

Selected Issues in Injury and Illness Prevention and the Team Physician: A Consensus Statement

DEFINITION

Prevention of injury and illness associated with athletic activity is one of the roles of the team physician (see (1) and (3)). This process involves understanding the pathophysiology of the injury or illness, evaluating the known risk factors that influence the incidence of injury or illness, implementing interventions to minimize the influence of the risk factors, and recording the outcomes of the interventions.

GOAL

The goal of this document is to help the team physician improve the care of the athlete by understanding and practicing methods of injury and illness prevention in specific sports medicine problems. To accomplish this goal, the team physician should have knowledge of general strategies of injury and illness prevention, and implement these strategies regarding:

- Musculoskeletal injuries to the ankle, knee and shoulder
- Head and neck injuries
- Cardiac illness
- Heat related illness
- Skin Issues
- Equipment issues

SUMMARY

This document provides an overview of selected medical issues that are important to team physicians who are responsible for the care and treatment of athletes. It is not intended as a standard of care, and should not be interpreted as such. This document is only a guide, and as such, is of a

general nature, consistent with the reasonable, objective practice of the healthcare profession. Adequate insurance should be in place to help protect the physician, the athlete, and the sponsoring organization. This statement was developed by a collaboration of six major professional associations concerned about clinical sports medicine issues; they have committed to forming an ongoing project-based alliance to bring together sports medicine organizations to best serve active people and athletes. The organizations are: American Academy of Family Physicians, American Academy of Orthopaedic Surgeons, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopaedic Society for Sports Medicine, and the American Osteopathic Academy of Sports Medicine.

EXPERT PANEL

Stanley A. Herring, M.D., Chair, Seattle, Washington
David T. Bernhardt, M.D., Madison, Wisconsin
Lori Boyajian-O'Neill, D.O., Kansas City, Missouri
Peter Gerbino, M.D., Monterey, California
Rebecca Jaffe, M.D., Wilmington, Delaware
Susan M. Joy, M.D., Cleveland, Ohio
W. Ben Kibler, M.D., Lexington, Kentucky
Walter Lowe, M.D., Houston, Texas
Margot Putukian, M.D., Princeton, New Jersey
Stephen Weber, M.D., Sacramento, California
Marcia Whalen, D.O., Newport Beach, California

CONSULTANT

Randy Dick, NCAA, Indianapolis, Indiana

GENERAL CONCEPTS IN RISK FACTORS AND PREVENTION STRATEGIES

The incidence of injury in sports medicine may be influenced by the presence of risk factors. Intrinsic factors may be physiological, biomechanical, anatomical or genetic, and may include prior injury, muscle weakness, inflexibility, imbalance or kinetic chain breakage (injuries

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or other alterations in distant parts of the body which affect function in the local joint). They may also include psychological factors, which have been addressed in the Team Physician Consensus Conference series (see (7)).

Extrinsic risk factors may be related to the inherent demands of the sport, such as the intensity and duration of play, or factors such as environmental, conditioning, or equipment issues. They may influence the process of chronic injury or illness development, or they may influence the occurrence of an acute injury or illness. Studies have shown that a strategy of identification of risk factors and implementation of processes to modify the risk factors prior to athletic competition may reduce the incidence of some injuries or illnesses. These studies show that the prevention strategies should be as specific as possible to the injury or illness, athletic activity, or sport, and need to be continued as long as the athlete is competing. A general format of prevention strategies includes:

- Understanding the pathophysiology of the injury or illness.
- Understanding and implementing procedures for identifying risk factors.
- Implementing interventional processes to modify the risk factors.

Assessing medical history, family history, and exertional symptoms is relevant in developing prevention strategies in medical conditions.

It is *essential* the team physician:

- Understand basic concepts of injury and illness prevention.

It is *desirable* the team physician:

- Set up policies and procedures to identify risk factors, implement intervention strategies, and quantify outcomes.
- Work with the athletic care network (see (3)) to educate athletes, parents, and coaches on the principles and practices of injury and illness prevention.

EPIDEMIOLOGY

Injuries

The type of injury and its related risk factors present various opportunities and methods of prevention. A source of consistent and systematic data is from the National Collegiate Athletic Association (NCAA) Injury Surveillance System (8) of injuries sustained in collegiate sports from 1988 to 2003. From this data, the following issues have been identified:

- Across all sports, injury rates are significantly higher in games than in practices.
- Lower extremity accounts for more than 50 percent of all practice and game injuries.

