



**TRAVELERS
MEDICAL
GUIDE**

**CONTRIBUTORS
PETAR J. DENOBLE, M.D.
JAMES CHIMIACK, M.D.**



PREFACE

Divers Alert Network® (DAN®) has published this first edition of the Travelers Medical Guide to provide a concise health guide with content relevant to all travelers, including scuba divers, boaters and swimmers. More information on scuba-specific topics is included in other DAN publications, which are available at [DAN.org/Health-Medicine/Health-Resources](https://www.dan.org/Health-Medicine/Health-Resources).

While all medical treatments should conform to the best practice guidelines available, travelers (and those who care for them) should understand that providers might need to adapt treatments to the constraints and environments where the need for care arises.

This guide is intended to be used only as a travel health and medical resource. For detailed information about DAN benefits, please refer to the description of coverage you received with your purchase.

We hope you find this guide helpful, and we invite your feedback to help make it better.

Safe travels!

Petar J. Denoble, M.D.

James Chimiak, M.D.



Petar J. Denoble, M.D.



James Chimiak, M.D.



CONTENTS

What Is DAN?	vi
Contacting DAN	vii
Using This Guide.	viii

SECTION 1 PLANNING AND PREPAREDNESS 9

Overview of Travel-Related Health Hazards	10
Most Common Health Issues for Travelers	11
Common Causes of Death Among Travelers	13
Hazards of Specific Modes of Travel	14
Plane Travel	14
Motor Vehicle Travel	16
Accessing Emergency Assistance	21
Rescue	22
Medical Evacuation	23
Repatriation	25
Prudent Travel Planning	26
Research Your Destination	26
Check Your Health	26
Know Your Medications	27
Pack Well	27

Have a Plan for Illness or Injury	30
Know Common Illnesses	30
Share Your Travel Plans	30

Medical Fitness to Travel	31
Medical Clearance to Fly	32
Traveling with Prescription Drugs.	33

Fitness to Dive	34
Physical Fitness	34

Dietary Considerations for Boaters	40
Caloric Intake	41
Healthy Eating	42

Traveling in the United States.	43
--	----

Resources	46
----------------------------	----

SECTION 2 DISORDERS CAUSED BY TRAVEL 48

Jet Lag	49
Motion Sickness	51
Deep Vein Thrombosis.	54



SECTION 3
ILLNESSES
TRAVELERS
MIGHT
ENCOUNTER 59

Common Infectious Diseases	60	Chikungunya	87
Common Vector-Borne Diseases	62	Dengue Fever	87
Key Facts	62	Ebola	88
Protective Measures Against Mosquito Bites	63	Hand, Foot and Mouth Disease	88
Managing Travel-Related Illnesses	64	Methicillin-Resistant <i>Staphylococcus Aureus</i> (MRSA)	90
Travelers' Diarrhea	64	Middle East Respiratory Syndrome (MERS)	92
Malaria	72	Severe Acute Respiratory Syndrome (SARS)	92
Other Conditions	74	COVID-19	93
Measles	80	Sexually Transmitted Diseases	94
New and Emerging Diseases: The Threat of Pandemic	81	Food Safety	96
Avian Influenza	85	General Recommendations	96
Chagas Disease	86	Seafood Safety	96

SECTION 4
TRAVELING WHEN
DIAGNOSED
WITH A CHRONIC
ILLNESS 99

Abdominal Wall Hernia	100	Gastrointestinal Issues	107
Asthma	101	Constipation	107
Cholelithiasis	102	Heartburn/Reflux (GERD)	108
Chronic Obstructive Pulmonary Disease	103	Hemorrhoids	110
Diabetes	104	Gout	111
		Heart Disease	113

SECTION 5
TRAVEL-RELATED
INJURIES 115

Exposure-Related Injuries	116	Water-Related Injuries	134
Hyperthermia	116	Snorkeling	136
Hypothermia	119	Scuba Diving	137
Altitude Sickness / Acute Mountain Sickness	126	Boating	142
Dehydration	128	Beachgoing	144
Other Exposure Concerns	130	Marine Animal Injuries	145



SECTION 6
KEY FIRST AID
PRINCIPLES 148

Essential Skills 149
 Providing First Aid 149
 Administering CPR 150

**Rescuing Divers
and Swimmers** 152
 Performing a Water Rescue 152
 Administering
 Emergency Oxygen 154

**Common Medical
Emergencies** 156
 Abdominal or Pelvic Pain 156
 Dislocated Joint 156

Gastrointestinal Bleeding 157
Headache 158
Heart Attack 159
Stroke 160
Toothache 160
Urinary Tract Infections 161
Wounds 162

**Neurological
Assessments** 163
 Field Neurology for Divers 163
 Neurological
 Assessment Course 163

SECTION 7
ASSEMBLING
A TRAVEL
MEDICAL KIT 164

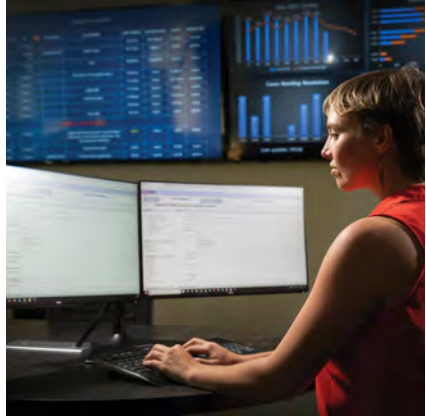
Medications 165
Protective Items 166
First Aid Supplies 166

Other Items 166
Documents 167
Reference Books 167

APPENDIX

**Preparticipation
Screening Questionnaire** 168
**Acronyms and
Abbreviations** 171
Glossary 172
Endnotes 177





WHAT IS DAN?

Divers Alert Network® (DAN®) was established in 1980 to provide the dive community with a 24-hour emergency hotline staffed by experts in dive medicine. DAN soon began offering broad financial and logistical support to divers through research and educational initiatives as well as products and services useful to divers. Today DAN is the world's largest dive safety organization.

Attracting the attention of nondivers who also want the security of access to emergency assistance when they need it most, DAN's 24/7 emergency hotline now serves anyone who experiences an injury or unexpected illness during any type of travel while still fulfilling DAN's mission to provide medical information and assistance to scuba divers who suffer dive-related injuries.

DAN also provides vital information to help travelers prevent and manage illnesses and injuries while away from home. With an international reputation for dive safety research and education, DAN applies the same scientific approach to informing all travelers about the most current and relevant health and safety guidelines.

Working with numerous global partners, DAN helps members who experience a medical emergency when they're away from home — whether it is minor or serious and whether it requires on-site treatment or evacuation. If you need help anywhere in the world, contact DAN for assistance. We are here to help.

For more information about DAN membership, visit [DAN.org/Membership](https://www.dan.org/Membership).



CONTACTING DAN

Among DAN's many membership benefits, perhaps the most valuable is the peace of mind from knowing that you can call on us at any time and from anywhere. DAN offers a wide range of resources, available via phone and online.

DAN EMERGENCY HOTLINE

Call +1 (919) 684–9111 for both diving and nondiving emergencies and to access TravelAssist services. The DAN Emergency Hotline is available 24/7 from anywhere in the world; DAN also accepts collect calls for emergencies.

For more information about TravelAssist services, visit [DAN.org/membership-insurance/membership/dan-membership-benefits](https://www.dan.org/membership-insurance/membership/dan-membership-benefits).

DAN must make all transportation arrangements prior to an evacuation.

DAN NONEMERGENCY INFORMATION

For nonemergency questions, call the DAN Medical Information Line at +1 (919) 684–2948 (available Monday through Friday, 8:30 a.m to 5 p.m. ET) or contact us online at [DAN.org/Ask-a-Medic](https://www.dan.org/Ask-a-Medic).

