Cardiac Screening and Prevention of Other Cardiac Emergencies in Cricket

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ABSTRACT
Cardiac screening has increasingly become a standard part of preventive care for elite athletes in cricket and many other sports around the world. Ideally, a cardiac screening program should be supported by a range of other strategies across the sporting organization focused on quality of care for athletes and prevention of other cardiac emergencies. This narrative review aimed to present key strategies for the successful implementation of cardiac screening and prevention of other cardiac emergencies. We present key strategies for the prevention of cardiac emergencies in elite cricket. These are cardiac screening, including electrocardiogram (ECG) interpreted by a physician with expertise in athlete ECGs, regular auditing of the cardiac screening program and ongoing quality improvement, building required sports cardiology infrastructure; cardiovascular awareness across the organization, and cardiac emergency preparation, including access to automated external defibrillators (AEDs), cardiopulmonary resuscitation (CPR) training, and prematch medical briefings. Some of these strategies may also be appropriate for nonelite matches but would need to be tailored according to the resources available. The ultimate aim is to provide better cardiac care for cricketers, staff, and the broader community.

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INTRODUCTION
Cardiac screening has increasingly become a standard part of preventive care for elite athletes in many sports, including cricket, worldwide. As we have previously noted, while the aim of cardiac screening is to detect conditions associated with sudden cardiac death (SCD) for professional athletes who are employed by their sport, there is a strong occupational health argument in favor of screening. That is, players who asked to train as hard as possible (and sometimes harder) as part of their work and a well-resourced professional organization should take reasonable steps to reduce any possible associated cardiac risk. Ideally, this should be supported by a range of other strategies across the sporting organization focused on quality of care for athletes and prevention of other cardiac emergencies.

In 2016, we reviewed the literature and proposed some expert consensus recommendations for the prevention of SCD in cricketers. This paper builds on these recommendations and adds updated evidence, including cricket-specific evidence. The aim is to present key strategies (Fig. 1) for the successful implementation of cardiac screening and prevention of other cardiac emergencies in the setting of elite cricket. We note that some strategies presented here may also be appropriate for cricket at levels below the elite but would need to be tailored according to the resources available.

FIVE KEY STRATEGIES FOR THE PREVENTION OF CARDIAC EMERGENCIES IN (ELITE) CRICKET

Cardiac Screening

Although cardiac screening is common in elite sports, there is currently no overarching International Cricket Council recommendation or requirement for cardiac screening in cricket. Formal cardiac screening policies have been implemented by

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The ECB program commenced in 2008 and now applies to all male and female academy players from the age of 14 years and to professional players. Screening is mandatory and is conducted every 2–5 years (depending on age). The protocol includes a health questionnaire, 12 lead ECG, and consultation with a cardiologist (with a physical examination at the cardiologist’s discretion). In addition, since 2018, a transthoracic echocardiogram (TTE) is required once per career. Results are uploaded to the ECB online injury surveillance program.

Regular Auditing of Cardiac Screening and Ongoing Quality Improvement

Regular auditing of cardiac screening results as part of an ongoing quality improvement model is ideal. This auditing should aim to check compliance with the policy, ensure records are complete, and confirm that any required follow-up is complete and documented. It also provides an opportunity to review policy and procedures and to make any changes necessary to improve the quality of the program. For example, considering which is the best time of year to screen players taking into account their upcoming playing and touring commitments, and leaving sufficient time for any additional testing that may be needed.

Regular auditing also allows the sporting organization to review the overall results of the screening program. Both CA and the ECB have recently published cardiac screening results. The CA audit was conducted in 2019 and reviewed records for all current players \( n = 710 \), 38% female, mean age 20.4 years. No conditions associated with SCD were detected, no serious cardiac incidents occurred during the period, and no players retired due to cardiac causes. ECG analysis showed athletic changes were common and supported the view that cricket is more accurately characterized as a sport with moderate cardiac demands.

The ECB audit included 1,208 players (11% female, mean age 20.8 years). Seven (0.6%) players were diagnosed with conditions associated with SCD. This included hypertrophic cardiomyopathy (HCM) \( n = 2 \), arhythmogenic cardiomyopathy (ACM) \( n = 1 \), and Wolff-Parkinson-White syndrome \( n = 2 \). In addition, of 342 athletes that had a routine TTE, there were two major diagnoses (bicuspid aortic valve with severe aortopathy and aortic regurgitation and an atrial septal defect associated with right ventricular volume overload) and 10 minor abnormalities detected. In total, two of these players retired from cricket due to cardiac diagnoses (one with HCM and one with ACM), while others were managed/monitored as appropriate and continued to play.

Sports Cardiology Infrastructure

A cardiac screening program needs to be supported by strong sports cardiology infrastructure. This point is emphasized by the American Medical Society for Sports Medicine position statement on cardiac screening, which recommends that those conducting screening “establish a close and collaborative relationship with local cardiology resources (to provide) specialist availability with rapid turnaround times; access to timely diagnostic testing; familiarity with athlete-specific ECG interpretation criteria; and a commitment to work in partnership following a major diagnosis.”