- Ankle sprains account for 14 percent of lower extremity injuries.
- Anterior cruciate ligament (ACL) injuries are relatively infrequent (three percent of all reported injuries) but are associated with significant loss of time from play.
- At the collegiate level, football has the greatest number of ACL injuries.
- At the collegiate level, women's gymnastics, women's basketball and women's soccer have the highest rates of ACL injury.
- Patellofemoral pain and tendinopathy are frequent injuries, particularly in women.
- Upper extremity accounts for approximately 20 percent of all practice and game injuries.
 - Shoulder injuries account for 10 percent of upper extremity injuries, including both contact (football, ice hockey) and noncontact (baseball, tennis) mechanisms. Noncontact mechanisms are more amenable to prevention strategies.
- Head and neck injuries account for approximately 12 percent of all practice and game injuries.
 - Concussions account for five percent of all injuries; rates have nearly doubled during the sample period. In collegiate athletics, football and men's and women's ice hockey, lacrosse and soccer have the highest risk of concussion.
 - Self-report data suggests significantly higher incidence of concussion (see (6)).
 - Most head, neck and spine injuries do not have catastrophic consequences. According to the National Center for Catastrophic Sports Injury Research, football, gymnastics, ice hockey, wrestling, and cheerleading have the highest risk of catastrophic injury. Concussion rates are increasing at all levels of participation.
- Ten-thousand spinal cord injuries occur each year in the United States; 10 percent are related to athletic events.

Medical Conditions

Sudden cardiac death is a rare occurrence. Causes in young athletes include:

- Hypertrophic cardiomyopathy
 - Condition occurs more frequently in men and African-American ethnicity
- Arrhythmias
- Coronary artery anomalies
- Myocarditis
- Ruptured aortic aneurysm (Marfan's Syndrome)
- Commotio Cordis
 - Most commonly occurs in baseball, lacrosse, ice hockey, softball, and other sports as well as recreational activities involving projectile or direct blow to chest
 - Most commonly reported in boys, between ages 7 and 16
 - Fifty percent occur in recreational sports/activities

Heat illness is sport- and environment-specific, most commonly occurring during preseason practices with its highest prevalence in football.

- Milder forms of heat illness are more common, but may be underreported; more serious forms of heat related illness are less common.
- Third leading cause of death in the high school athlete.
- Race and ethnicity appear to be risk factors for heat injury.

Skin Infections

- In collegiate athletics, skin infections account for one to two percent of all time loss injuries.
- In wrestling, skin infections have increased threefold over the past 10 years and account for 16 to 20 percent of time loss injuries.
- Herpes gladiatorum, fungal infections and impetigo are the most common skin infections in wrestling.

MUSCULOSKELETAL INJURY PREVENTION

Inversion Ankle Sprains

Pathophysiology, including risk factors:

- Traumatic inversion injury upon landing (variable amount of injury to all structures)
- High rate of recurrent injury
- Reported risk factors include:
 - Previous ankle injury
 - Ligamentous instability
 - Incomplete rehabilitation, including balance
 - Peroneal muscle weakness and/or decreased ankle dorsiflexion
 - Heel varus
 - Increased body mass index (BMI)

Injury Prevention Evaluation:

- Athletes in running, landing and cutting sports should have a thorough evaluation, including:
 - History of previous ankle injury
 - Ankle ligament evaluation
 - Heel alignment
 - Ankle muscle strength and flexibility testing
 - Balance and core control

Injury Prevention Interventions:

- Implement an education program and sport/activity conditioning program with periodization (see (3)), including:
 - Local muscle strengthening with eccentric emphasis
 - Improve dorsiflexion range of motion
 - Motor control (including balance and core control)
- Taping or bracing in athletes with a history of a previous ankle injury; the role of taping or bracing for injury prevention in a normal ankle is less clear.

It is *essential* the team physician understand:

- Mechanism of inversion ankle sprains.
- The usefulness of taping or bracing in an athlete with a previous inversion ankle sprain.
- The role of rehabilitation to decrease the risk of subsequent ankle sprains.

It is *desirable* the team physician:

- Implement a thorough preseason conditioning program including balance training for all athletes in running, landing, and cutting sports (see (3)).
- Work with the athletic care network to educate players, parents, and coaches on the principles and practices of ankle injury prevention.

