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Executive Summary

The Sports Safety Committee Report was first published in Singapore in 2007. This is the third edition.

With increased sports participation, the Committee hopes to step up sports safety. A strong preventative approach is advocated to manage the risks. In this report, we address the challenges faced in recent years and provide an overview on the practical aspects of improving sports safety standards across a range of settings, including competitive sports, school sports, active recreation and fitness activities.

The report is formulated by a panel of experts who represent various medical disciplines, and other key stakeholders of the sports community within Singapore. The focus areas are:

- Sudden cardiac death 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, evaluation and follow up

Key recommendations are made in each focus area of this report. In essence, a strong emphasis is placed on the responsibility and roles of 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, including non-heat-related factors that can cause heat injury.
- Awareness and water survival programs should be promoted to improve water safety in Singapore.
- All sports facilities should conduct risk assessment to identify the sources of risk and take all reasonably practicable measures to minimise the risks.
- Stricter enforcement of safety practices like pre-participation screening should be used for professional and carded athletes.
- Major organisations, schools, and clubs should actively raise awareness of sports safety.
- Where possible, facilities should have an operational system that monitors 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.

There are still many aspects of sports safety where knowledge is limited – there should be a concerted effort to systematically collect and evaluate relevant data, so that interventions can be refined objectively. The successful implementation of sports safety standards will require ownership and leadership by sports agencies, organisers, individuals and families of sports participants.

1. Definitions

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

1.1 Aquatic facilities – A man-made body of water used for sport, recreation, or therapeutic water activities.

1.2 Open water – Includes beach fronts, rivers, lakes and reservoirs.

1.3 Exercise and training facilities – Organisations that offer health and fitness programmes as their primary or secondary service or that promote high-intensity recreational physical activity (e.g. basketball, tennis, racquetball and swim clubs). Ideally such facilities have a professional staff, but those that provide space and equipment only (e.g. unsupervised hotel exercise rooms) are also included.

1.4 Exercise and training facility user - Dues-paying member or a guest paying a regular daily fee to use the facility specifically to exercise.

2 Introduction

First formed in 2007, the Sports Safety Committee aims to provide guidelines, which are practical and applicable to the Singapore context with a view to improving safety in organised and recreational sports. The 2007 report incorporated safety standards and systems based on international best practices. In 2015, the second version of the report was released and salient points were highlighted in each chapter for easy reference. The Sports Safety Committee adopted the water safety portfolio when the National Water Safety Council was dissolved in 2016. The Committee reconvened in 2017 to include a chapter on water safety and to also review existing recommendations.

In the lead up to this report, major trends have evolved, including a rising trend in extreme, ultra-endurance, combative, and mass-participation sports. Concurrently, exercise is also increasingly promoted as an integral part of the management of various chronic diseases.

This report is written for event organisers, officials, volunteers, and coaches; as well as facility owners, operators, and managers. These guidelines are in the process of being upgraded into a code of practice. This report is wide ranging and not intended to delve into details of specific sports. Every sport or activity is unique and discretion is advised when adapting these general guidelines to each specific sport.

3 Fundamental Principles of Sports Safety

Key Messages:

- All sports organisations and sports events organisers must have a sound and pro-active safety and health management system in place, and these must be effectively implemented.
- Risk assessment should be done by sports organisations and sports events organisers to identify sources of risks, with steps taken to treat risk and minimise foreseeable 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 risk. It is important to work through each step of the process to reduce the risk of creating inappropriate 'quick fixes' that can create more problems.
- Maintaining a safety and health management plan fosters a culture of continuous improvement.
- Resources on Risk Assessment and Management Systems are currently available on SportSG website: http://www.sportsingapore.gov.sg/sports-education/sports-safety/safety-resources-and-useful-links.

3.1 Safety and Health Management System

3.1.1 It is essential for all sports organisations and sports events organisers to have a risk assessment and management in place. The safety and health management system should be rigorous and benchmarked against the best practices. With effective implementation of the system, a world-class sports safety culture can be established, which is a key to sustaining high standards of sports safety in Singapore. A proactive approach should be adopted, rather than waiting for a serious event/accident to occur before measures are implemented. Most adverse events occur due to unsafe attitudes, behaviours and acts, rather than unsafe equipment or conditions. A sound safety and health management system ensures

that involved personnel do not become complacent owing to a long accident-free period, which can result in safety measures being overlooked or neglected.

3.1.2 A sports safety culture should be inculcated in every stakeholder, including participants, event organisers, sports organisations, coaches, teachers, instructors, parents and all members of the public. It is important for all to realize that they have a part to play in sports safety. Sports participants should be aware that they are responsible for their own safety, and take measures to ensure as such. Sports associations and event organisers should also realize that they are accountable for each participant's safety in every sport event, and as such should take measures to manage sport safety.

3.1.3 Effort should be made to pre-empt all possible adverse outcomes that can happen in any sport event, and measures should be devised to prevent or provide a solution to these outcomes. This will ensure that all involved in sports, from the sports associations to the participants to the members of the public, will be well prepared to handle any problems that may arise, and to act before any adverse event occurs.

3.2 Recommendations

3.2.1 Risk management is an ongoing process that helps ensure safety is well managed, supports the achievement of goals and minimises the likelihood of risks. The risk management documentation should include:

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

3.2.2 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 leading to a safer sporting experience.

3.2.3 Every sport and recreational activity involves physical risk depending on the type and timing of activity, location, participants' skill level and number of spectators. Risks are managed by assessing potential consequences and likelihood, developing clear actions and designing a response plan. Legal compliance and insurance coverage is an important consideration.

3.2.4 All sports facilities should conduct risk assessments to identify the source of risks and take all reasonably practicable steps to eliminate any foreseeable risk to any person who may be affected by its activities. Where it is not reasonably practicable to eliminate the risk, other reasonably practicable measures must be taken to minimise the risk. Risk assessment, together with communication of risks, review and monitoring of the risk assessment, is part of the risk management process. Everyone involved should be informed and aware of the risk management process.

3.2.5 Key responsibilities should be clearly assigned to specific people in areas such as risk monitoring and review, communication and training of other team members on risk management.

3.2.6 Risk assessment can be made simpler with four questions:

- What untoward things could happen?
- What would be the impact?
- What can we do about it?
- How do we inform everyone who are involved?

3.2.7 When identifying risks, consider the following factors:

- Age and capacity of participants especially children who require extra care
- Types of activities
- Past history of accidents, injuries and losses
- Rescue and lifesaving equipment
- Sport equipment

- Current problems with standard operating procedures or practices
- Facilities and its infrastructure
- Environment where activity is taking place

3.2.8 Currently, some organisations utilise risk management plans in the planning of their sports/activities. An example will be the Ministry of Defence, SportSG and MOE's use of the Risk Assessment Management System (RAMS), comprising hazards identification, risk management, risk control options and decisions, implementation of control measures and effective supervision (see Appendix 2: MOE RAMS or SportSG use of the Risk Assessment Management System (RAMS) found in SportSG website.). Other examples of risk management plans include the '5A-Way' (see Appendix 3: 5A-Way to Sports Safety). These risk management frameworks are by no means exhaustive or all-inclusive, and serve mainly to show the possible outlines of risk management plans.

3.2.9 In order to establish an "Incident-free Sports Safety Culture", sports organisations and event organisers need to establish an appropriate safety and health management system. Its framework should address the following areas as minimum:

- Management commitment on safety and health
- Safety attitudes, policy and principles
- Goals and objectives
- Setting high standards for sustainable performance
- Clear roles and responsibilities
- Safety organisation and structure
- Encompass pre-event, intra-event, and post-event safety measures
- Incident reporting and documentation, investigation, evaluation, and corrective action
- Supportive safety personnel
- Emergency response and planning
- Risk assessment and management

- Integrity of equipment
- Training and development
- Effective communication
- Pre-event and post-event safety review
- Change management (people, equipment, technology)
- Regular review of the Safety and Health Management System

3.2.10 Sports organisations and event organisers should establish or continually upgrade their safety and health management system to meet the above framework. A sound safety and health management system alone does not guarantee a good sports safety performance. Implementation is necessary, and the system must be run effectively, which is essential to building an incident-free sports safety culture. A sustainable performance in sports safety can only be achieved with a sound safety and health management system and effective implementation of it going hand in hand.

4 Training and Education

Key Messages:

- A Safety culture which is proactive seeks to empower the sports organiser, sports coach, a participant or a member of the public to conduct sports activities in a safe environment and also be a first responder to deliver life-saving first-aid, including CPR and/or defibrillation, when needed.
- Sports Organisers, National Sports Associations, sports clubs and schools should mandate all coaches to be registered members of the National Registry of Coaches to better ensure that updated knowledge and skills are applied for safe conduct of sporting activities.
- A Sports Safety Awareness program for all stakeholders can help to nurture a culture of safety in sports in the country.

4.1 Introduction

4.1.1 The rapid growth in sports participation rates implies that there is a relatively large population of novices taking part in sports events. First-timers and inexperienced athletes may not be aware of how hard they can safely push themselves. Their knowledge with regards to hydration, nutrition, training methods and principles, and competition rules may be lacking. Except for the larger events, medical advisories are not issued to participants at most organised events, and even if issued, the information tends to be scant.

4.1.2 Sports Safety is not only about ensuring that each sporting activity is being conducted in a safe environment. It has many facets and includes preparing sports activity organisers, coaches and sports participants and even family members of participants in all aspects of safety, including risk assessment, organisation of sporting events, being in the best of physical and mental health prior to the conduct of the sporting event and to be able to act immediately in the event participants get injured and suffer unexpected consequences.

4.1.3 Training in Sports safety would need to address these various facets and would need to be targeted to the needs of the participants being trained. This chapter will address the status of training in some of these areas, evaluate the relevance and importance of some of these and make recommendations for implementation in Singapore.

4.2 Current Status of Sports Safety Training in Singapore

4.2.1 **Sports Activity Organisers:** there is currently no uniform training program available for organisers of sporting activities in the country. Most organisers depend on prior experience assisting others who have organised similar events previously. While this, by itself, would be a tremendous means of transferring knowledge and skills in organisation of sporting events, it also results in transferring not-so-desirable skills, such as taking shortcuts in water safety, employing only the most minimal standards in meeting first-aid needs, frequently out of a desire to lower costs. The lack of uniform basic training programs in sports safety also means lack of opportunity to transmit national values and standards on sports safety and hindering development of a sports safety culture in the country.

4.2.2 **Sport Coaches:**

The previous National Coaching Accreditation Program (NCAP) and the current Singapore Coach Excellence (SG-Coach) Programme have, through our national sports associations been conducting training programs for their sports coaches to address needs specific to their sport. This is a good and promising development. There is also a National Registry of Coaches (NROC). While the programs cover specific areas related to sports safety, such as CPR, AED and First Aid and some aspects of injury prevention, there are a number of sports safety areas that have not yet been incorporated into coach training programs. These include the early recognition of conditions that could aggravate injuries, water discipline when training in hot and humid environments, water rescue, and others. Together with

existing programs this can constitute a comprehensive sports safety management program for coaches.

Sports coaches come from diverse backgrounds and organisations. Some belong to various national sports associations. Others are members of private sports clubs or other private groups. Some are school teachers who double-up as teacher-coaches in their schools. MOE's requirement for all school coaches to have valid certification in standard first-aid, CPR+AED, as well as training in Values and Principles in Sports, and be at least registered as provisional members of the National Registry of Coaches and working towards full membership, is a good move in the right direction.

Full registration with the National Registry of Coaches requires, in addition, 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 as outlined in para 4.5.1 below.

Until there is uniform implementation of baseline sports safety curricula in training of coaches, unevenness in attitudes adopted by some sports coaches towards safety in sport will continue. Good programs, such as the Basic Sports Science Course and the SG-Coach Level 1 Program are not yet mandatory for designated coaches in the various sports groups in the country. Though Sports Safety Division has conducted a variety of workshops in sports risk assessment and management of injuries during sports with participation of up to 140 coaches, there is yet no statutory requirement for all coaches of sports to have national licensing and attendance at available sports safety training programs.

