TRIAGE AND ACTION PLANS

Most events in track and field have a low risk of serious or critical injury, with the exceptions of events such as the pole vault, javelin, hammer, and discus. When providing medical care for an athletics event, both athletes and spectators should be considered. Therefore, planning should cover various athletic medical conditions as well as sudden illness (heart attacks, strokes, fainting, hypoglycemia, heat illness, asthma).

Sports medicine personnel must be acquainted with the principles of acute care, as much depends on the initial response. Personnel carrying out first aid must be familiar with the devices and medicines needed for primary care.

The following should be considered when providing medical support for an athletics event:

- Medical team and medical supplies
- Plan of Action (Emergency Action Plan)
- Triage and first aid measures

A. Medical Team

The medical team providing medical services for an event should include the following:

1. Medical physician with training in emergency medicine
2. Support staff (athletic trainers/physiotherapists, nurses, emergency medical technicians)
3. First Aiders (Red Cross)
4. Ambulance and driver on standby
5. Allied health care providers: masseurs, chiropractors, acupuncturists, etc.

As a guide, the number of First Aid staff required for an event would vary from 3–6 for a small event involving about 100 participants to 50–100 for a large event, e.g. a marathon involving more than 3000 participants.

B. Planning and Logistics

Planning and logistics for a major athletics competition include:

1. The need to have designated first aid stations, which could be in the form of tents or other cool, shady areas to treat injuries/illnesses.
2. Designated parking spaces for the ambulances.
3. Adequate first aid equipment and supplies including:
   a. First aid kits
   b. Portable, lightweight, reliable stretchers
   c. Coolers of water, towels, cold packs (or ice cubes in plastic bags)
   d. Communication sets (e.g. Walkie Talkie, cell phones)

4. Notification of all local medical facilities regarding the upcoming competition.

5. In addition, the team physician should coordinate:
   a. Compliance with all local, state, and federal regulations regarding storing and dispensing pharmaceuticals.
   b. Development of a chain of command that establishes and defines the responsibilities of all parties involved.
   c. Regular rehearsal of the emergency response plan.
   d. Establishment of a network with other health care providers, including medical specialists, athletic trainers/physiotherapists, and allied health professionals covering all competition sites (polyclinics, field events).
   e. Establishment of a policy that includes the team physician and athletic trainers/physiotherapist in the dissemination of any information regarding the athlete's health status.

C. Competition-Day Planning

1. Optimised Medical Care

Competition-day planning optimises medical care for injured or ill athletes. The team physician should coordinate:

   a. Medical operations and administrative medical policies.
   b. Preparation of the stadium/ field medical bags and station medical supplies.

2. Administrative Protocol

It is essential for the team physiotherapist/athletic trainer to coordinate:

   a. Assessment of environmental concerns and playing conditions.
   b. Presence of medical personnel at competition site with sufficient time for pre-competition preparations.
   c. Plan with the medical staff of the visiting teams for medical care of the athletes.
   d. Introductions of the medical team to competition officials.
   e. Review of the emergency medical response plan.
   f. Checking and confirmation of communication equipment.
   g. Identification of examination and treatment sites.
   h. Arrangements for the medical staff to have convenient access to the competition site.
   i. Post-meet review and necessary modifications to medical and administrative protocols.

3. On-Site Medical Supplies

The team physiotherapist/athletic trainer should have competition-day on-site medical bags and stadium medical supplies (see Appendix 6, *On-Site Medical Supplies for Injury Prevention and First Aid*).

D. Emergency Action Plan

Planning for any medical emergency is a must ("a failure to plan is the same as a plan for failure"). Points to note in planning include:

1. Specific instructions for specific personnel.
2. The route of evacuation by ambulance.
3. Medical supplies required.
4. Steps to take for likely serious problems e.g. collapse/unconsciousness, fracture, bleeding, medical transport for head and spine.

Once developed, the plan must be communicated to all concerned.