Other DAN medical resources include the following:

- DAN Medical Services and Information:
[DAN.org/Health-Medicine](https://www.dan.org/Health-Medicine)
- DAN Health and Diving Library:
[DAN.org/Health-Medicine/Health-Resources](https://www.dan.org/Health-Medicine/Health-Resources)

DAN's mailing address:

6 West Colony Place
Durham, NC 27705 USA



USING THIS GUIDE

This guide is a resource for travelers, divers, paramedics, first aid providers, physicians and others to help prevent, recognize and manage travel-related illnesses and injuries. It presents information in a simplified, easy-to-understand manner and is not intended to supply complete treatment plans or to be a substitute for a physician's advice. Individuals should consult with trained and experienced medical professionals before undertaking definitive treatment for any potentially significant illness or injury.

Traveling to different parts of the world requires knowledge and preparation. This guide offers general travel information as well as targeted advice regarding specific travel situations. Some topics covered here may not appear in other travel guides.

The seven sections of this guide cover topics ranging from general packing tips to instructions for conducting an on-site neurological examination. Readers should review the contents and bookmark the sections most pertinent to them for easy accessibility. A glossary and a list of acronyms

and abbreviations appear at the back of the book. Use this information when planning a trip and as a reference at any time.



Figure 1.
Risk of
Travel-Related
Adverse Health
Outcomes



SECTION 1

PLANNING AND PREPAREDNESS

While we all hope to avoid an emergency while traveling, many people do experience an incident — and sooner or later that person may be you. The better informed and prepared you are for such an occurrence, the less likely you will suffer severe or even dire consequences. Awareness of risks helps us to adopt risk-mitigating behaviors. Health risks for travelers vary depending on many factors, and no single statistic applies to all travelers. Figure 1 provides information from various sources to give you an idea of relative risk of adverse health outcomes in travelers.



OVERVIEW OF TRAVEL-RELATED HEALTH HAZARDS

Table 1 lists a variety of categories of health hazards and risks people may encounter while traveling. Some hazards can occur anywhere (including at home), some are more likely to occur in certain regions, and some are limited to specific locales. This is not a comprehensive list.

Table 1.
Examples of
Travel-Related
Health Hazards

Hazard Categories	Risks
altitude	acute mountain sickness
change in diet	indigestion, gout, gallbladder attack, pancreatitis, diarrhea/constipation
circadian rhythm	sleep disruption, fatigue
crowded living spaces	noroviruses, colds
human-transmitted diseases	sexually transmitted diseases, Middle East respiratory syndrome (MERS), COVID-19
infectious vectors	vector-borne diseases such as malaria, dengue, trypanosomiasis, zika, chikungunya and others
lodging	bedbugs, allergens
motion	motion sickness
public spaces	smoke exposure, air pollution
sanitation	diarrhea, hepatitis
season and climate	heat exhaustion, cold exposure
traffic accidents	injuries
wildlife encounters	rabies, bites, stings





Most Common Health Issues Among Travelers

1. travelers' diarrhea
2. systemic illnesses with fever
3. respiratory illnesses
4. skin and soft-tissue issues
5. injuries

Source: Angelo et al. 2017¹

Figure 2. Most Common Health Issues Among Travelers

MOST COMMON HEALTH ISSUES FOR TRAVELERS

Health risks among travelers vary by country of origin and destination, activity, age, health history and other factors.

Incidence and prevalence of acute health issues acquired during travel vary depending on the source of data, but the major patterns are similar. As Figure 2 shows, the most common health issue is travelers' diarrhea (TD), which may affect 30 percent to 70 percent of travelers, followed by febrile systemic illnesses, respiratory illnesses (2 percent to 26 percent), skin and soft-tissue issues, and injuries (0.5 percent to 7 percent).

Incidence and prevalence of acute health issues acquired during travel vary depending on the source of data, but the major patterns are similar. As Figure 2 shows, the most common health issue is travelers' diarrhea (TD), which may affect 30 percent to 70 percent of travelers, followed by febrile systemic illnesses, respiratory illnesses (2 percent to 26 percent), skin and soft-tissue issues, and injuries (0.5 percent to 7 percent).¹

Among Europeans returning from a trip, malaria, dengue fever, Zika virus, enteric fever, spotted-fever group rickettsioses, chikungunya and nonspecific viral syndromes were the most frequent contributors to acute



systemic febrile illnesses. Travelers most commonly contracted *Falciparum* malaria in West Africa, enteric fever on the Indian subcontinent, and leptospirosis, scrub typhus and murine (flea-borne) typhus in Southeast Asia.² Respiratory illnesses include common cold, flu, upper respiratory infections and pneumonia. Common skin and soft tissue infections,



mosquito bites (often infected) and allergic dermatitis were the most common skin conditions affecting travelers.³ U.S. citizens who seek medical help after returning from a trip abroad suffered most from illnesses of the gastrointestinal tract (58 percent) followed by systemic febrile illnesses (18 percent) and dermatologic disorders (17 percent).⁴

A study of travelers returning to China from 2014 to 2018 reported an overall sickness rate of 41.64 per million travelers, with 27.44 per million becoming sick

during travel and 14.2 per million developing illnesses within 14 days of return. Those who returned sick suffered mainly from respiratory infections such as influenza and rhinovirus and had returned from Asian countries. Travelers who got sick after return primarily had vector-borne diseases such as malaria and dengue and had returned from Africa.⁵

Risks during travel appear to be similar among Europeans of various nationalities. A study showed that 42.9 percent of German travelers reported illness, with 10 percent reporting more than one adverse health event. Gastrointestinal symptoms were 80 percent of reported illnesses, respiratory symptoms 13.7 percent and accidents 5 percent. The risk of getting ill significantly increased when visiting the Indian subcontinent or when traveling in areas with limited availability of modern medical care.⁶

Statistics for travelers from other countries and travelers to South America and the Caribbean are similar in the prevalence of disease categories, but specific diseases may vary due to the regional spread of diseases such as Zika or yellow fever.



COMMON CAUSES OF DEATH AMONG TRAVELERS

Cardiovascular disease is the leading cause of death among travelers abroad, accounting for nearly 50 percent of all deaths and the most deaths in travelers older than 55 years of age.⁷ This percentage is similar within the same age group at home and does not necessarily reflect travel-related risks.

Injuries are the cause of approximately 13 percent of travel-related deaths. Motor vehicle accidents are the most common cause of injury-related death in travelers younger than age 55, followed by drowning.^{8,9} Compared with

the incidence of injury-related death in the United States, the incidence doubles in Southeast Asia and nearly triples in Africa.¹⁰

Infectious diseases cause relatively few travel-related deaths. Travelers' risk of acquiring life-threatening infections is generally low because prophylactic medications or vaccinations can prevent many infectious diseases. New diseases such as COVID-19, however, can increase the risk.





HAZARDS OF SPECIFIC MODES OF TRAVEL

Plane crashes and shipwrecks make headlines, but the chances of experiencing such events are minuscule. Travelers can, however, plan for the more common hazards associated with various modes of travel.

PLANE TRAVEL

Flying exposes travelers to high altitudes, a decreased level of oxygen, relatively quick atmospheric pressure changes during ascent and descent, very dry air, and proximity to other travelers who may have transmissible diseases. While you should always be on guard against respiratory infections, it is especially important to follow public health recommendations at times of outbreaks and take care of personal protection. When planning travel by airplane, check with your air carriers and the U.S. Centers for Disease Control and Prevention (CDC) for current guidelines.

Major passenger airliners typically cruise at an altitude of 36,000 feet while maintaining cabin pressure at a level equivalent to 5,000 to 8,000 feet, which is roughly 15 percent to 25 percent less than sea-level atmospheric pressure. The oxygen in cabin air is proportionally reduced, affecting people with severe lung, heart or circulatory diseases. People with such conditions should consult their physicians before traveling by air.



During ascent or descent, cabin pressure changes relatively quickly. If gas cannot move freely in or out of your middle ears and sinus cavities, a pressure differential may occur, which can cause pain or discomfort in your ears or sinuses or in rare instances can rupture your eardrum. It is important to remain

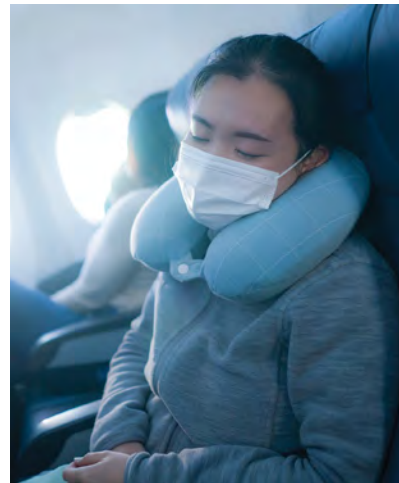


awake during ascent and descent so you can actively equalize your ears' pressure (see [DAN.org/Health/Ears](https://www.dan.org/Health/Ears)). If you are congested or suffer from excessive postnasal drip, consider taking an over-the-counter or prescription decongestant to help keep open your sinus passages and improve your ability to equalize middle-ear pressure.