Knee Injuries

ACL

Pathophysiology, including risk factors:

- Most ACL injuries are noncontact injuries. College data shows more ACL injuries in football to be contact injuries.
- Causes of noncontact ACL injuries are multifactorial (see (4)).
- Reported risk factors include:
 - Environment (turf and shoe-surface interface)
 - Anatomy
 - Hormonal status
 - Biomechanics (landing position)
 - Neuromuscular variables (*e.g.*, core and lower extremity strength, balance, flexibility and muscle activation patterns)
 - Family history
 - Increased BMI
- Noncontact ACL injuries occur commonly during deceleration, landing or cutting. At-risk positions during these maneuvers include:
 - Hip and knee extension
 - Knee valgus or knee varus
 - Flat foot landing
 - Off-balance body position

Injury Prevention Evaluation:

- Athletes in running, landing, and cutting sports should have a thorough evaluation (see (3)), including:
 - History of previous personal or family ACL injury
 - Lower extremity alignment
 - Motor control (including core and lower extremity strength, balance and flexibility)
- Other evaluation techniques may include:
 - Evaluation of the playing surface and shoe type
 - Screening biomechanical analysis of jumping and landing

Injury Prevention Interventions:

- Implement a sport-specific conditioning program with periodization (see (3) and (4)), including these ele-

ments that have been shown to have efficacy in specific populations:

- Motor control (including core and lower extremity strength, balance and flexibility)
- Technique training to include landing and sport-specific athletic skills programs
- Risk awareness education
- Proper care of playing surfaces, and selection of shoe wear

It is *essential* the team physician understand:

- The multifactorial nature of ACL injury mechanisms.
- Modifying neuromuscular factors may decrease risk of ACL injury.

It is *desirable* the team physician:

- Evaluate for core stability, lower extremity strength, and motor control.
- Implement a sport-specific conditioning program, including:
 - Motor control (including core and lower extremity strength, balance, and flexibility)
 - Technique training to include landing and sport-specific athletic skills programs
 - Risk awareness education
- Evaluate the playing surface and shoe type
- Work with the athletic care network to educate players, parents, and coaches on the principles and practices of ACL injury prevention.

Other Knee Injuries

Patellofemoral Pain and Tendinopathy

Pathophysiology, including risk factors:

- Patellofemoral pain and dysfunction are multifactorial, including malalignment, articular cartilage lesions, instability, soft tissue factors, and psychosocial issues (see (4)).
- Sites of pain generation in the anterior knee include:
 - Patellar subchondral bone
 - Fat pads and synovium
 - Medial plica
 - Retinaculum
 - Patellar tendon
- Reported risk factors include:
 - Muscle weakness and/or imbalance and inflexibility, including quadriceps shortening
 - Trauma, overuse, training errors and/or previous injury
 - Patellar hypermobility
 - Hip muscle weakness
- Patellofemoral pain may occur in what appears to be a structurally intact knee.
- Chondromalacia means degenerative cartilage and may have no relationship to symptoms of anterior knee pain.

- The contribution of static and/or dynamic malalignment of the pelvis, hip, knee, ankle, and foot to anterior knee pain is less clear.

Injury Prevention Evaluation:

- Athletes should have a thorough evaluation (see (3)), including:
 - History of any previous lower extremity injury and rehabilitation
 - Present and anticipated volume/intensity of training and participation
 - Patellar and peri-patellar examination
 - Lower extremity alignment (e.g., Q-angle, foot pronation)
 - Core stability, especially hip external rotator strength, as well as quadriceps strength and hamstring flexibility
 - Training surface and shoe type

Injury Prevention Interventions:

- Implement sport/activity conditioning program with periodization (see (3)), emphasizing the proven interventions of quadriceps strengthening and increasing hamstring flexibility.
- Other interventions may include core and lower extremity strengthening, hip abductor and external rotator strengthening, and improving motor control.

It is *essential* the team physician:

- Understand the role of multiple risk factors in patellofemoral pain and tendinopathy.
- Evaluate the patella and peri-patellar soft tissues, quadriceps strength and hamstring flexibility.

It is *desirable* the team physician:

- Evaluate for core stability, lower extremity strength and flexibility, motor control, and postural alignment.
- Implement a thorough program for evaluation and conditioning (see (3)) for core stability, lower extremity strength, and motor control.
- Recommend shoe selection for anticipated activity.
- Work with the athletic care network to educate players, parents, and coaches on the principles and practices of patellofemoral and tendon injury prevention.

