



**SPORTS SAFETY
COMMITTEE REPORT
MARCH 2019**

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MESSAGE FROM SPORT SINGAPORE



Lim Teck Yin
Chief Executive Officer
Sport Singapore

This third edition of the Sports Safety Committee Report is a timely reminder that efforts to eliminate preventable safety incidents must be unrelenting.

The Report provides practical guidelines and international best practices to improve sport safety. They cover a wide range of settings, including competitive and school sport, recreation and fitness activities, and addresses the risks and challenges to good safety practice that we have encountered in recent years. Experts across various relevant disciplines including the medical domain have provided important input that enables us to put forward our best efforts to uphold safety in our actions.

The Report advocates a strong proactive approach to managing risks, especially with the desire to increase sport participation across all demographics. We want to foster a culture of continuous improvement to safety that is both prudent and practical in application.

New additions in this edition take into account the fundamental principles of risk management and key responsibilities, representing a shift towards a national baseline for sport safety in Singapore. Get Active Questionnaire, which replaces the Physical Activity Readiness Questionnaire (PAR-Q), as well as dedicated chapters on heat injuries and water safety.

I would like to thank the Co-Chairs, Dr Ben Tan and Mr Rostam Umar, and the committee and advisors to the 2019 Sports Safety Committee Report, and commend them for their significant contributions to this updated edition.

Lim Teck Yin

Chief Executive Officer, Sport Singapore

MESSAGE FROM SPORTS SAFETY COMMITTEE



Adj A/Prof Benedict Tan
Chairman
Sports Safety Committee



Mr Muhammad Rostam Bin Umar
Chairman
Sports Safety Committee

With rising interest in sport and active lifestyle, more attention needs to be drawn to enhance safety levels during sporting experiences, taking into account that more organised sports are now taking place on any given day.

The 2019 Sports Safety Committee Report places emphasis on the roles and responsibilities of individual participants, athletes, coaches, sports officials, volunteers and event organisers in various aspects of sports safety. It makes recommendations for key responsibilities to be assigned to specific personnel in risk monitoring and review, communication and training of other team members on risk management, and will better equip sports facilities to identify the sources of risks.

This Report also covers pertinent topics revolving around sports safety including its fundamental principles, training and education in sports safety, water safety, sudden cardiac death, pre-participation screening, heat injuries, medical support planning, ensuring safe exercise facilities and lastly surveillance, evaluation and follow up of sports injuries. 2019 Sports Safety Committee Report is a timely reminder and guide that focuses on eliminating preventable incidents and taking a zero tolerance approach on accidents leading to deaths and injuries.

With a systematic approach to the various aspects involved, we encourage event organisers and our National Sports Associations (NSAs) to work together with relevant stakeholders to implement these recommendations. The importance of risk management protocols and a robust medical support plan cannot be over-emphasised. We urge all in the sporting community to take safety seriously. At the end of the day, sports safety is a shared responsibility that we need to be cognisant of.

We would like to take the opportunity to thank our fellow Sports Safety Committee Members for their invaluable contributions.

Sports should be an integral part of our lives. We remain committed to encourage Singaporeans to take ownership of their safety and to lead active and healthy lifestyles, and for every one of us to enjoy sports in a safe and considered manner.

Adj A/Prof Benedict Tan
Chairman, Sports Safety Committee

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EXECUTIVE SUMMARY

This is the third edition of the Sports Safety Committee Report. The first edition was published in 2007 and the second in 2015.

This third edition addresses the sport safety challenges faced in recent years and provides a practical overview to raising standards. A panel of experts representing various domains, as well as the key stakeholders within the Singapore sporting community developed this report. A strong preventative approach is being advocated to manage the risks, especially with the increase in sport participation. The report is applicable across a range of settings including competitive sports, school sports, active recreation and fitness activities.

The focus areas are:

- Fundamental principles of sports safety
- Training and education in sports safety
- Water safety
- Sudden cardiac death in sports
- Pre-participation screening
- Heat injuries in sports
- Event medical support plan
- Exercise and training facilities
- Surveillance, evaluation and follow up

Key recommendations have been made in each focus area. An emphasis is placed on the roles and responsibilities of individual participants, athletes, coaches, sports officials, volunteers and event organisers in various aspects of sports safety. The recommendations are broadly summarised as follows:

- Athletes must be able to recognise warning symptoms of sudden cardiac arrests, understand how to minimise the risk and be prepared to respond accordingly.
- Athletes, coaches, and event organisers should be educated on the preventive measures of heat injuries and be able to identify risk factors.
- Water safety awareness and survival programs should be stepped up.
- All sports facilities should conduct regular risk assessments to identify the sources of risks and take all reasonably practicable measures to minimise them.
- There should be stricter enforcement of safety practices for professional and carded athletes (e.g. pre-participation screening).
- Sports organizations, schools, and clubs should actively raise the awareness of sports safety.
- Where possible, sporting facilities should have an operational system to monitor the presence and identity of its users.
- A graded medical resourcing based on the risk assessment matrix is recommended for sports events.
- A minimum data set should be defined and stakeholders/organisations should be encouraged to capture these in their injury-reporting format (see Appendix 4: Sports Injury Reporting Form and Summary of Sports Injury Report).

1. Introduction

The Sports Safety Committee was formed in 2007 to improve the safety of organised and recreational sport. Its aim was to provide practical guidelines for the Singapore context.

In 2007, The Committee released its first report incorporating safety standards and systems, drawing from international best practices. In 2015, this report was updated, highlighting salient guidelines for ease of reference and application. In 2016, the National Water Safety Council was dissolved, after which the water safety portfolio was adopted by The Sports Safety Committee. In 2017, the Committee reconvened to integrate water safety into the overall sports safety framework, as well as to review existing recommendations.

The Committee has considered the changing trends in sport, in particular:

- Increased participation in extreme, ultra-endurance, combative, and mass-participation sports
- Exercise promoted as integral to the management of various chronic diseases.

This latest report outlines general safety guidelines relevant to the present landscape of sport. It is intended for individual participants, event organisers, officials, volunteers, coaches, facility owners, operators, and managers.

A code of practice will be developed from this edition.

Note: The report does not delve into the details of specific sports. Discretion is required when adapting the report's general guidelines for specific sports.

2. Fundamental Principles of Sports Safety

Key Messages:

- All sports organisations and sports events organisers should have a sound and pro-active safety and health management system in place. Implementing and maintaining a safety and health management plan fosters a culture of continuous improvement.
- Sports organisations and sports events organisers should conduct risk assessments to identify risk sources as well as the approaches to mitigate risk.
- Risk management planning includes the systematic application of management policies, procedures and practices. It also includes the tasks of establishing the context, identifying, evaluating, managing, monitoring and communicating risks. It is important to identify the root of the issue and work through each step of the process. This prevents implementing 'quick-fixes' that can result in problems.
- Resources on risk assessment and management systems are available on Sport Singapore's website: <http://www.sportsingapore.gov.sg/sports-education/sports-safety/safety-resources-and-useful-links>

2.1 Background: Safety and Health Management Systems

2.1.1 It is essential to have a safety and health management system that is benchmarked against best practices. With effective implementation of a rigorous system, a sound sports safety culture can be established. This is key to sustaining high standards of sports safety in Singapore. A proactive approach should be adopted, instead of reactionary measures whenever events or accidents occur. A long accident-free period can result in complacency, and safety measures can be overlooked or neglected. Unsafe attitudes, behaviours and acts cause most serious events incidents rather than unsafe equipment or conditions. Thus, a safety and health management system ensures every personnel remains vigilant and prepared.

2.1.2 A sports safety culture involves every stakeholder including participants, event organisers, sports organisations, coaches, teachers, instructors, parents and all members of the public. It is important to cultivate the awareness that everyone has a part to play. Sports participants need to be personally responsible, taking measures for their own safety. Sports associations and event organisers should take measures to manage sport safety at sport events, as they are accountable for the participants' safety.

2.1.3 All in all, efforts should be made to pre-empt all possible adverse outcomes at sport events, and preventive measures taken to avoid adverse events. This will ensure that everyone involved in the sport is well prepared.

2.2 Recommendations: Fundamental Principles of Sport Safety

2.2.1 **An “Incident-free Sports Safety Culture” can be achieved through establishing an appropriate safety and health management system.** A sound and sustainable safety and health management system, with effective implementation and continual upgrading is critical in the development of an incident-free sports safety culture.

2.2.2 **Sports organisations and event organisers should utilise a safety framework to guide the management of their plans.** A good framework should cover the following areas, at minimum:

- Management commitment for safety and health, including the allocation of adequate resources
- Safety attitudes, policy and principles
- Goals and objectives
- Setting high standards for sustainable performance
- Clear roles and responsibilities
- Emergency response and planning
- Safety organisation and structure

- Pre-event and post-event safety review
- Encompass pre-event, intra-event, and post-event safety measures
- Incident reporting and documentation, investigation, evaluation, and corrective action
- Training and development, including regular safety drills reflecting a variety of scenarios
- Supporting safety personnel
- Risk assessment and management
- Equipment deployment
- Effective communication of plans and measures
- Change management (people, equipment, technology)
- Regular review of the Safety and Health Management System

2.2.3 Risk management frameworks are useful in the planning process. These frameworks are by no means exhaustive or all-inclusive, and serve mainly to show the possible outlines of risk management plans. For details, please refer to Appendix 1.

2.2.4 Risk management is an on-going process that ensures safety is well managed, supports the achievement of safety goals, and minimises the likelihood of risks. The risk management process involves (i) risk assessment, (ii) the communication of risks, (iii) review and monitoring of the risk assessment. Key responsibilities should be clearly assigned to specific people in areas such as risk monitoring and review, communication and training of team members on risk management. Everyone involved should be informed and aware of it.

2.2.5 Risk assessment is an integral component of the safety and health management system. With effective risk management, the potential costs and liabilities can be minimised thereby enabling a safer sporting experience. Sport and recreational activity involves physical risk, which varies with the type and timing of the activity, location, participants' skill level and number of spectators. Risks are managed through assessing their likelihood and potential consequences,

developing clear actions and designing a response plan. Legal compliance and insurance coverage should also be considered.

2.2.6 Risk management documentation should include:

- A comprehensive risk management plan
- An incident/accident register
- A post event review/report

2.2.7 The management of sports facilities should conduct risk assessments. This allows the sources of risks to be identified and reasonably practicable steps taken to eliminate any foreseeable risk to those involved. Where it is not possible to eliminate risk, other reasonably practicable measures must be taken to minimise risk.

2.2.8 Risk Assessment can be made simpler with four questions:

- What unexpected or negative things could happen?
- What is the likely impact?
- What can we do about it?
- How do we inform everyone who is involved?

2.2.9 When identifying risks, the following factors should be considered:

- Age and capacity of participants, especially those who require extra care (e.g. young children, the elderly, those with special needs)
- Types of activities
- Personal past history of accidents, injuries and losses
- Rescue and lifesaving equipment
- Sport equipment
- Current and potential issues with standard operating procedures or practices
- Facilities and their infrastructure
- Environment where the activity is happening

3 Training and Education

Key Messages:

- Training and Education is critical to nurturing a culture of sport safety. Done proactively, it empowers sports organisers, coaches, participants and the general public to conduct sports activities in a safe environment. In an emergency, they can act as a first-responder delivering life-saving first-aid when needed.
- The National Registry of Coaches (NROC) promotes quality standards in coaching and safety practices. All coaches under the NROC are required to continually update their applied knowledge and skills to safely conduct sporting activities. Sport coaches under the registry benefit from a mark of standard continued education. Sports organisers, National Sports Associations, sports clubs, schools, parents, and anyone who employs coaches are strongly encouraged to only engage coaches that are on the registry.
- A Sports Safety Awareness program for all stakeholders can help to nurture Singapore's sport safety culture.

3.1 Background: Training and Education

- 3.1.1 There has been a rapid growth in sports participation rates and a large population of novices are taking part in events. Novices may have limited knowledge in hydration, nutrition, training methods and principles, as well as competition rules, making them susceptible to injury. Being inexperienced, they may not be aware of their physical limits. Beyond the large events, medical advisories are generally not issued to participants at most organised events. When issued, the information is often insufficient. Apart from changes in the mix of participants, there may be the addition of new events as the sport evolves (e.g. the addition of kiteboarding, an extreme sport, to the traditional sailing format), presenting “uncharted territory” and new challenges in terms of safety measures.
- 3.1.2 Sports Safety is not only about ensuring that each sporting activity is being conducted in a safe environment. It includes many facets such as risk assessment,

pre-event physical and mental health, and the ability to act immediately during accidents or emergencies.

3.1.3 Training and Education in Sports Safety should address the various facets of sport safety and be specific and tailored to the application context. Sports organisers, coaches and sports participants and their family members can benefit from training and education.

3.1.4 For a sports safety culture to take root, it is necessary to have a multi-pronged approach targeting sports organisers and associations, sports coaches, sports participants and their families. The program should:

- Raise awareness and knowledge of sports safety in all the four groups;
- Increase accessibility to sports safety training, including life-sustaining first-aid;
- Promote lifelong learning in sports safety through refresher training programs.

3.1.5 With the increased rate of sports participation, sport safety is of essence. A sports safety culture can be nurtured through awareness programs aimed at all sports organisations, participants and their families. Existing training centres and resources can be used to bring this about. Timelines to achieve set targets should be worked out.

3.2 Current Status of Sports Safety Training in Singapore

3.2.1 **Sports Organisers:** There is an opportunity to establish basic training programs in sports safety, which will communicate national values and standards on sports safety and help to develop our local sport safety culture. Currently, there are no standardised training programs available for sports organisers in Singapore. Most organisers depend on past experiences to drive future events. Informal knowledge transfer is valuable in developing the standards of organisation of sporting events. However, there is a need for established standards and training to mitigate undesired practices, such as shortcuts in water safety and employing minimal standards in first-aid to cut cost.

Sports organisers, officials, administrators also need to incorporate emerging issues into their safety training and development (e.g. harassment and abuse and mental health).

The responsibility for sports safety is often thrust upon coaches alone, who already have a lot on their plate. Sport safety is a shared responsibility, involving not just the coaches but the management and technical officials. When required, designated safety officers should also be appointed.

3.2.2 Sport Coaches: Sport Coaches under the National Registry of Coaches (NROC) are encouraged to continually upgrade themselves in the areas of coaching and safety. The Singapore Coach Excellence (SG-Coach) Programme (previously National Coaching Accreditation Program, NCAP) has been working with our national sports associations to provide sport-specific safety programmes for sports coaches. The SportSG's Safety Management Division also conducts a variety of workshops in sports risk assessment and management of injuries in sports.

Sports coaches come from diverse backgrounds and organisations. These include coaches under national sports associations, private clubs, private groups and teachers that provide coaching to their schools. The Ministry of Education (MOE) requires all coaches in schools to have valid certification in standard first-aid, CPR+AED, training in Values and Principles in Sports, as well as registration under provisional membership minimally under the NROC¹. These moves are positive for local sport.

¹ Full registration with the National Registry of Coaches requires completion of various additional basic training programs, viz. Basic Sport Science (BSS) Certificate, SG-Coach Level 1 (Theory), and SG-Coach Level 1 (Technical) or their equivalent. The SG-Coach Level 1 (Theory) program should eventually aim to cover all aspects of sports safety awareness.

On the whole, there is a pressing need for uniformed implementation of baseline sports safety curricula in the training of coaches. There is presently no statutory requirement for all sports coaches to have national licensing and attendance at sports safety training programs. Programs such as the Basic Sports Science Course and the SG-Coach Level 1 Program are not yet mandatory for all coaches in the country. More can be done to enhance safety attitudes and practices.

Specifically, the provision of training in these other aspects would provide coaches with a more comprehensive view on safety. While the existing programs cover specific areas related to sports safety, such as CPR, AED, First Aid and specific aspects of injury prevention, there are sports safety areas that have yet to be incorporated into coach training programs. These include the early identification of conditions that can aggravate injuries, hydration discipline for hot and humid environments and water rescue.

3.2.3 Sports Participants: Positive steps have been taken in recent years to equip sports participants with the basics of sport safety to reduce both the likelihood and severity of injuries.

- SportSG's Safety Management Division launched a Sports Safety Champs program in 2012 to inculcate a safety-first mentality and instil a sense of responsibility for the safety of participants and others. To-date, more than 12,000 students, teachers, volunteers and working adults have attended the programme. In 2016 a Water Safety Champs programme was also introduced to equip individuals and condominium residents with water safety and drowning prevention skills and knowledge. The Division has also collaborated with other agencies, public institutions and community groups to reach out to the much larger groups of school students and members of the public.
- In MOE schools, students are educated on the knowledge and skills for injury prevention as a part of the Physical Education (PE) Curriculum² in

² Refer MOE PE Syllabus 2014: <https://www.moe.gov.sg/education/syllabuses/physical-education>

order to exercise care for themselves and others. All teachers teaching PE are required to be trained in first-aid, CPR and AED and maintain the currency of their CPR and AED certification as part of the prevention measures against catastrophic outcomes for cardiac cases. Since 2017, all Secondary 1 students in MOE schools are taught the knowledge and practical skills of CPR, and the use of the AED as part of the PE curriculum.

Efforts such as these are generally lacking in other sectors of the sports ecosystem. Training provided by most sports clubs and associations also needs to go beyond basic measures. Safety must be consistently emphasized. For first-responder assistance to be available nationally, we need to equip a larger critical mass with knowledge and skills. Appropriate and timely buddy assistance for the injured is significant in terms of clinical outcomes.

3.2.4 Parents and Families of Sports Participants: Parents and families can be a major influence ensuring that school-going children are better prepared before engaging in sports. More can be done to engage them in sports safety. Outreach can involve reporting of sporting injuries and reinforcing safety messages.

3.2.5 Existing Sports Safety Awareness Guides: SportSG publishes a variety of sports safety guides for education and outreach. The NSAs and sports coaches are generally familiar with these sports safety guidelines. There is room to increase an awareness of these guides amongst the larger sporting community. Some of these guides are listed below (not exhaustive):

- CPR & AED Rescue Tips
- Heat Disorders Prevention Guide
- Injury Prevention & Safety Tips
- Recreational Diving Safety Guide
- Safe Baseball and Softball Guide
- Safe Cycling Guide
- Safe Equestrian Guide

- Safe Football Guide
- Safe Judo Guide
- Safe Running Guide
- Safe Rugby Guide
- Safe Sailing Guide
- Safe Ultimate Frisbee Guide
- Safe Water Skiing And Wakeboarding Guide
- Safe Wushu Guide
- Safety Guidelines for Children and Young People in Sport and Recreation
- Safety Risk Assessment Management in Sports
- Sports Concussion Guide For Young Athletes
- Sports Rage Prevention Guide
- Sports Safe Club Guide
- Sports Safe U Guide
- Sports Safety Management System Guidebook
- Sports Safety Tips For Competitive Sports
- Triathlon Safety Tips
- Water Surveillance Guide

Safety Resources may be found at: <https://www.sportsingapore.gov.sg/sports-education/sports-safety/safety-resources-and-useful-links>

3.2.6 CPR and AED Training: First Aid and CPR+AED training is typically an occupational requirement for sports coaches, PE instructors and in certain vocations. However, training is voluntary for the rest of the sporting community including sports enthusiasts and competitive athletes. There is a need to increase the awareness and need for sports safety and first-response capability.

Successful resuscitation of a collapsed athlete is dependent on an early response, as the risk of death otherwise increases 7-10 % per minute of delay. Early initiation of cardiopulmonary resuscitation (CPR) and the use of an automated external defibrillator (AED), halves the death risk to about 3-4% per minute. It is crucial that

the first responder of any planned sports activity is competent in delivering CPR and in using an AED. To minimise the delay in initiating CPR and using the AED, those in the proximity of the sports participant should be trained in administering first aid, performing CPR and/or the use of the AED. Hence, sports organisations, schools, coaches, trainers, clubs, as well as competitive and non-competitive sports participants and their families should be equipped with appropriate training to make a difference.

First-aid training has traditionally been carried out in first-aid training centres accredited by the National First Aid Council (NFAC). Figures are not available to-date on the numbers who undergo basic first-aid training on an annual basis. Current Standard First-aid training programs are conducted over approximately 16 to 24 training hours in these centres. This relatively long duration of training may be a deterrent to some who may, otherwise, voluntarily come forward to learn first-aid. The newly constituted National Resuscitation and First Aid Council (NRFAC) is looking into shortening the Standard First-Aid program in Singapore to 16 hours. Officers from various service companies that have Standard First-Aid training as part of their occupational requirements attend these training courses. In January 2016, the National Resuscitation Council (NRC) and the National First Aid Council (NFAC) together launched the Citizens First-Responder Program (CFRP). This compressed course is a five-hour hands-on program providing basic skills in Standard First aid and CPR+AED. Potentially extending the reach of these skills. The training of instructors and providers of this program is presently managed by the Singapore Red Cross Society.

Singapore has 120 training centres providing training in Cardio-Pulmonary Resuscitation (CPR) and the use of automated external defibrillators (AEDs). Since April 2018, the National Resuscitation and First Aid Council (NRFAC) has been the accreditation body. Previously, it was the National Resuscitation Council (NRC). In 2017 alone, these centres trained at least 180,000 persons in the skills of CPR+AED. Most people who were voluntarily trained were motivated by the need to be equipped to manage cardiac arrests in the home or at the workplace.

The national target is to have one trained first responder in every household. With the current two-year validity of CPR+AED certification, this translates to at least 500,000 persons trained each year – 50,000 to receive the full provider program (3-4 hours), and 450,000 to receive refresher training (1-2 hours). The cumulative number of trained members of the public has helped increase the self-initiated bystander CPR rate from about 21.9% in 2011 to at least 43% in 2015.

