FEDERATION INTERNATIONALE DE SKI
INTERNATIONAL SKI FEDERATION
INTERNATIONALER SKI VERBAND

FIS MEDICAL GUIDE
containing Medical Rules and Guidelines

(revised 2009)

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Foreword

June 2009

The newly revised FIS Medical Guide is not designed to be a “Mini Textbook of Medicine Specialties”, rather it aims to provide support for team physicians, therapists, trainers and other team members with regard to issues of health and injury prevention for athletes and all the team members participating in the sport disciplines of skiing and snowboarding. Its principal aim is to provide a resource to help with the management and organisational problems linked with medical and legal issues for medical personnel travelling with elite ski and snowboard teams.

Section 1 contains the requirements of FIS, as specified in the ICR Article 221.6.

Participation in sport promotes and supports the basis of a healthy lifestyle. The health, wellbeing and safety of all athletes is the primary aspiration of all medical support personnel working with athletes and teams. Providing medical support and care for athletes and teams is a substantial responsibility that can be unique and challenging, yet is incredibly rewarding. It provides a distinctive and special privilege of those involved to work with high level athletes however the responsibilities involved in decision making, often in intense settings, are great leading to outcomes that often affect the competitive success of not only the athlete, but also the team.

The intent of the FIS Medical Guide is designed to offer a ready reference aid for medical personnel working with ski teams to assist their decision-making in medical and other linked problems.

The FIS Medical Committee plans to review and revise this reference guide on an annual basis; it will thus offer continual evaluation of issues and problems that become evident in the participation of the sport disciplines covered by the International Ski Federation.

FIS Medical Committee

A special thank you to **Anton Wicker** who coordinated this edition and all other contributors of this guide.

FIS MEDICAL GUIDE
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1. FIS Event Organiser Medical Support Requirements

1.1 Medical Services Required from Event Organisers

The health and safety of all those involved in the FIS disciplines is a primary concern of all event Organisers.

The scope and specific composition of the medical support system is dependent on several variables:

- The size and level of the event being held (World Championships, World Cup, Continental Cup, FIS-level, etc.)
- The estimated number of competitors, support staff and spectators.

The Event Medical Director must confirm with the race director or technical delegate that the required rescue facilities are in place before starting the official training or competition. In the event of an incident, the back up plan must be in place before recommencing the official training or competition.

1.2 Required Facilities & Resources

Available facilities

- The Event Organising Committee (OC) must assure that emergency medical services are available for each official day of training and competition
- Medically equipped tent or clinic in close vicinity of the base/finish of event location for initial triage and minor issues
- Public facility for medical care of spectators
- Top of course medical care for athlete needs prior to competition
- Intermediate medical course stations depending on event
- A minimum of one Advanced Life Support (ALS) ambulance for transport must be available with a back-up plan if transport is used
- Alpine Speed, Freestyle Aerials SkiCross, Snowboard Cross ,Big Air and Skiflying competitions must have a fully equipped Advanced Life Support Team and a replacement available with transport at all times during official training or competition
- For Alpine Speed, Freestyle Aerials, Ski Cross, Snowboard Cross, Big Air and Skiflying competitions, a rescue helicopter or medically equivalent evacuation method must be available on a basis consistent with local law. The chosen method of evacuation must be capable of immediate patient off-hill evacuation.

1.3 Personnel/Staff

Specific job descriptions with requirements must be created according to the specific requirements of the event.

1.3.1 Event Medical Director

This individual is responsible to direct and coordinate all medical services provided at the event. This person is usually a member of the Organising

Committee and reports to the committee regarding medical issues with the event. This individual should be competent in Emergency Medical Care, triage and evacuation procedures, and have a good understanding of operational procedures of all systems with respect to the event and as such, have a good understanding of the sport with regard to possible injuries or incidents that could occur. If this person is not a medical doctor, then one should be appointed as an advisor for the event.

Specific responsibilities:

- Outline facilities and resources required for the event
- Establish an evacuation plan for injured athletes – for all possible locations within the "field of play" from site of injury to initial triage to hospital or trauma centre if indicated
- Secure availability of all necessary facilities, resources and personnel to support evacuation plan through working inter-relationships
- Create a back up plan/system that could be operational if one or more major evacuation is utilized
- Establish a separate plan and/or staff for visitors, spectators of the event depending on expected crowds.
- Define specifically the personnel roles and responsibilities and communicate these clearly to all parties involved.
- Review the emergency medical plan with the Organising committee and event staff to discuss the interactions with other aspects of the event – clarify communications protocol
- The Event Medical Director should review the overall medical plan at the initial team captains meeting for all coaches and team medical personnel. At this time, he/she should establish a specific medical meeting/orientation with all team physicians and/or medical personnel to review the specific evacuation medical plan in detail
- Support of the Technical Delegate with the record and track all incidents that occur during official training and competition with the completion of the FIS Injury Report for each athlete injury.

1.3.2 Ski Patrol

- Act as first responders to a downed athlete
- Ski patrol must have adequate and experienced skills in skiing
- The staff is to be placed along the course so they always have the athlete in view
- Numbers/staffing determined by the nature and course of the event
- Consideration of additional staffing to fill positions left open following response to an accident quickly and efficiently so as to not delay the competition.

1.3.3 Trauma Teams

- Determined from the overall medical plan regarding specific needs for event. Generally positioned along course where they can reach any critically injured athlete within 4 minutes maximum time limit
- These teams generally consist of medically trained individuals that are Advance Cardiac or Advance Trauma Life Support qualified and/or paramedic with capability of advanced airway management.

1.3.4 Team Physicians

- Team physicians may only assist with the field of play athletes care and stabilization under direction of event medical staff.

1.4 Information to the Teams

General Medical Coverage of Competition Protocols must be published and given to all teams in their information packs for their medical personnel. This should include:

- On-Course medical support map with details of all stations (staffing/equipment/supplies)
- Evacuation protocols for each level of injury from course with criteria for helicopter transport
- Location/contact phone of Clinic or level I Trauma Centre that athlete would be transported to - depending on Level of Injury
- Contact for Event Medical Director
- A listing of all local medical services to include the phone contact and address for location. This information should include: local medical clinics, physicians, dental offices, pharmacies and the contact information for the level I Trauma Centre .
- A medical meeting for the persons taking care of medical matters in the teams will take place prior to the first official training (for Alpine downhill events after the first course inspection) or the competition and minutes and a signed attendance list must be taken. This can provide the more detailed information regarding evacuation procedures from the course. The time of this meeting must be communicated at the team captains meeting

2. The FIS Medical Supervisor – Role and Responsibilities

For all major skiing and snowboarding events (Olympics and World Championships) the FIS will appoint one or more Medical Supervisors to act as a liaison or advisor to the organising committee for the event with regard to sport specific issues. The Medical Supervisor is nominated by the FIS Medical Committee to the FIS Secretary General for approval by the FIS Council. This process will normally take place about one year in advance of the scheduled event.

In general, the individual nominated will be a member of the FIS Medical Committee with current knowledge of issues within the realm of medical and anti-doping. If a committee member is not available, then by general agreement from the committee, an individual may be recruited from outside the committee to perform the duties of the FIS Medical Supervisor. In his/her job as a Medical Supervisor for the FIS, the individual may not act as a team doctor or as doctor for the organising committee concurrently with performing the job of the Medical Supervisor.

Once approved by the FIS Council, the event organisers will be notified of the name and contact details of the appointed supervisor, as well as recommendations set out in the FIS Medical Guide regarding expected medical support services for the event.
It is the responsibility of the Organising Committee to contact the FIS Medical Supervisor and provide all information regarding the organisation and delivery of medical services that will be provided during the course of the event.

2.1 Specific Role and Responsibilities of FIS Medical Supervisor

- To act as Liaison/Adviser to Event Organising Committee
- To facilitate expected medical services of event as defined by FIS
- To have a good understanding of possible medical issues that may arise during the event
- To have a good understanding of Event Logistics and 'flow' of schedule with ability to make recommendations to the Organising Committee.

2.2 Organisational Placement

- To integrate with the Organising Committee as advisor and FIS Staff to agree daily logistics
- To integrate with Anti-Doping Agencies for logistical facilitation of the execution of Anti-Doping controls both, pre and post event. The supervisor is not directly involved with doping controls or blood testing but rather the logistics surrounding appropriate execution of these requirements.

2.3 Pre Event Requirements

- To communicate with the Event Organising Committee regarding FIS approved guidelines for organisation, preparation and execution of all medical support services, safety issues and anti-doping organisation and logistics associated with events
- To undertake and complete a Site Visit and Medical Check list in order to confirm that the FIS guidelines are fully incorporated, as well as to ensure familiarisation with facility structure, location and availability
- To facilitate Pre-event Team Physician meeting to communicate logistics and execution of all medical support services and Anti-Doping controls
- To review Anti-Doping Logistics incorporating all aspects of event, ceremonies, awards and media.

2.4 Execution during Event

- To act as Facilitator and Problem Solver between all agencies providing services for the event
- To maintain close collaboration with all FIS appointed officials throughout duration of event
- To be responsible for implementation and facilitation of FIS/WADA rules with respect of medical and safety issues and Anti-Doping rules
- To communicate directly with Race Director/TD regarding any medical or Anti-Doping issues not consistent with FIS/WADA rules.