NONCONTACT SHOULDER INJURIES IN THROWERS AND OTHER OVERHEAD ATHLETES

The Disabled Throwing Shoulder

Pathophysiology, including risk factors:

- The “disabled throwing shoulder” describes the proven findings that create pain and/or decreased function in

throwers and other overhead athletes. These findings are:

- Anatomical injuries: superior labral tears, partial rotator cuff tear, and capsular attenuation.
- Physiological deficits: posterior rotator cuff weakness, decreased internal rotation, pectoralis minor inflexibility, scapular muscle weakness, and kinetic chain changes in core strength or flexibility.
- Alterations of biomechanical motions: abnormal humeral head translation on the glenoid, alteration of arm position, and scapular dyskinesis.
- Risk factors include:
 - Volume and intensity of overhead activity and throwing
 - History of previous injury in other parts of the kinetic chain
 - Gleno-Humeral Internal Rotation Deficit (GIRD): side-to-side asymmetry of total range of shoulder internal/external rotation measured with the arm in 90-degree abduction and in the scapular plane. GIRD may be present in asymptomatic shoulders and may predispose the shoulder to injury.
 - Scapular dyskinesis: alteration of scapular static position or dynamic motion that can be observed as medial border prominence on clinical exam
 - Posterior shoulder weakness
 - Loss of internal and external range of motion of the hip
 - In baseball, increased number of game pitches per week and per season, and specialty pitches in skeletally immature athletes.

Injury Prevention Evaluation:

- Throwers should have a thorough evaluation (see (3)), including:
 - History of any previous injury and rehabilitation
 - Present and anticipated volume/intensity of training and participation
 - Examination of gleno-humeral joint for GIRD, labral tears, instability, and strength
 - Examination for scapular dyskinesis
 - Examination for core strength and stability and kinetic chain function

Injury Prevention Interventions:

- Address gleno-humeral deficits, including GIRD and scapular dyskinesis
- Address core strength, motor control and kinetic chain deficits
- Implement sport/activity conditioning program with periodization (see (3))
- Enforcement of pitch counts per game and per season, and limitation of specialty pitches in skeletally immature athletes

It is *essential* the team physician understand:

- The potential importance of GIRD as a risk factor for the disabled throwing shoulder.
- Multiple alterations exist in the symptomatic disabled throwing shoulder.
- Skeletally immature throwing athletes require specific oversight.

It is *desirable* the team physician:

- Implement a thorough program for evaluation and conditioning (see (3)).
- Know how to reliably measure GIRD.
- Work with the athletic care network to educate players, parents, and coaches on the principles and practices of shoulder injury prevention.

MEDICAL INJURY PREVENTION

Cardiovascular Issues

Hypertrophic cardiomyopathy

Pathophysiology:

- Mutations in beta-myosin heavy chain gene, cardiac troponin gene or alpha-tropomyosin gene
- With or without LV outflow tract obstruction
- Systolic and/or diastolic dysfunction
- Sudden death most often secondary to arrhythmia

Reported risk factors for sudden death:

- Prior history of aborted sudden cardiac death (survival from cardiac arrest)
- Family history of sudden cardiac death
- History of syncope
- Symptomatic ventricular tachycardia on Holter monitor
- Vigorous exercise
- Inducible ventricular tachycardia on electro-physiological study (EPS)
- Wall thickness
- Genotype

Arrhythmias

Pathophysiology:

- Abnormalities in atrial or ventricular rhythm include:
 - Congenital causes such as Wolfe-Parkinson-White Syndrome, Long Q-T syndrome, Brugada's Syndrome, hypertrophic cardiomyopathy, arrhythmogenic right ventricular dysplasia.
 - Acquired causes such as electrolyte disturbance, medications or drug use, myocarditis, and other cardiomyopathies.

Risk factors for sudden death:

- Vigorous exercise
- Chest wall trauma

Coronary artery anomalies

Pathophysiology:

- Ischemia and/or arrhythmia, secondary to abnormal anatomy

Risk factors for sudden death:

- Vigorous exercise

Ruptured aortic aneurysm (Marfan's Syndrome)

Pathophysiology:

- Inherited disease of collagen causing weakening of the aortic wall (cystic medial necrosis), leading ultimately to rupture.

