Alan Remde, MD
Robert Wood Johnson Medical School, Family Medicine Residency at Capital Health, Trenton, NJ

Nancy Calabretta, MS, MEd
Cooper University Hospital, Camden, NJ

ASSISTANT EDITOR

Justin Bailey, MD
Family Medicine Residency of Idaho, Boise

Q/ Should preparticipation physicals for school-aged athletes include routine EKGs?

EVIDENCE-BASED ANSWER

A/ **PROBABLY NOT.** Although some European and international experts recommend that all athletes undergo preparticipation electrocardiogram (EKG) screening, it's unclear whether screening reduces the risk of sudden cardiac death (SCD); US experts don't recommend it routinely for school-aged athletes (strength of recommendation [SOR]:**C,** observational studies and expert opinion).

However, further cardiac work-up, including EKG, is indicated if concern exists about increased cardiovascular risk (SOR: **C,** expert opinion).

Evidence summary

SCD in athletes is a rare event; researchers estimate the annual incidence at 0.5 to 2 per 100,000 athletes per year.[1,2] The rarity of SCD, lack of registries recording cases, multiple causes, and varying demographics limit accurate estimation of its incidence.[3] Experts also debate whether the ability of a single EKG to detect a potentially lethal arrhythmia outweighs the expense and potential harm of false-positive results. No randomized controlled trials have assessed the efficacy of preparticipation screening, with or without EKG, to reduce SCD. The major studies evaluating this issue are observational and retrospective.

An Italian study suggests lower SCD mortality with EKG screening

An Italian observational study of 33,735 athletes reported results of a 25-year program of mandated SCD screening (1979-2004).[4] Researchers found that the incidence of sudden death was 89% lower at the end of the screening program (0.4/100,000 athletes/year), compared with the baseline (3.6/100,000 athletes/year).

The program used highly trained sports medicine physicians and supplemented the history and physical examination with universal EKG screening. Screening began at 12 to 14 years of age and was repeated regularly as long as the athlete was engaging in competition. The incidence of SCD in nonathletes (0.79/100,000 nonathletes/year) didn't change over the 25 years of the study.

Limitations of the study include the lack of a concurrent control group of unscreened athletes and time-dependent bias, also known as immortal time bias. (Studies with time-dependent outcomes in which the test of interest, such as EKG screening, and the outcome analyzed, such as SCD, occur during the same period are susceptible to immortal time bias. Athletes who may have died suddenly during the prescreening period would never have made it to the first screening, so the group of athletes who made it alive to the first screening already represented a selected lower-risk population whose characteristics contributed to the lower mortality rates in the postscreening period.)

Other study limitations included baseline differences in male-to-female ratio (82% male) and age range (12-35 years). In addition, the study used a short measurement time (approximately 3 years) to establish a baseline SCD incidence, resulting in a higher incidence than the average in other studies.

TABLE

12 cardiovascular risk factors to watch for during preparticipation physicals for school-aged athletes

Personal history
1. Exertional chest pain or discomfort
2. Unexplained syncope or near-syncope (exertional syncope is of particular concern)
3. Excessive exertional and unexplained dyspnea or fatigue associated with exercise
4. Previous recognition of a heart murmur
5. Elevated systemic blood pressure
Family history
6. Premature death (sudden and unexpected or otherwise) in one or more relatives <50 years old because of heart disease
7. Disability from heart disease in a close relative <50 years
8. Relatives with: hypertrophic or dilated cardiomyopathy, long QT syndrome or other ion channelopathies, Marfan syndrome, or clinically important arrhythmias
Physical examination
9. Heart murmur—perform auscultation in both supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstructions
10. Femoral pulses to exclude aortic coarctation
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure (sitting position), preferably in both arms

An Israeli study suggests otherwise

An uncontrolled observational study done in Israel compared the number of SCDs before and after implementation of a mandatory nationwide screening program for all athletes.[5] The screening protocol included a medical questionnaire, physical examination, resting EKG, and exercise stress test. Researchers estimated the SCD incidence by scrutinizing newspaper reports of sudden deaths in competitive athletes for 2 time periods: 12 years before (1985-1997) and 12 years after (1997-2009) the intervention.

They identified 24 presumed cardiac deaths, all in male athletes 12 to 44 years of age (mean 23.9 years). The incidence of SCD in the athletes before and after this protocol was 2.54 and 2.66/100,000 athletes/year, respectively (*P* not significant).

An advantage of this study is the longer period used to estimate SCD incidence (12 years compared with approximately 3 years). A disadvantage is that the researchers calculated the SCD incidence by relying only on media reports rather than on a death registry.

A US comparison study supports the Israeli findings

In the United States, researchers compared SCD rates in high school and college athletes in Minnesota with the rates reported in the Italian study discussed previously.[1] They collected mortality data from several sources, including a national death registry, over a similar time period (1985-2007), during which routine EKG screening of Minnesota athletes wasn't mandated or recommended.

During the 23-year study period, SCD mortality rates in young athletes in Minnesota remained stable at 0.97/100,000 athletes/year (range 0.5-1.3). This rate didn't differ significantly from the death rate reported at the end of the Italian study.[4] The US authors concluded that their data didn't support the hypothesis that routine EKG screening in young athletes results in lower SCD mortality.[1]

Recommendations

All major groups acknowledge that EKG screening improves the sensitivity of the preparticipation physical exam. The European Society of Cardiology Study Group of Sport

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Although some European and international experts advocate preparticipation EKG screening for all athletes, US experts don't recommend it routinely.

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Cardiology and the International Olympic Committee advocate routine screening.[6,7]

The American Heart Association (AHA) Council on Nutrition, Physical Activity, and Metabolism and the American College of Sports Medicine don't recommend routine EKGs as part of the preparticipation evaluation of school-aged athletes.[8,9]

The AHA recommends that a qualified examiner perform a full history and physical exam, which includes assessments of 12 key risk factors (**TABLE**), and advocates cardiovascular referral for patients who show positive findings. JFP

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