In 2011, a CPR+AED awareness program was initiated through a combined effort of Ministry of Health (MOH), Singapore Civil Defence Force (SCDF) and the Unit for Pre-hospital Emergency Care (UPEC). This programme focused on promoting telephone-provided CPR to families while they were waiting for arrival of the emergency ambulance. Called the DARE (Dispatcher-Assisted first REsponder) program, its aim was to help bystanders gain the knowledge of calling the SCDF's Emergency Ambulance Service (995) and being guided by their Call Centre Dispatcher in initiating CPR while the ambulance is on its way to the patient's location. This has added another 10% to the bystander CPR rate to bring the overall rate to 54.1% in 2015. (Data provided by the Unit for Pre-hospital Emergency Care [UPEC], Ministry of Health.)

With proven results and a ready pool of training centres and instructors, a concerted effort can increase the penetration of first-responder training.

3.3 Recommendations: Training and Education

3.3.1 SportSG should continue to enhance the existing sports safety training programmes and resource package. It should be made accessible to all sports enthusiasts and organisations, and cover the following areas of sports safety at a minimum:

- The benefits of sports.
- The potential dangers of unsafe sports.
- Participant preparation that can aid safe participation in sports.

- The safety considerations in setting up and conducting safe sporting activities.
- The immediate actions that need to be taken if injuries occur during sporting activities. This includes the need to report early warning symptoms to a doctor during sporting activities.
- The need for all stakeholders involved in sporting activities to be trained and ready to actively assist in the event of unexpected injury.

3.3.2 Sports organisers, sports associations, sports clubs and schools can play a significant role in promoting sport safety in Singapore. They can do so by encouraging training in sports safety awareness and promote sports safety amongst their officials, staff and participants by using SportSG's Safety Awareness packages.

3.3.3 Sports coaches should be registered under the National Registry of Coaches (NROC). Sports organisers, national sports associations, sports clubs, schools and the general public can encourage this move by only engaging coaches registered under the NROC. In this way, sport safety standards may be applied more consistently.

3.3.4 An environment of sport safety is everyone's responsibility. Sports participants should be equipped with either Standard First Aid + AED, CPR+AED, or at least, the Citizens First Responder Program (CFRP). An example is how students in MOE schools are introduced to the DARE programme in primary schools. All secondary one students also learn practical skills in CPR+AED as part of the PE curriculum. **National sports associations and sports clubs/organisations** should make sports safety a priority in their annual planning and operations (e.g. as a Key Performance Indicator).

3.3.5 The families of sports participants should be encouraged to be equipped. This outreach may be done through conducting or promoting available sports

awareness and training sessions in either Standard First Aid, CPR+AED or, at least, CFRP as best-practice standards.

4 Water Safety

Key Messages:

- All swimming pool users, water sports participants and enthusiasts should practise personal responsibility to be water safe.
- Swimming and water survival programs as well as water safety awareness programs are necessary for public education.
- Adults must exercise care and responsibility by abiding with safety regulations and maintaining close supervision of their children.
- Parents/care-givers should stay attentive and within an arm's reach of their unaccompanied children when bringing them to water bodies. This enables parents to pull their children out of the water in the event of an emergency. During swimming lessons, parents may help with supervising their children by staying near and in the direct line of sight of the class.
- Aquatic and water sports facilities should support surveillance efforts and provide rescue equipment such as rescue tubes, poles and throw ropes with instructions.
- The nature and conditions of open water environments need to be well understood by users. Therefore, public education and outreach remains essential.

4.1 Background: Water Safety at Aquatic Facilities

4.1.1 Between January 2011 and December 2015, 104 children presented to the KK Women's and Children's Hospital (KKH) for submersion injuries, 10 of which resulted in death. All 10 drowning deaths took place in private pools located at condominiums, private homes or hotels with half of them happening during pool parties. The submersion injuries involved children from below a year old to 15 years old, and more than half of these incidents happened in condominium pools. According to KKH, children aged six years and below were found to be at the highest risk, accounting for more than 76% of the incidents.

4.1.2 Drowning occurs for many different reasons, and is often due to a lack of:

- Vigilance and supervision from parents and caregivers

- General and water safety knowledge among Singaporeans
- Swimming proficiency
- Cardio-pulmonary resuscitation and lifesaving skills among care givers and supervisors.

4.1.3 Not all swimming pools, beaches and recreational water bodies are staffed with lifeguards. It is therefore important to foster collaborative approaches and collective efforts to prevent drowning incidents.

4.2 Recommendations for Aquatic Facilities

4.2.1 **Swimming and water survival programs are essential for water safety.** Swimming proficiency programs and water safety training are encouraged to be undertaken by the individual and facility operators.

4.2.2 **Water safety awareness programs should be organised by facility owners and operators (including educational institutions) to advocate key areas of action covering at least the following topics:**

- Prevention of shallow water black-outs
- Swimmers' behaviours and identification of swimmers in distress
- Get Active Questionnaire (GAQ)
- Swimming and water survival skills
- Stretching and warm-up exercises
- Lifesaving and rescue equipment
- Cardio-Pulmonary Resuscitation/Automated External Defibrillator usage (CPR/AED)
- Drowning and near-drowning case studies

4.2.3 **Infants, toddlers and pre-schoolers should be under constant adult supervision when they are in and around water.** One parent or caregiver should be within immediate arm's reach at all times to keep them safe in or around water. Parents or caregivers should be familiar with the child's capabilities and equip the

child with personal floatation devices if necessary. Even with flotation devices, constant supervision of children is necessary to ensure their safety.

4.2.4 Surveillance and rescue efforts may be supported by technology. Installing surveillance systems eases the process of supervision in aquatic facilities and can possibly reduce the risk of drowning.

4.2.5 Facility owners and operators should promote the water safety code as advised by the National Water Safety Council:

- Follow Safety Rules and Signs
- Never Swim Alone
- Learn Swimming and Water Survival Skills
- Understand the Dangers of Water
- Supervise Children and Weak Swimmers at all times
- Swim in Safe Areas

4.2.6 A Code of Practice for Aquatic Facilities should be developed to promote water safety. This Code of Practice provides guidelines on drowning prevention to stakeholders (e.g. hotels and condominiums with swimming pools) as well as the industry (e.g. water sports event organisers and enthusiasts). Risk assessment of aquatic facilities is fundamental and strongly emphasized in the Code of Practice.

4.2.7 Water safety certification should be introduced in Singapore to facilitate the adoption of the Code of Practice. In adopting the Code of Practice, aquatic facility owners and water sports event organisers may apply for this certification as a mark of efficiency and standards. Regular validation should be required to ensure that the guidelines are implemented.

4.3 Background: Water Safety in Open Water

4.3.1 In open water conditions, environmental hazards are present and they are essential to note. They include but are not limited to:

- Water temperature
- Water currents and eddies, including riptides
- Tidal flows
- Water quality
- Obscure underwater and overhanging hazards
- Water depth
- Conditions underfoot
- Marine animals
- Haze
- Ultraviolet (UV) rays

4.3.2 There are four categories of open water activities: recreational activities, competitions, water sporting events, and open water swimming lessons. The nature and process of each activity is different, therefore it crucial to identify the roles and responsibilities of people involved in each activity.

4.3.3 Users should be responsible for their own safety and take necessary preventive measures such as using the Get Active Questionnaire, using personal floatation devices if necessary, wearing appropriate attire, and protecting themselves from the environmental hazards mentioned above. In addition, users should be responsible and practice care through prior assessments of factors such as tide, temperature and weather.

4.3.4 The higher risks of open water would require various stakeholders such as facility owners, users, lifeguards, trainers, etc. to understand the safety requirements and practices. All regulatory requirements must be adhered to. Safety and rescue equipment must be made available. A risk assessment should also be conducted to identify risks and determine the appropriate control measures.

4.4 Recommendations: Open Water Safety

4.4.1 Users must be responsible for their own safety and need to understand the nature and conditions of open water.

- Participants travelling overseas for open water sporting activities should seek information on the safety of beaches or water bodies, as well as if there are trained lifeguards on duty. It is essential to abide by the safety regulations and guidelines of the facility owner.
- Users should participate in activities within their capabilities and use personal floatation devices where necessary.
- Users should avoid consumption of alcohol or any medication before participating in open water activities.
- Children need to be closely supervised by an adult.

4.4.2 Open water locations should have physical structures to inform users of critical safety information. Physical structures such as information signs and pontoons are useful in conveying critical safety information. This includes restricted swim zones, restricted water activities, procedures of using the safety equipment etc.

4.4.3 A public announcement system can disseminate critical information when required. Warning sirens should be used to inform users of possible emergency or dangers and the activation of the siren can be used during inclement weather, change of tides, release of water, or when dangerous activities are spotted.

4.4.4 Technology can play a crucial role in improving the safety of open water users.

- Communication devices – aids efficient communication between safety staff
- Security alarms – to be used within authorized premises
- Emergency alarms – for audio warnings during inclement weather, change of water flow, opening of tidal gates at reservoirs, dangerous occurrences etc.

- Closed Circuit Television (CCTV) – for wider coverage and more efficient monitoring by life guards/security officers
- Drowning detection system – a computer aided drowning detection system can alert onsite personnel of drowning victims.

Definitions

For the purpose of this report, the following definitions shall apply:

- **Aquatic Facilities:** a man-made body of water used for sport, recreation, or therapeutic water activities.
- **Open Water:** includes beach fronts, rivers, lakes and reservoirs.
- **Exercise and training facilities:** organisations that offer health and fitness programmes as their primary or secondary service, or promote high-intensity recreational physical activity (e.g. basketball, tennis, racquetball and swim clubs). Ideally such facilities should have professional staff. Facilities that only provide space and equipment are also included (e.g. unsupervised hotel exercise rooms).
- **Exercise and training facility user:** dues-paying member or a guest paying a regular daily fee to use the facility specifically to exercise.

References

1. Building and Construction Standards Committee (2010). *Code of practice for the design and management of aquatic facilities*. SS556: 2010.

5. Sudden Cardiac Arrest/Sudden Cardiac Death in Sports

Key Messages:

- Sports related sudden cardiac arrest (SCA) / sudden cardiac death (SCD) in athletes under 35 years of age is usually associated with underlying structural, electrical or biochemical heart abnormalities. The major cause of SCA in athletes above 35 years of age remains as coronary artery disease.
- Warning symptoms may precede SCA. Recreational and competitive athletes should be educated on the important early warning symptoms and signs to look out for, and to seek further medical review to evaluate these symptoms.
- The risk of sudden cardiac death and sports related injuries while participating in sport is low and the benefits of regular exercise outweigh these risks.

5.1 Background

5.1.1 Regular physical activity confers numerous health benefits for individuals of all ages. Exercise is an important tool in the management of various cardiovascular risk factors such as hypertension, diabetes mellitus (or insulin resistance), hyperlipidaemia and obesity, as well as coronary artery disease itself. The increase in cardiorespiratory fitness through exercise has also been shown to reduce the risk of all-cause mortality (Blair, 1989).

5.1.2 However, there is a paradoxical increase in the risk of sudden cardiac arrest (SCA) and/or death (SCD) during or shortly after exercise, particularly vigorous exercise.

Fact Box: SCA/SCD Definitions

Exercise-associated SCA/SCD is arbitrarily defined as occurring during or within an hour of physical activity.

The National Collegiate Athletic Association (NCAA) (Hainline, 2016) does not set a specific timeframe from physical activity – as outlined within its consensus statement made in 2016 on the cardiovascular care of college student-athletes.

Instead, NCAA considers SCD as an unexpected death due to cardiac causes that occurs within a 'short time', happening within a person with or without previously known cardiovascular disease.

- 5.1.3 SCD should be differentiated from other causes of exertional death in an athlete that is not primarily due to a cardiac cause, such as heat stroke and severe muscle injury (rhabdomyolysis).
- 5.1.4 Sports-related sudden death occurs most frequently during sports activity (92%), less frequently within 30 minutes (7.4%) and rarely more than 30 minutes after cessation of sports activity (Marijon E, 2011).
- 5.1.5 The exact incidence of SCA/SCD is difficult to assess because there is no national registry in Singapore and there are also differences in methodology and definitions of numerators and denominators. It is likely that SCA/SCD risk varies with age, gender, intensity of activity, race and ethnicity.

Fact Box: Competitive vs. Non-Competitive Athletes

The absolute number of SCD is reportedly low in studies in competitive athletes, ranging from 1 in 43,000 to 1 in 83,000 U.S. college athletes (about 5 – 10 NCAA SCDs per year) to 2.03 in 100,000 male marathon runners (Hainline, 2016). Certain athlete groups such as male athletes, competitive athletes, African-American athletes and male basketball players are at higher relative risk than others. However, the prevalence of sports related SCD in the general population has been shown in recent publications to be much higher than previously thought, with the possibility of underreporting (Marijon, 2011).

The prevalence of SCD in non-competitive young athletes was 2.5 times higher when compared to competitive young athletes (39 vs. 15 per year in France). This is because more than 90% of SCA/SCD occurred during recreational sport (Marijon, 2011).

- 5.1.6 It is important to recognize that the incidence of SCD is highest for athletes in their thirties and forties, when they are at risk from both congenital structural heart disease and acquired ischaemic heart disease.

Fact Box: Causes of SCA / SCD

More than 80% of SCA/SCD in both young and old athletes are from cardiovascular causes. The age cut-off between young and older athletes has been arbitrarily adopted in most literature as 35 years old. The division of the athletes by age is artificial but allows the categorization of causes of SCD from the cardiovascular standpoint. In athletes under 35 years of age, sports related SCA/SCD is usually associated with underlying structural or electrical cardiac abnormalities (Maron, 2014) (Corrado, 2001) (Maron, 2009). On the other hand, the major cause of SCA in athletes above 35 years of age remains as ischaemic heart disease.

- 5.1.7 SCD in young athletes has been the focus of much public attention and expert debates. It is important to place an equal emphasis on older athletes as well. Locally, 81.8% of exercise-related SCD occurred in individuals over the age of 35 between 2001-2008, with a mean age of death at 50.9 years (Cheah, 2010). This is similar to published data in Caucasian populations (Marijon, 2011) (Lawless, 2014).
- 5.1.8 A large proportion of cardiac arrests occur during cycling (30%), jogging (21%), soccer (13%), and swimming (3.8%) (Marijon, 2011). Drowning is included in SCD data as it is increasingly recognized as a potential manifestation of underlying heart disease (Papadakis, 2009).
- 5.1.9 Although the risk of SCA is acutely and transiently increased during or soon after exertion, this is more likely to occur in adult individuals with some form of structural

heart disease particularly coronary artery disease. For healthy people, the relative risk of SCA during exercise decreases with increasing physical activity.

Fact Box: Correlation between SCA during Exercise and Increasing Physical Activity

In one study, men who exercise for less than 20 minutes per week had a relative risk of exercise-related SCA that was 56 times the risk at rest, whereas those who exercise more than 140 minutes per week had a relative risk of only five times the risk at rest (Thompson, 2007). More importantly, a dose-response relationship exists between the amounts of exercise versus the cardiovascular benefits of exercise. As physical activity increases, there is a greater reduction in the incidence of SCA at rest and during exercise. In the least active group, the total incidence of cardiac arrest was 18 events per 1 million person-hours, compared to 5 events per 1 million person-hours in the most active group (Thompson, 2007).

The majority of exertion-related deaths occurred during unaccustomed exertion (56%) (Burke, 1999). Only 16% occurred during habitual exercise, while 28% occurred during emotional stress. Another study showed that in those who exerted themselves less than once a week, the risk of having an myocardial infarction (MI) in the hour after heavy exertion is 107 times the risk of MI during less vigorous physical exertion or none, while those who exerted themselves at least 5 times a week had a relative risk of MI of 2.4 (Mittleman, 1993).

5.2 Recommendations:

- 5.2.1 **Athletes should learn to recognise warning symptoms, and seek medical reviews when needed.** Education efforts and resources are required to ensure that athletes know the signs and symptoms, as well as reporting channels that they can openly relate to.

Athletes should also be educated on measures to exercise safely, such as refraining from exercise when they have a fever or other systemic signs of infection. Foreign athletes from temperate climates are encouraged to spend some time acclimatising to local climate and humidity prior to competition.

Warning symptoms, which may have been ignored by the athletes, may precede SCD. It is of utmost importance that athletes are educated on the important symptoms to look out for. These include exertional chest pain/discomfort, fainting or near fainting spells, palpitations, as well as excessive exertional and unexplained breathlessness/fatigue associated with exercise (Maron et al., 2015). If detected, athletes need to undergo further medical reviews to evaluate these symptoms. The medical review may or may not involve exercise testing. A physician may perform a typical cardiovascular screening for congenital and genetic heart disease.

5.2.2 Athletes with positive family history of premature (<50 years old) heart diseases or cardiac death, or hereditary cardiac conditions should seek cardiac clearance for sporting participation and competition (Barry et. al. 2007). This includes those with a family history of specific hereditary heart condition (e.g. hypertrophic cardiomyopathy or long QT syndrome). Wide-reaching public education is critical in raising public awareness on issues in sports safety. These include the indications for seeking medical review, the limitations of screening and the benefits of exercise versus risk of SCD from exercise.

5.2.3 To minimise the risk of SCA, athletes should have adequate and appropriate training. During a race, they should run at steady pace, avoid spurting and learn to recognise and respond to their limits.

It is critical to have a training programme with a gradual build-up in volume and intensity. Allowing the body to adapt to the load gradually reduces the risk of exercise related SCA. Race conditions change for each individual over years and

runners need to always prepare for each race diligently and respond to their body's signals.

Exercise capacity drops with detraining. Standard prudent measures of refraining from exercising when unwell and ensuring proper acclimatisation are important. Therefore, for periods in which exercise routines may be halted (e.g. owing to illness or work), athletes should resume training at a level lower than when they stopped.

Cardiac collapses in a marathon are most often at the final mile or finishing line (Thompson et al., 2007). There are individuals who participate in marathons without adequate preparatory training. Coupled with the desire to complete the race, many push themselves towards the end of the race. Athletes are advised not to sprint in the last mile of the race or near the finishing line, unless there is sufficient specific conditioning.

References

1. Barry, J. M., Paul, D. T., Michael, J. A., et al. (2007). Circulation: *Recommendations and Considerations Related to Preparticipation Screening for Cardiovascular Abnormalities in Competitive Athletes: 2007 Update*. 115(12), 1643-1655.
2. Blair, S. N., Kohl, H. W. 3rd, Paffenbarger, R. S. Jr, Clark, D. G., Cooper, K. H., Gibbons, L.W. (1989). Physical fitness and all-cause mortality. A prospective study of healthy men and women. *JAMA*, 262(17), 2395-2401.
3. Burke, A. P., Farb, A., Malcom, G.T., et al. (1999). Plaque rupture and sudden death related to exertion in men with coronary artery disease. *JAMA*, 281(10), 921- 926.
4. Cheah, S. O., Ong, M. E. H., Chuah, M. B. F. (2010). An Eight Year Review of Exercise-related Cardiac Arrests. *Annals, Academy of Medicine Singapore*, 542-547.
5. Corrado, D., Basso, C., Thiene, G. (2001). Sudden Cardiac Death in young people with apparently normal heart. *Cardiovascular Research*, 399-408.
6. Day, S. M., Thompson, P. D. (2010). Cardiac risks associated with marathon running. *Sports Health*, 2(4), 31-36.
7. De Noronha, S. V., et al. (2014). The Importance of Specialist Cardiac histopathological examination in the investigation of young sudden cardiac deaths. *Europace*, 16(6), 899-907.
8. Hainline, B., Drezner, J. A., Thompson, P. D., et al. (2016). Interassociation Consensus Statement on Cardiovascular Care of College Student-Athletes. *Journal of American College of Cardiology*, 67(25), 2981-2995.
9. Kim, J. H., Malhotra, R., Baggish, A. L., et al. (2012). Cardiac Arrest during Long-Distance Running Races. *The New England Journal of Medicine*, 366, 130-140.

10. Lawless, C. E., Asplund, C., Asif, I. M., et al. (2014). Protecting the heart of the American athlete: proceedings of the American College of Cardiology Sports and Exercise Cardiology Think Tank October 18, 2012, Washington, DC. *Journal of the American College of Cardiology*, 64(20), 2146-2171.
11. Maron, B. J., Doerer, J. J., Mueller, F.O., et al. (2009). Circulation: Sudden Deaths in Young Competitive Athletes. Analysis of 1866 Deaths in the United States, 1980 – 2006. 119, 1085-1092.
12. Maron, B. J., Hass, T. S., Rutten-Ramos, S. J., et al. (2014). Incidence and Causes of Sudden Death in U.S. College Athletes. *Journal of the American College of Cardiology*, 63(16), 1636-1643.
13. Maron, B. J., Levine, B. D., Washington, R. L., et al. (2015). Circulation: Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 2: Preparticipation Screening for Cardiovascular Disease in Competitive Athletes: A Scientific Statement From the American Heart Association. 267-272.
14. Marijon, E., Tafflet, M., Joven, X., et al. (2011). Circulation: Sports-related Sudden Death in the General Population. 124(6), 672-681.
15. Mittleman, M. A., Maclure, M., Tofler, G. H., et al. (1993). Triggering of acute myocardial infarction by heavy physical exertion. Protection against triggering by regular exertion. Determinants of Myocardial Infarction Onset Study Investigators. *The New England Journal of Medicine*, 329(23), 1677-1683.
16. Papadakis, M., Sharma, S., Cox, S., Sheppard, M. N., Panoulas, V. F., Behr, E. R. (2009). The magnitude of sudden cardiac death in the young: a death certificate-based review in England and Wales. *Europace*, 11(10), 1353-1358.

17. Thompson, P. D., Franklin, B. A., Balady, G. J., et al. (2007). Circulation: Exercise and acute cardiovascular events placing the risks into perspective: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism and the Council on Clinical Cardiology. 115(17), 2358-68.