Long international flights can cause fatigue. The more time zones you cross, the more likely you will experience **jet lag** (see [Section 2](#)). Other contributors to heightened fatigue include the noise level on a plane, dryness of the cabin air, irritants that may be present in the cabin environment and the physical inactivity resulting from long flight. Avoiding alcohol and caffeine and using a sleep aid may help mitigate this problem. Try to build extra time into your schedule for rest after a flight through multiple time zones.

Sitting in a cramped airplane seat for a long time may cause some travelers to develop a severe condition known as **deep vein thrombosis** (DVT) or blood clots in the legs (see [Section 2](#)).

Billions of people fly each year, so just about any kind of medical emergency may occasionally occur on a plane. An estimated 24 to 130 in-flight emergencies occur per 1 million passengers.¹¹ If an incident does occur in flight, crew members have some first aid training but are not medical professionals, and they have limited equipment available to them. They usually depend on remote medical assistance through a service such as MedAire ([MedAire.com](https://www.medaire.com)), which provides medical advisory services to airlines worldwide.



Some airline personnel check for visibly sick passengers in their waiting areas and during the boarding process. If you look like you may be sick, you may not be permitted to board the plane.

If you get sick while you are on a plane, note the following:

- Tell a crew member as soon as possible.
- If you cough, you will be asked to wear a surgical mask or cover your mouth and nose.
- If your illness is severe, crew members may move you to a different part of the plane or, if necessary, have the plane rerouted to the nearest airport so you can deplane there and be transported to a medical facility.

MOTOR VEHICLE TRAVEL

Motor vehicle accidents are the primary cause of disability or loss of life among travelers. A variety of factors contribute to these accidents, most of which can be prevented or diminished. Primary among these factors is seat belt usage.

If you plan to drive, reduce your accident risk by familiarizing yourself with local traffic laws and patterns before getting behind the wheel. Be aware that locals' observation of traffic laws in some regions may be limited. Know

Motor Vehicle Accidents

- Every year, 20 million to 50 million people worldwide are injured and 1.3 million are killed in motor vehicle crashes.
 - 90 percent of these casualties occur in developing countries.
 - 25,000 of the deaths are among tourists.
- Road-related accidents are the No. 1 cause of preventable death among healthy American travelers.
- Nearly half of medical evacuations to the United States are the result of a car crash.
- A medical evacuation can cost more than \$100,000.

Source: Sauber-Schatz et al. 2019²





Eight Simple Steps to Minimize Your Risk of Motor Vehicle Accidents

- 1. Always wear a seat belt and put children in car seats.**
- 2. Avoid riding in a car in a developing country at night.**
- 3. Avoid riding motorcycles. If you must ride a motorcycle, wear a helmet and body protection.**
- 4. Know local traffic laws before you get behind the wheel.**
- 5. Do not drink and drive.**
- 6. Ride only in marked taxis with seat belts. Ridesharing companies are increasing in popularity, but do your research to learn about approved services and their safety in the countries you'll be visiting.**
- 7. Be alert when crossing the street, especially in countries where people drive on the other side of the road.**
- 8. Avoid overcrowded, overweight or top-heavy buses, vans or trains.**



which side of the road to drive on, and plan ahead so you know the routes you'll be taking. Most smartphones have GPS chips, and apps are available with preloaded maps that could be a great resource without needing to use an international cellular data plan.

The risks of a motor vehicle accident are likely greatest in developing nations due to poor road infrastructure, the disrepair of many vehicles, a modest culture of safety and limited or inaccessible medical care. Remote locations may not have local emergency medical services or a level of care sufficient to meet the needs of a seriously injured traveler. Screening of blood supplies and sterilization of instruments and needles may also be inadequate. Remote regions of the world have their appeal, but consider these drawbacks as you make your travel plans.

The most important action that travelers can take with motor vehicles is to wear seat belts in cars and helmets on motorcycles and scooters. They really do save lives.

BOAT TRAVEL

Marine travel involves some general hazards as well as ones specific to certain types of vessels, destinations and activities. The majority of seagoing travelers are aboard either large cruise ships or small recreational boats or liveaboards.

Cruise ships: Cruise ships have their own onboard health hazards independent of the destination, often providing extended exposure to other passengers and the crew, who have likely come from all parts of the world and may be carrying potentially communicable diseases. Outbreaks of COVID-19, chickenpox and rubella (German measles), for example, have occurred on cruise ships.





A common shipboard outbreak is vomiting and diarrhea caused by noroviruses. Respiratory infections and foodborne poisonings are also common as are lifestyle disorders due to dietary changes, overeating and excessive alcohol consumption.

Regardless of your itinerary, make sure you are up to date on all necessary or recommended vaccinations for diseases including but not limited to measles/mumps/rubella, varicella (chicken pox), tetanus, seasonal flu and pneumonia.

Cruise ship hazards that are related to being on a moving platform include motion sickness, falls that result in injuries and falls overboard that result in drowning.

If you are sick or injured while on a cruise ship, note the following:

- Tell a crew member as soon as possible.
- Cruise ships usually have a small medical facility on board where your illness may be treated.
- If your illness is serious, the medical staff may stabilize your condition and move you to a hospital on land for further treatment.

Medical evacuation at sea is complex, hazardous and expensive. Consider your health before you go on a cruise, and be sure to purchase insurance that covers **medical evacuation**, which is not covered by standard health insurance policies or Medicare.





The most important thing boaters can do is to wear life jackets. They save lives.

Recreational vessels: Health concerns for recreational boaters include injury, acute illness and other travel-related diseases. The **American Boating Association** reports that in 2019 almost 12 million recreational vessels were registered in the United States. That year the U.S. Coast Guard logged 4,168 marine accidents, which involved 2,559 mandatory reportable injuries and 613 deaths. Little data are available about the nature of the nonfatal injuries, but most of the fatal injuries occurred on small vessels of 21 feet or less, including open motorboats, canoes and kayaks. Drowning was the cause of death in

79 percent of fatal boating accidents; trauma or hypothermia were among the other causes. Of those who drowned, 86 percent were not wearing a life jacket.¹⁴

Alcohol use is a major contributing factor in boating accidents and is the leading factor in 23 percent of deaths. Other common risk factors include operator inattention, improper lookout, operator inexperience and excessive speed.¹⁵ Take steps to minimize or eliminate these factors whenever you set sail.

The most important thing boaters can do is to wear life jackets. They save lives.





The three stages of emergency medical assistance for travelers are: rescue, evacuation and repatriation.

ACCESSING EMERGENCY ASSISTANCE

Rescue or evacuation services may not be available in some very remote locations. All travelers — especially those going to remote territories — should develop an emergency action plan in the event they encounter unforeseen circumstances. The U.S. Department of State may assist you in an emergency, but you will have to pay your travel and accommodation expenses.¹⁶

Your emergency action plan should include emergency contact numbers and details about what services may be available at your destination. Make extra copies of your passport and travel documents to keep with you, and provide copies to someone back home.

A benefit of DAN membership is to assist with all three stages of emergency medical assistance for travelers: rescue, evacuation and repatriation.





RESCUE

The process of locating travelers in need of assistance, retrieving them and getting them to someone who can provide initial medical care is defined as the rescue phase of assistance. DAN's ability to help with the early stages of a DAN member's rescue in a remote wilderness area or far out at sea may be very limited. Sometimes a traveler is unable to alert DAN due to poor communications, or search-and-rescue teams may be out of range or unavailable in that region. Even with good communications, contacting DAN might not be the most expedient way of accessing rescue assistance; local rescue organizations may offer the best service.

