

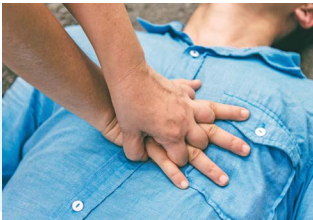
Patrick Brighton, MD

# STAYING SAFE

Backyard to  
Backcountry



# TABLE OF CONTENTS



**FIRST THINGS FIRST: AIRWAY, BREATHING, CIRCULATION, AND CPR .....1**

**STEP 1: Airway .....2**

**STEP 2: Breathing .....4**

**STEP 3: Circulation.....7**

**CPR.....9**

        Automated External Defibrillators (AEDs)  
        and How to Use Them .....17

**Choking and the Heimlich Maneuver. .... 22**



**FIRST AID FOR COMMON MINOR MEDICAL ISSUES ..... 25**

    Rashes and Skin Conditions ..... 25

    Sunburn ..... 27

    Bruises and Scrapes..... 28

    Blisters..... 29

    Cramps..... 30

    Dehydration..... 30

    Mild Sprains .....31

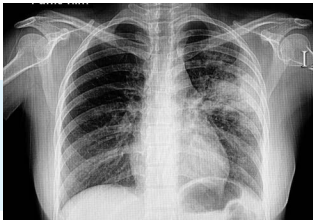
    Dental Emergencies..... 33



**MAJOR MEDICAL ISSUES..... 35**

    Heart Attacks ..... 35

|                                       |           |
|---------------------------------------|-----------|
| <b>Strokes</b> .....                  | <b>41</b> |
| <b>Shock</b> .....                    | <b>46</b> |
| <b>Altitude Sickness</b> .....        | <b>49</b> |
| HACE.....                             | 50        |
| HAPE.....                             | 52        |
| <b>Hypothermia</b> .....              | <b>54</b> |
| <b>Hyperthermia</b> .....             | <b>58</b> |
| <b>Frostbite and Chilblains</b> ..... | <b>60</b> |
| <b>Diabetes</b> .....                 | <b>63</b> |
| <b>Seizures</b> .....                 | <b>68</b> |
| <b>Asthma</b> .....                   | <b>69</b> |
| <b>Opioid Overdose</b> .....          | <b>70</b> |



## **INFECTIOUS DISEASES..... 73**

|  |           |
|--|-----------|
| <b>Central Nervous System Infections</b> ..... | <b>73</b> |
| <b>Pulmonary Infections</b> .....              | <b>77</b> |
| <b>Gastrointestinal Infections</b> .....       | <b>83</b> |
| <b>Miscellaneous Infections</b> .....          | <b>90</b> |
| Ear Infections.....                            | 90        |
| Urinary Tract Infections.....                  | 92        |
| Soft Tissue Infections.....                    | 94        |



## **INSECT AND ANIMAL ENCOUNTERS..... 97**

|                                      |            |
|--------------------------------------|------------|
| <b>Mosquito-borne Diseases</b> ..... | <b>97</b>  |
| <b>Tick-borne Diseases</b> .....     | <b>99</b>  |
| <b>Envenomations</b> .....           | <b>102</b> |
| Snakebites.....                      | 102        |
| Spider Bites.....                    | 105        |
| <b>Anaphylaxis</b> .....             | <b>107</b> |
| <b>Animal Bites and Rabies</b> ..... | <b>109</b> |