6. Pre-Participation Screening

Key Messages:

- Pre-participation screening aims to pick up existing conditions that may cause harm during strenuous physical activities.
- Individuals should complete pre-participation questionnaires prior to embarking on strenuous physical activities.
- Reporting and acting on early warning symptoms (EWS) can prevent injury and harm during physical activity. Athlete and coach education is significant in raising this awareness.
- Risk stratification enables athlete screening to be done optimally, especially with limited resources.
- Athletes, as well as their clubs and schools, are instrumental in ensuring that proper pre-participation screening is mandated and adhered to.

6.1 Background:

6.1.1 People of all ages and levels of fitness engage in sporting activities of low, moderate or high intensity. Every year a number of individuals of various age groups sustain cardiovascular collapse while engaged in active sporting activity. The numbers who develop sudden cardiac arrest during sporting activities is small. Pre-participation screening aims to pick up existing conditions that may cause harm during strenuous physical activities.

Fact Box: Incidence of Death During Exercise

The absolute incidence of death during exercise in the general population is believed to be low averaging 0.55 collapses per 100,000 men per annum (Thompson et al, 1982) (Thompson, 1996) (Siscovick et al., 1984) (Van Camp et al., 1995). Figures quoted have varied from 0.13 per 100,000 young female athletes and 0.75 per 100,000 young male athletes (Van Camp et al., 1995) to 6 per 100,000 in middle-aged men (Thompson, 1996) during active exertion.

Although figures vary from country to country, most countries that have such figures would show similar rates.

- 6.1.2 A system of pre-participation screening may be useful in predicting a person's likelihood of having a cardiac arrest. Through careful history and evaluation, the factors contributing to cardiac arrest (i.e. drugs and infections) can be potentially deduced.

Fact Box: Factors Contributing to Cardiac Arrest

There are many factors that contribute to cardiac arrest during strenuous exercise. These include coronary artery disease, cardiac abnormalities, such as hypertrophic cardiomyopathy (or athlete's heart), abnormal anatomy of the vessels supplying the heart, drugs, infections and other unknown causes. The prevalence of anatomical abnormalities of the heart such as hypertrophic cardiomyopathy, abnormal vessels and genetic defects is extremely low (0.2% to 1.3%) (Barry et al., 1995) (Laureti et al., 2005) (Yamanaka, Hobbs, 1990) (Liberthson et al., 1974) (Alexander, Griffith, 1956) (Wilkins et al., 1998) (Yildiz et al., 2010). The majority of these patients do not show symptoms.

6.2 International Perspectives on Pre-Participation Screening for Sports

- 6.2.1 The generally positive impact of sport on a person's health has led to an understanding that sports is an important cultural component within most societies. There are currently no internationally accepted guidelines on the use of pre-participation screening for sports. Communities around the world have tried to address the issue of pre-participation screening.

- 6.2.2 Only a minority of persons with structural heart disease develop cardiac arrest during strenuous activity. However, majority of people with any positive cardiovascular findings are denied access to sporting activity. This deprives the affected persons of many benefits of sports and exercise and appears contrary to the principle of development of a healthy body and healthy mind through sport.

Such denial also opens up the potential of deleterious physical and psychological sequelae (Thompson et al., 2007) (Shiroma, Lee, 2010).

6.2.3 The United States Preventive Services Task Force (USPSTF) study (Moyer, 2012) concluded that the additional information obtained by doing resting and exercise ECG of asymptomatic adults (with a low risk for adverse cardiac events) is highly unlikely to result in lower cardiac arrest rates. The potential benefit of ECG screening of previously asymptomatic populations will not outweigh the adverse impact of large numbers of potential ECG abnormalities (*for the details of the United States Preventive Services Task Force (USPSTF) study, please see Fact Box: Resting and Exercise ECG Abnormalities and the Adverse Risk of Cardiac Events*).

Fact Box: Resting and Exercise ECG Abnormalities and the Adverse Risk of Cardiac Events

A United States Preventive Services Task Force (USPSTF) study (Moyer, 2012) has demonstrated adequate evidence that resting and exercise ECG abnormalities are associated with an increased risk of adverse cardiac events. However, only a small proportion of those with abnormal ECG's actually sustain adverse cardiac events (though at a higher rate than for those with normal ECG).

The USPSTF concluded that the incremental information obtained by screening previously asymptomatic adults at otherwise low risk for adverse cardiac events is highly unlikely to result in changes in risk stratifying the screened general asymptomatic population that would result in lower cardiac arrest rates.

In discussing the pros and cons of conducting general ECG screening of asymptomatic general sports enthusiasts, the task force also concluded that any potential benefit of ECG screening of previously asymptomatic populations will not be matched by the adverse impact of large numbers of potential ECG abnormalities. These apparent abnormalities may result in the conduct of large

numbers of follow-up tests. In addition, there could be a negative impact on those with some form of apparent ECG abnormality, which may not relate to cardiovascular risk.

For individuals with multiple cardiac risk factors the evidence available was not conclusive as to whether there was a net benefit for those who were previously asymptomatic.

6.2.4 Italy is one of the few countries in the world where there is a compulsory nationwide pre-participation screening program conducted by sports medicine physicians for all young competitive athletes (12 – 35 years of age). It has apparently provided adequate sensitivity and specificity for detection of competitive athletes affected by potentially dangerous cardiac issues and led to the reduction in mortality (see Fact Box: Nationwide Pre Participation Screening in Italy).

Fact Box: Nationwide Pre Participation Screening in Italy

Italy is one of the few countries in the world where there is a compulsory nationwide pre-participation screening program conducted by sports medicine physicians for all young competitive athletes (12 – 35 years of age). High-performance competitive athletes undergo a detailed cardiovascular evaluation before being allowed to compete in intensive sporting activities. This has been implemented since 1982 and has been reported to be successful.

The screening protocol included athlete's personal and family history, physical examination, and twelve-lead electrocardiogram (ECG) as first-line examination. Additional tests such as echocardiography or exercise testing were conducted only for subjects who had positive findings at the initial evaluation. This process involved more than a million Italian competitive athletes over a period of more than 25 years.

It has apparently provided adequate sensitivity and specificity for detection of competitive athletes affected by potentially dangerous cardiomyopathy or arrhythmia at risk of athletic-field death and has led to substantial reduction of mortality amongst young competitive athletes (by approximately 90%), mostly by preventing sudden death from cardiomyopathy (Corrado et al., 2005) (Corrado et al., 2006) amongst the athletes who were screened. The conduct of the protocol was facilitated by the availability of large numbers of specialist sports physicians and cardiologists more than is available in most communities. The programme did not cover non-competitive athletes such as recreational gym users.

6.3 Current Practices in Singapore

6.3.1 There are currently no internationally accepted guidelines on the use of pre-participation screening for sports. Currently, in Singapore, individuals in certain groups undergo compulsory pre-participation screening, including:

- All carded athletes (i.e. national athletes receiving SportSG grants)
- Singapore Premier League soccer players and other professional athletes
- Students enrolling into Singapore Sports School
- Participants attending certain courses (e.g. Outward Bound Singapore) and lifeguards prior to taking their Lifeguard Proficiency Award test
- National Service Pre-enlistees, active national servicemen (NS Men) and Singapore Armed Forces (SAF) regulars

6.3.2 The annual pre-participation screening that the carded athletes undergo comprise medical history, physical examination, chest X-Ray, resting ECG, urinalysis, urine microscopy, full blood count, and for contact sports, hepatitis screen. It is compulsory for all carded athletes to undergo annual pre-participation screening, but there has not been full compliance (Van Camp et al., 1995). Challenges can therefore be expected for pre-participation screening to be mandated in other groups.

6.3.3 Singapore Premier League soccer players have undergone annual screening before the start of each season since 2000. The Football Association of Singapore Medical Committee set the test protocols comprising medical history, a physical examination, a chest X-ray, resting ECG, urinalysis and blood tests. Blood is taken to test for haemoglobin and serum creatinine levels, as well as to test screen for HIV, hepatitis B and syphilis. A full screen is done at entry into the S-League, and an abbreviated screening is conducted annually thereafter. There have been a few foreign potential players that failed the screening process and therefore disallowed to play in the League.

6.3.4 In the Singapore Sports School, pre-enrolment screening is similar to the pre-participation screening for carded athletes. This compulsory pre-participation screening program is limited to competitive athletes who form a small segment of the sporting population.

Fact Box: Medical Cases Identified through Screening

Pre-enrolment screening at the Singapore Sports School identified 11 cases of abnormal results between 2006 and 2007. After further investigations, eight individuals were certified safe for enrolment and three were not cleared. Of the eight who required follow-up, there were two cases with haematuria, one with haematuria and low body weight (weight for height at 80-90%), one with obesity, one with abnormal blood pressure, two with exercise-induced asthma, one with normochromic normocytic anaemia. Three cases were not cleared: one had Wolf Parkinson White syndrome, one had mild pulmonary stenosis, and one with Marfanoid appearance and bullae in middle and lower zones of his/her right lung.

6.3.5 Nationwide pre-participation screening programmes being conducted include:
- SAF's comprehensive pre-participation screening

6.3.6 The Singapore Armed Forces' (SAF) screening programme involves all individuals serving in the SAF, whether NSF or Regular NSFs undergo a pre-enlistment

medical screening and are additionally screened when undergoing certain courses or undertaking certain forms of training (fitness for instruction or FFI). All active serving personnel, including NS men, also undergo screening at milestone ages and annual screening after the age of 35 years.

There are two screening protocols:

- a) Panel I – medical examination, resting ECG, urine dipstix, fasting lipids, fasting glucose) is done at age 35 and annually thereafter.
- b) Panel II – Audiometry, Creatinine, Full Blood Count and HIV screen) is done additionally at ages 35, 40, 43, 46, and 49 and annually thereafter. More detailed screening will be done with servicemen with more risk factors.

For 40 years, the SAF has utilised a system of verbal wellbeing checks administered by local ground commanders prior to participation in strenuous physical activity. This reminder to soldiers and strenuous activity participants is part of their Training Safety Regulations. It ensures safety precautions have been taken and the opportunity for anyone feeling unwell to withdraw from the activity.

6.3.7 The School Health Service (SHS) is responsible for the school-based health screening and immunisation programme. The two main objectives of the Schools Programme are:

- To detect common health conditions among the primary and secondary school population
- To prevent illness from communicable diseases through immunization.

6.3.8 The School Health Service (SHS) has primary and secondary school health teams, serving approximately 450,000 students in 191 primary schools and 155 secondary schools. The primary school health team comprises seven nurses and a medical officer and the secondary school health comprises 3 nurses. The medical officers provide quick medical examinations for the primary one and primary five students. However, there is no mandatory pre-participation screening specifically directed at competitive school athletes.

6.3.9 With the SHS programmes in place, all Singaporeans would have been medically screened between age 6 and 16. In addition, National Servicemen would have additional screening at age 35 and annually thereafter while still in active service.

6.3.10 Schools under the Ministry of Education require all parents to submit an annual declaration of their children's medical conditions such as periodic loss of consciousness, heart condition, allergies, precautions or advice for physical activity. Following a review on PE Safety by MOE in 2014, the list of medical conditions was reviewed and updated. It has been made available to teachers in charge of PE and co-curricular activities (CCA) so that necessary precautions may be taken. In addition, the PE curriculum in MOE schools introduce elements of the Get Active Questionnaire (GAQ) (Appendix 2).

6.3.11 The general population may undergo general health screening, for example when purchasing certain insurance policies, taking up a new job (i.e. pre-employment screening), or on their own accord. The screening protocols vary, and may include some element of pre-participation screening (in particular, the cardiovascular clearance components), such as with resting ECG and exercise stress testing.

Unfortunately, most of these screening protocols are not conducted regularly and only have sporadic coverage. They are not specifically designed for sports participation and also do not emphasise the musculoskeletal component. They may suffice for a recreational athlete, but may not be adequate for competitive athletes. Many of these protocols do not address the early warning prodromal symptoms that have been recognised for sudden heart emergencies.

6.3.12 "Opportunistic pre-participation screening" via self-administered questionnaires can be done on joining a gym. These can help to raise an awareness of sports safety. Some local gym operators request new members to complete a pre-participation questionnaire.

Fact Box: Pre-Participation Screening Challenges Faced Overseas

These challenges are also faced abroad. A survey of 65 health clubs in Ohio, United States, revealed that 28% of the clubs failed to use pre-entry cardiac screenings (Thompson et al., 2007). Another survey of 110 facilities in Massachusetts, United States, found that nearly 40% of responding facilities do not use a screening interview or questionnaire to evaluate new members (Balady et al., 1998).

6.4 Evaluating the Effectiveness of Pre-Participation Screening

6.4.1 The concept of pre-participation screening appears sensible since sports injuries and sudden death are often related to underlying medical conditions.

6.4.2 There are challenges to general non-selective screening of a large population (Maron et al., 2007). These include:

- The very low incidence of underlying conditions that predispose to sudden death and hence whether there should be ECG screening of large populations.
- The variety of causes of sudden death, thus requiring different diagnostic tests and approaches.
- The limited specificity and sensitivity of available tests results in large numbers of false positive test results, which require further and usually costly investigations. It can lead to the inappropriate exclusion of fit individuals from exercise.
- The resources required to screen large populations are tremendous and may not be available on the scale required to address large numbers.
- Countries that have adopted pre-participation screening procedures on a large scale, such as Canada, attest to the usefulness of the tool in helping to identify those who may not be fit for increased levels of physical activity required for strenuous sports.

6.4.3 There is still value in doing ECG for screening purposes. In the older population (individuals above 35 years), the most common cause of sudden death is coronary artery disease (CAD) resulting in heart attack. ECG is sometimes useful in picking up CAD.

Fact Box: ECG Screening and Coronary Artery Disease (CAD)

The value of screening for CAD and the test choices available have different predictive levels and their routine use is controversial. The resting ECG is not a useful tool for detection of CAD since many patients with CAD have normal resting ECGs and many individuals without CAD have ECG findings that are suspicious of CAD, thus unnecessarily raising concern (Barry et al., 1995).

Exercise testing (i.e. exercise stress test) has limited sensitivity (Greenland, Gaziano, 2003) in an asymptomatic population with a low likelihood of CAD (Laureti et al., 2005).

6.4.4 ECG screening has other limitations:

- It is of limited value in preventing or predicting acquired or environmental causes of sudden death or injury due to acute illness, such as heat-stroke, infection of the heart (myocarditis) or traumatic causes of injury.
- Some conditions which may cause sudden death, such as congenital anomalous origin of the coronary arteries, are not usually detectable by simple tests such as the resting or exercise ECG, and require more advanced imaging, such as cardiac magnetic resonance imaging (MRI) or computed tomography (CT) angiogram (Hendel et al., 2006).
- Other causes of sudden death, such as some primary arrhythmias (abnormal heart rhythms) occur in the absence of easily detectable abnormalities of cardiac structure, and hence are not easily diagnosed even with advanced imaging technology.
- All of these conditions are uncommon or rare, so that large numbers of individuals would need to be screened to detect any cases.

- 6.4.5 The study conducted in Italy is the committee's best evidence demonstrating the efficacy of pre-participation screening for competitive athletes (see Fact Box: National Pre-participation Screening in Veneto, Italy).

Fact Box: National Pre-participation Screening in Veneto, Italy

It is helpful to examine the situation in Italy, one of the few countries in the world where a compulsory national pre-participation screening program conducted by sports medicine physicians for all young competitive athletes (12 – 35 years of age) has been implemented since 1982 and been reported to be successful.

In the Veneto region of Italy, this program was able to detect 879 individuals with abnormalities who were subsequently disqualified from competitive sports, including 345 cases of conduction and rhythm abnormalities, 30 cases of hypertrophic cardiomyopathy, 16 cases of arrhythmogenic right ventricular hypertrophy, and 14 cases of dilated cardiomyopathy over a 24-year period (Corrado et al., 2006). Over the same period, there was a significant and impressive 89% decline in the number of sudden deaths in this region, from 3.6 to 0.4 deaths per 100,000 athletes. There was no change in deaths during this period among the unscreened non-athletes, suggesting that screening mediated the decrease.

It is to be noted, however, that the reduction in deaths pre- and post-screening is only statistically significant for individuals with hypertrophic cardiomyopathy. To detect the 30 cases of hypertrophic cardiomyopathy, screening of 42,386 young athletes with a general history, physical examination and resting ECG was required. In addition, over 3,900 of them who had positive findings on history, physical examination or ECG, underwent additional tests including cardiac ultrasound, 24-hour ECG monitoring, stress testing, cardiac magnetic resonance imaging, electrophysiological study, contrast angiography, or a combination. It is unknown how many athletes were referred for additional tests based on ECG

findings specifically, and as such, difficult to evaluate the value or usefulness of ECG for picking up anomalies in this case.

6.4.6 The European Society of Cardiology has recommended the routine inclusion of an ECG in pre-participation screening, but this policy is not in widespread practice outside Italy (Corrado et al., 2005). In contrast to the European guidelines, the American Heart Association, the American College of Cardiology (Maron et al., 2007), and the American College of Sports Medicine do not recommend that a resting ECG is mandatory in the screening of competitive athletes, based on the limitations mentioned above.

6.4.7 It is therefore crucial that any pre-participation screening policy be based on evidence of effectiveness, the conditions being screened for, and assessment of benefit in the Singapore context. The recommendations in this chapter are based on existing evidence and what would rationally be suitable for the local sports safety and participation environment.

6.4.8 Use of Self-administered Pre-Participation Screening Questionnaires:

- Since the 1980s, one of the most commonly used self-administered pre-participation screening tools used around the world has been the Physical Activity Readiness Questionnaire (PAR-Q) developed by the Canadian Society for Exercise Physiology (CSEP) (Shepard, 1998). Over the years it has become the de-facto international standard pre-participation screening instrument and has also been used widely in some countries by primary care physicians when screening healthy individuals for non-competitive physical activity.
- The objectives of such pre-participation screening tools have been to identify individuals for whom an increase in physical activity or sports participation may be hazardous. However, there is also the need to ensure that such tools are simple, can be self-administered (not onerous) and require only a few simple

parameters to be verified by the participant. One also needs to consider the literacy requirements of the tool, the purpose of the screening and the recall or time period to measure. These tools have thus been the objective of extensive reviews (Modified Physical Activity Readiness Questionnaire, *University of Florida Health*) (Cardinal & Cardinal, 1995).

- Over the years, various forms of the PAR-Q have been created such as the modified PAR-Q (Warbuton et al., 2001), PAR-Q+ (Warbuton et al., 2011) and the most recent Get Active Questionnaire (GAQ) (Get Active Questionnaire Reference Document, *Canadian Society for Exercise Physiology*). Having evaluated the revised versions of the CSEP's PAR-Q, the Committee is concerned at their increasing complexity and length and difficulty for self-administered use in Singapore.
- In Singapore, SportSG has recommended the PAR-Q form for the last ten years. It is necessary to review the screening tools in use to ensure their relevance to address local needs and ease of implementation.

6.4.9 It is important to note that even without a screening program, some individuals can already be identified as being at higher risk owing to pre-existing medical conditions, symptoms, or past episodes of events.

Fact Box: Prior Medical Symptoms and Cardiovascular Events

There are published reports suggesting that:

- Many individuals with exercise-related cardiovascular events had prodromal symptoms that were ignored by the victims or their physician (Thompson et al. 2007)
- Maron et al. (1996) reported that of 134 young competitive athletes with sudden cardiac death, 24 (18%) had probable cardiac symptoms in the 36 months prior to their death.

- Among adults, 50% of joggers, 75% of squash players, and 81% of distance runners with sudden cardiac death during exercise had probable cardiac symptoms before death (Maron et al., 2007).
- The commonest symptoms that portend potential cardiac emergency (Koester, 2001) (Basso et al., 2000) are:
 - chest pain
 - palpitations
 - fainting spells or seizures during exercise
 - dizziness or chest pain during exercise
 - unexplained breathlessness, extreme fatigue during exercise

6.5 Pre-Participation Screening Philosophy

6.5.1 There is a need for some form of pre-participation screening to identify the cohort of athletes and sports enthusiasts affected by unsuspected underlying cardiovascular disease. This enables appropriate interventions to prevent sudden cardiac death during sports.

6.5.2 Every individual who is involved in sports should take some measures for his/her own safety by actively participating in safety screening procedures. This will best inculcate the culture of sports safety that is necessary for minimising the prevalence of injuries during sports.

6.5.3 While the government can set up the basic infrastructure for a culture of sports safety, it may not be practical to conduct a nationally administered physical examination as pre-participation screening for all individuals involved in sporting activities.

6.5.4 The recommendations for pre-participation screening are based on:

- A preference for locally relevant, self-administered pre-participation screening questionnaires prior to all sporting activities (as a minimum standard of sports safety in the country).
- Selective further screening of the identified at-risk population, to increase the pre-test probability of identifying at-risk individuals and the risk stratification should in turn be based on:
 - The individual's intrinsic risk of sudden death or serious injuries (e.g. prodromal symptoms, positive family history);
 - Current health condition;
 - The level of competition (Figure 6.1);
 - The degree of risk of the particular sport or activity (Table 8.1).
- Evidence-based screening protocols (as far as possible), graded according to the degree of risk, and customized to each sport, where applicable. Where the evidence-base is weak, sound reasoning principles should be applied to better ensuring population safety during sporting activities.
- The appropriate management of identified at-risk individuals.
- The optimisation of existing resources.
- Minimising the hindrance to sports participation and sports excellence.
- The recognition that pre-participation screening is only part of the strategy to decrease the chance of sudden death and adverse events. Education is the other crucial component of the overall strategy. Individuals should be educated on symptoms and signs that require medical attention before embarking on sports activities or exercise.

