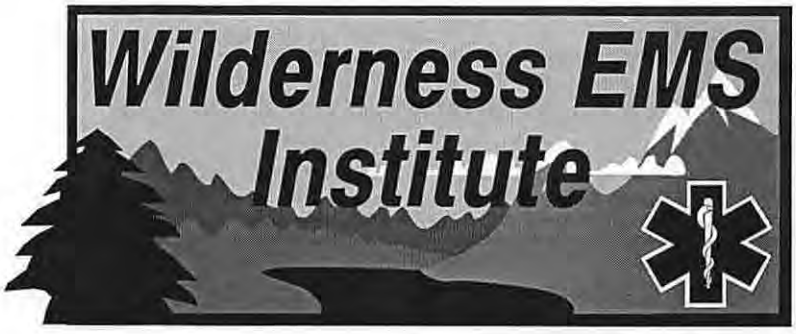
## Chapter XII:

# Wilderness Medical Problems




Appalachian Search and Rescue Conference
Center for Emergency Medicine of Western Pennsylvania

# Wilderness EMT Textbook

## Chapter XII: Wilderness Medical Problems

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## The ASRC-CEM Wilderness Emergency Medical Services Institute

The ASRC-CEM *Wilderness Emergency Medical Services Institute*, previously named the *Wilderness Emergency Medicine Curriculum Development Project*, is devoted to developing curricula for wilderness EMS providers and medical control physicians, and fosters wilderness EMS research. It is a cooperative venture of the Appalachian Search and Rescue Conference and the Center for Emergency Medicine of Western Pennsylvania. The ASRC is a large, tightly-knit wilderness search and rescue organization with eight teams throughout the mid-Appalachian states. The Center for Emergency Medicine is an emergency medicine and prehospital care research and teaching organization. It provides a medical helicopter service, an emergency medicine residency, Emergency Medical Services for the city of Pittsburgh, and conducts a variety of related projects.

## The WEMSI Wilderness EMT Curriculum

This chapter is one part of the ASRC-CEM Wilderness Emergency Medical Technician Textbook. In concert with the WEMT Curriculum, the Textbook has been in development since 1986, and took as its starting point a program Dr. Conover developed for the National Association for Search and Rescue in 1980. The Project has also drawn on many other sources in creating this Textbook. These include the Wilderness EMT program of SOLO (Stonehearth Open Learning Opportunities), the WEMT program developed by Wilderness Medical Associates, and the Winter Emergency Care Course of the National Ski Patrol. The Wilderness Medical Society's educational and research publications provide needed background for the Textbook. The National Association of EMS Physicians has developed and has published clinical guidelines for delayed/prolonged transport; WEMSI protocols are also available as a model.

With textbooks used by its EMT and SAR prerequisites, this Textbook provides all the training material needed to complete the Wilderness Prehospital Emergency Care curriculum established by the Wilderness Medical Society. (Indeed, early drafts of this textbook were a major resource for the WMS curriculum.) We assume that students have the knowledge and skills of an EMT-Basic or EMT-Paramedic. (The curriculum can accommodate both EMTs and paramedics in the same class.) We also assume that students have the knowledge and skills of the Virginia Ground Search and Rescue Field Team Member standards or better. (EMT standards are available from state EMS offices or the U.S. Department of Transportation. The Virginia GSAR standards and GSAR Manual are available from the Virginia Department of Emergency Services, 310 Turner Road, Richmond, VA 23225-6491.) The curriculum is competency-based rather than hours-based, but can be competed in roughly five intensive days. The curriculum also recommends clinical training, for which guidelines are available in the Curriculum.

## WEMT Textbook Chapter Development

An outline for each of the twenty sections of the WEMT curriculum was created by a Task Group of five to twenty selected members, but draws on many published sources and consultants. A Task Group Leader guides the Task Group in reviewing and revising the section, and the Curriculum Coordinator supervises all aspects of curriculum development.

When the outline satisfies the Task Group, it goes to our **Editorial Board**; this includes officers of the ASRC and CEM. It also includes experts in emergency medicine, search and rescue, and education, and a State EMS director. Once acceptable to the Board, it is released to the public.

The Task Group Leader and Editor-in-Chief then produce a Textbook chapter based on the outline. Having a single editor provides a coherent, unified style. Basing chapters on the Task Group's Lesson Plans, as approved by the Editorial Board, ensures accuracy. Each chapter provides a glossary of terms new to a reader with basic EMT and SAR training. In the complete textbook, these glossaries will be merged and alphabetized. Each chapter also provides references to support its statements and for further reading. Background that need not be presented in a class based on the Curriculum appear *in this small, italic font.*

The textbook will be commercially published when completed. All profits will be used to support curriculum development. The textbook will be submitted for publication in 1994. Until then, preliminary versions of the chapters will be printed in this format. These preliminary versions are for use **only** at classes authorized by the Executive Director.

A Course Guide with information about Wilderness Emergency Medical Technician training and course scheduling, will also be available in late 1994; a checklist for recommended in-hospital training is available now. For a price list of available publications, write to: Center for Emergency Medicine, 320 McKee Place, Suite 500, Pittsburgh, PA 15213-4904, (412) 578-3203.

We actively solicit suggestions from anyone reading any of our Lesson Plans or Textbook chapters. Please send your comments to the Editor-in-Chief, as listed on the title page.

# Educational Objectives

1. Identify the causative organism, means of spread (including common vectors), clinical course, prevention, and treatment for the following:
   a. rabies;*
   b. hepatitis;
   c. AIDS; and
   d. tetanus.
2. Outline an approach to headache in the wilderness setting; give examples of episodes of headache:
   a. that can be managed in the wilderness without aborting a task;
   b. that are cause for ending a task and starting a non-urgent evacuation; and
   c. that are cause for immediate evacuation.
3. Outline the diagnosis and wilderness treatment for:
   a. foreign bodies in the eye, corneal abrasions, and snowblindness;
   b. conjunctivitis;
   c. sudden one-sided blindness;
   d. subconjunctival hemorrhage;
   e. retinal detachment;
   f. epistaxis;
   g. dental fractures and infections;
   h. pharyngitis and peritonsillar abscess;
   i. laryngitis; and
   j. esophageal foreign body.
4. Outline the diagnosis, wilderness treatment, and effects on air travel or diving of:
   a. otitis externa;
   b. otitis media;
   c. tympanic perforation;
   d. viral upper respiratory infections;
   e. sinusitis; and
   f. allergic rhinitis.
5. Outline an approach to chest pain in the wilderness setting; give examples of episodes of chest pain:
   a. that can be managed in the wilderness without aborting a task;
   b. that are cause for ending a task and starting a non-urgent evacuation; and
   c. that are cause for immediate evacuation.
6. Outline the diagnosis, causes, and wilderness treatment for:
   a. bronchitis and pneumonia; and
   b. asthma, COPD, and other bronchospastic disorders.
7. Define deep venous thrombosis and pulmonary embolism, and describe their risk factors, diagnosis, and prevention in team members and wilderness patients.
8. Outline the principles for management of hypertension in the wilderness.
9. Outline guidelines for cardio-pulmonary resuscitation in the wilderness, including:
   a. indications for CPR in the wilderness;
   b. contraindications for CPR in the wilderness;
   c. modifications of standard CPR procedures for wilderness patients, especially those who are profoundly hypothermic or victims of near-drowning.
10. Describe how to identify an acute abdomen, and identify appropriate management in the wilderness.
11. Describe how to manage motion sickness, both with and without medications.
12. Describe the signs and symptoms and treatment for gastritis, esophageal reflux, peptic ulcer disease, and constipation.

* Rocky Mountain Spotted Fever, Lyme Disease, Tularemia, and Tick Paralysis are covered in the chapter on *Bites and Stings*.

13. Describe the causes and wilderness management of acute gastroenteritis, including the advantages and disadvantages of antimotility drugs (e.g., Imodium®).
14. Describe the difference between hemorrhoidal and other types of GI bleeding, and the wilderness management of each.
15. Outline the signs and symptoms, wilderness treatment, and disposition of team members with cystitis, pyelonephritis, and urinary retention.
16. Describe the wilderness management of a team member with nontraumatic testicular pain.
17. Define the following:
    a. menses;
    b. dysmenorrhea;
    c. menorrhagia; and
    d. metrorrhagia.
18. Identify the signs, symptoms, and wilderness treatment for impacted renal stones.
19. Identify the differences in management of stroke and seizure between "the street" and the wilderness.
20. Outline the signs and symptoms, prevention, and treatment for plant contact dermatitis, fungal skin infections, and stinging nettle stings.
21. Describe the signs and symptoms and wilderness management of:
    a. impetigo;
    b. cellulitis;
    c. ascending lymphangitis; and
    d. abscesses.
22. Outline the differences between "street" and wilderness treatment of those with diabetic illness.
23. Describe the range of generalized allergic reactions, and the wilderness management of each.

### Notes: *Wilderness Medical Problems*

This chapter provides a condensed summary of medical problems (as opposed to surgical problems, covered in the *Wilderness Surgical Problems* Chapter). The criteria for including a problem are three. A problem is included if it is common in the wilderness and can be treated by the WEMT. Second, a problem is included if it is important for WEMTs to recognize, even if they cannot treat it. Why? Even if they can't treat, WEMTs may make a significant intervention, even if it's just aborting the task and returning to base, or starting an immediate evacuation. Third, the problem is included if management of the problem in the wilderness differs from that taught to "street" EMTs. This chapter also covers medical problems that might develop in a patient during a long evacuation. Note that the chapter on *Principles of General Medicine* contains general information on the care of patients, including considerations such as nutrition and hydration, whereas this chapter covers specific medical problems.

In many cases, the treatment for medical conditions involves the use of over-the-counter or prescription medications. The choice of wilderness medical kit drugs and their use is up to the WEMT's medical director and appropriate state laws and regulations. However, OTC and prescription medications are carried and used by most wilderness travelers, including search and rescue team members, and the WEMT, as the team medical expert, must understand proper use of these medications, and interactions and problems to expect from their use.

This chapter potentially overlaps with the chapters on *General Medicine*, *Patient Assessment*, *Wilderness Surgical Problems*, and *Wilderness Trauma*. We have indicated in the text when a related topic is covered in one of these other chapters.

## Disclaimer

**Recommendations for medical treatment in this textbook are presented for training purposes only. We have attempted to ensure that all recommendations are consistent with current medical practices, but all care provided by WEMTs must be by the order of a physician. Your physician medical director must set protocols and standing orders, and you must follow them, even if they conflict with the recommendations in this textbook.**

# Contagious and Infectious Diseases

The principles of infectious disease, including agents (e.g., viruses and bacteria), disease spread, and asepsis and other medical countermeasures, are covered in the chapter on General Medicine. Any selection of diseases is somewhat arbitrary, because of the great number and variety of infectious diseases. This chapter discusses infectious diseases that are common to the wilderness environment in the U.S. It also addresses those that are important to the members of any U.S. wilderness search and rescue team.

Major world-wide infectious diseases such malaria, schistosomiasis and trachoma inflict far more mortality and morbidity (death and illness) than the diseases presented here. However, they rarely occur in the U.S., and thus they are covered in the chapter on disasters.

## *Rabies*[1]

Rabies ("hydrophobia") is a viral infection of the central nervous system. It is spread by blood or saliva. Once symptoms have started, the disease is uniformly fatal. (Only one survival has ever been documented). Rabies causes paralysis of the swallowing muscles, leading to frothing at the mouth ("hydro"=water, "phobia"=fear of, or in this case, inability to drink), and brain infection causes bizarre behavior. Wild animals with rabies, we are told, will sometimes come right up to a human and act in a tame fashion. Although there is a small possibility of contracting rabies from the air in caves with many infected bats, the most common route of transmission is through the bite of an infected animal.

The rabies virus spreads along nerves; the closer the bite is to the brain, the sooner symptoms appear. If you are bit on the face, symptoms may occur in days. If the bite is on the hand or foot, the virus may take weeks or even months to reach your brain and cause symptoms. Receiving the rabies vaccine in this time will prevent the disease from progressing to infect your brain.

You can reduce the amount of virus in a bite wound, and thus the possibility of infection, by scrubbing the wound briskly with a scrub brush. (A local anaesthetic, if available, is usually appreciated by the patient, but the wound should be scrubbed vigorously even if no anaesthesia is available). Use alcohol and soap if they are available. Although you are taught never to put strong antiseptics or alcohol into wounds, mammal bites are an exception. Alcohol has been shown to kill the virus, and soaps will help remove the virus.

Those regularly going to endemic areas (i.e., parts of South America) should consider preexposure immunization. The series of three doses of human diploid-cell vaccine (HDCV) in the shoulder is almost painless, though expensive. If titers are checked and boosters given regularly, the vaccine provides a high degree of immunity.

In the U.S., the most common carriers of rabies are raccoons, skunks, coyotes, jackals, foxes, feral dogs, and bats. Rodents (e.g., mice or squirrels) and lagomorphs (e.g., rabbits) have a very low infection rate, and thus a rabbit or rodent bite is not a significant risk for rabies. However, be suspicious of any wild animal that is acting abnormally tame. In the U.S., because of almost-universal domestic animal vaccinations, 85% of all rabies reported in the U.S. now occurs in wild animals. Only zero to five cases of human rabies are reported each year. In contrast, in developing countries without effective domestic animal vaccinations, rabies is much more common (e.g., about 15,000 deaths a year from rabies in India). Therefore, WEMTs who may be responding to disasters in developing countries should consider preexposure vaccination.

Any unprovoked attack by a wild mammal should make you suspicious of rabies. If a person was exposed to the mammal's saliva, and if the animal can be killed without danger, do so, and arrange for the head to be taken to a public health service laboratory. After scrubbing the wound, immediately evacuate the patient for

possible postexposure vaccination. If the patient has already been vaccinated for rabies, the need for evacuation depends on the wound itself (discussed in the chapter on *Wilderness Surgical Problems*).

Prevention of rabies consists of:

* avoiding "friendly" wild animals;
* scrubbing any potentially-infected wounds; and
* possibly, obtaining the human three-shot immunization series.

## *Hepatitis*

The term hepatitis is a generic one that refers to any inflammation of the liver (e.g., alcoholic hepatitis, autoimmune hepatitis). However, the most common form of hepatitis worldwide, and the most important from your view, is infectious hepatitis, caused by three or more species of virus.

The symptoms of hepatitis are varied. Generalized weakness and anorexia (loss of appetite) are common. The damaged liver may not excrete bile pigments into the GI tract normally, so the stools may be pale. Bile pigments may build up in the blood, coloring the skin and whites of the eyes yellow (jaundice) or spill into the urine, causing dark urine. Hepatitis typically produces symptoms for one to two weeks before jaundice develops. The liver itself may cause pain in the right upper quadrant, or the liver may be enlarged and tender on exam, but mild, nonspecific abdominal pain is more common. Itching and muscle or joint aches are common.

Usually, symptoms begin to go away as the jaundice appears, and in another few weeks, the patient is well again. Sometimes, however, the liver may fail entirely, causing the blood to lose its ability to clot properly, and causing buildup of waste products leading to stupor, coma, and then death. Occasionally, the liver does not fail completely, but the patient does not recover completely. Such chronic hepatitis is most often due to Non-A/Non-B Hepatitis (about 25-35% of cases) and, rarely, Hepatitis B. Hepatitis A is not known to go on to chronic hepatitis.

**Hepatitis A**, also known as infectious or short-incubation hepatitis, is a mild disease that seldom causes serious problems, and may be totally asymptomatic. However, it is highly contagious, and is spread primarily by the fecal-oral route. Drinking water or eating shellfish contaminated by traces of human fecal material is a common way to get Hepatitis A, especially in developing countries. About half the population of the U.S. has protective antibodies against the Hepatitis A virus. The incubation period is 3-7 weeks.

A word about the fecal-oral route: this is not something that occurs only in slums of developing countries, but is a common cause of disease spread even among "clean" people in North America. When viruses are particularly virulent (small numbers can cause infection), fecal contamination may be submicroscopic and still transmit disease. Remember, too, that some fecal bacteria form part of the normal skin flora of the human body. Thus, it is conceivable that, by scratching your leg and then handing a water bottle to someone, you could also hand them a disease. Complete cleanliness is not possible in the wilderness, even when not on a search and rescue operation. But some care, thoughtfulness, and occasional hand-washing may be helpful in preventing the whole team from getting diarrhea or Hepatitis A. The importance of good hygiene is pointed out by the fact that those infected with Hepatitis A generally shed virus for 2-3 weeks before becoming jaundiced. When WEMTs are in a disaster setting, careful food-handling and hand-washing are essential.

**Hepatitis B**, also known as serum or long-incubation hepatitis, is also caused by a known virus. It is not as virulent as Hepatitis A, so it is transmitted only by sexual contact, blood, or possibly saliva. The incubation period is 2-4 months. If any blood or saliva contacts your mouth, nose, or eyes, you must assume there is a risk of Hepatitis, AIDS, or other infectious disease; you must rinse the mucous membranes with copious amounts of clean water or saline.