4.2.3 **Sports Participants:** These are the persons who are usually injured during the active conduct of sporting activities.

Any training received by participants, if any, tends to be basic, with just enough skills to get by. The focus by most sports clubs and associations is in training the participant in only the basic skills needed to perform the sport. Sometimes safety measures may or may not be emphasized.

SportSG's Safety Management Division launched a Sports Safety Champs program in 2012 to inculcate a safety-first mentality and instill 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.

Basic understanding on sports safety is being taught in MOE schools as part of the PE curriculum[1], together with basic injury prevention and management of injuries. All qualified[2] PE teachers who teach the PE curriculum in MOE schools are trained in standard first-aid, keep their CPR (with AED) certifications current, and are trained in youth sports injury prevention and management, so as to be able to deliver the PE curriculum effectively. Since 2017, MOE school students have also begun to have some exposure to the Dispatcher-assisted CPR+AED program. However, efforts such as these are generally lacking in other sectors of the sports ecosystem. Such efforts can decrease the likelihood and severity of sports injuries. First responder assistance can only be expected if the training reaches a critical mass of stakeholders and substantial numbers are trained. The likelihood of appropriate and timely buddy assistance being provided in the event of injury would be greater with better and speedier clinical outcomes for those injured.

[1] Refer MOE PE Syllabus 2014: https://www.moe.gov.sg/education/syllabuses/physical-education
[2] Qualified PE teachers are specialist teachers who have passed the two-year Diploma or Post-Graduate Diploma in Education (Physical Education), or their equivalent.

4.2.4 **Parents and families of Sports participants:** This group can be better engaged in enhancing sports safety through, for example reporting of sporting injuries and reinforcing safety messages. Parents and families can exert a major influence in ensuring that school going children are better prepared before engaging in sports.

4.3 Sports Safety Culture

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

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

4.4 Sports Safety Awareness and Training Guides and Programs

4.4.1 SportSG publishes a variety of sports safety guides for education and outreach purposes. 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 Waterskiing 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: https//www.sportsingapore.gov.sg/sports-education/sports-safety/safety-resources-and-useful-links

4.4.2 There is a need to increase awareness of these guides amongst the non-competitive sporting community. It is not enough that SportSG and NSAs and sports coaches are the ones mainly familiar with sports safety guidelines. In addition, while sports coaches and school physical education instructors and certain segments of society have also been trained in CPR+AED and standard first-aid as a requirement of their work-place processes, such training is voluntary for the large numbers of sports enthusiasts, including competitive athletes, who from the bulk of the community. There is, a need to increase awareness of the need for sports safety and first-response capability and that these can be taught to lay persons as well as members of the sports community.

4.4.3 In Singapore, training in Cardio-Pulmonary Resuscitation and the use of automated external defibrillators (AEDs) is carried out by the more than 120 training centres previously accredited by the National Resuscitation Council (NRC) and from April 2018 by the National Resuscitation and First Aid Council (NRFAC). In 2017 alone, these centres trained at least 180,000 persons in the skills of CPR+AED. Most underwent the training voluntarily, compelled by their perceived need to manage members of their family or work colleagues in the event of cardiac arrest 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. Another approximately 10% of bystander CPR was from Dispatcher-assisted CPR provided by the Call centre of the Singapore Civil Defence Force. With the proven results and the ready pool of training centres and instructors, there should be a concerted effort to increase the penetration of sports safety training and first-responder training amongst members of sports organisations, including schools, sports associations and clubs, competitive sports participants, non-competitive sports participants and their families.

4.4.4 In 2011, a CPR+AED awareness program to promote telephone-provided CPR to families while they were waiting for arrival of the emergency ambulance 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). Called the DARE (Dispatcher-Assisted first REsponder) program this aims 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%* (updated information provided by A/Prof Marcus Ong, EH Unit for Pre-

hospital Emergency Care, SGH) to the bystander CPR rate to bring the overall rate to 54.1% in 2015.

4.4.5 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. However, if CPR and AED are initiated early, the increase in death risk is halved to about 3-4% per minute. It is crucial that the first responder is competent in delivering cardiopulmonary resuscitation (CPR) and in using an automated external defibrillator (AED). To minimise the delay in initiating CPR and using the AED, those in the proximity of the athlete, including members of the public, fellow participants, first-aiders, sports trainers, coaches, and frontline sports officials, should be trained in administering first aid, performing CPR and/or the use of the AED, and the certification should be current.

4.4.6 First-aid training has traditionally been carried out in first-aid training centres that are 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 a duration of approximately 16 to 24 hours in these training 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 NRFAC is looking into shortening the Standard First-Aid program in Singapore to be 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 NRC and the National First Aid Council (NFAC) together launched the Citizens First-Responder Program (CFRP). This teased the training down to the basic skills needed in Standard First aid and CPR+AED into a five-hour hands-on program. Potentially extending the reach of these skills. Training of instructors and providers in this program is presently led by the Singapore Red Cross Society.

4.5 Recommendations for Training and Education

4.5.1 SportSG should continue to enhance the existing sports safety training programmes to create a resource or package that should be easily accessible to all sports enthusiasts and organisations and that covers at least the following areas of sports safety:

- The tremendous benefits of sports
- The potential dangers of unsafe sports
- The need for every person and organisation to prepare for safe sporting activities and conduct such activities in an environment of safety
- The need for all persons to report to a doctor the occurrence of early warning symptoms during sporting activities
- The immediate actions that need to be taken if injuries occur during sporting activities
- The need for every level of the chain of sports activity to be trained and ready to actively assist in the event of such unexpected injury.

4.5.2 Sports organisers, sports associations, sports clubs and schools should encourage training in sports safety awareness and promote sports safety amongst their officials, staff and participants by using SportSG's Safety Awareness packages. This should be a natural consequence of the support provided by SportSG to these organisations and will reflect their support for sports safety in Singapore.

4.5.3 There should be a requirement for all sports coaches used by Sports Organisers, National Sports Associations, sports clubs and schools should work with SportSG to move towards all coaches to be registered under the National Registry of Coaches (NROC). A time-table for this process should be worked out to demonstrate their commitment to sports safety.

4.5.4 National sports associations, and sports clubs should train their sports participants in either standard first aid + AED, CPR+AED or, at least, the Citizens First Responder Program (CFRP). The percentage of their sports participants who are currently certified in any one of these programs should be an annual Key Performance Indicator for all such organisations. While students in MOE schools are introduced to the DARE programme (para 4.12) in primary schools and all secondary one students are slated to learn practical skills in CPR+AED as part of the PE curriculum, these efforts could be further expanded to the large sports community.

4.5.5 Sports organisers, national sports associations, sports clubs and schools should either conduct or encourage families of sports participants, through comprehensive public outreach programs, to attend available sports awareness programs and training sessions in either SFA, CPR+AED or, at least, CFRP as best practice standards. This can be by organisation of such programs at their institutions, other locations or publicizing the conduct of and encouraging attendance at such programs by families of their sports participants.

Conclusion

4.6 A sports safety culture can be nurtured through conduct of awareness programs aimed at all sports organisations, participants and their families. Use should be made of existing training resources and centres to bring this about. Timelines to achieve set targets should be worked out.

5 Water Safety

Key Messages:

- All swimming pool users, water sports participants and enthusiasts should practise personal responsibility to be water safe.
- Public education and outreach remains very important because users need to understand the nature and conditions of open water. Adults must exercise care and responsibility by abiding to the safety regulations and maintain close supervision of their children.
- Parents/care givers when bringing children to water bodies, should pay greater attention by staying within arm's reach of their unaccompanied children. This will enable parents to pull their children out of the water in the event of an emergency. During swimming classes, parents could be seated near the class and also help to supervise their children.
- Rescue equipment such as rescue tube, poles and throw ropes with instructions to explain its use should be provided at aquatic and water sports facilities.

5.1 Aquatic Facilities

5.1.1 Based on cases seen at KK Women's and Children's Hospital (KKH), there were 94 near-drowning incidents between January 2011 and December 2015 involving children from below a year old to 15 years old; and 10 drowning cases. More than half of these incidents happened in condominium pools. All 10 drowning deaths over the past five years took place in private pools such as condominiums, private homes or hotels with half of them happening during pool parties. According to KKH, children aged six years and below were found to be at the highest risk, accounting for more than 76 per cent of the incidents.

5.1.2 Drowning occurs for many different reasons, commonly due to a lack of:

- Vigilance and supervision from parents and caregivers
- General and water safety knowledge among Singaporeans

- Swimming proficiency and
- Cardio-pulmonary resuscitation and lifesaving skills among care givers and supervisors.

5.1.3 It is important that we foster collaborative approaches and collective effort to prevent drowning incidents as not all swimming pools, beaches or any recreational body of water are staffed with lifeguards. Therefore, it becomes essential that we exercise responsibility and advocate collaborative approaches and collective effort to prevent drowning incidents.

5.2 Recommendations: Aquatic Facilities

5.2.1 Four key focus areas have been identified and recommended as measures to improve water safety in Singapore:

- Swimming and water survival programs
- Water safety education and awareness
- Surveillance and rescue
- Policy, standards and enforcement

5.2.2 Various government and non-government agencies should promote and introduce swimming proficiency programs and water safety training.

5.2.3 Facility owner and/or operator including educational institutions should organise water safety awareness programs to advocate key areas of action such as adult supervision, water familiarization and CPR skills. They should also 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

5.2.4 Topics should include but not limited to the following:

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

5.2.5 Infants, toddlers and preschoolers are never safe when in or around water and must be under constant adult supervision. They must be supervised closely and carefully in and around water by one parent or care giver within immediate arm's reach at all times. Parents/care givers should be aware of the child's capabilities and equip the child with personal floatation devices if necessary.

5.2.6 Installation of technology to aid supervision for water activities in an aquatic facility or open waters can possibly reduce the risk of drowning.

5.2.7 A Water Safety Code of Practice (COP) on Aquatic Facilities should be developed to provide guidelines on drowning prevention to the industry and stakeholders such as hotels and condominiums with swimming pools, water sports event organisers and enthusiasts.

5.2.8 To encourage adoption of the guidelines and facilitate relevant stakeholders to assess risks, a water safety certification should be introduced for Singapore. Aquatic facility owners and water sports event organisers that have adopted components of the COP can apply for this certification in recognition of efficiency and standards.

5.2.9 Regular validation is also recommended for organisations with the water safety certifications to ensure the guidelines are practiced.

5.3 Open Water

5.4 Background

5.4.1 There are four categories of open water activities namely: recreational activities, competitions, water sporting events, and open water swim lessons. While they are similar in nature, every process is different and therefore, it is very crucial to clearly understand the roles and responsibilities of every activity.

5.4.2 Regardless of the activity, the environmental hazards are present and they are very important to note. They include but are not limited to:

- Water temperature
- Water currents and eddies
- Tides
- Water quality
- Obscure underwater and overhanging hazards
- Water depth
- Conditions underfoot
- Marine animals
- Haze
- Ultraviolet (UV) Rays

5.4.3 Users should be responsible for their own safety and take necessary preventive measures such using the Get Active Questionnaire, using personal floatation devices if necessary, wearing appropriate attire, and to protect themselves from the environmental hazards mentioned above. Additionally, users should be

responsible and practice care by assessing such factors: tide, temperature and weather; beforehand.

5.5 Recommendations: Open Water

5.5.1 Key recommendations are categorised into three areas: user's responsibility, physical structures, and technology.

5.5.2 User's Responsibility

Users need to understand the nature and conditions of open water and limit their activities according to their capabilities. For those travelling overseas to participate in open water sports activities, they should seek information or advice from the travel agent if the beach is safe and if trained lifeguards are on duty. They should be responsible of their own safety and use personal floatation device, where necessary; abide by the safety regulations of the facility owner. Avoid consumption of alcohol or any medication before participating in open water activities.

Children must be closely supervised by adults or care givers.

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 be conducted to identify risks and determine the appropriate control measures.

5.5.3 Physical Structures

Open water locations should be equipped with various types of physical structures such as information signs, pontoons, and a public address (PA) system. These

would inform the users of critical information and alert them over the PA system when necessary.