6.6 Risk Stratification – based on Participant's Profile, Competitive Intensity and Type of Sport for Physician-led Screening

6.6.1 Athletes can be risk-stratified based on the level of competition (Figure 6.1). Generally, with a higher level of competition comes a higher training intensity and volume, and therefore, a higher risk of sudden death and injuries. Risk stratification based on competitive levels should be used in consideration with other risk factors such as the type of sport, state of training and other inherent risk factors. For

example, a 55-year old novice to marathon running may over-zealously undergo high-mileage training without building up to it, and would be considered at risk of sudden death even as a club runner.

6.6.2 Sports activities can be risk-stratified based on cardiovascular demands (Table 8.1). The duration of participation (e.g. endurance or ultra-endurance events), contact/collision risk, or environmental stress, can also affect risk levels. Nevertheless, cardiovascular activity (i.e. percentage of maximum aerobic capacity) has been chosen as the main factor owing to its stronger association with known intrinsic risk factors.

6.6.3 The categorization in this report serves only as a rough guide, and individual sports organisations should exercise discretion with the sport-specific guidance of their medical advisors, medical committees, or international federations, where applicable. The risk of any physical activity is an interaction of the exercise per se and the individual's fitness and medical conditions. For example, for a fit individual, a category 1 event would be easy whereas to an unfit person with congestive heart failure, a category 1 event may be intolerable. It is also important to consider that the competitiveness of the individual also influences the risk, for instance, a category 1 or 2 sport may cause excessive strain in an overzealous competitor.

6.7 Recommendations: Pre-Participation Screening

6.7.1 **The Committee recommends the adoption of the Get Active Questionnaire (GAQ) by the Canadian Society for Exercise Physiology.** Going forward, the Committee recommends the development and validation of a Singapore Physical Activity Readiness Questionnaire (S-PAR-Q) that will have taken into consideration the various factors that need to be considered for initial pre-participation screening.

6.7.2 **All persons participating in sports activities should undergo pre-participation screening.** The type of screening should fit the competition level (Figure 6.1), type of sport and individual's risk-level.

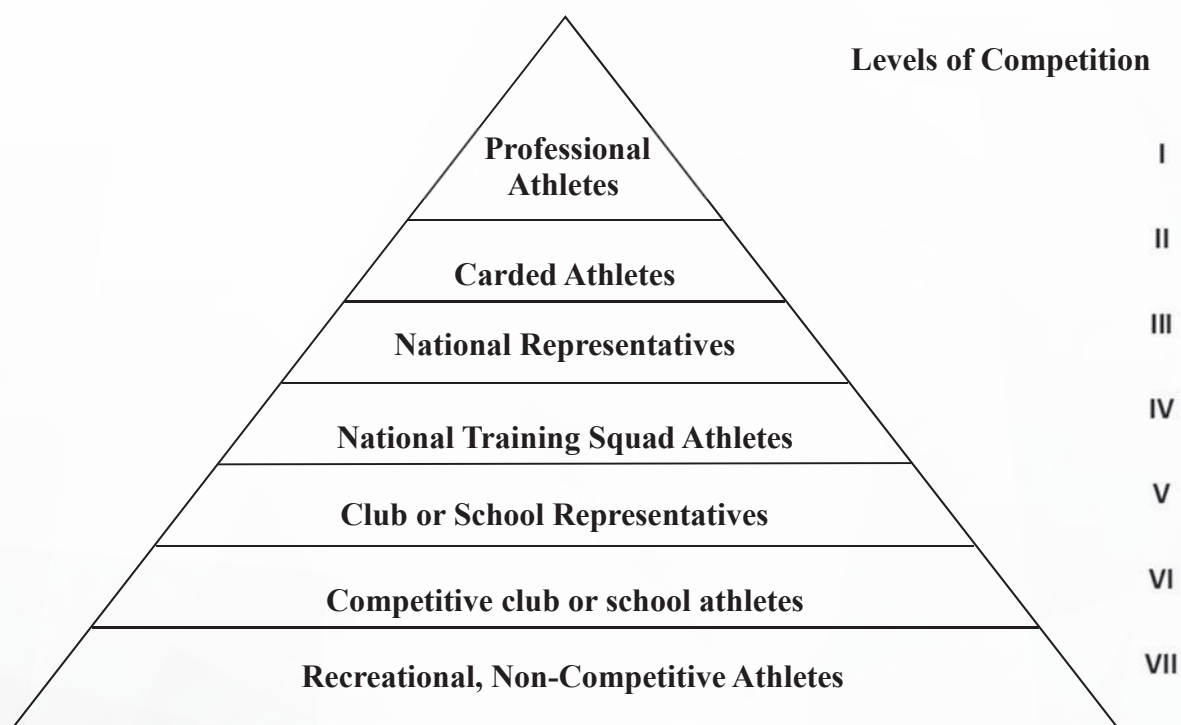


Figure 6.1 Athletes' Competitive Levels

6.7.3 The practice of compulsory annual pre-participation screening for professional athletes (Level I) and carded athletes (Level II) (see Figure 6.1), regardless of sport category, should be continued with stricter enforcement.

6.7.4 National Sports Associations (NSAs) responsible for National Representatives (Level III) and National Training Squad Athletes (Level IV) should ensure that they annually undergo pre-participation screening, regardless of the sport category. The training intensity and volume for these athletes are very similar to that of the Professional Athletes (Level I) and Carded Athletes (Level II). As carding is not entirely based on training intensity and volume it should not be used to differentiate those who should or should not be screened. For example, an elite athlete training at a high intensity and volume may not be carded because his sport is not included in the Major Games. Another example is how the athletes of the Singapore Sports School spend more time training than the typical school athlete (or even some of those who represent Singapore) and should

therefore be treated as level III and IV athletes. As such, they should continue to be required to undergo annual pre-participation screening.

The pre-participation screening system for these categories of athletes should be as follows:

- Annual pre-participation screening using a self-administered questionnaire.
- Any other types of screening procedures determined necessary by the medical representatives of the NSA, such as 12-lead ECG or pre-participation physical evaluation or both. All NSAs should appoint either a formal Medical Committee comprising relevant expertise (sports physician or sports medical practitioner or other physician with a keen interest in the sport), or at least a Medical Advisor to advise the NSA Executive Committee on medical matters, including pre-participation screening.
- Further investigations and referral to an appropriate medical facility in the event of any untoward abnormalities noted during either pre-participation screening or NSA-specific screening procedures and certification by the NSA physician on the fitness of the individual to undergo competitive sports in that area of activity.
- All NSAs should determine their final medical screening protocol and submit it to SportSG to better ensure uniform implementation of safety practices within the sports fraternity in the country. New protocols should be in place within two years of the release of this report.

6.7.5 For club representatives (Level V) and competitive club athletes (Level VI) annual pre-participation screening, such as at least the Get Active Questionnaire (GAQ), is strongly recommended. As clubs, they should be able to demonstrate evidence of such screening during official competitions. Sports clubs can contribute to reasonable, common standards of sports safety in the country by implementing these recommendations within two years of the release of this report.

- 6.7.6 **To further cultivate the culture of safety in these clubs, the Committee recommends sports safety awareness programme in these groups to be conducted annually and to precede the conduct of pre-participation screening.**
- 6.7.7 **For Category Band C sports (Table 8.1), the Committee recommends that event organisers should reinforce the sports safety message by reminding participants about the need to either perform Get Active Questionnaire (GAQ) screening or, at least, provide verbal advisory well-being checks before the start of the event.** Follow-up action should be taken as indicated by the questionnaire or response to the advisories.
- 6.7.8 **For Club or School Representatives (Level V), Competitive Club or School Athletes (Level VI) and Recreational, Non-competitive Athletes (Level VII), as a minimum, the Get Active Questionnaire (GAQ) should be completed at least annually.** For this group, pre-participation screening just before each sporting event cannot be mandated owing to the large numbers.
- 6.7.9 **Individuals should routinely complete at the least, the Get Active Questionnaire (GAQ) prior to joining a club, competition, course, or organised sports activity.** This must be completed before commencement of the physical activity. The questionnaires identify individuals with known conditions as well as those without any prior history of medical illness but who have symptoms or a past history of events such as chest pain, breathlessness, fainting, dizziness, or palpitations. If indicated by the questionnaire, the participant should consult a doctor. As new symptoms may develop after the completion of the questionnaire, such questionnaires should be completed at least annually. The Committee strongly encourages all individuals involved in sports to take personal responsibility for their own health and to make use of these simple-to-use, self-administered pre-participation screening questionnaires.

6.7.10 Comprehensive pre-participation screenings, such as those currently conducted by the Singapore Armed Forces (SAF) should be continued.

6.7.11 All persons who encounter symptoms, such as palpitations, fainting spells or seizures or dizziness or chest pain or unexplained breathlessness, extreme fatigue during exercise or other sporting activities should see a medical practitioner as early as possible and have these carefully evaluated.

This is in view of the presence of prior early warning symptoms in a number of persons who have suffered sudden cardiac arrest during sporting activities. Education on the need for this should be included in sports safety awareness briefings and in school PE curricula. Medical practitioners should also carefully evaluate these symptoms with view to excluding underlying heart disease that could be potentially life threatening.

References

1. Alexander, R. W., Griffith, G.C. (1956). Circulation: Anomalies of the coronary arteries and their clinical significance. 14(5), 800-805.
2. Balady, G. J., Chaitman, B., Driscoll, D., Foster, C., Froelicher, E., Gordon, N., Pate, R., Rippe, J., Bazzarre, T. (1998). Circulation: Recommendations for cardiovascular screening, staffing, and emergency policies at health/fitness facilities. 97(22), 2283-93.
3. Barry, J. M., Julius, M. G., John, M. F., Samuel, S. G., Tom, T. K. and Diane, E. B. (1995). Circulation: Prevalence of Hypertrophic Cardiomyopathy in a General Population of Young Adults. 92, 785-789.
4. Basso C, Maron BJ, Corrado D, Thiene G. (2000). Clinical profile of congenital coronary artery anomalies with origin from the wrong aortic sinus leading to sudden death in young competitive athletes. *Journal of the American College of Cardiology*, 35, 1493–1501.
5. Cardinal, B. J., Cardinal, M. K. (1995). Screening Efficacy of the Revised PAR-Q in older adults. *Journal of Ageing and Physical Activity*, 3, 399-308.
6. CASS Principal Investigators and their Associates (1983). Circulation: Coronary Artery Surgery Study (CASS): A Randomised Trial of Coronary Artery Bypass Surgery Survival Data. 68, 939-950.
7. Corrado D, Pelliccia A, Bjornstad HH, Vanhees L, Biffi A, Borjesson M, et al. (2005). 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. *European Heart Journal*, 26, 516–524.

8. Corrado, D., Basso, C., Pavei, A., Michieli, P., Schiavon, M., Thiene, G. (2006). Trends in sudden cardiovascular death in young competitive athletes after implementation of a pre-participation screening program. *JAMA*, 296, 1593–601.
9. Get Active Questionnaire Reference Document. *Canadian Society for Exercise Physiology*. Retrieved 15 July 2018 from URL <http://www.recreationnl.com/wp-content/uploads/2017/11/CSEP-Get-Active-Questionnaire1.pdf>.
10. Giese, E. A., O'Connor, F. G., Depenbrock, P. J., Oriscello, R. G. (2007). The Athletic Preparticipation Evaluation: Cardiovascular Assessment. *American Family Physician*, 75(7), 1008-1014.
11. Greenland, P., Gaziano, J.M. (2003). Clinical practice. Selecting asymptomatic patients for coronary computed tomography or electrocardiographic exercise testing. *New England Journal of Medicine*, 349:465.
12. Hendel RC, Patel MR, Kramer CM, et al. (2006) ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 Appropriateness Criteria for Cardiac Computed Tomography and Cardiac Magnetic Resonance Imaging. A Report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology. *Journal of the American College of Cardiology*, 48, 1475-1497.
13. Koester, M. C. (2001). A Review of Sudden Cardiac Death in Young Athletes and Strategies for Preparticipation Cardiovascular Screening. *Journal of Athletic Training*, 36(2), 197-204.

14. Laureti, J. M., Singh, K., Blankenship, J. (2005). Anomalous coronary arteries: a familial clustering. *Clinical Cardiology*, 28(10), 488–490.
15. Liberthson, R. R., Dinsmore, R. E., Bharati, S., et al. (1974). Circulation: Aberrant coronary artery origin from the aorta. Diagnosis and clinical significance. 50(4), 774– 779.
16. Maron, B. J., Thompson, P. D., Ackerman, M. J., Balady, G., Berger, S., Cohen, D., ... Puffer, J. C. (2007). Circulation: Recommendations and considerations related to pre-participation screening for cardiovascular abnormalities in competitive athletes: 2007 update: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation. 115(12), 1643-1655.
17. Maron, B. J., Thompson, P. D., Puffer, J. C., McGrew, C. A., Strong, W. B., Douglas, P. S., Clark, L. T., Mitten, M. J., Crawford, M. H., Atkins, D. L., Driscoll, D. J., Epstein, A. E. (1996). Circulation: Cardiovascular preparticipation screening of competitive athletes. A statement for health professionals from the Sudden Death Committee (clinical cardiology) and Congenital Cardiac Defects Committee (cardiovascular disease in the young), American Heart Association. 94(4), 850-6.
18. Modified Physical Activity Readiness Questionnaire. *University of Florida Health*. Retrieved on 10 July 2018 from URL https://shands-wellnesscenter.sites.medinfo.ufl.edu/files/2014/02/2014-PARQ.pdfm_.pdf.
19. Moyer V. A. (2012) Screening for Coronary Heart Disease with Electrocardiography: U.S. Preventive Services Task Force Recommendation Statement. *Annals of Intern Medicine*, 157, 512–518.
20. Rose, G., Baxter, P.J., Reel, D.D., and McCartney, P. (1978). Prevalence and prognosis of electrocardiogram findings in middle-aged men. *British Heart Journal*, 40, 636–643.

21. Shepard, R. J. (1998) PAR-Q. Canadian Home Fitness Test and exercise screening alternatives. *Sports Medicine*, 5(3), 185-195.
22. Shiroma, E. J., Lee, I. M. (2010). Circulation: Physical activity and cardiovascular health: lessons learned from epidemiological studies across age, gender, and race/ethnicity. *Circulation*, 122, 743–752.
23. Siscovick, D. S., Weiss, N. S., Fletcher, R. H., Lasky, T. (1984). The incidence of primary cardiac arrest during vigorous exercise. *New England Journal of Medicine*, 311, 874–877.
24. Thompson, P. D. (1996). The cardiovascular complications of vigorous physical activity. *Archives of Internal Medicine*, 156, 2297–2302.
25. Thompson, P. D., Franklin, B. A., Balady, G. J., Blair, S. N., Corrado, D., Estes NA III., Fulton, J. E., Gordon, N. F. ... Costa F. (2007). Circulation: Exercise and acute cardiovascular events placing the risks into perspective: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism and the Council on Clinical Cardiology. *Circulation*, 115: 2358–2368.
26. Thompson, P. D., Funk, E. J., Carleton, R. A., Sturner, W. Q. (1982). Incidence of death during jogging in Rhode Island from 1975 through 1980. *JAMA*, 247, 2535–2538.
27. Van Camp, S. P., Bloor, C. M., Mueller, F. O., Cantu, R. C., Olson, H. G. (1995). Nontraumatic sports death in high school and college athletes. *Medicine & Science in Sports & Exercise*, 27(5), 641–647.
28. Warburton, D. E. R., Gledhill, N., Jamnik, V. K., Bredin, S. S. D., McKenzie, D. C., Stone, J., et al. (2011). Evidence-based risk assessment and recommendations

for physical activity participation clearance: Consensus Document 2011. *Applied Physiology, Nutrition and Metabolism*, 36, S266–S298.

29. Warburton, D. E. R., Jamnik, V. K., Bredin, S. S. D., Gledhill, N. (2011). The Physical Activity Readiness Questionnaire (PAR-Q+) and electronic Physical Activity Readiness Medical Examination (ePARmed-X+). *Health & Fitness Journal of Canada*, 4(2), 3-23.
30. Wilkins CE, Betancourt B, Mathur VS, et al. (1998). Coronary artery anomalies: a review of more than 10 000 patients from the Clayton Cardiovascular Laboratories. *Texas Heart Institute Journal*, 15(3), 166 –173.
31. Yamanaka, O., Hobbs, R. E. (1990). Coronary artery anomalies in 126 595 patients undergoing coronary arteriography. *Catheterization and Cardiovascular Diagnosis*, 21(1):28–40.
32. Yildiz, A., Okcun, B., Peker, T., Arslan, C., Olcay, A., Vatan M. B. (2010). Prevalence of Coronary Artery Anomalies in 12,457 Adult Patients Who Underwent Coronary Angiography. *Clinical Cardiology*, 33(12), E60–E64.

7. Heat Injuries in Sports

KEY MESSAGES:

- Environmental heat stress is a perennial hazard in Singapore. Event organisers, coaches and athletes must learn to manage this when training and competing in Singapore.
- Adherence to good practices can reduce the risk of heat injury. This involves acclimatisation to heat, progressive training and early identification of risk factors.
- Early recognition of symptoms of exertional heat stroke and rapid first responder intervention can reduce morbidity and mortality.
- Heat stroke can also be triggered by suboptimal immune function. Immune suppression can result from the combination of prolonged intense training coupled with the lack of opportunity for recovery, subclinical infection and recent illness.

7.1 BACKGROUND: HEAT STROKE IN SINGAPORE

7.1.1 Singapore has a humid tropical environment – year-round warm ambient temperatures coupled with high levels of relative humidity and rainfall. Wind speeds are also low. Increased risk of heat injuries is seen in conditions of high environmental heat stress that inhibit effective thermoregulation.

7.1.2 Members of the public, amateurs and professional athletes who exercise and are not acclimatized under hot climates face higher risks of heat injury. Adherence to good practices can mitigate the risks of heat injury. For the individual, this involves progressive training and personal readiness to optimise thermoregulatory capacity. For coaches and event organisers, this means that additional measures may be required to effectively manage the risks of heat injury, over and above the risks of traumatic injury and cardiac events.

7.1.3 Heat stroke is the most severe form of heat injury and is manifested in two forms:

- I. Classical Heat Stroke – results from prolonged passive exposure to extreme environmental heat and occurring mostly during heat waves, affecting infants, toddlers and the elderly; and
- II. Exertional Heat Stroke (EHS) – results from physical activity with high rates of metabolic heat production and occurring even in cool environments, affecting athletes and persons undertaking physically intense work.

7.1.4 The focus of this chapter is on EHS, which is more relevant to exercise, training and sport environments. Under normal circumstances, the behavioural response to hot environments is a reduction in exercise intensity or cessation of moderate to vigorous physical activity altogether. However, when pursuing physical activity or sport, these impulses are often overruled. Activities continue as metabolic heat accumulates and physiological processes begin to fail when core temperature exceeds normal physiological thresholds. These physiological failures may manifest in the symptoms of nausea, mental disorientation, altered mental status and loss of consciousness. Once loss of consciousness has occurred, the risks of fatality and organ damage increases exponentially. Even with appropriate medical interventions, EHS can result in coma, multi-organ failure, haemorrhage, systemic inflammation and, possibly, death. Some who recovered from EHS suffer permanent deficits in cognitive functions.

7.1.5 Heat stroke can also be triggered by compromises in the immune system in the absence of extreme heat stress. A prolonged period of intense training, without sufficient opportunity for recovery, can lead to suppression of the immune system and increase in the risks of having an infection in athletes. The compromised immune function sets the stage for heat stroke to occur. This happens when the body's defence is weakened against bacteria that migrate from the intestine into the central circulation during intense exercise. Preservation of health through good dietary habit, well-regulated sleep routine and catering for recovery in between training bouts are key measures to preventing training-induced immune suppression.

Fact Box: The Pathophysiology of Heat Stroke

Body core temperatures may range from approximately 37°C at rest to 41°C during prolonged physical work in hot environments (Lim et al., 2008). Failure to effectively thermoregulate or exceeding one's thermal limit during vigorous physical activity may disrupt the body's normal physiological functions and increase the risks of heat injury.

Metabolic heat is a by-product of physical activity. This enables heat transfer through conduction, convection and radiation. Heat is also lost through the process of evaporation of sweat, which is the primary mode of heat dissipation during exercise and directly associated with the dryness of the air (i.e., low humidity). When the humidity is relatively high, evaporative cooling is impeded.

Intense exercise and training in the heat also impose a high degree of stress to the immune system, which is also an underlying cause of heat stroke. Scientific evidence suggests that immune disturbance is the primary cause of heat stroke cases that occur below a core temperature of 42 °C. Therefore, protecting the immune system is equally important as keeping the body cool to prevent heat stroke.

Under normal and healthy conditions, these bacteria are readily removed from circulating blood by the liver and other components of the immune system. During intense training and exposure to heat stress, the physical barrier of the intestine is compromised, allowing harmful bacteria to translocate from the intestine into the blood circulation. During this state of immune suppression, the bacteria content in the blood can continue to increase to the point of triggering an infection. This then causes damage to the organs in the body, including the brain which is basically heat stroke. Heat stroke victims display similar clinical features as patients suffering from central infection due to other causes. Much has been written about the pathophysiology of heat stroke (Lim & Mackinnon, 2006).

Fact Box: Incidences of Exertional Heat Stroke (EHS)

Overseas data estimates the incidence rate of EHS at 1.20 per 100,000 athlete-exposures in U.S. American youth (Kerr et al., 2013). The annual incidence rate seen in the U.S. military is reported to be as high as 14.5 per 100,000 servicemen (Carter et al., 2005). Data from the US Twin Cities marathon showed an incidence rate of 10 to 20 per 100,000 entrants for the marathon (Roberts, 2000). Races over shorter distances, such as the 11.3km Falmouth Road Race report EHS incidence rates as high as 213 per 100,000 finishers (DeMartini et al., 2014).