Risk factors for sudden death:

- Vigorous exercise

Illness Prevention Evaluation of hypertrophic cardiomyopathy, arrhythmias, coronary artery anomalies and ruptured aortic aneurysm (Marfan's Syndrome):

- Thorough evaluation including:
 - Family history of premature sudden death, especially first degree relatives, and heart disease in surviving relatives
 - Personal history of heart murmur, hypertension, excessive fatigue, syncope or near syncope, exertional chest pain, and excessive exertional shortness of breath
 - Physical examination of pulses, heart murmurs, blood pressure, heart rhythm, and stigmata of Marfan's Syndrome

Illness Prevention Interventions of hypertrophic cardiomyopathy, arrhythmias, coronary artery anomalies and ruptured aortic aneurysm (Marfan's Syndrome):

- Additional testing and/or consultation.
- Modification or preclusion of activity.
- Screening evaluation for prevention of illness in family members.
- Emergency action plan for all practices and competition.

It is *essential* the team physician understand:

- The major causes of and risk factors for sudden cardiac death.
- The role of preparticipation examination in screening for cardiac conditions.
- Exertional symptoms are particularly worrisome.
- Establish an emergency action plan for all practices and competition (see (2)).
- Despite screening, sudden cardiac death may be the only presenting event.

It is *desirable* the team physician:

- Coordinate, evaluate, and review the preparticipation examination.

- Implement an emergency action plan that includes the on-site availability of an automated external defibrillator (AED).
- Work with the athletic care network to educate players, parents, and coaches regarding the common causes of sudden cardiac death.

Comotio Cordis

Pathophysiology:

- Blunt chest trauma over the cardiac silhouette during vulnerable period of cardiac cycle, producing arrhythmia.
- Dramatic increase in survival with early defibrillation (within three minutes).
- In animal studies, hardness of ball correlates to induction of ventricular fibrillation.
- Almost 30 percent of fatal events occur in organized competitive sports where athletes are already wearing chest protectors.

Risk factors for sudden death:

- Age (majority under 16 years old)
- Sport

Illness Prevention Evaluation:

- No known tests

Illness Prevention Intervention:

- Emergency action plan in place
- Age-specific safety balls
- Educate coaches and players that players should avoid taking a direct blow to the chest (*e.g.*, stepping in front of shot).
- Current chest protectors have not been shown to prevent commotio cordis.

It is *essential* the team physician understand:

- The clinical presentation of commotio cordis.
- The importance of having an emergency action plan.
- The importance of age-specific safety balls for sports at risk for commotio cordis.
- The inadequacy of current chest protectors in preventing commotio cordis.

It is *desirable* the team physician:

- Implement an emergency action plan that includes the on-site availability of an AED.
- Work with athletic care networks to educate players, parents, and coaches on the principles and practices for sports where commotio cordis is possible.

HEAD AND NECK

Concussion

Pathophysiology, including risk factors:

- Process affecting the brain induced by direct or indirect biomechanical forces (see (6)).

- Experimental models of severe head injury indicate a cascade of biochemical, metabolic, and gene expression changes.
- There may be subtypes of concussion based on clinical, anatomic, biomechanical impact, genetic phenotype, neuropathologic change, or other mechanism.
- Clinical symptoms largely reflect functional disturbance rather than structural injury.
- Neuro-cognitive deficits may persist despite the resolution of clinical symptoms.
- There may be a different physiologic response to head trauma in young athletes.
- Risk factors include:
 - Prior concussion history, including number, proximity, and severity
 - Sport

Injury Prevention Evaluation:

- Athletes should have a thorough evaluation including:
 - Prior history of concussion, including number, proximity, and severity
 - Consideration of neuropsychological testing

Injury Prevention Interventions:

- Educate athletes, parents, and coaches on the importance of reporting symptoms of concussion.
- Athletes with signs and/or symptoms of concussion should not continue participation.
- Helmet use decreases the incidence of skull fracture and major head trauma, but does not prevent, and may actually increase, the incidence of concussion.
- Improper use of the head and improper fit of helmet or protective equipment may increase the risk of concussion.
- There are rules to limit head injury (e.g., sparring, head-to-head contact, leading with the head) (6).
- Support the use of mouthguards to decrease the risk of dental and facial injury, although the protection they provide to concussion risk is unclear.

It is *essential* the team physician understand:

- The recognition and management principles of concussion.
- Treatment should be individualized to limit the risk of subsequent concussions.