Some other important points to note about emergency planning:

1. Must include personnel trained (and certified) in CPR, athletic trainers/physiotherapists who are familiar with the first aid kit available (training/practice required).
2. Must include names and contact numbers of important persons, e.g. physician in charge.
3. Must include a map that shows site of sports event/training ground, evacuation route for ambulance (to nearest hospital), locations of emergency telephone(s) (and include emergency telephone numbers), first aid kits. For coin phones, the emergency plan should include having coins available (if necessary).
4. Get valuable input to the plan from physicians, facility managers, local emergency medical service personnel.
5. Plans need to be reviewed and improved regularly, e.g. yearly.

E. Triage and First Aid Measures

To ensure adequate and timely care of casualties, proper triage is important. The steps would include primary survey (ABCDE [airway, breathing, circulation, disability/neurologic status, expose athlete]), resuscitation, and secondary survey, as well as the other necessary first aid (for bleeding, fractures, head and spine injury, see Part 2 of this chapter, *First Aid Management of Acute Sports Injuries*). Common causes for sudden collapse include heart attack, stroke, heat exhaustion/stroke, and fainting.

1. Airway assessment is the first priority in any casualty. The airway must be kept open and patent (remove foreign debris, chin lift or jaw thrust).
2. Breathing is then assessed with "look, listen and feel" method. If the casualty is not breathing, then mouth-to-mouth resuscitation must be instituted. Medical coverage staff for sports events should be CPR- and defibrillator-trained (see Appendix 7, *CPR/Adult Basic Life Support*).
3. Palpating peripheral pulse, e.g,. the carotid pulse at the angle of the jaw next assesses circulation. If there is no pulse, then external cardiac compressions are instituted, along with defibrillation where appropriate.

4. Disability is then determined with a very rapid and brief neurologic assessment using the pneumonic "AVPU" (alert, responding to vocal stimuli, responding to painful stimuli, unresponsive).
5. Exposure of the casualty must be adequate to allow for a careful examination and assessment.

Following the primary survey, the necessary resuscitative measures must be implemented, e.g. continued CPR, use of defibrillator when available/appropriate, fluid replacement (if necessary with an intravenous line), cooling of the athlete (if heat stroke/exhaustion suspected), stopping any bleeding (direct pressure is best and adequate for almost all types of bleeding), splinting of suspected fractures. Secondary survey may not always be feasible at the site of the event, and may need to be done only at the hospital (or in the ambulance while on the way to hospital). This involves surveying the whole body from head to toe to check for injuries. Procedures would include evaluating pupillary size, checking the fundi, assessing possible cervical spine injury, chest injury (e.g. pneumothorax), abdomen and extremities.

For athletes who are stable and conscious, management should focus on the injuries sustained or other medical conditions. The following section describes common problems and their first aid management.

Reference

1. American Heart Association. 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005. http://circ.ahajournals.org/content/vol112/24_suppl/

First Aid Management of Acute Sports Injuries

Sport is a potentially dangerous activity; fortunately, life-threatening injuries are rare. A sports physician should be acquainted with the principles of acute care, as much depends on first aid. It is very important to recognise injuries with serious outcome, and transport the injured to the adequate institution after proper first aid has been carried out. The physician carrying out first aid should be acquainted with the devices and medications of primary care. In this section we will deal with primary care during the pre-hospital phase of injury management.

A. Spinal Injuries

Injuries to the spine may occur when a faulty landing happens after jumping, as a result of being struck by an implement, or during conditioning training. Trauma to the spine may result in injuries to the bone, cartilage, tendon, or spinal cord. In severe vertebral or cordal injury, stability of the spine may be compromised and there may be evidence of neurological findings. Whenever the mechanism of injury or the clinical findings indicate bone or tendon involvement, spinal cord injury should be taken into consideration, unless proven otherwise.

If the patient is conscious, a fracture or cord injury is accompanied by severe neck muscle spasm and pain, which indicates the nature of the injury. However, the unconscious athlete is open to further cord injury unless the medical staff is not alert to this possibility. It is essential that no neck manipulation be carried out on the field.

During the initial evaluation, proper preventive steps must be utilised in order to prevent severe nervous system complications. These can occur, for example:

1. When nerve lesions remain unrecognised after bone-injury.
2. When first aid is delayed and irreversible nerve damage occurs.
3. When the unstable spine is improperly treated and deterioration develops.