2.5 Post Event Report

The Medical Supervisor will provide a comprehensive report including details of communication prior to the event, pre-site visitation and a summary of all event medical services, injuries sustained during official training and competition, and Anti-Doping logistics or issues encountered during the course of the event. This report will be forwarded to the following:

- FIS Secretary General
- Chairman of FIS Medical Committee and subsequently to Medical Committee Members
- Organising Committee for the event.

3. The Role of the Event Medical Director

The Event Medical Director is responsible for directing and coordinating all medical services provided at the event. He/she is a member of the Organising Committee and reports to the committee regarding medical issues related to the event. He/she is head of a team that must be competent in the provision of emergency medical care, triage and evacuation procedures. He/she and their team should have a good understanding of operational procedures of all systems with respect to the event and also have a good understanding of the sport discipline with regard to possible injuries or incidents that could occur.

Team Physicians should contact the Event Medical Director to obtain information about medical services in the area, names of medical specialists, possibilities for getting drugs for team treatment, phone numbers of medical providers and special information about particular medical regulations in this country or area where the event takes place.

The Team Physician will assist ensuring optimal care of the athletes and staff, but the Team Physician is NOT an OFFICIAL of the EVENT ORGANISING COMMITTEE (OC).

It is not the task of the Team Physician to impose conditions regarding medical issues to the Organising Committee. In respect of all medical and organisational problems he should report to the Event Medical Director.

3.1 Required Responsibilities of the Event Medical Director:

- To outline facilities and resources required for the event
- To establish an evacuation plan for injured athletes – for all possible locations within the “field of play” from site of injury to initial triage and transport to hospital or trauma centre if indicated
- To coordinate and secure availability of all necessary facilities, resources and personnel to support evacuation plan
- To create a back up plan/system in case one or more major means of evacuation is already utilised
- To establish a separate plan and/or staff for visitors and spectators of the event depending on expected crowds
- To define specifically the personal roles and responsibilities and communicate these clearly to all parties involved
- To review the emergency medical plan with the Organising Committee and event staff to discuss the interactions with other aspects of the event – clarify communications protocol
- Also to review the overall medical plan at the initial team captains meeting for all coaches and team medical personnel. At this time he/she should establish a specific medical meeting for orientation with all team physicians and medical personnel to review the specific evacuation medical plan in detail
- He/she should support the Technical Delegate in keeping records of injuries and incidents that occur during official training and competition, and help in particular with the completion of the FIS Injury Report for each athlete injury.

The Event Medical Director should be the first line of contact for the Team Physician with regard to all medical or linked organisational problems. The Event Medical Director should normally be a Medical Doctor. If this person is not a Medical Doctor, then a Medical Doctor from his/her team should be appointed as an advisor for the event with the required responsibilities.

It is very useful for Team Physicians to be present at the Team Captains Meeting, because this is a very good opportunity to make personal contact with members of the Organising Committee and other officials at the event. The Team Captains Meeting is the best place to optimise channels of communication.

4. Physicians Travelling with Ski Teams – Roles and Responsibilities

4.1 Team Physician

Physicians travelling with teams serve as a tremendous resource to athletes, physiotherapists, trainers and coaches in the management of health related issues for the elite athletes. The job involves a unique challenge, not without responsibilities, and can at times be demanding and difficult, very often in time-sensitive situations. They are often expected to make decisions regarding athletes' health, fitness and ability to train/compete in critical situations under immense pressure. The ramifications of such decisions can impact not only on the individual athlete, but also many other individuals involved. The primary aim of a team physician is to provide for the safety and long term wellbeing of athletes by providing optimal medical care.

To fulfill the primary goal, a team physician must possess a broad base of medical knowledge, and should have the ability to resource and manage multiple specialists if required in order to ensure the best medical care and management for athletes. He/she should have a working knowledge of trauma, musculoskeletal injuries and general medical care for issues that commonly arise within the sport.

A team physician should also be willing to commit sufficient time to interact with and fully support a team, its support staff, and individual athletes by involvement in training camps and competition scenarios in order to appropriately address medical management of chronic issues, injury and illness. This involvement will enhance their knowledge base with regard to medical issues within this sport.

4.2 Role with Event Coverage and On Hill Safety Protocols

Team physicians travel with athletes and staff to provide care and services while away from their homes. There is a wide variety of training experience in these individuals and it is important for not only event medical staff to communicate and educate these individuals with the plan for medical coverage of a particular event, but also for the team physicians to communicate with event/location staff to improve their understanding of the medical support available in a particular location. The Team Staff Emergency Care Protocol (appendix 1) can offer assistance in organisation of the information important to all individuals involved with providing medical care in an acute situation. It not only outlines information specific to the event but also assists in defining supportive roles within a team staff in management of an acute medical situation in a training scenario.

Team doctors can be extremely helpful in care for their athletes, assistance with any language barrier, and in clarifying any pertinent medical history. Clearly defining the team physician role/responsibilities within the medical care protocol for events can be helpful in assuring good interaction and coordination of medical care should an incident occur. The team physician should be allowed to attend to the athlete in more severe situations along with the first responders. In order to do this he/she needs to have accreditation to be on the slopes.

4.3 Team Emergent Action Plans at Camps and Competitions

In case of change of personnel, or absence for all or part of the event, it is necessary to draw up and establish a generic Emergent Action Plan. A team physician can be instrumental in assisting the staff in the development of this plan should medical staff be present or not. The actual process of formalising discussions regarding who on the staff will be responsible for what in the time of an emergency generally improves the efficiency of function under stressful situations. All divisions of teams should develop an emergent action plan within their staff to clarify location, communication and actions should an injury occur.

4.4 General Health Considerations Encountered by Team Physicians

Annual Examination/Screening Recommendations

All athletes should have an annual medical check that includes a review of medical history, a clinical examination, an orthopaedic examination, laboratory indices, rest and stress heart rate and blood pressure measured with an electrocardiogram tracing every other year and functional screening as indicated. Additionally, it is recommended that periodically (once every 2-3 yrs) the annual medical check should also include a chest x-ray and pulmonary function testing as well as any specific evaluations with regard to concerns identified over the recent season. These examinations shall be completed early in the preparation period to assess any injury risk, health concerns or chronic issues to allow sufficient time to address the issues or concerns. Most importantly, there should be a mechanism developed for communication of all identified problems and the coordinated plan for resolving the issues between athlete, coach, trainers, team physician and specialists.

Medical/Functional Clearance from Injury

Any athlete returning from a more significant injury should be required to complete a medical examination and functional evaluation for clearance to return to sport specific training. These examinations are specific to the injury sustained and the particular demands of the sport to which the athlete will return. The initial clearance is often conditional, allowing for return at a specific level of training (in conditioning or sport specific training) and then is progressed, within a continuum, to higher levels of training. Clearance for full load training within a sport will follow as recovery proceeds. An outline protocol of this nature should be established between the physician and team medical personnel and the coaches in order to facilitate the best integration back into full sport training.

4.5 Recommended Immunisation Status

Immunisation status is an important area of general healthcare that is often overlooked as athletes leave the school systems. It is particularly important in businesses that involve extensive travel throughout the world since some developing countries still have difficulty with some diseases preventable by vaccines.

It is difficult to list all recommendations for all areas of the world, and certain factors such as age, health, location of travel and duration of travel all impact on the risk of disease and the need for immunisations. The following list outlines most of the current recommendations regarding the vaccinations that should be considered for the areas most likely to be visited by ski and snowboard athletes and staff.

Legal requirements for specific immunisations for entry into specific countries can vary from time to time and often unpredictably. Specific details and the most up to date information regarding recommended immunisations for travel can be obtained

from the WHO (World Health Organisation) www.who.org.

Adverse reactions to vaccination are rare and usually local rather than general. A history of previous serious allergic reaction is the only absolute contraindication to vaccination. However, live attenuated virus vaccines such as oral polio, yellow fever, varicella-zoster and measles, mumps and rubella are contraindicated in individuals who are immunocompromised or pregnanct.

Tetanus and Diphtheria – Individuals who had this series as a child should receive a tetanus-diphtheria (Td) booster every 10 years. Anyone who has had surgery or required stitches for a laceration will probably have been given a booster. Diphtheria outbreaks have occurred in the past several years in Russia, Albania, Dominican Republic, Brazil, Ecuador and many other countries in Asia and Africa

Influenza – These viruses cause epidemics annually most commonly in the winter but obviously can occur in the southern hemisphere during the opposite seasons of the northern hemisphere. It is most severe and associated with high morbidity and mortality in the elderly and immunocompromised individuals. However, the immune systems in athletes can be taxed from heavy training and stress. Thus, it is a highly recommended vaccine that should be obtained annually and possibly more than once annually depending on the travel incurred in competition.

Hepatitis A – HAV is a viral disease endemic throughout developing countries. Immunisation is recommended for travellers going anywhere outside USA, Canada, Western Europe, Japan, Australia or New Zealand. The highest prevalence of infection occurs in areas with low standards of sanitation. Travellers are at risk through ingestion of contaminated food and water. Boiling or cooking to 85 degrees for at least a minute can inactivate HAV. The vaccine is a 2 shot series, the booster coming 6-12 months after the initial dose. Antibodies are protective 2-4 weeks after the first dose.