**Non-A, Non-B Hepatitis** is transmitted the same ways as Hepatitis B (blood, sex, and saliva), but also may be water-borne, especially in developing countries. There are a variety of viruses that cause Non-A, Non-B Hepatitis. One is blood-borne and has been recently isolated and named Hepatitis C; other forms may be water borne. The incubation period is five to ten weeks for the blood-borne type, and one week to two months for the water-borne type.

"Many treatments have been recommended for viral hepatitis, but it is unlikely that any of them alters the course of the disease. . . Patients should be encouraged to eat whatever they can. . . . Abstention from alcohol is advised during the acute phase, although alcohol has not been shown to affect viral hepatitis adversely."[2] For those in high-risk occupations (including all EMTs), and those traveling to developing countries, a safe and effective Hepatitis B vaccine is available.

Preventing hepatitis, for those who will be exposed to Hepatitis B, is best achieved by obtaining the three-shot human vaccine series.

For those traveling to areas where Hepatitis A is endemic, standard prevention is an injection of gamma globulin every four months.* Gamma globulin is a purified preparation of antibodies, including antibodies against Hepatitis A. (See the chapter on *Principles of General Medicine* for an explanation of immunizations.)

For all kinds of hepatitis, prevention focuses on the routes of transmission:

For Hepatitis A prevention, avoid fecal-oral contamination. Wash your hands compulsively. Avoid food that may have been contaminated by cooks or food servers with poor hygiene when in developing countries. Treat all water with iodine or chlorine.

Hepatitis B and Non-A, Non-B Hepatitis are transmitted by sex and by contaminated needles (which may be used in medical facilities in developing countries). Non-A, Non-B Hepatitis may be transmitted by blood transfusions, even in advanced medical systems, and by contaminated water. So, when in developing countries, observe carefully that all needles and surgical equipment are sterilized, and treat all water with iodine.

## *AIDS*

Acquired Immunodeficiency Syndrome (AIDS) is a slowly progressive but uniformly fatal disease, resulting in infection of, and depletion of, a certain subset of white blood cells (T lymphocytes), resulting in susceptibility to many infections. AIDS is caused by the Human Immunodeficiency Virus (HIV). AIDS is transmitted the same way as Hepatitis B (primarily blood and sex). Be wary of contracting AIDS from poorly-sterilized surgical equipment and syringes in medical facilities in developing countries. Since those infected with the virus may be asymptomatic for up to 10 years, EMTs must treat all their patients as potentially infectious: observe **Universal Precautions**

## *Universal Precautions*

In the U.S., "universal precautions" are mandated by OSHA (the federal Occupational Health and Safety Administration). It is the law that you follow these precautions if you are taking care of a patient and may be exposed to blood or other body fluids.

The best barrier to AIDS, hepatitis, and other blood-borne infections is intact skin. But, a small break in the skin may allow entry to a virus particle. Wear rubber gloves whenever contact with a patient's secretions is possible. You may

* The standard schedule for gamma globulin used to be every 6 months. However, at the May 1991 meeting of the International Society of Travel Medicine, it was reported that some Peace Corps workers in Nepal were getting Hepatitis A in the month or two before their gamma globulin injections.

wear two pairs of surgical gloves under rope-handling gloves when ropework is necessary, or under winter mittens when the weather is cold.

Handle all contaminated needles as potentially infectious. Don't recap used needles; place them in an approved container. Every wilderness Advanced Life Support kit must contain safe storage for used needles and for other contaminated trash. These containers can be strapped on the outside of a medical pack.

Disposable impermeable gowns that are available on ambulances and in emergency departments, but are unfortunately entirely unsuitable for the wilderness. Any clothing that is contaminated with blood or bodily fluids must be cleaned appropriately as soon as possible.

## *Tetanus*

*Clostridium tetani*, a normally innocuous anaerobic soil bacterium, will cause tetanus when it grows in puncture wounds or wounds that have been repaired (creating an anaerobic environment). However, 10-20% of people with tetanus have no visible cuts or puncture wounds. The infection does not cause much in the way of local symptoms, but the bacteria secrete a toxin (poison) that causes muscle spasm, respiratory paralysis, and rapid death ("lockjaw"). The U.S. sees only about 75 cases a year, because of widespread immunization, but in developing countries, tetanus is much more common (about a million deaths a year).

Tetanus bacteria require an environment with only a small amount of $O_2$, which is why puncture wounds and repaired wounds are sites for this kind of infection.

Tetanus infections can be treated with antibiotics, but antibiotic treatment will not prevent death from the poison. A much better approach is available through the immune system. The problem is not the infection itself, but the poison the bacterium happens to produce. If we can neutralize the poison with antibodies, the infection itself would cause no problems.

Almost all younger adults and children in the U.S., except immigrants, have had a series of tetanus shots. For adults who have not had it before, the series consist of two shots a month apart, then another at six months. Tetanus Toxoid, which is what we mean when we talk about "getting a tetanus shot," contains a version the tetanus poison itself. It has been modified so that it is no longer poisonous. However, it still "looks" like the poison to your body. When your body makes antibodies against the tetanus toxoid, these antibodies will also protect you against the real tetanus toxin.

If your wound is high-risk for tetanus, and you never had a full series of tetanus shots, or haven't had a booster within the last five years, you need more than tetanus toxoid. Why? Because it will take several days to develop enough antibodies, and you could die of tetanus in those few days. You need a dose of someone else's antibodies against the tetanus poison. This is called Tetanus Immune Globulin.

There are no documented cases of tetanus within five years after booster and only a few cases between five and ten years after. Therefore, the general rule is that a "tetanus shot" (tetanus toxoid booster) is good for 10 years for routine purposes, but only five years if you have a tetanus-prone wound. If you get a tetanus-prone wound, you go to the Emergency Department and get a booster. However, WEMTs and other wilderness travelers, who might not be able to get needed booster promptly when in the wilderness, and other high-risk people, should get a tetanus toxoid booster every five years. Everyone else should get a booster every 10 years.

Wounds are divided into "low risk" and "high-risk" for tetanus infection. High risk wounds include a puncture wound, second or third degree burns, and a wound that will be surgically repaired. Nearly half all soil samples test positive for spores of the tetanus bacterium, so any dirty or puncture wound is suspect. All other wounds would be "low-risk" for tetanus. (Don't confuse the risk of tetanus with the risk of other wound infections, as described in the *Wilderness Surgical Problems* chapter. For instance,

a tendon laceration with a sterile knife would be at a low risk for tetanus but a high risk of infection or other problems.)

# Head, Ears, Eyes, Nose, Throat

## *Headache*

Headache is caused by many different causes; some are serious, most are not. You should evaluate each case of headache with a careful history, a detailed exam of the head and neck, and a quick neurological exam.

Intracranial hemorrhage or **subarachnoid hemorrhage** classically causes "the worst headache of my life," and if blood leaks into the cerebrospinal fluid, the neck may be stiff, mimicking meningitis. Hemorrhage may come from a large stroke, from high blood pressure, or, in young people, from an aneurysm that ruptures. Anyone with "the worst headache of my life" merits immediate evacuation.

Hypertension (a diastolic pressure above 130) may cause headache. Anyone with a diastolic above 130 and with headache, visual or neurological symptoms, or chest pain should be evacuated immediately.

*Eyestrain may cause headache: after extended exposure to bright light, or after extended use of eyes in poor light, a headache may develop. We suspect this is from overuse of muscles in or around the eye. Rest, cool compresses, and acetaminophen or ibuprofen often help. When exposure to bright light is a factor, you need to consider snowblindness; however, most of the pain of snowblindness is in the eyes.*

Other eye problems may cause headache. Infections and abrasions of the eye are usually obvious, but glaucoma (high fluid pressure in the eye) may sometimes cause severe headaches without much eye pain (see below).

Muscle tension causes headaches and may become a contributor to other types of headache. You may detect this by palpable tender muscle spasm in the muscles over the ears and at the back of the head. With a muscle tension headache, the patient characteristically describes the headache as a "tight band" around the head (which is more or less an accurate description of the problem). Acetaminophen or ibuprofen, heat, and rest are usually indicated. Massage may help greatly.

**Migraine headaches** are caused by spasm and then expansion of the blood vessels of the brain and face, usually on one side. At the beginning of a migraine, the sufferer of a "classic" migraine sees a "scintillating scotoma": flashing lights that obscure part of the visual field. "Atypical" migraines are more common than the classic form, however. Atypical migraines may occur without any visual symptoms, or with the pain being the same on both sides of the head. Intravenous prochlorperazine (e.g., Compazine®) has recently attracted attention as a good treatment for migraines. Oral prochlorperazine is common in many personal wilderness medical kits, and may work. If the patient is vomiting, the pill may be ground up and given rectally. Migraines may rarely cause more severe neurological deficits, including abnormalities of sensation, motor strength, and reflexes.* Symptomatic treatment, including rest in a dark area, and acetaminophen, ibuprofen, or stronger pain medication, will sometimes make a migraine resolve. Sometimes, they will last for days and will be disabling. Anyone suffering from migraine-like symptoms should be evaluated by a doctor as soon as possible unless the history of migraines is well-established. Migraines often cause nausea or vomiting, even if the headache

* In the wilderness, it is probably not appropriate to diagnose a neurological deficit as being from a migraine. Even if you suspect migraine as a cause, evacuate as if the person had a cerebro-vascular accident or transient ischemic attack.

is not very severe. Migraines often occur at the time of menses. A related type of **vascular headache** called **cluster headache** is often associated with a flushed face, runny nose, and tearing of the eye on the affected side, although this sometimes occurs with migraines as well. $O_2$ may be of some help.

*Ear infections and sinus infections may cause headache without overt ear or sinus pain. However, infected ears are generally obvious when examined with an otoscope; if no otoscope is available, tenderness of the ear may be a clue to an ear infection. Infected sinuses are generally tender to pressure or to a tap with your finger (see below for more).*

An intracranial *tumor may cause headache, but usually it is very slow in onset and should not be a problem for you. However, three cases of brain tumors presenting as high altitude cerebral edema have been reported. (David Shlim, M.D.; 1990 annual meeting, Wilderness Medical Society.)*

Temporal arteritis *is a rare but serious type of headache. Any patient with a bounding pulse over a tender artery at the temple, and any significant visual disturbances, might have temporal arteritis and should be evacuated. If untreated, it can lead to blindness. Although rare, it is most common in middle-aged women. The treatment is a steroid medication such as prednisone.*

## *The Eye*

A painful foreign body sensation in an eye can be caused by a variety of problems. Most of these can be diagnosed in the field with a little knowledge and a few tools.

The first step in examining a painful eye, if you have prescription medications and physician orders for their use, is to relieve the pain so that you can do a good examination. Put a few (e.g., three to twenty) drops of ophthalmic anaesthetic (e.g., proparacaine or tetracaine) in the eye and wait for a minute. If you can't get the person to open the eye enough to get the drops in, have the person lie flat. Place a few drops at the corner of the eye next to the nose. In about a minute, even if the person can't blink to help it along, the drops will work their way into the eye. This will bring dramatic relief, but a caution is in order: ocular anaesthetics are only for the initial examination. Continued use is thought to interfere with healing and predispose to infection.

The next step (or first step if you have no eye anaesthetic) is to check visual acuity. It is best to check visual acuity in each eye before using anesthesia. However, you may need the anesthetic so the person can open the eye enough that you can check visual acuity (e.g., ability to read a label at 12 inches).

The next part of the exam is to check the integrity of the eyeball proper. If the globe itself is injured (i.e., a possible penetrating injury), bandage both eyes properly and transport immediately.

If the globe is intact, pull the lower lid down and have the person look up, and examine the lower conjunctival sac. Then evert the upper lid over a cotton applicator or small stick; have the patient look down, and examine the upper conjunctival sac. Remove any foreign material: irrigate with clean water from a Ziploc™ bag with a small hole in it, or use a cotton applicator or the corner of a gauze pad.

Next, use a penlight and examine the eye in a dark area. Shine the light obliquely across, and look at the cornea for abrasions and foreign bodies. (If available and physician orders permit, a drop of fluorescein solution makes abrasions much easier to see and causes no ill effects.) Abrasions are usually easy to see. If you see a loose foreign body on the cornea, flush it off the cornea, then remove it as described above. You may also see a foreign body implanted in the cornea. Experienced physicians may remove corneal foreign bodies in the field, but WEMTs should not do so. If you don't see a foreign body, try irrigating anyway — you may wash out something you couldn't see. If there is still no sign of a foreign object, and you can't see an abrasion, the pain may still be from an abrasion you can't see.

Exposure to bright light (ultraviolet light in particular) with inadequate eye protection may cause **actinic keratitis**, better known as **snowblindness**. This is a sunburn of the cornea. The conjunctiva (lining of the eye and eyelid) is usually inflamed, too. Part of the pain is due to

irritation of the corneal surface, but a large part is due to spasm of the muscles that focus the eye's internal lens (the ciliary muscles). When examined with a penlight, the cornea appears dull, and may show a "punctate" pattern with many small dots.

Treatment is the same for implanted corneal foreign bodies, abrasions, and snowblindness. If no prescription medications are available, apply cool soaks for pain relief (snow is excellent if available). When cold applications are not being applied, keep the eye patched.

Much of the pain from an abrasion, foreign body, or snowblindness is caused by spasm of tiny eye muscles. Putting a drop of mydriatic in the eye will dilate the pupil, and will relax these muscles. Mydriatics such as cyclopentolate (e.g., Cyclogyl®)* will relieve the eye muscle spasm and much of the pain. Since it dilates the pupil, it makes the person sensitive to bright light. If a mydriatic is available, and medical control permits, put a drop or two of it in the eye.

Mydriatics may cause problems in people with a rare disease called **narrow-angle glaucoma**, in which the iris is bowed outward toward the cornea, instead of lying flat across the anterior chamber of the eye. Most people with narrow-angle glaucoma know they have it. You may use a flashlight to check for a shallow anterior chamber (see Figure 1). Those with a narrow anterior chamber should not use mydriatic drops, as they might result in severe angle-closure glaucoma (one type of glaucoma). If severe pain persists despite the above, use acetaminophen, ibuprofen, or a narcotic analgesic.

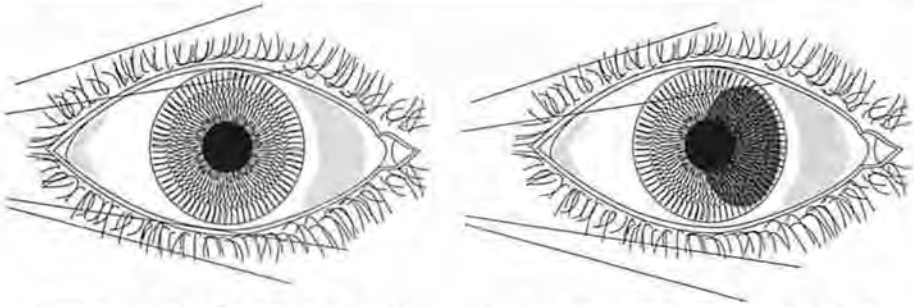
Next, and again only if available and permitted by a doctor's orders, place some ophthalmic antibiotic ointment such as polymyxin-bacitracin (e.g., Polysporin®), sulfacetamide, gentamicin, or erythromycin in the eye and patch firmly with two or three gauze pads and tape. (N.B. nonophthalmic antibiotic ointment is too irritating to put in the eye.) For minor abrasions, the patch may be removed in 24 hours (most abrasions heal in that time). If the eye still hurts, add a drop of mydriatic and some more antibiotic ointment and repatch.

**Subconjunctival hemorrhage** is bleeding under the outer covering of the eye (the conjunctiva) and over the sclera (white part of the eye). It may happen spontaneously or after minor increases in blood pressure such as coughing or straining, or after direct trauma to the eye.

Most often, there is no history of trauma, and no pain. It is usually noticed by looking in a mirror, or by a friend. It is usually unilateral, and rarely indicates any significant problem. The best treatment is to ignore it for three weeks, by which time it should have been reabsorbed. Having an emergency medicine physician or ophthalmologist look at the eye at some point is reasonable. It is not a reason for evacuation or for cutting short a search task.

If, however, the hemorrhage is after trauma, you rule out bleeding inside the eye. Ask about haziness of vision that might suggest bleeding inside the eye. Carefully inspect the eye, including a penlight exam to rule out a significant abrasion or hyphema (see below). A significant scleral abrasion should be treated the same as corneal abrasion. You should also examine the face carefully for evidence of a fracture, particularly of the orbital rim; you should also remember to check extraocular motions and ask about double vision on upward gaze to ensure the inferior rectus muscle is not entrapped in a blowout fracture of the floor of the orbit. An isolated blowout fracture with no other visual or traumatic problems is reason for leaving the field, but not for an urgent evacuation; surgery is indicated, but can be delayed for days.

* Cyclopentolate lasts for about a day, so it is an appropriate mydriatic for wilderness medical kits. Other mydriatics, such as atropine or homatropine, last longer, and thus are less useful in the wilderness.