|   |            |
|---|------------|
| <b>TRAUMA</b>                                   | <b>111</b> |
| Penetrating Trauma                              | 112        |
| Blunt Trauma                                    | 114        |
| Head, Facial, and Spinal Cord Trauma            | 119        |
| Head Injuries                                   | 119        |
| Facial Injuries                                 | 124        |
| Spinal Cord Injuries                            | 126        |
| Thoracic Trauma                                 | 128        |
| Blunt Thoracic Injuries                         | 128        |
| Penetrating Thoracic Injuries                   | 137        |
| Abdominal and Pelvic Trauma                     | 139        |
| Extremity Trauma                                | 148        |
| Blunt Extremity Trauma                          | 148        |
| Fractures                                       | 149        |
| Vascular Injuries of the Lower Extremities      | 160        |
| Dislocations                                    | 161        |
| Soft Tissue Injuries and Bleeding               | 169        |
| Burns and Electrical Accidents                  | 174        |
| <b>EQUIPMENT LISTS</b>                          | <b>180</b> |
| Car Medical Kit                                 | 180        |
| Car Emergency Kit                               | 181        |
| Backcountry Expedition Kit                      | 181        |
| <b>ANATOMY DIAGRAMS</b>                         | <b>183</b> |
| <b>RECOMMENDED RESOURCES</b>                    | <b>189</b> |
| Websites  | 189        |
| Recommended Reading                             | 189        |
| First Aid, CPR, and Wilderness Medicine Courses | 189        |
| <b>QUICK REFERENCE INDEX</b>                    | <b>190</b> |
| <b>INDEX</b>                                    | <b>191</b> |
| <b>ABOUT THE AUTHOR</b>                         | <b>194</b> |

# FIRST THINGS FIRST: AIRWAY, BREATHING, CIRCULATION, AND CPR

Medical terminology includes an almost limitless quantity of confusing and unnecessary acronyms. These will generally be avoided in this text except when special emphasis is required. This chapter represents one of those occasions. Life-threatening emergency situations require immediate action, and in such cases, a simple acronym can help you remember exactly what to do.

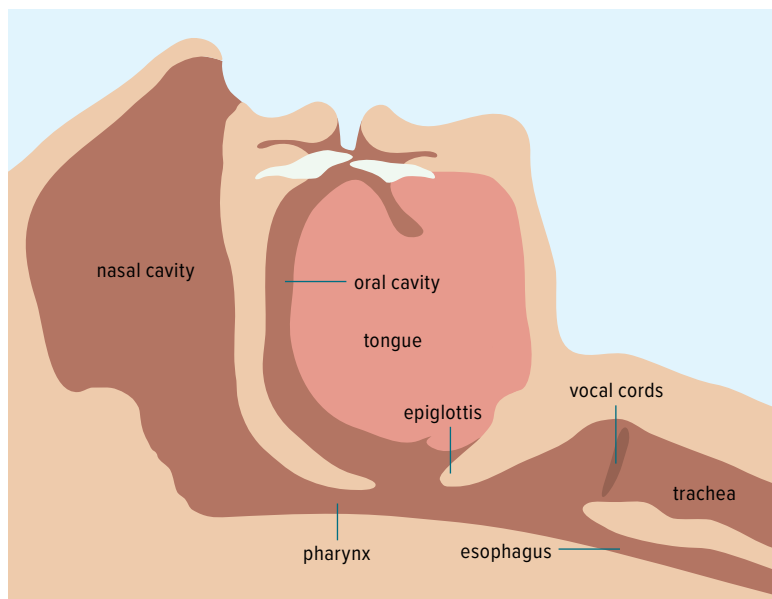
When individuals are faced with a medical emergency, whether it's a traumatic event injury or the result of a medical condition, the natural human response is dismay and even terror. But such feelings, however natural, can prevent first responders from providing prompt lifesaving care.

That's where the mnemonic **ABC** comes in: **Airway, Breathing, Circulation**. Brief and easy to follow, the ABCs help calm rescuers and tell them precisely where to start, as well as the sequence of subsequent steps. We'll cover the ABCs below.

## **A—Airway    B—Breathing    C—Circulation**

Why ABC? Fortunately, these letters represent the beginning of the alphabet that we all learned as toddlers, and thus they are ingrained into our subconscious, but they also represent the sequence of bodily systems that, when they fail, will kill us in descending order of rapidity.

The airway is nothing more than a hollow tube that allows for free passage of inhaled air (including oxygen) and expired waste gases (including carbon dioxide). For our purposes, the limits of the airway include the nasal passages (nares) and lips (upper extent of the airway) to the vocal cords. The vocal cords are two flaps of tissue that separate the upper airway from the lower airway. They reside inside the trachea, roughly at the level of the Adam's apple. Although the airway technically extends to the very outer fringes of the lungs (alveoli), we describe the airway in these



A simplified drawing of the human airway

terms because this section represents the only portion that nonadvanced medical responders may be able to clear in the event of an obstruction.