Travelers who are going to remote locations should have an emergency action plan that includes the contact information for a remote rescue service in that region. These services could include local emergency medical services, the nearest search-and-rescue team, the country's coast guard or even the local police, whatever might be applicable. Verify that they would be available to assist you in the event of an emergency. Contact the local service first if the need for a rescue arises.

Search-and-rescue operations can be quite expensive, so travelers to remote areas should have insurance that will cover such assistance. Even policies that cover rescues generally limit the reimbursable amount and typically pay only organizations that are trained and approved to undertake search-and-rescue missions.



Below is a list of emergency numbers from around the world. Some countries have different numbers for different types of emergencies. Research the emergency numbers for your destination before traveling.



- 000** – Australia
- 106** – Australia for text/phone/TTY
- 110** – China, Korea, Japan (different numbers for ambulance and fire)
- 112** – European Union, Russia and on GSM mobile networks across the world Also, the National Sea Rescue Institute in South Africa uses 112 from within South Africa.
- 100** – India, Greece, and Israel
- 108** – India (22 states)
- 119** – Jamaica and parts of Asia
- 111** – New Zealand
- 911** – North America and the Philippines
- 999** – Number used in many other countries
- 122** – Specific services in several countries

MEDICAL EVACUATION

A medical evacuation (medevac) is the transportation of an injured or sick person from one medical facility, such as a small hospital that provides an initial assessment and primary care, to another facility that can provide more comprehensive and sophisticated care. A medevac begins after medical personnel at the nearest medical facility have evaluated the patient's condition and when resources to evacuate the individual are available. Transportation is usually by land or air, but a boat might be the only available evacuation method in some remote areas.

Travel assistance organizations optimize the evacuation process by balancing several factors: the type and urgency of the medical need, the available means of evacuation and the proximity of facilities that can provide care. An evacuation may be delayed due to factors such as inclement weather or the unavailability of transportation at night. Patients will not necessarily be returned to their countries of origin but instead will be moved to the closest, most appropriate medical facility before they can move on to the next level of care.





Medical Rescue and Medical Evacuation

A *rescue* is an attempt to save someone from a dangerous or unpleasant situation. In emergency medicine, a medical rescue is any activity that brings a victim (of disaster or accident) to safety.

A *medical evacuation* (medevac) is the timely and efficient movement and en route care of a patient by medical personnel. This evacuation can be transportation either from the scene of an accident to a receiving medical facility or between medical facilities.

The main difference between the two terms is that a medical rescue is the emergency transportation efforts necessary for an injured person in the field to become a patient at a medical facility or at a point where local emergency medical services can take over; in a medical evacuation, the person being transported is already a patient.

A medical evacuation sometimes can cost more than \$100,000 if it includes several stages or requires the use of a specialized air ambulance. Insurance that covers evacuation is essential if you plan to travel to a remote area.

REPATRIATION

Transportation of ill or injured travelers back to their home countries is called *repatriation*. Insured travelers who are injured or fall sick while traveling and require hospitalization will be returned to their home country at the insurer's expense if their condition warrants medical travel, if they are stable enough to travel and if the travel does not pose any additional risk to their condition.

For DAN members, DAN TravelAssist makes all such medical determinations in consultation with the treating physicians and then makes all travel arrangements if they deem repatriation is advisable.



While DAN members hope to never need the emergency medical assistance benefit that DAN membership provides, they are glad to have it available if the need arises. To ensure coverage, members **MUST** contact DAN to arrange for and coordinate **ALL** emergency medical assistance.





PRUDENT TRAVEL PLANNING

Planning for safe travel involves much more than securing your plane tickets and hotel reservations. Prudent planning can eliminate or mitigate many hazards associated with travel — even to remote places. Before you leave home or even book your trip, be sure to take the following steps.

RESEARCH YOUR DESTINATION

All travelers should learn some basic facts about their destination. Knowing the typical weather for the time of year you'll be visiting your destination will allow you to pack appropriate clothing to keep you safe and comfortable. Knowing the extent of local health precautions will help you determine what is safe to eat and drink and what items to avoid. This planning is an essential first step in ensuring a great trip, whether to a favorite site or new location.

CHECK YOUR HEALTH

How is your health? Have there been any changes in your health status since your last trip? Are you seeing a physician before your trip to treat even a minor health issue? A “simple” hernia, for example, could become entrapped and require emergency surgery where no such service exists. It would be prudent to get your doctor's approval for an upcoming trip and recommendations for maintaining good health while you are away. Consider



any activity limitations that would restrict the amount of walking, climbing or bicycling you do on your journey. Your abilities should match the type of lodging you choose and the means of transportation you will use during your trip. (See also [Medical Fitness to Travel](#).)

BE S-A-F-E ON EVERY TRIP

SEEK consultation with a travel medicine specialist at least two months before travel.

ASK about vaccines that might be recommended for specific destinations.

FIRST AID kit should contain regular and special medication for the trip; be sure to pack it in your carry-on luggage.

EVACUATION and travel insurance are necessary to cover health emergencies while abroad.

KNOW YOUR MEDICATIONS

Daily medication that enhances your health can be easy to take for granted when it is readily available. Do you know your medications well, including their dosage and possible side effects? Some medications, for example, can make you drowsy, inattentive or more susceptible to acute mountain sickness. Other medications can cause hypotension (low blood pressure), muscle pain, photosensitivity (an abnormal reaction to the sun), headache or other side effects. Some malaria prophylactics such as Mefloquine are contraindicated for diving. Medication side effects can range from annoying to severe, and some may increase your risk of injury.

If you must start a new medication before a trip, discuss with your physician when it will be safe for you to travel. Some countries require you to carry an original prescription bearing your name and your physician's signature for certain medicines.

PACK WELL

Ensure you have all appropriate health- and safety-related necessities, but otherwise travel as light as possible. Hauling around heavy luggage may hurt your shoulders or back and spoil your trip. If you are flying, make sure your carry-on luggage contains essentials such as your passport and other travel documents, medications, valuables and anything else you need to travel in comfort. Try to limit your carry-on luggage in number, size and weight so you can move expeditiously through airports and easily lift your bag into the overhead compartment. If possible, keep the space under the seat in front of you empty so you can stretch your legs.

If you must walk for a long distance, try not to carry more than 10 percent of your weight. Put a copy of your travel documents in each piece of luggage so you'll still have critical information in case any baggage is delayed or lost.



DIVERS: DO YOU HAVE THE APPROPRIATE TRAINING AND EXPERIENCE FOR YOUR DESTINATION?

Before booking a trip, become familiar with the dive conditions at your destination, and make an honest evaluation of your fitness to dive in those conditions. Keep in mind that conditions can vary widely by season.

Skills acquired through basic open-water training may be enough for leisurely diving in calm, shallow water, but many of the world's most exciting dive sites are rife with challenges, both at the surface and underwater. Entering through the surf, coping with currents and participating in drift diving, low-visibility conditions or night diving and other challenging conditions may warrant special skills, equipment, physical capabilities or additional training.

While people often spontaneously handle many of life's first-time experiences, certified divers should prepare for their first-time experiences in certain dive conditions by either taking organized training or asking for help from divers experienced in those conditions. When you research your dive destination, make sure you understand local challenges that may exceed your previous experience and take the time to prepare for them.

When you arrive at your destination, ask the dive operator to properly brief you about the dive sites. This orientation could be just what you need, but it is also a good idea to do your own research. Find out how prepared your dive operator is to provide first aid and oxygen, ask them about their emergency action plan, and update your emergency action plan accordingly.

When you make your emergency action plan, incorporate what medical and rescue services may be available at your destination, consider conditions on board your dive vessel and the remoteness of the locations, and bring copies of your travel documents with you. For more information about creating an emergency action plan, visit [DAN.org/safety-prevention/diver-safety/divers-blog/how-to-create-an-effective-emergency-action-plan-eap](https://www.dan.org/safety-prevention/diver-safety/divers-blog/how-to-create-an-effective-emergency-action-plan-eap).