The following indicates spinal or spinal cord injury:

1. Tenderness to the spine
2. Palpable spinal deformity or haematoma
3. Nervous system injury is suspected if there is:
   a. Abnormality in chest breathing.
   b. Abnormality of movements.
   c. Segmental anaesthesia or numbness.
   d. Pain that is referred to the limbs.

According to the above-mentioned principles, first aid should be carried out as follows:

1. Ensure breathing and circulation.

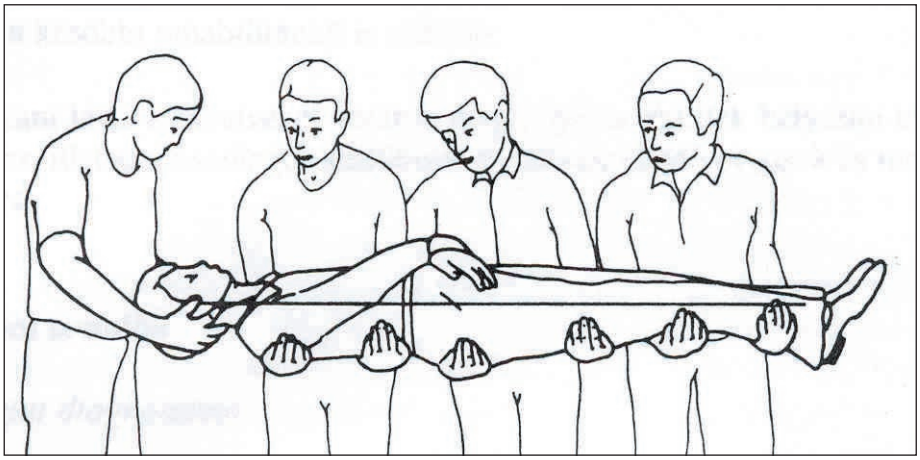

Figure 8-1. Proper technique for transferring a patient suspected of having sustained a neck injury, in the absence of a stretcher.

2. When spinal injury is suspected, a thorough neurological examination is to be performed as soon as possible, after breathing and circulation have been maintained.
3. If the mechanism of injury is unknown and the patient is unconscious, spinal injury must be assumed initially and treated accordingly. The same is necessary if the patient is conscious and spinal injury cannot be definitely ruled out.
4. If cervical injury cannot be ruled out, the neck should be stabilised routinely in a neutral position with a rigid brace or collar, sandbags, or with a Schantz-collar (but not a soft collar).
5. Having stabilised the neck, a vacuum mat is to be used as in spinal injuries. The injured should be laid on a scoop or shovel-stretcher, or, if these are not available, transfer should be carried out as shown in Figure 8-1.
6. The seriously injured should be transferred to a hospital where both modern diagnostic and therapeutic facilities are available. Transfer should be carried out by helicopter if possible.
7. In case of a definite cord injury, high dose methyl-prednisolone should be administered during the pre-hospital phase (30mg/kg within 15 minutes, 5 mg/kg 45 minutes later, 4 mg/kgh for 23 hours). Smaller doses of steroids are inadequate, as only with high doses is oedema, which is responsible for later neurological symptoms, prevented.
8. Volume substitution may be necessary, because cross sectional lesions of the spine may lead to vasodilation and shock. Therefore infusion and alpha-adrenergic medication (epinephrine or dopamine) may be necessary.
9. The injured should be protected from being over-heated or cooled.
10. Narcotic analgesics are contraindicated in case of spinal injury.

Table 8-1. Glasgow Coma Scale used to assess degree of head injury.

Reaction	Points
Eye opening	
❑ Spontaneous	4
❑ To speech	3
❑ To pain	2
❑ No response	1
Motor response	
❑ Follows commands	6
❑ Localises pain	5
❑ Movement or withdrawal to pain	4
❑ Decorticate flexion	3
❑ Decerebrate extension	2
❑ No response	1
Verbal response	
❑ Alert and oriented	5
❑ Disoriented conversation	4
❑ Speaking but nonsensical	3
❑ Moans or unintelligible sounds	2
❑ No response	1

B. Head Injuries

Head injuries usually occur as a direct trauma to the head. Often concomittant injury to the spine or spinal cord must be considered. Injuries to the soft tissues of the head are treated as in other soft tissue injuries (disinfection of the wound and surroundings, sterile gauze, and tetanus anti-toxin). If the athlete is unconscious, we must proceed under the assumption that there is a fracture of the cervical spine.