Hepatitis B – This viral infection is associated with significant morbidity and mortality. It has become a vaccination recommended for ALL persons to effectively control the disease. In travel, it is generally recommended for high-risk individuals (health care workers, anyone who may have sexual contact with new partners) and those who may require medical or dental care in endemic areas. It has become a routine immunisation for infants and children under the age of 2. This is a 3 shot series on a schedule of 0, 1-4 months, 6-18 months.

Measles – All travellers are strongly encouraged to ensure that they are immune to measles. The first vaccination is normally done as a child, followed with a booster in high school or on entering college. Individuals born after 1957 who have NOT received 2 doses of measles vaccine without evidence of measles immunity (laboratory titers) should be vaccinated prior to travel. International travellers may require 2 doses 1 month apart.

Rubella – Rubella is endemic and epidemic in many countries throughout the world. International travellers should be confident that they are immune to rubella either through demonstration of antibody titers or documentation of vaccine after the 1st birthday.

Polio – Poliomyelitis has nearly been eradicated worldwide. Immunisation is recommended for travellers in Third World countries where it is not totally eradicated. There are 2 types of vaccine; OPV, which is the live attenuated oral vaccine consisting of one dose for adults and IPV, the inactivated vaccine given in injectable

form in 2 doses 4 weeks apart. Those individuals who received a primary series as a child may need a booster if travelling to areas at risk for exposure to wild poliovirus.

Varicella-Zoster – This is the virus commonly known as "chicken pox" as a child. It is a more significant health risk if contracted as an adult and is associated with higher morbidity and mortality in adults from the associated complications. A history of chicken pox as a child is an acceptable indicator of immunity. If unsure, serologic testing can determine immunity. If not immune, a new vaccine is highly recommended for adults. It is a 2 dose series 1-2 months apart.

4.6 General Recommendations to Athletes for Staying Healthy

In pursuit of international success, an athlete can leave no stone unturned. All variables should be controlled as far as possible; an athlete must think and act proactively in all areas. Becoming ill can ruin a few days to a week of training, or at the wrong time, an important series of competitions. Staying sick can ruin half a season, and training or racing/competing when sick can even ruin an entire career.

Sleep - The kind of rest you get from sleep cannot be replicated doing anything else. Make time for sleeping 8+ hours a night, plus naps during heavy training or racing.

Hydration - Appropriate hydration is vital to short and long term performance and health.

Nutrition – If there is not adequate nutritional intake for energy production, the body does not replenish the stores for energy and becomes very susceptible to illness. All athletes should consider vitamin/mineral supplements particularly during times of high stress from training and/or competing to help supplement the regular diet.[1]

Appropriate recovery time/Relaxation - Time is the most important element of recovering. Mental and physical stress can make the body more susceptible to illness. Take the time to relax mentally as well as physically.

Stay warm & dry. Shower after training sessions – Do not remain in damp clothing following training – shower and change into dry clothing.

Commonsense – be careful about sharing drinks, silverware, kisses, etc. Avoid those who are sick, and isolate athletes who become ill. Pay attention to being stuck in a poorly ventilated public place, having had to stay up late a night or two in a row, hard training/racing or travel schedule. **Wash your hands!** You bring germs to your face, nose, eyes and mouth with your hands.

Don't suffer – seek proper consultation. If an athlete becomes ill in spite of common proactive advice, further diagnostic evaluation should be considered to address appropriate medication treatment. Don't suffer through an illness or allow a chronic illness to linger, be proactive in addressing it.

Warning Signs - Pay particular notice to the following "HINTS" in possible illness and make proper adjustments in training/lifestyle:

1 Extreme caution is recommended regarding supplement use. The use of dietary supplements by athletes is a concern because in many countries the manufacturing and labeling of supplements may not follow strict rules, which may lead to a supplement containing an undeclared substance that is prohibited under anti-doping regulations. A significant number of positive tests have been attributed to the misuse of supplements, and taking a poorly labeled dietary supplement is not an adequate defense in a doping hearing. (Source: WADA).

- tired, itchy eyes, sneezing or slightly stuffy nose
- sudden feeling of overall fatigue, becoming sleepy, grumpy, and/or irritable
- feeling woozy, unmotivated,
- generalized aches, and unusually sore muscles
- sweating for no good reason
- a dry throat, or very slightly sore throat
- sudden weight gain or loss, loss of appetite.

Adjust training load from the start of an illness:

When ill, be it a viral illness or bacterial infection, any type of increased metabolism (exercise) can make recovery from the illness slower rather than faster. This is of utmost importance particularly when the illness is in the acute phase. Once the body is past the acute phase of the illness, light exercise can enhance recovery. Thus, the following stages give examples of how training loads should be adjusted to enhance the body's ability to fight the infections:

Fatigued — No specific symptoms however, feel excessively fatigued for the level of training – recommend cutting back on training volume and intensity training for a day or two. Consider total rest.

Cold/URTI — Mild runny/stuffy nose with no other symptoms - take one or two days off; and consider taking an extra day off even if you feel better

Increasing Symptoms — Runny/stuffy nose, scratchy/sore throat (not too bad) - take at least two days off and reevaluate on the third day. Eliminate hard training for a week, and cut back on the volume

Head Cold — Definite cold, +/- fever. Eliminate training for the full duration of acute symptoms (fever/chills, head stuffy and ache). Re-enter training with low volume, very light aerobic exercise. Do not train hard until you are fully recovered.

Flu -like symptoms — Headache, body aches, fever/chills, +/- sore throat, cough, etc. Eliminate training for the full duration of the acute illness (until the fever has gone and the coughing is controlled) and follow recovery guidelines after acute phase has passed.

4.7 Travel Considerations

Participation in training and competition within snowsports entails a significant amount of national and international travel. Travel represents yet another stress that the body must accommodate - this taxes the immune system. There are also the additional stresses of training, foreign foods, changing sleep patterns, exposure to "new" germs, etc. All this means that an athlete must be PROACTIVE in minimizing stresses as much as possible. In addition to those measures mentioned above, it is also recommended that athletes be proactive in having basic medications/supplements familiar and known that might be needed if illness occurs in a foreign location. Athletes should consider carrying familiar medications from home to treat minor illness early, in order to prevent worsening symptoms and to avoid the difficulty of finding what you need in a foreign location. The Team Physicians can assist teams by providing a list of recommended medications to address the common cold or upper

respiratory infections to be carried by the individual

4.8 Proper Hydration Recommendations

Dehydration can be caused by many factors, most commonly by not drinking sufficient fluids to replenish the losses encountered from a variety of mechanisms such as training, travel in airplanes, altitude and dry climates (whether hot or cold). Electrolytes are usually lost alongside water in a dehydrated person. Although water is the most obvious and perhaps the most important element to replace, electrolyte replacement (salts in the body fluids – sodium, potassium) is important as well. Dehydration causes fatigue, headaches, dry mucous membranes, nose bleeds, sore throats and dry itchy eyes. These symptoms can then lead to the over production, in compensation, of mucous and mucosal swelling resulting in stuffy noses and mild upper respiratory infections.

The best way to optimize the absorption of water and electrolytes (so they don't just go straight through), is to drink a good VARIETY of fluids. Examples:

- Water (not ultra pure – natural spring waters or tap water are best)
- Sports drinks (with sugars and electrolytes)
- Soups
- Fruit juices
- Fresh fruits
- Hot chocolate
- Herbal teas (caffeine free)
- Milk shakes.

Avoid or cut back on caffeine (found in coca cola, tea and coffee) and alcohol – all are diuretics, so they to make you lose water.

If travelling for long distances or to an environment with increased risk of dehydration, try pre-loading by drinking plenty in advance in addition in route and ensure plenty of fluids are available on arrival. Thirst is a late indicator of dehydration - once signs and symptoms of dehydration occur, it is already too late.

General Recommendations for Fluid/electrolyte replacement:

Normal fluid needs	2-3 L / day
Training on the hill	250mL for each hour you are out – half water, half sport drink (polycose, fructose electrolyte mix)

Add ½ a litre for a typical 4 hr on hill session if:
- the altitude is greater than 2000m
- the weather is warm and sunny
- the humidity is less than 60%

4.9 Iron Status and Deficient States

(Incorporated from FIS Nutritional Guide for Cross Country Skiers)

Iron status has a major effect on an athlete's work capacity. The three key functions of iron are:

- Transport (haemoglobin) and storage (myoglobin) of oxygen
- Energy production and cell diffusion
- A functional role in the immune and central nervous systems.

Iron (Fe) deficiency is the most prevalent nutritional deficiency in females. It is a nutritional problem commonly reported in athletes undergoing heavy training and has been found in both male and female athletes from many different sports. Iron deficiency directly affects aerobic performance and recovery from multiple anaerobic sessions. It also affects low-end recovery rates such as active recovery sessions and resting overnight. Exposure to altitude may be particularly challenging for athletes with iron deficiency anemia. It has been shown that adaptation to altitude may be impaired under such conditions.