7.2 Recommendations

- 7.2.1 **All athletes, coaches and event organisers should be educated on how to prevent heat injuries. It is critical to identify and respond to risk factors such as recent illness, and to seek medical advice prior to any sports activity.**

Table 7.2 – A checklist of Intrinsic Risk Factors for Exertional Heat Stroke

Are you at risk for Exertional Heat Stroke (EHS)?	
1. Are you physically ready for training and competition?	Athletes need to match their exercise intensity with their fitness level. Novice athletes with poor physical fitness tend to outpace themselves during competition. An overload in exercise intensity is a key factor contributing to EHS.
2. Have you acclimatised to the climate?	In Singapore's context, it is important for visiting athletes to have adequate acclimatisation to the heat and local climate.
3. Have you been ill recently?	Heat stroke risk can be increased by disturbances to the immune system e.g. from a recent bout of illness or sub-clinical infection (Chung & Pin, 1996).
4. Are you taking any medications?	Athletes on medication for chronic medical conditions need to consult their prescribing

	<p>physician on the risks of undertaking strenuous physical activity (Chung & Pin, 1996). Stimulants, antihistamines, diuretics and other common medications can impair the body's ability to mount an effective thermoregulatory response during exercise in the heat. Athletes taking medication for recent illness should be advised against participation in view of the dual risks medication and recent illness pose.</p>
<p>5. Do you tend to push your body hard?</p>	<p>An athlete's high level of motivation is one of the most consistent hallmarks of exertional heat stroke. Signals which urge the body to slow down are blocked out when athletes knowingly pushing the limits to reach the highest levels of performance (Epstein et al., 2000).</p>
<p>6. Are you at risk for heat injury?</p>	<p><u>High Body Mass:</u></p> <p>High body-mass athletes expend metabolic energy at higher absolute rates than their lean counterparts, placing high body-mass athletes at higher risk of heat injury (Epstein et al., 2000).</p> <p><u>Children and Youth:</u></p> <p>Children and youth may be unable to assess and mitigate risks of training and competing in the heat.³</p>

7.2.2 All athletes and coaches should be aware of heat injury prevention techniques such as gradual conditioning and acclimatisation to heat.

³ The role of age and sex in heat injury risk is a subject of debate. Thermoregulatory responses in children were once thought to be drastically different from those in adults, although a recent review described no differences (Falk, B. & Dotam, R. (2008). Children's theroregulation during exercise in the heat: a revisit. Applied Physiology, Nutrition and Metabolism 33(2), 420-427.).

- a) **Athletes intending to compete in hot and humid environments benefit from heat acclimatisation as a means of reducing heat strain.** For example, Singaporeans training in climate-controlled gyms or foreigners arriving from temperate climates.
- b) **The supervision of an experienced coach or with a partner is highly recommended for such training.** Before the event, acclimatisation can be achieved through gradual exposure to heat strain over a period 10 to 14 days in an external environment or in an environmental chamber (more commonly known as heat acclimation). This process will either see athletes self-regulating their training or initially decreasing baseline training loads to accommodate for the hotter environment. With heat acclimatisation the body will have enhanced responsiveness in its thermoregulatory mechanisms during exercise, as well as an increased level of work tolerance in the heat.
- c) **The use of protective, heat-trapping clothing in heat acclimatisation needs to be weighed against the increased risks of injury during acclimatisation training.**
- d) **Athletes might seek to enhance competitive performance by training during the hotter hours of the day, with sufficient attention given to fluid replacement and gradual progression.**

7.2.3 Athletes, event staff and medical care providers should be educated on how to recognise the early signs of heat injury and how to activate an emergency medical responder when these signs are observed.

- a) **It is essential that athletes exercise individual responsibility to understand and practice basic safety precautions when training and competing in the heat.** Inadequate conditioning and heat acclimatisation,

recent illness, cumulative fatigue and overtraining can increase the risks of heat injury.

b) Athletes must know their own state of health and be conscious of the risks of exceeding their threshold for safe participation in the activity.

When in doubt, athletes should consult a medical practitioner with relevant experience in heat injury prevention (e.g. sports physician).

c) During training and competition, athletes and coaches can take proactive steps to minimise excessive heat accumulation and to optimise thermoregulation.

Preservation of health through good dietary habit, well-regulated sleep routine and catering for recovery in between training bouts are key measures to preventing training-induced immune suppression.

d) Athletes and coaches must also pay attention to early symptoms of overtraining and illness

(e.g. sore throat, diarrhoea, cough, yellowish phlegm, a blocked nose (not allergy-related) and low grade fever). Athletes should seek medical attention if necessary and keep coaches informed about change in state of health. Training plans should be adjusted to allow the athlete to recover before resuming intense training again.

Some tips include:

- Choose to alternate between exertion and rest
- Facilitate recovery
- Drinking fluids
- Reducing outdoor activities
- Sponging with cold water
- Planning sports and exercise for cooler hours of the day
- Watching for early signs of heat-induced illnesses

Fact box: Early Signs of Heat Injury

Symptoms of Heat Injury (as experienced by athletes)

- Giddiness and Dizziness
- Shortness of breath even at rest
- Numbness, cramps, weakness of extremities
- Light-headedness, fatigue, drowsiness
- Nausea
- Headache

Signs of Heat Injury (as witnessed by onlookers)

- Altered Mental Status (confusion, disorientation, combativeness)
- Ataxia (inability to maintain balance, frequent falling)
- Hyperventilation
- Vomiting
- Loss of consciousness
- Seizures

7.2.4 **Coaches and Event Organisers must be aware of how they can prevent heat exertion. The preventive primary, secondary and tertiary measures are captured in the table below:**

Primary Prevention:	<ul style="list-style-type: none"> • Organisers should provide participant advisories on the prevention of heat injuries. This is given the prevailing environmental heat stress conditions in Singapore. • Organisers should also have available the necessary instruments and/or means of communication to conduct on-site risk assessments prior to the start of and through to completion of sporting activities. Organisers bear the
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	<p>added responsibility of ensuring adherence to sport-specific regulations on continuation of play - a non-exhaustive list of which is featured in Appendix 3. In the absence of formal sport-specific regulations issued by international sports federations on competing in the heat, it is advisable that organisers seek input from relevant authorities (e.g. World Health Organisation) and national governing bodies (e.g. Ministry of Health, SportSG). Event organisers should be aware that international guidelines for high impact sports such as long-distance running, marathon events and prolonged intense activity in external environments are often designed for application in temperate environments.</p>
<p>Secondary Prevention:</p>	<ul style="list-style-type: none"> • Organisers and coaches may also choose to institute additional breaks and provide dedicated cooling/drinking facilities to facilitate fluid intake and intermittent cooling. In particular, at outdoor events such as road races, there should be adequate stations providing water, isotonic drinks and energy gels for longer races. • Local event organisers should consider having water points at every 1.6km during the marathons organised in Singapore. Measures to improve air-exchange, encourage flow of air and cool playing environments can be considered for training and competition during the hottest periods of the day.
<p>Tertiary Prevention:</p>	<ul style="list-style-type: none"> • When play is in session, it is also the responsibility of the organiser and coach to ensure that athletes in distress are identified in a timely manner and that remedial actions are executed safely. While the responsibility might be entrusted to onsite safety and medical personnel, it is essential that all members of staff, coaches and athletes themselves are mindful of early symptoms of

	heat injury and are able to communicate to organisers should they encounter an athlete in distress.
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Fact Box: Marathons and Water Points

One good example is the international guideline for marathon events provided to Marathon organisers by the International Marathon Organisers Association, which recommends that water points should be available at intervals of at least every 2.5 km of the route. In spite of this recommendation, the intervals used in some international marathon events vary significantly as follows:

Marathon Event	Experimental Condition	Water Point Locations
Boston Marathon	Temperate, low temperature, low humidity	Every 1.6km interval beginning from start point and up till end point.
London Marathon	Temperate, low temperature, low humidity	Every 1.6km interval beginning from start point and up till end point.
Tokyo Marathon	Temperate, low temperature, low humidity	Every 1.6km interval beginning from start point and up till end point.
Singapore Marathon	Tropical, high temperature, high humidity	Every 2.5km interval beginning from start point and up till end point.

If the respective International Federations have stated guidelines with regard to safety, the respective National Sports Associations must adopt these guidelines accordingly.

Event organisers are encouraged to collect local data (e.g. heat injury and hyponatremia rates), and based on the data, continually refine the generic guidelines to the local context. Organisers should therefore exercise discretion.

7.2.5 Medical professionals need to keep abreast with latest recommendations and practices in the emergency management of exercise-associated collapse.

a) Primary, Secondary and Tertiary Preventive Measures:

Table 7.3 – Preventive Measures for Medical Professionals	
Primary Prevention:	<ul style="list-style-type: none"> • Medical professionals should advise athletes to pace themselves according to their fitness level and present health condition. Those with symptoms of a compromised immune system (e.g., runny nose, cough, sore throat) should not be exercising intensely, or be advised to refrain from physical exertion if necessary.
Secondary Prevention:	<ul style="list-style-type: none"> • Medical professionals need to work with athletes, coaches and organisers to ensure that early detection measures are in place during training and competition. This can be in the form of education on the warning signs of thermoregulatory failure or active screening of athletes at specific check-points.
Tertiary Prevention:	<ul style="list-style-type: none"> • When a casualty is presented to an aid post, medical professionals must be adequately equipped to identify the heat casualty and rule out differential diagnoses (including hyponatremia and cardiac events). Confusion

	<p>and disorientation are indicative of exertional heat stroke in an athletic setting (Lim, 2016). Professional experience and a high index of suspicion are key.</p> <ul style="list-style-type: none"> • Medical professionals must communicate effectively with first responders to establish the sequence of events and possible mechanisms of injury. In the initial stages, it is important to manage the competing needs of delivering resuscitation and cooling measures concurrently. It is desirable to have a means of assessing core temperature for the purpose of diagnosis and monitoring during treatment. The most accurate means of core temperature measurement in an emergency scenario is rectal temperature (Lim et al., 2008). • Once the casualty has been stabilised and evacuated for further care, medical professionals must inform organisers and advise on whether play or competition should be allowed to continue. It is important to note that in endurance events, a heat casualty is rarely an isolated incident.
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b) Responding to Exertional Heat Stroke:

- **When EHS is noticed in a participant, it is critical to respond immediately by eliminating danger, activating emergency medical services and securing airway, breathing and circulatory support.** These measures were identified in the risk assessment and management of EHS cases (Roberts, 2006). Severe central nervous system dysfunction in EHS victims may at times escalate to seizure activity (McDermott et al., 2009), necessitating the use of sedative drugs.

- **Using ice-water and cold water immersion as cooling modalities achieved the highest rates of temperature reduction during heat injury – as identified during a recent systematic review** (Tan et al., 2017). Novel devices designed to provide therapeutic hypothermia for cardiac care have achieved remarkable rates of cooling when evaluated on human hyperthermia models in the hospital setting (Casa et al., 2012).
- **The decision on return-to-play after a heat injury must be made on a case-by-case basis depending on the nature of sport played, risk factor profile and severity of heat injury sustained** (O'Connor & Casa, 2010). While there are standardised test protocols available to assess thermoregulatory function in laboratory settings, a recent American College of Sports Medicine (ACSM) round-table panel concluded that there were limited scientifically valid criteria to determine recovery from heat illness or the risk of recurrence (Racinais et al., 2015).

7.2.6 Event organisers should also provide athletes with advice on the risks of over-hydration leading to water intoxication.

Fact Box: Hydration

Hydration status can contribute to regulation of body temperature during intense exercise. When prolonged and without sufficient fluid replacement, the accompanying hypovolemia impairs shunting of blood to the skin thereby curtailing convective and radiative heat transfer to the external environment. Evaporative heat loss accounts for about 80% of heat dissipation during exercise. Therefore the more detrimental effect of severe dehydration is the decrease in sweat rate and volume, which directly limits evaporate heat loss.

- a) It is important for athletes to understand how hydration status is determined by their own behaviour before, during and after participation in moderate to vigorous physical activity.** High performance athletes

consciously allow their bodies to encroach on dehydration in time and distance-limited events in order to economise on time lost through drinking. Inexperienced athletes might face difficulties gauging and planning their own hydration needs.

- b) Over-hydration occurs in athletes when the supply of fluid exceeds the body's current needs and storage capacity.** Excess fluid intake is closely linked with voluntary hyponatremia or water intoxication. There is consensus that it is normal for athletes to be dehydrated for up to 3% of body mass loss during the activity without health implications. The degree of dehydration that can be tolerated is highly individualized and athletes should monitor their body weight changes before and after exercise to track their state of fluid balance. Each kilogram of body weight loss after training is equivalent to one litre of sweat loss (or fluid deficit).
- c) Athletes should drink enough water during exercise to prevent a deficit of 3% of body mass (e.g., 1.8 L of water for a 60kg person).** Using this equation, athletes should measure their pre- and post-training body mass during routine training and develop an individual hydration plan for use during races and competition events. A fluid deficit of more than 3% of body mass may compromise physical performance (Cotter et al., 2014) (Glazer, 2005). Athletes should aim to maintain a level of hydration that is optimal for performance and safety.

Fact Box: Hyponatremia

Hyponatremia refers to low sodium concentration in the blood, due mainly to over drinking of water during exercise. Hyponatremia can lead to serious health consequences and fatality, including cerebral edema, pulmonary edema, coma and death. The incidence of hyponatremia ranges from 0% (in New Zealand and South Africa) up to 13% (in USA) and is associated with excessive fluid intake habits. Gaining weight during exercise as a result of fluid intake is a risk factor for hyponatremia. Cases of hyponatremia in local athletes have been

seen in endurance running events (Tan et al., 2016) (Tan et al., 2016) (Tan et al., 2017) (Lee et al., 2011). Generally, if participants drink according to a regime, the rate of hyponatraemia appears to be higher, whereas if they drink according to their thirst, the rate of hyponatraemia appears to be lower (Hew-Butler et al., 2006). Signs and symptoms of acute hyponatremia overlap with those of exertional heat stroke.

References

1. Carter III, R., Cheuvront, S. N., Williams, J. O., et al. (2005). Epidemiology of hospitalizations and deaths from heat illness in soldiers. *Medicine and Science in Sports and Exercise*, 37(8), 1338-1344.
2. Byrne, C., Lee, J. K., Chew, S. A., Lim, C. L., & Tan, E. Y. (2006). Continuous thermoregulatory responses to mass-participation distance running in heat. Retrieved from URL <https://www.ncbi.nlm.nih.gov/pubmed/16672830>
3. Casa, D. J., Armstrong, L. E., Kenny, G. P., (2012). Exertional heat stroke: new concepts regarding cause and care. *Current Sports Medicine Reports*, 11(3), 115-123.
4. Chung, N. K., & Pin, C. H. (1996). Obesity and the occurrence of heat disorders. *Military Medicine*, 161(12), 739-742.
5. Cotter, J. D., Thornton, S. N., Lee, J. K., et al. (2014). Are we being drowned in hydration advice? Thirsty for more? *Extreme Physiology & Medicine*, 3(1). doi:10.1186/2046-7648-3-18
6. DeMartini, J. K., Casa, D. J., Belval, L. N., et al. (2014). Environmental conditions and the occurrence of exertional heat illnesses and exertional heat stroke at the Falmouth Road Race. *Journal of Athletic Training*, 49(4), 478-485.
7. Epstein Y., Shani Y., Moran D.s., et al. (2000). Exertional heat stroke – The prevention of a medical emergency. *Journal of Basic and Clinical Physiology and Pharmacology*, 11(4), 395-402.
8. Falk, B. & Dotam, R. (2008). Children's theroregulation during exercise in the heat: a revisit. *Applied Physiology, Nutrition and Metabolism* 33(2), 420-427.
9. FIFA. *Playing in the Heat*. Retrieved from URL <http://www.fifa.com/development/medical/players-health/minimising-risks/heat.html>

10. Glazer, J. L. (2005) Management of heatstroke and heat exhaustion. *American Family Physician*, 71(11), 2133-2140.
11. Hew-Butler, T., Verbalis, J. G., & Noakes, T. D. (2006). Updated fluid recommendation: position statement from the International Marathon Medical Directors Association (IMMDA). *Clinical Journal of Sport Medicine*, 16(4), 283-292.
12. International Triathlon Union (2014). *Exertional Health Illness Prevention*. Retrieved from URL http://www.triathlon.org/uploads/docs/itusport_2014_medical_guidelines-for-exertional-heat-illness-prevention.pdf
13. Kerr, Z. Y., Casa, D. J., Marshall, et al. (2013). Epidemiology of exertional heat illness among US high school athletes. *American Journal of Preventive Medicine*, 44(1), 8-14.
14. Lee, J. K. W., Nio, A. Q. X., Ang, Q. H. (2011). First reported cases of exercise-associated hyponatraemia in asia. *International Journal Sports Medicine*. 2011(4); 32:297-302
15. Lee, J. K., Nio, A. Q., Lim, C. L., Teo, E. Y., & Byrne, C. (2010). Thermoregulation, pacing and fluid balance during mass participation distance running in a warm and humid environment. Retrieved from URL <https://www.ncbi.nlm.nih.gov/pubmed/20237797>
16. Lim, C. L. (2016). Look beyond Thermoregulation and Hydration in the Diagnosis of Heat Stroke. *Medicine and Science in Sports and Exercise*, 48(12), 2583-13.
17. Lim, C. L., & Mackinnon, L. T. (2006). The roles of exercise-induced immune system disturbances in the pathology of heat stroke. *Sports Medicine*, 36(1), 39-64.

18. Lim, C. L., Byrne, C., & Lee, J. K. (2008). Human thermoregulation and measurement of body temperature in exercise and clinical settings. *Annals Academy of Medicine Singapore*, 37(4), 347.
19. Lim, C. L., Byrne, C., & Lee, J. K. (2008). Human thermoregulation and measurement of body temperature in exercise and clinical settings. *Annals Academy of Medicine Singapore*, 37(4), 347.
20. McDermott, B. P., Casa, D. J., Ganio, M. S., et al. (2009). Acute whole-body cooling for exercise-induced hyperthermia: a systematic review. *Journal of Athletic Training*, 44(1), 84-93.
21. O'Connor, F. G., Casa, D. J., (2010) American College of Sports Medicine Roundtable on exertional heat stroke-return to duty/return to play: conference proceedings. *Current Sports Medicine Reports*, 9(5), 314-321.
22. Racinais, S., Alonso, J. M., Coutts, A. J., Flouris, A. D., Girard, O., González-Alonso, J., . . . Périard, J. D. (2015). Consensus recommendations on training and competing in the heat. Retrieved from URL <https://www.ncbi.nlm.nih.gov/pubmed/26069301>
23. Roberts, W. O. (2000). A 12-yr profile of medical injury and illness for the Twin Cities Marathon. *Medicine and Science in Sports and Exercise*, 32(9), 1549-1555.
24. Roberts, W. O. (2006). Exertional heat stroke during a cool weather marathon: a case study. *Medicine and Science in Sports and Exercise*, 38(7), 1197.
25. Tan, D. W., Yap, S. H., Wang, M., et al. (2016). Body Mass Changes Across a Variety of Running Race Distances in the Tropics. *Sports Medicine-open*, 2(1), 26.
26. Tan, P. M., Teo, E. Y., Ali, N. B., et al. (2017) Evaluation of Various Cooling Systems After Exercise-Induced Hyperthermia. *Journal of Athletic Training*, 52(2), 108-116.

27. Tan, P. M., Teo, E. Y., Ali, N. B., et al. (2017). Evaluation of Various Cooling Systems After Exercise-Induced Hyperthermia. *Journal of Athletic Training*, 52(2), 108-116.
28. Workplace Safety and Health Council (2012). *Workplace Safety and Health Guidelines: Managing Heat Stress at the Workplace, First Revision*. Available at: https://www.wshc.sg/files/wshc/upload/cms/file/2014/Heat_stress_guidelines_first_revision_2012.pdf
29. World Rugby. *Heat Guidelines*. Retrieved from URL <http://playerwelfare.worldrugby.org/?subsection=6>

8. Event Medical Support Plan

Key Messages:

- An event medical support plan establishes appropriate medical support services required in mass participation amateur sports events, based on the event risk assessment.
- The medical support plans should be clearly communicated to the working personnel for effective implementation. Emergency contact information should be made available to the participants.
- The increased participation at all levels and a heightened awareness for sports safety indicates that medical support planning is now a standard practice for mass participation events.

8.1 Introduction and Current Practices in Singapore

8.1.1 Sport and exercise play an increasingly prominent role in Singapore:

- There is an increase in participation in recreational sports and fitness activity as a culture and way of life.
- Exercise is now a key intervention in the management of many common non-communicable diseases.
- There is an increasing emphasis on competitive sports and sporting excellence, and there are more regional and international sporting events held in Singapore.
- Many Singaporeans are participating in endurance sports as a journey of personal excellence.

8.1.2 As the role of sports increases in society and more people participate in sports across a broader range of ages, societal expectations on the governance and standards of sports safety will increase. As Singapore grows into an international sporting hub to host more and larger-scale events, there is also a need to review the current state of governance and standards for sports safety to ensure it is adequate or whether there is a need to enhance these standards.

8.1.3 At a national level, a method for systematic data collection at a national level to assess exercise-related morbidity is lacking. Locally, there is little evidence available to link existing sports safety governance and standards to exercise-related mortality. However, internationally the available empirical evidence points to better morbidity and mortality-related outcomes with established event sports safety standards.

Given the detailed and available information, the Committee has chosen exercise-related mortality as a key indicator of the current adequateness of sports safety. Exercise-related morbidity and mortality are associated, and there are continuing occurrences of injuries and occasional mortalities. Therefore, the Committee finds it useful to have a continued review of the levels of governance and standards for sports safety, as shown by recent exercise-related mortality data. This is particularly relevant for mass-participation sporting events (refer to Chapter 11 on Surveillance and Evaluation).