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 were spotted.

Information boards can convey critical information such as, restricted swim zones, restricted water activities, procedures of using the safety equipment, etc.

5.5.4 **Technology**

Technology can play a crucial role in improving the safety of open water users. While there are limitations to the different systems, they aim to improve the water safety.

- Communication devices – ensure efficient communication between the different roles
- Security alarms – to be used within authorized premises
- Emergency alarms – Audio warnings will be triggered during inclement weather, change of water flow, opening of tidal gates at reservoirs, dangerous occurrences.
- Closed Circuit Television (CCTV) – for a wider coverage and more efficient monitoring by life guards/security officers
- Drowning detection system – A computer aided drowning detection system to alert when there are drowning victims.

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6. Sudden Cardiac Arrest/Sudden Cardiac Death in Sports

Key Messages:

- The risks of sudden cardiac death and sports related injuries during sports are low and the benefits of regular exercise outweigh these risks.
- In athletes under 35 years of age, sports related sudden cardiac arrest (SCA)/sudden cardiac death (SCD) 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.
- SCA may be preceded by warning symptoms. 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.

6.1 Introduction to Sudden Cardiac Death in Sports

6.1.1 Regular physical activity confers numerous health benefits for individuals of all ages. However, the benefits of cardiovascular protection come at a price of a paradoxical increase in the risk of sudden cardiac arrest (SCA) and/or death (SCD) during or shortly after exercise, particularly vigorous exercise.

6.1.2 Exercise-associated SCA/SCD is arbitrarily defined as occurring during or within an hour of physical activity. However, the consensus statement on cardiovascular care of college student-athletes by the National Collegiate Athletic Association (NCAA) from the United States in 2016 (1) does not set a specific timeframe from physical activity, and instead considers SCD as an unexpected death due to cardiac causes that occurs in a ‘short time’ in a person with or without previously known cardiovascular disease. 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 (2).

6.1.3 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).

6.1.4 The exact incidence of SCA/SCD is difficult to assess as there is no national registry in Singapore (3), 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. 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 (1) (4). 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 (2). The prevalence of SCD in non-competitive young athletes was 2.5 times higher (39 vs 15 per year in France), compared to competitive young athletes, because more than 90% of SCA/SCD occurred during recreational sport (2). While the relative risk of SCD in young competitive athletes is higher (estimated at 4.5 times), the absolute risk appears to be higher in the general population. A collection of local unpublished data totals 117 cases of exercise related cardiac arrest over 5 years from the year 2010 to 2014 in adults above 16 years of age. This works out to about 0.4-0.5/100,000/year of SCD in Singapore. Similar to a previous study of 55 cases over 8 years (5), there is a predominance of SCD in male (88.9%), with the highest incidence amongst the Chinese (65.8%) followed by Indians (11.1%).

6.1.5 The majority (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 (6) (7) (8). On the other hand, the major cause of SCA in athletes above 35 years of age remains as ischaemic heart disease. 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.

6.1.6 Based on local data (personal communication), 77.8% of SCDs were aged older than 35 with a mean age of death at 44 years (range 16-85). This is similar to published data in Caucasian populations (2) (9). Thus, although SCD in young athletes has been the focus of much public attention and expert debates, our document places equal emphasis on older athletes.

6.1.7 A large proportion of cardiac arrests occur during swimming (22.2%), followed by badminton (15.3%), running (13.6%) and soccer (9.4%). Drowning is included in SCD data as it is increasingly recognized as a potential manifestation of underlying heart disease. (10)

6.2 Exercise and the risk of Sudden Cardiac Arrest

6.2.1 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 (11).

6.2.2 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. 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 (12). More importantly, a dose-response relationship exists between the amount 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 (12). It is also of note (13) that the majority of exertion-related deaths occurred during unaccustomed exertion (56%). 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 (14).

6.3 Individual Athlete Advocacy

6.3.1 Resources are required to provide education efforts to ensure that athletes know the signs and symptoms, as well as how and to whom to report these concerns in a manner they feel safe and which protects their confidentiality.

6.3.2 SCD may be preceded by warning symptoms which may have been ignored by the athletes. It is of utmost importance that athletes are educated to know the important symptoms to look out for, and to seek further medical review to evaluate these symptoms. Important symptoms to educate include exertional chest pain/discomfort, fainting or near fainting, palpitations, as well as excessive exertional and unexplained breathlessness/fatigue associated with exercise (15). The medical review may or may not involve exercise testing. A typical cardiovascular screening checklist for congenital and genetic heart disease may be performed by a physician.

6.3.3 Athletes with a positive family history of premature (<50 years old) heart disease or cardiac death in close relatives, or a known family history of specific hereditary heart condition (e.g. hypertrophic cardiomyopathy or long QT syndrome) should seek medical clearance prior to competition (16).

6.3.4 Public education via mass media is critical in raising public awareness on issues in sports safety such as the indications for seeking medical review, the limitations of screening and the benefits of exercise versus risk of SCD from exercise.

6.3.5 Athletes should also be educated on measures to exercise safely, such as not exercising 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.

6.3.6 The importance of a good exercise training programme, with a gradual build-up in volume and intensity, cannot be overemphasized. It is not uncommon to hear of individuals who participate in a marathon without adequate preparatory training. Coupled with the desire to complete the race, many push themselves towards the end of the race. Cardiac collapses in a marathon are most often at the final mile or finishing line (17). To reduce the risk of exercise-related SCA, individuals should have adequate exercise training, run at a steady pace, avoid sudden increase in speed and intensity, and learn to recognise their limits. Having completed a previous marathon uneventfully does not guarantee another uneventful marathon, as race conditions change for each individual over years.

6.3.7 Even for individuals who exercise regularly, there may be times when they will need to temporarily halt their exercise routines for varying time periods (e.g. owing to illness or work). It is important to educate these individuals that exercise capacity drops with detraining, and that they should resume their exercise at a lower level than what they stopped at.

6.4 **Recommendations**

6.4.1 Athletes should learn to recognise warning symptoms, and seek medical reviews when needed.

6.4.2 Athletes with positive family history of premature heart diseases or cardiac death, or hereditary cardiac conditions should seek cardiac clearance.

6.4.3 To minimise the risk of SCA, athletes should have adequate exercise training, run at steady pace, avoid spurting and learn to recognise their limits. Standard prudent measures of refraining from exercising when unwell and ensuring proper acclimatisation are important.

6.4.4 Athletes are advised not to sprint in the last mile of the race or near the finishing line, unless there is sufficient practice or training.

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7 Pre-Participation Screening

Key Messages:

- Pre-participation screening aims to pick up existing conditions that may cause harm during strenuous physical activities.
- Risk stratification of athletes enables optimal use of limited resources for the screening of athletes.
- Individuals should, at regular intervals, complete a pre-participation questionnaire prior to embarking on strenuous physical activities.
- Athletes and the clubs and schools they belong to are instrumental in ensuring that proper pre-participation screening is mandated and adhered to.
- Reporting and follow-up of early warning symptoms (EWS) during training has to be taught and strongly encouraged.

7.1 Introduction

7.1.1 Many people of all ages and levels of fitness engage in sporting activities of either 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. 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 (1-4). Figures quoted have varied from 0.13 per 100,000 young female athletes and 0.75 per 100,000 young male athletes (4) to 6 per 100,000 in middle-aged men (5) during active exertion. Though figures vary from country to country, most countries that have such figures would show similar rates.

7.1.2 The factors that contribute to cardiac arrest during strenuous exercise are many and include coronary artery disease, cardiac abnormalities, such as hypertrophic cardiomyopathy (sometimes referred to as athlete's heart), abnormal anatomy of

the vessels supplying the heart, drugs, infections and often unknown causes. The prevalence of anatomical abnormalities of the heart such as hypertrophic cardiomyopathy, abnormal vessels and genetic defects is extremely low (between 0.2% to 1.3%) (6-12). The majority of these patients are asymptomatic. Drugs and infections as factors contributing to cardiac arrest can be potentially deduced through careful history and evaluation. The query in most populations would be whether the persons' likelihood for cardiac arrest could have been predicted by a system of pre-participation screening.

7.2 International Perspectives on Pre-Participation Screening for Sports

7.2.1 There are currently no internationally accepted guidelines on the use of pre-participation screening for sports. In Italy, high-performance competitive athletes undergo a detailed cardiovascular evaluation before being allowed to compete in intensive sporting activities. Launched in 1982, this nationwide program of pre-participation screening of individuals embarking in competitive sports activity was launched. 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 > 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 (13,14) amongst the athletes so 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.

7.2.2 Most communities elsewhere in the world have tried to address the issue of pre-participation screening. There is the understanding that sports is an important component of the culture of most societies owing to the generally positive impact of sport on a person's health. Denial of access to sport activity because of a positive cardiovascular finding on screening deprives the persons of the many benefits of sports and exercise. This is especially so when only a minority of persons with structural heart disease develop cardiac arrest during strenuous activity and denying the majority the opportunity to participate in sport because of the possibility of adverse cardiac events 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 (15, 16).

7.2.3 A United States Preventive Services Task Force (USPSTF) study (17) has demonstrated adequate evidence that resting and exercise ECG abnormalities are associated with an increased risk of adverse cardiac events. However, as stated earlier, 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 Task Force has, therefore, 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.

7.3 Current Practices in Singapore

7.3.1 Currently, in Singapore, individuals in certain groups undergo compulsory pre-participation screening, including:

- All carded athletes (i.e. those national athletes receiving SportSG grants)
- Singapore Premier League (former S-League) soccer players and other professional athletes
- Students enrolling into Singapore Sports School
- Those 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

7.3.2 The annual pre-participation screening that the carded athletes undergo comprise history, physical examination, chest X-Ray, resting ECG, urinalysis, urine microscopy, full blood count, and for contact sports, hepatitis screen. While it is compulsory for all carded athletes to undergo annual pre-participation screening, there is only partial compliance, for various reasons. To illustrate challenges in enforcement, in 2012, which was an Olympic Games year, 1238 out of 1422 (87%) carded athletes were screened, while in 2013 (a non-Olympic year) only 413 out of 1452 (28%) carded athletes were screened. As full compliance is hard to achieve even in a "captive" group such as carded athletes, we can expect challenges if we try to mandate pre-participation screening in other groups.

7.3.3 Since 2000, Singapore Premier League soccer players undergo annual screening before the start of each season. The test protocols are set by the Football Association of Singapore Medical Committee, and comprise history, physical examination, 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. A few potential foreign sign-ups failed the screening process and were not allowed to play in the League.

7.3.4 In the Singapore Sports School, pre-enrolment screening is similar to the pre-participation screening for carded athletes. Pre-enrolment screening identified 11 cases in 2006 and 2007, of which eight were cleared but sent for further investigations 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.

7.3.5 The above compulsory pre-participation screening program are limited to competitive athletes who form a small segment of the sporting population.

7.3.6 Nationwide pre-participation screening programmes currently being conducted include:

- SAF's comprehensive pre-participation screening
- School Health Services' school-based screening programme. Although this is not truly a pre-participation screening, there are elements of it as the medical officers who examine the students do auscultate the heart for murmurs for the Primary One (6+ to 7 years) and Primary Five (11+ to 12 years) children and refer suspicious cases to the Student Health Centre at Health Promotion Board for further screening, with subsequent referral to a pediatric cardiologist, if necessary.

7.3.7 The SAF's screening programme involves all individuals serving in the SAF, whether NSF or ReguNSFs 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 NSmen, also undergo screening at milestone ages and annual screening after the age of 35 years.
- There are two screening protocols:
  - Panel I (medical examination, resting ECG, urine dipstix, fasting lipids, fasting glucose) is done at age 35 and annually thereafter
  - 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.
- The SAF has, for about 40 years, a system of "verbal advisory well-being checks" administered by local ground commanders just before participation in strenuous physical activity as part of their Training Safety Regulations to once again remind their soldiers and strenuous activity participants to ensure they have taken safety precautions and for anyone not feeling well-enough to fall-out of the activity.

7.3.8 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.