Iron deficiency is most commonly described as occurring in three stages. Stage I refers to the depletion of iron stores, which is characterized by low serum ferritin levels. Depleted iron stores have not been found to cause any dysfunction, although new data suggest that training adaptation may be improved when iron depleted athletes increase dietary iron intake through iron supplementation. However, the major concern of iron depletion is that it may progress to stage II - iron deficiency. In fact, some evidence exists that seasonal changes in training intensity and volume increases the risk for the development of stage II iron deficiency in female athletes. Abnormalities such as reduced work capacity and exertional fatigue are seen in stage II, which can be detected by low serum iron, reduced transferrin saturation levels and low serum ferritin. Stage III, iron deficiency anemia, is the most severe stage identified by a significant reduction in haemoglobin and haematocrit levels and clear signs and symptoms of reduced work capacity, delayed recovery, and greater susceptibility for illness.

4.9.1 Parameters for the Diagnosis of Iron Depletion, Deficiency, and Anemia

Stage	CHANGE IN IRON MEASURES	Serum ferritin (mcg/l)	Haemoglobin (g/dl)	Transferrin Saturation (%)
Normal iron storage	All iron status measures within reference range	> 30	> 12	20 - 40
Stage I Depletion	Low ferritin, normal to high serum transferrin saturation, normal haemoglobin and haematocrit	< 30	Normal range of hemoglobin	20 - 40
Stage II Iron Deficiency	Low ferritin, low transferrin, low serum iron, reduced transferrin saturation, free erythocyte protoporphyrin increases, normal haemoglobin	< 12	Normal range of hemoglobin	< 16 - 20
Stage III Iron deficiency anemia	Low haemoglobin, hypochromic, microcytic, red blood cells, reduced MCV, low haematocrit, low serum iron, low transferrin and transferrin saturation	< 10	< 12	< 16
Factors affecting measures: dehydration, inflammation, malignancy, infection, acute exercise in trained, intense prolonged exercise				

The prevalence of iron deficiency anaemia is low in the athletic population (3%), however, iron depletion occurs in 37% of athletes (both males and females) and is higher in endurance sports and in female and adolescent athletes regardless of type of sport and intensity of training. The prevalence of iron depletion (serum ferritin < 20 - 30 mg/dL) in cross-country skiers ranges

from 42 to 50%. These data, however, were reported in the early and late 1980s when iron supplementation was not used as frequently as today. Iron supplementation has become a common practice among elite athletes to prevent iron depletion and deficiency and to optimise training adaptation, especially at altitude. The lower prevalence of iron depletion found in the IOC-funded study was probably due to the high use of iron supplementation (74% of all study participants).

Maintaining iron homeostasis is a major problem for various athletes involved in regular exercise. The reported causes of iron deficiency are diverse and none fully explains this medical condition. Examples include excessive sweating, gastro-intestinal bleeding, mechanical trauma, and impaired iron absorption. Other most likely causes include heavy bleeding at time of menstruation, growth spurts, insufficient dietary intake of iron, and increased blood volume.

4.9.2 Treatment Recommendations

Treatment aims to normalise iron stores, and it takes approximately 6 weeks but can vary greatly from athlete to athlete depending on genetics, training load, altitude, and diet. Treatment consists of increasing the dietary intake of absorbable iron, iron supplementation, and when appropriate, attempts to reduce blood loss (e.g., menstrual loss). It is important to monitor ferritin levels while supplementing with elemental iron. Athletes should plan to re-check their levels each 6 to 8 weeks following initiation of the supplementation schedule.

An iron supplement that consists of 45 to 60 mg of elemental iron should be consumed with a glass of orange juice. As food and other multi-vitamin and mineral tablets may impair the absorption of iron, iron supplementation should be done 30 minutes prior to or after a meal. Because one of the side effects of iron supplementation is constipation, athletes need to be aware of consuming a high fibre diet with sufficient fluid intake during the supplementation period. If symptoms continue, athletes should try supplementing every second day.

The amount of iron potentially available from foods depends not only upon the amount of iron consumed, but the bioavailability and the composition of the meal. Iron in food exists in two forms: haem and non-haem iron. Haem iron predominantly comes from animal products, with 30 to 40% in pork, liver, and fish and 50 to 60% contained in beef, lamb and chicken.

The non-haem iron pool consists of iron from plant products such as vegetables, grains, fruit, as well as from the non-haem iron in meats, poultry and fish, fortified foods, and from liquid iron supplements. They all have limited availability.

Unique to non-haem iron is that the amount of absorbed iron can be modified markedly by components of food ingested concomitantly. Dietary factors, which increase the absorption of non-haem iron as much as four-fold, are vitamin C and haem iron present in meat, chicken, and fish. As the quantities of these substances in a meal increase, absorption also increases. If these enhancing products are not present in a meal, the absorption of non-haem iron is very low. Foods rich in the minerals that compete with iron for transport (e.g., zinc, calcium, and manganese) may decrease iron availability. In addition, there are a multitude of inhibitors that decrease non-haem iron availability. Table 10 provides a list of enhancers and inhibitors for iron

absorption. Absorption of non-haem iron in the iron-deficient individual may be as much as 20% when enhancers are abundant. A meal lacking enhancers and/or containing high levels of inhibitors, reduces non-haem absorption to 2%.

4.9.3 Factors That Enhance or Inhibit Iron Absorption

Iron Enhancers	Examples	Iron Inhibitors	Examples
Vitamin C rich foods	Citrus fruits and juices	Phytates	Cereal grains, legumes, soy products
Fermented Foods (low pH)	Miso, sauerkraut	Tannins	Tea, coffee, herb tea, cocoa
Haem Iron	Meat, fish or poultry foods	Calcium	Milk, cheese and yogurt
Organic acids	Citric acid and tartaric acid	Peptides from plant proteins	Soy protein, legumes, nuts
Alcohol	Beer, wine, liqueurs	Oxalic acids	Rhubarb, strawberries

Athletes, coaches, and sport scientists all want to discover the optimum haemoglobin and haematocrit levels for enhancement of performance. Unfortunately, we do not know the answer to these questions. Blood doping is illegal and risky to health, but has been prevalent in some sports (including cross- country skiing). Athletes and their support staff need to be cautious on ingesting large doses of supplemental iron, as excess iron stores (high serum ferritin) is a risk factor for heart disease, stroke, cirrhosis of the liver, and diabetes. It is, therefore, advisable for female Cross-Country skiers to keep serum ferritin levels between 35 - 200 mcg/l and to not use iron supplements without monitoring iron status.

4.10 The Female Athlete Triad

(Incorporated from FIS Nutritional Guide for Cross Country Skiers)

The Female Athlete Triad (TRIAD) consists of disordered eating, amenorrhoea (absence of menstrual cycles), and osteoporosis (low bone mass) and was first recognized in the early 1990s. Today, it is well established that each component of the TRIAD exists on a continuum and that subclinical or less severe manifestations of the TRIAD also affect performance and health in the female athlete. A recent IOC Statement regarding the Female Triad is available on the IOC website.

4.10.1 Screening and Assessment

Screening and assessment should be an integral part of each female athlete's physical evaluation before she begins training. If an athlete is identified with one component of the TRIAD she should be screened for the others. See *Appendix F of the FIS Nutritional Guide for Cross-Country Skiers* for details on screening; it also lists the signs and symptoms of anorexia nervosa and bulimia nervosa.

Warnings signs of disordered eating and the TRIAD can be best observed by those nearest to the athlete (coach, physical therapist, athletic trainer, teammate). Behaviour and physical characteristics consistent with anorexia nervosa are easier to identify than those for bulimia nervosa. It may be that certain characteristics surface during vulnerable times such as an abrupt change in training intensity. On the other hand, athletes with only 1 or 2 physical symptoms or behavioral characteristics may not necessarily have an eating disorder or the TRIAD, but the risk for the development certainly increases.

Once an athlete has been screened and identified as having one or more components of the TRIAD, it is essential that a treatment team referral system is in place for immediate action. The extent to which the TRIAD treatment team (physician, dietitian, psychologist, physiologist) will be activated depends on the severity of the disorders. The team physician may request further tests to rule out other underlying pathologies. It is generally not advised to withdraw the athlete from all team training and competition, although this depends on the severity of the TRIAD in a particular athlete and the impact on other team members this condition could have. Remaining a part of the team with a modified training plan and coherent treatment activities may be best for the athlete. Return to training or competition depends primarily on treatment success and is determined by the physician. Involving other staff or the coach may be advisable not only because of the athlete-coach relationship but also because the treatment process can be a great learning process for those involved. Keeping close contact with the athlete may be a unique opportunity for the coach-athlete relationship, particularly when trigger factors of disordered eating are abundant (see below for examples).

4.10.2 Prevention

For staff, working with female athletes, it is essential to understand trigger factors associated with disordered eating.

Trigger Factors of Disordered Eating

- Sudden increase in training load (volume or intensity)
- Early start of sport-specific training
- Early dieting behaviour
- Traumatic events (loss of a loved one, an injury, or a loss of coach).