8.1.4 SportSG has promoted sport safety in Singapore. It published the Sports Safety Management System Guidebook, promoted the use of the Physical Activity Readiness Questionnaire (PAR-Q) for screening, and collaborated with National Sports Associations (NSAs) to publish specific safety guidebooks on 15 sports for outreach and education efforts. NSAs have been encouraged to partner SportSG to publish safety guidelines for their respective sports. NSAs who have yet to do so can rely on the published guidelines of their respective international sporting federations.

8.1.5 The Ministry of Education's (MOE) Committee on Safety in School Sports concluded in December 2010 that the sports safety framework in schools is largely sound, and generally in line with local and international best practices. MOE has since instituted close monitoring and regular reviews, and has reinforced its safety education and training program. All physical education teachers are scheduled to complete the Youth Sports Injury Management module in 2018. Risks

assessments and management in schools and the National Schools Games (NSG) are currently in place to minimise adverse events. These measures include safety checklists, students' health declaration and information sharing with teachers, external safety validation exercises, and safety audits (including outdoor adventure facilities). In a case of an unforeseen circumstance, monitoring, intervention and follow-up measures are in place to ensure better incident reporting, reviews and management of such events.

8.1.6 Sport in schools will continue to come under the governance of MOE. SportSG's sports safety publications and the NSAs will continue to serve as references and points of consultation respectively for MOE.

8.2 Event Medical Support: Goals and Principles

8.2.1 The ethos of sport simultaneously embraces participation and competition to promote health and provide entertainment. The communities built around sport are woven into the fabric of our national identity. Amateur and professional athletes aspire towards physical excellence, and must accept that risk-taking will go hand in hand with their pursuit. Safe sporting practices, both during training and at competitions, are essential to sustainability of the sport. Failure to manage these risks can prove detrimental to the conduct of sports and games, and may jeopardise the real and intangible benefits of having a vibrant sporting environment.

8.2.2 Even with the best preventive measures in place, injuries and incidents may still happen. Still, sports safety should be a primary focus as it is the most effective measure for minimising exercise-related injuries and mortality. Event medical support should be viewed in this perspective – as an essential support tool to good safety practices and planning. Any medical support plan should complement the event safety plan.

8.2.3 In addition to covering the medical support plan for events, this chapter also discusses the responsibilities of sport events' organisers, participants, and

members of the public. Lastly, it provides a framework and guidelines to help organisers and athletes determine the requirements for medical support for both routine and event-based sports activities.

8.2.4 A good event medical support plan will provide persons with injuries or medical conditions with timely and appropriate medical support, manage injured athletes effectively to reduce the impact of their medical condition, and reduce the exercise-related morbidity and mortality. The following principles should be observed during planning:

- Pre-participation baseline health assessment
- Sports safety and health education
- Pre-event and event day risk assessment and mitigation
- Robust and well-resourced medical support plan
- Close coordination and strong execution of medical support
- Post-event feedback and review

8.2.5 Sporting events vary widely according to the type of sport, the participant profile, the environment, and the number of participants. While this report aims to cover the whole spectrum adequately, it will not be able to provide in depth coverage of highly-specific areas relating to certain sports.

8.2.6 Mass participation amateur sports is growing in popularity. The most common activities are running, cycle and swimming, or any combination of the three⁴. In 2013 and 2014, there were more than 70 such events per year. This means that on average, there is more than 1 event per week taking place in Singapore. As the medical coverage for these events is demanding, there have been calls from both event organisers and participants to establish a national event medical support guideline.

⁴ Carnival-style events like a one-day soccer, rugby-7s or softball tournaments can also have a large number of participants, but the risk assessment for these events are very different.

The following mass participation amateur sports and events are covered in this report:

- (i) Activities involving more than 1,000 participants⁵
- (ii) Running, cycling or swimming, or any combination of the three; or similar activities involving long distances and a large field of play (e.g. mass-participation wheelchair races)⁶

⁵ *The Committee did not find any internationally defined cut-off for the number of participants before an event can be classified as a “mass participation event”. However, the publications which were referenced were unanimous in agreeing that risk assessment increases along with the number of participants in the event. For the purpose of this guideline, the Committee arbitrarily set the cut-off at 1,000 participants, as the working definition of “mass participation sporting events”.*

⁶ *These activities take place along a route, and differ from sports carnivals where participants are confined to a static location or venue. The risk for these activities is usually higher and the medical support more demanding, as can be harder to reach each casualty.*

8.3 Recommendations: Event Medical Coverage

8.3.1 The event medical support plan should primarily cater to event participants.

In large-scale events with large number of spectators and organising staff, the medical support plan should also cater to the possibility of casualties coming from spectators or event organisers.

8.3.2 Event medical support plans for mass-participation amateur sports involve the management of a large number of participants and have unique requirements.

This is covered specifically in the later part of this chapter (ref: Section 9.9 Recommendations: Mass-Participation Amateur Sports and Events).

8.4 Recommendations: Risk Assessment & Categorisation

8.4.1 Sport events vary widely in terms of risk assessment and categorization, based on the type of sport, level of competition, age group and skill level of participants, and other factors. The committee has closely referenced international publications and reports, and recommends the categorization of event risk based on (i) cardiovascular risk and (ii) contact/collision risk. This matrix assessment approach categorizes sporting events into low, medium and high-risk categories (labelled as Category A, B and C respectively).

Category:	A	B	C
Risk:	Low	Medium	High

8.4.2 For training sessions and competitions in category B and C, organisers need to conduct a risk assessment and have a medical support plan.

Table 8.1: Classification of Sports Based on Cardiovascular Activity and Contact/Collision Risk (adapted from Maron et al 2005, Rice et al 2008)

		Contact/Collision Risk		
		Low	Medium	High
Cardiovascular Risk	High	Canoeing/ Kayaking Dragonboat Rowing	Cycling Ice-skating (speed) Rollersports	Boxing/Wrestling Muay Thai# Mixed Martial Arts#
	High Moderate	Running (mid-distance) Bodybuilding Swimming (pool) Modern Pentathlon#	Badminton# Squash# Triathlon# Open Water Swimming	Basketball Handball# Ice Hockey@ Extreme Sports\$
	Moderate	Running (spring) Running (long-distance) Field (throwing) Dancesport Mountaineering Pickleball Sailing Lifesaving Tennis	Field (jumping) Floorball Ice-skating (figure) Waterski/Wakeboard Gymnastics Skiing & Snowboarding Wushu^ Weightlifting^	Soccer Hockey Judo Karate-do Kendo Rugby Silat Taekwondo Ultimate Frisbee#
	Low Moderate	Archery Table Tennis Underwater Activities ¹ Scuba#	Fencing Netball Sepak Takraw Baseball/Softball Cricket^ Volleyball Platform Diving	Cheerleading# Equestrian^ Motor Sports^ Powerboat^
	Low	Bowling/Bowls Chess Contract Bridge Cuesports Darts Gateball/Woodball		

		Golf Lawnball# Pentanque# Shooting Weiqi/Xiangqi	
<p>@ Sports with new National Sport Associations</p> <p># New sports added to table based on Committee consensus</p> <p>^ Previously existing sports reclassified based on Committee consensus</p> <p>¹ Underwater activities carry a different set of risks such as drowning, hyperbaric injuries, and an activity-specific risk assessment should be performed by the event organizing committee.</p>			

8.5 Recommendations: Resource Management

8.5.1 **The committee recommends graded medical resourcing.** As sports events vary widely with specific needs, it is not useful to have a one-size-fits-all guideline on the appropriate resourcing for sports events. This resource recommendation for training and competition is built on each of the three risk categories within the risk assessment matrix (Section 8.4 Recommendations: Risk Assessment & Categorisation).

Table 8.2: Recommended Event Medical Coverage Personnel & Facilities

Risk Category	Training or Competition	Resource Requirement					
		1 st Aid, CPR & AED Trained Official Present (e.g. coach)	Dedicated First-Aider or Paramedic Onsite	Doctor Onsite	Nearest Hospital Informed	Ambulance ¹ On Standby	Medical tent / Post / Centre Onsite ¹
A - Low	Training	No	No	No	No	No	No
	Competition	No	No	No	No	No	No
B - Medium	Training	Yes	No	No	No	No	No
	Competition	Yes	Yes	No	Yes	No	No
C - High	Training	Yes	No	No	No	No	No
	Competition	Yes	Yes	Preferred	Yes	Preferred ¹	Yes, if >100 participants

- 8.5.2 **While the personnel in Table 8.2 have been identified by their vocational lines, others with the skill may also perform that role.** For example, beyond a first aider, someone with the skills can identify an athlete in distress and render first aid and CPR if necessary. This person can be anyone such as a teacher, a volunteer or a bystander.
- 8.5.3 **For events that are dynamic / mobile or with a large field-of-play the recommendations in Table 8.2 require adaptations.** The recommendations in Table 8.2 apply primarily to static events. Thus for events such as open-water kayaking, cycling and long-distance running where the medical support plan (for training and competition must take into account the timely access of medical support and evacuation of casualties. For such events, the Chief Safety Officer or Event Medical Director will have to adapt the recommendations when drawing up the safety and medical support plan.
- 8.5.4 **For Category C high-risk competitive events, there should be timely access to medical evacuation.** This may be provided using any emergency medical services for timely access to care. In Singapore, although 995 ambulances have an overall indicator to respond within 11 minutes for 80% of the time, it does not take into account unique challenges such as heavy traffic, blocked access routes, terrain etc. that may increase the time to access for the emergency medical services. If the event Medical Director assesses that the response time is insufficient, or the nature of the event makes it challenging for evacuation, then plans for forward deployed ambulance coverage should be put in place. In addition, the event Medical Director needs to consider that managing a pre-planned event with known cardiovascular risks would create higher expectations for a more responsive onsite medical support system to mitigate these *additional* risks.

8.6 Recommendations: Manpower and Training

- 8.6.1 **A Safety Officer should be assigned by the event organiser or person-in-charge to be in charge of the event safety and medical coverage.** Medical

support staff should be briefed on the medical support plans including the use of medical equipment, activation procedures, evacuation routes and communication channels.

8.6.2 Organisers should consider the appointment of an Event Medical Director to be closely involved and responsible for the planning and execution of the medical support plan. This applies to events that involve:

- (i) Mass participation,
- (ii) Simultaneous multiple events (e.g. Youth Olympic Games),
- (iii) A large field of play (e.g. road races, triathlons).

8.6.3 Event organisers should review the experience and qualifications of the appointed safety and medical personnel to ensure that they are able to perform their roles effectively. Different levels of personnel competencies are required for different risk categories and type of events (i.e. training or competition, refer to Table 8.2).

8.6.4 Safety and medical personnel should be certified, and certifications kept current. These should be based on national standards and recognised accreditation programmes (e.g. Basic Cardiac Life Support training and certification with training centres accredited by the Singapore Resuscitation and First Aid Council).

8.6.5 Sufficient numbers of trained safety personnel and first responders should be deployed to ensure that time required for the first responder to attend to a participant in distress is three minutes or less.

8.6.6 For specialised events such as water sports or disability sports, it is essential that personnel involved in event coverage are adequately trained. Necessary skills might include lifesaving skills and surveillance techniques for water sports, or being equipped to work with persons with particular disabilities etc.

For recurrent events, the event medical plan should be reviewed along with the safety plan for continued improvement in subsequent events.

8.7 Recommendations: Medical Equipment

8.7.1 Specialised personnel are each expected to have full and rapid access to respective equipment required. For instance, first-aiders should have access to an adequately equipped first aid box and medical support teams should have well equipped and stocked medical items. The medical items carried by medical teams for field cover should contain resuscitation equipment (e.g. airway equipment, drip sets and fluid for resuscitation, bandages and dressings, etc.). Commonly required medical equipment includes:

- First-Aid Box/Kit
- Facemask for CPR
- Automated External Defibrillator (AED)
- Oxygen (*for water sports*)
- Splints and cervical collars
- Medical items for medical support teams
- Stretcher (regular or wheeled)
- Evacuation vehicle

8.7.2 Equipment should be visible and accessible, kept well stocked and well maintained.

8.7.3 Event organisers must ensure that medical teams have prompt access to casualties. To enable this, physical and administrative barriers should be addressed during the planning phase of the event. The safety of participants should be the prime consideration for event organisers and medical support personnel.

8.7.4 All sports facilities and NSAs have one or more well-maintained AEDs that are easily accessible and located by users. The goal is for response time of

three minutes or less – the duration from the time of cardiac arrest to defibrillation. Therefore, the absolute number of AEDs in each facility is dependent on the layout and size of the facility. Sports facilities should store AEDs in a transparent cabinet that is highly visible/prominent and accessible, ensuring clear signage for users to locate the nearest AED. An alarm system with indicator lights will alert the public when the AED is removed. All facilities where exercise, training, and competition take place should have public access defibrillators. NSAs that require additional mobile AEDs for event medical coverage may loan units from vendors.

Fact Box: Locating AEDs in Singapore

AEDs can also be located through the **Singapore Registry for AED Integration**, jointly launched by the Singapore Civil Defence Force and the Singapore Heart Foundation in 2014.

8.7.5 Evacuation and safety vehicles need to be adequately equipped, operated and located to enable effective medical assistance. For instance, safety and rescue boats should facilitate the transfer of the casualties in and out of the boat and be given adequate space to carry out resuscitation. They should be appropriately equipped, competently manned and driven (to minimise the risk of propeller injuries to the victim).

8.8 Recommendations: Communication and Coordination

8.8.1 All key event management and event medical personnel should have a clear communications plan covering safety and medical requirements. This should cover:

- First aid station locations
- Signage
- Ingress and egress routes for evacuation vehicles
- Types of medical vehicles to be used: bikes, buggy, ambulances etc.

- Medical protocols and procedures
- Inclement weather and haze (following guidelines issued by National Environment Agency)
- Activation of medical team and evacuation process
- Zone/sector coverage of lifesaving and rescue teams for water sports

8.8.2 To provide timely lifesaving first aid to a participant or spectator, the following procedures should be clearly communicated:

- Identification of victim
- Call for help
- Dispatch of medical team
- Transportation of medical team and equipment to victim or vice versa
- Level of on-scene care

8.9 Recommendations: Mass-Participation Amateur Sports and Events

8.9.1 After reviewing various published guidelines, the Committee recommends the following guidelines as suitable for Singapore's context:

- (a) The United Kingdom Athletics' (UKA) Road Race Medical Services Good Practice Guide
- (b) The Emergency Medicine Society of South Africa's Practice Guideline (Mass Gathering Medical Resource Model)

8.9.2 Local medical coverage should take into consideration the adverse effects of Singapore's climate and weather such as heat, humidity and lightning. The local climatic conditions in Singapore may require the greater use of facilities such as additional water points, water sprays and cooling systems to minimize the likelihood of adverse effects (e.g. heat exhaustion and heat stroke).

8.10 Recommendations: Post-Event Feedback and Review

8.10.1 Post-event feedback on the safety management and medical support plan is important to improving the organisation of future events.

8.10.2 For events endorsed by SportSG, event organisers should submit their post-event report to SportSG.

8.10.3 For events endorsed by NSAs, organisers should send in their post-event report to the respective NSAs.

RESOURCE REFERENCE

Appendix 4: Sports Injury Reporting Form and Summary of Sports Injury Report

9. Exercise and Training Facilities

Key Messages:

- Exercise and training facilities or services should promote the use of pre-participation screening questionnaires among its users.
- Facility operators should require users to declare and update their medical conditions via pre-participation questionnaires, as well as orientating and guiding them in the safe usage of the facility.
- Through risk management, established emergency policies and professional operations a facility can mitigate unnecessary risks and promote a positive experience for users.
- Facilities must ensure staff and independent contractors are professionally equipped and certified, as well as familiarised with the safety practices of the facility.

9.1 Introduction

9.1.1 This chapter aims to provide exercise and training facilities with a set of guidelines to enhance safety while providing a positive exercise experience.

9.1.2 With Singapore's ageing population and the associated rise in chronic non-communicable diseases such as heart disease and hypertension, exercise and training facilities will see an increase in clientele with medical conditions. In response to this trend, initiatives such as SportSG's Active Health Lab have been introduced nationally. As healthcare institutions manage those with severe and poorly controlled medical conditions (Exercise is Medicine Singapore 2012), community exercise and training facilities can expect to receive clients with well-controlled medical conditions. With this, the exercise risks are relatively low, but nevertheless higher than in healthy individuals.

9.1.3 The emergence of novel business models, such as 24-hour unstaffed exercise and training facilities, will also require safety approaches to evolve in tandem.

9.1.4 Much of the recommendations in this section are adapted from the American College of Sports Medicine's (ACSM) Health/Fitness Facility Standards and Guidelines (fourth edition) which may be referred to (ACSM's health/fitness facility standards and guidelines, 4th edition, 2012).

9.2 Recommendations: Pre-participation Questionnaires

9.2.1 **Facility operators should advise all users to declare and update their medical conditions via a pre-participation questionnaire.** Sport participants should adhere to proper training principles and guidelines to pursue physical activity in a safe manner.

9.2.2 **All specific pre-participation screening tools shall be reviewed and interpreted by qualified staff (e.g. qualified health/fitness or healthcare professional).** The review results should be filed by the facility for a period of at least two years from the time the tool was reviewed and interpreted.

9.2.3 **In facilities with free uncontrolled usage of its equipment (e.g. fitness parks or unsupervised hotel fitness centres), pre-participation questionnaires should be easily accessible and users made aware of its presence.** This could be done through websites or by means of signs at the facility. The committee recommends the adoption of the Get Active Questionnaire (GAQ) by the Canadian Society for Exercise Physiology.

9.2.4 **Facility operators should comply with the new American College of Sports Medicine (ACSM) pre-participation guideline, and seek medical clearance from a qualified healthcare provider if required (Thompson et al., 2013).**

9.3 Recommendations: Orientation and Supervision

9.3.1 Assistance and guidance in relation to physical activity should be made available to facility members and users engaged in exercise and training programmes.

9.4 Recommendations: Risk Management and Emergency Policies

9.4.1 Facility operators must have well documented and regularly reviewed emergency response policies and procedures. Physical rehearsals should be conducted twice annually to ensure that employees are equipped to respond to basic first-aid situations and emergency events in an appropriate and timely manner.

9.4.2 Facility operators should conduct safety audits to mitigate injury-causing hazards, thus keeping employees, facility members and users safe.

9.4.3 Facility operators should use waivers of liability and/or assumption of risk documents with facility members and users.

9.4.4 Automated External Defibrillators (AEDs) should be located within facilities with the goal of being available to any casualty within 3 minutes of call. A notice highlighting the availability of an AED at the facility (or nearby with the directions) should be prominently displayed near entry to the facility. AED signage(s) should follow Singapore Resuscitation and First Aid Council (SRFAC) guidelines. In larger facilities, directional arrows are helpful when there is not direct line-of-sight to the AED location.

9.4.5 Facility operators should provide employees with the opportunity to receive training and certification in first aid and the use of CPR and an AED.

9.4.6 Staffed facilities should have at least one staff member on duty during operating hours. At least one staff member on duty should be currently trained and certified in the delivery of cardiopulmonary resuscitation (CPR) and in the use of an AED.

9.4.7 Unstaffed facilities should have a public access defibrillation program for members and users (or an external emergency responder) to use in response to an emergency. This should enable a response in three minutes or less (from the time of call to defibrillation) and should be part of a facility’s documented emergency response policies and procedures. (e.g. Dispatcher Assisted First Responder (DARE) programme).

9.5 Recommendations: Professional Staff & Independent Contractors

9.5.1 Staff that administer physical activity programmes or have supervisory responsibilities must meet professional standards (e.g. certification) in their training and experience required for their designation.

Below is a list of personnel requirements for fitness centres (Table 9.1).

<u>Table 9.1:</u> Personnel Requirements for Fitness Centres	
Designation	Requirements/Job Scope
General Manager/Executive Director	<ul style="list-style-type: none"> • Overall management of facility, design and delivery of exercise programs
Medical Liaison	<ul style="list-style-type: none"> • Review of medical emergency plans and incident reports, witnessing and critique of emergency drills. • Level 2 and 3 facilities: physician or registered nurse trained in advanced cardiac life support • Level 4 and 5 facilities: physician
Fitness Director	<ul style="list-style-type: none"> • Design and management of exercise and fitness programs, training and supervision of staff <p>Core requirement</p> <ul style="list-style-type: none"> • Bachelor’s degree in exercise science with > 8 years of experience in the fitness industry, of which 5 years are in

	<p>supervisory appointments (this should be the core requirement)</p> <ul style="list-style-type: none"> • Maintain currency in CPR and AED • Fitness instructor certification as provided by SportSG. •
<p>Fitness Professionals (including professional exercise leaders, personal trainers, etc.)</p>	<ul style="list-style-type: none"> • Provide instruction and leadership in professional exercise programs • Degree in Exercise Science from a recognised university • Diploma from Republic Polytechnic and NITEC from ITE and the local fitness trainer certification programme for those with existing qualification in a degree in Exercise Science. • Trained in CPR and AED use, desirable to be trained in 1st aid, prior supervised internship or experience in health/fitness industry

9.5.2 Professionals engaged in pre-activity screening or prescribing, instructing, monitoring, or supervising of physical activity programs should have current AED and CPR certification from a local organisation accredited by the national accreditation agency.

9.6 Recommendations: Facility Operating Practices

9.6.1 Facilities should have a manual or digital operations system that monitors the presence and identity of individuals that enter the facility or participate in activities, programmes and services (e.g. members, users).

9.6.2 Facility operators should ensure that there is sufficient space (both physical activity space and non-activity spaces) to accommodate user-demand.

9.6.3 Facilities that offer a sauna, steam room, or whirlpool should have a technical monitoring system and AED in place to ensure that the areas are maintained at the proper temperature and humidity level. They should also

ensure appropriate warning systems and signage are in place to notify members and users of risks related to the use of these facilities. This includes warning users about unsafe changes in temperature and humidity.