## STEP 1: AIRWAY

No matter whether someone appears to be having a seizure, heart attack, or some other medical ailment—or if they have sustained severe bodily trauma, especially to the head or face—airway assessment should be the first and only initial consideration for a rescuer. The patient may be gasping for air, spitting up blood or vomit, or unconscious. Regardless, the airway needs to be investigated and cleared completely before any other assessment or treatment is undertaken. The sequence for this is as follows:

With the patient on the ground and turned slightly



The proper technique for sweeping out the airway

## CHOKING AND THE HEIMLICH MANEUVER

Earlier in this chapter, we detailed the importance of clearing the airway for traumatic and medical conditions, but in this section, we will specifically cover what to do when someone is choking. If we inadvertently inhale food or other objects into the trachea instead of swallowing them down the esophagus and into the stomach, we are at risk for that object lodging at the level of the vocal cords which, in turn, causes us to choke.

Such objects may cause a complete or partial obstruction of the airway. Either way, the situation is an emergency, but complete, untreated airway blockage will result in death in only a few minutes. Rapid recognition and intervention become vital in order to save the person's life.

### **Signs and Symptoms of Partial Airway Obstruction**

- Violent coughing
- Extreme difficulty with both inhalation and exhalation
- Hoarseness or inability to speak

### **Signs and Symptoms of Complete Airway Obstruction**

- Inability to exchange air either in or out
- Inability to make any sound
- Extreme panic
- Clutching throat with hands

## TREATMENT

If the patient is coughing and able to exchange sufficient air, give them space and allow them to attempt to cough it out. If this is not successful within a minute or so, emergency personnel should be called if available. If in the backcountry, continue to allow them to try to expel the object on their own unless their clinical condition deteriorates or they lose consciousness. At this point, intervention as per complete obstruction should be implemented.

For complete obstruction, treatment should begin immediately. If the victim is conscious and upright, stand behind

# FIRST AID FOR COMMON MINOR MEDICAL ISSUES

This section will cover medical topics that, while not necessarily life-threatening, will still require field management. There is an almost infinite number of minor medical issues that may crop up in the outdoors. We will cover some of the more common ones. Hopefully, if you encounter a situation that is not covered here, you can figure out what to do based on the information provided.

## RASHES AND SKIN CONDITIONS

Many plants in North America and around the world produce irritating and/or toxic substances on their surfaces to deter herbivores from eating them. Unfortunately for us, these substances may produce skin reactions that can be quite painful—even debilitating in some cases. Recognition and avoidance are the most effective means of preventing these rashes (called contact dermatitis), but pants, long sleeves, and even gloves will help prevent exposure if one must pass through an environment rich in toxic plants. Some of the more common plants are listed below.



Eastern Poison Ivy



Poison Sumac



Poison Oak



Poison Wood Tree



Stinging Nettle



Many varieties of grasses,  
such as Bermuda Grass





# MAJOR MEDICAL ISSUES

This chapter deals with the backcountry management of nontraumatic medical conditions, which are presented in descending order of severity and/or frequency. It should be noted that any medical condition that may affect an individual in urban areas may also do so in rural settings. On top of these possibilities exist many other conditions unique to the backcountry setting. Additionally, many illnesses that may not present significant diagnostic or treatment challenges in metropolitan areas may quickly become life-threatening when treatment and evacuation resources are limited.

The most important consideration in the management of medical calamities in a wilderness setting is to try to make the most accurate diagnosis possible. Doing so will provide the foundation for expeditious field treatment and evacuation planning.

Even for trained personnel, making an exact diagnosis of a medical condition may be difficult or even impossible without the appropriate technologies available in a hospital setting, but we will cover simple diagnostic algorithms that will hopefully allow a rescuer to make as accurate an assessment of the patient's condition as possible given backcountry resource limitations.

As discussed in the first chapter concerning the ABCs, any individual who appears to be suffering from a condition that could be potentially life-threatening must first receive a rapid ABC assessment. Further diagnostic maneuvers may be undertaken once these basics are covered.

