

EDITORIAL COMMENT

Is the Cost the Reason for Missing the ECG Advantages?*

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In this issue of the *Journal*, Halkin et al. (1) describes the projected Medicare costs for electrocardiogram (ECG)-based screening in the population of high school and college athletes in the United States.

Screening athletes and participants in organized competitive sports for cardiovascular disease is universally considered as a justifiable, necessary, and compelling initiative on the basis of ethical, legal, and medical grounds. Indeed, pre-participation screening (PPS) is commonly viewed as an important public health initiative (2). However, the best strategy for PPS is still debated, in particular regarding the implementation of the 12-lead ECG, which has been supported by the European Society of Cardiology Sport Cardiology, International Olympic Committee, and the International Federation of Association Football (3,4), and currently is rejected by the AHA (2,5).

See page 2271

The Halkin et al. paper (1) presents the ultimate evidence against the implementation of the ECG, by showing that projected costs will be prohibitive in the United States. Based on Medicare's list to compute the costs for diagnostic testing needed on the estimated 8.5 million U.S. athlete population over a 20-year period, the investigators reached the conclusion that the cost per life saved would be largely in excess of \$10 million. Based on their computations, we agree that cost for ECG-based PPS (i.e., at minimum \$224 for history and physical exam, 39\$ for ECG, totaling \$263 in each athlete) is clearly prohibitive in the United States, but most likely in all countries over the world.

We believe, however, that this way to assess the cost of PPS is misleading. We do not argue that Medicare is the current standard for pricing diagnostic testing in the United States, but we do argue that the cost of PPS should be computed by this approach. In our opinion, PPS (including

history, physical exam, and ECG) is a unique medical procedure, and the cost should be computed as a package, not for the individual tests.

Our belief is based on the following considerations: 1) PPS is a preventive medicine program that targets young individuals, most of whom are healthy; 2) PPS is commonly located out-of-hospital (e.g., in colleges and schools); and 3) PPS is performed by team physicians and does not require cardiologists, except in a minority of athletes referred for a second opinion. Consequently, the PPS should be priced as a package of preventive medicine program, which is by far less expensive than pricing the individual diagnostic testing.

For example, in Italy, where the screening program is mandatory for athletes engaged in competitive sports (6), the PPS fee is computed (as a package) at about 50 Euros (e.g., \$60) per athlete. This modest price, based on the agreement between the Board of Sport Physicians and the federal government, is largely affordable for most Italian athletes and is even refunded by the National Health System for young individuals with very low income.

The rationale to implement a mandatory screening program, which conveys an obligatory cost to citizens participating in sport, is based on the widely accepted perception that individuals engaged in competitive sport are exposed to an increased risk (7) and, for this reason, deserve greater public attention. Screening athletes, therefore, is not seen in Italy as a discriminatory policy targeting a subset of our population, but as an expression of our attitude for preventive medical programs, which are widely accepted and economically supported by the Italian population.

We acknowledge that reimbursement of PPS as a preventive medicine program does not currently exist in the Medicare system, and this represents a major obstacle, in our opinion, to implementation of the ECG-based PPS. Legitimacy for PPS reimbursement with Medicare, however, will require a change in the cultural attitude and current medical policy in the United States, where preventive medicine programs are unlikely to be federally supported. Therefore, we acknowledge that most of the alleged obstacles to implementing ECG-based PPS reflect the cultural and social differences existing between our societies rather than being rooted in economic reasons.

One major obstacle for physicians in the United States to accept the ECG-based PPS is, in our opinion, the justified concern for the legal consequences potentially related to misinterpretation of the ECG. Exposure to dreadful consequences may paradoxically rise for the physician in cases of debated decisions aimed to prevent sudden death in a susceptible individual (8).

U.S. physicians pay great attention to the appropriate interpretation of ECG in athletes, which sometimes present changes mimicking cardiac disease (9). Even though ECG training is a core part of medical education, the ability of most physicians in the United States to interpret correctly

*Editorials published in the *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of JACC or the American College of Cardiology.

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an athlete's ECG is relatively poor. However, we believe that a significant improvement of physicians' accuracy may occur by introducing standardized criteria to distinguish normal from abnormal ECG patterns (10), and preliminary evidence has been reported that this improvement occurs regardless the physician's specialty (and predominantly in noncardiologists) (11). Therefore, we believe that team physicians may be educated appropriately and become totally capable of distinguishing normal from abnormal ECG patterns in athletes. Therefore, in our opinion, ECG-based PPS does not routinely require the expertise of cardiologists, except in borderline and doubtful cases, which represent a minority of the athlete population (12).

We believe that physician's education is the key point to make implementation of ECG-based PPS possible in the United States. At present, "sport cardiology" is almost an unknown subspecialty in the United States, and peculiarities of evaluation of athletes presenting with ECG abnormalities are (with a few remarkable exceptions) largely unknown to the larger medical community. However, we see a number of signals emerging within the U.S. society that testify an increasing interest for a wider use of ECG in athletes' care. Several scientific initiatives have flourished in the recent years that aim to understand the value of the novel European Society of Cardiology criteria to read ECG (10) when applied to U.S. athlete population (13), and normal standards for interpretation of the ECG in the U.S. athletes, derived from the long-standing athletes program implemented at Stanford University, have been published (14). However, in our opinion, a surprising gap exists between the predominant academic positions that still emphasize obstacles and limitations for ECG implementation and the increasing expectation of the majority of professional cardiologists and team physicians, who are exposed to difficult decision-making regarding interpretation and management of ECG abnormalities in athletes.