Normal Anterior Chamber: all of iris is illuminated by oblique penlight

Shallow anterior chamber: far side of iris is shaded by anterior bulge of iris

**Figure 1. Examining depth of anterior chamber**

**Hyphema** refers to blood in the anterior chamber of the eye, usually after trauma. It may easily be seen in the lower portion of the anterior chamber, over the colored iris, by a penlight exam. This must be treated promptly or it will almost invariably lead to blindness. Evacuate the patient as soon as possible. Hyphema may be the only clue to other eye trauma, e.g., high-speed penetration by a small piece of metal from someone chopping wood or pounding in a bolt or tent stake.

If, after a blow to the head or eye, a patient complains of continued flashing lights, a visual field defect (inability to see in one part of the visual field), or "something like a curtain coming down across my eye," you must assume a retinal detachment. Have the patient avoid sudden movements of the head; evacuate for examination by an ophthalmologist as soon as possible. (There is little that can be done for this in an Emergency Department).

You may easily diagnose severe glaucoma by noting a painful eye that is stony hard to palpation. (With the lids closed, press on the side of the eye; compare to a normal volunteer.) A red eye with a "steamy" looking cornea also suggests glaucoma. No routine wilderness medical kit medication is effective, although if you carry acetazolamide for altitude acclimatization, you may give it with some lowering of the pressure. If an advanced life support drug kit available, IV mannitol will bring the intraocular pressure down in about an hour, and keep it down for about five or six hours.

*If eye pain has come on gradually, associated with itching or burning, it may be conjunctivitis. If there is considerable redness of the white of the eye or the inside of the eyelids, perhaps with crusting of the eyelids in the morning or a white or yellow discharge, it is* **conjunctivitis** *(inflammation of the lining of the eye and eyelids). Conjunctivitis may be due to allergy, or infection, or from nonspecific irritants like dust. You must make a careful check for a foreign body, as described above.*

If itching is prominent, or if other allergic symptoms are present (e.g. itchy, runny nose with sneezing), the conjunctivitis is probably allergic and will respond to aspirin and an antihistamine (e.g., chlorpheniramine).

If not, the cause may be infectious. Most infectious conjunctivitis is viral ("pink-eye"), and does not respond to antibiotics, but rarely causes anything more than itchy red eyes for a week or two. With viral conjunctivitis, there is only a small amount of discharge from the eye, and vision is normal. This kind of conjunctivitis is highly contagious, and proper hand washing is essential to prevent spread. For viral conjunctivitis, you should place antibiotic ointment in the eye twice a day to prevent a secondary bacterial infection. Viral conjunctivitis is not cause for evacuation or for ending a search task.

If a case of conjunctivitis has a large amount of discharge, or any decrease in vision, you must assume the conjunctivitis is bacterial. For bacterial conjunctivitis, place the antibiotic ointment in the eye frequently (i.e., once an hour) and evacuate the patient urgently.

Since all conjunctivitis is highly contagious, regular hand washing is essential.

Sudden blindness in one eye is usually caused by a clot in a retinal artery or vein. This is cause for immediate evacuation to an ophthalmologist.

## *Ear infections*

**External ear infection (otitis externa)** is easy to diagnose: if the ear canal looks red, or has some discharge, and is tender to the touch, consider it infected. Clean out any debris (only that which you can see) with the corner of a gauze pad soaked in some clean water. Make a wick out of a half inch wide piece cut off a gauze pad, soak it in antibiotic ointment, and gently place it in the ear canal; use a straightened and re-bent paper clip if necessary, but be gentle. To hold the wick in place, tape a gauze pad loosely over the ear.

With a **middle ear infection (otitis media)**, the ear canal is seldom red, but pulling on the ear or opening the mouth widely will usually cause pain. Hearing may be decreased in the ear, and vertigo (spinning dizziness) is sometimes seen.

The treatment is an oral antibiotic to kill the bacteria and decongestants to aid drainage. You may use a nasal spray decongestant as follows. Lay on your back, with your head hanging somewhat upside down. Spray the decongestant spray into your nose. Wait ten minutes for it to get into the back of the nose and throat and to get to the openings of the tubes that drain the ear (the Eustachian tubes). Acetaminophen with codeine (e.g., Tylenol #3®) or a similar analgesic may be appropriate if the pain is severe.

**Those with middle ear infections are prone to rupture of the eardrum due to pressure changes from diving or flying, and should not dive or fly.**

A **ruptured eardrum (tympanic perforation)** is usually accompanied by sudden sharp pain in the ear. It usually occurs during pressure changes (e.g., during flight). Or, it may come after a sudden pressure injury (e.g., an explosion or a slap on the ear), or from pressure from otitis media. Hearing is usually decreased in the ear. With an otoscope, you can often see a small hole. The main treatment is to keep the ear dry (no swimming or diving), to keep a piece of cotton in the ear to protect it, and to follow up with an ENT specialist within a week or two. Most but not all perforations heal on their own in a few weeks.

## *Nasal Problems*

Treatment of a nosebleed (**epistaxis**) in the wilderness is the same as anywhere else: lean forward (to avoid swallowing blood and then vomiting), squeeze the nose firmly, and hold firmly for ten minutes without letting go. You may roll up a small gauze pad (not a tissue or paper towel that will partially dissolve) and place it in the bleeding side of the nose to aid in direct pressure. It will also serve as a pressure dressing once pressure is released. To avoid infections, leave gauze pads in place for no more than 1-2 days. You may spray some decongestant nasal spray into the nose before applying direct pressure.

**Rhinitis** (a stuffy, runny nose) may be a result of allergy or of a minor viral infection (a "cold"). Allergic rhinitis responds well to antihistamines (e.g., chlorpheniramine), and nasal colds generally respond well to antihistamines such as diphenhydramine (e.g., Benadryl®) or chlorpheniramine (e.g., Chlor-Trimeton®) and decongestants such as pseudoephedrine pills (e.g., Sudafed®) and oxymetazoline nasal spray (e.g., Afrin®). A caution is in order: if you overuse nasal spray decongestants, it may lead to dependence, and long-term use may even give you a type of stuffy nose ("**rhinitis medicamentosa**"). Acetaminophen seems to relieve the discomfort of rhinitis, though it probably does little for the congestion. **Those with rhinitis often have difficulty equalizing pressure in their ears, and are prone to rupture of the eardrum due to pressure changes from diving or flying, and should not dive or fly.**

**Sinusitis** is characterized by pain in the face and tenderness over the sinuses. (One sinus lies to

either side of the nose, and one is over the medial aspect of each eyebrow.) With sinusitis, you will often find yellow or green nasal discharge, foul odor of the breath, postnasal drip, and sometimes fever. Sinusitis can be caused by viral or bacterial infections. Treatment is decongestant nasal spray, used as described for middle ear infections, above, and an oral antibiotic. Hot soaks to the face often offer great relief of the pain. (Warmth helps liquefy the mucus and help it drain from the sinuses). As with any infection, you should have a lower threshold for evacuating diabetics. **Those with sinusitis are prone to severe pain due to pressure changes from diving or flying, and should not dive or fly.**

## *Dental Fractures, Avulsions, and Infections*

*A tooth may fracture because of cavities or due to trauma. Trauma may also cause a traumatic extraction. You may treat small fractures simply with pain medications, and, if available, you may apply some Eugenol (Oil of Cloves) to the fracture for local anaesthesia.*

If the tooth is completely out of the socket (a complete avulsion), you may rinse dirt off it. But, don't scrub it, even with a gauze pad, as this will destroy the delicate layer of cells that will allow it to reattach. Further treatment depends on the time until you can reach a dentist or oral surgeon.

If you are within an hour or two of a dentist or oral surgeon, and a tooth is completely out, keep it moist so that an oral surgeon can reimplant it. Keeping the tooth in the patient's cheek is ideal, since the patient's own saliva is the best protection.

If you are distant from a dentist or oral surgeon, replace the tooth in its socket as soon as possible. Apply some dental splinting material to keep the tooth in place if you have some. A large wad of chewing gum often works fairly well as a dental splint.

No matter the distance to the dentist or oral surgeon, you must assure that the patient doesn't aspirate the tooth. If the route out involves some difficult climbing, or if the patient is only semiconscious, don't put the tooth in the mouth. Instead, place it in a gauze pad dampened with the patient's saliva and a bit of clean water or saline, then put it in a plastic bag. Evacuate the patient immediately but not urgently, unless there are more severe injuries.

Dental infections include **gingivitis** *(infection of the gums) which may progress to* **pyorrhea** *(pus draining from the gums). The tooth may decay (cavities, also known as caries), and if the cavity reaches the nerve, it may cause severe pain. If an infection develops around the base of the tooth, where it is seated in the bone of the jaw (a* **periapical abscess***), the whole side of the jaw may swell, and the patient may develop fever. If a particular tooth is tender to a light tap, this strongly suggests a periapical abscess. The ideal treatment for dental infections includes oral penicillin (erythromycin or clindamycin for those who are allergic to penicillin), warm salt water rinses, and good toothbrushing.*

A variety of temporary dental filling kits are available. Each contains instructions for its use.

## *Throat Problems*

A sore throat (**pharyngitis**) is seldom more than a discomfort; most are minor viral infections that need no antibiotics. Strep throat, caused by beta-hemolytic Group A *Streptococci*, may require antibiotics to avoid delayed consequences. There is no way to tell strep throat from a viral sore throat without a throat culture, and therefore, in the wilderness, severe sore throats should usually be treated with erythromycin, if doctor's orders permit.* Acetaminophen or ibuprofen

* Penicillin is a more usual antibiotic for strep throat, but is seldom carried in wilderness medical kits. Cephalexin and erythromycin are commonly carried and are reasonable alternatives. If the patient cannot tolerate oral medications, an IM injection of ceftriaxone (Rocephin®), a common injectable

will reduce the pain, and salt water gargles will reduce the swelling and make swallowing easier. Don't take aspirin for sore throats or viral "colds." With some viral infections, aspirin may cause a rare form of liver failure called Reye's Syndrome. A case of pharyngitis that causes difficulty breathing or makes you unable to swallow your own saliva (not just pain on swallowing) is reason for urgent evacuation. In the hospital, these cases are managed with IV hydration and IV antibiotics; IV steroids help reduce swelling. You can recognize a **peritonsillar abscess** by inspecting the throat with a penlight: one tonsil is red and bulging, and the uvula (the floppy piece of tissue that hangs down in the back of the throat) is displaced to the opposite side. This, too, is reason for urgent evacuation. Sometimes such abscesses are surgically drained.

**Laryngitis** is characterized by hoarseness, usually after a sore throat or cold. In adults, the condition is usually self-limited. The treatment includes rest with a nearby humidifier (in the wilderness, this can be simulated with a warm, wet cloth held across the mouth and nose). Those with laryngitis should not smoke or talk. A cough suppressant is usually indicated. Many people carry acetaminophen with codeine (e.g., Tylenol #3®) or with hydrocodone (e.g., Vicodin®) in their personal wilderness medical kits. The narcotic in these medications is an excellent cough suppressant. Children (and rarely, adults) may develop a stridorous cough or excessive drooling which may indicate **croup** or **epiglottitis**. Treatment is the same as for adult laryngitis, but because of the possibility of airway obstruction, any child (or adult) with excessive drooling or a croupy cough should be evacuated urgently. Because of the possibility of laryngospasm, do not use a tongue blade to inspect the mouth. Croup is viral and epiglottitis is bacterial. Since you may have difficulty distinguishing the two in the field, you should treat any patient with either croup or epiglottitis with antibiotics if available and physician orders permit.

**Esophageal foreign bodies** may be a minor discomfort or life-threatening.

The classic sign of an impacted esophageal foreign body is excessive salivation. Most people can accurately point to the site of obstruction if they have one. If the object is very large, it may press the esophagus into the soft part of the trachea and cause dyspnea.

The most common example is a person who is eating and has a particularly large or irregular piece of food get "stuck." Usually, eating a few pieces of bread or similar foods will push the piece on down into the stomach. Sometimes, an abrasion of the esophagus will cause discomfort to last for several hours after the offending object is gone from the esophagus.

For objects that do not go on down after some bread, removal is often attempted in the Emergency Department. This is usually done by using a gastroscope (a lighted fiberoptic device used to look for ulcers and other abnormalities in the esophagus and stomach; it is "swallowed" down the esophagus). An alternative is having the patient "swallow" a Foley catheter, then inflating the balloon, and then pulling the Foley out. This is seldom used in Emergency Departments anymore, and because of dangers of perforation of the esophagus, we cannot recommend it for wilderness use.

# Chest Pain

Determining the cause of chest pain can be difficult, even for a doctor in a modern hospital, and can be problematic in the wilderness.

For the street EMT, chest pain is simple to deal with: $O_2$, IV, EKG monitor, transport, and let the ER doctor figure out what's causing the

antibiotic in wilderness medical kits, is an alternative.

pain. You, however, have a more difficult job. For instance, can a young, healthy team member with mild chest pain continue the task? This may be a real dilemma, especially when the team is evacuating a severely injured patient. Can an older team member with chest pain walk out, or should the team make a bivouac for the night and send out someone to bring in an evacuation team?

Pressure-type chest pain with characteristics of heart pain, or in a person with many risk factors for coronary artery disease, should be taken seriously. Common characteristics of heart pain include radiation to the left arm or jaw, and associated symptoms of shortness of breath, cold sweats (diaphoresis), or nausea or vomiting. If the pain persists, provide pain relief with nitroglycerine, and narcotics, if available. Even if the pain resolves, but you have a suspicion that the pain was new-onset angina, or unstable angina (more frequent, more often than usual, or lasting longer than usual), evacuate with a minimum of fuss, and with minimal exertion on the patient's part. A slow downhill walk is probably better than a very loud and confusing stretcher evacuation, provided the exercise doesn't cause the pain to recur. Risk factors for chest pain being from coronary artery disease include:

* any history of prior coronary artery disease (angina or myocardial infarction);
* prior peripheral vascular disease (arterial insufficiency in the legs, or an abdominal aortic aneurysm) or cerebrovascular disease (surgery for a carotid artery blockage, or a history of TIA or stroke);
* male gender;
* age over 35;
* obesity;
* smoking within the last 10 years;
* a history of high blood pressure;
* a history of high blood cholesterol;
* a history of diabetes; and
* a history of family members having heart attacks at an early age (under 45).

Other causes of chest pain include pulmonary embolism (PE), pneumonia, chest wall pain secondary to coughing from any cause, muscle strain, rib bruises or fractures, esophageal reflux and esophagitis, constipation, peptic ulcer disease, gastritis, liver or gallbladder problems, and spleen or liver injuries.

Pleuritic chest pain (pain that is worse with a deep breath) that is not due to trauma suggests pneumonia, PE, or pleurisy (a viral inflammation of the lining of the chest). Pain that is very clearly pleuritic is not likely to be related to angina or a myocardial infarction. If the team member is quite active, has had no swelling or cramps of the leg, and is not short of breath, and has no risk factors, PE is unlikely. Risk factors for PE are recent trauma to the leg, prolonged activity, obesity, smoking, birth control pills, severe dehydration, or a history of deep venous thrombosis or PE in the past. If the patient has a fever or cough producing purulent (yellow or green) sputum, pneumonia is likely. Pericarditis, which is inflammation of the sac around the heart, often due to a viral illness, may produce pleuritic substernal pain, but is rare. Pleuritic pain that is also worse with arm movement suggests a muscular injury; if you palpate the chest and find marked muscle tenderness in the chest muscles, it would tend to confirm the diagnosis. If there is nothing to suggest PE or coronary disease, and if not too short of breath or in too much pain, team members with pleuritic chest pain may walk out with assistance.

A team member who has substernal chest pain but no cardiac risk factors, whose pain is promptly relieved by antacid, may continue with the task. This is likely to be due to gastroesophageal reflux (acid going back up into the esophagus = "heartburn"), and certainly the stress of wilderness search and rescue operations is thought to predispose to reflux. Caution the team member to avoid those things that tend to increase stomach acid and gastroesophageal reflux (caffeine, tobacco, alcohol, aspirin, mint,

chocolate, and eating just before going to bed.) Taking antacids an hour after every meal and at bedtime will help prevent gastroesophageal reflux from returning.

If an episode of chest pain in a team member is not clearly due to trauma or a muscle strain, or to gastroesophageal reflux, or to pneumonia or bronchitis, it is best to treat it as a possible myocardial infarction and proceed with an evacuation.

Any patient who had chest pain in the field should be evaluated by a physician on return to civilization.

# Pulmonary

## *Pulmonary infections*

**Bronchitis** and **pneumonia** are usually distinguished by history, lung exam, and the chest X-ray. Localized pleuritic chest pain, shortness of breath, areas of dullness to percussion, localized bronchial breath sounds (sounds like those normally heard only over the trachea or major bronchi) or rles on lung exam, and high fever all suggest pneumonia. (However, remember to consider high altitude pulmonary edema if ascending or at high altitude.) Cough producing green or yellow sputum without these signs and symptoms is interpreted as bronchitis, which is diffuse lung infection without the **consolidation** characteristic of pneumonia. (Consolidation means an area of lung tissue that becomes filled with fluid and "solid" rather than spongy like normal lung.)

