such as the European Society of Cardiology (14), the European Heart Rhythm Association (15), as well as sports organisations like the IOC (International Olympic Committee) (16), FIFA

(International Football Association) (17) and UEFA (Union of European Football Associations) (18) recommend screening.

The Swedish National Board of Health and Welfare introduced cardiac screening for elite athletes in 2005, covering both junior and senior categories. The effect of this screening has been evaluated (19), and the number of sports-related deaths has fallen considerably in the past decade. The authors attribute this to the deployment of automated defibrillators, screening and increased public awareness of the issue. One study shows that thorough examinations, including a detailed review of medical history and family history over two generations, could help identify 89 % of fatal hypertrophic cardiomyopathies before death (20).

The Danish Society of Cardiology advises against general screening aimed at preventing sudden unexpected cardiac death in young athletes (21). They argue that there is no evidence to support the screening of elite athletes. A limitation of the Danish data is that autopsies were not commonly performed at the time of the studies, though this has since changed. However, it is recommended that athletes with exercise-related cardiac symptoms, as well as those with a familial predisposition, be considered a risk group that should undergo further investigation.

«We recommend targeted screening of defined risk groups as opposed to the screening of all athletes»

What should Norway do?

In weighing the benefits and drawbacks of screening athletes, and considering the limitations of the scientific evidence, we support targeted screening. Significant methodological advances are taking place in areas such as cardiac genetics, sports screening methods and imaging diagnostics. Norway should actively contribute to this development, even though we currently lack the necessary infrastructure and sufficient expertise, which should be built up.

We recommend targeted screening of defined risk groups as opposed to the screening of all athletes. Elite athletes have been identified as having an increased risk, especially those with a heavy training volume. This applies to high-intensity sports and endurance training, such as professional road cycling and stop-start sports like football. Additionally, ethnic African American athletes have an increased risk. A key challenge for clinicians will be accurately identifying individuals at increased risk, to ensure that follow-up is as targeted as possible. However, unnecessary exclusion from or restricted access to sports participation must be avoided. The Norwegian Society of Cardiology will draw up guidelines on how cardiac screening should be performed.

Regardless of screening, we recommend a low threshold for investigating athletes with exercise-related cardiac symptoms, especially syncope or near-syncope, palpitations and unexplained disproportionate dyspnoea. We also recommend in the sports context, investigating individuals with a family

history of cardiovascular disease, including cardiac events in men under 50 years or women under 60 years, as well as those with genetically determined cardiovascular diseases or familial clustering of other such diseases.

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