In conclusion, we believe that assessing the benefits of ECG-based PPS uniquely in terms of lives per year saved and the costs by pricing the individual diagnostic testing according to Medicare is simplistic and misleading. Forgotten benefits include, for example, individuals timely identified with cardiovascular abnormalities who will be treated appropriately and avoid sudden death, as well as the several disorders affecting the skeletal, ocular, and other noncardiac systems, which do not convey risk for death and can be appropriately treated. Eventually, PPS represents the occasion for educational activities targeted to prevent metabolic and cardiovascular disease in young athletes and their families. On the other hand, costs of ECG-based PPS may reasonably be lower than predicted here and might become affordable even in the United States, according to the model of package previously discussed.

Finally, it seems quite odd that PPS without ECG is still advocated by the American Heart Association as the current medical practice (2) despite being completely inefficient to detect cardiac disease at risk (15). If the cost is the main

criterion, then the only wise decision is to abolish the current screening program, which is costly and inefficient to the scope.

On the other hand, if a screening program has to be implemented, as suggested by the American Heart Association (2), then the ECG should be part of this program, based on the evidence that it substantially improves the efficacy of the PPS (16) and at present is the best medical practice for screening athletes (17).

We believe that competitive athletes (and their families) should be informed regarding the limitations of history and physical examination and should not be deprived of the opportunity to be screened by ECG, if they choose to do it. We also believe that high schools, colleges, and international sport federations share the ethical obligation to ensure that their young affiliates should be screened accordingly.

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REFERENCES

- Halkin A, Steinvil A, Rosso R, Adler A, Rozovski U, Viskin S. Preventing sudden death of athletes with electrocardiographic screening: what is the absolute benefit and how much will it cost? *J Am Coll Cardiol* 2012;60:2271-6.
- Maron BJ, Thompson PD, Ackerman MJ, et al. Recommendations and considerations related to preparticipation screening for cardiovascular abnormalities in competitive athletes: 2007 update: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism. *Circulation* 2007;115:1643-55.
- Corrado D, Pelliccia A, Bjornstad HH, et al. Cardiovascular pre-participation screening of young competitive athletes for prevention of sudden death: proposal for a common European protocol. Consensus Statement of the Study Group of Sport Cardiology of the Working Group of Cardiac Rehabilitation and Exercise Physiology and the Working Group of Myocardial and Pericardial Diseases of the European Society of Cardiology. *Eur Heart J* 2005;26:516-24.
- Ljungqvist A, Jenoure P, Engebretsen L, et al. The International Olympic Committee (IOC) Consensus Statement on periodic health evaluation of elite athletes March 2009. *Br J Sports Med* 2009;43:631-43.
- Maron BJ. National electrocardiography screening for competitive athletes: feasible in the United States? *Ann Intern Med* 2010;152:324-6.
- Pelliccia A, Maron BJ. Pre-participation cardiovascular evaluation of the competitive athlete: perspectives from the 30-year Italian experience. *Am J Cardiol* 1995;75:827-9.
- Corrado D, Basso C, Rizzoli G, Schiavon M, Thiene G. Does sport activity enhance the risk of sudden death in adolescents and young adults? *J Am Coll Cardiol* 2003;42:1959-63.
- Maron BJ. Sudden death in young athletes: lessons from the Hank Gathers affair. *N Engl J Med* 1993;329:55-7.
- Pelliccia A, Maron BJ, Culasso F, et al. Clinical significance of abnormal electrocardiographic patterns in trained athletes. *Circulation* 2000;102:278-84.
- Corrado D, Pelliccia A, Heidbuchel H, et al., for the Section of Sports Cardiology, European Association of Cardiovascular Prevention and Rehabilitation. Recommendations for interpretation of 12-lead electrocardiogram in the athlete. *Eur Heart J* 2010;31:243-59.
- Drezner JA, Asif IM, Owens DS, et al. Accuracy of ECG interpretation in competitive athletes: the impact of using standardized ECG criteria. *Br J Sports Med* 2012;46:335-40.

12. Pelliccia A, Culasso F, Di Paolo F, et al. Prevalence of abnormal electrocardiograms in a large, unselected population undergoing preparticipation cardiovascular screening. *Eur Heart J* 2007;28:2006–10.
 13. Baggish AL, Hutter AM Jr., Wang F, et al. Cardiovascular screening in college athletes with and without electrocardiography: a cross-sectional study. *Ann Intern Med* 2010;152:269–75.
 14. Uberoi A, Stein R, Perez MV, et al. Interpretation of the electrocardiogram of young athletes. *Circulation* 2011;124:746–57.
 15. Maron BJ, Shirani J, Poliac LC, Mathenge R, Roberts WC, Mueller FO. Sudden death in young competitive athletes: clinical, demographic, and pathological profiles. *JAMA* 1996;276:199–204.
 16. Corrado D, Basso C, Pavei A, Michieli P, Schiavon M, Thiene G. Trends in sudden cardiovascular death in young competitive athletes after implementation of a pre-participation screening program. *JAMA* 2006;296:1593–601.
 17. Pelliccia A. The preparticipation cardiovascular screening of competitive athletes: is it time to change the customary clinical practice? *Eur Heart J* 2007;28:2703–5.
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Key Words: athletes ■ electrocardiogram ■ screening ■ sports ■ sudden death.