7.3.9 The School Health Service 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.

7.3.10 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.

7.3.11 Schools under the Ministry of Education require all parents to submit an annual declaration of their children's medical conditions (see Appendix 5), such as whether they have epilepsy, periodic loss of consciousness, heart condition, ear disorder, respiratory disorder, allergies, on regular medication, whether they have been advised to modify physical activity or exercise participation, and any other medical information, with any special precautions to take for their children. The list of medical conditions was reviewed and updated following a review on PE Safety by MOE in 2014. The information collected is made available to teachers in charge of PE and co-curricular activities (CCA) so that necessary precautions can be taken where relevant. In addition, the use of the Get Active Questionnaire (GAQ) (Appendix 4) is already being taught in MOE schools as part of the PE curriculum.

7.3.12 The general population may undergo general health screening, for example when purchasing certain insurance policies, when taking up a new job (i.e. pre-employment screening), as part of their corporate benefits, or on their own volition. The screening protocols vary, and these may include some element of pre-participation screening (especially the cardiovascular clearance components), such as with resting ECG and exercise stress testing. Unfortunately, the majority of these do not emphasise the musculoskeletal component, is not done at regular intervals, and have only sporadic coverage. They may suffice for the recreational athlete, but may not be adequate for competitive athletes. Many of these do not address the early warning prodromal symptoms that have been recognised for sudden heart emergencies.

7.3.13 "Opportunistic pre-participation screening" via self-administered questionnaires can be done on joining a gym. This can also help to raise awareness of sports

safety. There are a number of gym operators in Singapore and some of them ask members joining the gyms to complete a pre-participation questionnaire. In some of these gyms, at least 30-40% of members refuse to complete the pre-participation screening questionnaire. As a comparison, a survey of 65 health clubs in Ohio, United States, revealed that 28% of the clubs failed to use pre-entry cardiac screenings (15). 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 (18).

7.4 Effectiveness of Pre-Participation Screening

7.4.1 Since sports injuries and sudden death are often related to underlying medical conditions, the concept of pre-participation screening appears sensible. However, there are challenges to general non-selective screening of a large population (19). 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, obliging further (usually costly) investigations and possibly leading 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, as in Canada, attest to the usefulness of the tool in helping to identify those who may not be fit for increased levels of physical activity as it strenuous sports.

6.4.2 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 (20). 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.

7.4.3 Value of screening ECG:

- In the older population (individuals of age > 35 years), the most common cause of sudden death is coronary artery disease (CAD) resulting in heart attack.
- 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 alarm bells. Approximately one-third to one-half of individuals with a normal coronary arteriogram have ECG abnormalities (17) and approximately 30% of individuals with angiographically proven CAD have a normal resting ECG (21). Most coronary events occur in individuals without resting ECG abnormalities (22).
- Exercise testing (i.e. exercise stress test) has limited sensitivity (23) in an asymptomatic population with a low likelihood of CAD. In a population with a prevalence of CAD of 1%, assuming the reported overall specificity of the test is 77%(24), it can be estimated that approximately 97% of ‘abnormal’ results would be false positive results. CT angiography has higher accuracy than ECG stress testing but is associated with radiation exposure and is not recommended for routine screening of low-risk individuals. The United States Preventive Services Task Force (USPSTF) examined the use of the resting

ECG, exercise ECG test, or electron beam computed tomography (EBCT) scanning for coronary calcium to screen for CAD, and recommended against routine screening in adults at low risk for coronary heart disease events. They concluded that there was insufficient evidence to recommend for or against routine ECG screening in adults at increased risk for events (17).

7.4.4 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 (14). 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. This study is the best evidence that we have, to-date, to demonstrate the efficacy of pre-participation screening for competitive athletes.

7.4.5 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, 24h 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. 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 (13).

7.4.6 In contrast to the European guidelines, the American Heart Association, the American College of Cardiology (19), 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.

7.4.7 Hence it is 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. Our recommendations will be based on existing evidence and what would rationally be suitable for the local sports safety and participation environment.

7.4.8 **Use of Self-administered Pre-Participation Screening Questionnaires**

Traditionally, 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) (25). 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 has been to identify individuals for whom increase in physical activity, as in sports participation may be hazardous. However, there is also the need to ensure that the use of such tools is simple, ability to easily self-administer and not onerous and requiring just 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 (26, 27).

Over the years various forms of the PAR Q questionnaires have been created such as the modified PAR-Q (28), PAR-Q+(29) and the most recent Get Active Questionnaire (GAQ) (30). Having evaluate 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. There is a need to review currently used screening tools to better ensure that they remain relevant to address local needs and are easy to implement.

7.4.9 **Prior Medical Symptoms**: It is important to remember 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. 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 (15)
- Maron et al. (1996) (31) 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 (19).
- The commonest symptoms that portend potential cardiac emergency (32, 33) are:
    - chest pain
    - palpitations
    - fainting spells or seizures during exercise

- dizziness or chest pain during exercise
- unexplained breathlessness, extreme fatigue during exercise

7.5 Pre-Participation Screening Philosophy

7.5.1 The Committee appreciates the need for some form of pre-participation screening to identify the cohort of athletes and sports enthusiasts affected by unsuspected cardiovascular diseases so as to be able to prevent sudden cardiac death during sports by appropriate interventions.

7.5.2 The Committee considers that 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.

7.5.3 The Committee recognises that while the state needs to set up the basic infrastructure for a culture of sports safety, nationally administered physical examination as pre-participation screening for all individuals involved in sporting activities id not practical or prudent for the reasons discussed above.

7.5.4 Hence, the Committee's recommendations on pre-participation screening are based on:

- 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
- The risk stratification is in turn 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 7.1)
- The degree of risk of the particular sport or activity (Table 9.1)

- Screening protocols that are evidence-based as far as possible, graded according to the degree of risk, and customized to each sport, if applicable
- Where the evidence-base is weak, to apply sound reasoning principles for better ensuring population safety during sporting activities
- Appropriate management of identified at-risk individuals
- Optimisation of existing resources
- Minimising the hindrance to sports participation and sports excellence
- 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.

7.6 Risk Stratification Based on Participant's Profile, Competitive Intensity and Type of Sport for Physician-led Screening

7.6.1 Generally, the higher the level of competition, the higher the training intensity and volume, and therefore the higher the risk of sudden death and injuries. Athletes can be risk-stratified based on the level of competition (Figure 7.1). 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 though only a club runner.

7.6.2 Sports activities can be risk-stratified based on cardiovascular demands (Table 9.1). Duration of participation (e.g. endurance or ultra-endurance events), contact/collision risk, or environmental stress, can also affect risk, but

cardiovascular activity (percentage of maximum aerobic capacity) was chosen as the main factor owing to its stronger association with known intrinsic risk factors.

7.6.3 The risk of any physical activity is an interaction of the exercise per se and the individual's fitness and medical conditions. For example, to a fit individual, a category 1 event would be easy whereas to an unfit person with congestive heart failure, a category 1 event may not be tolerable. One should also bear in mind that the competitiveness of the individual also influences the risk – a category 1 or 2 sport may cause excessive strain in an overzealous competitor. For the reasons just discussed, it is important to realize that this categorization 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.

7.7 Pre-Participation Screening Requirements

7.7.1 The Committee recommends the adoption of the Get Active Questionnaire (GAQ) by the Canadian Society for Exercise Physiology. In the meantime, the Committee will develop and validate 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.

7.7.2 All persons participating in sports activities should undergo pre-participation screening. The type of screening should fit the competition level (Figure 7.1), type of sport and individual's risk-level.

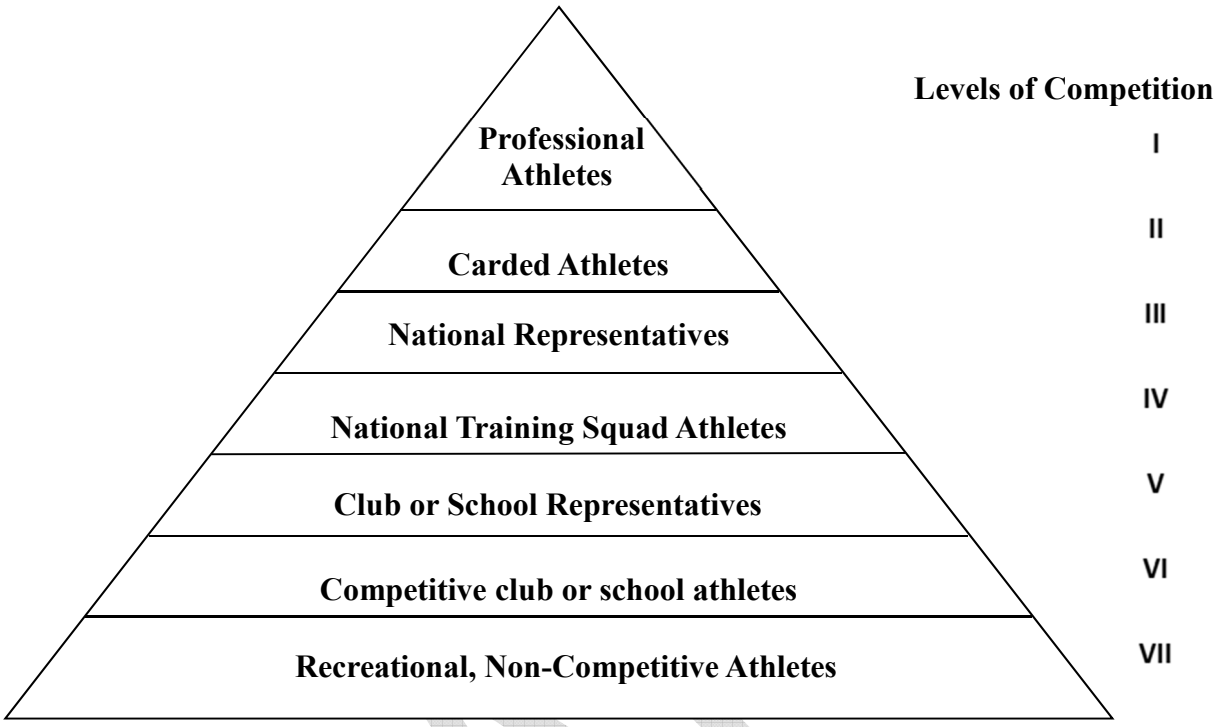

Figure 7.1 Athletes' Competitive Levels

7.7.3 Currently, professional athletes (Level I) and carded athletes (Level II) in Singapore are required to undergo compulsory comprehensive annual pre-participation screening, regardless of sport category. This practice should continue, but with stricter enforcement.

7.7.4 As the training intensity and volume for the national representatives (Level III) and national training squad athletes (Level IV) are very similar to that of the professional and carded athletes, the Committee recommends that National Sports Associations (NSAs) responsible for these athletes should work with them to better ensure that they annually undergo pre-participation screening, regardless of the sport category. Carding is not totally based on training intensity and volume (e.g. an elite athlete may not be carded because his sport is not included in the Major Games), and therefore should not be used to differentiate those national representatives who should or should not be screened. Singapore Sports School

athletes spend more time training than the typical school athlete (a significant number of whom are national representatives), and should therefore be treated as level III and IV athletes, and 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 to SportSG. This will better ensure uniform implementation of safety practices within the sports fraternity in the country. The new protocols should be in place within two years of the release of this report.

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

7.7.6 To better instill the culture of safety in these clubs, the Committee recommends a

program of sports safety awareness in these groups to be conducted annually and to precede the conduct of pre-participation screening.

7.7.7 For Category Band C sports (Table 9.1), the Committee recommends that event organisers should reinforce the sports safety message by reminding participants about the need to either perform 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.

7.7.8 Schools under the Ministry of Education (MoE) already administer a yearly parent's declaration of student medical conditions screening questionnaire (Appendix 5). The Committee recommends modification of this screening questionnaire to incorporate the additional information from use of early warning symptoms (Appendix 6). The Committee also recommends the same system for schools not under the purview of the MoE.