It is *desirable* the team physician:

- Provide postinjury instructions to athletes and others.
- Coordinate emergency action plan.
- Implement concussion awareness and education program for medical staff, athletes, parents, coaches, administrators, and officials.
- Participate in developing rule changes to reduce head injury.

- Work with the athletic care network to educate players, parents, and coaches regarding the risk of concussion.

Cervical Spine Injury

Pathophysiology, including risk factors:

- Axial loading of the slightly flexed cervical spine is the mechanism that most often causes spinal cord injury in sport.
- Transient quadriplegia is a cervical spine injury associated with sensory and/or motor changes in all four extremities. Some cases present only with upper bilateral sensory and/or motor changes.
- “Stingers” are compression or distraction injuries of the cervical nerve root or brachial plexus that produce transient unilateral radiating pain, burning, paresthesias, and occasionally weakness in the upper extremity. They usually involve either the C5 and/or C6 nerve roots, or the upper trunk of the brachial plexus.
- Risk factors include:
 - Improper technique
 - Previous episode of transient quadriplegia
 - Surgical spinal fusion, depending on level and number of levels fused
 - Cervical spine radiological findings including stenosis, instability, spinal cord changes, odontoid abnormalities, and Klippel-Feil deformities

Injury Prevention Evaluation:

- Athletes should have a thorough evaluation including:
 - History of cervical spine injury or abnormality
 - Cervical spine and neurological examination
 - Consideration of additional testing and/or consultation

Injury Prevention Interventions:

- Comprehensive rehabilitation to limit risk of subsequent stingers
- Sport-specific techniques to prevent cervical spine injury (e.g., “see what you hit” in football)
- Enforcement of existing rules (e.g., sparring in football, checking from behind in ice hockey)
- Education of coaches, parents, and athletes regarding the importance of rules and techniques
- The role of shoulder pad modification and neck rolls in football in preventing cervical stingers is unclear
- Management of the downed athlete

It is *essential* the team physician understand;

- Mechanisms and risk factors for cervical spine injury.
- The importance of having an emergency action plan.

It is *desirable* the team physician;

- Coordinate emergency action plan.
- Work with the athletic care network to educate players, parents, and coaches on prevention principles and practices for sports where cervical spine injury is possible.

HEAT ILLNESS

Physiology/Pathophysiology, Including Risk Factors

- Heat illnesses may occur anytime, but most likely to occur in hot, humid weather.
- Heat illnesses occur as the result of the inability to dissipate heat.
- Heat illnesses occur on a spectrum, with the most severe form being heat stroke, which may be life threatening.
- Heat production during exercise is 15–20 times greater than at rest.
- Mechanisms to dissipate heat include conduction, convection, evaporation and radiation, and are more efficient in acclimatized individuals.
- Risk factors:
 - Age
 - BMI
 - Dehydration
 - Lack of acclimatization
 - Poor fitness
 - Prior history of heat illness
 - Medications (*e.g.*, antidepressants, diuretics, antihypertensives, and antihistamines, Attention Deficit Hyperactivity Disorder drugs)
 - Certain supplements (stimulants, such as caffeine)
 - Alcohol
 - Tight-fitting, dark and nonbreathable clothing and layers of equipment
 - Race/ethnicity

Injury Prevention Evaluation:

- Athletes should have a thorough preseason evaluation, including:
 - History of risk factors
 - Evaluation of fluid intake
 - Evaluation of present and anticipated volume/intensity of training and participation
 - Evaluation of athlete's state of acclimatization
 - Screening for sickle cell trait (heat exacerbates complications)
- Monitor pre- and postpractice weight of athletes
- Address clothing and equipment
- Monitor on-site wet bulb globe temperature (WBGT) and/or heat stress index (see (5)).

Injury Prevention Interventions:

- Optimize acclimatization (5 to 10 days based on age, activity, environment and equipment).

- Optimize hydration strategies for practice and competition (see (5)).
- Optimize recovery (fluid status, core temperature and strength)
- Implement sport/activity conditioning program with periodization (see (3)).
- Optimize medication/supplement management
- Optimize clothing (loose-fitting, light colors, breathable fabrics for exercise in the heat) and equipment (minimizing equipment on days with excessive heat)
- Modify and/or cancel sport-specific activities based on environmental conditions.

It is *essential* the team physician:

- Recognize the spectrum of heat-related disorders and at-risk individuals.
- Have a means by which to properly assess temperature and/or heat-stress index.
- Have an emergency action plan to manage acute heat illness (see (2)).