## HEART ATTACKS

As the pump that distributes oxygenated blood and retrieves toxic byproducts from every tissue in the body, the heart obviously represents a critical piece of machinery. When this pump fails to operate smoothly, even for brief periods,

# STROKES (CEREBROVASCULAR ACCIDENTS)

The term *stroke* is frequently used in the lay press to describe a certain condition that affects the brain, although stroke refers to a rather broad array of sudden-onset events that occur to the brain. The result of any of these events is that a section of the brain is suddenly deprived of its blood supply. When this occurs, the involved brain matter may suffer irreversible damage within only a few minutes. The physical manifestation of such damage depends entirely on which part of the brain is involved. The brain controls all bodily functions—both voluntary and involuntary. This means that the signs and symptoms of a stroke are numerous and may include a wide variety of physical alterations from very subtle all the way to death.



Weakness on one side of the body, including the face, is a sign of stroke.

## Some of the More Common Signs and Symptoms of Stroke

- Weakness or complete loss of motor function on one side of the body (hemiparesis or hemiparalysis)
- Weakness of the muscles on one side of the face (facial droop)
- Confusion
- Difficulty speaking, or markedly altered speech (various types of aphasias)
- Vision changes—even blindness in one or both eyes
- Extreme headache

It bears repeating that some symptoms may be extremely subtle, so a high index of suspicion must be maintained. It can be very helpful to question a companion of the patient to see if the friend has noticed any changes.

## SEIZURES

The topic of seizures represents a very broad set of considerations. We will focus only on the issues germane to backcountry management of this condition.

The term seizure indicates a situation where a spot in the brain engages in uncontrolled, random discharges of neurons. This event then produces violent, involuntary muscle spasms. The scope of these spasms can be anywhere from imperceptible muscle twitches and a mild decreased level of consciousness to total body spasmodic contractions and complete loss of consciousness. This latter group is generally referred to as *grand mal* or, in medical terms, *generalized tonic-clonic* seizures.

Often, individuals know beforehand that they suffer from this episodic condition and take daily medication for it. If patients forget their medication or take other substances such as new medications that interfere with the absorption of the anti-seizure medication, they may be more prone to such an attack. Unfortunately, absent a hospital setting, not much can be done in the backcountry to stop the event once it has begun. Our job as rescuers is to attempt to mitigate the negative effects of such an occurrence. Some of these negative effects include: airway obstruction due to tongue falling back into throat or blood/teeth if the patient bites their tongue or breaks a tooth, inability to generate adequate respiratory effort if the seizure lasts long enough, and trauma from falling to the ground or off of a high place.

To ameliorate these potentially untoward results, the rescuer(s) should do the following:

- Lay the patient on their side in a safe place. The patient may vomit, so side positioning is very important to prevent aspiration into the airways.
- If possible, position an object between the teeth, such as part of a towel, to allow ingress for air and to prevent the person from biting the tongue or breaking teeth.
- Do not place fingers into the mouth—they will be bitten!
- Consider calling for assistance if trauma has occurred or the seizure lasts more than 30 seconds or so.



# INFECTIOUS DISEASES

Just as in the urban setting, a staggering array of infectious possibilities exist in the backcountry. The difference here is that help is much farther away, so prompt recognition and early treatment become even more important. In this chapter, we will divide infections into categories depending upon the body part or organ system involved. The unifying element in all of these is that they are caused by a microscopic organism of some sort. The variety of organisms far surpasses the capacity of a single text to delineate. Our purpose here is to provide a potential rescuer with the knowledge to recognize the fact that an infection has taken place, then outline steps that may be taken in a backcountry setting to ameliorate the process. We will break down these infections into broad categories. Although some specific responsible organisms will be mentioned, it is not necessary to compile an exhaustive list of bacteria, viruses, spirochetes, and more.

## CENTRAL NERVOUS SYSTEM INFECTIONS

The central nervous system (CNS) is composed of the brain and spinal cord. Protecting these vital structures are three separate membrane layers collectively called meninges. When an infection affects these layers, a condition called meningitis occurs. It is no surprise that an infection of these tissues represents a severe and potentially life-threatening situation. An infectious process that involves the meninges may be fatal in only a few hours. Therefore, it is vitally important that this condition be recognized immediately by a rescuer in the backcountry so that early evacuation and treatment may be instituted.