This model is well established at CA and the ECB. CA has a multidisciplinary expert sports cardiology panel that oversees screening policy design, implementation, and optimization; provides panel review of any results or cases as required; provides specialist consultations (often at short notice) and has published 14 scientific papers together. The ECB model is similar and provides extensive expert support.

Cardiovascular Awareness Across the Organization

Ideally, the prevention of cardiac emergencies involves broad awareness across the sporting organization. The prominence of cardiovascular health and prevention is important and relevant for both players and staff. There are numerous ways this can be supported, such as providing screening audit results to all medical staff and also to the board; offering cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) training to all staff and players; engaging with players’ associations about cardiovascular health and prevention; and publicizing information about cardiac screening to staff and athletes in advance of screening dates.

Technology has also fostered increased cardiovascular awareness. Many athletes have wearables that can measure heart rate and rhythm and can essentially conduct “self-screening” for some arrhythmias. Other devices, such as smartphone ECGs (iECG) with 1-lead or 6-lead ECG capability, have been shown to be highly accurate. In the professional sports setting, these devices can be carried by team doctors or even athletes themselves and used immediately whenever an arrhythmia is suspected. There are several published case studies.
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The most important piece of equipment is the AED, and the aspects of emergency planning related to AED usage are of utmost importance. Survival from a cardiac arrest reduces rapidly as minutes pass without defibrillation being attempted. There should now be at least one AED at every sporting stadium, and for the larger stadiums that host events with large crowds, there is a requirement for more than one.

Having medical staff (doctors, paramedics, and physiotherapists) available at elite-level games is important, along with space for them to work in an emergency (i.e., medical room and ambulance). It is now recommended that a prematch medical briefing (also called a “medical time out”) be conducted 1 hour before play. This model, becoming universal in elite-level cricket, is also followed by other sporting organizations, such as the National Football League and the International Federation of Association Football.

Ideally, prematch medical briefings include the following:

- A meeting with match day medical staff, physios, paramedics, umpires, security managers, and relevant venue and event managers.
- Sharing of contact details of relevant staff for the day and location of emergency equipment (oxygen, AEDs, MediCab/stretcher, and medical bag).
- Notification of any players with special health conditions that would be relevant in an emergency (e.g., diabetics, epileptics, asthmatics, and those with a history of anaphylaxis).
- Confirmation of emergency protocols, including hand signals to be used on the field if assistance is required (Fig. 2).

Cardiac Emergency Preparation

The importance of cardiac emergency preparation cannot be overstated. While there is some debate about the value of cardiac screening, the case for implementing emergency action plans ensuring staff are able to respond effectively to cardiac (and other) emergencies is clear and uniformly supported.

In cricket, emergency policies should be in place at the elite level for all matches, training sessions, and tours. These should include relevant training and equipment for doctors and other medical staff.

Matches—Emergency Planning and Prematch Medical Briefings

Thorough emergency planning at elite cricket matches involves numerous departments of the organization (e.g., medical, events, risk, and legal), as well as venue staff and paramedics. Responding adequately to a cardiac arrest or other event in players is clearly important, and from a venue perspective, it is also important to respond well to cardiac arrests and similar emergencies in staff (umpires, team staff, media, and venue staff) and spectators.

It requires a more comprehensive list than can be presented as part of an overview article to detail all of the medical equipment that could be useful as part of emergency/incident response. In a cardiac (arrest) viewpoint, by far, the single most important piece of equipment is the AED, and the aspects of emergency planning related to AED usage are of utmost importance. Survival from a cardiac arrest reduces rapidly as minutes pass without defibrillation being attempted. There should now be at least one AED at every sporting stadium, and for the larger stadiums that host events with large crowds, there is a requirement for more than one.

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- Confirmation of emergency protocols, including hand signals to be used on the field if assistance is required (Fig. 2).
Cardiac screening has emerged as a crucial component of preventive care for elite athletes across various sports, including cricket. Ideally, such a screening program should be bolstered by a suite of strategies across the sporting organization, all aimed at enhancing the quality of care for athletes and averting other cardiac emergencies. This narrative review has sought to present key strategies for the successful implementation of cardiac screening and the prevention of other cardiac emergencies within the context of elite cricket. Building upon previous recommendations, this paper incorporates updated evidence, including cricket-specific findings.

We outline strategies in five key areas for the prevention of cardiac emergencies in elite cricket. These encompass—cardiac screening, including ECG interpretation by a physician with expertise in athlete ECGs; regular auditing of the cardiac screening program coupled with ongoing quality improvement; the construction of necessary sports cardiology infrastructure; fostering cardiovascular awareness across the organization; and preparation for cardiac emergencies, including access to AEDs, CPR training, and prematch medical briefings. While some of these strategies may also be suitable for nonelite matches, they would need to be adapted accordingly to the resources available. The overarching goal is to enhance cardiac care for cricketers, staff, and the wider community.

Authors’ Contributions
JJO and JWJ conceived the idea and drafted the manuscript; RP, PI, and LG critically reviewed and amended the manuscript.

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