Diving skills will deteriorate if not practiced. If you have not been diving in a few months, practice fundamental skills in confined or shallow

water before your open-water dives. If you have not been diving in a year or more, take a refresher course with a dive instructor. DAN highly recommends both the classroom portion (which includes basic dive physics and physiology as well as dive planning and execution using dive tables and computers) and the in-water skills portion. If you take your refresher course at home before your trip, you will have more time to enjoy your destination dives, plus you can ensure your equipment is functioning properly before you haul it on your travels.

FOR YOUR FIRST DIVE AFTER A PERIOD OF INACTIVITY:

- Do not dive alone.
Consider diving with a divemaster or instructor.
- Dive at a familiar site with the following conditions:
 - shallow
 - minimal or no currents
 - no major hazards
 - not remote
- Practice the following skills and others in confined water before you dive in open water:
 - pre-dive checks
 - buoyancy
 - proper weighting
 - mask clearing
 - mask removal and replacement
 - regulator recovery and clearing
 - shared-air ascent
 - emergency swimming ascent or controlled emergency swimming ascent (depending on what your training agency teaches)

Consider taking a continuing education course at the level recommended by your training agency.





HAVE A PLAN FOR ILLNESS OR INJURY

Consider purchasing travel health and medical evacuation insurance. Travelers are often responsible for hospital fees and other medical expenses they incur while abroad. Check to see if your health insurance plan will cover your medical needs abroad. If you do have coverage, be prepared to pay out of pocket at the time you receive any medical services while you are traveling. Be sure to purchase additional coverage for your trip if your health insurance won't cover you while you are traveling. Remember that the **DAN membership benefit** is for medical evacuation to a location where you can receive the appropriate care if you are seriously ill or injured while traveling.

KNOW COMMON ILLNESSES

Before you leave for a trip, especially if you are going to a remote area or a developing country, make sure you know the signs and symptoms of common illnesses you might encounter there so you can recognize them and quickly take action if needed. This guide covers some conditions you should know.

SHARE YOUR TRAVEL PLANS

Be sure that at least one person back home has details of your itinerary, a copy of your passport and visas, and information for how to reach you and where you'd likely be taken in case of a medical emergency. Make sure you declare an emergency contact other than your spouse or travel companion.





MEDICAL FITNESS TO TRAVEL

The stress of travel may be exhausting for a healthy person but is unlikely to cause significant harm. If you are healthy and fit, regular wellness visits to your doctor — such as annual physicals and screenings as suggested for your age — may suffice. If you have any preexisting conditions, have recently suffered an acute illness, lead a sedentary lifestyle or have not had a medical checkup in a while, you should schedule a pretrip health check with your primary-care physician. Ask your physician about a medical summary of your overall health history. This might be helpful information for an examining physician in case you need a thorough medical evaluation while traveling.

Of particular concern for travel are illnesses that affect the heart, lungs or immune, hormonal, central nervous or locomotive systems — all of which can limit travelers' ability to cope with the physical and mental stress of travel. Women in advanced pregnancy, newborns and infants require special consideration.

Adventure travel and participation in sports such as scuba diving involve additional demands on travelers' health. Depending on your destination, you may need to present a written medical assessment proving your fitness. DAN can refer you to doctors who are trained to help you make travel decisions and advise you on planning and preparing for a trip based on your health.

Seek medical advice before a trip rather than assuming that a health problem won't occur or deciding that you are willing to accept the risk. Your doctor can also provide you with an explanatory note if, for example, you need to carry epinephrine pens or syringes and/or injectable medications



such as insulin while flying or crossing borders. Such circumstances require planning ahead, but doing so can save you hassle and time and may even prevent some illnesses from worsening or occurring.

Before you start a trip, develop a health maintenance plan: Carry a list of the medications you take and the times you take them, limit your intake of caffeinated beverages and alcohol, and drink (safe) water during and between meals to maintain a healthy level of hydration.

The healthiest travelers are those who regularly see their physician, take their medication as prescribed, eat nourishing meals and engage in regular exercise.

MEDICAL CLEARANCE TO FLY

If you become ill or injured abroad, you may need to obtain medical clearance to fly before you can return home. You may also require medical clearance to fly with certain preexisting conditions or if you require special in-flight accommodations for medical reasons. Regulations may vary from airline to airline, so travelers and their physicians should check with the airline's medical department. Most airlines have their own medical clearance and fitness-to-fly forms, which must be filed well in advance of the flight and finalized at least 48 hours prior to departure.

The following conditions may require preflight clearance:

- recent illness, hospitalization, injury or surgery
- existing unstable medical condition
- need for additional oxygen or use of medical equipment on board
- traveling for medical reasons or treatment

An airline's capacity to accommodate a patient who needs to be lying down or who needs oxygen administration is limited, and flights may not be immediately available.

The CDC recommends that people who have a chronic illness should visit their health care provider or a travel medicine clinic at least a month before traveling abroad. Certain medications can weaken your immune system and make you more susceptible to infections.



TRAVELING WITH PRESCRIPTION DRUGS

People who take prescription medications and plan to travel abroad may be required to carry a letter from their physician describing their medical condition's nature. Be sure to place this letter in your carry-on bag, wallet or purse and keep it with you at all times. People with diabetes or other illnesses may want to wear a medical alert bracelet.



Keep your medicines, eyeglasses and contacts in your carry-on luggage in case your checked luggage is delayed or lost — and consider packing extras. If traveling abroad, leave medications — including over-the-counter pain relievers and prescription drugs — in their original, clearly labeled containers. Place all your medicines in a clear plastic zip-top bag so customs officials can quickly view them. If you have been prescribed a controlled substance such as a narcotic, check with the foreign embassies of any countries you plan to visit to ensure such medication is legal there.

The U.S. Department of State provides contact information for all the countries that maintain [embassies and consulates in the United States](#).

DAN members have access to a wealth of expert health and travel guidance. Log in to your DAN account at [members.DAN.org](#) or join DAN at [DAN.org/Membership](#) if you are not already a member.

Personal Medical Summary

Ask your doctor to provide you with a summary of your personal medical history, and consider having this summary translated into the language of the countries you plan to visit. If you need medical care during travel, this summary could save time, help overcome a language barrier, provide context for exam findings or help ensure you don't forget anything. The summary should include the following:

- your full name and date of birth
- known allergies
- chronic diseases
- medications, both prescription and over-the-counter
- surgical history
- blood type
- any positive findings on a physical exam, such as
 - known left arm weakness from an obstetric complication
 - idiopathic benign anisocoria (asymmetric pupils)
 - a known 2x2 cm opacity on right upper lobe
 - borderline chronic kidney disease
- anything else your doctor might want to convey to another doctor examining you



FITNESS TO DIVE

Fitness to dive includes physical fitness to exercise as well as medical fitness.

PHYSICAL FITNESS

Major components of physical fitness are mobility, aerobic capacity, strength, balance and flexibility. All of these are important elements of fitness for divers, boaters and travelers. Some travelers who are sedentary at home may be tempted to try some leisurely activities when traveling, so it is essential to provide some references to help with making reasonable decisions.

Aside from clear physical handicaps, the most significant limiting factor for participation in physical activities is aerobic capacity, which is a measure of the body's ability to sustain exercise with energy produced from energy-rich nutrients and oxygen. The amount of oxygen that the body consumes at rest is called 1 metabolic equivalent (MET). It increases at maximum exercise to up to 12 METs in an average person and up to 20 METs in top athletes.

The body's main source of oxygen is the air we breathe. It takes healthy lungs, a healthy heart, adequate circulation and healthy blood to effectively inspire, extract and deliver this oxygen to the exercising muscles. In healthy subjects, the respiratory and cardiovascular systems' performance decreases gradually with age. With a disease, the functional capacity of these systems may decrease drastically and diminish a person's ability to exercise. Regular vigorous exercise may increase aerobic capacity at a young age and slow the decrease of aerobic capacity that occurs with aging.

Recreational scuba diving is usually a leisurely activity, but circumstances or conditions such as waves or currents may make it a vigorous exercise, requiring a moderate to high level of aerobic fitness. Table 2 and Figure 3 show a comparison of aerobic metabolism in METs for various forms and intensities of exercise. Table 3 shows grades of the exercises' intensities based on the metabolism and subjective.