7.7.9 For club or school representatives (Level V), competitive club or school athletes (Level VI) and recreational, non-competitive athletes (Level VII), pre-participation screening just before each sporting event cannot be mandated owing to the large numbers. Instead, as a minimum, the GAQ should be completed at least annually.

7.7.10 Individuals should routinely complete at the least, the 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.

7.8 Current SAF pre-participation screening requirements are comprehensive and should continue.

7.9 In view of the presence of prior early warning symptoms in a number of persons who have suffered sudden cardiac arrest during sporting activities, 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. 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.

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8 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 mitigate 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.
- Strong emphasis should be given to raise awareness that heat stroke can also be triggered by suboptimal immune function, in the absence of extreme heat stress. Immune suppression can result from the combination of prolonged intense training coupled with the lack of opportunity for recovery, subclinical infection and recent illness.

8.1 Training and Competing in the Heat

8.1.1 Metabolic heat is a by-product of physical activity. For heat to dissipate away from the body, air temperature must be cooler than skin temperature, thus enabling 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). High relative humidity impedes evaporative cooling. Body core temperatures may range from approximately 37^{o}C at rest to 41^{o}C during prolonged physical work in hot environments (1). Failure to effectively thermoregulate or when one's thermal limit is exceeded during prolonged moderate to vigorous physical activity may disrupt the body's normal physiological functions and increase the risks of heat injury.

8.1.2 Members of the public, amateurs and professional athletes who exercise 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.

8.1.3 Heat stroke can also be triggered by a compromised 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 by lowering the body's defence 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.

8.2 Acclimatisation to Heat

8.2.1 Athletes intending to compete in hot and humid environments (e.g. Singaporeans training in climate-controlled gyms and foreigners arriving from temperate climates) stand to benefit from heat acclimatisation as a means of reducing heat strain. Acclimatisation is achieved through gradual exposure to heat strain over a period 10 to 14 days in an environmental chamber (more commonly known as heat acclimation) or external environment before the event. This process will either see athletes self-regulating their training or initially decreasing baseline training loads to accommodate for the hotter environment. The main benefit of heat acclimatisation is an enhanced responsiveness of the body's thermoregulatory mechanisms during exercise and increase the level of work tolerance in the heat.

8.2.2 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. Training under supervision of an experienced coach or with a partner is highly recommended for such an undertaking. Also, the use of protective, heat-trapping clothing in heat acclimatisation needs to be weighed against the increased risks of injury during acclimatisation training.

8.3 The Pathophysiology of Heat Stroke

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

- Classical heat stroke which results from prolonged passive exposure to extreme environmental heat and occurring mostly during heat waves, affecting infants, toddlers and the elderly; and
- Exertional heat stroke (EHS) which 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.

8.3.2 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. On the playing field or during competition, these impulses are overruled, thus allowing activities to continue and metabolic heat to accumulate. Physiological processes begin to fail when core temperature exceeds normal physiological thresholds. These physiological failures may manifest in 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.

8.3.3 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. 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. Under normal and healthy conditions, these bacteria are readily removed from circulating blood by the liver and other components of the immune system. However, when training under a state of immune suppression, (see 3.1.3), the bacteria content in the blood can continue to increase to the point of triggering an infection, which can cause damage to the organs in the body, including the brain i.e., heat stroke. Heat stroke victims display similar clinical features as patients suffering from central infection due to other causes. Scientific evidence suggests that immune disturbance is the primary cause of heat stroke cases that occur below a core temperature of 42 ^{o}C. Therefore, protecting the immune system is equally important as keeping the body cool to prevent heat stroke.

8.3.4 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. Much has been written about the pathophysiology of heat stroke (2).

8.4 The Incidence of Severe Heat Injuries

8.4.1 Overseas data estimates the incidence rate of EHS at 1.20 per 100,000 athlete-exposures in U.S. American youth (3). The annual incidence rate seen in the U.S. military is reported to be as high as 14.5 per 100,000 servicemen (4). Data from the US Twin Cities marathon showed an incidence rate of 10 to 20 per 100,000 entrants for the marathon (5). Races over shorter distances, such as the 11.3km Falmouth Road Race report EHS incidence rates as high as 213 per 100,000 finishers (6).

8.4.2 Given the local climate, we may expect a higher risk of heat injuries in mass-participation running events. Data from the Singapore Marathon, comprising both full and half-marathon distance events, showed that EHS incidence can range from 4 to 25 per 100,000 participants (Table 8.1).

Table 8.1: Singapore Marathon Heat Injury Cases 2008 to 2017 (SportSG)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	19	43	29	32		101	76	127		9

8.5 Intrinsic Risk Factors for Exertional Heat Stroke

8.5.1 Poor physical fitness

A key factor contributing to EHS is an overload in exercise intensity. While experienced athletes are more capable of matching exercise intensity with their fitness level, novice athletes tend to outpace themselves during competition.

8.5.2 Inadequate heat acclimatisation

In Singapore's context, the problem of inadequate acclimatisation to the heat mostly affects visiting athletes who are unfamiliar with local climate.

8.5.3 Body habitus

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 (7).

8.5.4 Immune suppression and Illness

Heat stroke risk can be increased by disturbances to the immune system, e.g. from a recent bout of illness or sub-clinical infection (7).

8.5.5 Medication

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. Athletes

on medication for chronic medical conditions need to consult their prescribing physician on the risks of undertaking strenuous physical activity (7).

8.5.6 **High Motivation**

One of the most consistent hallmarks of exertional heat stroke is a high level of motivation on behalf of the athlete. Knowingly pushing the limits to reach the highest levels of performance, athletes block out the signals which urge the body to slow down (8).

8.5.7 **Age and Gender**

The role of age and gender in heat injury risk is a subject of debate. It is well established that classical heat stroke typically affects the very young and the very old. Thermoregulatory responses in children were once thought to be drastically different from those in adults, although a recent review described no differences (9). Nevertheless, it is important to note that children and youth may be unable to assess and mitigate risks of training and competing in the heat.

8.6 Environmental Heat Stress

8.6.1 Increased risk of heat injuries is seen in conditions of high environmental heat stress that inhibit effective thermoregulation. The humid tropical environment in Singapore is distinguished by year-round warm ambient temperatures coupled with high levels of relative humidity and rainfall. Other features of local weather include relatively low wind speeds, a small 5℃ to 6℃ variation between average daily minimum and maximum temperatures and a very high number of days with lightning.

8.7 Heat Injury Prevention – Individual Responsibility

8.7.1 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. Above all, athletes, while cognizant of the benefits of training and competition, 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).

8.7.2 When training and competition are in progress, athletes can take proactive steps to minimise excessive heat accumulation and to optimise thermoregulation. They might choose to alternate between exertion and rest, if the sporting activity allows this, to facilitate recovery and optimise in-game performance.

8.7.3 Precautionary actions include: wearing loose clothing, drinking fluids, taking breaks between activities, reducing outdoor activities, sponging with cold water, planning sports and exercise for cooler hours of the day and watching for early signs of heat-induced illnesses.

8.7.3 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. Athletes should also pay attention to early symptoms of overtraining and illness e.g., sore throat, diarrhea, cough, yellowish phlegm, blocked nose (not allergy-related) and low grade fever, etc. 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.

8.8 Heat Injury Prevention – Coaches and Event Organisers

8.8.1 Primary Prevention: Given the prevailing environmental heat stress conditions in Singapore, organisers should provide advisories on the prevention of heat injuries.

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 added responsibility of ensuring adherence to sport-specific regulations on continuation of play - a non-exhaustive list of which is featured in Appendix 7. In 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. 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 one 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.

8.8.2 Secondary Prevention: Organisers may also choose to institute additional breaks and provide dedicated cooling/drinking facilities to facilitate fluid intake and intermittent cooling. There should be adequate stations providing water, isotonics and energy gels for longer races (e.g. Marathon). 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.

8.8.3 Tertiary Prevention: When play is in session, it is also the responsibility of the organiser 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.

8.9 Heat Injury Prevention – The Role of Medical Professionals

8.9.1 Primary Prevention: Athletes must be advised to pace themselves according to their fitness level, and those with symptoms of a compromised immune system (e.g., running nose, cough, sore throat) should not be exercising intensely, or be advised to refrain from physical exertion if necessary.

8.9.2 Secondary Prevention: 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.

8.9.3 Tertiary Prevention: In the event of a casualty presenting to the aid post, medical professionals must be adequately equipped to identify the heat casualty and rule out differential diagnoses including hyponatremia and cardiac events. The tell-tale signs of confusion and disorientation are indicative of exertional heat stroke in an athletic setting (13). Professional experience and a high index of suspicion are key. It is equally important that medical professionals 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 the rectal temperature, although there may be a role for oral or axillary temperature measurements at initial onset of heat injury (14). Once the casualty has been stabilised and evacuated to the next echelon of care, medical professionals must inform organisers and advise on whether play or competition should be allowed to continue. In endurance events, a heat casualty is rarely an isolated incident.

8.10 Hydration Status

8.10.1 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. However, the more detrimental effect of severe dehydration is the decrease in sweat rate and volume, which directly limits evaporate heat loss. Evaporative heat loss accounts for about 80% of heat dissipation during exercise.

8.10.2 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). 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. The aim is to maintain a level of hydration is that is optimal for performance and safety of the athlete.

8.10.3 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.

8.10.4 Hyponatremia refers to low sodium concentration in the blood, due mainly to overdrinking 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 (15 - 17). 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 (18).

8.10.5 A fluid deficit of >3% of body mass (e.g., 1.8 L of water for a 60kg person) may compromise physical performance. Athletes should drink enough water during exercise to prevent a deficit of 3% of body mass (19, 20).

8.10.6 Signs and symptoms of acute hyponatremia overlap with those of exertional heat stroke.

8.11 Cooling for Exertional Heat Stroke

8.11.1 In the risk assessment and management of EHS cases, the most immediate activities should focus on eliminating danger, activating emergency medical services and securing airway, breathing and circulatory support (21). Severe Central nervous system dysfunction in EHS victims may at times escalate to seizure activity (22), necessitating the use of sedative drugs.

8.11.2 A recent systematic review on cooling modalities evaluated that ice-water and cold water immersion achieved the highest rates of temperature reduction during heat injury (23). 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 (24).

8.12 Return to Play

8.12.1 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 (25). 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 (26).

8.13 Recommendations

8.13.1 All athletes, coaches and event organisers should be educated on how to prevent heat injuries by identifying established risk factors including recent illness, and to seek medical evaluation to evaluate fitness to participate when in doubt.

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

8.13.3 Event organisers for endurance events such as marathons, duathlons, triathlons, etc. should ensure the provision of adequate aid stations consisting of water, isotonics and energy gels. In addition, they should consider setting up mist spray stations.

8.13.4 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.

8.13.5 Advice on the risks of over-hydration leading to water intoxication should be provided for endurance events.

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

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9 Event Medical Support Plan

Key Messages:

- This set of guidelines for medical support plans in mass participation amateur sports events establishes the appropriate medical support services required, based on the event risk assessment.
- The medical support plans should be clearly communicated to the working personnel for its effective implementation. Emergency contact information should be made available to the participants.
- Increased participation at all levels combined with heightened awareness for sports safety means that medical support planning is now standard practice for mass participation events.

9.1 Introduction to Current Practices

9.1.1 Sport and exercise play an increasingly prominent role in Singapore on several fronts.

- Increased participation in recreational sports and fitness activity as a culture and way of life.
- Exercise is a key intervention in the management of many common non-communicable diseases.
- An increasing emphasis on competitive sports and sporting excellence.
- More regional and international sporting events held in Singapore.
- Trend of seeking self-actualisation through participation in endurance sports.

9.1.2 There will be increased expectations from society on the governance and standards of sports safety as the role of sports increases in society and more people participate in sports across a broader range of ages. And as Singapore grows into an international sporting hub to host more and larger-scale events, there is a need to review if the current state of governance and standards for sports safety is adequate or whether there is a need to enhance these standards.