### MENINGITIS

Meningitis may result from either viruses or bacteria, although bacterial meningitis represents the most common

## PULMONARY INFECTIONS

At rest, adult humans typically breathe 12–20 times per minute, making the lungs uniquely positioned for significant environmental exposure. This means that any pathogen in the air may be inhaled and thus incorporated into the body. In a normal state of immunocompetency (i.e., no underlying conditions that would weaken the immune system), the lungs possess a tremendous capacity to neutralize potential invaders. This is not always the case, however. Other factors that can influence whether the body can fight off airborne invaders include state of nutrition, physical exhaustion, altitude, and a higher-than-normal concentration of environmental exposure. Some densely populated cities, for instance, cause increased numbers of pulmonary infections due to higher concentrations of airborne viruses and bacteria coupled with high levels of pollutants that may weaken the immune system. An example would be travelers passing through Kathmandu on their way to a Himalayan expedition. It is very common for expedition members to acquire



Kathmandu, a common stop on the way to the Himalayas



# INSECT AND ANIMAL ENCOUNTERS

Ticks, mosquitoes, and other insects are the intermediate hosts for a variety of pathogens that may infect humans. Intermediate hosts means that the animal (insects in this case) carry the virus, bacteria, etc., but do not become ill as a result. They are capable, however, of passing the pathogen on to the definitive host (humans in this case), who do become ill because of the pathogen.

It should be emphasized that insects all over the world carry disease-causing pathogens that may infect humans through bites or stings. Fortunately, the number and severity of diseases transmitted in this manner are relatively small in the United States, but readers are encouraged to educate themselves on the diseases that are prevalent in any country or region they anticipate traveling to. Countries that lie along the equator typically harbor the greatest variety of disease-carrying insects. The farther one travels from the equator, the fewer and generally less severe the infectious possibilities. We will consider only those parasites endemic to the United States in this text.

## MOSQUITO-BORNE DISEASES

We have already considered the specific disease processes of encephalitis caused by viruses transmitted by mosquitoes (page 75). Other diseases caused by mosquito-transmitted pathogens include malaria, chikungunya, dengue, yellow fever, West Nile virus, and Zika virus.

With the exception of West Nile virus, the remaining diseases on the list not only rarely occur in the United States, but they are also limited to the hotter, more humid Southern states such as Florida, Alabama, and Georgia. Sporadic outbreaks, especially of malaria, do occur every few years, but the other diseases on the list are mostly seen in travelers returning from tropical climates. West Nile virus remains a persistent problem throughout much of the US.

## ANAPHYLAXIS

This section deals with the very specific and dangerous situation in which an individual is exposed to a substance that triggers an extreme defensive response by the body to combat this ostensibly harmful substance. In the vast majority of individuals, the substances that cause these extreme reactions are completely benign and do not elicit any sort of system-wide response. Examples include peanuts, wasp or bee stings, cinnamon, and a large variety of less-common substances.

The reaction that such people experience results from an exaggerated release of a certain inflammatory chemical. The exact reason for this unwarranted response is unknown. The medical condition is called anaphylaxis or anaphylactic



For those with serious allergic reactions, carrying an EpiPen is essential.

shock. The symptoms typically appear seconds after an exposure, such as a bee sting or the ingestion of peanut products. The chemical released from the body's own cells causes hives (raised red bumps on the skin); wheezing, shortness of breath, and use of accessory muscles (neck, intercostal muscles) to breathe; a drop in blood pressure; and, if left untreated, respiratory collapse and death.





# TRAUMA

Worldwide, trauma represents the number one killer of people less than 45 years of age and is the fourth-leading cause of premature death across the entire population. In the backcountry, the percentage of trauma deaths and injuries are even greater. For this reason, it is critical that a potential rescuer possess a solid framework of decision-making when approaching a trauma scene. Obviously, no text or even occasional multiday training can prepare a nonmedical person for every traumatic eventuality. The goal here is to provide the reader with a basic framework from which to develop an efficient, timely algorithm when confronted with a critically injured patient.