9.6.4 Facilities shall have written policies displayed visibly, for instance, restroom practices, age requirements or entry limits for children and the need for parental/guardian presence on site.

9.6.5 Facilities should be designed to maintain background noise levels below 70 decibels and never above 90 decibels.

9.6.6 Floor surfaces in physical activity areas should meet specifications for the proper level of absorption and slip resistance to minimise the risk of fall-related injuries.

9.7 Recommendations: Facility Equipment

9.7.1 The facility operator should have a preventive maintenance program for fitness equipment, including updated documentation indicating when the scheduled work was performed.

9.8 Recommendations: Facility Signage

9.8.1 Facility operators should display visually prominent notices on danger and warnings of hazards, and proper caution.

9.8.2 Facility operators should display visually prominent signage indicating the location of any rescue/lifesaving equipment, such as AED and first-aid kits.

9.8.3 Facility operators should post the appropriate emergency and safety signage pertaining to fire and related emergency situations, such as fire extinguishers and hose reels.

Table 9.2: Staffing and Equipment in Exercise and Training Facilities

Recommendations for staffing and emergency equipment according to facility type (Note: Size of facility is not included)

Facility Characteristics	Level 1	Level 2	Level 3	Level 4	Level 5
Type of Facility	Unsupervised exercise room	Single Exercise Leader	Fitness Centre for Healthy Clients	Fitness Centre Serving Clinical Populations	Medically Supervised Clinical Exercise program
Personnel	None	Exercise leader Recommended: Medical liaison	General Manager Fitness Instructor Exercise Leader Recommended: Medical liaison	General Manager Exercise Specialist Fitness Instructor Medical liaison	General Manager Exercise Specialist Fitness Instructor Medical liaison
Emergency Plan	Present	Present	Present	Present	Present
Emergency Equipment	<ul style="list-style-type: none"> •Telephone in room/ parks • Signs •Encouraged: PAD plan with AED as part of the composite PAD plan in the host facility (e.g. hotel, commercial building, 	<ul style="list-style-type: none"> • Telephone in room • Signs • Encouraged: blood pressure kit • PAD plan with AED 	<ul style="list-style-type: none"> •Telephone in room •Signs • Encouraged: blood pressure kit; stethoscope • PAD plan with AED 	<ul style="list-style-type: none"> • Telephone in room • Signs • Blood pressure kit • Stethoscope • Strongly recommended; PAD plan with AED 	<ul style="list-style-type: none"> • Telephone in room • Signs • Blood pressure kit • Stethoscope • Oxygen • Cash cart • Defibrillator

	apartment complex, park)				
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AED – Automatic External Defibrillator

PAD – Public Access to Defibrillator

Definitions

For the purpose of this report, the following definitions shall apply:

- **Aquatic Facilities:** a man-made body of water used for sport, recreation, or therapeutic water activities.
- **Open Water:** includes beach fronts, rivers, lakes and reservoirs.
- **Exercise and training facilities:** organisations that offer health and fitness programmes as their primary or secondary service, or promote high-intensity recreational physical activity (e.g. basketball, tennis, racquetball and swim clubs). Ideally such facilities should have professional staff. Facilities that only provide space and equipment are also included (e.g. unsupervised hotel exercise rooms).
- **Exercise and training facility user:** dues-paying member or a guest paying a regular daily fee to use the facility specifically to exercise.

References

1. ACSM's health/fitness facility standards and guidelines, 4th edition (2012). *The American College of Sports Medicine*.
2. Exercise is Medicine Singapore. (2012). Retrieved from URL <https://www.eims.sg/>
3. Thompson, P. D., Arena, R., Riebe, D., et al. (2013). ACSM's New Preparticipation Health Screening Recommendations from ACSM's Guidelines for Exercise Testing and Prescription, Ninth Edition. *American College of Sports Medicine*.

10. Surveillance and Evaluation

Key Messages:

- Injury surveillance is integral to improving sports safety.
- All event organisers should conduct injury surveillance and perform post-event debriefings.
- It is advisable to have a central repository to capture data for sporting injuries, sudden deaths and serious adverse events.

10.1 Introduction

10.1.1 To continually improve on sports safety, it is important that National Sports Associations (NSAs), event organisers and other relevant stakeholders have a clear system for incident reporting, evaluation, and follow up. Injuries and other adverse incident statistics should be clearly documented and evaluated

10.2 Current Practices

10.2.1 Injury surveillance is not commonly practiced in Singapore sports, with the exception of Sailing and a few other sports (1). Presently, local data for the incidence of specific adverse events in specific sports is not available (e.g. data for the incidence of anterior cruciate ligament (ACL) tears among soccer players in Singapore, and the factors associated with such injuries).

10.2.2 For sports events, there are better records. Injury records are kept for major events such as the Singapore Marathon and Singapore International Triathlon (2). As an example of its usefulness, in the 2005 edition, the Singapore Marathon's organisers observed that 1 in 525 participants suffered heat injury. This led them to increase the number of water points, subsequently reducing the rate of heat injuries to one in 1,148 participants in the subsequent marathon.

10.3 Recommendations

- 10.3.1 **A minimum data set should be defined by sporting organizations to allow easier compilation of standardised data** (e.g. name, identity number, age, cause of death or adverse event or circumstance or event leading up to death) (See Appendix 4: Sport Injury Reporting Form). Stakeholders and organisations should be encouraged to incorporate this data set into their own reporting formats.
- 10.3.2 **It is the responsibility of NSAs, stakeholders and event organisers to compile data on participants with medical problems detected during screening (using their own reporting system/protocol, including the minimum data set) or those injured during sports events (using the Injury Reporting Form in Appendix 4).** They should document the follow up plan, and allow the above data to be easily accessible by relevant parties (e.g. medical personnel) while protecting medical confidentiality. The compilation and evaluation of such data in each sport will allow for more accurate risk stratification and will also provide information on the adequacy of event safety plans.
- 10.3.3 **Each NSA is encouraged to conduct its own injury surveillance among its athletes.** This enables comparisons with international benchmarks and the systematic improvement of sports safety. For example, if the rate of impact injuries in soccer players sees a seasonal trend and is associated with hard pitches from dry weather, interventions can then be confidently applied to reduce unnecessary injuries (e.g. watering the field an hour before practice).
- 10.3.4 **Where applicable, NSAs should establish their own sport-specific medical committee (or at least appointing a medical advisor or equivalent) to help comply with the above recommendations, including periodically reviewing data collected on sports-related injuries/adverse events, and managing the data.** For a start, the information could be quite basic with minimal data requirements and the information could be refined/increased as the process matures).

10.3.5 NSAs and Event Organisers should conduct debriefings and post event reviews of sports events. They should promote sharing of essential points amongst organisations, and invite feedback from members of the public and participants. Improvements can be publicized to raise public awareness (via NSA / event websites etc.).

10.3.6 Surveillance and evaluation systems need to contain a follow-up and tracking element to prevent incidents of similar nature in the future (Junge et al., 2008).

10.3.7 The setup of a central sports injury registry is recommended. It will provide the following functions:

- a) To verify compliance with rules and guidelines;
- b) To develop guidelines on safe conduct of activities, spread best practices, and promote general awareness of sports safety; and
- c) To capture data on sporting injuries, sudden death and adverse events, to provide an objective basis for the design and continual improvement of effective interventions.

References

1. Junge, A., Engebretson, L., Alonso, J. M., et al., (2008). Injury surveillance in multi-sport events: the international Olympic committee approach. *British Journal of Sports Medicine*, 42, 413-421.
2. Leong, D., Tan, B., Pardal, C. V., et al. (2017). Injury and illness surveillance during the international sailing federation sailing world championships 2014. *British Journal of Sports Medicine*, 51, 349-350.
3. Lee, J. K. W., Nio, A. Q. X., Ang, W. H., et al. (2011). First reported cases of exercise-associated hyponatremia in Asia. *International Journal of Sports Medicine*, 32(04), 297-302.

11. Conclusion

Sports can build resilience in people, bond communities, unite and inspire a nation. Together with partners from the public, private and people sectors, a greater participation in sports is being encouraged. A strong culture in sports safety must underpin this greater participation.

This report has covered a variety of topics to address sports safety in Singapore. The objective has been to inculcate a safety-first mentality, as well as the sense of individual and collective responsibilities. The topics covered were:

- Sudden cardiac deaths in sports
- Heat injuries in sports
- Water safety
- Fundamental principles of sports safety
- Pre-participation screening
- Training and education in sports safety
- Exercise and training facilities
- Event medical support plan
- Surveillance and evaluation

Sports safety is the responsibility of every individual. It is therefore critical to focus on every individual's personal responsibility for their safety and health, including the need to listen to their bodies and know their limits while engaging in sporting activities. This will involve a considerable effort in public education to raise safety awareness and commitment. Every life is precious and every effort has to be made to reduce incident rates. Safety training and education will therefore enable sustainable improvements in sport safety in Singapore.

SportSG's Risk Assessment for the Sports Fraternity

Document will be uploaded in the link below:

<https://www.sportsingapore.gov.sg/sports-education/sports-safety/safety-resources-and-useful-links>

Get Active Questionnaire (GAQ)



Get Active Questionnaire

CANADIAN SOCIETY FOR EXERCISE PHYSIOLOGY –
PHYSICAL ACTIVITY TRAINING FOR HEALTH (CSEP-PATH®)

Physical activity improves your physical and mental health. Even small amounts of physical activity are good, and more is better.

For almost everyone, the benefits of physical activity far outweigh any risks. For some individuals, specific advice from a Qualified Exercise Professional (QEP – has post-secondary education in exercise sciences and an advanced certification in the area – see csep.ca/certifications) or health care provider is advisable. This questionnaire is intended for all ages – to help move you along the path to becoming more physically active.

- I am completing this questionnaire for myself.
- I am completing this questionnaire for my child/dependent as parent/guardian.

YES	NO	PREPARE TO BECOME MORE ACTIVE	
<p>The following questions will help to ensure that you have a safe physical activity experience. Please answer YES or NO to each question <u>before</u> you become more physically active. If you are unsure about any question, answer YES.</p>			
●	●	1	Have you experienced ANY of the following (A to F) within the past six months ?
●	●	A	A diagnosis of/treatment for heart disease or stroke, or pain/discomfort/pressure in your chest during activities of daily living or during physical activity?
●	●	B	A diagnosis of/treatment for high blood pressure (BP), or a resting BP of 160/90 mmHg or higher?
●	●	C	Dizziness or lightheadedness during physical activity?
●	●	D	Shortness of breath at rest?
●	●	E	Loss of consciousness/fainting for any reason?
●	●	F	Concussion?
●	●	2	Do you currently have pain or swelling in any part of your body (such as from an injury, acute flare-up of arthritis, or back pain) that affects your ability to be physically active?
●	●	3	Has a health care provider told you that you should avoid or modify certain types of physical activity?
●	●	4	Do you have any other medical or physical condition (such as diabetes, cancer, osteoporosis, asthma, spinal cord injury) that may affect your ability to be physically active?
	> NO to all questions: go to Page 2 – ASSESS YOUR CURRENT PHYSICAL ACTIVITY>	
		YES to any question: go to Reference Document – ADVICE ON WHAT TO DO IF YOU HAVE A YES RESPONSE ...>>	

ASSESS YOUR CURRENT PHYSICAL ACTIVITY

Answer the following questions to assess how active you are now.

- 1 During a typical week, on how many days do you do moderate- to vigorous-intensity aerobic physical activity (such as brisk walking, cycling or jogging)? DAYS/WEEK
 - 2 On days that you do at least moderate-intensity aerobic physical activity (e.g., brisk walking), for how many minutes do you do this activity? MINUTES/DAY
- For adults, please multiply your average number of days/week by the average number of minutes/day: MINUTES/WEEK

Canadian Physical Activity Guidelines recommend that adults accumulate at least 150 minutes of moderate- to vigorous-intensity physical activity per week. For children and youth, at least 60 minutes daily is recommended. Strengthening muscles and bones at least two times per week for adults, and three times per week for children and youth, is also recommended (see csep.ca/guidelines).



GENERAL ADVICE FOR BECOMING MORE ACTIVE

Increase your physical activity gradually so that you have a positive experience. Build physical activities that you enjoy into your day (e.g., take a walk with a friend, ride your bike to school or work) and reduce your sedentary behaviour (e.g., prolonged sitting).

If you want to do **vigorous-intensity physical activity** (i.e., physical activity at an intensity that makes it hard to carry on a conversation), and you do not meet minimum physical activity recommendations noted above, consult a Qualified Exercise Professional (QEP) beforehand. This can help ensure that your physical activity is safe and suitable for your circumstances.

Physical activity is also an important part of a healthy pregnancy.

Delay becoming more active if you are not feeling well because of a temporary illness.



DECLARATION

To the best of my knowledge, all of the information I have supplied on this questionnaire is correct.
If my health changes, I will complete this questionnaire again.

I answered **NO** to all questions on Page 1

I answered **YES** to any question on Page 1

Sign and date the Declaration below

Check the box below that applies to you:

- I have consulted a health care provider or Qualified Exercise Professional (QEP) who has recommended that I become more physically active.
- I am comfortable with becoming more physically active on my own without consulting a health care provider or QEP.

Name (+ Name of Parent/Guardian if applicable) [Please print] Signature (or Signature of Parent/Guardian if applicable) Date of Birth

Date Email (optional) Telephone (optional)

With planning and support you can enjoy the benefits of becoming more physically active. A QEP can help.

- Check this box if you would like to consult a QEP about becoming more physically active.
(This completed questionnaire will help the QEP get to know you and understand your needs.)

Use this reference document if you answered **YES** to any question and you have not consulted a health care provider or Qualified Exercise Professional (QEP) about becoming more physically active.

1 Have you experienced ANY of the following (A to F) within the past six months?	
<p>A A diagnosis of/treatment for heart disease or stroke, or pain/discomfort/pressure in your chest during activities of daily living or during physical activity?</p> <p><input type="checkbox"/> YES</p>	<p>Physical activity is likely to be beneficial. If you have been treated for heart disease but have not completed a cardiac rehabilitation program within the past 6 months, consult a doctor – a supervised cardiac rehabilitation program is strongly recommended. If you are resuming physical activity after more than 6 months of inactivity, begin slowly with light- to moderate-intensity physical activity. If you have pain/discomfort/pressure in your chest and it is new for you, talk to a doctor. Describe the symptom and what activities bring it on.</p>
<p>B A diagnosis of/treatment for high blood pressure (BP), or a resting BP of 160/90 mmHg or higher?</p> <p><input type="checkbox"/> YES</p>	<p>Physical activity is likely to be beneficial if you have been diagnosed and treated for high blood pressure (BP). If you are unsure of your resting BP, consult a health care provider or a Qualified Exercise Professional (QEP) to have it measured. If you are taking BP medication and your BP is under good control, regular physical activity is recommended as it may help to lower your BP. Your doctor should be aware of your physical activity level so your medication needs can be monitored. If your BP is 160/90 or higher, you should receive medical clearance and consult a QEP about safe and appropriate physical activity.</p>
<p>C Dizziness or lightheadedness during physical activity</p> <p><input type="checkbox"/> YES</p>	<p>There are several possible reasons for feeling this way and many are not worrisome. Before becoming more active, consult a health care provider to identify reasons and minimize risk. Until then, refrain from increasing the intensity of your physical activity.</p>
<p>D Shortness of breath at rest</p> <p><input type="checkbox"/> YES</p>	<p>If you have asthma and this is relieved with medication, light to moderate physical activity is safe. If your shortness of breath is not relieved with medication, consult a doctor.</p>
<p>E Loss of consciousness/fainting for any reason</p> <p><input type="checkbox"/> YES</p>	<p>Before becoming more active, consult a doctor to identify reasons and minimize risk. Once you are medically cleared, consult a Qualified Exercise Professional (QEP) about types of physical activity suitable for your condition.</p>
<p>F Concussion</p> <p><input type="checkbox"/> YES</p>	<p>A concussion is an injury to the brain that requires time to recover. Increasing physical activity while still experiencing symptoms may worsen your symptoms, lengthen your recovery, and increase your risk for another concussion. A health care provider will let you know when you can start becoming more physically active, and a Qualified Exercise Professional (QEP) can help get you started.</p>

After reading the **ADVICE** for your **YES** response, go to **Page 2** of the **Get Active Questionnaire – ASSESS YOUR CURRENT PHYSICAL ACTIVITY**

Use this reference document if you answered **YES** to any question and you have not consulted a health care provider or Qualified Exercise Professional (QEP) about becoming more physically active.

2 Do you currently have pain or swelling in any part of your body (such as from an injury, acute flare-up of arthritis, or back pain) that affects your ability to be physically active? **YES**

If this swelling or pain is new, consult a health care provider. Otherwise, keep joints healthy and reduce pain by moving your joints slowly and gently through the entire pain-free range of motion. If you have hip, knee or ankle pain, choose low-impact activities such as swimming or cycling. As the pain subsides, gradually resume your normal physical activities starting at a level lower than before the flare-up. Consult a Qualified Exercise Professional (QEP) in follow-up to help you become more active and prevent or minimize future pain.

3 Has a health care provider told you that you should avoid or modify certain types of physical activity? **YES**

Listen to the advice of your health care provider. A Qualified Exercise Professional (QEP) will ask you about any considerations and provide specific advice for physical activity that is safe and that takes your lifestyle and health care provider's advice into account.

4 Do you have any other medical or physical condition (such as diabetes, cancer, osteoporosis, asthma, spinal cord injury) that may affect your ability to be physically active? **YES**

Some people may worry if they have a medical or physical condition that physical activity might be unsafe. In fact, regular physical activity can help to manage and improve many conditions. Physical activity can also reduce the risk of complications. A Qualified Exercise Professional (QEP) can help with specific advice for physical activity that is safe and that takes your medical history and lifestyle into account.

After reading the ADVICE for your YES response, go to Page 2 of the *Get Active Questionnaire – ASSESS YOUR CURRENT PHYSICAL ACTIVITY*

WANT ADDITIONAL INFORMATION ON BECOMING MORE PHYSICALLY ACTIVE?

► csep.ca/certifications

CSEP Certified members can help you with your physical activity goals.

► csep.ca/guidelines

Canadian Physical Activity Guidelines for all ages.

Parent's/Guardian's Signature

Date

Sport-Specific Regulations Concerning the Continuation of Play Under High Environmental Heat Stress

Sport / Authority	Cut-off	Description	Action
Football / Federation Internationale de Football Association (FIFA) (10)	WBGT > 32°C	The risk of heat illness does not only depend on the temperature, but also on the humidity of the air. With higher humidity, the cooling effect of sweating is reduced. Further, wind and sun radiation influence the effect of high temperatures on your body.	At FIFA matches, additional cooling breaks are considered when WBGT is above 32°C.

Sport / Authority	Cut-off	Description	Action
<p>Rugby / World Rugby (11)</p>	<p>HSI[^] >150</p>	<p>Whilst the Heat Stress Index has been successfully utilized by Australian Rugby League players (League players), World Rugby recognizes that World Rugby players (Rugby players) are potentially at a higher risk of a heat illness than League players. The reasons for this opinion are listed below and have been taken into account when formulating the World Rugby Prevention Interventions:</p> <ol style="list-style-type: none"> 1. Rugby athletes are generally bigger athletes 2. League players are able to access interchange (substitution) during their games 3. Aerobic fitness of League players is higher 4. Less “hugging” in League 5. Rugby athletes from Northern Hemisphere less acclimatized. 	<p>2-minute break at the 20-minute mark of each half. The focus of this break should be threefold: a medical assessment of each athlete for signs of heat stress, cooling of athletes and re-hydration. It is suggested that cooling would be best achieved by immediately removing jersey and shoulder pads, application of ICE water to head ± body. Utilizing sideline fans and shade (if game during day) would also be ideal. It should be noted that a 2-minute break has been recommended (as opposed to a 1-minute break) because the focus during this break is primarily medical assessment and cooling.</p>

Sport / Authority	Cut-off	Description	Action
Tennis / World Tennis Association (WTA)	-	Individual tournaments, e.g. Australian Open and Wimbledon, have their own policies to deal with extreme heat events.	Postponement / suspension of matches or closure of retractable roofing.
	WBGT 27-28°C	EHS risk for unfit, non acclimatized individual is high.	Caution should be taken and athletes should be advised of the danger and to increase their normal fluid intake.
Triathlon / International Triathlon Union (ITU) (12)	WBGT 25-28°C	The level for EHS risk is cancelled and uncompensable heat stress exist for all athletes. Difference of local climate and individual heat acclimatization status may allow activity at higher levels than outlined above in acclimatized fit and elite athletes.	The ITU technical delegate, medical delegate, the race medical director and the local organizing committee should work together to monitor weather conditions and a specific contingency plan should be implemented to consider the scenario of extreme meteorological situations that could force to modify (reducing race length), to rescheduling the event until less stressful conditions prevail, or even cancel the competition.
^ Heat Strain Index (HIS) as measured by a hygrometer.			