Pressure to reduce body weight or fat has frequently been used to explain the development of disordered eating in an athlete. However, it may be more to do with the ways in which this message is communicated to the athlete by coaches, peers, and scientists (e.g., the words used, the situation chosen, and whether the athlete was offered help in achieving weight loss goals). Some female athletes may also self-impose their own goals to lose weight based on comparisons to non-athletic females, such as friends outside of their sport, or general societal ideals. Another important factor seems that athletes are often pressured to lose weight quickly or within a certain time period. This may lead to frequent weight cycling, which represents a further trigger factor of disordered eating. If weight loss is necessary in an athlete, the off-season with the transition into the main preparatory season should be chosen for this process. Weight loss strategies should not be handled by the athlete alone but should be in collaboration with a dietitian, especially when weight loss goals need to be achieved during high volume/intensity training.

Prevention of the TRIAD, ensuring a safe and successful training environment, should be a high priority for those working with female athletes. Education regarding the TRIAD is a successful tool to decrease its prevalence. Education should be directed twards athletes, coaches, and parents, and should centre around eating disorders and issues such as growth and development, the relationship between body weight, composition, health, and exercise performance, and fueling the body for training and competition. It should place emphasis on strength and fitness rather than thinness, and address psychological aspects of training young female athletes. Messages

such as “winning at all cost” should not be part of a team’s philosophy. Close monitoring of dietary patterns, menstrual regularity, injuries, and illnesses, in addition to changes in performance and skill, mood state, resting heart rate, and biochemical markers are key.

4.10.3 Glossary of Terms Related to The Female Athlete Triad

The Female Athlete Triad	Syndrome of disordered eating, amenorrhoea, and osteoporosis first identified in 1992
Eating Disorder	Anorexia nervosa, bulimia nervosa, and eating disorder not otherwise specified
Disordered Eating	A wide spectrum of abnormal eating patterns that may eventually endanger an athlete’s health and performance
Energy Balance	Energy intake - energy expenditure = 0
Low Energy Availability	Dietary energy intake below exercise energy expenditure
Energy Restriction	Attempt to decrease caloric intake to maintain a low weight
Eumenorrhea	Regular menstrual cycle shorter than 35 days
Amenorrhea	Primary: onset of menstruation after the age of 16 years despite secondary sex characteristics; Secondary: loss of 3 consecutive menstrual cycles or fewer than 3 cycles per year
Oligomenorrhea	Irregular menstrual cycles: cycles longer than 36 days or less than 6 to 9 cycles per year
Osteoporosis	Low bone mineral density (< 2.5 standard deviations below the mean for young, healthy adults according to World Health Organisation)
Osteopenia	Low bone mineral density (1 - 2.5 standard deviations below the mean for young, healthy adults according to World Health Organisation)
Stress Fracture	A break in a bone, usually small, that develops because of repeated or prolonged forces against the bone

5. Special Recommendations for Youth and Children

5.1 General Aspects - Physical, Physiological and Psychological

Officials, coaches, teachers and parents must be aware of the individual variations that occur in the physical, physiological and psychological capacities of young athletes. Enormous changes in height, weight, strength and endurance occur through childhood and adolescence, and potential for sports performance also changes. Temporary changes in balance and coordination occur during puberty, and the limitations on performance must be understood and accepted. Clearly there may be enormous disparity in physical size among children of the same age, the disparity being particularly evident amongst adolescent boys. All these factors must be considered when defining the limits of participation and competition.

- Take good care of the young athletes! Enjoyment and safety are crucial
- Any child or adolescent complaining of pain, tenderness, limitation of movement or disability should be promptly referred to an appropriate specialist
- Pre-existing conditions (e.g. asthma, diabetes) merit particular care and concern; participation should be encouraged within the limits of the particular condition
- All exercise should be preceded by appropriate warm-up
- The frequency, duration and intensity of exercise in young athletes should be monitored. Damaging repetitions should be avoided

- Athletes should be encouraged to respect the rules that are in place with regard to their safety. Equipment (height of bindings/plates, length and radius of curvature of skis, and so on), protection, and the variables of the competition itself (terrain, length and type of course, vertical drop) are modified according to the size and maturity of the young athletes, to protect them as far as possible from injury
- Sport-specific protection should be worn when recommended. In particular, back protectors are recommended for children of all ages in all disciplines. Helmets are compulsory in all disciplines
- Particular care should be taken in relation to climatic conditions – sun, altitude, cold, wind-chill. A relatively high surface area per unit mass renders the younger athletes more liable to heat loss, and they become therefore more susceptible to cold injury and hypothermia
- Nutrition is of crucial importance during the growth period of an athlete. Watch for evidence of eating disorders (prevalent in adolescence), and ensure adequate intake of nutritious foods generally, as well as prior to exertion, and particularly at times of rapid growth spurt
- Ensure adequate hydration during exercise
- Monitor the growth and development of the athletes (height, weight, age at menarche, and so on). Coaches should develop talent markers, and ensure that talented late developers are not left out of the system
- Take full advantage of developmental 'windows of opportunity'. For example, agility, balance, co-ordination and speed are best learned at ages 6-9, more sports specific skills at ages 10-12. Encourage participation in a variety of sports, both across the various snow sports and in other areas
- Recognise and encourage the major motivational factors in order to keep young athletes in the sport – winning is often the least important factor. Surveys have shown that the leading motivational factors are to have fun, to improve skills and learn new ones, and to be with friends and to make new ones; family participation and enthusiastic leadership are also important influencing factors. Programmes should be adjusted to encourage these aspects of the sport.

5.2 Management of Musculo-Skeletal Conditions

Injuries may differ from those in adults due to the differences between adult and growing bone, in particular because of the presence of growth cartilage.

- The junction between epiphyseal (cartilaginous growth) plate and the metaphysis is vulnerable to distortion, particularly to shearing forces
- Tendon attachment sites (apophyses) are relatively weak and are predisposed to inflammation and avulsion injuries
- The shaft (metaphysis) of the long bones is more elastic, and incomplete 'greenstick' fractures occur
- The articular cartilage is thicker in children and adolescents and can remodel.

Fractures in young athletes fall into three groups:

- **Metaphyseal** fractures – the treatment of greenstick fractures is usually simple immobilisation. Full fractures of other types should be managed as for adults. Healing occurs more rapidly than in adults
- **Growth plate fractures** – these are of particular concern because of the dangers of interruption of the normal growth process. X-rays of both limbs should be taken for comparative purposes. Careful anatomical reduction is crucial, especially if the joint surface is involved. However, long term damage may result even if reduction is accurate
- **Avulsion fractures** – for example a tear of the tibial attachment of the anterior cruciate ligament is more commonly seen in children than a tear of the ligament itself. Surgical reattachment may be required, depending on the site of the injury.

5.3 Apophyseal Injuries and Inflammation

Injuries of this type used to be considered rare in children but may account for up to 30-50% of sports injuries seen in children. Injuries of the various non-articular apophyses appear to result from repeated tensile stress – i.e. they are injuries that may be related to overuse. They include Osgood-Schlatter's disease (osteochondritis at the growth plate of the tibial tuberosity), Sinding-Larsen-Johansson disease (a similar condition at the proximal end of the patellar tendon at its junction with the distal pole of the patella) and Sever's disease (apophysitis of the insertion of the Achilles tendon into the calcaneum).

The basis of treatment and rehabilitation consists of the following:

- Stretching of the muscle-tendon unit
- Local application of ice
- Anti-inflammatory medication
- Alteration of activities to allow safe participation whilst reducing the stress at the apophyseal site.

Rest is known to reduce pain, but there is no evidence that it accelerates the healing process.

5.4 Additional Special Considerations

Pain in a young athlete may be due to injury caused by trauma, but it is important to rule out other conditions.

For example:

1. Hip pain
   - Perthé's Disease (prevalent at ages 4-10)
   - Slipped femoral epiphysis (most common during the age range 12-15 years).
2. Knee pain
   - Osgood-Schlatter disease
   - Sinding-Larsen-Johansson disease
   - Hip pathology – examination of the hip joint is mandatory in the assessment of any young athlete presenting with knee pain.

5.5 General Child Welfare

Good practice guidelines should be defined and national policies for protection and welfare of children (i.e. athletes under the age of 18 – this definition may vary between nations) developed. Policies should include sections on good practice, and on recognition of abuse occurring both within and outside the sport.

Abuse may take one or more of four forms - physical, emotional, sexual or neglect.

Child abuse in sport can range from inappropriate touching when demonstrating techniques, inappropriate training methods that give excessive physical loads to children and physical or emotional aggression when disciplining a child, through to sexual assault and sexual intercourse with a minor.

It is very important to recognise the general signs and symptoms that may become apparent in a young athlete who has been subject to bullying – these may range from an unexpected drop in performance, behavioural changes such as depression and loss of concentration, to frequent loss of possessions. Bullying may take the form of physical or verbal/emotional abuse.

All forms of abuse may lead to long-lasting problems for the child, and recognition and appropriate management (which may include referral of the case to police or social services) is essential. Mechanisms for reporting concerns must be set in place.

Vetting procedures introduced as part of national guidelines may have the added benefit of preventing access to children by individuals known to have abused children in the past.