The treatment is the same for team members with both pneumonia and bronchitis in the wilderness, and depends on how ill the patient is. If the patient is not very ill, you can send the patient back to base with a companion. If return to base will be delayed, and an antibiotic such as erythromycin is available, use it. If the patient is one you are rescuing, or a team member who is immobilized or very sick, you should observe good general pulmonary care.

## *General Pulmonary Care*

Prevent **atelectasis** (collapse of small segments of lung) and pneumonia with suction (if needed), postural drainage and chest Physical Therapy (PT), and deep breathing exercises. **Postural Drainage** is designed to help bring up lung secretions in those who are having difficulty doing so on their own. This includes those who are very weak from exhaustion, starvation, severe illness, or other injury. The technique is simply to assess where the pneumonia or secretions are located in the chest, and then to position the patient with this part uppermost (i.e., on one side). Tilt the patient in the slightly head-down position. If you can't tell which side is the source of the phlegm, have the patient alternate lying on the left and right sides. **Chest PT*** is pounding moderately on the chest, with cupped hands. The action comes from the wrist, with alternate clapping of the hands. You may use a minute of this clapping every hour or two. **Deep Breathing Exercises** help in clearing secretions from the bronchial tree. By directing the patient very specifically in expanding the lungs, you may encourage the patient to take a deeper breath, opening sections of the lung to drain. **Coughing** is an important method of clearing secretions. Because of pain or tiredness, patients may not want to cough. By explaining and encouraging coughing, you can promote drainage. If the patient is sick enough to need chest PT and deep breathing/coughing exercises, you should evacuate promptly but not hastily.[3]

* Strictly speaking, chest PT includes a variety of techniques. However, it is commonly used to refer to clapping.

## *Asthma and Chronic Obstructive Pulmonary Disease*

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are similar disorders of breathing. Asthma is intermittent; COPD is present all the time, though with intermittent worsening. Inhalation of smoke or other noxious fumes may cause **bronchospasm** that is indistinguishable from asthma. Fluid overload or ARDS (Adult Respiratory Distress Syndrome) may cause a picture that is similar to asthma. With fluid overload, you can usually see some pedal edema or presacral edema (swelling over the sacrum and lower back). An asthma attack or exacerbation of COPD may be caused by exercise, exposure to smoke, bronchitis, cold air, or for that matter, any infection or strong emotion.

All bronchospastic disorders are characterized by a decrease in the ability to **expire** (breathe out) air. In asthma, this is caused solely by thick mucus and spasm of the bronchioles. In COPD, this is superimposed on damage to the lung tissue from smoking, black lung from mining, or sometimes from long-term asthma.

An important step in the diagnosis of these problems is to compare the amount of time the patient takes to take in a breath (inspiration: usually about one third of each breath) and to exhale a breath (usually about two-thirds). In both asthma and COPD, expiratory time and the expiratory:inspiratory ratio are increased. To confirm this, you may ask the patient to take a deep breath and blow it out as fast as possible. Obstructions to expiration tend to cause wheezing, especially on expiration. Noting wheezing is not as important as checking for expiratory prolongation, the respiratory rate, and how hard the patient is working to breathe. Since air is trapped in the lungs, the lungs will generally have a more resonant percussion tone. Clues to assess the severity of the attack include:

* Has the patient ever been on **steroids** such as prednisone before? (This means the patient has had severe asthma before.)
* Has the patient ever been **intubated** for asthma or COPD before? (The patient may need it again.)
* Is it a **rapid downhill course** or has the patient been doing fairly well for a long time? (If it has come on very fast, it may get worse very fast.)
* What is the **respiratory rate**? (Higher rates generally mean a more serious attack.)
* How much air does the patient seem to be moving, and **how "tight"** do the lungs seem (expiratory prolongation)?
* Is the patient **cyanotic**, or showing signs of **central nervous system depression** from hypoxia or hypercarbia ($CO_2$ retention)?
* Can the patient speak in **complete sentences** without pausing for breath?
* Are the nostrils **flaring** with each breath? (A sign of severe distress.)
* Are the supraclavicular and intercostal spaces **retracting** with each breath? (A sign of severe distress.)
* Is the patient having to use the **accessory muscles** of the neck and arms to breathe? (A sign of severe distress.)

Wilderness treatment for both asthma and COPD is the same.

The danger of high-flow $O_2$ in a patient with COPD has been emphasized in some EMT training.* Anyone who shows signs of respira-

* The premise is as follows. By giving high concentrations of $O_2$, you increase the concentration of $O_2$ in the blood ($pO_2$). Patients with COPD may have a drive to breathe based solely on their $pO_2$, because they have become accustomed to a high concentration of $CO_2$ ($pCO_2$). When you give lots of $O_2$, they may breathe so shallowly that the $CO_2$ builds up to levels that may cause CNS depression.

tory distress, cyanosis, or central nervous system depression, however, needs high-flow $O_2$ despite any possible $CO_2$ retention from COPD. The way to avoid $CO_2$ retention is to observe the patient continuously. Intubate and/or start artificial respiration if you see signs of central nervous system depression or respiratory failure.

If you see evidence of possible infection in the lungs (sputum that is yellow or green, localized chest pain, or fever), an antibiotic is usually in order.

**Steroids** have recently become a mainstay of the treatment of asthma. Steroids take several hours to work, so the adrenergic agents must be used at first. Steroid inhalers are now a common preventive treatment for asthma. Standard treatment of asthma exacerbations now includes short courses (i.e., about a week) of oral steroids, e.g., prednisone.

The primary immediate pharmacologic treatment for asthma or COPD exacerbations is to use **adrenergics**, also known as **sympathomimetics**, because they mimic the fight-or-flight sympathetic nervous system response. The best known of these drugs is epinephrine (adrenaline), which is often used in children with asthma, and may be used in adults if nothing else is available. A variety of inhaled agents are available for treatment of asthma. Patients with asthma may have their own pocket nebulizers, and you should encourage them to bring their inhalers on wilderness trips and SAR missions. Many wilderness Advanced Life Support kits contain an adrenergic inhaler. **Albuterol** is the most common. A side effect of all these medications is tachycardia.

For chronic treatment, a drug called **theophylline** is sometimes given in pill form. A variant called **aminophylline** is found in some wilderness ALS kits, and is given IV. Caffeine is a readily available but relatively poor substitute. Several cups of coffee, tea, or caffeine-containing soft drink will have an effect similar to theophylline, though the side effects are more prominent (sweating, tachycardia, tremor, irritability). Caffeine, like theophylline, can be toxic if taken in too-large doses. Seven hundred milligrams of caffeine, which is about seven cups of coffee, is enough to cause primary psychiatric symptoms even in those without stress. Two thousand milligrams, which is about twenty cups of coffee, is a fatal dose for an adult. (These amounts assume the caffeine is taken all at once, with no opportunity for any of it to be excreted.)

## *Deep Venous Thrombus and Pulmonary Embolism*

**DVT (Deep Venous Thrombus)** and **PE (Pulmonary Embolism)** are related problems. While there is little that you can do for them in the wilderness, it may be important for you to recognize them, and distinguish them from other problems.

Risk factors for DVT include:

* **injury** (recent trauma, surgery, or even a bump to the leg);
* **stasis of blood**, whether from immobilization, as in sitting during a long plane or car ride, being stranded or entrapped, or being sedentary, or from dehydration;
* **predisposition to clots** such as using birth control pills, certain cancers, smoking, and possibly obesity; and
* history of a **previous DVT.**

Small clots form in your veins regularly, and these sometimes return to the heart, where they pass through into the lung. As long as these are small clots, the lungs' efficient fibrinolytic mechanisms dissolve the clots.

If, however, a large venous clot forms, say in the deep vein of the leg, and a large piece breaks off and proceeds into the lung, a true PE results. The resulting blockage can cause infarction of part of the lung, and severe hypoxia that may not improve much even when you give $O_2$. A large PE may cause death in a matter of minutes, whether the patient is in the hospital or at 14,000 feet.

The commonest cause of a PE is a DVT in the leg, though clots in the pelvic veins, especially after trauma, may cause a PE.

Superficial thrombophlebitis (a clot in a small superficial vein) can be recognized by superficial swelling along the course of the vein and distal to it, tenderness along the vein, and sometimes a palpable clot in the vein. There is usually some redness and warmth, as well, though not as much as with cellulitis. (Sometimes it is very difficult to tell thrombophlebitis from cellulitis; if in doubt, treat as if both.) Superficial thrombophlebitis is treated by warmth and elevation, and does not cause PEs.

A classic DVT in the leg is characterized by swelling in the leg and ankle, just on one side, with mild redness and warmth. The calf is swollen compared with the unaffected side, and is tender to deep palpation (compare with the unaffected side). If the foot is forcibly dorsiflexed (pushed up), the resulting traction on the calf causes pain. This is known as a positive Homans' test. The Homans' test is not very reliable: a negative test doesn't rule out a DVT. However, it is easy and commonly used. Sometimes, you can feel the tense, clotted veins behind the knee or in the upper calf or posterior thigh ("cords").

If the clot does not extend up past the knee (very hard to tell on physical exam alone), the treatment is bed rest, elevation, and warmth. If the clot extends beyond the knee, the patient is put on IV heparin (a blood thinner) in the hospital for a few days. Often a venogram (injection with dye or mildly radioactive tracer, then X-rays or a nuclear scan) is needed to tell whether a patient needs heparin or not. The point of all of this for you as a WEMT is as follows. If there is any suggestion the patient might have a DVT extending above the knee, **don't let the patient** walk out. Walking on the leg could make a piece of clot break off and go to the lung, causing a PE. Evacuate with the leg elevated and keep it warm with heat packs. (We think heat will help the body reabsorb the clot.) Even if the clot is all below the knee, there is still risk that the clot will grow and extend into the thigh.

A PE is characterized by pleuritic chest pain, cough (sometimes with bloody sputum), dyspnea, and resting tachypnea and tachycardia and apprehension as in shock. (Tachycardia and tachypnea are important clues to a PE, but may also come simply from pain, anxiety, or high altitude.) Sometimes, with a pulmonary infarct, you can hear pleural squeaks similar to those with viral pleuritis (PE vs. pleurisy: an important distinction!), and can have tenderness between the ribs, like with a muscle strain from coughing (PE vs. muscular chest pain: another important distinction!). What are the clues that you are dealing with a PE rather than viral pleuritis or a muscle strain? First, resting tachycardia or tachypnea (without significant pain, anxiety, or altitude) are good clues to a PE. Apprehension or evidence of hypoxia suggests a PE. Anyone with evidence of a DVT (or risk factors or history consistent with having had one recently) and any chest pain or dyspnea has a PE until proven otherwise.

A PE is treated the same as a DVT that extends above the knee: admission to the hospital and IV heparin. In the field, the main treatment is high-flow $O_2$ and rapid evacuation. IV heparin is generally only given only when controlled by blood-clotting tests not available in the field. It is potentially possible to start treating a DVT (or PE) in the field with SQ heparin. A standard regime starting with an initial dose of 15,000 units SQ has been shown as effective as IV heparin.[4] For this regime, a clotting time is checked in 12 hours; this gives you 12 hours to get the patient to a hospital. However, this is risky, and you should do this only by direct order of a Wilderness Command Physician. An exception is that, in some patients with no contraindication, you could give small doses SQ to prevent DVTs (5000 units SQ every 12 hours). Because of infrequent use, many wilderness ALS kits don't even include heparin.

Team members may decrease the probability of DVTs by:

* not smoking;

* regular leg exercise (i.e., isometric tightening and relaxation), even if confined to a car or aircraft seat; and
* good hydration.

# Cardiovascular

## *Hypertension*

Hypertension is rarely an acute problem; its ill effects are subtle and accumulate over years.

When you find a headache, chest pain, or neurological or visual symptoms accompanied by a **diastolic** pressure over 130, you may suspect that the high pressure may be the cause. However, not all people with a diastolic pressure over 130 have symptoms; and, some of those with a headache, chest pain, or neurological/visual symptoms and a high pressure may have the high pressure secondary to an intracranial bleed, myocardial infarction, or stroke. Also, pain itself may cause severe hypertension; for a patient in pain with hypertension, treat the pain and recheck the pressure.

A single elevated blood pressure is not an indication of hypertension; human blood pressure usually varies, and anxiety or other hyperadrenergic states may boost the blood pressure temporarily. Always remember to ask if the patient is taking medications that might cause hypertension, (e.g., decongestants such as pseudoephedrine), or if the patient has established hypertension and missed doses of prescribed medication. (Suddenly stopping a beta blocker such as Inderal®, atenolol, and metoprolol is well-known to cause severe "rebound" hypertension.)

Treatment of hypertension in the wilderness is the same as on the street, using medications from an Advanced Life Support kit. Sublingual nitroglycerine and nifedipine (e.g., Procardia®) are common oral medications carried in wilderness ALS medical kits for treating hypertension. WEMTs should not, however, be overeager to treat hypertension. Especially in older patients, a sudden drop from a long-established high blood pressure may cause orthostatic lightheadedness or syncope that may lead to other injury.

**Angina** and **Myocardial Infarction** are discussed in the section on chest pain, above.

## *Cardio-Pulmonary Resuscitation in the Wilderness*

**Basic Cardiac Life Support** (BCLS: external cardiac compression and artificial respiration), also known as cardio-pulmonary resuscitation (CPR), was popularized in the 1960's as a first aid method for people who suddenly collapsed without breathing or pulse. The technique assumes that the person has suffered a cardiac arrhythmia (e.g., ventricular fibrillation). It also assumes that providing temporary support of circulation and respiration might lead to recovery. Or, alternately, it aims at continuing cere-

| | | Time to ALS | | |
|---|---|---|---|---|
| | | < 8 min. | 8-16 min. | > 16 min. |
| Time to BLS | < 4 min. | 43% | 19% | 10% |
| | 4-8 min. | 27 % | 19% | 6% |
| | > 8 min. | N/A | 7% | 0% |

**Table 1. Cardiac Arrest Survival Times**

bral circulation until Advanced Cardiac Life Support (ACLS) techniques such as intubation, drugs, and defibrillation can be brought to the patient or vice versa.

Current guidelines for CPR on the street say that CPR should be continued until:

* effective spontaneous breathing and circulation have been restored;
* the victim's care has been transferred to another responsible person who continues CPR;
* the victim's care has been transferred to a physician or Advanced Life Support team;
* the rescuer is exhausted and unable to continue; or
* a physician pronounces the patient dead.[5]

These guidelines allow withholding of CPR from:

* patients who are obviously dead;
* patients who have suffered injuries incompatible with life (e.g., decapitation or transection of the torso); and
* patients dying of a terminal condition.

A large and much-quoted study published in 1979 documents the effect of BCLS and ACLS on survival from unexpected cardiopulmonary collapse (see Table 1).[6]

Despite some anecdotal reports to the contrary, most recent evidence suggests that Basic Cardiac Life Support, even if performed perfectly, results in less than 30% of normal brain perfusion, and no significant coronary artery (heart) perfusion. This, combined with the above study's results, suggests that a person in full cardiac arrest in the wilderness has no hope of survival if there is no spontaneous recovery (with or without CPR). By definition, ACLS is remote in any wilderness setting; an exception might be when a patient being evacuated by a wilderness rescue team goes into cardiac arrest.

"Traumatic arrest" (cardiac arrest following trauma) carries a high mortality, even when it occurs in a Level I Trauma Center. Recent research suggests that the chances of a person surviving a traumatic arrest in the wilderness, even with CPR, is so remote as to be insignificant.[7]

Specific protocols on CPR are the province of the EMS agency operational medical director, following existing state and regional medical policies. WEMTs who believe that discontinuing CPR is indicated according to the above guidelines should contact medical command. If the situation meets the above guidelines for stopping CPR, and you cannot contact medical command, you should continue CPR only if there is no significant risk to personal safety in doing so.

In the wilderness, when body energy stores may be critical to personal survival, continuing CPR "until the rescuer is exhausted" may be a significant hazard to the rescuer. Therefore, start CPR in the wilderness only when it is clearly indicated and stands a reasonable chance of resuscitating a victim.

The following have been proposed as standards for CPR in the wilderness:[8]

*CPR is useless, and should not be started in the wilderness in the following situations* [we would rewrite this to read "Always start CPR in a pulseless wilderness victim unless one of the following contraindications is present" –Ed.]:

*If cardiac arrest is due to trauma;*

*If a drowning victim has been immersed for more than an hour, even in cold water;*

*If Advanced Cardiac Life Support is more than an hour away;*

*In cases of unwitnessed cardiac arrest, when there is no way of knowing when it began;*

*Persons who appear dead because of:*

*Rectal temperatures that are the same as that of the environment;*

*Rigor mortis* [or dependent lividity; but, only in a non-frozen patient –Ed.]

*Lethal injuries, such as decapitation, massive head or chest injuries, severed trunk, etc.*

*In the wilderness, CPR should generally be discontinued if, after 30 minutes of effort, one can detect no*

*evidence of spontaneous pulse or respirations.* [We would add, "if CPR cannot be continued throughout the evacuation." Since CPR cannot be continued during a wilderness litter evacuation, this rules out continuing CPR in most wilderness rescues, but words it in a more acceptable way. –Ed.]