In cases of head injury, attention must be focused on potential intracranial lesions (cerebral concussion, cerebral contusion, subdural, or epidural haematomas). Treatment should be carried out as follows:

1. A thorough neurological assessment should be made. During the examination, signs and symptoms of possible neurological deficiencies are sought. Symptoms of increased intracerebal pressure should be looked for. The seriousness of head injury can be estimated by the Glasgow Coma Scale as seen in Table 8-1, which is also useful as an indicator for intratracheal intubation or for later assessment.[1]
2. Complete CPR if necessary (see Appendix 7, *CPR/Adult Basic Life Support*).
3. In case of increased intracranial pressure, the following should be initiated:
   a. The patient's head should be placed at 30º.
   b. Intravenous diuretics should be administered (40 mg of furosemide).
   c. Mannitol 0.25–1 g/kg IV.

The signs and symptoms of intracranial pressure should be sought for carefully: (headache, vomiting, tachycardia, hyperventilation, hypertension, meningeal signs (Brudzinki, Kernig-sign), stiffness of the neck, drowsiness, stupor, wide-, non-reacting pupils, anisocoria, coma, Kussmaul-breathing, convulsions, increase in muscular tone, bradycardia, hypotension, flaccid muscles, hyperpyrexia, slow breathing, brady-arrhythmias, no circulation, no breathing).

4. If inadequate circulation or breathing are noticed, oxygen should be administered.
5. An IV line should be ensured and intravenous crystalloids should be given, so that mean pressure of 90mm Hg is maintained. In the later stage, reduced cerebral perfusion pressure is necessary in order to prevent cerebral oedema.
6. The patient should be transferred to a hospital where neurosurgery is available.

Please note: If the examiner notices symptoms of brain concussion (transient unconsciousness, dizziness, nausea, vomiting, paleness), the patient should be admitted to the hospital, because an intracranial lesion should be suspected. It is possible that, in case of head injury, the patient will regain consciousness and be symptomless. However, small veins around the dura may rupture causing a haematoma, which will present with late neurological symptoms. This is called the lucid state (status lucidum).

C. Fractures

Fractures may result from several causes, including direct trauma, such as a blow; from twisting; or as the end result of an unrecognised incomplete stress fracture.

The diagnosis can often be made from the history, plus physical findings. The physical examination will reveal the classical signs and symptoms of fractures (local oedema, pain, deformity, restriction of movement).

First aid in case of fractures:

1. Do not move the patient until the injury is totally immobilised. Do not attempt to straighten a misshapen bone or joint to change its position.
2. Fractures should be stabilised (most commonly pneumatic devices are used). If the ends of these fractures are not stabilised, secondary injuries to the nerves and vessels may occur. A compartment syndrome may also develop.
3. If a broken bone pierces the skin, take steps to prevent infection.
4. Take steps to prevent shock. Lay the patient flat, elevate the feet 20–25 cm and cover with a coat or blanket. Keep flat if a head, neck, or back injury is suspected.
5. Analgesics may be administered if there is severe pain (see Soft Tissue Injuries, below).
6. The patient may need to be admitted to the hospital for final care.

D. Joint Dislocation and Subluxations

Always keep in mind that dislocations or subluxations of the joint may injure the surrounding area (vessels, nerves, tendons), as well as the capsule of the joint.

In case of joint injury the following is recommended:

1. The joint should be examined thoroughly. An unstable joint and haematoma indicate capsule injury. Every joint has its own method of examination, which will not be discussed in this text.
2. The joint should be put at rest and stabilised with a splint or bandage.
3. In case of pain, local or general anaesthetics are necessary.
4. Ice packs should be administered to prevent eventual later consequences; they also lessen pain.
5. The patient should be referred to a clinic or hospital, where diagnostic procedures including X-ray, ultrasound, or MRI are available to diagnose fractures or intra-articular lesions and cartilage and soft tissue involvement.

