

# Cardiac Screening and Prevention of Other Cardiac Emergencies in Cricket

Jessica J Orchard<sup>1</sup>, Rajesh Puranik<sup>2</sup>, Philippa J Inge<sup>3</sup>, Leigh Golding<sup>4</sup>, John W Orchard<sup>5</sup>

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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 in the setting of elite cricket. It builds on previous recommendations and adds updated evidence, including cricket-specific evidence.

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.

**Keywords:** Athlete, Defibrillator, Electrocardiogram, Sudden cardiac arrest, Sudden cardiac death.

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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.<sup>1</sup> 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.<sup>2,3</sup> 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.<sup>3</sup> 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

<sup>1,5</sup>Sydney School of Public Health, The University of Sydney, New South Wales, Australia

<sup>2</sup>Central Clinical School, The University of Sydney, New South Wales, Australia

<sup>3,4</sup>Department of Sports Science & Sports Medicine, Cricket Australia, Victoria, Australia

**Corresponding Author:** John W Orchard, Sydney School of Public Health, The University of Sydney, New South Wales, Australia, Phone: 61293518118, e-mail: john.orchard@sydney.edu.au

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Cricket Australia (CA) and the England and Wales Cricket Board (ECB), which have both published audits of their programs. Other countries have commenced cardiac screening protocols as well.

The CA policy commenced in 2016 and recommends screening for all male and female elite players from under 17 years, under 18, under 19, and adult state and national squads.<sup>4</sup> This also includes all players in domestic T20 competitions (W/BBL). Players are offered screening on commencement with their squad, and then every 2 years (for those aged under 21 years) or every 5 years (for those aged 21 years and over). The policy is opt-out, and players choosing not to participate sign a waiver annually. Screening includes a personal/family history and physical examination (H&P) and resting 12-lead electrocardiogram (ECG) interpreted by a physician with



Fig. 1: Key strategies for the prevention of cardiac emergencies in cricket; AED, automated external defibrillator; BLS, basic life support; CPR, cardiopulmonary resuscitation

expertise in athlete ECGs, which is very similar to most elite sports in Australia.<sup>5</sup> Results are stored in a central electronic system.

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.<sup>6</sup> 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.<sup>7</sup> 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).<sup>4</sup> 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.<sup>8</sup>

The ECB audit included 1,208 players (11% female, mean age 20.8 years).<sup>6</sup> Seven (0.6%) players were diagnosed with conditions associated with SCD. This included hypertrophic cardiomyopathy (HCM) ( $n = 2$ ), arrhythmogenic 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<sup>9</sup>), 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.”<sup>10</sup>

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.<sup>11</sup> 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

where an iECG has been used to document transient exercise-induced arrhythmias in cricketers, contributing to the accurate diagnosis of atrial fibrillation and supraventricular tachycardia.<sup>12</sup>

### 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.<sup>10</sup>

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. From 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.

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.<sup>13,14</sup>

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).



**Figs 2A and B:** Signals for medical assistance and emergency equipment. (A) Signals for medical assistance during play; (B) Emergency equipment

In addition, practicing a highly coordinated protocol for basic life support and AED use a few times a season with regular staff is recommended to ensure the response in an emergency situation is efficient.

### Training Sessions and Lower-level Matches

Staffing at both lower-level matches (sub-elite and community) and at training sessions is lower than at competitive matches. Cricket is a sport that generally has an absence of any medical staff at community-level matches. Protocols will therefore vary at different levels, but there will soon be an expectation that AEDs are available at cricket matches of any organized level and that one player or staff member from each team is trained in first aid, including basic life support (especially AED use). It can (and should) soon be part of match preparation, even at community-level, that the person preparing the pitch and the equipment for a match also checks to make sure that an AED is available.

### Medical

All doctors involved in match-day care of elite cricketers should undertake regular emergency training. This could include, for example, a full-day emergency medicine course every 3 years and a refresher CPR course annually. On tour, doctors may carry a portable AED and a iECG. In the future, single-use pocket-size AEDs may be rolled out more widely.<sup>15</sup>

## CONCLUSION

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 according to the resources available. The overarching goal is to enhance cardiac care for cricketers, staff, and the wider community.

## AUTHORS' CONTRIBUTIONS

JJO and JWO conceived the idea and drafted the manuscript; RP, PI, and LG critically reviewed and amended the manuscript.

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## ORCID

Jessica J Orchard <https://orcid.org/0000-0002-5702-7277>

Rajesh Puranik <https://orcid.org/0000-0003-2774-1311>

Philippa J Inge <https://orcid.org/0000-0001-5545-8527>

Leigh Golding <https://orcid.org/0000-0001-7527-7619>

John W Orchard <https://orcid.org/0000-0003-3530-1711>

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