6. Team Physician, Drugs and Aspects of Medical Practice (Legal Conditions Related to Travelling with Drugs)

Actions of the team physician are subject to national and local laws, rules and regulations according to respective medical boards. This includes the use and carriage of medications.

Team physicians are encouraged to contact the event medical director to clarify national/local/state regulations.

7. Incident Management

The main goal in addressing any accident/injury is to save life and limb with transport to a medical facility as soon as possible. This is often referred to as “Load and Go”. The extent of interventions will vary depending on the location of the incident, as well as availability of medical support and transport capacity. The time for required to transport the injured athlete to nearest trauma centre, the type and severity of the injury are the critical decisive factors with regard to pre-hospital care. If the time anticipated for travel to a hospital/trauma center is less than 20 minutes, the focus of the treatment is stabilisation of life-threatening conditions and transport. If transport to a hospital is expected to take longer, a more thorough examination is appropriate.

7.1 Scene Assessment

7.1.1 SAFETY - Official Clearance to Enter Course or Field of Play

Medical Staff will be officially notified by course officials, event medical staff, TD or Coaches with radio communication to know when it is safe to enter the course and proceed to the incident. At NO time will any medical personnel ascend/descend to the incident scene until the course/field is closed and cleared. Failure to regard this may result in severe injury to the medical support, athlete or other personnel on course.

7.1.2 Scene Assessment

When first approaching an incident, the caregiver should survey in general what has occurred which is referred to as the scene assessment. Typical areas of note should include:

- Safety at the scene – it must be secured. What environmental hazards may be present? An assessment should be made regarding the location of the patient, weather, visibility, ongoing race, course hold, avalanche danger, steep/ice terrain, entanglement, etc
- One or more patients – assess need for additional assistance
- Appropriate transport mechanisms (ski patrol/ambulance/helicopter) should be called as soon as possible once scene evaluated
- Mechanism of injury (MOI) – what has likely happened
- Obvious indications of injury - responsive/unresponsive, talking/breathing, bleeding, limb deformity, etc
- If the patient is to be transported to hospital/trauma centre, the facility should be alerted as soon as possible to the patient's general status/vital signs/responsiveness, name/age/sex, visible or probable injury, mechanism of injury, time of accident and expected arrival time at hospital and interventions completed in the field.

7.2 Patient Assessment

Generally, on approaching the sight of an accident, the scene assessment is automatically done on arrival and a general impression of the patient(s) is formed. Care should be given as soon as possible for any life-threatening conditions, remembering to address only those conditions that can be dealt with in the environment to stabilise and prepare for transport to the trauma centre as quickly as possible. Typically, the patient assessment can be viewed in two steps - Primary (Rapid) Survey and Secondary Survey.

7.2.1 Primary Survey

- Assess Responsiveness – assume possible spinal injury; stabilise head by placing hand on forehead while talking to the patient to assess responsiveness. If patient is unresponsive, assess responsiveness to verbal stimulus by observation of eyes opening to verbal stimuli and responds in an intelligible manner. If patient remains unresponsive or answers in an unintelligible manner, assume serious injury. If patient does not respond to verbal stimulus, try response to a painful stimulus by pinching the earlobe
- ALWAYS assume spinal injury, especially to the cervical spine in unresponsive or altered responsive patient. Stabilise cervical spine and maintain stabilisation throughout assessment and transport.

- Assess/Stabilise Airway, Breathing and Circulation (ABC's)

  1. **A**irway - If normal breathing, wait for help to stabilise head/neck to move patient to supine position. If not breathing, quickly move patient to supine position to open the airway. The most effective method is the head tilt-chin lift technique. Test for gag reflex prior to inserting an oral or nasal airway to maintain open airway. If patient gags, do not insert airway
  2. **B**reathing - If patient is not breathing or breathing is ineffective, begin rescue breathing. Rescue breathing should be at a rate of one breath per 5 seconds (12/min) and each breath should last for 2 seconds. As soon as oxygen is available, begin high-flow oxygen at 10 L/min or more using a non-rebreathing mask
  3. **C**irculation – Assess carotid pulse. Be sure to check for up to 45 seconds, particularly in a patient with hypothermia to not miss a very faint pulse. If pulse is present and there is no spontaneous breathing, continue rescue breathing. If pulseless, begin external CPR - chest compressions at 60/min pausing each 15 for 2 rescue breaths. Note that CPR done at altitude can require additional individuals to continue compressions adequately for appropriate perfusion
  4. AED - Automatic External Defibrillator – A patient in cardiac arrest, should have access to AED use as soon as it is available and safe to do so. Use of most AED's involves the following simple steps:
     - ➔ Confirm absence of circulation - No Pulse for >10 secs
     - ➔ Wipe Chest Dry
     - ➔ Attach pads to chest – 1 on upper right chest and other on lower left side
     - ➔ Plug Electrode Cable into AED
     - ➔ Let AED "Analyse" rhythm or push "Analyse" button
     - ➔ MAKE SURE EVERYONE IS CLEAR
     - ➔ Deliver Shock to Patient if Indicated by AED.

- Supplemental Oxygen

  1. Without adequate oxygen, insufficient oxygen reaches the cells of the body. Supplemental oxygen can improve the delivery of oxygen, relieve pain and make breathing easier.

Rescue Breathing	(	delivers 16% oxygen
Resuscitation Mask	(	delivers 16% without Oxygen 50% with supplemental Oxygen
Bag Valve Mask	(	delivers 21 % without Oxygen 100% with supplemental Oxygen

- Management of Severe Bleeding (Haemorrhage)

  1. Bleeding that is spurting or rapidly flowing from any wound can be as life threatening as respiratory or cardiac arrest. Control the loss of

blood as quickly and effectively as possible by applying direct pressure to the wound site. This may involve cutting away clothing. Arterial tourniquets are generally not necessary but, if used, should be released every 5 minutes while continuing with the direct pressure to evaluate the need for the tourniquet.

7.2.2 Secondary Survey

- Rapid Total Body Survey once ABC's stable
  1. Head – look for any lacerations, bleeding, contusions, pupil response, nose, ears, mouth. Palpate skull & face for defects or deformities
  2. Neck – with stabilisation maintained, palpate for tenderness
  3. Chest – observe for any abnormalities in breathing, inspect for wounds and palpate for tenderness
  4. Abdomen/Pelvis – look for any irregularities, palpate for tenderness
  5. Extremities – observe for deformity, check circulation, motion, sensation (CMS)

- Disability – evaluate of neurological status including Glasgow Coma Scale. Track the level of consciousness and responsiveness from the time of the accident until transported

- Exposure – a major concern in the typical environment of skiing and snowboarding is hypothermia. Cover the patient with blankets and clothing as soon as possible. Remove the patient from cold surroundings as soon as possible. Clothing should be removed ONLY if patient is in warm surroundings.

7.3 Shock

The circulatory system of the heart, blood vessels and blood, delivers oxygen to the cells of the body. The failure of this system to deliver oxygen rich blood and perfuse the tissues is what is termed "Shock". It is a vague term used to describe how the body responds to decreased circulation (low blood pressure) with subsequent lack of oxygen delivery to the tissues and in particular to the brain.

7.3.1 Symptoms of Shock

- Pulse rate is rapid
- Blood Pressure is low
- Respirations are increased and shallow
- Skin is cold, clammy and bluish (sometimes difficult to assess in environments of skiing and snowboarding)
- Increased restlessness, agitation
- Delayed capillary refill (circulation).

7.3.2 Supportive Treatment Awaiting Transport

- ABC's
- Control bleeding, stabilise fractures

- Maintain Open Airway
- Provide Supplemental Oxygen
- Insulate from environment to prevent hypothermia
- Intravenous fluid support if available
- Pain Control if available and ventilation good.

7.4 Transport, Communication and Documentation

All treatment occurring in the field should be documented and communicated during transportation. The patient must be continually monitored regarding level of consciousness, respiration and circulation. Cardiac monitoring, oxygen saturation and blood pressure if available, should be monitored and recorded at regular intervals throughout transportation. Timeline of treatment should be written as well as communicated to the trauma team receiving the patient in the hospital.

7.4.1 Radio Communication of Status – Radio Soap

Situation, Location, MOI, History

Observations and initial vitals

Assessment and possible problems to expect

Plan for evacuation and additional support/equipment needs

8. Environmental Issues and Conditions in Ski and Snowboard Sport

8.1 Altitude Acclimatisation and Altitude Illness

In training for skiing and snowboarding athletes can be exposed to “moderate” to “high" altitudes, (5-12,000 ft or 1550-3660 m). Altitude illness syndromes are rarely encountered under 7000 ft (2100m), and are almost universal over 14,000 ft. if ascent is rapid. Multiple physiologic events occur to produce symptoms. At 8000 ft (2440m), the “normal” PaO2 is 60 with an arterial saturation of 92%. Ventilation increases producing a respiratory alkalosis for several days, plasma volume decreases 10-15 % within hours but fluid may third space producing peripheral edema. Eventually red cell mass and haematocrit increases, sometimes above the allowed limits. Resting HR is higher yet cardiac output drops due to lower stroke volume. Acclimatisation occurs gradually with 80 % occurring in 10 days. The risk of acute altitude syndromes is highest in those first few days.