What we are aiming for are rescuers who can reproduce the same rapid assessment for each injured person they are tasked to assist, followed by (or concurrent with) quick, effective treatment, while arranging for additional resources as needed. This sounds prohibitively complicated, but the foundation for every scenario is the same. Well-executed rescue efforts use this foundation as a springboard to develop a coherent treatment and evacuation plan for whatever eventuality ensues.

Trying to assist an individual who has just sustained a significant traumatic event should elicit an extreme stress response in any compassionate person. To mitigate this, it is recommended to follow some simple mental pathways. The sequences are described here.

Trauma is divided into two basic categories: **Penetrating** versus **Blunt**. Penetrating injuries include gunshot wounds, impalements, stabbings, arrow injuries, etc. Blunt injuries include everything else, including falls, motor vehicle accidents, blast injuries, etc. There are several miscellaneous categories, such as **burns** and **lightning strikes**, that will also be covered in this text.



## HEAD, FACIAL, AND SPINAL CORD TRAUMA

Brain and spinal cord injuries represent a major portion of the trauma-related morbidity and mortality worldwide. One reason for this is that, even though the central nervous system (brain and attached spinal cord) is protected on all sides by a bony endoskeleton (skull and vertebral column), it has an extremely limited capacity to heal or regenerate, unlike other structures. This means that whatever deficit occurs after an injury to these structures is likely to persist permanently. Some mitigating treatments can be administered in trauma centers, but the caveat here is that the patient must receive definitive care in a hospital dedicated to central nervous system injuries as quickly as possible.

The salient aspects of field treatment include rapid assessment and rapid evacuation. Specific injuries are discussed below.

### HEAD INJURIES

We can think of the brain as the central processing unit of our bodies. All received information in terms of environmental stimuli is processed here, and then motor signals are distributed to the appropriate organ system. A grain of sand touches our cornea and we blink. We spot a rock falling toward us and we dodge out of the way. It is for these basic survival instincts, as well as the ability for higher thought processes, that it is imperative that the very fragile brain be protected. This is where the skull comes into play. The average skull thickness in adults ranges 6–8 mm. While this bony structure does provide some protection against minor traumas, it is startling how little force is required to cause permanent neurologic injury. We will again divide injury patterns into blunt versus penetrating.

#### Blunt Force Head Injuries

As the brain is a very soft and fragile organ contained within the skull, it is extremely susceptible to bruising because of trauma to the skull. Any blow with force sufficient to cause bruising or laceration to the scalp may, in turn, cause damage to the brain. Not only is the brain matter immediately

- Rapid transport. It is difficult to overstate the importance of this. Again, even asymptomatic patients who have sustained significant head trauma may deteriorate without warning. This can lead to death in a matter of minutes.

### Eye Response

| Scale                                 | Score |
|---------------------------------------|-------|
| Eyes open spontaneously               | 4     |
| Eyes open to verbal command or speech | 3     |
| Eyes open to pain                     | 2     |
| No eye opening                        | 1     |

### Verbal Response

| Scale  | Score |
|--|-------|
| Orientated   | 5     |
| Confused conversation but able to answer questions | 4     |
| Inappropriate responses                            | 3     |
| Incomprehensible sound or speech                   | 2     |
| No verbal response                                 | 1     |

### Motor Response

| Scale                                    | Score |
|--|-------|
| Obeys commands for movements             | 6     |
| Purposeful movement to painful stimulus  | 5     |
| Withdraws from pain                      | 4     |
| Abnormal flexion or decorticate posture  | 3     |
| Extensor response or decerebrate posture | 2     |
| No motor response                        | 1     |