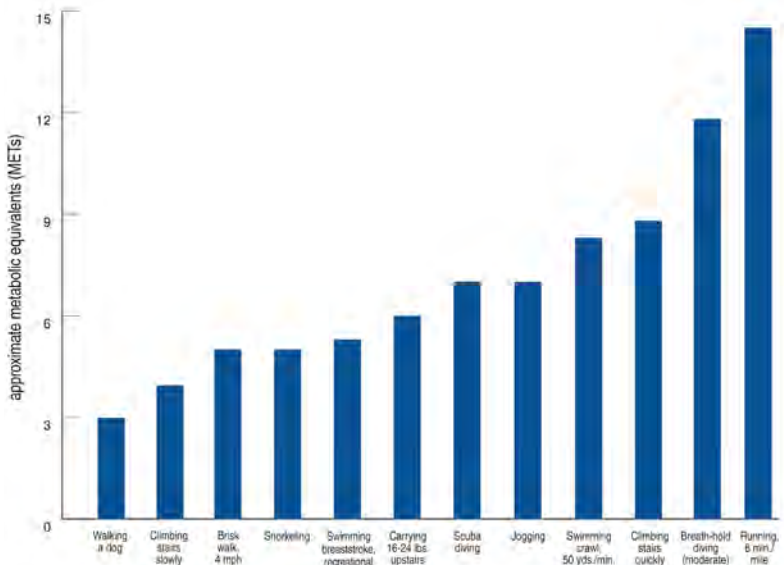




Snorkeling (5 METs) is considered moderate exercise on this scale, breath-hold diving (11.8 METs) is regarded as vigorous exercise, and scuba diving varies from moderate to vigorous. If you lead a sedentary lifestyle, you should begin training to gradually improve your exercise capacity before you snorkel or dive.

If you spend most of your day sitting and do not exercise regularly, you may not be fit for diving or other physical activities and should consider beginning an exercise program. Before engaging in exercise of greater intensity than you are used to, you may need to consult your health care provider. Complete the Preparticipation Screening Questionnaire ([Appendix](#)) to choose your best approach.

**Figure 3.
Approximate
Metabolic
Levels for
Various
Physical
Activities**



Source: *Compendium of Physical Activities.*
sites.google.com/site/compendiumofphysicalactivities



Table 2.
Approximate
Metabolic
Levels
for Different
Activities

Activity	Speed/Intensity	Classification	METs	
walking	3 kph (2 mph)	light	2.8	
	4 kph (2.5 mph)		3.0	
	5 kph (3 mph)		3.6	
	5.6 kph (3.5 mph)	very brisk	4.3	
	6 kph (4 mph)		5.0	
	7 kph (4.5 mph)		7.0	
	8 kph (5 mph)		8.3	
jogging/ running	8 kph (5 mph)	2.2 mps (12 min/mile)	8.0	
	10 kph (6 mph)	2.7 mps (10 min/mile)	9.8	
	11 kph (7 mph)	3.1 mps (8.5 min/mile)	11.0	
	13 kph (8 mph)	3.6 mps (7.5 min/mile)	11.8	
	14 kph (9 mph)	4.1 mps (6.5 min/mile)	12.8	
	16 kph (10 mph)	4.5 mps (6 min/mile)	14.5	
swimming	breaststroke, recreational		5.3	
	leisurely		6.0	
	crawl, 46 meters/min (50 yards/min)		8.3	
	crawl, 69 meters/min (75 yards/min)		10.0	
stairs	descending stairs		3.5	
	climbing stairs		slow pace	4.0
	carrying 0.5–7 kg (1–15 lbs) upstairs			5.0
	carrying 7–11 kg (16–24 lbs) upstairs		6.0	
	carrying 11–22 kg (25–49 lbs) upstairs		8.0	
	climbing stairs		fast pace	8





Table 3.
Grading
Exercise
Severity

Activity Description	Intensity*	MET Level**	Breathing and Heart Rate	Perception (examples)
easy	3–4	less than 3.0 METs	minimal increase	feels easy (e.g., easy walking)
moderate	5–6	3.0–6.0 METs	noticeable increase	feels fairly easy to somewhat hard (e.g., brisk walking)
vigorous	7–8	greater than 6.0 METs	large increase in breathing and heart rate but not out of breath	feels somewhat hard to hard (e.g., jogging, vigorous sports)

*Intensity scale: 0–10 in which 0 = sitting and 10 = all-out effort

** MET level: sitting = 1 MET



**Table 4.
Guidelines
for Lifelong
Fitness
to Dive**

Who	When	What
Candidates for entry-level or continuous education training	preparticipation	Diver Medical Participant Questionnaire
Healthy divers	annually	Diver Medical Participant Questionnaire
Asymptomatic divers with two or more risk factors (Smoking or vaping, high blood pressure, high cholesterol, obesity, family history of heart disease or premature death, lack of exercise)	every 5 years	Medical Evaluation (Diver Medical Physical Evaluation Form)
Healthy divers > 45 years of age		
Healthy divers > 65 years of age Preexisting diseases of the heart, lungs, blood, metabolism, neuropsychiatric conditions or any other disease that affects your capacity to exercise or effectively dive without assistance	every year	Medical Evaluation (Diver Medical Physical Evaluation Form)
Acute illness: Do not dive. See health care provider as needed.	after regaining pre-illness exercise capacity, before return to diving	Diver Medical Participant Questionnaire



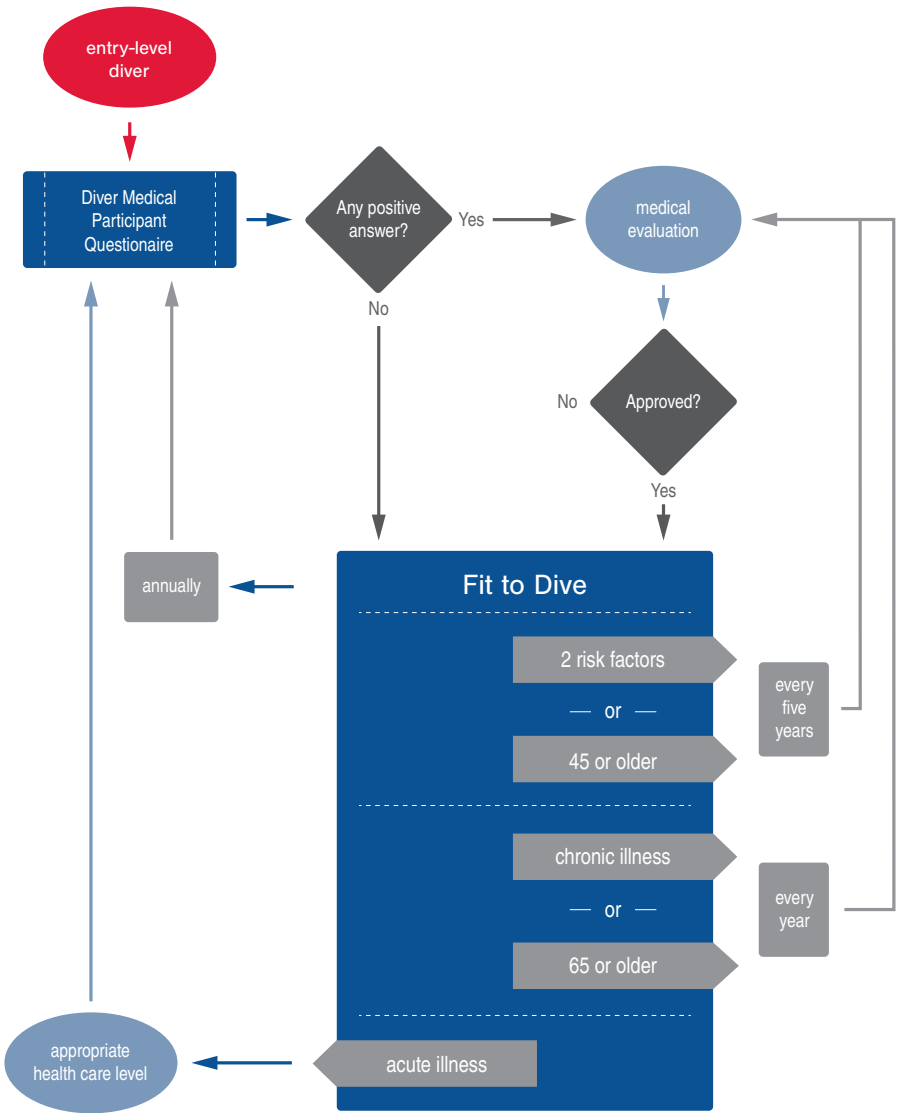


Figure 4.
Assessment
of Medical
Fitness To
Dive



DIETARY CONSIDERATIONS FOR BOATERS

Leisurely cruising on powerboats may involve very little physical exertion, whereas boating in nonmotorized vessels such as canoes, kayaks or sailboats may involve strenuous exercise. Along with requiring varying amounts of physical activity, boat trips may last hours, days, weeks or even longer, so nutritional demands will vary depending on the type of boating excursion.