It is *desirable* the team physician:

- Screen athletes at the time of preseason evaluation for risk factors for heat illness.
- Oversee acclimatization recovery and hydration practices.
- Assist in scheduling practices and events around times of increased potential for heat illness.
- Implement mechanism for rapid cooling.
- Work with the athletic care network to educate players, parents, and coaches on the principles and practices of heat illness prevention.

EQUIPMENT AND INJURY PREVENTION

There are equipment selections and modifications that have been demonstrated to prevent injury.

- Helmet use decreases the incidence of skull fracture and major head trauma, but does not prevent, and may actually increase, the incidence of concussion.
- Faceshields provide protection from facial injuries and lacerations.
- Mouthguards protect from dental injury; it is unclear if they protect against concussion.
- Shin guards decrease the incidence of tibia fractures in soccer.
- Breakaway bases decrease the incidence of ankle injuries/fractures in softball and baseball.
- Protective eye wear in women's lacrosse is associated with decreased incidence of eye injuries.
- Taping or bracing in athletes with a history of a previous ankle inversion sprain decreases the risk of recurrent injury; the role of taping or bracing for injury prevention in a normal ankle is less clear.
- Prophylactic medial collateral ligament bracing has not been shown to prevent injury and may increase risk of lateral side knee fractures.

- Securing soccer goalposts is associated with a decrease in fatalities.

It is *essential* the team physician understand:

- Limitations of and indications for protective equipment.

It is *desirable* the team physician:

- Work with the athletic care network to educate players, parents, and coaches on the role of equipment in injury prevention.

SKIN DISEASE

Pathophysiology, including risk factors:

- Increasing frequency of antimicrobial resistance among infectious organisms is of great concern.
- Of particular concern is the recent emergence of methicillin resistant staphylococcus aureus (MRSA). MRSA is increasingly reported in wrestling, fencing and football.
- Although the overall incidence of skin infections is small, this is an area where prevention is possible.
- Infections are spread by direct physical contact or fomite (equipment, mats).
- Risk factors:
 - Previous history of infection
 - Host immune status
 - Sport
 - Poor personal hygiene

Illness Prevention Evaluation:

- Athletes should have a thorough evaluation prior to participation including:
 - General health history
 - Identification of communicable skin lesions
 - History of prior or current treatment

- Hygiene practices should be assessed in practice and training room sites.

Illness Prevention Interventions:

- Routine surveillance is recommended in high-risk sports.
- To decrease transmission, withhold athletes with bacterial and herpes skin infections from practice or competition.
- Promote good hygiene with regular bathing.
- Avoid contact with drainage from skin lesions of other players.
- Wash hands regularly with soap and water or use alcohol-based hand gel.
- Equipment sanitation.
- Avoid sharing towels, clothing, bedding, bar soap, razors, and toothbrushes.
- Prophylactic medications
- Coverage of skin lesions
- Cleaning of equipment and other environmental surfaces with which multiple athletes have bare skin contact
- Encourage student-athletes to report skin lesions.
- Educate coaches regarding common skin infections.

It is *essential* the team physician:

- Understand management principles regarding common skin infections.
- Recognize skin infections that may be contagious.
- Limit or preclude activity as indicated.

It is *desirable* the team physician:

- Coordinate hygiene practice guidelines for practice and competition.
- Work with the athletic care network to educate athletes, coaches, and parents on recognizing and reporting skin lesions.

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- American Academy of Family Physicians (AAFP)
11400 Tomahawk Creek Pkwy
Leawood, KS 66211
800-274-2237
www.aafp.org



- American Academy of Orthopaedic Surgeons (AAOS)
6300 N River Rd
Rosemont, IL 60018
800-346-AAOS
www.aaos.org



**AMERICAN COLLEGE
of SPORTS MEDICINE**

- American College of Sports Medicine (ACSM)
401 W Michigan St
Indianapolis, IN 46202
317-637-9200
www.acsm.org



- American Medical Society for Sports Medicine (AMSSM)
11639 Earnshaw
Overland Park, KS 66210
913-327-1415
www.amssm.org



- American Orthopaedic Society for Sports Medicine (AOSSM)
6300 N River Rd, Suite 500
Rosemont, IL 60018
847-292-4900
www.sportsmed.org



- American Osteopathic Academy of Sports Medicine (AOASM)
7600 Terrance Ave., Suite 203
Middleton, WI 53562
608-831-4400
www.aoasm.org

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