Controversies relating to preparticipation cardiovascular screening in young athletes: time for a realistic solution?

M Papadakis,1,2 N Chandra,1,2 S Sharma1,2

The sudden death of any young individual is a tragic event that causes immeasurable damage to family lives. The sudden death of a young athlete from a cardiac disorder is particularly emotive and is often associated with considerable media coverage, drawing attention to the youth, the athletic prowess of the individual and the number of life years lost consequent to a cardiac disorder that could have been detected during life. Most exercise-related sudden cardiac deaths (SCDs) are attributed to congenital or hereditary cardiac disorders that are asymptomatic in most victims.1 2 Unsurprisingly, the death of a young athlete often galvanises urgent discussions relating to preparticipation cardiovascular screening involving members of the community, sports physicians and sporting governing bodies.

There is considerable resistance to implementing widespread cardiovascular screening of athletes. The low incidence of deaths and the low prevalence rates of all implicated disorders challenge the cost efficacy of such a programme. Furthermore, there are concerns relating to the overlap between the physiological adaptation to exercise and the cardiac disease resulting in false-positive results and unnecessary anxiety or even disqualification of an athlete from future competitive sport.3 It is also recognised that up to 11% of deaths in athletes occur at rest; therefore, cessation of sport will not necessarily prevent death in all athletes.1 Finally, there are issues relating to the lack of infrastructure and expert personnel trained in athlete’s heart and the broad phenotype of the heterogeneous disorders implicated in the sudden death of an athlete. The UK and many other Western countries do not favour screening of athletes. Indeed, screening of athletes in the UK is confined to elite sporting organisations such as the Premier League football association and the Lawn Tennis Association that mandate independently financed screening programmes in all youth athletes.

In the USA and Italy, preparticipation cardiovascular screening programmes are in existence to minimise the risk of sudden death due to cardiac disorders in young athletes.4 The US programme utilises a health questionnaire relating to cardiac symptoms and a family history of premature cardiac disease, as well as physical examination of the cardiovascular system. Unfortunately, the reputation of such basic screening programmes has been jeopardised by American physicians holding international expert status in sports cardiology studies that have emphatically demonstrated an extremely poor yield in identifying athletes with fatal disorders.5

In Italy, a state-sponsored screening programme has been in place since the late 1970s and includes a health questionnaire, a cardiovascular physical examination and a 12-lead electrocardiography (ECG). The Italian experience from Veneto has shown that screening with ECG has reduced the death rate in athletes from 4.19/100 000 person-years during the late screening period (1993–2004) and fourfold higher than the reported incidence of 0.43/100 000 person-years in the 2001–2004 period. Although a longer period may offer epidemiologically more robust results, it is important to acknowledge that the latter figure of 0.43/100 000 person-years is likely to provide a more accurate estimate of the real potential of screening that is reinforced by the fact that the incidence of SCD plateaus during the 2001–2004 period and is likely to have remained so during the proceeding years.

Unfortunately, there are no data from other European countries in the literature relating to screening young athletes that are comparable in magnitude with the Italian data, which can be simply explained by the fact that screening competitive athletes is not mandatory in most countries. Elston and Stein extrapolate findings from the Italian experience to apply directly to the UK in an attempt to facilitate the debate regarding the benefits, but more importantly, the potential harms of screening. Based on this fundamental assumption, the numerical implications of false-positive results and expected disqualifications from sport are discouraging. Of the potential 1 520 021 young athletes screened, 140 361 would require further investigations, and for every life saved, 791 athletes would be disqualified.4

However, the epidemiological study by Elston and Stein highlights important limitations that may have influenced the results and underestimated the impact of screening in the prevention of SCDs in athletes and the population as a whole. The authors consider as postscreening period the first 25 years of screening (1982–2004), claiming that this may provide a more realistic picture, as it includes the period when screening mechanisms and expertise were developed and the full potential of screening is unlikely to have been realised. Consequently, the reported postscreening incidence of SCD is quoted as 1.57/100 000 person-years. This estimate is twofold higher than the reported incidence by Corrado et al of 0.87/100 000 person-years during the late screening period (1993–2004) and fourfold higher than the reported incidence of 0.43/100 000 person-years in the 2001–2004 period. Although a longer period may offer epidemiologically more robust results, it is important to acknowledge that the latter figure of 0.43/100 000 person-years is likely to provide a more accurate estimate of the real potential of screening that is reinforced by the fact that the incidence of SCD plateaus during the 2001–2004 period and is likely to have remained so during the proceeding years.

Furthermore, Elston and Stein underestimate the incidence of SCD in young (14–35 years old) individuals in the UK. A recent study analysing the Office of National Statistics data indicates around 400 SCDs per year in the UK in this age group, which is likely to be disease and valvular heart disease. Most disqualifications are on anecdotal grounds and lack evidence-based credibility.

1 King’s College Hospital, London, UK; 2 University Hospital Lewisham, London, UK
Correspondence to Professor Sanjay Sharma, King’s College Hospital, Denmark Hill, London SE5 9RS, UK; ss Sharma21@hotmail.com

References

1 King’s College Hospital, London, UK; 2 University Hospital Lewisham, London, UK
Correspondence to Professor Sanjay Sharma, King’s College Hospital, Denmark Hill, London SE5 9RS, UK; ss Sharma21@hotmail.com

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Editorial

an underestimate of the true incidence
given the experience from previous pro-
spective epidemiological studies within
the UK and potential misclassifications
of SCDS as epilepsy or accidental
drowning.7

The study also fails to take into account
current screening experience in the UK.8
Our own experience of screening highly
trained athletes using the Italian model
indicates a lower false-positive rate of
3.7%, compared with 9% by Corrado
et al. This is most likely to reflect the dif-
fences in interpretation of an abnormal
ECG because in our practice, isolated
large QRS complexes, borderline right
axis deviation, a borderline prolonged
QTc9 and T-wave inversions in the right
deceleration leads in athletes <16 years
old10 would not be indications for fur-
ther investigations in asymptomatic ath-
letes in the absence of a family history
of premature cardiac disease or SCD.
Similarly, there is no evidence that ath-
letes with hypertension who continue to
exercise are at risk of a fatality, and the
significance of mitral valve prolapse and
isolated ventricular extrasystoles in the
aetiology of sudden death is debatable.
Therefore, such athletes should not be
considered to be at risk of sudden death
and would not be advised to refrain from
exercise. Conversely, the UK is more eth-
nically diverse than the Veneto region of
Italy. In particular, there are significantly
more athletes of Afro-Caribbean origin in
the UK who are known to exhibit bizarre
repolarisation electrical changes and may
generate a significant number of false-
positive results.

In a prospective and ongoing pilot study
involving >8000 athletes conducted by the
charitable organisation Cardiac Risk in the
Young (CRY), a potentially fatal disorder
is identified in 0.3%. This figure is not
externally peer reviewed. MP and NC are
funded by a research grant from the
charitable organisation Cardiac Risk in the
Young (CRY), which supports preparticipation screening in young athletes.

Competing interests The charitable organisation Cardiac Risk in the Young (CRY), which supports pre-
participation screening in young athletes, has provided
facilities, including necessary staffing, electrocardiogra-
phy and echocardiography machines for screening many
national sporting squads including rugby, tennis, boxing,
swimming, athletics and football. The data from the
screening programme have resulted in several publica-
tions in major peer-reviewed journals. SS is a consultant
cardiologist to CRY.

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M Papadakis, N Chandra and S Sharma

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