*For certain situations, the possibility of resuscitation with Basic Cardiac Life Support is high, and WEMTs should be aggressive (i.e., continue CPR for more than half an hour):*

*Cold water immersion less than an hour* [hypothermia and possibly the mammalian diving reflex tend to slow metabolism –Ed.];

*Avalanche burial;*

*Arrest after known hypothermia;*

*Lightning or arrest secondary to electric shock.*

Use of CPR in a person who is hypothermic is a complex (and potentially confusing) subject. If a person in the wilderness is unresponsive and cold, this could indicate either death or severe hypothermia. How do you decide whether to start CPR? And, what do you do when a severely hypothermic patient becomes unresponsive? This is discussed in detail in the chapter on *Cold-Related Disorders.*

# Gastrointestinal

## *Abdominal Pain*

Abdominal pain may come from many problems, ranging from inconsequential to life-threatening.

Anyone with severe abdominal pain, spasm of the abdominal wall muscles (guarding), and exquisite tenderness of the abdomen has an "acute abdomen." There are many possible causes. Just to name a few: appendicitis, perforated ulcer, infected gallbladder, diverticulitis, ectopic pregnancy, ruptured aortic aneurysm, splenic infarction from sickle cell disease, and pancreatitis.

There are several rules to follow in wilderness management of the acute abdomen.

Evacuate anyone with an acute abdomen as quickly as possible, because the patient might need surgery.

Give nothing to eat or drink. The patient with an acute abdomen will probably not absorb anything you give. He or she is likely to vomit during the evacuation, or regurgitate and aspirate during anaesthesia once the patient reaches the operating room.

If possible, place a nasogastric tube to decompress the stomach, an IV to provide hydration, and a Foley catheter or Texas drain to measure urine output.

If it will be a long time until the patient reaches the hospital, give an IV or IM antibiotic according to your Wilderness Command Physician's orders.

For pain control, transport with the hips and knees bent to relieve some pain from abdominal wall muscle spasm. Give pain medications only as ordered by your Wilderness Command Physician. Pain medications may mask worsening of the patient's abdominal condition, or make it difficult for a surgeon to tell whether the patient needs surgery. You can reverse narcotics by giving narcotic antagonists such as naloxone (e.g., Narcan®), but you cannot reverse ketorolac (Toradol®). Therefore, when you must give pain medications for abdominal pain, but may want to reverse the pain medicine for a surgeon's reevaluation, use a narcotic.

Milder abdominal pain does not need to be managed so aggressively, but you need to do a careful exam. If you can discuss the case with a Wilderness Command Physician, follow the Wilderness Command Physician's orders regarding evacuation. Otherwise, you must form a tentative diagnosis, at least as far as the severity of the problem, and decide whether to evacuate or not based on the diagnosis. Repeated abdominal exams (e.g., every 2-3 hours during the night if stationed at a camp-in) are probably your best tool to decide how serious the problem is.

The abdominal exam has been covered in the chapter on *Patient Assessment*. When a patient has abdominal pain, you should specifically look for the following common presentations.

Sudden onset of extremely severe crampy pain in the side, flank, and in one side of the abdomen, with costovertebral angle tenderness, tenderness in the upper quadrant on the affected side, and blood in the urine. This suggests a kidney stone impacted in the ureter. Kidney stones are more common with increasing age, in whites more than blacks, and in men more than women. A young white woman with similar symptoms might have pyelonephritis (see below), especially if having a fever, and urinary frequency, urgency, and dysuria. The treatment of a kidney stone is pain medication, aggressive oral hydration, and straining the urine to detect any stones that pass. Patients with kidney stones tend to writhe in pain, which is much different from those with peritonitis, who tend to lie still.

Assume a team member with a history of "heartburn" develops pain under the bottom of the sternum which radiates through to the back, an hour after a meal. You should think of the possibility of Peptic Ulcer Disease (PUD) or gastritis.

Some other common clinical syndromes of abdominal pain are described in the sections below.

## *Peptic Ulcer Disease, Gastritis, and Reflux*

Peptic ulcer disease (PUD) develops when the acids and other digestive agents in the stomach's secretions start digesting the stomach (or more commonly duodenal) wall, forming an ulcer. (The duodenum is the first section of the small bowel, and it is roughly 12 inches long, which is how it got its name; "duoden-" is Latin for 12.) Diffuse irritation of the stomach lining (gastritis) can cause similar symptoms.

Ask for more history that would tend to confirm the diagnosis of PUD or gastritis. Ask about pain coming on an hour after meals (this is when there is much acid left over from meals, but no more food to use it up). Ask about pain awakening the person at night. Ask about relief of the pain with food or antacids. If considering a tentative diagnosis of PUD or gastritis, you should ask about symptoms of GI bleeding (see below).

The treatment for presumed PUD or gastritis is to reduce the acidity of stomach contents. This is done with antacids four times a day: an hour after every meal, and at bedtime. Or, stomach acid can be reduced with a class of drugs known as $H_2$ blockers such as cimetidine (e.g., Tagamet®), ranitidine (Zantac®), or famotidine (Pepcid®). The patient may also take antacids as often as needed for relief of pain. $H_2$ blockers are convenient, but antacids are as effective for treating ulcers. People with ulcer disease should avoid caffeine, tobacco, salicylates (e.g., aspirin or Pepto-Bismol®), NSAIDs such as ibuprofen, and alcohol; all are known to worsen ulcer disease and gastritis. It used to be taught that drinking milk was good for an ulcer. Now we know it is not true. Milk will relieve the symptoms, but the protein in it will cause a "rebound" of even stronger acid production an hour later.

**Gastroesophageal Reflux** (or sometimes called just "reflux") is a major cause of "heartburn." Excess stomach acid creeps back up the esophagus, sometimes far enough to leave a bitter acidic taste in the back of the throat. Reflux can cause a burning pain in the chest as it irritates the esophagus. Severe reflux can irritate the vocal cords and cause laryngospasm, with resulting stridor and dyspnea. Treatment for reflux is the same as for gastritis or ulcers, with the following additions:

* sleep with the head up on two pillows; and
* avoid chocolate and mint, both of which loosen the sphincter valve between the stomach and the esophagus.

If a team member with known PUD develops an acute abdomen, perforation of an ulcer is a significant possibility. Treatment is as outlined under acute abdomen, above.

## *Nausea and Vomiting*

**Motion sickness** includes seasickness, carsickness, and airsickness. The various stimuli of modern transportation, especially confusion of the balance organs of your inner ear, may result in nausea and vomiting. Fixing your vision on the horizon or on a distant object sometimes helps prevent motion sickness. The nausea and vomiting of motion sickness respond poorly to antinausea medications such prochlorperazine (e.g., Compazine®), but respond fairly well to chewing a 25 mg. tablet of meclizine (available over the counter as Bonine® or by prescription as Antivert®). A new method of administering medication, developed for NASA astronauts, works well in preventing motion sickness: transdermal scopolamine. A prescription transdermal scopolamine patch (Transderm-Scop®) will relieve motion sickness for about three days, and has few side effects except dry mouth or occasional lightheadedness or sleepiness. However, the adhesive on the patch has a "loading dose" of scopolamine, and if a bit of this gets onto your fingers and then into your eye, it can cause a dilated pupil. Smaller people may develop toxicity from the single standard dose of the scopolamine. This is usually evidenced by dilated pupils, dry mouth, and sometimes confusion. Taking the patch off for a few hours every day and then replacing it may be effective for people who have this problem. You may also cut a patch in half and only use half at a time. (Remember not to get the glue on your fingers and then into your eyes.) Antihistamines such as diphenhydramine (e.g., Benadryl®) may help motion sickness but may cause significant drowsiness and should not be used by those who must be alert (e.g., drivers, belayers); the new nonsedating antihistamine astemizole (Hismanal®) also seems to be effective. "Acupressure bands," which are reputed to help prevent motion sickness by putting localized pressure on a particular place on the wrist, were the subject of one study; they were found no more effective than placebo.[9]

You may also see nausea and vomiting in a variety of illnesses and as a reaction to medications; ibuprofen, narcotics, and the antibiotic erythromycin are all well-known to cause nausea. Vomiting can come from infectious gastroenteritis (see below).

Nausea from causes other than motion sickness may be treated with a variety of medications; the most commonly used is **prochlorperazine (Compazine®)**, but others include trimethobenzamide (e.g., Tigan®) and metoclopramide (e.g., Reglan®). These medications are available as suppositories, but the suppositories must be refrigerated and tend to disintegrate in a normal search and rescue pack. If pills cannot be taken orally, you may crush the pills and administer the powder rectally, but with some difficulty. The over-the-counter antihistamine diphenhydramine (e.g., Benadryl®) has a mild antinausea effect, and over-the-counter meclizine (Bonine®) may be of some benefit for non-motion-sickness nausea as well. (The *Pharmacology* chapter discusses these drugs in more detail.)

## *Diarrhea*

Diarrhea is common in the wilderness, and even more so with disaster relief operations in developing countries.[10,11]

**Gastroenteritis** is a general term for irritation of the stomach or intestines, which may result in cramps, diarrhea, or vomiting. It is useful to divide gastroenteritis into four categories: food poisoning, travelers' diarrhea, viral enteritis, and infectious dysentery.

**Food poisoning** is caused by the poisons produced by certain bacteria, including *Staphylococci*, and *Bacillus*. When food, particularly that containing mayonnaise or custard, is left unrefrigerated, staphylococcal bacteria may multiply in it and leave behind this *exotoxin* (also known as enterotoxin). Though the bacteria may all be dead, the exotoxin still exerts its effects. Within two hours to a day after eating the contaminated food, nausea, vomiting, cramps, and diarrhea begin; they generally subside within twelve hours to a day. Fever is seldom seen.

Other bacteria may stay alive in the bowel for a time and secrete their exotoxin there; **travelers' diarrhea** is this kind of diarrhea, usually from drinking contaminated water, or eating contaminated food during foreign travel. (The most common cause is enterotoxigenic *E. Coli*, a common bacterium that sometimes has a particular gene for causing diarrhea.) The bacteria do not actually invade the wall of the intestine. However, they grow inside the intestine and secrete a poison similar to the Staphylococcal enterotoxin. So, the disease is similar to that of food poisoning, but lasts longer and may include low-grade fever. Antibiotics can be used to prevent travelers' diarrhea. But, because of possible ill effects from the antibiotic, "the cure is worse than the disease."[12] Taking two bismuth subsalicylate tablets (e.g., Pepto-Bismol®) four times a day works well to prevent travelers' diarrhea, and has few side effects.[13,14,15]

Recent research shows excellent results from **treating** with a combination of loperamide (Imodium®) and an antibiotic such as norfloxacin (Noroxin®), ciprofloxacin (Cipro®), or trimethoprim-sulfamethoxasole (e.g., Bactrim®, Septra®).[16]

Summary: use careful food-handling, handwashing, and bismuth subsalicylate to prevent travelers' diarrhea; if travelers' diarrhea occurs, and doctor's order or prescription permits, use loperamide and an antibiotic to treat.

**Viral enteritis** ("stomach flu") occurs in outbreaks, is transmitted from person to person, and is characterized by diarrhea, nausea, vomiting, abdominal cramps, headache, low-grade fever, and fatigue. It is caused by a variety of parvoviruses and usually lasts 24 to 48 hours. Another type of viral diarrhea found mostly in children is caused by a rotavirus; this diarrhea generally lasts 4-7 days, and can cause significant illness from dehydration. Adults and older children who get rotavirus infections have a syndrome similar to the Norwalk agent (i.e., only 24-48 hours of diarrhea), probably due to antibodies from previous infections.

In **dysentery**, bacteria invade the intestinal wall, causing fever and diarrhea with blood and mucus; the person usually looks (and feels) extremely sick compared with the other diarrheal diseases. An important part of the diagnosis is finding small streaks of blood or mucus (pus) in the bowel movements. The bacteria *Salmonella*, *Shigella*, *Yersinia*, *Vibrio parahemolyticus*, and *Campylobacter*, may cause dysentery, as may protozoa such as *Entamoeba histolytica*. These diseases are transmitted by water and by the fecal-oral route. Provided you prevent dehydration, most of these infections are self-limited. If used without an antibiotic, antimotility drugs such as diphenoxylate (e.g., Lomotil®) and loperamide (Imodium®) may lengthen the course of dysentery, and may make the person sicker (higher fever, worse abdominal pain). Therefore we **do not** recommend them for dysentery, unless taken along with an appropriate antibiotic. Of antibiotics commonly carried in wilderness medical kits, trimethoprim-sulfamethoxasole (e.g., Bactrim®) is effective against *Shigella*, and erythromycin is effective against *Campylobacter*. Norfloxacin (Noroxin®), ciprofloxacin (Cipro®), and ofloxacin (Floxin®) are all effective against *E. Coli*, *Shigella*, *Salmonella*, and *Campylobacter*, and therefore are the recommended treatment for dysentery in nonpregnant adults.

Antibiotics may themselves cause diarrhea. Amoxicillin-clavulanate (e.g., Augmentin®) is well-known to cause mild diarrhea. In the intestine, virtually any antibiotic can kill the normal bacteria, and thus cause "overgrowth" of bacteria that are normally rare. Though rare, this can result in serious diarrhea. This is one reason to avoid indiscriminate use of antibiotics.

The most serious consequence of diarrhea is dehydration, which may even progress to shock. Therefore, the most important treatment for diarrhea is **fluid replacement**. (Oral rehydration fluids are discussed in the chapter on *Heat Illness*.)

After infectious diarrhea, adopting an appropriate diet may prevent the diarrhea from lingering. Clear fluids are the first place to start, because they are almost totally absorbed, leaving

no residue to form stool and prompt an unwanted bowel movement.

If clear liquids are tolerated, start eating as soon as possible. Food will stimulate regeneration of intestinal enzymes, and will increase water absorption. Easy-to-digest starches will actually decrease the diarrhea. Bread, toast, crackers, rice, potatoes, and cooked vegetables are good to start with. For young children and infants, the BRAT diet is commonly recommended: Bananas, Rice cereal or noodles, Applesauce, and Toast.

Avoid greasy foods, as diarrhea washes out the digestive chemicals needed to absorb fat. Avoid spicy foods that tend to cause loose bowel movements at the best of times (e.g., barbecue sauce or Thai food). Diarrhea washes certain enzymes out of the gut, and it takes three or four days for these to regenerate. Eating foods that require these enzymes will cause diarrhea, even if the infection is gone. The enzymes are those responsible for absorbing fruit and milk sugars, so avoid these sugars. Don't eat or drink milk, milk shakes, ice cream, or fresh fruit or fruit juices for three to four days. You may eat and drink items containing table sugar, as found in sherbet, gelatin desserts, and soda drinks, and dextrose, as found in *Gatorade*™ and similar drinks.

You can reduce the frequency of bowel movements with antimotility agents, all of which are narcotics or narcotic derivatives. The codeine or hydrocodone in acetaminophen with codeine or hydrocodone (e.g., Tylenol #3®, Vicodin®) slows diarrhea, but also may cause sedation and lightheadedness. Diphenoxylate (e.g., Lomotil®) and loperamide (Imodium®) are narcotic derivatives that provide little pain relief or sedation, but are good at slowing the activity of the intestine. Loperamide is now available over-the-counter as Imodium® AD; diphenoxylate (e.g., Lomotil®) is much cheaper and has about the same effects, but requires a prescription. However, diarrhea often serves to flush bacteria or toxins out of the intestine; antimotility agents slow this also, and may simply postpone the diarrhea, or with dysentery, may make the infection worse. In mountain rescue situations, it may still be appropriate to take loperamide to get you back to civilization (where it's easier to deal with diarrhea), though you may have extended the diarrhea by a day or so.

## *Constipation*

Constipation may seem a trivial problem, but accounts for many Emergency Department visits. Constipation is commonly severe among wilderness travelers, and especially search and rescue team members, who eat little fiber and seldom can spare time for even essential bodily needs.

Warm drinks are sometimes effective at getting the bowels moving. If not, taking one or two over-the-counter bisacodyl (e.g., Dulcolax®) tablets at night will usually result in a bowel movement in the morning. If discussing constipation sounds trivial to you, consider how much effort you put into keeping the weight of your SAR pack to a minimum. Now, just think— if you go for three days without a bowel movement, that's about eight pounds you could have left at Base Camp!

Constipation may present with gradual onset of left upper quadrant pain. Or, sometimes, it presents with left chest pain or pain in other parts of the abdomen. Often the constipated have anorexia, nausea and possibly vomiting, and decreased frequency of hard bowel movements. The person will be without fever or chills, and you will find a benign abdominal exam except slight tenderness over stool in the transverse and descending colon. There are few other problems that cause left upper quadrant pain and tenderness. Use of enemas or laxatives may cause a bowel movement and alleviate the pain. While you may not consider this a serious problem, constipation is a very common cause of abdominal pain in ER patients, and probably in wilderness travelers and search and rescue team members, too. However, you can never be sure that the problem is nothing but constipation until the person has a large bowel movement and is suddenly cured.

A bowel movement or two will usually alleviate the discomfort. Warm drinks and rest are sometimes effective. If not, taking one or two over-the-counter bisacodyl (e.g., Dulcolax®) tablets at night will usually result in a bowel movement in the morning. Enemas may provide more immediate relief.