Boating also often affects eating patterns, which may have short- or long-term nutritional health consequences. Since many boats have limited storage for perishable food and may or may not accommodate cooking, boaters often opt for preserved or concentrated foods instead of fresh foods. This selection may present no issues in short-term situations, but on longer trips this could be problematic.

The National Marine Manufacturers Association reported that in 2011 about 83 million people, or nearly one-third of the adult population of the United States, participated in recreational boating. About 15 percent sailed, 15 percent paddled in kayaks or canoes, and about 60 percent used powerboats, 96 percent of which were 26 feet or shorter. Most vessels are suitable for nearshore day trips rather than long-term cruises covering significant distances. For day-trip boaters on small vessels, the primary dietary concern is food safety, while boaters cruising for longer periods need to also be concerned about the nutritional value of their food.

Ensuring sufficient intake of vitamins and minerals, maintaining proper biota and regularity, and preventing or managing some ailments that result from a change in nutrition and lifestyle are the main nutritional concerns for boaters on long excursions.



CALORIC INTAKE

The average sedentary adult requires between 1800 kilocalories (kcal) and 2000 kcal for women and between 2000 kcal and 2200 kcal for men. Adults who lead more active lifestyles with exercise levels that amount to walking more than 4.8 kilometers (3 miles) per day at an intensity of 4.8 to 6.4 kilometers per hour (3 to 4 miles per hour) — in addition to the activities of independent living — need another 500 kcal to 600 kcal per day.

Competitive sailing is considered a high-intensity activity, and daily energy expenditures may range from 3500 kcal to 5800 kcal. Kayaking and canoeing are usually classified as moderate physical activities with energy consumptions of 3.5 kcal to 7 kcal per minute or 200 kcal to 420 kcal per hour, so prolonged paddling may burn a significant number of calories. Elite sailors and kayakers with higher energy needs may have to resort to high-energy foods to meet their daily recommended caloric intake.



Most people aboard powerboats, however, will expend less energy cruising than they usually do in their daily lives unless they actively pursue exercise opportunities. Boaters cruising for weeks at a time may be at risk of gaining weight if they do not adapt their caloric intake to the change in their activity level due to the prevalence of preserved and highly caloric food on boats.

HEALTHY EATING

The U.S. Food and Drug Administration (FDA) recommends a diet that incorporates foods from all main food groups (vegetables, fruits, grains, dairy and protein) and a variety of subgroups for adequate daily caloric intake and to maintain a proper balance of vitamins and minerals.

Vegetables are important sources of vitamins, minerals and fiber. Dark-green vegetables are rich in vitamin K, red and orange vegetables contain vitamin A, legumes offer dietary fiber, and starchy vegetables contain



potassium. The recommended serving is 2½ cups of fresh, frozen, canned or dried vegetables daily, either cooked, raw or juiced. Eating a variety of vegetables is the best strategy for obtaining all necessary nutrition. Day boaters and cruisers in intracoastal waters can easily carry fresh vegetables. For longer cruises where fresh vegetables are scarce, boaters should



consider a variety of preserved vegetables. Canned legumes are already a common choice for many people at home, and boaters should consider bringing canned leafy greens such as spinach, collard greens, mustard greens and turnip greens, which are very nutritious. In some countries where refrigeration is less common, there is a wide variety of canned vegetables.

An important source of dietary fiber, potassium and vitamin C, fruits can be consumed fresh, canned, frozen, dried or as juice. The recommended serving of fruit is 2 cups per day. Whole fruit is preferred to juice because it contains dietary fiber, while juice is

generally very high in sugar. Fruit is available in most parts of the world, and many types of fruits keep well if not previously frozen. Canned fruit may be a better option for long trips, but most canned fruit has added sugar, so choose one with as little sugar as possible. Dried fruit is especially suitable for boat pantries because it provides twice as many nutrients as the same amount of fresh fruit.

Grains are either whole or refined. Nutrients including dietary fiber, iron, zinc, manganese, folate, magnesium, copper, thiamin, niacin, vitamin B6, phosphorus, selenium, riboflavin and vitamin A come from the bran and germ of whole grains. The recommended serving of grains for people with basic activity levels is 6 ounces per day, and at least half of this amount should be whole grains. Diets should include brown rice, oatmeal, quinoa, whole wheat or whole grain breads, cereals, pasta and crackers. If you prefer refined grains and wheat products such as white bread or cereal, use vitamin- and mineral-enriched products fortified with folic acid. Many products such as cookies, cakes and some snacks contain added sugars that may unnecessarily increase your calorie intake.





TRAVELING IN THE UNITED STATES

The overall health risks of traveling in the United States are low. There are no vaccination requirements for visitors to the U.S. The high standard of living, high level of sanitation, high vaccination rate and well-organized public health systems contribute to the overall safety of traveling here.



Foodborne diseases may occur, but the risk is low. Fresh fruit and vegetables are safe despite rare contamination outbreaks, mostly of salmonella. Seafood poisoning is possible, but the risk is also low. Most seafood poisonings result from imported seafood. Periodic red tide events in Atlantic coastal waters may render locally harvested seafood toxic, but a monitoring system effectively prevents contaminated seafood from being sold. Water in the U.S. is generally safe for drinking with the possible exception of well water in some rural areas that may not be treated or adequately controlled.

Vector-borne diseases represent a small to moderate risk. Mosquitoes are present all over the U.S., but human reservoirs of mosquito-transmitted diseases are small or nonexistent. Ticks are present throughout the country and may transmit a range of diseases. The most significant tickborne disease is Lyme disease, with 96 percent of reported cases in the Northeast and upper Midwest (around the Great Lakes). The risk of infection is limited





to areas with trees, bushes and high grass inhabited by deer. People are most at risk for contracting Lyme disease in spring and summer.

Another tickborne disease to be aware of in the U.S. is Rocky Mountain spotted fever. Most tickborne diseases are seasonal but may be present year-round in temperate and warm climates. American trypanosomiasis (Chagas disease) is a neglected tropical disease transmitted by kissing bugs (triatomines). Vector-borne transmission of Chagas disease occurs in the Americas, including the southern half of North America. This could be a risk for campers in the U.S. southern states where triatomines are endemic.

Contagious diseases that spread from person to person are rare except for the seasonal flu and more recently COVID-19. Outbreaks of hepatitis A may occur among drug users and homeless people. Traveling internationally increases your risk of coming in contact with contagious diseases in general, so vaccinations for measles and influenza are recommended.

Risk of injury is relatively low in the U.S., but traffic accidents are a significant cause of injury for travelers. Drowning is a risk for recreational swimmers, due in part to rip currents present off some beaches. Hurricanes can be a threat along the Atlantic coast from June through November, so watch for storm warnings and follow the instructions issued by authorities.





Adventure sports and wilderness activities expose participants to various risks; additional training may be warranted to keep these risks under control.

Popular weekend and vacation destinations for Americans are the American and Caribbean tropics. Overall health risks for traveling in the American and Caribbean tropics are moderate to high. The warm and humid climate contributes to risks of both foodborne and vector-borne diseases. Sanitation levels vary and with it the risk of travelers' diarrhea and other foodborne diseases. Dengue and chikungunya are endemic in some areas. Seafood poisoning is common, with ciguatera being the most prevalent cause.