Sports Injury Reporting Form and Summary of Sports Injury Report

Name of Injured Person: _____

NRIC: _____

Gender: M / F

Age: _____

Contact. No.: _____

Player / Technical Official / Coach/ Spectator

Date: ___/___/_____

Time: ___:___

Venue: _____

Sport: _____

Training/Competition

New Injury/Recurrent Injury/Pre-existing Illness

Condition of injured person on treatment

Conscious/Semi-Conscious/Unconscious

Body Region Involved

- Head and Neck
- Torso
- Abdomen
- Groin/Pelvis
- Upper limb
- Lower limb
- Others _____

Nature of Injury

A. Abrasion/Blisters Laceration Bruise/Contusion
B. Swelling

Sprains/Ligament Injury Strain Muscle Injury
C. Fracture Dislocation/Subluxation
D. Concussion/Head Injury
E. Facial Injury – Eye, Dental Trauma
F. Cardiac Contusion/Angina/Arrest
G. Respiratory Distress
H. Abdominal Cramp/Vomiting
I. Heart Related Illness
J. Others:-

State if injured person is bleeding

Slight/Minor/Heavy/Require Stitches

Cause of Injury

- Struck/Collision by other player
- Struck/Collision by ball or object of play
- Fall on same level or while jumping/poor landing
- Overexertion/Overuse
- Heat related
- Others: _____

Diagnosis: _____

Description of Incident

Protective equipment used? Y / N _____

Initial Treatment

- RICE
- Dressing
- Stretching
- Splint/Sling
- CPR Required? No. of cycles
- AED Required? No. of 'Shocks' delivered
- Others: _____

Outcome

- Return to play
- Rest at side
- Referred to specialist outpatient clinic
- Referred to hospital A&E
- Conveyed to hospital A&E by ambulance

Treated By:

- Paramedic
- First aider
- Sports trainer
- Others: _____

Name of medical personnel: _____

Signature: _____

SUMMARY OF SPORTS INJURY REPORT (Compiled at the end of the event)

Date: ___/___/_____

Reporting Time In: ___:___

Reporting Time Out: ___:___

Venue: _____

Sport: _____

Number of Participants: _____

Type of Injury	Number of Incidents	Treated on Site	Conveyed to Hospital
<i>A.</i> Abrasion/Blisters/Laceration/Bruise/Contusion			
<i>B.</i> Swelling/Sprains/Ligament Injury/Strain Muscle Injury			
<i>C.</i> Fracture/Dislocation/Subluxation			
<i>D.</i> Concussion/Head Injury			
<i>E.</i> Facial Injury – Eye, Dental Trauma			
<i>F.</i> Cardiac Contusion/Angina/Arrest			
<i>G.</i> Respiratory Distress			
<i>H.</i> Abdominal Cramp/Vomiting			
<i>I.</i> Heat Related Illness			
<i>J.</i> Others: _____			

Cause of Injury

- Struck/Collision by other player
- Struck/Collision by ball or object of play
- Fall on same level or while jumping/poor landing
- Overexertion/Overuse
- Heat related
- Others: _____

Outcome

Total no. of referred to hospital A&E: _____
Total no. conveyed to hospital A&E by ambulance: _____

Prepared by:

Name of medical personnel: _____

Contact No.: _____

Signature: _____

Risk Management Learner's Guide (CoachSG)



RISK MANAGEMENT

LEARNERS' GUIDE

Name of Learner: _____

RISK MANAGEMENT

Overview

As a coach, performing risk management effectively helps ensure that your athletes are safe during sport activities. In this module, you will learn about the roles and responsibilities of a coach in sport safety and understand how to perform risk assessment correctly.

At the end of this module, you will be able to:

- Understand what risk assessment is and why it is important
- Describe the three steps of risk assessment
- Develop a risk management plan
- Describe the safety framework for schools' sports coaches

Total Number of Learning Hours: 2 hours

Assessment Method for Module: Workbook

Written Assessment

1. Safety and Risk

Safety should be of utmost importance when you conduct training. Whatever the goals and objectives of any sporting activity, safety should be a critical part of your planning. Unsafe practices often lead to unnecessary injuries and consequences e.g. an athlete could miss out on training and playtime for the season due to injuries sustained through poor safety practices. Worse, lives could even be lost as a result of safety neglect!

Still, playing sport carries a certain element of risk. Some risks cannot be completely prevented e.g. in a football game, players attempting to head the ball may collide with each other, or a basketball player could sprain his ankle in a game due to a poor landing. Such occurrences are fairly common, although unwelcome.

So, under what circumstances is a coach at fault when accidents occur? What can a coach do to minimise safety risks in sport?

2. What is Risk Assessment and Management System (RAMS)?

To mitigate safety risk(s), coaches can refer to the Risk Assessment and Management System (RAMS) – a process that identifies occupational safety and health hazards – to evaluate risk(s) and prioritise the necessary measures or actions to undertake.

The purpose of risk assessment is to assess factors that affect the health and safety of persons who could be affected by taking part in an activity. Identifying hazards and the risk of injuries or accidents is the duty of the personnel-in-charge.

3. Why RAMS?

With proper RAMS in place, the severity and frequency of accidents can be reduced – protecting the safety and health of the coach and trainees. It enables you to be aware of and take responsibility for managing your own safety as well as the trainees under your charge. Safety outcomes are important as legal obligations are involved when proper procedures are not present or maintained.

Failure to take the necessary precautions is deemed as negligence. Negligence refers to actions or behaviours that fall below a reasonable standard of care. In sport, a coach's actions will be under scrutiny should any accident occur during his duty of care.

Often, these three factors determine the presence of negligence:

- There is a duty of care
- There is a breach of that duty of care
- Harm (damage) suffered due to a breach of that duty of care

3.1 Duty of Care

In any form of sports coaching, a duty of care based on an understanding or contractual agreement between parties would be established. This understanding varies for organisations as well as participants' age. Generally, younger participants require a higher demand of care from the carer (in the context of sport coaching, the carer is the coach).

3.2 A breach of that duty of care

In assessing whether a coach has breached his or her duty of care, it is necessary to determine how "standard of care" is defined and measured. The standard expected of a carer is that he or she acts like a "**reasonable**" man. In sport, what a coach does to exercise his or her duty of care will be compared with what other coaches would have done under the same circumstances of the training and incident.

The concept of what is **foreseeable** is important and is related to the standard of care. A reasonable man in the position of a coach must carefully consider and perform or avoid acts that he could foresee might cause harm or injury to any athlete.

For example, a "reasonable" coach would avoid conducting training activities on a poorly maintained and defective surface with holes and jagged protrusions because he should foresee the risk of harm to athletes.

When coaching children, coaches have to apply a standard of care that is similar to that of a prudent parent. Generally, a higher standard of care applies when children are involved because children are presumed to be less capable than adults of taking care of themselves.

3.3 Harm suffered by breach of duty of care

The harm (injuries) sustained must be a result of the breach of duty on the part of the coach (Lowe, 1986). It is necessary to determine whether the coach could have reasonably foreseen that damage that would occur from his or her act of omission.

4. How to Manage Risk?

There are several types of Risk Assessment tools available such Risk Assessment, Hazard & Operability Analysis (HAZOP), Failure Mode Effect Analysis (FMEA), Job Safety Analysis (JSA), Fault-Tree, Event Tree, Risk Matrix, etc. This course will introduce you to the Risk Assessment method, which is quantitative by design. The Risk Assessment method outlines three steps to mitigate risk(s). They are: Find it, Access it and Fix it.

4.1 Find it – IDENTIFY

In this step, we seek to identify the inherent risk(s) of conducting and participating in the activity. These risks could stem from environment, the coach or participants, nature of the activity and equipment. Through screening the contributing factors, we would be able to proceed to the next step of evaluating.

Discussion

- What would be the expected reactions of the players and their parents arising from the respective incidents above?
- Is the coach at fault in each case? Was there anything that the coach could have done to make the activities safer?
- Using 5 "Ws" in the table below, identify the possible hazard(s) and the potential accident(s) that may occur in your sport.

	Possible Hazard	Potential Incidents / Accident
What		
When		
Who		
Where		
Weather		

A good start to help you identify risk (s) is to get your athletes to fill in the Physical Activity Readiness Questionnaire (PAR-Q) before participating in any activity.

Regular physical activity is fun and healthy. Increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctors before they start becoming more physically active.

Personal Safety should always come first when one participates in sport and do teach your athlete to listen to their own body. They need to know when to stop, bearing in mind that not all of us have the same level of physical abilities.

Check for adequate rest and water before getting them to exercise and do proper warm up and cool down with them. Pay attention to details such as the attire of your athletes and ensure that they wear proper protective gear and using correct sports equipment to reduce the risk of injuries and harm.

For sporting experience to be fun and invigorating, all of us need to uphold the role in ensuring safety comes first at all times.

4.2 Assess it – EVALUATE

In this step, we seek to assess identified risk(s). Risk Assessment has expressed risk mathematically as $Risk = f(Likelihood, Severity)$. This equation means that risk is a function of the likelihood of an occurrence and the severity of an occurrence.

As seen from the table below, likelihood can be expressed in different ways.

Likelihood	Description
Remote	Not likely to occur
Occasional	Possible or known to occur
High	Common or repeating occurrence

As seen in the table below, severity could be mild, moderate or major.

Severity	Description
Mild	No injury, some injury or ill health requiring first aid. Treatment for minor cuts and bruises, irritation, ill health with temporary discomfort.
Moderate	Injury requiring medical treatment and/or leads to ill health. Injury leading to disability, lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders.
Major	Fatal, serious or life-threatening injury Occupational injury like amputations, major fractures, multiple injuries or diseases like occupational cancer, acute poisoning and fatal diseases.

Be realistic as well as mindful of the number of people affected by the risk(s) and the profile of every individual put at risk. By pairing the likelihood and severity of risk, you can determine the risk level by using the Ministry of Manpower's (MOM) recommended risk matrix below.

		Likelihood		
		Remote	Occasional	High
Severity	Major	Medium risk	High risk	High risk
	Moderate	Low risk	Medium risk	High risk
	Mild	Low risk	Low risk	Medium risk

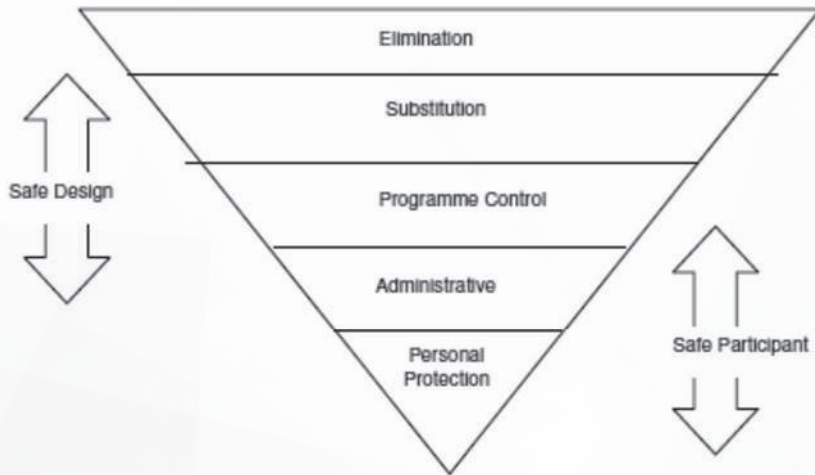
} Risk Level

After establishing the level of risk you are exposed to, use the standards put in place by MOM to establish if the risk level is acceptable or unacceptable and recommended actions for each level.

Risk Level	Risk Acceptability	Recommended Actions
Low Risk	Acceptable	No additional risk control measures may be needed. May need frequent reviews to ensure risk level is accurate and does not increase over time.
Medium Risk	Moderately acceptable	Carry out a careful hazards evaluation to ensure risk level is reduced to as low as reasonably possible within a defined time period. Interim risk control measures like admin controls, may be implemented. Management attention is required.
High Risk	Not acceptable	A High Risk level must be reduced to Medium Risk before work commences. There should be no interim risk control measures. Risk controls should not be too dependent on Personal Protective Equipment. Hazards should be eliminated before work commences. Immediate management intervention is required before work commences.

4.3 Fix it – CONTROL

In this step, the goal is to control the risk level of the identified risk(s) to an acceptable level. This can be achieved by putting in place reasonable and practicable measures to eliminate or reduce identified risks. The diagram below depicts the various layers where measures to control risk can be implemented:



- | | |
|---------------------|--|
| Elimination | - Elimination layer is where the risk can be controlled by deleting an activity e.g. removing swimming from the camp programme due to lack of safety boat coverage. |
| Substitution | - Substitution layer is where the risk can be controlled by substituting an alternative activity e.g. changing the swimming venue from seaside to wading pool to better suit the proficiency of participants. |
| Programme Control | - Programme control is where the risk can be controlled by insertion of a control or check before or during the execution of the programme e.g. equipment to be tested prior to the programme. |
| Administrative | - Administrative control is where the risk is controlled through the insertion of a control or check at administrative end e.g. All participants are required to submit a PARQ as part of the registration process. |
| Personal Protection | - Personal protection is where risk can be controlled by ensuring that personal attire offers adequate protection from the elements e.g. request all participants to wear sports shoes prior to the commencement of a run. |

Table 1: Sample of Risk Assessment Matrix

Risk Identified	Risk Evaluation			Risk Control
Examples	Severity	Likelihood	Risk Level	Strategies to reduce risk to an acceptable level
Sprained ankle during football game	Mild	Occasional	Low Risk	Proper footwear, warm-up and strengthening exercises
Bruises on knees of volleyball player	Mild	High	Medium Risk	Wear knee-guide, learn proper landing technique
Heat exhaustion during endurance run	Major	Occasional	High Risk	Ambulance with heat exhaustion treatment present (in addition to proper hydration before)
Car accident from road relay outside school	Major	Remote	Medium Risk	Organise race within school or in a park

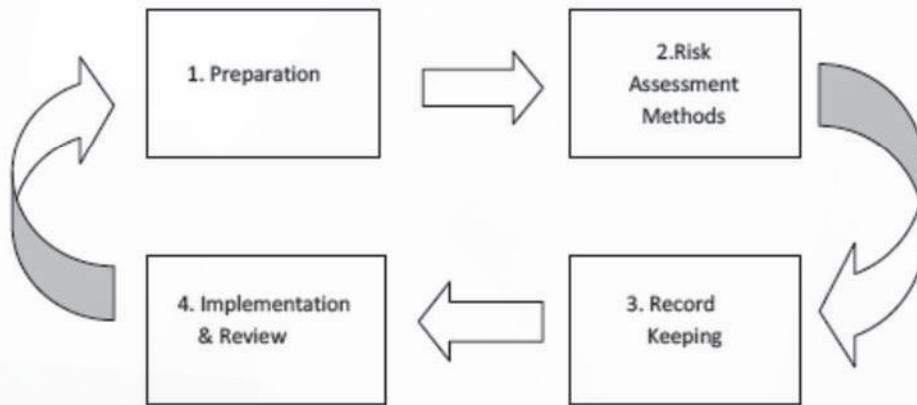
5. Are Risk Assessment Methods sufficient?

Depth of assessment is the critical component that one must bear in mind during assessment of risks. Risk assessment is all about sufficiently addressing all foreseeable risk and customising the assessment to suit your work processes.

Essentially, the key outcomes of performing risk assessment is to assess and evaluate risks present, put in place risk control measures or actions, keep the person-at-risk informed, actively implement effective safe work procedures and constantly do reviews to ensure that the environment and processes are safe for all.

To help you ensure that potential risks are taken into consideration, properly evaluated, controlled and documented, an example of the process to check if your risk assessments methods are effective is suggested for your consideration:

Example of a Risk Assessment Process



6. Emergency Plans

Despite all the prevention strategies, accident may still happen during sports training or competition. Thus, a plan has to be in place for an emergency. The plan would cover three main phases; Evaluation, Escalation, and Evacuation.

6.1 Evaluation

When an emergency occurs, there would be certain degree of chaos and uncertainty. As a coach, it is under your duty of care to ensure prompt and adequate care is given. To ensure this, a coach should:

- ✓ Take control and assess the situation
- ✓ Make sure all participants are safe and accounted for
- ✓ Instruct participants to leave the injured participant alone and avoid moving him or her
- ✓ Assess injury and determine if further assistance is required
- ✓ If an ambulance is *not needed*, decide how to administer first-aid

To establish safety at the scene and immediate care of the athlete, a key consideration is to prevent further aggravation of injury or incident by ascertaining control. If there are any doubts, the rule of thumb is to assume that the gravity and severity of the injury or incident is at the higher end.

With these in mind, the plan would include information of location and content of the first aid kit and AED as well as information of the first aid and/or medically trained individual.

6.2 Escalation

Upon evaluation, there may be a need to escalate the matter to various parties:

- Medical and first-aid trained individual (on-site)
- Venue facilities office (on-site)
- Emergency medical services (995 for an emergency in Singapore)
- Nearest clinic(s)
- Teachers-in-charge or parents

Thus, information on the process of escalation (e.g. phone tree) as well as individuals' contact details should be present in the plan.

6.3 Evacuation

Should the injury require evacuation for further medical attention, the plan should include:

- Information of nearest clinic(s)
- Information of nearest hospital
- Existing medical conditions and allergies of athletes (if any)

With these in mind, the Emergency Action Plan (EAP) should cover necessary information as well as required actions individuals should carry out in the event of an emergency.

7. Emergency Action Plan (EAP)

There are five main components in an Emergency Action Plan (EAP):

- Emergency personnel
- Emergency communication
- Emergency equipment
- Venue and athlete Information
- Emergency Action Plan (EAP) checklist for non-medical emergencies

7.1 Emergency Personnel

This component identifies the first responder(s), which typically the coach or other identified individuals, in an emergency situation.

7.2 Emergency Communication

This component identifies a communication process that ensures a quick and efficient emergency response. A pre-established process (e.g. phone tree) will ensure that all relevant parties are notified. There must be access to a phone (either fixed or mobile) or other device with a back-up communication avenue.

7.3 Emergency equipment

This component allows quick access of all necessary emergency equipment (on-site). A coach should read through the list to understand and be proficient in the use of emergency equipment in the event of an emergency.

7.4 Venue and athletes' Information

This component allows emergency medical services rapid access to the site or injured athlete. This would include maps to the nearest hospital(s), nearest clinic(s), etc.

7.5 EAP checklist for non-medical emergencies

This component caters for non-medical emergencies like a fire. There would be some forms of EAP when an individual is coaching under an organisation. Thus, gaining access and understanding the EAP is important. However, there could be situations whereby the coach is expected to develop his or her own EAP due to the lack of an existing one.

Emergency Action Plan

With reference to the template below, prepare an Emergency Action Plan for a sport that is specific to your training venue.

Sample Emergency Action Plan

I. Emergency Personnel

In an event of emergency, please contact:

Name (Designation)	Contact

Important Contacts List

Name (Designation)	Contact
Ambulance	995
Teacher-in-charge	XXXX-XXXX
Facilities office	XXX-XXXX
ABC Clinic	XXX-XXXX

ii. **EMERGENCY COMMUNICATION** (to be presented as process flow or table format)

Note: This is a basic plan.

Steps	Actions
1.	Call 995 (For local training venue)
2.	The following information should be provided to the dispatcher: a) Your name b) Exact location where injury occurred and where you will meet them c) The number you are calling from d) Number of injured athletes e) The condition of the athlete(s) f) The care being provided g) Hang up the phone only after the dispatcher has hung up

3.	As EMS is being dispatched, make sure you designate someone to retrieve any required emergency equipment.
4.	Have the individual serve as crowd control and keep other athletes away from victim.
5.	Inform the teacher of the incident.
6.	Send someone to meet the ambulance at the designated spot.
7.	The coach will accompany the injured athlete to the hospital.
8.	Coach to update the teacher (based on the organisation's guidelines) on the location of the hospital as well as the medical condition of the athlete.

III. EMERGENCY EQUIPMENT

The following is a sample list of emergency equipment needed:

<p>First Aid Kit which include:</p> <ul style="list-style-type: none"> • sterile gauze pads of different sizes • adhesive tape • adhesive bandages in several sizes • elastic bandage • a splint • antiseptic wipes • antibiotic ointment • antiseptic solution • hydrocortisone cream (1%) • tweezers • sharp scissors • safety pins • disposable instant cold packs • calamine lotion • alcohol wipes or ethyl alcohol • thermometer • plastic non-latex gloves (at least 2 pairs) • flashlight and extra batteries • spine board and neck brace • automatic Electronic Defibrillators (AED's) 	<p>Available at stadium facilities office</p>
--	---

IV. VENUE AND ATHLETES' INFORMATION

Venue information

Note: Provide turn-by-turn (leading up from the gate) instructions.

Venue	EMS Route: Entrance #	Nearest AED Location
Sport Complex	Road Name by Road Name (East Gate)	By the main entrance of multi-purpose hall
Out-door basketball court	Road Name by Road Name (East Gate)	Beside the entrance of the gym located first floor at sport complex

Medical Conditions and Allergies

Name	Medical conditions and allergies
Tan Ah Kow	Asthma

8. Sports Safety in Schools

The majority of coaches in Singapore are under the employment of schools. Thus, understanding their specific requirements is important. In 2010, the Ministry of Education (MOE) concluded that MOE's sports safety framework is pivotal to keeping the injury rate low within schools. The framework can be classified into three areas:

- i. Safety education and training
- ii. Preventative measures
- iii. Monitoring, intervention and follow-up measures

The framework outlines the responsibility of a coach in each area as follows:

<p><u>Safety education and training</u></p> <ul style="list-style-type: none">- Ensure that the coach meets the minimum requirements in terms of technical skills, pedagogical skills, continuing training areas mentioned.- Communicate and ensure that students are aware of safety rules and regulations.- Establish and promote safety habits for student-athletes (e.g. warm-ups before training or events).
<p><u>Preventive measures</u></p> <ul style="list-style-type: none">- Conduct regular checks to ensure that the equipment and facilities (fitness stations, courts, fields, availability of water, first aid kit) are safe and well maintained.- Exempt students feeling unwell from physical activities.
<p><u>During conduct of activities</u></p> <ul style="list-style-type: none">- Create an environment that encourages fair play and playing within the rules.- Ensure that activities are appropriate for the physical abilities and skill levels of different students, and be aware of students' medical conditions.- Pay attention to students in need or those who need to cease participation.
<p><u>Responding to safety incidents</u></p> <ul style="list-style-type: none">- First responder to safety incidents.- Perform first aid if necessary.- Attend to student and seek medical help if needed.- Report incident to MOE teacher-in-charge.- Take note of relevant details and assist in investigations if necessary.

Source: MOE's CSSS School Sport Safety Report, 2010.





Partner in Sport



Giving Hope
Improving Lives.

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