8.1.1 Categories of Altitude Illness

There are 3 main altitude syndromes of concern:

Acute Mountain Sickness (AMS) is the most common and is characterized by global dull headache in conjunction with one or more of: GI distress, fatigue, lightheadedness, sleep disturbance and malaise. Symptoms rarely present in less than 8 hr after arrival, usually occur after the first sleep period, and peak at 72-96 hr. Headache is worst in the early morning after nocturnal desaturation. Dyspnoea is universal at altitude so is not generally part of the diagnostic criteria. Additionally, cognitive function may be impaired. Prior

history of altitude intolerance portends repeat problems.

High Altitude Pulmonary œdema (HAPE) is characterized by progressive dyspnea and cough with eventual rales and wheeze. Low grade fever, < 100.00 (37.8) is common, patient will appear dusky and cyanotic and severely ill people will have pink frothy sputum. CXR shows bilateral “fluffy” infiltrate, usually greater on the Right.

High Altitude Cerebral œdema (HACE) is much less common, but may be catastrophic. Ataxia, anorexia, vomiting, confusion, and eventual altered LOC are seen. Head CT may be normal early on, with no evidence of œdema but MRI will be markedly abnormal.

8.1.2 Prevention Strategies

Slow ascent, for example stopping at 5000 ft for 1 overnight, has been shown to prevent about 50 % of the problems in people with a history of mild altitude illness. In non-athletes, Acetazolamide 125 mg bid or dexamethasone are useful if begun 24 hr. before ascent and continued for 3 days after, BUT neither medication is permitted by WADA in athletes. Nifedipine XL 20 mg Q8Hr can also be used and in NON hypertensive individuals does NOT cause hypotension. For all, extra attention to hydration is mandatory and will also help prevent syncope and thromboembolism, both of which are seen more frequently at altitude. NSAIDS have been evaluated for prevention and found to not be useful.

8.1.3 Treatment Recommendations

Once symptoms have begun, Nifedipine can still be used. Oxygen, if available, at 2-3 L/m, especially at night can be all that is required. Acetaminophen or NSAIDS for headache and extra fluids are helpful but the fluids may worsen the peripheral edema. The most effective treatment is descent; sometimes only 1000 ft is enough. Activity should be light, complete rest exaggerates the tendency to hypoventilate. Full training can resume when the symptoms are completely resolved.

8.2 Alterations in Circadian Rhythm, Athletic Performance & Jet Lag

Sporting competitions take place around the World, frequently with little time for adjustment by the athletes between each event. Snow sports require a nature specific environment in which human intervention is severely limited. Skiers and Snowboarders, depending on where they live, must travel to the areas that have snow for training as well as competitions. Competitions span continents, or are intercontinental in nature thanks to modern air travel and the universal appeal of sport. This usually means travelling by jet rapidly through several time zones for the athletes and coaches, and enduring the concomitant displacement in time.

The human body has not evolved to adjust to the rapid changes produced by jet travel. The results of this rapid time zone change are called "jet lag". The causes of jet lag revolve around the adjustments the human body makes to the normal variations produced by the 24-hour cycle of daylight. These adjustments are called circadian rhythms. Several important physiological processes are time dependent and vary with the time of day, or the light-dark cycle present in a 24-hour period. Jet lag produces a misalignment of internal circadian rhythms (or our internal clock), caused by variations in timing of the light dark cycle of the new time zone when compared to the one just left. Body rhythms of important processes and hormone levels are still functioning in the temporal sequence dictated by the light-dark cycles of the initial

time zone. The symptoms of jet lag include severe periodic fatigue during the day, disorientation and confusion, inability to sleep at night, large variations in athletic performance, and irritability. The severity of the effects of jet lag are individual in nature, and interfere with an athlete's ability to perform to varying degrees.

One example of important physiological mechanisms affected by circadian rhythm changes involves normal sleep patterns. The brain has "built-in" systems that determine the sleep/activity cycle for all humans. The pineal gland in the brain constantly senses variations in light intensity throughout the day. It begins producing the peptide melatonin early in the evening and, in adults, production peaks around 10:30 at night. Increased concentrations of melatonin in the brain has been shown to induce sleep and to also lower body temperature slightly less then 1° C. Athletic performance has been linked to body temperature. Lower body temperatures correlate with decreased muscle power, strength and joint flexibility. When the highest brain production of melatonin is displaced several hours, the effects of lower body temperature and the drowsiness of associated with the desire to sleep cause decrements in athletic performance.

Unfortunately, the latency for temporal adaptation to changes in circadian rhythms is considerably longer then the alteration in the time zone produced by jet travel. A useful rule of thumb is one day in the new time zone is needed for a one-hour correction in circadian rhythm caused by the time displacement. Therefore, for example, a trip from the east coast of America to the European continent involves a 6-hour time shift. A good approximation is that it will take six days for complete circadian rhythm adaptation. Formally, it was thought that travel from west to east was more debilitating to athletic performance then travel from east to west. The latest scientific evidence indicates that this is not true. Serious impediments to maximal performance exist from jet travel regardless of direction of travel.

Another important determinant of peak athletic performance that is circadian rhythm sensitive is adrenal gland production of cortisol. The adrenal glands are located in close approximation to the kidneys, and produce several important hormones associated with athletic performance. Cortisol levels reach their peak in the morning. Cortisol increases mobilisation of lipid stores, and enhances the action of other hormones that are involved in increased glucose production which fuels muscle activity. Peak athletic performance has been closely linked to increased cortisol production. Other important hormonal systems that affect athletic performance, such as growth hormone production by the pituitary gland, are closely linked to circadian rhythm disturbances produced by jet lag.

Clearly, these circadian rhythm disturbances must be dealt with in order to ensure peak athletic performance. The question is how. There have been many attempts to alter sleep patterns before undergoing jet travel. These involve everything from artificially altering the athlete's light dark cycle to ingestion of sleep aids and/or stimulants. The supposition being that this will help ameliorate the effects of jet lag. Unfortunately, these attempts have met with little success. Impositions on an athlete's time caused by external circumstances such as externally imposed hours for training and time commitments for other activities are dictated by the light/dark cycle of the home time zone and impossible to change.

Even if the sleep wakefulness cycle could be successfully changed several days before jet travel, other important circadian rhythm driven systems (as outline above) are not sleep linked and temporal displacement would still produce serious decrements in peak athletic performance. Alterations in sleep patterns, eating times and training times several days before jet travel will meet with little success. The only

sure way to deal with jet lag is to allow the athlete's circadian rhythms the necessary time to readjust to the new time zone. The one-hour adjustment in circadian rhythms per day for each time zone shift is an approximation and has some individual variation; however, it is a good point to start since it is the adjustment formula that is true for the largest number of people. A sufficient number of days of advance travel to allow readjustment is not always possible because of scheduling problems, but cognizance of time displacement problems by competition organisers and coaches would help alleviate the jet lag problem.

Suggestions for further reading:
Lemmer, B. et al. Jet lag in athletes after eastward and westward time-zone transition. Chronobiol Int. 2002 Jul;19(4):743-64.

Waterhouse et al. identifying some determinants of "jet lag" and its symptoms: a study of athletes and other travellers. Br J Sports Med. 2002 Feb;36(1):54-60.

8.3 Hypothermia and Recommended Guidelines

Ski and Snowboard competitions and training occur in environments where hypothermic reactions can develop. Hypothermia occurs with the body cannot generate or conserve enough heat to overcome losses due to exposure in the environment. Exposure causing heat loss can be due to temperature, humidity or wind chill factor. The impact that the wind chill has on lowering the relative temperature has often been overlooked in winter competitions, which has lead to severe cases of hypothermia.

Acute Hypothermia – refers to a sudden drop in body core temperature within a few hours. This generally happens when the body has been submerged in cold water with resultant wet clothing or in a change in the environment suddenly where the ambient temperature drops rapidly possibly in combination with precipitation and increased wind.

Chronic Hypothermia – refers to a gradual drop in the body core temperature following several hours of exposure to environmental conditions not considered extremely severe simply by not paying proper attention to basic prevention considerations.

8.3.1 Prevention – Heat loss occurs through conduction, convection, radiation and evaporation. Most cases can be prevented by attention to minimizing heat losses through these mechanisms by choosing appropriate clothing, staying dry, avoiding overexertion and maintaining adequate hydration and nutrition.

8.3.2 Treatment – general principles apply for all levels, the individual must be removed form the environmental exposure, remain calm and in recumbent position, remove any wet clothing and insulated to prevent further heat loss.

8.3.3 Specific Recommendations for Evaluation/Treatment of Hypothermia

Mild Hypothermia – core body temperature of 32-35 C (90-95 F).
Signs/Symptoms: generally aggressive shivering, poor fine motor coordination, mild confusion, lack of judgment, sluggish thinking. Slurred speech and ataxia are definite signs of hypothermia.

Treatment: most individuals at this level can re-warm themselves though shivering to create heat production as long as exposure can be protected. Fatigue from energy required for shivering may inhibit recovery over time. Adequate hydration and nutrition utilizing warm high-energy drinks will help with energy requirements. Warm water bottles may also be used for re-warming – avoid direct contact with skin. Exercise can increase heat production but also may cause "afterdrop" – a drop in core body temperature. Thus, mild exercise should only occur after 45-60 minutes of shivering in a protected environment.