9.1.3 The committee acknowledges that there is a lack of systematic data collection method at a national level to assess exercise-related morbidity. While there is little evidence available locally to link existing sports safety governance and standards to exercise-related mortality, empirical evidence available internationally point to better morbidity- and mortality-related outcomes with established event sports safety standards. The Committee elected to work on exercise-related mortality as a key indicator of the current adequateness of sports safety, as information on this aspect is more detailed and available. Accepting that exercise-related morbidity and mortality are associated, noting the continuing occurrence of injuries and occasional mortalities, the Committee found that the recent and available exercise-related mortality data showed that there should be continued review of the levels of governance and standards for sports safety. This is particularly relevant for mass-participation sporting events, which will be covered in detail in a subsequent section (Chapter 11 – Surveillance and Evaluation).

9.1.4 SportSG published the Sports Safety Management System Guidebook, promoted the use of the Physical Activity Readiness Questionnaire (PAR-Q) for screening, and collaborated with NSAs to publish specific safety guidebooks on 15 sports for outreach and education. While NSAs are encouraged to partner with SportSG to publish safety guidelines for their sport, NSAs who have yet to do so can rely on the respective published international sports associations/federations' guidelines.

9.1.5 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, with all PE teachers scheduled to complete the Youth Sports Injury Management module in 2018. Risks assessments and management in schools and the National Schools Games (NSG), including safety checklists, students' health declaration and information sharing with teachers,

external safety validation exercises, and safety audits (including outdoor adventure facilities) are currently in place to minimise adverse events. When they do happen, robust monitoring, intervention and follow-up measures have been instituted to ensure better incident reporting, reviews and management of such events.

9.1.6 Sports 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.

9.2 Event Medical Support: Goals and Principles

9.2.1 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. As athletes - both amateur and professional - aspire towards physical excellence, we must accept that risk-taking will go hand in hand with the pursuit of health and happiness. Safe sporting practices, both during training and at competitions, are essential to sustainability. Failure to manage these risks can prove detrimental to the conduct of sports and games, thus jeopardising the real and intangible benefits of having a vibrant sporting environment.

9.2.2 Sports safety should be a primary focus as it is the most effective measure to minimise exercise-related injuries and mortality. But even with the best preventive measures in place, injuries and incidents can still happen. Event medical support should be viewed in this perspective, as an essential support tool to good safety practices and planning. The medical support plan should complement the event safety plan.

9.2.3 The earlier chapters in this document covered sports safety in general, pre-participation screening, training safety and safe sports facilities. 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 planners and athletes determine the requirements for medical support for both routine and event-based sports activities.

9.2.4 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 (some of which may have been covered in earlier chapters of the document) 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

9.3 Recommendations: Event Medical Coverage

9.3.1 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.

9.3.2 Sporting events vary widely according to the type of sport, the participant profile, the environment, and the number of participants. So while this document aims to cover the whole spectrum adequately, it will not be able to cover in depth some of the highly-specific areas relating to certain sports.

9.3.3 Event medical support plans for mass-participation amateur sports deserve a special mention because of the large number of participants they are expected to manage. It will be covered in the later part of this chapter.

9.4 Recommendations: Risk Assessment & Categorisation

9.4.1 Sports 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. Closely referenced to international publications and reports, the Committee has selected to categorize event risk based on (1) cardiovascular risk and (2) 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).

Legend	Category		
	A	B	C
Risk	Low	Medium	High

Table 9.1: 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	
@ New NSA Sports # New sports added to table based on Committee consensus ^ Previously existing sports reclassified based on Committee consensus			

[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.

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

9.5 Recommendations: Resource Management

9.5.1 As sports events vary widely, it is not useful to have a one-size-fits-all guideline on the appropriate resourcing for sports events. Hence, the Committee recommends graded medical resourcing based on the risk assessment matrix outlined in Table 9.1. Table 9.2 details the resource recommendation for training and competition in sports from each of the three risk categories.

Risk Category	**Whether for Training or Competition**	**Resource Requirement**					
		1st Aid, CPR & AED Trained Official (e.g. coach) Present	**Dedicated First-Aider or Paramedic Onsite**	**Doctor Onsite**	**Nearest Hospital Informed**	**Ambulance[1] On Standby**	**Medical tent / Post / Centre Onsite[1]**
A	Training	No	No	No	No	No	No
	Competition	No	No	No	No	No	No

B	Training	Yes	No	No	No	No	No
	Competition	Yes	Yes	No	Yes	No	No
C	Training	Yes	No	No	No	No	No
	Competition	Yes	Yes	Preferred	Yes	Preferred[1]	Yes, if >100 participants

Table 9.2: Personnel & Facilities Recommended for Event Medical Coverage

9.5.2 In addition, it is to be noted that although the personnel in the table above are identified based on their job vocations, the underlying concept is to be skills-based. For example, it is not the presence of a first aider that is important, but someone who has the skills to identify an athlete in distress and render first aid and CPR if necessary. This person can be anybody, from a teacher to a volunteer and including a bystander.

9.5.3 The recommendations in Table 9.2 apply primarily to static events. For events that are dynamic/mobile, with a large field-of-play (e.g. open-water kayaking, cycling and long-distance running), the recommendations in Table 9.2 may be inadequate as the medical support plan for both training and competition should 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.

9.5.4 For competitive high-risk events (Category C), there should be timely access to medical evacuation. This may be provided using 995 emergency medical services if there is timely access to care. In Singapore 995 ambulance is able to reach a venue within 11 minutes, 80% of the time. If the event medical director assesses that the response time is not good enough, or the nature of the event makes it challenging for evacuation, then plans for forward deployed ambulance coverage should be considered.

9.6 Recommendations: Manpower and Training

9.6.1 The event organiser or person-in-charge should designate a safety officer to be in charge of the event safety and medical coverage.

9.6.2 For events that (1) involve mass participation, (2) have multiple events occurring simultaneously (e.g. Youth Olympic Games) OR (3) occur over a large field of play (e.g. road races, triathlons), the organiser 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.

9.6.3 The event organiser should review the experience and qualifications of the appointed safety and medical personnel to ensure that they are able to perform their duties appropriately. Different levels of personnel competencies should be available for categories of event risk, depending on whether the event is a training session or competition (Table 9.2). Sufficient numbers of trained safety personnel and first responders should be deployed to ensure that the time required for the first responder to attend to a participant in distress is three minutes or less. Medical support staff should be briefed on the medical support plans including the use of medical equipment, activation procedures, evacuation routes and communication channels.

9.6.4 For special events (such as water sports or disabled sports), it is essential that personnel involved in event coverage are trained adequately (e.g. lifesaving skills and surveillance techniques for water sports, volunteers familiar with disabilities for disabled sports events). For recurrent events, the event medical plan should be reviewed along with the safety plan for areas of improvement so that subsequent event can be better supported.

9.6.5 Safety and medical personnel should be certified, and the certifications should be kept current, in accordance with the available national standards and accreditation

programme (i.e. Basic Cardiac Life Support training and certification with training centres accredited by the Singapore Resuscitation and First Aid Council).

9.7 Recommendations: Medical Equipment

9.7.1 Each specialised personnel are expected to have full and rapid access to respective equipment required (e.g. an adequately equipped first aid box / kit for first aiders, adequately equipped and stocked medical items for medical support team.)

- 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

9.7.2 Equipment should be visible, accessible, well-stocked, and well-maintained. 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.).

9.7.3 Event organisers must ensure that medical teams have prompt access to casualties and physical and administrative barriers that slow access of medical teams to casualties should be removed even at the planning stage. Safety of participants should be the prime consideration for event organisers and medical support personnel.

9.7.4 In addition, it is recommended that all sports facilities and NSAs have one or more well-maintained AEDs that are easily accessible to users. Sports facilities should

store AEDs in a transparent cabinet that is highly visible/prominent and accessible, with signages to 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. The absolute number of AEDs in each facility is dependent on the layout and size of the facility, with the goal being to ensure that the response time (i.e. from the time of cardiac arrest to defibrillation) is three minutes or less. 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.

9.7.5 NSAs that require additional mobile AEDs for event medical coverage may loan units from vendors.

9.7.6 Evacuation and safety vehicles need to be located to perform their intended tasks adequately, e.g. safety/rescue boats should facilitate transfer of the casualty in and out of the boat, have adequate area to carry out resuscitation, be appropriately equipped and manned, and competently driven (to minimise the risk of propeller injuries to the victim).

9.8 Recommendations: Communication and Coordination

9.8.1 All key event management and event medical personnel should have a clear communications plan on:

- First aid station locations
- Signage
- Ingress and egress routes for evacuation vehicles
- Types of vehicles to be used: bikes, buggy, ambulances
- Medical protocols and procedures
- Inclement weather and haze: to follow guidelines issued by National Environment Agency
- Activation of medical team and evacuation process

- Zone/sector coverage of lifesaving and rescue teams *(for water sports)*

9.8.2 To provide timely lifesaving first aid to a participant or spectator, there should be clear communication on the following procedures:

- 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

9.9 Recommendations: Mass-Participation Amateur Sports and Events

9.9.1 Mass Participation Amateur Sports is growing in popularity. The most common activities are running, cycle and swimming – or any combination of the three. 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.

For the purpose of this document, we will only address mass participation amateur sports and events involving:

- Activities involving more than 1,000 participants. 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 we did reference were unanimous in agreeing that risk assessment increases along with the number of participants in the event (1). 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".

  AND

- 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). 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 it is harder to reach each casualty.

9.9.2 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.

9.9.3 As the medical coverage for these events is challenging, there have been calls from both event organisers and participants to establish a national event medical support guideline. After reviewing various published guidelines, the Committee recommends that (a) the United Kingdom Athletics' (UKA) Road Race Medical Services Good Practice Guide, and (b) the Emergency Medicine Society of South Africa's Practice Guideline (Mass Gathering Medical Resource Model) are suitable for adaptation to Singapore's context (2)(3).

9.9.4 In the context of sports in Singapore, medical coverage should consider the impact of adverse effects of weather such as heat, humidity and lightning risks.

9.10 Recommendations: Post-Event Feedback and Review

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

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

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

9.10.4 Refer to (Appendix 8) for an example of a sports injury reporting form and summary of sports injury report.

10 Exercise and Training Facilities

Key Messages:

- Exercise and training facilities or services should continue to promote the use of pre-participation screening questionnaires among its users.
- Emergence of novel business models, such as 24-hour unstaffed exercise and training facilities, will require safety approaches to evolve in tandem.

10.1 Introduction

10.1.1 To promote physical activity in a safe manner, individuals should adhere to established training principles and guidelines. This chapter aims to provide exercise and training facilities with a set of guidelines to enhance safety while providing a positive exercise experience.

10.1.2 With our ageing population and the concomitant rise in the prevalence of chronic non-communicable diseases, exercise and training facilities will see an increase in clientele with medical conditions. Initiatives such as *Exercise is Medicine* ™ and SportSG's Active Health Lab have been introduced to manage this trend. While those with severe and poorly managed medical conditions will be managed by our healthcare institutions(1), exercise and training facilities will be expected to receive clients have their medical conditions under control. With good control of the underlying medical conditions, the exercise risks are low, but nevertheless higher than healthy individuals.

10.1.3 Much of the recommendations in this section are adapted from the ACSM's Health/Fitness Facility Standards and Guidelines, fourth edition - the reader is advised to refer to this document as well (2).

10.2 Recommendations: Exercise and Training Facilities

10.2.1 Facility operators should advise their users to declare and update their medical conditions via a pre-participation questionnaire.

10.2.2 All specific pre-participation screening tools shall be reviewed and interpreted by qualified staff (e.g., a qualified health/fitness professional or healthcare professional), and the results of the review and interpretation shall be retained on file by the facility for a period of at least two years from the time the tool was reviewed and interpreted.

10.2.3 For facilities where there is free uncontrolled usage of its equipment (e.g. fitness parks or unsupervised hotel fitness centres), such questionnaires should be available easily (e.g. through websites or by means of signs at the facility itself) and the public should be educated of its presence.

10.2.4 The facility operator should comply to the new American College of Sports Medicine (ACSM) pre-participation guideline, and refer to a qualified healthcare provider for medical clearance if recommended (3).