Sometimes, constipation gets so bad that the person simply cannot have a bowel movement, despite laxatives, stool softeners, or enemas. In this case, you may place a gloved and lubricated finger into the rectum and break up and manually remove the stool ("disimpaction").

## *Appendicitis**

Suppose a patient has fever, anorexia (poor appetite), and diffuse noncrampy pain, initially around the umbilicus, then later, worsening abdominal pain localizing to the right lower quadrant. This is a classic history for appendicitis. If not treated, it may go on to rupture, causing high fever, and inflammation of the abdominal lining leading to a rigid abdomen (peritonitis). Patients with appendicitis, and those with peritonitis from any cause, tend to lie very still. (Those with kidney stones, in contrast, tend to writhe around trying to find a comfortable position.)

Although the appropriate treatment for appendicitis is evacuation for surgical removal before it ruptures and causes peritonitis, you may be faced with a patient with peritonitis but no way to get out. (An example would be if your team had to bivouac in a blizzard.) Treatment with antibiotics has a fairly high cure rate, and thus you should give IV or IM antibiotics when evacuation will be delayed.**

## *GI Bleeding*

GI bleeding is characterized by vomiting of blood or "coffee-grounds" material (blood that has been partially digested), bloody bowel movements, or melena (dark, loose, tarry stools that are also a form of digested blood).

All such GI bleeding is cause for immediate evacuation.

You should check the patient for orthostatic changes in BP or pulse, signifying significant volume depletion. Check for paleness of the conjunctiva, signifying anemia (a low level of red blood cells in the blood) from significant blood loss. Hyperactive bowel sounds are a clue that loose melanotic stools will soon be appearing. (Blood is a powerful cathartic.)

You should, if available, start IV fluids with large-bore IV needles (in case the bleeding should become severe).

GI bleeding may come from the stomach or from the lower GI tract. If the patient is vomiting blood, the blood is coming from the upper tract. If the patient has not vomited, but is having melena, the blood may be coming from the upper or lower GI tract (the upper is more likely). If the patient is producing bright red blood from the rectum, the bleeding is most likely from the lower GI tract.

Causes of upper GI bleed include:

* nosebleed with swallowed blood (not truly a GI bleed but may present to you as "I'm throwing up blood");
* esophageal varices (dilated veins) in those with advanced cirrhosis of the liver (probably rare in wilderness patients);

* Appendicitis is a surgical disease. The treatment of choice is an appendectomy. However, Wilderness EMTs aren't going to do an appendectomy in the field, so appendicitis appears here along with the medical causes of abdominal pain.

** The selection of antibiotics for such a problem is up to the physician medical director of the WEMT. Metronidazole plus either ciprofloxacin or norfloxacin might be a reasonable choice.

* a Mallory-Weiss tear, which is a small rip in the stomach's lining, usually from vomiting, e.g., from gastroenteritis;
* severe gastritis (erosion of the stomach lining); and
* a bleeding ulcer in the stomach or duodenum.

Common causes of lower GI bleeding include:

* cancer of the colon; and
* diverticulitis (inflammation of an aneurysmal outpouching of the colon) with irritation and bleeding.

If evacuation of a patient with an upper GI bleed will take more than an hour or so, and you are permitted to do so, place a nasogastric tube and evacuate the stomach. It is much easier on the patient, and less likely to cause rebleeding, if blood in the stomach drains out by an NG tube rather than the patient vomiting it up. Blood in the stomach is nauseating, and will often provoke vomiting. Lavaging (rinsing) the stomach with saline or water to remove clots may help stop the bleeding. (Although the evidence on this point is poor at best, it is a routine part of Emergency Department management of upper GI bleeds.)

If a patient with a suspected upper GI bleed will be many hours before reaching the hospital, you may give PO antacids every four hours, to minimize the effects of acid on a possible bleeding ulcer. (If an NG tube is in place, you may clamp the tube for half hour after every dose of antacids.)

There is no specific field treatment for lower GI bleeding except fluid replacement (or even possibly blood) as needed.

### *Hemorrhoids*

Hemorrhoids are dilated veins around the anus. They may come from pregnancy, from constipation and straining at bowel movements, from cirrhosis, or sometimes for no apparent reason. When they first appear, they may rupture and cause small amounts of bleeding. Bleeding from hemorrhoids is characterized by streaking of blood on the toilet paper; or, there may be small amounts of blood around normally formed stool, or a small amount of blood in the toilet bowl. The hemorrhoids sometimes thrombose (clot) and become itchy or sometimes, extremely painful. The standard treatment for hemorrhoids includes stool softeners or laxatives to prevent constipation, hot soaks to the area (difficult in the wilderness!), and soothing ointments or suppositories. A small amount of rectal bleeding that seems consistent with hemorrhoids is not a cause for ending a task. However, a visit to a physician on return to civilization is appropriate to rule out other causes of rectal bleeding.

## Genitourinary

### *UTI's (Urinary Tract Infections)*

Cystitis is an infection of the urinary bladder, also known as a "lower UTI," or, more commonly, simply a "UTI."

Much more common in women in men, because of the short female urethra, cystitis is usually caused by bacteria ascending the urethra. Since urination helps keep the urethra free of bacteria, dehydration is a common predisposing factor for cystitis. (So is continuing a task for twelve hours without a stop to urinate.)

The classic symptoms of cystitis include:

* dysuria (burning on urination);
* frequency of urination; and
* urgency of urination (having to go right now).

Other symptoms may be associated with cystitis:

* incontinence of urine (dribbling of urine, especially with coughing or sneezing); and

* blood in the urine ("hemorrhagic cystitis")

Even if left untreated, some cystitis will resolve. (However, sometimes it will go on to a more severe infection; see below.) Sometimes, drinking copious amounts of fluids and urinating frequently will "wash out" the infection. Cranberry juice is particularly good, because it contains an organic acid that makes the urine acidic, which helps kill bacteria. Team members with symptoms of cystitis need not return to base unless the symptoms are severe.

Treatment of simple cystitis in a patient with no complicating medical problems (e.g., diabetes) generally includes:

* An antibiotic such as trimethoprim-sulfamethoxasole (e.g., Bactrim®) amoxicillin, or erythromycin (many physicians treat without sending a urine culture first).
* Increased fluid intake.
* Sometimes, a prescription medication called phenazopyridine (e.g., Pyridium®) that acts as a local anesthetic as it is excreted through the urinary tract. Phenazopyridine causes the urine to become bright orange. It is used when there is significant bladder pain, and provides temporary relief until the antibiotic does its work.

**Pyelonephritis** is an infection of the kidney, usually coming after cystitis, when bacteria ascend the ureters.

**"Pyelo"** is characterized by fever, costovertebral angle (CVA) tenderness and pain, flank pain, abdominal pain, and often the symptoms of cystitis, as well.

Pyelonephritis is a much more serious problem than cystitis. The patient often becomes quite ill. Although physicians treat some cases of pyelonephritis with the patient at home on oral antibiotics, many are admitted to the hospital for IV hydration and IV antibiotics. A team member with symptoms suggesting pyelonephritis should return to base. Those accompanying the member should be prepared to start an improvised evacuation if the team member is unable to continue. If the evacuation will be delayed at all, and an antibiotic is available, administer it according to your command physician or standing orders. Appropriate antibiotics would include IM or IV ceftriaxone (Rocephin®); or PO trimethoprim-sulfamethoxasole (e.g., Bactrim®); or PO quinolones such as norfloxacin, ciprofloxacin, or ofloxacin; or PO amoxicillin-clavulanate (Augmentin®) or plain amoxicillin, or PO erythromycin.

## *Urinary Retention*

As they age, men invariably develop hypertrophy (increase in size) of the prostate gland (a walnut-sized gland that surrounds the male urethra). This eventually narrows the urethra, and it then takes a lot of force to push urine out through the narrowed urethra. A small bit of swelling of the urethra, from trauma or a mild infection, may then be enough to make it impossible to urinate at all. The urinary bladder has a remarkable expansibility, but it has limits (painful limits).

Certain urethral infections and UTIs may cause enough swelling of the urethra that the person cannot urinate, even without prostate enlargement (or even without a prostate: it can happen to women, too).

If evacuation is delayed, the best treatment is to place a Foley urinary catheter, which will then allow urine to drain. After leaving the catheter in overnight, you may remove it, and the patient might then be able to urinate without further problems.

If a Foley catheter is not available, but IV needles are, it is possible for a physician to insert an IV catheter over the top of the pubic bone directly into the bladder. This is not an EMT or paramedic level skill.

## *Vaginitis*

Vaginitis is an infection of the vaginal vault.

The vaginal vault is normally host to many bacteria. When the balance of this "normal flora" is upset (e.g., by antibiotics or stress), a symptomatic infection may result. Taking birth control pills and wearing nylon instead of cotton underwear are also thought to make vaginitis more likely. Yeast such as *Candida*, or bacteria such as *Gardnerella*, which are normally present in only small numbers, may "bloom." This will cause itching, burning, vaginal discharge, and sometimes even some burning on urination, if the end of the urethra becomes irritated. When vaginitis is accompanied by severe itching and there is a thick white discharge that looks like cottage cheese, *Candida*, a type of yeast, is often the culprit. The over-the-counter antifungal creams miconazole nitrate (Micatin® or Monistat®), and the prescription cream clotrimazole, are all effective against yeast if applied into the vagina nightly for five to seven nights. Another common cause of vaginitis is a type of bacterium called *Gardnerella* (also known as "bacterial vaginosis"). Usually the discharge from *Gardnerella* is runny, slightly yellow, and smelly. Oral metronidazole (e.g., Flagyl®) is used as a treatment for *Gardnerella*. Yeast and *Gardnerella* are not transmitted in any significant way by sex. *Trichomonas*, another common cause of vaginitis, often causes a brown, smelly discharge. *Trichomonas*, however, can be transmitted by sex, though men rarely have symptoms if carrying *Trichomonas*. Metronidazole treats *Trichomonas* as well as *Gardnerella*. These three infections (yeast, *Gardnerella*, and *Trichomonas*) are annoying but not dangerous.

Organisms foreign to the vagina may also cause an infection; *Gonococcus*, and *Chlamydia*, are common external causes. Each is treated by an antibiotic: a single dose of IM ceftriaxone (Rocephin®) is effective *Gonococcus* (gonorrhea), and a seven-day course of doxycycline for *Chlamydia*. Ofloxacin is also an effective treatment for both gonorrhea and *Chlamydia*. Unlike the three minor vaginal infections, gonorrhea and *Chlamydia* may cause serious long-term problems.

Since the accurate diagnosis of these infections requires a microscope and cultures, there is no good way to diagnose them in the field.

## *Pelvic Inflammatory Disease*

Pelvic Inflammatory Disease (PID) results when a vaginal infection spreads from the vagina into the uterus and Fallopian tubes and then deep into the abdomen. Lower abdominal pain, fever, and vaginal discharge are characteristic of PID. Common organisms in PID are *Gonococcus*, *Chlamydia*, and sometimes anaerobic bacteria normally found in the vagina but not deep within the abdomen. Mild PID is treated by antibiotics against these common organisms. A single 250 mg injection of IM ceftriaxone (Rocephin®) or a single 400 mg pill of ofloxacin (Floxin®) will treat for gonorrhea. Either ofloxacin 300 mg twice a day for seven days, or ten days of doxycycline 100 mg twice a day will treat for *Chlamydia*. Many cases of gonorrhea are also infected with *Chlamydia* and vice versa, so both treatments are usually used. Sometimes metronidazole (e.g., Flagyl®) is added to cover anaerobic bacteria. Serious cases of PID require hospitalization. If you suspect PID in a team member, evacuate immediately.

## *Scrotal Pain*

Scrotal pain may be caused by trauma or by a variety of other problems.

The most important possible diagnosis for nontraumatic testicular pain is **testicular torsion.**

Although the testes are normally well-anchored inside the scrotum, in a significant fraction of men, they are not. If a testicle twists within the scrotum, it may become "stuck." Although this torsion may untwist spontaneously, sometimes it may stay "stuck," and if the twisting of the spermatic cord is enough to cut

off the blood supply to the testicle, the testicle may infarct (die). Not only is this painful, but ischemia may lead to sterility in just a few hours, even before infarction occurs.

The signs and symptoms of torsion include:

* pain, tenderness, and swelling of the affected testicle, sometimes with accumulation of fluid in the scrotal sac; and
* sometimes, palpable twists in the spermatic cord itself.

The treatment is to "untwist" the spermatic cord. This is usually done surgically in operating room, but sometimes it can be done by hand, which would be the only treatment in the wilderness. Anyone who has had an episode of testicular torsion, even if reduced manually or spontaneously, should have the testes fixed to the scrotum by a simple surgical procedure.

A more common cause of testicular pain is inflammation of a small organ lying on top of the testicle proper: **epididymitis.**

The epididymis is a small organ that sits just on top of the testicle. It is a mass of small tubules that collects and stores sperm cells, and connects through the spermatic cord with the urethra at the prostate gland.

Bacteria or similar organisms may travel from the urinary tract to the epididymis and set up an infection there. Or, urine may travel backwards into the epididymis from heavy lifting.

The signs and symptoms are very similar to those of torsion. However, tenderness and swelling are localized to the epididymis itself, rather than the testicle as a whole. Epididymitis is also known to come on several days to a week after trauma, presumably from damage to normal defenses, or to traumatic introduction of bacteria into the spermatic system.

The treatment is an antibiotic, often of the tetracycline family (e.g., doxycycline) or quinolone family (e.g., norfloxacin, ciprofloxacin, or ofloxacin), pain medications, and rest.

If a team member develops acute nontraumatic testicular pain, you should do an exam, and if torsion appears likely, try manually untwisting the testicle. If you have an appropriate antibiotic (e.g., doxycycline, norfloxacin, ciprofloxacin, or ofloxacin for adults), evacuation will be delayed, and physician orders permit, give it. Unless you're sure it's epididymitis, evacuate the patient urgently.

## *Vaginal Bleeding*

Vaginal bleeding is a normal occurrence during a menstrual period, but may be more than normal in amount (**menorrhagia**) or between periods (**metrorrhagia**). Excessive bleeding may or may not be associated with severe cramping. There are many causes of excessive or irregular vaginal bleeding, and they include:

* stress,
* missing birth control pills,
* miscarriage,
* tubal (ectopic) pregnancy,
* trauma, and
* PID.

If a team member has small amounts of unexpected bleeding, or more than normal menstrual flow, but no pain worse than usual menstrual cramps, and she has normal orthostatic vital signs, she may continue with the task. If the flow is enough to soak a pad every hour or so, or if the pain is more than the team member's usual menstrual period cramps (**dysmenorrhea**), send her back to base. If the flow is more than a pad an hour, or if she is orthostatic, you should call for an immediate evacuation.

Women who normally have significant cramping with their menstrual periods often find relief from taking an antiinflammatory drug. Ibuprofen 600 or 800 mg PO every six hours is a common prescription.

## *Renal Stones*

Renal stones are solid concretions that form in the large cavities of the kidney (the renal pelvis).

If one of these stones starts traveling down the ureter, it will scrape the walls of the ureter,

causing pain and blood in the urine. Urine backing up behind the stone may cause the kidney on that side to swell, causing flank pain and costovertebral angle tenderness. The ureter usually contracts in waves several minutes apart, causing the intermittent ("colicky") pain characteristic of renal stones.

Emergency Department management of a patient with a stone usually includes the following.

The ED physician will confirm the diagnosis with a sonogram (using ultrasound to localize the stone and swelling), or an intravenous pyelogram ("IVP"). During an IVP, dye is injected IV, then X-rays are taken as this dye is excreted by the kidneys, outlining the ureters and any obstructing stones. The patient is given pain medication. (The pain of kidney stones is severe and often requires large doses of narcotics for relief.) IV hydration is started if the patient is unable to drink fluids because of pain, or because of nausea from pain medications.

Most stones will pass into the bladder; soon after, the pain disappears. Later, the stone will pass in the urine. Since there are different types of stones, and prevention depends on the type, those with stones should strain their urine for stones.

The wilderness management of renal stones consists of administering whatever pain medication is available, and encouraging PO fluids. While evacuation is not absolutely necessary, a return to base may be needed to confirm the diagnosis or for pain control.

# Neurological

## *Stroke/CVA*

**Stroke**, also known as CVA (CerebroVascular Accident, not to be confused with CostoVertebral Angle, as in CVA tenderness), is not a common wilderness problem. Management of a CVA in the wilderness is the same as on the street, but the following points deserve to be emphasized:

Use the lateral decubitus position to protect the airway if the patient is having any difficulty with secretions, or is stuporous. Nasal airways may help in some patients.

Reassurance is vital. Most people with strokes go on to have a significant recovery, and you should explain this to the patient, even if he or she seems unresponsive.

You should be alert for signs of hypoventilation, and should be prepared to intubate or assist ventilations as needed.

If the patient shows signs of increasing intracranial pressure (ICP), treat as such. (Diagnosing and treating increased ICP is discussed in the *Wilderness Surgical Problems* chapter.)

## *Seizures*

Seizures may have a variety of causes.