E. Ligament Strains

Strains of the ligaments usually take place on the proximal and distal endings, rarely along the whole ligament.

In case of strains, the following is recommended:

1. A thorough physical examination, which will reveal the degree of the injury of the ligaments as follows:
   a. *First degree:* swelling and tenderness is possible, the joint is stable.
   b. *Second degree:* under loading the ligament is loose, but there is a stable end-point.
   c. *Third degree:* the whole ligament is disrupted, movement is lax (no endpoint).
2. In case of first degree injury, treatment is as for soft tissue injuries (see below).
3. Second and third degree injuries should be treated in hospital after exact diagnostics. Third degree injury is usually treated surgically.

F. Muscle Strains

Muscle strain is the most frequent injury in sports. It usually occurs due to bad technique: while strengthening the agonist muscular group, the antagonist group is not relaxed accordingly, due to ionic imbalance or fatigue. Strains usually occur where the muscle attaches to the bone, or in the muscle itself at the musculo-tendinous junction. In children, the muscle may avulse the apophysis; for example, the hamstring attachment at the ischial tuberosity

In case of strains, the following is recommended:

1. For muscle strains, determine the degree of the injury according to its anatomic and functional status.

a. *First degree:* the muscle fibres are partially injured. There is local swelling and tenderness if the patient contracts the muscle against resistance.
b. *Second degree:* more fibres are injured. Minor contraction will cause pain or the muscle cannot contract; the injury is palpable.
c. *Third degree:* the tendon of the muscle is detached from its adhesion point or a large amount of the muscle is damaged. The muscle is functionless, the lesion can be palpated, haematoma results within a short time.

2. Principles of first aid for muscle strains are the same as for soft tissue injuries (see below).

G. Soft Tissue Injuries (see also Chapter 9, *Soft Tissue Damage and Healing*)

There are many mechanisms that may cause soft tissue injury in athletics, from overload of soft tissues (e.g. overextension of the muscle) to direct trauma. Soft tissue injury is accompanied by surrounding oedema, haematoma, and tissue necrosis. The accumulated blood sets off an inflammatory cascade that results in further swelling. This leads to increased pressure on the surrounding tissues causing hypoxia, which will increase the degree of the injury. In case of inadequate first aid, the injured area and its surrounding develop scarring and muscle atrophy due to haematoma, tissue necrosis and oedema.

Soft tissue treatment is performed according to the mnemonic **PRICES**:

1. P = protection: protect the injured area from further damage.
2. R = rest: the limb should be put at rest (this should be done before examination), the degree of injury should be quickly assessed because the least load may result in deterioration.
3. I = ice: icing of the injury has many benefits:
   a. Lessens the pain, so the surrounding muscle tone will decrease.
   b. Increases vasoconstriction, which reduces bleeding.
   c. Hypothermia reduces the oxygen and nutrition demands of the injured tissues.
   d. Local inflammatory reaction decreases.

   Please note: In case of minor injuries the athlete should be instructed to cool the injury. In case of extensive injury, an ice bath should be used. After training, it is recommended that ice be applied to the muscles, because loading leads to microtraumas. If chemical ice packs are used, they should be applied through a layer of clothes or wrap in order to prevent freezing. Usually cold packs are used for 10–20 minutes every 2 hours, during the first 2 days.
4. C = compression: compression raises the tissue pressure, which reduces bleeding and swelling. Compression should be used during and after ice therapy. The bandage should be applied firmly, from distally to proximally,

with an overlap of one-half the bandage's width. An ice pack can be placed over a layer of compression wrap.

5. E = elevation: the injured area should be elevated above the level of the heart. This will decrease swelling by enhancing drainage via lymphatic channels, and reducing venous stasis.
6. S = support: use braces, splints, etc. to support the injured area.