10.3 Recommendations: Orientation and Supervision

10.3.1 Exercise and training facilities should provide a means by which members and users who are engaged in a physical activity programme within the facility can obtain assistance and/or guidance.

10.4 Recommendations: Risk Management and Emergency Policies

10.4.1 Facility operators must have written emergency response policies and procedures, which shall be reviewed regularly and physically rehearsed at least twice annually.

These policies shall enable staff to respond to basic first-aid situations and emergency events in an appropriate and timely manner.

10.4.2 Facility operators should ensure that a safety audit is conducted that routinely inspects all areas of the facility to reduce or eliminate unsafe hazards that may cause injury to employees and health/ fitness facility members or health/fitness facility users.

10.4.3 Facilities should use waivers of liability and/or assumption of risk documents with all facility members and users.

10.4.4 AEDs in a facility should be located such that the AED is available to any casualty within 3 minutes of call. A notice highlighting the availability of an AED at the facility should be prominently displayed near entry to the facility and AED signage(s) should follow SRFAC guidelines. In larger facilities, directional arrows are helpful when there isn't direct line-of-sight to the AED location.

10.4.5 A facility should extend to each employee or staff the opportunity to receive training and certification in first aid and the use of CPR and an AED.

10.4.6 A staffed facility during operating hours shall assign at least one staff member to be on duty during all facility operating hours. The staff member should be currently trained and certified in the delivery of cardiopulmonary resuscitation and in the use of an AED.

10.4.7 Unstaffed facilities shall have as part of their written emergency response policies and procedures a public access defibrillation program as a means by which either members and users or an external emergency responder can use to respond from time of call to defibrillation in three minutes or less.

10.5 Recommendations: Professional Staff & Independent Contractors

10.5.1 Professionals who have supervisory and oversight responsibility for the physical activity programs and the staff who administer them shall have an appropriate level of professional education, work experience, and/or certification.

10.5.2 Professionals who engaged in pre-activity screening or prescribing, instructing, monitoring, or supervising of physical activity programs for members and users shall have current automated external defibrillation and cardiopulmonary resuscitation (AED and CPR) certification from a local organisation accredited by the national accreditation agency.

10.6 Recommendations: Facility Operating Practices

10.6.1 Facilities shall have an operational system in place that monitors, either manually or technologically the presence and identity of individuals (e.g. members and users) who enter and participate in the activities, programs, and services of the facility.

10.6.2 Facility operator shall ensure that there are sufficient space (both physical activity space and non-activity spaces) to accommodate user demand.

10.6.3 Facilities that offer a sauna, steam room, or whirlpool shall have a technical monitoring system in place to ensure that these areas are maintained at the proper temperature and humidity level, that the appropriate warning systems and signage are in place to notify members and users of any risks related to the use of these areas, including subsequent unsafe changes in temperature and humidity.

10.6.4 Facilities shall have written policies displayed visibly, such as requirement age entry limit of children, restroom practices and parental/guardian presence on site.

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

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

10.7 Recommendations: Facility Equipment

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

10.8 Recommendations: Signage

10.8.1 Facilities operators shall display notices visibly on danger and warnings of hazards, and proper caution.

10.8.2 Facility operators shall display signages indicating the location of any rescue/lifesaving equipment, such as AED and first-aid kits.

10.8.3 Facility operators shall post the appropriate emergency and safety signage pertaining to fire and related emergency situations, such as fire extinguishers and hosereel.

10.8.4 The onus for sports safety lies not only on the facility provider, but also on the athlete/participants/users as well. Unlike competitions, where there are usually larger numbers of participants, training groups tend to be smaller, making it less cost-effective to provide comprehensive medical support during training sessions. Hence, the individual must be prepared to personally assume some of the risks. It is not realistic to expect organisers to provide full medical support during training

sessions, and insisting on it would only cause organisers to withdraw and choose not to conduct training sessions.

Facility Characteristics					
	Level 1	**Level 2**	**Level 3**	**Level 4**	**Level 5**
Type of Facility	Unsupervised exercise room	Single exercise leader	Fitness center for healthy clients	Fitness center 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	• 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,	• Telephone in room • Signs • Encouraged: blood pressure kit • PAD plan with AED	• Telephone in room • Signs • Encouraged: blood pressure kit; stethoscope • PAD plan with AED	• Telephone in room • Signs • Blood pressure kit • Stethoscope • Strongly recommended; PAD plan with AED	• Telephone in room • Signs • Blood pressure kit • Stethoscope • Oxygen • Cash cart • Defibrillator

	apartment complex, park)				

Table 10.1: Exercise and training facilities – staffing and equipment. AED = Automatic External Defibrillator. PAD = Public Access to Defibrillator

Personnel in exercise and training facilities must meet professional standards and have the training and experience required for their designation.

Designation	Requirements/Job Scope
General Manager/Executive Director	Overall management of facility, design and delivery of exercise programs
Medical Liaison	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	• Design and management of exercise and fitness programs, training and supervision of staff • Level 3 facilities: ACSM health fitness instructor certification or equivalent • Level 4 and 5 facilities: ACSM exercise specialist certification or equivalent; trained in CPR and AED use. At least one year's experience in supervision in fitness industry
Fitness Professionals (including professional exercise leaders, personal trainers, etc.)	• Provide instruction and leadership in professional exercise programs • Level 1-3 facilities: ACSM exercise leader certification or equivalent • Level 4 facilities: ACSM health fitness instructor certification or equivalent

	• Level 5 facilities: ACSM exercise specialist certification or equivalent, or health fitness instructor under direct supervision of exercise specialist • Trained in CPR and AED use, desirable to be trained in 1st aid, prior supervised internship or experience in health/fitness industry

Table 10.2: Personnel and requirements for fitness centres

Reference

1. Exercise is Medicine Singapore. (2012). Retrieved from https://www.eims.sg/

2. The American College of Sports Medicine. ACSM's health/fitness facility standards and guidelines 4th edition (2012)

3. Thompson P.D., Arena R., Riebe D., et al. ACSM's New pre participation health screening recommendations from ACSM's guidelines for exercise testing and prescription, ninth edition. 2013; 12(4), 215-217

11 Surveillance and Evaluation

Key Messages:

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

11.1 Introduction

11.1.1 To continually improve on sports safety, it is important that 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

11.2 Current Practices

11.2.1 Injury surveillance is not commonly practiced in Singapore sports, sailing being one of the exception (1). There is no data available for the incidence of a certain adverse event in a particular type of sport (e.g. what is the incidence of anterior cruciate ligament (ACL) tears among soccer players in Singapore, and what are the factors associated with such injuries).

11.2.2 For sports events, the situation is slightly better. Injury records are kept for major events such as the Singapore Marathon and Singapore International Triathlon (2). For the Singapore Marathon, organisers felt that the rate of heat injuries in the 2005 edition, at 1 in 525 participants, was unacceptably high and decided to increase the number of water points. This led to a drop in the rate of heat injuries to one in 1,148 participants.

11.3 Recommendations

11.3.1 A minimum data set should be defined (e.g. including name/ID/age/cause of death or adverse event/circumstance or event leading up to death) and stakeholders/organisations should be encouraged to incorporate this data set into their own reporting format. This is to allow easier compilation of standardised data.

11.3.2 It is the responsibility of NSAs, stakeholders and event organisers to compile data (using their own reporting system/protocol, but also including the minimum data set) on participants with medical problems detected during screening (using their own reporting system/protocol, but also including the minimum data set) or injured during sports events (using the Injury Reporting Form in Appendix 8). 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.

11.3.3 Each NSA is encouraged to conduct its own injury surveillance among its athletes. This allows comparisons with international benchmarks and systematic improvement of sports safety. For example, if the rate of impact injuries in soccer players sees a seasonal trend and is associated with dry weather (and hence hard pitches), interventions (e.g. watering the field an hour before practice) can then be confidently applied to reduce unnecessary injuries.

11.3.4 Where applicable, NSAs should establish its own sport-specific medical committee (or at least 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).

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

11.3.6 Surveillance and evaluation systems need to contain a follow-up and tracking element to prevent incidents of similar nature in the future (3).

11.3.7 It is recommended for a central sports injury registry to be set up, providing the following functions:

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

References

1. Leong D., Tan B., Pardal C.V., et al. Injury and illness surveillance during the international sailing federation sailing world championships 2014. Br J Sports Med. 2017;51:349-350

2. Lee, J. K. W., Nio, A. Q. X., Ang, W. H., et al. First reported cases of exercise-associated hyponatremia in Asia. International journal of sports medicine, 2011; 32(04), 297-302.

3. Junge A., Engebretson L., Alonso JM, et al. Injury surveillance in multi-sport events: the international Olympic committee approach. Br J Sports Med. 2008;42:413-421

12 Conclusion

Sports can build resilience in people, bond communities, unite and inspire the nation. Together with partners from the public, private and people sectors, it is aimed to encourage to greater participation in sports; and greater participation in sports is underpinned by a strong culture in sports safety.

Sports safety is the responsibility of every individual, regardless of age or gender. To inculcate a safety-first mentality, and instill a sense of responsibility for the safety of self and others, this report covers a variety of topics to address sports safety in Singapore. The topics are:

- 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

Raising safety awareness and commitment focusing on individual's responsibility is key. This includes considerable effort to educate the public that individuals have to assume personal responsibility for their safety and health while engaging in sporting activities. They have to listen to their bodies and know their limits. Every life is precious and every effort has to be made to reduce incident rates. Safety training and education will achieve sustainable improvements in safety performance.

Appendix 1

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

Appendix 2

MOE Risk Assessment & Management System (RAMS) Guidelines

INTRODUCTION

Risk Assessment provides teachers and principals a useful tool to assess potential risks in an activity and encourages schools to think of less risky alternatives. The most important point about effective risk management is that risks are actually evaluated prior to each activity so that deliberate management decisions can be taken to reduce risks to a minimum to ensure safety of participants.

The Risk Assessment Management System (RAMS) will commit schools to systematically identify possible hazards in an activity and take measures to control the risks in all phases of the activity.

The procedure for carrying out risk assessment in schools is:-

a) Simple to operate;
b) Of practical relevance to the process of ensuring safety;
c) To help in identifying how and why activities should be run in a certain way.

SCOPE

There is no necessity to apply RAMS to every single activity and schools will use their discretion as to its application. However, schools will be expected to apply RAMS for outdoor adventure activities and activities that need close supervision e.g. mass events.

ADMINISTRATION

The process of risk assessment of an activity will be administered by the teacher-in-charge. This should be done in consultation with the Principal, Vice Principal, HOD and/or other relevant members of the school staff. Other teachers involved in the activity will assist in monitoring and verifying that the control measures are appropriate.

PROCEDURES AND MANAGEMENT

The procedures and management of RAMS are to be implemented in concurrence with the existing guidelines on "Procedures and Safety in the Conduct of Outdoor Activities". A 5-step management process is adopted. They are:-

a) Hazards Identification
b) Risk Assessment
c) Risk Control Options And Decisions
d) Implementation of Control Measures
e) Effective Supervision

Step 1: Identification of Hazards

The major elements in an activity must be examined for hazards, which are potential sources of danger. To be able to assess or control the risk, an accurate assessment of hazards is important. The hazards may be from the surroundings or from within the group of participants. Teachers-in-charge must be vigilant during an activity as hazards not identified earlier may emerge.

Example: In the middle of a hike around MacRitchie reservoir, a group of TAF Club pupils had their path completely blocked off by a huge fallen tree. The way through is either to climb over the slippery tree trunk or go around it from the side. Going around the tree trunk will have the pupils wading in knee-deep water. Hazards not identified earlier have emerged. As such, teachers will have to remain constantly vigilant for any hazard signs, assess the situation and remove or minimise the risk

Step 2: Risk Assessment

The objective of Risk Assessment is to assess the level of risk and determine the potential impact of a hazard on an activity. It is to be noted that a dangerous situation will occur when both the human and environmental elements are at their highest risk levels. Hence, it is imperative that the teacher-in-charge is able to recognize the potential danger in any situation. This is best accomplished by the "What if"" question.