A team member with a known seizure disorder, who has a single short seizure, may continue with the task once he or she feels well and seems oriented.

Management of seizures is no different in the wilderness than on the street. For WEMT-Ps, a seizure that does not stop promptly can be controlled with diazepam (e.g., Valium®), as on the street.

If you are confronted with a patient with new-onset seizures, the Wilderness Command Physician will often order the patient to have a gram (1000 mg.) of phenytoin (e.g., Dilantin®), either IV or PO, over a half hour or hour. Patients with a known seizure disorder, but who have been off their medication due to being lost or injured in the wilderness, will have low or nonexistent levels of their normal anticonvulsants. Such patients who are normally on an anticonvulsant probably need to be "loaded" with their anticonvulsant, too. (The loading dose depends on how long the patient has been off the anticonvulsant.) (The idea of "loading"

is discussed further in the chapter on *Pharmacology.*)

If you are confronted with an extended evacuation for a patient with a seizure disorder, but medical command is not available, you should not withdraw the medication. The patient should continue to take the medication as prescribed by the patient's primary physician. The only exception would be if you received specific orders to the contrary from a medical command physician. He or she should be familiar with wilderness rescue (i.e., a Wilderness Command Physician); if not, present him or her with a complete report of the situation before asking for or accepting orders. If dealing with a command physician unfamiliar with wilderness rescue, phrase your report properly; the command physician must understand that you are asking whether to **withdraw** a medication prescribed by another physician. Also ask whether to give additional doses to make up for those the patient might have missed. If you word this properly, you should have no problem obtaining an order to continue the medication.

# Dermatology

## *Plant Contact Dermatitis*

**Background:** Plant contact dermatitis is the bane of many a wilderness traveler. It is also the largest cause of worker's compensation in the U.S. Plant contact dermatitis is a true allergy, though a severe one. About 75% of the population of the U.S. get plant contact dermatitis at once in their lives. Only about 15% of the population is "immune" (not allergic) to urushiol (the oil in poison ivy to which so many people are allergic).

**Sources of Toxicodendron Exposure:** Many substances can cause skin allergy, but the most common are poison ivy, poison oak, and poison sumac. These plants contain an oily substance (urushiol) which usually causes a severe delayed allergic skin reaction. These plants used to be grouped as *Rhus*, now renamed *Toxicodendron.* Related plants include the tropical mango and the Japanese lacquer plant. If you are severely allergic to *Toxicodendron* plants, you may develop allergy from picking mangoes or touching furniture coated with lacquer made from the Japanese lacquer tree.

**Skin Allergy:** An acute skin allergy is manifested by itching, swelling, and redness; more severe cases may develop scaling, blisters, or open, oozing sores. Itching leads to scratching, which may result in a secondary bacterial infection. A small amount of cloudy to purulent material may be found in the blisters of a severe allergy, but a large amount of purulent drainage indicates a secondary bacterial infection.

The typical rash starts in a single place and "spreads" to nearby areas. This is not truly spreading, but it is simply that the areas with less exposure take longer to react. The fluid from blisters or sores does not have any urushiol to spread the rash, whether to other areas or to other people.

**Prevention:** Recognition of poison ivy, poison oak, and poison sumac is the best prevention. However, wilderness rescuers may find themselves unable to avoid these plants. For example, it is hard to recognize them by headlight at night, or while carrying a litter.

For a wilderness search and rescue team member with a history of severe reactions to *Toxicodendron* plants, a dermatologist or allergist probably can provide allergy shots that decrease the member's allergic response to exposure.

You may apply various blocking agents to prevent urushiol from penetrating the skin. One, Ivy-Shield™, was effective in controlled studies. It is available from Inter-Pro, Haverhill, MA. Another effective urushiol blocker, though not marketed as such, is Stokogard Outdoor Cream, available from some outdoor stores and industrial suppliers*.[17] The most effective, however, is organoclay (a quaternary ammonium salt of Bentonite, to be more specific). This has long been used as an inert ingredient in many deodorant and antiperspirant sprays. However, the

Food and Drug Administration has required complete reexamination of it for blocking plant contact dermatitis. It will probably not, therefore, be commercially available for this use (probably under the trade name Ivy-Block) until the mid-1990's.[17] Until organoclay is commercially available, outdoors enthusiasts may start using deodorant sprays to prevent plant contact dermatitis. If they use a deodorant that is also an antiperspirant, they might well make themselves very susceptible to heatstroke.

Urushiol is difficult to wash off, and may be spread by hands or contaminated clothes, gloves, climbing gear, or pets. Washing clothes or gear with detergent once or twice should remove any urushiol. Pretreating clothes with alcohol may help remove the urushiol.

Removing urushiol from the skin as soon as possible after of exposure will decrease the eventual rash. A long, hot shower (copious amounts of warm water) is effective, although urushiol is oily and not very water soluble. So, if copious amounts of warm water are not available (i.e., if you're in the backcountry, far away from hot showers), you must use another method. Alcohol is very effective at dissolving urushiol, and thus you might use alcoholic beverages. Some, however, think that alcohol wipes will merely spread the urushiol around. Some dermatologists suggest that soap may merely spread the urushiol, especially when only small amounts of water are available. If you have large amounts of cold water available (e.g., a lake or stream, or a fire hose), using alcohol or soap and then rinsing with large amounts of water seems appropriate. An inexpensive commercial product, Tecnu Poison Oak-Poison Ivy cleaner; somewhat better than alcohol at removing urushiol, is available. It has reportedly been found effective used even up to 48 hours after exposure.* For carrying in a backcountry medical kit, small bottles of alcohol, or the Tecnu product, may be the best choice.[17]

Urushiol is spread through the smoke when *Toxicodendron* plants burn in a fire. Exposure to such smoke can produce severe dermatitis. Inhalation of the smoke can cause severe pulmonary symptoms. Since some *Toxicodendron* species grow in ivy form on trees, and the urushiol can last for long periods after death of the vine. Careful selection of firewood, therefore, is essential for anyone building a campfire.

**Treatment:** Local anaesthetic creams or sprays are greatly desired by those with plant contact dermatitis, sunburn, and other rashes. Diphenhydramine (e.g., Benadryl®) is available as a cream, but when applied to the skin, tends to cause diphenhydramine allergy. Tetracaine, procaine, and benzocaine are also commonly used in over-the-counter anaesthetic creams, and they, too, tend to cause allergy. We recommend nonsensitizing anesthetics such as pramoxine (available in nonprescription form as Prax™ cream) or menthol. An excellent choice for a medical kit is Pramosone™ 1% (pramoxine and hydrocortisone). This cream is now (1992) a prescription medication, but may be available over-the-counter in the future.

**Oral antihistamines** such as diphenhydramine will both reduce itching and decrease the degree of the reaction. Aspirin or acetaminophen (two every four hours) may also help relieve itching and swelling. Of the nonsedating prescription antihistamines now available, terfenadine (Seldane®) seems better for itching. Astemizole (Hismanal®) seems to take two or three days to build up blood levels high enough to help itching.

Most severe cases of plant contact dermatitis (i.e., with blistering) are treated by physicians with a potent prescription steroid cream if just a small area. If very severe or over a large area, they treat it with PO or IM steroids. (Over-the-counter steroid cream is limited to 1% hydrocortisone cream. This is so weak as to be

*** Stockhausen, Inc. Greensboro, NC 27406; 1-800-334-0242.

* call Tecnu at 1-800-ITCHING for further information.

essentially ineffective against poison ivy.) Steroid cream is much more effective if it can be applied before blistering occurs, i.e., within the first day after exposure.

**Stinging nettles** are plants whose stems and leaves are covered with small, hollow needles filled with an irritant poison. A team member brushing against a nettle may experience severe pain, and may develop marked swelling of the area. Nettle stings may be treated with over-the-counter local anaesthetics such as Sting-Eeze™ or Prax™, or the prescription-only Pramosone. The juice of the jewelweed plant, which often grows near nettles, is extremely effective when rubbed on nettle stings. (Unfortunately, jewelweed sap is useless for poison ivy.[18])

### *Fungal Infestations*

**Fungal infestations** are characterized by redness, scaling, cracking, itching, and possibly vesicles (tiny blisters). The types of fungus that cause these problems grow only in the dead outer layers of skin, but scratching and cracking may lead to bacterial infection of the deeper tissues. These problems are all slightly contagious. There are four common types:

* athlete's foot (tinea pedis),
* jock itch (tinea cruris),
* ringworm (tinea corporis), and
* yeast vaginitis (candidiasis).

**Athletes' Foot (Tinea Pedis)** occurs between the toes, and sometimes on the sides or sole of the foot. It is made worse by dampness. Regular sock changes and using "wicking" liner socks such as polypropylene instead of cotton are important in preventing athletes' foot.

**Ringworm** shows up typically as a ring-shaped rash, on the trunk or extremities. The rash has central clearing, with an "active border" with redness and occasionally with small vesicles.

**Yeast Vaginitis** is caused by a fungus different from that causing the three types of tinea. Yeast vaginitis is characterized by a thick, white, cheesy discharge and severe itching. There also may be red itchy areas on nearby skin.

All four problems can be effectively treated with washing and over-the-counter 2% miconazole nitrate cream (Micatin® or Monistat®). For skin problems, use it three or four times a day. For yeast vaginitis, use it intravaginally each night.

Soaking feet in vinegar water each day (one part vinegar to 10 parts water) also helps athlete's foot.

Steroid creams are known for worsening fungal infestations, so don't use them if you think the rash is caused by a fungus. If you put steroid cream on a rash and it gets worse over several days, you have some good evidence that it is a fungal infestation. Switch to an antifungal cream if this occurs.

Although these fungal infestations do not invade live skin, they may disrupt normal barriers from cracking, or from abrasions from scratching. This may predispose to bacterial infections including cellulitis.

### *Other Rashes*

There are many other common rashes, and you should not hesitate to say "I have no idea what it is" when confronted with a rash.

Insect bites are covered in the chapter on *Bites and Stings*.

## Superficial Infections

**Bullous Impetigo** is a skin infection, usually of children, characterized by superficial blisters with minimal redness. ("Bullous" means having blisters.) The blisters quickly rupture, leaving oval reddish patches that develop a slight golden crust. Often, a single blister is soon followed by "satellite" blisters nearby. The infection is caused by a particular kind of *Streptococcus*, possibly along with some *Staphylococcus*. The infection is

highly contagious. It is usually treated with an antibiotic ointment (e.g., Polysporin®) and with an oral antibiotic such as cephalexin (e.g., Keflex®) or erythromycin.

An abrasion or scratch may develop **impetigo** without developing any blisters. In such cases, you will see clear fluid leaking from the area, and a golden crust will form.

**Cellulitis** is a skin infection which is characterized by spread of the bacteria through the interstitial spaces of the tissue.

In its early stages, cellulitis shows just as a red, warm patch. The site that started the infection may or may not be evident. The skin may be flat or swollen.

Later, the area shows more redness, more warmth, and becomes painful; the area may become tense and swollen (though not always), and red streaks may radiate up from the initial infection, as it spreads along lymphatic vessels ("ascending lymphangitis"). Lymphangitis is often popularly called "blood poisoning." The skin may break down and ulcerate.

Cellulitis may progress quite rapidly and may quickly result in a generalized blood infection. The patient may develop fever or shaking chills. These are signs of entry of the bacteria into the blood stream in significant amounts.

The primary treatment for cellulitis is an antibiotic. The most common cause of cellulitis is *Streptococcus*, which is killed by cephalosporins such as cephalexin (e.g., Keflex®), penicillin, amoxicillin, amoxicillin-clavulanate (Augmentin®), and erythromycin.

There is no effective field treatment unless you have antibiotics such as cephalexin or erythromycin. Hot soaks may help some, and splinting the area may decrease pain.

Evacuate the person urgently if:

* any ascending lymphangitis
* swollen lymph nodes proximal to the area
* the area is large
* if there are risk factors for rapid spread (diabetics and those on steroids such as prednisone are particularly susceptible to rapid spread of cellulitis), or
* if there is fever or shaking chills.

If a team member has none of these symptoms or risk factors, however, and can start oral antibiotics in the field, the team member may continue with the task.

**Lymphangitis** is infection spreading along a lymphatic vessel, often but not always from an area of cellulitis (sometimes the source of the infection is a tiny wound that is well-near invisible). Lymphangitis is shown by a red line, looking very much like it was drawn by a red felt-tip marker, following along the course of a lymphatic vessel. The significance and treatment are the same as for cellulitis.

## *Abscesses*

An abscess or **boil** is a skin infection with a localized collection of pus, much like a large whitehead. Cellulitis is caused by bacteria such as *Streptococcus ("strep"). The bacteria* secrete materials that help them spread. Abscesses, on the other hand, are caused by bacteria such as *Staphylococcus* which secrete materials that cause them to become "walled off."

This "walling off" process allows dead bacteria, dead skin cells, and dead white blood cells to accumulate (pus).

The abscess wall also prevents the body's normal defenses from clearing up the infection. White blood cells do not work well in pus, and if body cannot clear pus out because of the abscess wall, the infection may last for a long time.

There are two essential treatments for an abscess.

First is **incision and drainage** ("I and D"). This allows the pus to drain. Antibiotics are seldom indicated for an abscess unless there is associated cellulitis.

Since the incision tends to scab over, the second essential treatment is **hot soaks**. This will loosen the scab and allow drainage to continue.

Hot soaks will also bring more blood to the area, to promote healing. Sometimes, hot soaks may be enough to make small abscess resolve. Hot soaks may even be enough to make a small abscess "come to a head" and start draining without any incision.

Occasionally, an abscess is deep enough that the incision will scab over and close even with hot soaks, or if hot soaks are not feasible (i.e., as in a wilderness area). Then, the abscess cavity can be **packed** with gauze, leaving a small "wick" through the skin to allow drainage to continue.

Whether you may drain abscesses, and when and where you may do so, are matters for local medical control. "I and D'ing" a **paronychia** (small abscess next to a fingernail) is a minor procedure and without significant risk. However, draining an abscess on the face presents dangers of cutting vital nerve and causing irreversible facial paralysis

# Endocrine: Extended Management of Diabetes

Because diabetes mellitus (DM) is such a common disease, you are likely to have to deal with it occasionally, whether in team members or in patients.

*Diabetics fall into two classes:*

*Type I Diabetes is also known as juvenile-onset or Insulin-Dependent Diabetes Mellitus (IDDM). Those with Type I diabetes have no significant insulin function of their own, and are dependent on external insulin to allow sugar to pass from blood into cells. When deprived of external insulin, Type I diabetics develop ketoacidosis and become quite ill. A significant problem with a Type I diabetic who develops ketoacidosis is* **dehydration**, *from the high blood sugar spilling over into the urine, and causing continued urine production despite dehydration.*

*Type II diabetes is also known as adult-onset or Non-Insulin Dependent DM. These patients tend to be obese (their excess body fat increases insulin need over supply), and are* **not** *dependent on external insulin to allow sugar into cells. However, if the insulin level is low, the relative lack of sugar in cells increases sugar production and absorption, and sugar levels in the blood rise to very high levels. This causes glucose to spill into the urine, which draws fluid with it, resulting in dehydration. This dehydration, combined with the high blood sugar level, causes a hyperosmolal state which can lead to hyperosmolal nonketoacidotic coma (got that?).* **Hyperosmolal** *means increased of solutes, such as salt and sugar, compared with water, resulting in very concentrated blood.*

A major problem with a Type I diabetic with ketoacidosis, or a Type II diabetic with hyperosmolality, is **dehydration**. Standard EMT training teaches you that any sick diabetic should be given sugar, because it will make insulin shock better and will not harm someone who is hyperosmolar or in ketoacidosis. We should add to this, for wilderness problems, that any diabetic who does not get better with sugar will need hydration. Since insulin needs refrigeration, it is rarely available in the wilderness. However, relieving dehydration will help quite a bit in Type I diabetics, and may even "cure" a Type II diabetic with hyperosmolal coma. (Note: although Type II patients with hyperosmolar states have an excess of sugar and salt compared with water, the primary problem is volume depletion. Thus fluids such as normal saline are better than fluids such as $D_5W$ or half-normal saline.)

# Allergy

**Mild allergy** may be manifested by hay fever (allergic rhinitis and sinus congestion: discussed above), localized skin rashes, or allergic conjunctivitis (also discussed above.)

Some people may have a **generalized allergic reaction** to allergens such as certain medications, stings, plants, foods, or other materials in the environment. This systemic reaction is not limited to the area of contact with the allergen. Its most prominent sign is a rash. With some allergies, especially those to medications, the rash may be made up of many flat, itchy, red macules (tiny patches). In other cases, a wheal-like rash (like mosquito bites without the bite),

which may occur over the entire body. You can treat these itchy hives, also known as urticaria, with cold applications, and by using aspirin and an antihistamine (e.g., diphenhydramine or chlorpheniramine). Danger signs for progression toward anaphylaxis include:

* lip swelling;
* hoarseness; or
* wheezing or shortness of breath.

