

# Practical management of sudden cardiac arrest on the football field

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## ABSTRACT

Sudden cardiac arrest (SCA) remains a tragic occurrence on the football field. The limits of preparticipation cardiovascular screening make it compulsory that prearranged emergency medical services be available at all football matches to immediately respond to any collapsed player. Management of SCA involves prompt recognition, immediate cardiopulmonary resuscitation (CPR) and early defibrillation. Any football player who collapses without contact with another player or obstacle should be regarded as being in SCA until proven otherwise. An automated external defibrillator (AED), or manual defibrillator if an AED is not available, should be immediately accessible on the field during competitions. This study presents guidelines for a practical and systematic approach to the management of SCA on the football field.

## INTRODUCTION

Sudden cardiac arrest (SCA) is the leading cause of death in athletes during exercise and sport, and a tragic occurrence on the football field.<sup>1–7</sup> Although the precompetition medical assessment (PCMA) was developed by F-MARC<sup>8,9</sup> to provide a standard evaluation to identify athletes at risk for SCA, it is not yet a mandatory requirement for all amateur or professional football players internationally.<sup>10,11</sup> The variable compliance with PCMA for all footballers combined with the limits of preparticipation cardiovascular screening in athletes makes it compulsory that prearranged emergency medical services be available at all football matches to immediately respond to any collapsed football player on the field who may be in cardiac arrest.<sup>12</sup>

Management of SCA involves prompt recognition, immediate cardiopulmonary resuscitation (CPR) and early defibrillation where appropriate.<sup>13,14</sup> Although the literature makes reference to various aspects of SCA and its immediate management on the football field,<sup>11</sup> proper emergency planning for this life-threatening incident is not universally practised, thereby leaving it up to each field-side medical team, physician or attending rescuer to enact a practical plan *ab initio*. The aim of this paper is to recommend a practical and systematic approach to the management of SCA on the football field, and to emphasise the critical importance of local adaptation of these guidelines at all football venues.

## RECOGNITION

Any football player who collapses without contact with another player or obstacle should be regarded as being in SCA until it is proved otherwise.<sup>1,11,15</sup> Delayed recognition of SCA by first responders can lead to critical delays or even failure to initiate

resuscitative measures. Brief seizure-like activity or involuntary myoclonic movements have been reported in over 50% of athletes with SCA.<sup>16</sup> Thus, SCA should not be mistaken for a seizure. Inaccurate rescuer assessment of pulse or respirations is another cause of delayed resuscitation. Agonal or occasional gasping can occur in the first minutes after SCA and be misinterpreted as normal breathing. Therefore, to avoid potentially fatal delays in resuscitation, any collapsed and unresponsive athlete should be managed as SCA including immediate CPR and application of an automated external defibrillator (AED), or manual defibrillator if an AED is not available, as soon as possible for rhythm analysis and shock as indicated.<sup>15</sup>

On the field, once SCA has been recognised by the field medical team, players, or the referee, additional medical personnel and the defibrillator should enter the field of play simultaneously.<sup>1,11</sup> Each football venue for training or competition must have access to an AED, or manual defibrillator if an AED is not available, with a goal of a less than 3 min time delay from player collapse to first defibrillation shock.<sup>11,15</sup> For competitions, the home team and stadium management should be responsible for ensuring that a defibrillator is present and located preferably with the fourth referee official. However, it should be a matter of routine that the location of the AED must be reviewed by both teams prior to the match, including a brief readiness check of the device by the team physician.

Time taken to initiate CPR and defibrillation are important determinants of successful cardiac arrest resuscitation,<sup>13,14,17</sup> hence delay in entering the field of play in a potential SCA must be minimised, even if the FIFA (Fédération Internationale de Football Association) Rules of the Game are to be amended to accommodate management of this life-threatening event, including education of referees.<sup>11</sup>

## EMERGENCY ACTION PLAN

Once it has been established that the collapsed player is in cardiac arrest, a preplanned, prerehearsed emergency action plan should be initiated. CPR should be effectively established and the AED immediately retrieved. Concerned football players should be directed away from the collapsed player to provide sufficient space for the resuscitating medical team. The referees may be helpful to organise the players on the field in this regard. Other field staff should be responsible for directing an ambulance onto the pitch as soon as possible (if feasible).

## CARDIOPULMONARY RESUSCITATION

SCA in an active footballer on the field usually means that the blood oxygen saturation level is sufficient for

hands-only chest compression to be undertaken for the first few minutes of CPR.<sup>17</sup> After that an effective form of rescue ventilation should be initiated via mouth-to-mask or manual resuscitator ventilation,<sup>13</sup> with or without supplemental oxygen and with or without use of an appropriate supraglottic airway.