Example: In the scenario given in the example above, the teacher would first need to assess whether there is any imminent danger posed to his pupils, plan his alternatives and assess the risk involved. To do that, he should consider the fitness level and ability of his pupils and also his ability to provide assistance should any of his pupils face difficulty.

Step 3: Risk Control Options and Decisions

The third step is to identify as many ways as possible to control the risks then select the most appropriate ones. The teacher-in-charge is responsible for finding the proper balance between risk control and risk taking; to eliminate or reduce the risk. If the hazard cannot be eliminated, the next best option is to control it. The teacher-in-charge should:-

a) Determine whether the total level of risk is acceptable;
b) Accept risks only when the benefits outweigh the costs;
c) Proceed with the activity only if he concludes that the risk is acceptable.

If the overall risk is found to be unacceptable and the teacher-in-charge is unprepared to accept the risk, then the activity should not be carried out.

Step 4: Implementation of Control Measures

The fourth step is the key activity for Risk Management. The teacher-in-charge should choose one or more appropriate control measures from among the possible control measures evaluated in Step 3 and implement the chosen control measure. The teacher may need to integrate specific control measures into operation plans, standard operation procedures, or processes and procedures.

Step 5: Effective Supervision

The final step for Risk Management is "Effective Supervision", which will ensure the effectiveness of risk controls. The teacher-in-charge is responsible for enforcing the control measures and will have to be vigilant at all times. School principals must monitor, follow-up, verify, and modify as appropriate the control measure which the teacher has imposed.

Appendix 3

5A-Way to Sports Safety

N Krishnamurthy
Safety Consultant and Trainer, Singapore

The “5A-Way to Safety” formulated by the author, based on certain time-honoured principles of personal and professional management, consists of five steps of the mental process which can lead to individuals and organisations to translate a vision into action.

In coming up with this 5A-way, the author stands on the shoulders of many all-time greats: such as Socrates, Confucius, and Gandhi. So there may be very little that is new in terms of basic ideas or goals – it is offered only as a fresh, somewhat different, sequence of thought processes in a logical sequence towards the desirable goal of promoting safety culture in Singapore.

In what follows, the technique is applied specifically to sports safety:

1. Attitude:

Make sports safety a core value, a shared concern.

2. Awareness:

Learn what can cause harm, to whom, when, and how.

3. Acceptance:

Take complete ownership of safety of athletes at all times.

4. Analysis:

Identify hazards, assess risks, and develop effective controls.

5. Action:

Enable all concerned to implement all safety measures.

1. Principles of the 5A-Way

Themes of the 5A-Way are presented in Fig.1 – graphics a collaboration between the author and the Ministry of Manpower.

(A-1) Attitude is believing in it.

- It is the beginning, the foundation for all we want to do
- In sports safety, it means that we want every one of the athletes who comes in for training or for competitions, to return home safe and sound.
- It means that we wish to share information and knowledge about incidents and accidents with all our cohorts.
- And so we can proudly tell ourselves, and tell others: “I accept sports safety as a core value!”

(A-2) Awareness is knowing what is involved

- Knowing what is going on around us in the relevant activities.
- In sports safety, it means we must learn what can cause harm, to whom, with what impact.
- It means that we must sense and understand the potential dangers, identify all of them, so that we can eliminate or control them.
- To save the athletes from injury or death, to save their family and friends from heartache, and our national reputation from damage.

(A-3) Acceptance is taking responsibility for it.

- Being pro-active, taking initiative, leading the way.
- In sports safety, it means being accountable for the welfare and safety of all athletes.
- It means treating all of them and all others involved in the activity as partners.

- It means making risk management part of our mission and our vision… not only by words but also with funds and personnel to achieve our goals.

(A-4) Analysis is planning what to do.

- Applying the right principles, using the right tools.
- In sports safety, it means identifying the hazards, estimating if and when accidents may happen, evaluating how bad they may be if they do and their combined risk level.
- It means that we decide which risks are acceptable, which are unacceptable, and which are tolerable and can be managed.
- And then what and how to control, and also who and when.

(A-5) Action is going ahead and doing it!

- Translating our hopes and plans to reality
- In sports safety, it means getting all the athletes and sports officials to participate.
- It means documenting background with facts, implementing our decisions, … getting on with the actions for safety, with safety in our actions.
- Communicating with all concerned, reviewing progress, continuing to advocate and promote safety first… and safety last.

Appendix 4

Get Active Questionnaire (GAQ)

CSEP | SCPE
THE GOLD STANDARD IN EXERCISE SCIENCE AND PERSONAL TRAINING

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.

PREPARE TO BECOME MORE ACTIVE

The following questions will help to ensure that you have a safe physical activity experience. Please answer **YES** or **NO** to each question before you become more physically active. If you are unsure about any question, answer **YES**.

	YES	NO
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

PAGE 1 OF 2

CSEP | SCPE
THE GOLD STANDARD IN EXERCISE SCIENCE AND PERSONAL TRAINING

Get Active Questionnaire

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

Sign and date the Declaration below

I answered YES to any question on Page 1

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.)

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Get Active Questionnaire – Reference Document

ADVICE ON WHAT TO DO IF YOU HAVE A **YES** RESPONSE

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?	
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? ☐ **YES**	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.
B A diagnosis of/treatment for high blood pressure (BP), or a resting BP of 160/90 mmHg or higher? ☐ **YES**	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.
C Dizziness or lightheadedness during physical activity ☐ **YES**	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.
D Shortness of breath at rest ☐ **YES**	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.
E Loss of consciousness/fainting for any reason ☐ **YES**	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.
F Concussion ☐ **YES**	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.

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

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Get Active Questionnaire – Reference Document

ADVICE ON WHAT TO DO IF YOU HAVE A **YES** RESPONSE

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.

Appendix 5

Annual Parent's Declaration of Student Medical Conditions used by MOE Schools (extracted)

Please complete the form and return it to your child/ward's Form Teacher.

(Note: Information contained in this section will not prevent your child/ward from taking PE lessons unless further medical advice warrants exclusion)

Name:		NRIC:
Date of Birth:	Sex: Male/Female	Class:

Medical Condition	**Yes/No**	**If yes, please state the special precaution to take for my child/ward.** [Please attach supporting medical information from the attending doctor(s)]
Epilepsy		
Periodic Loss of Consciousness		
Heart Condition		
Ear Disorder		
Respiratory Disorder e.g., Asthma		
Is your child/ward on regular medication?		
Has your child/ward been specifically told to modify his/her physical activity or exercise participation?		
Other relevant medical information		

I authorize the teacher and instructors to obtain medical assistance which they deem necessary should an accident occur.

I submit the **attached medical information from the attending doctor(s)** concerning my child/ward which includes details of limitations that he/she has for activities concerned.

I confirm that the above information is correct.

Parent's/Guardian's Name:	Parent's/Guardian's Contact Number:

_____ _____

Parent's/Guardian's Signature Date

Appendix 6

Annual Parent's Declaration of Student Medical Conditions used by MOE Schools

Please complete the form and return it to your child/ward's Form Teacher.

(Note: Information contained in this section will not prevent your child/ward from taking PE lessons unless further medical advice warrants exclusion)

Name:		NRIC:
Date of Birth:	Sex: Male/Female	Class:

Medical Condition	**Yes/No**	**If yes, please state the special precaution to take for my child/ward.** *[Please attach supporting medical information from the attending doctor(s)]*
Epilepsy / Seizures		
Any fainting spells DURING exercise, emotion or when startled?		
Any fainting spells AFTER exercise?		
Previous extreme fatigue associated with exercise (different from other children)?		
Any unusual or extreme shortness of breath during exercise?		
Any discomfort, pain or pressure in his chest during exercise?		
Has a doctor ever ordered a test for your child's heart?		
Any Heart Condition		
Ear Disorder		
Respiratory Disorder e.g., Asthma		
Allergies e.g., medication, insect bites and stings		
Is your child/ward on regular medication?		
Has your child/ward been specifically told to modify his/her physical activity or exercise participation?		
Other relevant medical information		

I authorize the teacher/instructors to obtain medical assistance which they deem necessary should an accident occur.
I submit the **attached medical information from the attending doctor(s)** concerning my child/ward which includes details of limitations that he/she has for activities concerned.
I confirm that the above information is correct.

Parent's/Guardian's Name:	Parent's/Guardian's Contact Number:

_

_____ _____

Parent's/Guardian's Signature Date

Appendix 7

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
Rugby / World Rugby (11)	HSI^ >150	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: 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.	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.

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.			

Appendix 8

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
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. Heat Related Illness			
J. 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: _____

Appendix 9

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 foresees 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.

As a coach, do get your athletes started by answering the seven questions seen on the form below:

Are You Sports Safe?

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly:

check: YES or NO

Regular physical activity is fun and healthy, and 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 doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

		YES	NO
1	Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?	☐	☐
2	Do you feel pain in your chest when you do physical activity?	☐	☐
3	In the past month, have you had chest pain when you were not doing physical activity?	☐	☐
4	Do you lose your balance because of dizziness or do you ever lose consciousness?	☐	☐
5	Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?	☐	☐
6	Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?	☐	☐
7	Do you know of any other reason why you should not do physical activity?	☐	☐

More information on PAR-Q can be found at
http://www.sportsingapore.gov.sg/sports-education/sports-safety/sports-safe-u-guide

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

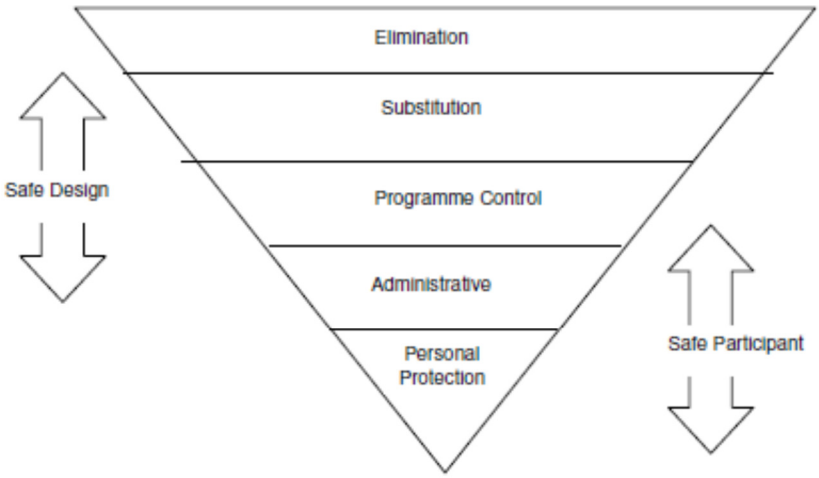
Risk Level

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

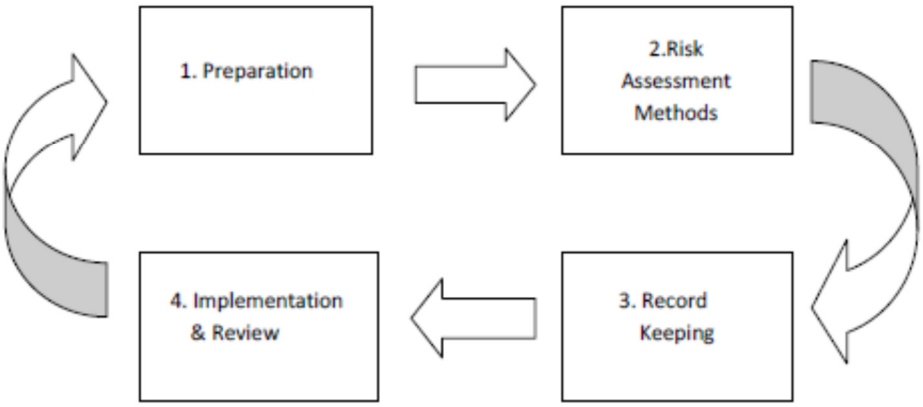
5. Are Risk Assessment Methods sufficient?

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:

First Aid Kit which include: • 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)	Available at stadium facilities office

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:

<u>Safety education and training</u> - 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).
<u>Preventive measures</u> - 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.
<u>During conduct of activities</u> - 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.
<u>Responding to safety incidents</u> - 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.