H. Medical Treatment

Effective medication should be administered throughout the entire treatment process, taking into account banned drugs. If in spite of local measures the patient still has pain, the first drug of choice is paracetamol (500 mg–1g). If paracetamol is not enough, more effective drugs should be administered. NSAIDs are useful and popular: diclofenac 50 mg given parenterally (maximum daily dose 150 mg), ibuprofen 800 mg (maximum daily dose 2400 mg), indomethacin 50 mg (maximum daily dose 100 mg); in addition to their analgesic effect they are also good anti-inflammatory drugs. NSAIDs can cause stomach irritation for some individuals. In this case, an H_2-blocker may be used to reduce the amount of gastric acid secretion. If the injury is accompanied by extreme bleeding, the administration of an NSAID should be considered carefully, as they reduce platelet aggregation and increase bleeding. Corticosteroids have no place in first aid treatment.

Please note: Pain is a good indicator of the status of the injury. Analgesics and anti-inflammatory drugs should never mask pain in an effort to allow an athlete to continue to compete or train, which may lead to severe consequences.

I. Follow-Up Management

Depending upon the site of injury and its extent, additional treatment may be utilised as a part of the treatment/rehabilitation process (see Chapter 9, *Soft Tissue Damage and Healing*, for additional details).

1. Protected Mobilisation

Protective taping and bracing permits the injured area to be mobilised actively and passively while damaged tissue is protected. This prevents excessive stress on muscles, joints, and ligaments during the healing process.

2. Electro-Therapeutic Modalities

Electrical therapies are an additional means of providing heat energy to deep tissues, mobilising lymphatic and capillary circulation, and promoting healing. These modalities include: interferential current, ultrasound, and magnetic field therapy. Ultrasound should be used with caution around children's physes.

3. Manual Therapy

Manual techniques are useful in the healing process and in reducing the sequelae of injury. Stretching is valuable in reducing tissue contraction and muscle

spasm, and preserving muscle and ligament length. Friction massage is helpful in decreasing scar tissue contraction that follows the inflammatory reaction. Mobility exercises, both passive and active, are essential for maintaining joint range of motion and muscle length.

4. Fitness Maintenance

During the acute phases of the healing process, as well as during rehabilitation, cardiovascular fitness must be maintained. This can be accomplished in a variety of ways, depending upon the site of the injury. An exercise bicycle can be used if the lower extremity can bear weight. Otherwise, swimming, or running in a swimming pool with a flotation jacket, can be used. At first, the athlete can "run" in deep water, and then progress to shallower water with partial weight bearing. Strength and range of motion of all the uninjured parts must be maintained with appropriate stretching and resistive exercises.

J. Evaluation of Treatment

The clinician should constantly assess each treatment's effectiveness by comparing symptoms and signs prior to and after treatment. Continual evaluation leads to the most appropriate treatment course for the specific injury and allows the programme to be adapted to the individual's needs.

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Footnote

[1]The Glasgow Coma Scale is the most widely used scoring system for quantifying the level of consciousness following traumatic brain injury. It is used primarily because it is simple, has a relatively high degree of interobserver reliability, and correlates well with outcome following brain injury.

The Scale is easy to use, particularly with a table such as shown in Table 8-1 (page 3 of this section). One determines the best eye opening response, the best verbal response, and the best motor response. The score represents the sum of the numeric scores of each category. A Coma Score of 13 or higher correlates with a mild brain injury, 9–12 is a moderate injury, and 8 or less a severe brain injury.

However, there are limitations to a simple application of the table. If there is an endotracheal tube in place, the patient cannot talk. Hence, it is important to document the score by its individual components. For example, a Glasgow Coma Score of 15 would be detailed as follows: E-4, V-5, M-6. An intubated patient would be documented as E-4, V intubated, M-6. Of these factors, the best motor response is probably the most significant.

Other factors that alter the patient's level of consciousness will interfere with the Scale's ability to reflect the severity of the brain injury. Hence, shock, hypoxemia, drug or alcohol use, or metabolic disturbances may alter the Scale independently of brain injury. A spinal cord injury will invalidate the motor score, and an orbital injury may impair the ability to open the eye.

For more information on the Glasgow Coma Scale, see www.trauma.org/scores/gcs.html.