### ON-FIELD DEFIBRILLATION

The single greatest factor affecting survival from SCA is the time interval from cardiac arrest to defibrillation, with survival decreasing to 10% per minute defibrillation is delayed in the absence of CPR but 3% to 4% with CPR.<sup>14</sup> Survival following SCA has been greatly improved by rescuer and public access defibrillation programmes designed to shorten the time interval from SCA to shock delivery, with survival rates >60% in young athletes if prompt CPR and defibrillation can be achieved.<sup>14 16</sup>

Immediately after SCA recognition, the defibrillator should be retrieved and positioned next to the collapsed player and applied as soon as possible. AEDs will determine whether a shockable rhythm is present and charge the AED accordingly, whereas manual defibrillators require healthcare rescuer rhythm recognition and manual defibrillation. Wet sweaty and/or excessively hairy chests may make it problematic for adequate defibrillation pads attachment or paddle placement, necessitating the use of a towel and/or disposable razor.<sup>14</sup> For these situations, it is recommended that each defibrillator meant for the football field has an accessory kit that contains a rescue-type scissors, a cloth towel, two disposable razors and spare AED pads or extra defibrillation gel as minimum. These items are likewise useful when SCA and defibrillation are undertaken in the rain, which is a safe practice.

### IMMOBILISATION AND TRANSFER

Players who experience SCA may collapse in an uncontrolled and unprotected manner with the potential for a cervical spinal injury.<sup>18</sup> Therefore, cervical spine precautions should be taken when transferring the player from the ground onto an appropriate rigid immobilisation device (eg, basket stretcher or spine board), and to immobilise the neck with head blocks accordingly.

Initial sequences of CPR and defibrillation should occur on the field at the location of collapse to avoid unnecessary delays in resuscitation by attempting to move the player. The decision to transfer the player from one's initial position of collapse and CPR is critical, because external chest compression in transit, with a player strapped to a rigid immobilisation device, may not be as effective as when stationary on the ground and may compromise the success of the resuscitation.<sup>13</sup> Therefore, at least three cycles of external chest compression and intermittent defibrillation (as per international guidelines<sup>13 14 17</sup>) should be undertaken as a minimum before transfer is considered. Interruptions in CPR should be minimised with chest compressions re-initiated immediately after shock delivery.<sup>13 17</sup>

If on-field measures do not return the player to a spontaneous rhythm, or if ventricular fibrillation appears to persist, the player should be loaded into an ambulance, preferably that has been brought onto the field, where more advanced cardiac care can be provided during transport to a hospital facility. It is imperative to continue, without delays or interruptions, effective, efficient CPR and intermittent appropriate defibrillation, until a spontaneous cardiac rhythm is obtained with signs of life.

### POST-SCA PROCEDURES AND REPORTING

After a major medical event of this nature on the football field, protocols should be instituted which address issues related to psychological team debriefing and event review. Comprehensive

documentation is likewise mandatory for not only medical and legal purposes, but to assist in research of SCA, its aetiology and successful treatment.

### EDUCATION AND TRAINING

It is strongly recommended that all players, officials, referees and associated staff at stadiums and training grounds be trained in basic CPR and AED use because of the potential life saving benefits that may result on and off the football field of play.

#### Box 1 Key recommendations for emergency planning for sudden cardiac arrest on the football field

- ▶ Every team and venue hosting football training or competition should have a written emergency response plan for SCA.
  - ▶ Potential responders to SCA on the field (ie, coaches, referees, physiotherapists, athletic trainers, and other medical staff) should be regularly trained in CPR and AED use, and demonstrate skills proficiency in this regard.
  - ▶ An AED should be immediately available on the pitch during competitions.
  - ▶ Both teams should review prior to the match the location of the AED and details of the emergency response plan.
- AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; SCA, sudden cardiac arrest.

#### Box 2 Practical management of sudden cardiac arrest on the football field

- (1) Prompt recognition of SCA
  - ▶ SCA should be assumed in any collapsed and unresponsive athlete
  - ▶ Seizure-like activity, and abnormal breathing or gasping must be accepted as SCA until proven otherwise
- (2) Early activation of the emergency medical response system and call for additional rescuer assistance
- (3) Early CPR
  - ▶ If unresponsive and not breathing normally, begin Hands-Only (compression only) CPR—push hard, push fast
  - ▶ C–A–B (chest compressions—airway—breathing).
- (4) Immediate retrieval of the AED or manual defibrillator.
- (5) Application of the AED or manual defibrillator as soon as possible—while CPR continues. Stop CPR only for rhythm analysis and shock delivery if indicated
  - ▶ If no shock is delivered, CPR and life support measures should be continued until the player becomes responsive or a non-cardiac aetiology can be clearly established.
  - ▶ If a shock is delivered, immediately continue CPR for 2 minutes, then allow AED to reanalyse the rhythm.
- (6) On the discretion of the senior clinician on scene, transport of the SCA victim to a hospital facility capable of advanced cardiac life support, realising that effective CPR should be continued en route.
- (7) Upon return of spontaneous circulation, while still in coma, rapid cooling (induced hypothermia) for SCA victims with VF arrest has been shown to improve survival and decrease neurological complications.

AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; SCA, sudden cardiac arrest; VF, ventricular fibrillation.

## SUMMARY

Proper emergency planning for SCA (box 1) and prompt management of SCA (box 2) on the football field are critical practices to improve outcomes from SCA in football.

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