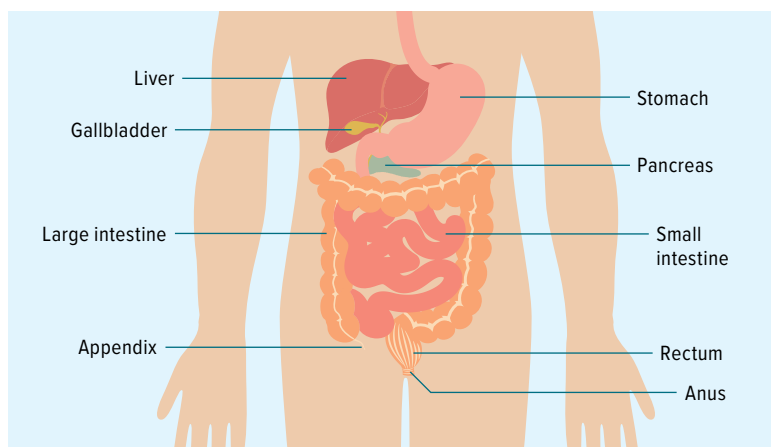
## ABDOMINAL AND PELVIC TRAUMA

As we continue downward on the body, we will next consider injuries to the abdominal and pelvic areas. The abdominal cavity houses a variety of disparate organ systems, all of which are at risk in the event of a concentrated, forceful blow to the front, sides, and even the back.

The contents of the abdomen are protected in the back by the vertebral column, the broad back muscles, and a bit by the ribs. The walls of the flanks and the front are composed of heavy cross-layered muscles that provide an effective shield against low-energy traumatic insults. As with all human tissue, when the protective ability of these barriers is breached by an extreme force, internal damage ensues. Falls from heights, rockfall, motor vehicle accidents, and other high-energy transfer incidents may result in internal abdominal injuries. The salient issue with all intra-abdominal traumatic injuries is that they are essentially all serious and potentially life-threatening. The two main categories of damage to abdominal organs include hemorrhage and rupture of the gastrointestinal tract.

### INTRA-ABDOMINAL HEMORRHAGE

Bleeding that occurs within the confines of the abdominal cavity originates from either rupture of the spleen, liver, or kidneys (strictly speaking, the kidneys are separated from the abdominal cavity by a membrane, but we will include them



The abdominal cavity is home to a host of important organs.

## EXTREMITY TRAUMA

As we continue our examination of traumatic conditions from central to more peripheral locations, we finally come to the consideration of injuries to the arms and legs. Note that the anatomy of the arms and hands are remarkably similar to that of the legs and feet. Given this fact, any condition that affects an upper extremity may be treated in a similar fashion to the same condition that occurs in a lower extremity and vice versa. Obvious differences exist in terms of size, weight bearing, and other factors.

### BLUNT EXTREMITY TRAUMA

Blunt force injuries to an extremity may produce a broad array of tissue damage from minor scrapes and bruising, all the way to the loss of an extremity and even death. Fortunately, we have evolved in such a way that the most vital structures are protected by the heavy bones that form the internal structural support of the extremities. These vital structures include the large arteries that supply oxygenated, nutrient-rich blood to the tissues of each extremity; the large veins that return oxygen-depleted, toxin-laden blood back to the heart and lungs; and the nerves that supply motor function and sensation to the muscles and soft tissues.

These important structures are tucked medial (closer to the body core) of the large bones so that even high-impact forces may be absorbed by the bones, thus protecting the vital neurovascular tissues. Car bumpers work in a similar way—the outer elements are sacrificed to protect the occupants.

In an evolutionary sense, this configuration has ensured that more humans reach the age of reproduction instead of succumbing to minor injuries during childhood.

For our purposes, it means that more patients stand a chance of surviving to reach a tertiary care facility despite high energy-transfer insults.

An example of this is seen at the top of the next page, which shows the large single brachial artery of the upper extremity protected by the upper arm bone—the humerus. After the brachial artery splits into the two large arteries of the forearm, the radial and ulnar arteries, we see that these

# A worst-case scenario can happen anytime, anywhere.

This book is filled with practical advice and real-life stories to help you prepare for outdoor emergency situations. Learn what preventative steps can minimize your risk. Discover the recommended first aid responses to various wilderness illnesses, injuries, and emergencies—from sunburn to heart attack.

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- Easy-to-find information organized by type of injury
- Easy-to-understand instructions that help you decide how to proceed
- Medical techniques based on the latest research and Dr. Brighton's decades of experience

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**Patrick Brighton** is a board-certified general and trauma surgeon. A Fellow in the American College of Surgeons for more than 20 years, he has evaluated and surgically managed thousands of critically injured trauma patients. Dr. Brighton spends his free time as a member of the Ouray Mountain Rescue Team in Colorado.

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