Moderate Hypothermia – core body temperature of 28-32 C (82-90 F)
Signs/Symptoms: as the core temperature drops, shivering becomes progressively inhibited and the individual is unable to re-warm themself. Mental status changes become apparent, the patient becomes apathetic, muscular rigidity develops; then the pulse slows and respirations decrease.

Treatment: shivering is non-apparent thus, spontaneous re-warming does not occur. Use of body to body contact may help as will application of warm water bottles. Oxygen that is warmed and humidified can also be helpful.

Severe Hypothermia – core body temperature < 28 degrees C (82 deg F).
Signs/Symptoms: the patient can be conscious with fixed dilated pupils, be rigid with impalpable pulse, no respirations and yet is not dead. A person cannot be considered dead until warmed with no respirations and no pulse.
Treatment: Aggressive methods of re-warming can trigger lethal arrhythmias and thus patient should be handled as carefully as possible and kept in horizontal position to avoid triggering ventricular fibrillation. Cardiac monitoring is necessary. Rapid central re-warming with humidified oxygen should be started.

8.4 Frostbite Evaluation/Treatment

Frostbite refers to a localized freezing of cells and tissue death. There are progressing levels of tissue death with specific treatment recommendations. Always maintain adequate hydration and nutrition for metabolically active tissue healing. Use Ibuprofen 400mg prior to spontaneous thawing for inhibition of thromboxane production to minimize cellular damage.

Frostnip – refers to a superficial level of frostbite where a small area of skin turns white but can rapidly return to normal with warming. There is no special treatment required.

Partial Thickness (superficial layer) – refers to an area of skin exposed that is pale, cold and numb however, the underlying tissue is soft and pliable. This can be re-warmed with skin-to-skin contact and rapid re-warming. Do not expose to excessive heat for re-warming. A few blisters may develop in the re-warming process. Avoid refreezing throughout the healing process. Management of blisters as in treatment of superficial burn.

Full Thickness (deep tissue) – refers to involvement of deep tissues being involved such as muscle, tendons and bone. Area is hard and non-pliable. These patients should be evacuated immediately with area protected from environment with dry, insulated material. In controlled setting, rapid re-warming with water bath (40-42 deg C) where body part is fully suspended in water bath. Avoid excessive heat and treat

pain with analgesics/narcotics. Hemorrhagic blistering will occur. Treat to minimize likelihood of development of infection.

Prevention:

- Minimise exposure of skin to cold environment – keep head, face and neck covered
- Avoid tight fitting boots that inhibit circulation for re-warming
- Stay dry and avoid skin-fluid contact
- Stay well hydrated and have adequate caloric intake for maintained metabolism.

9. Anti-Doping

9.1 General

At the FIS Congress held on 30th May 2008 in Cape Town (RSA), FIS adopted the revised (2009) World Anti-Doping Code (the “Code”). The Anti-Doing Rules are compiled and implemented in conformance with FIS's responsibilities under the Code, and are in furtherance of FIS's continuing efforts to eradicate doping in the sport of Skiing. They are complemented by other FIS documents and WADA International Standards addressed throughout the Rules.

Any Anti-Doping programme seeks to preserve what is intrinsically valuable about sport. This intrinsic value is often referred to as "the spirit of sport"; it is the essence of Olympism; it is how we play true. The spirit of sport is the celebration of the human spirit, body and mind, and is characterized by the following values:

- Ethics, fair play and honesty
- Health
- Excellence in performance
- Character and education
- Fun and joy
- Teamwork
- Dedication and commitment
- Respect for rules and laws
- Respect for self and other participants
- Courage
- Community and solidarity.

Doping is fundamentally contrary to the spirit of sport.

9.2 Description of FIS Anti-Doping Activities

The FIS Medical Committee is responsible for advising the FIS Council on anti-doping education and preventative programmes, which includes:

- developing anti-doping education and preventative programmes which can be used by National Ski Associations;
- reviewing the WADA Prohibited List in relation to specific knowledge about the FIS disciplines;
- advising on sports-specific information in regard to characteristics of disciplines and types of performance-enhancing substances.

Responsibilities for other aspects of FIS Anti-Doping activities, such as the

organisation of Testing, etc. are defined in the relevant Articles of the FIS Anti-Doping Rules.

The FIS Anti-Doping expert is responsible for developing and overseeing the testing programme.

Links for further information:

- The FIS Anti-Doping Rules can be downloaded from the FIS website, Anti-Doping section
- The 2009 WADA Code can be found on

  http://www.wada-ama.org/rtecontent/document/code_v2009_En.pdf
- The WADA International Standards can be found on

  http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=268

10. Event Injury Record – FIS Injury Surveillance System

10.1 Injuries in Skiing and Snowboarding

As we know, injuries happen in all skiing sports, most often in alpine skiing and snowboarding. The severity of injuries varies, but knee and head injuries are of particular concern in all disciplines, as are wrist fractures and other upper extremity injuries in snowboarding. Such injuries often lead to a long-time absence from sports, and increase the risk of chronic problems, permanent disability, or even death in the case of serious head and neck injuries.

Effective prevention depends on comprehensive information on risk factors and injury mechanisms. Unfortunately, our current understanding is limited and consequently, we have a limited ability to suggest effective preventive measures.

10.2 FIS Injury Surveillance System

To reduce the number of injuries suffered by top level athletes, FIS has established an Injury Surveillance System (ISS) for all FIS disciplines. The FIS ISS is led by the Oslo Sports Trauma Research Center and supported by DJ Orthopedics, a global medical device company specialising in rehabilitation and regeneration products.

The main objective of the FIS Injury Surveillance System is to provide reliable data on injury trends in international skiing and snowboarding at the elite level. Specific objectives include:

- Monitoring injury patterns in all FIS disciplines
- Monitoring trends in injury risk with time
- Providing background data for in-depth studies of the causes of injury for particular injury types in specific disciplines, e.g. knee and head injuries in alpine skiing and snowboarding.

The ultimate objective of the FIS ISS is to reduce injury rates through changes in rules and regulations, equipment or coaching techniques based on data provided by the project.

10.3 Gathering the Data

The FIS ISS will be developed based on the injury reporting system already established by the FIS Medical Commission, and commenced data collection from the beginning of the 2006-2007 winter season. Injury and exposure data for the FIS ISS will be collected from all FIS competitions.

For the purposes of the FIS ISS, a reportable injury is defined as:
***an injury that occurs during competition or official training and requires attention by medical personnel*.**

A detailed Injury Report must be complete for each injury. This report will include:

- event information
- personal information
- type of injury
- body part injured
- severity of injury
- injury circumstances
- course conditions
- weather conditions
- wind conditions
- availability of video recording of the injury.

If multiple injuries result from the same accident, the report should include information on all injuries. An example would be a skier who suffers a concussion, fractured ribs and a punctured lung from the same fall.

The Injury Reports are collected by FIS for medico-legal purposes and the ISS protocol will be submitted to the National Committees for Research Ethics in Norway. All data entered into the ISS will be anonymised, and the identity of injured athletes will be protected.

10.4 Roles and Responsibilties – Who Needs to Do What?

- The event Technical Delegate (TD) needs to collect the Injury Reports for all injuries occurring during competition or official training at their event. TDs at World Cup events should e-mail or fax the Injury reports from their events to the FIS administration within three days. TDs at other events can send them by regular mail
- To obtain the technical medical information to complete the Injury Reports, the TD should enlist the help of a medically trained individual (event medical supervisor, physician, physical therapist, athletic trainer, ski patrol), whenever available
- Event TDs should also check whether tapes or videos were taken of the injury by team coaching staff or others, and provide information on contact details to obtain a copy of the injury videotapes
- FIS Administration will check the Injury Reports for completeness of the event and personal information
- The Oslo Sports Trauma Research Center will monitor the injury data for World Cup events on a continuous basis and actively contact TDs, team staff or athletes, to obtain missing information. It will also collect exposure data through

the FIS results database

- Oslo Sports Trauma Research Center will also validate the Injury Report data by comparison with data obtained through other sources, such as coach/athlete interviews and team medical personnel records
- After the end of the season, the Oslo Sports Trauma Research Center will cross-check video recordings with the injury reports and analyse them to describe the mechanisms of injury.

10.5 FIS ISS Steering Committee and Reporting

A Steering Committee has been established with three members, including the chair, appointed by FIS and the other two by the Oslo Sports Trauma Research Center (OSTRC). The Steering Committee consists of Eero Hyvärinen, FIS (chair), Hans Spring, FIS, Hubert Hörterer, FIS, Roald Bahr, OSTRC and Stig Heir, OSTRC. The Steering Committee meets twice yearly to report on the ISS and related research activities. The Steering Committee also handles requests from other research groups for access to data from the ISS.

Reports are presented to the FIS Medical Committee and other relevant FIS committees annually for review. The reports will serve as the basis for a risk management process, whereby the data are used to identify injury risk in FIS competitions and ensure that every possible effort is made to protect the health of the athletes.