Anaphylactic reactions are characterized by wheal (hive) formation that is very severe. As with milder urticaria, the primary problem is leaking of fluid from capillaries. In anaphylaxis, though, the leakage is so massive that volume depletion and shock may result. Not only that, but the leakage in the lungs may cause wheezing, and leakage in the mucous membranes of the airway may cause airway obstruction. You cannot treat this sort of obstruction by a surgical airway (i.e., a cricothyroid membrane puncture will not help). The treatment of choice is epinephrine SQ, followed by IM, IV, or PO diphenhydramine (e.g., Benadryl®). Sometimes, your Wilderness Command Physician may order steroids such as IV or IM dexamethasone (e.g., Decadron®) or PO prednisone, especially if the diphenhydramine does not prevent the allergic symptoms from returning.

# Glossary

**Abscess:** A boil. A skin infection with a localized collection of pus, much like a large whitehead.

**Actinic Keratitis:** Snowblindness. A sunburn of the cornea.

**Adrenergic:** Pertaining to the hormone adrenaline (epinephrine) or its effects. Adrenergic drugs are those that have effects similar to those of adrenaline.

**AIDS:** Acquired Immunodeficiency Syndrome. A slowly progressive but uniformly fatal disease, resulting in infection of, and depletion of, a certain subset of white blood cells (T lymphocytes), resulting in susceptibility to many infections. AIDS is caused by the Human Immunodeficiency Virus (HIV).

**Allergen:** Something that causes an allergic reaction. Examples include ragweed pollen, penicillin, and shrimp.

**Aneurysm:** A balloon-like weakening in the wall of a blood vessel.

**Anorexia:** Loss of appetite.

**Antihistamine:** A medicine that blocks the inflammatory effects of histamine, as found in many allergic conditions.

**Anus:** Asshole.

**Appendicitis:** Infection of the appendix, a small sac that protrudes from the end of the large intestine where it joins the small intestine in the right lower quadrant.

**Atelectasis:** Collapse of small segments of lung.

**Autoimmune:** When one develops an immune reaction (allergy) to some part of one's own body.

**Beta-Hemolytic:** Refers to types of bacteria that cause a particular kind of lysis (disruption) of red blood cells when grown in culture. The type of "strep" (*Streptococcus*) that sometimes causes kidney and heart damage is beta-hemolytic.

**Bile Pigments:** Dark chemicals that are secreted into the gastrointestinal tract by the liver. They give stool its characteristic dark brown color. Bile pigments are waste products from the hemoglobin molecules of dead red blood cells.

**Bronchial Breath Sounds:** Sounds like those normally heard only over the trachea or major bronchi; when heard over part of the lung, suggests pneumonia.

**Bronchitis:** An infection of the large bronchial tubes. Pneumonia, an infection of the tissue of the lung, is a more serious lung infection.

**Bronchospasm:** Narrowing of small airways in the lungs. Bronchospasm may come from asthma or from inhalation injury. Bronchospasm may also contribute to a COPD exacerbation.

**Bullous Impetigo:** A skin infection, mostly in children, characterized by fragile blisters. ("Bullous" means having blisters.)

**Campylobacter:** *Campylobacter* is the name of a family of bacteria known to cause dysentery in humans.

**Caries:** Also known as cavities, these erosions into a tooth are caused by infection from mouth bacteria.

**Cathartic:** Something that induces loose bowel movements.

**Cellulitis:** A skin infection which is characterized by spread of the bacteria through the interstitial spaces of the tissue.

**Chest PT:** Chest Physical Therapy. Strictly speaking, chest PT includes a variety of techniques. However, it is commonly used to refer to clapping.

Clapping is pounding moderately on the chest, with a cupped hand, with the patient in a slightly head-down position with the affected lung uppermost.

**Cirrhosis of the Liver:** Scarring of the liver. Leads to fluid retention, especially in the abdomen (ascites), and to esophageal varices.

**Cluster Headache:** A type of vascular headache characterized by occurring in clusters over a period of several days.

**Colicky:** When referring to pain, means pain that comes in spasms, rather than being continuous.

**Conjunctival Sac:** The inside of the eyelid.

**Conjunctivitis:** Inflammation of the lining of the eye and eyelids.

**Consolidation:** An area of lung tissue that is filled with fluid and "solid" rather than spongy like normal lung.

**Cornea:** The clear covering of the front of the eye.

**Costovertebral Angle:** The angle formed by the posterior ribs and the spine, used as a landmark for the underlying kidney.

**Croup:** A viral upper respiratory infection, primarily in children, which causes swelling of the large airways just under the larynx and a stridorous cough.

**CVA:** CerbroVascular Accident; or, CostoVertebral Angle.

**Decongestant:** A medicine that shrinks swollen mucous membranes. These medicines are vasoconstrictors.

**Disimpaction:** Placing a gloved finger into the rectum and breaking up and manually removing impacted stool.

**Diverticulitis:** An infection in an acquired outpouching of the large intestine (a diverticulum). Diverticulosis is the state of having diverticula, while diverticulitis is an actual infection.

**DM:** Diabetes Mellitus.

**DVT:** Deep Venous Thrombus.

**Dysentery:** Infectious bacterial diarrhea when bacteria invade the wall of the intestine, usually causing high fever and abdominal pain.

**Dysmenorrhea:** Menstrual cramps.

**Ectopic Pregnancy:** A pregnancy outside the uterus. An ectopic pregnancy may rupture and cause an acute abdomen or enough bleeding to cause death.

**Endemic:** a disease that is constantly present in a community.

**Entamoeba histolytica:** A protozoan amoeba parasite known to cause dysentery in humans.

**ENT:** Ears, Nose, and Throat. A medical specialty.

**Epididymis:** A small organ that sits just on top of the testicle.

**Epiglottitis:** A bacterial infection of the epiglottis, primarily in children, that causes severe pain, drooling and stridor, which may lead to airway obstruction.

**Epistaxis:** Nosebleed.

**Esophageal Reflux:** Gastroesophageal reflux. Stomach acid coming back up the esophagus, causing irritation of the esophagus and "heartburn" chest pain.

**Esophagitis:** Irritation of the esophagus. The most common cause is gastroesophageal reflux.

**Eugenol:** Oil of Cloves. A local anaesthetic used in dental work.

**Eustachian Tubes:** The tubes that drain the middle ear into the back of the throat.

**Evert:** Turn inside out.

**Extraocular Motions:** Movements of the eyes (up, down, and to both sides).

**Fibrinolytic:** Tending to break down fibrin, a major component of blood clots.

**Flank:** The side of the torso.

**Gastritis:** Diffuse irritation of the stomach lining.

**Gastroesophageal Reflux:** Esophageal reflux. Stomach acid coming back up the esophagus, causing irritation of the esophagus and "heartburn" chest pain.

**Gastroscope:** A lighted fiberoptic device used to look for ulcers and other abnormalities in the esophagus and stomach; it is "swallowed" down the esophagus.

**Gingivitis:** Infection of the gums.

**Glaucoma:** Increased fluid pressure in the eye. If severe and not treated, it can lead to blindness.

**Hemorrhoids:** Dilated veins around the anus.

**Heparin:** An anticoagulant (blood thinner). May be given IV or SQ, but not PO.

**Hepatitis:** inflammation of the liver; usually but not always caused by a viral infection.

**Hives:** see Urticaria.

**HIV:** Human Immunodeficiency Virus.

**Homan's Test:** If the foot is forcibly dorsiflexed (pushed up), and the resulting traction on the calf causes pain, the test is positive. A positive test is associated with (but not diagnostic of) a DVT.

**Hyperadrenergic States:** When adrenaline (epinephrine) levels are high and the sympathetic nervous system is activated. An example would be when you are being chased across a field by a large bull.

**Hyperosmolal:** An increased amount in the blood of solutes, such as salt and sugar, compared with water, resulting in very concentrated blood.

**Hypertrophy:** Increase in size.

**ICP:** IntraCranial Pressure.

**IDDM:** Juvenile-onset or Insulin-Dependent Diabetes Mellitus. Now called **Type I DM.**

**Impacted:** Stuck.

**Impetigo:** A superficial skin infection. Characterized by clear fluid leaking from the area, and a golden crust. See also *Bullous Impetigo.*

**Incubation period:** The time lag from exposure to a contagious disease until the development of symptoms.

**Infarction:** Death of tissue from lack of blood supply.

**Inferior Rectus Muscle:** A muscle on the bottom of the eye; when it contracts, the eye rotates so it looks down. Entrapment of this muscle in a blowout fracture of the lower part of the orbit prevents the eye from looking up.

**Inflammation:** A reaction of the body to injury or infection, characterized by redness, warmth, pain, swelling, and decreased function.

**Intracranial:** Inside the head.

**Intravenous Pyelogram (IVP):** When dye is injected IV, then X-rays are taken as this dye is excreted by the kidneys, outlining the ureters and any obstructing stones or other abnormalities.

**Iris:** The colored part of the eye.

**IVP:** Intravenous pyelogram.

**Jaundice:** Yellow coloring of the skin and eyes from the buildup of bile pigments, often from liver failure or hepatitis.

**Laryngitis:** Inflammation of the vocal cords leading to hoarseness.

**Laryngospasm:** Spasm of the vocal cords leading to airway obstruction.

**Lymphangitis:** Infection spreading up lymph vessels. Characterized by a red, warm line along the course of the lymph vessels. Popularly called "blood poisoning."

**Lymphocyte:** A type of white blood cell.

**Mallory-Weiss Tear:** A small rip in the stomach's lining, usually from vomiting. A cause of GI bleeding.

**Meningitis:** Irritation or infection of the fluid and membranes surrounding the brain and spinal cord.

**Menorrhagia:** Menstrual periods with more than normal blood flow.

**Menses:** A woman's monthly menstrual flow.

**Metrorrhagia:** Menstrual bleeding between periods.

**Migraine Headaches:** Headaches caused by spasm of cerebral blood vessels.

**Montezuma's Revenge:** travelers' diarrhea.

**Mydriatics:** Drops that dilate the pupil.

**Norwalk Agent:** A virus well-known for causing viral enteritis ("stomach flu").

**NSAID:** Non-Steroidal Anti-Inflammatory Drug. Ibuprofen (e.g., Motrin®) is an example.

**Ophthalmologist:** A medical and surgical eye doctor (an M.D. or D.O.). Not to be confused with an optometrist (O.D.), who checks refraction for glasses.

**Orbital Rim:** The bony parts surrounding the eye socket.

**Otitis:** An ear infection. Otitis media is a middle ear infection, and otitis externa is an outer ear (ear canal) infection.

**Otoscope:** A special lighting instrument to aid in looking into ears.

**Pancreatitis:** Inflammation of the pancreas, a small organ in the epigastric region (just under the bottom of the breastbone at the top of the abdomen). Pancreatitis may come from alcohol abuse, trauma, certain medical problems, or a gallstone in the common duct that connects the liver, gallbladder, and pancreas to the gut.

**Parvoviruses:** A type of virus known for causing "stomach flu."

**Pelvic Inflammatory Disease:** An infection of the female genital tract extending deep into the abdomen.

**PE:** Pulmonary Embolism.

**Perforated Ulcer:** An ulcer in the duodenum or stomach that has eroded through the wall of the intestine or stomach.

**Periapical Abscess:** An abscess at the base (root) of a tooth.

**Pericarditis:** Inflammation of the sac around the heart, often due to a viral illness.

**Peritonitis:** Infection of the peritoneum (the inside lining of the abdomen). Symptoms include severe abdominal pain, high fever, and a rigid abdomen.

**Peritonsillar Abscess:** An abscess inside a tonsil on one side of the throat. A peritonsillar abscess may need surgical drainage.

**Pharyngitis:** Sore Throat.

**Phlegm:** Mucus from a respiratory infection.

**PID:** Pelvic Inflammatory Disease.

**Placebo:** an inactive substance resembling a medication, or an inactive treatment resembling a real treatment, which may be used as a control in experiments.

**Pleurisy:** A viral inflammation of the lining of the chest.

**Pleuritic Chest Pain:** Pain that is worse with a deep breath.

**Pneumonia:** An infection of the tissue of the lung. Bronchitis is an infection just of the large bronchial tubes and is less serious than pneumonia.

**Presacral Edema:** Swelling over the sacrum and lower back.

**Prostate Gland:** A walnut-sized gland that surrounds the male urethra.

**Protozoa:** Single-celled organisms.

**Pulmonary Embolism:** A blood clot that has broken off and floated into the lung, where it clogs a large blood vessel.

**Punctate:** Pointlike. When used to describe keratitis (erosion of the cornea of the eye), it refers to many small pinpoint erosions.

**Pyorrhea:** Pus draining from the gums.

**Quinolone:** The quinolone family of antibiotics includes norfloxacin (Noroxin®), ciprofloxacin (Cipro®), and ofloxacin (Floxin®). These antibiotics kill a variety of bacteria, and are unrelated to penicillins or sulfa drugs. They are not considered safe for women who might be pregnant, or for children or adolescents.

**Retina:** The thin layer of the back of the eye that detects light.

**Reye's Syndrome:** A particular type of liver failure that is associated with a variety of viral infections. Taking aspirin during one of these viral illnesses will make Reye's Syndrome more likely; take acetaminophen instead.

**Rhinitis:** A stuffy, runny nose. Rhinitis may be a result of allergy or of a minor viral infection (a "cold").

**Rhinitis Medicamentosa:** Rhinitis caused by overuse of nasal decongestants.

**Rhus:** See *Toxicodendron.*

**Rotavirus:** A virus well-known for causing diarrhea ("stomach flu"), especially in children.

**Salivation:** Mouth-watering; drooling.

**Salmonella:** *Salmonella* is the name of a family of bacteria known to cause dysentery in humans.

**Scintillating Scotoma:** Flashing lights that obscure part of the visual field. Associated with the beginning of a migraine headache.

**Sclera:** The white part of the eye.

**Scrotum:** The sac holding the testicles.

**Sedentary:** not moving around. The current slang term "couch potato" neatly encapsulates the sedentary lifestyle.

**Shigella:** *Shigella* is the name of a family of bacteria known to cause dysentery in humans.

**Sickle Cell Disease:** Found in some with African ancestry; caused by an abnormal hemoglobin molecule in red blood cells. When subjected to low $O_2$ levels, the abnormal hemoglobin crystallizes, causing red blood cells to twist into "sickle" shapes. The cells then aggregate and cause clots in many small blood vessels. Lack of $O_2$ then causes more sickle cells to deform, making the problem worse. Sickle cell genes protect against malaria, which is why it still exists despite the disadvantage to some who carry it.

**Snowblindness:** A sunburn of the cornea.

**Stasis:** Slowing down or stopping.

**Stridor:** Upper airway "wheezing" indicating partial obstruction, as occurs in croup or epiglottitis. A cough that is barking or seal-like is called a stridorous cough.

**Stuporous:** Having a decreased level of consciousness, but not being unconscious.

**Subarachnoid Hemorrhage:** Bleeding into the cerebrospinal fluid, often from a ruptured aneurysm.

**Subconjunctival Hemorrhage:** Bleeding under the outer covering of the eye (conjunctiva) over the sclera (white part of the eye.

**Sulfacetamide:** A sulfa antibiotic often used in eye drops and eye ointments.

**Sympathomimetics:** Drugs that mimic the fight-or-flight sympathetic nervous system response. Also known as adrenergics, because of the similarity to the effects of adrenaline.

**Systemic:** Having effects throughout the body.

**Temporal Arteritis:** Inflammation of the temporal artery.

**Tendon:** Tendons connect muscles to bones.

**Tetanus Immune Globulin:** A concentrated preparation of antibodies against the tetanus poison.

**Tetanus Toxoid:** A "tetanus shot." Contains a modified form of the tetanus poison. This "toxoid" will make the body develop antibodies that will protect against the real tetanus toxin (poison).

**Thrombophlebitis:** A clot in a small superficial vein with resulting inflammation.

**TIA:** Transient Ischemic Attack. A transient neurological deficit that resolves within a few hours.

**Toxicodendron:** The formal name for a group of plants including poison ivy, poison oak, and poison sumac.

**Toxin:** Poison.

**Travelers' Diarrhea:** Non-dysentery diarrhea that occurs about 2-5 days after traveling to a different country. One cause is a particular bacterium called "enterotoxigenic" *E. coli.* travelers' diarrhea is also known as "turista" or "Montezuma's Revenge."

**Turista:** travelers' diarrhea.

**Tympanic Perforation:** A ruptured eardrum.

**Umbilicus:** Belly button.

**Unilateral:** On one side only.

**Urticaria:** An allergic wheal-like rash (like mosquito bites without the bite), which may occur over the entire body.

**Urushiol:** The oil in poison ivy and similar plants to which so many people are allergic.

**UTI:** Urinary Tract Infection.

**Uvula:** The uvula is the floppy piece of tissue that hangs down in the back of the throat.

**Varices:** Dilated veins.

**Vascular Headache:** A migraine or cluster headache; caused by spasm of cerebral blood vessels.

**Vesicle:** A tiny blister.

**Vibrio parahemolyticus:** *Vibrio parahemolyticus* is the name of a species of bacteria known to cause dysentery in humans.

**Yersinia:** *Yersinia* is the name of a family of bacteria known to cause dysentery in humans.

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