Health care services in the United States are excellent, but in rural areas health care is not always readily available. Emergency medical services are not free, and health care in the United States can be very expensive, so health insurance is highly recommended.



RESOURCES

The CDC's website ([CDC.gov/Travel](https://www.cdc.gov/Travel)) is a highly reliable source for current vaccination recommendations and country-specific health information. Information is downloadable in several formats, so travelers can load pertinent resources onto their phones or other electronic devices before they leave. The CDC and CDC Vaccine Schedules apps can also be great resources on the go.

The CDC publishes a biennial guide called **CDC Health Information for International Travel**, popularly known as the “Yellow Book.” This detailed publication, which offers immunization guidelines and travel health information, is aimed primarily at health care professionals but can be a valuable resource for anyone interested in healthy international travel. The book is available online, as an app or in a print edition.

An abundance of other useful information is available on a variety of platforms. Nonprofit, academic and governmental websites are likely to contain the most reliable information; in the United States such sites have domains ending in *.org* (for nonprofits such as DAN), *.edu* (for academic institutions) or *.gov* (for governmental agencies).

The following are additional sources of well-researched, dependable travel health information:

Association websites

- International Society of Travel Medicine ([ISTM.org](https://www.istm.org))
- American Society of Tropical Medicine and Hygiene ([ASTMH.org](https://www.astmh.org))
- World Health Organization ([WHO.int](https://www.who.int))
- National Travel Health Network and Centre ([travelhealthpro.org.uk](https://www.travelhealthpro.org.uk))

Governmental outbreak reports

- CDC's Morbidity and Mortality Weekly Report ([CDC.gov/MMWR](https://www.cdc.gov/mmwr))
- WHO's Weekly Epidemiological Record ([WHO.int/WER](https://www.who.int/wer))
- Canada Communicable Disease Report ([PHAC-ASPC.gc.ca/publicat/ccdr-rmtc](https://www.phac-aspc.gc.ca/publicat/ccdr-rmtc))



CDC Health Information for International Travel



Malaria information

- CDC Malaria Information and Prophylaxis by Country ([CDC.gov/malaria/travelers/country_table](https://www.cdc.gov/malaria/travelers/country_table))
- WHO's Malaria Information for Travelers ([WHO.int/malaria/travellers/en](https://www.who.int/malaria/travellers/en))

Other online resources

- CDC Travelers' Health ([CDC.gov/travel](https://www.cdc.gov/travel))
- U.S. Department of State: Passports and International Travel (travel.state.gov)

Books

- *Hunter's Tropical Medicine and Emerging Infectious Diseases*, 10th ed. Ryan ET, Hill DR, Solomon T, Aronson NE, Endy TP. Elsevier Health Sciences, 2019.
- *Manson's Tropical Diseases*, 23rd ed. Farrar J, Hotez P, Junghanss T, Kang G, Lalloo D, White N. Saunders, 2013.
- *Manual of Travel Medicine and Health*, 3rd ed. Steffen R, DuPont HL, Wilder-Smith A. PMPH-USA, 2007.
- *Oxford Handbook of Tropical Medicine*, 4th ed. Davidson R, Brent A, Seale A. Oxford University Press, 2014.
- *Red Book: 2021 Report of the Committee on Infectious Diseases*, 32nd ed. Kimberlin DW, ed. American Academy of Pediatrics, 2021.
- *Travel and Routine Immunizations: A Practical Guide for the Medical Office*. Thompson RF. Shoreland, 2003.
- *Travel Medicine*, 4th ed. Keystone JS, Kozarsky PE, Connor BA, Nothdurft HD, Mendelson M, Leder K. Elsevier, 2019.
- *Tropical Infectious Diseases: Principles, Pathogens and Practice*, 3rd ed. Guerrant RL, Walker DH, Weller PF. Saunders, 2011.



SECTION 2

DISORDERS CAUSED BY TRAVEL

The process of getting from one place to another around the globe can cause some disorders. The three most common of these conditions are jet lag, motion sickness, and deep vein thrombosis.





JET LAG

Flying across several time zones in a short time causes jet lag, also known as “rapid time-zone change syndrome.” The jet lag results from the body’s internal clock conflict with the day-night cycle at the new geographic location.

Symptoms: Symptoms of jet lag include feeling sleepy, hungry or alert at odd times, which affect people’s social life, ability to work, exercise, and sleep. The internal clock usually synchronizes with a new environment within a few days. However, the more times zones crossed, the more intense symptoms are likely to be and the longer they will take to abate.

Treatment: Melatonin is an effective jet lag treatment. Doses as small as 0.5 milligram of melatonin 30 minutes before your bedtime at your departure location might be helpful. Upon arrival at your destination, stay active during daylight hours and go to bed in the evening at your usual time. You may also want to take melatonin before your bedtime for the first few days at your destination. In the morning, getting some sunlight or exercise will help your circadian rhythm adjust.

In the U.S., melatonin is an over-the-counter substance that is classified as a food supplement, so it is not regulated. The amount of active ingredient in one dose may vary slightly from what is declared on the box, and some people may need a higher dose to feel any effect. Taking too much melatonin, however, may disrupt your sleep. Melatonin is considered nonaddictive and safe for short-term use, but it can interact with certain medications, including anticoagulants, immunosuppressants, diabetes medications and birth-control pills. If you have any health conditions, check with your doctor before using melatonin. Refrain from activities that require alertness, such as driving or diving, until four or five hours after taking melatonin.



Prevention: A few days to a week before your departure, try to gradually move your bedtime to what it will be at your destination. If you are traveling east, where night comes sooner than it does at your departure location, go to bed one hour earlier than you usually would for as many days as the number of time zones you'll cross. To make it easier to fall asleep early, avoid caffeine, alcohol and exercise for three to four hours before your new bedtime. Then get up earlier in the morning and get some sunshine to help your body's internal rhythm adjust. If you are traveling west, do the opposite: Gradually go to bed later and stay in bed longer in the days before your departure. If you have 12 hours of time zone changes, try to split up the adjustments into six hours of time zone changes before and after your departure date, if possible.



Poor sleep during an overnight flight can also exacerbate jet lag. Falling asleep on a plane can be difficult for several reasons. During sleep, the body's temperature drops and the activity of some hormones changes. These events usually occur at a similar time every day and are prompted by changes in surrounding light and noise. With the onset of darkness, the pineal gland in the brain starts secreting the hormone melatonin, which helps the body fall asleep and stay asleep, but it is not strong enough to do so on its own. To sleep well during a flight, it is important to avoid excessive consumption of alcohol and caffeine. Drink plenty of water instead. Using earplugs and a blindfold to reduce noise and mimic darkness may also help.

Diving on the day you arrive at your destination after a long flight is not a good idea. Take some time to rest.

Considerations for divers: Diving on the day you arrive at your destination after a long flight is not a good idea. Take some time to rest, have a light meal, and drink plenty of fluids. You may want to take melatonin at bedtime to get well-rested for diving the next day. If you arrive at your destination very late and take melatonin after midnight, you should abstain from the first morning dive if scheduled for less than five hours after taking the melatonin. Technical divers should be especially aware of this issue.

Recent studies have shown that animals deprived of sleep are more susceptible to seizures caused by hyperbaric oxygen; administering melatonin did not reverse this effect.¹⁷ The conclusion is that melatonin may help you get to sleep, but it can't counteract a susceptibility to seizures.





MOTION SICKNESS

Motion sickness (also known as seasickness) is a common complaint of travelers on planes, boats, motor vehicles and even animals such as camels.

Symptoms: The most distressing symptoms of motion sickness are nausea and vomiting, caused by an overstimulation of the inner ear's vestibular balance organs and a mismatch between the sensory input from the eyes and inner ears. Other symptoms include excessive sweating, pallor (pale skin), mild headache and generally ill-feeling. Motion sickness is not a severe medical problem, but it may lead to dive incidents because affected individuals can develop an almost desperate inattentiveness and reduced ability to perform common tasks.

The most common symptoms of motion sickness — dizziness and nausea — may also signal other injuries, especially in divers.

Treatment: Treatment options include oral drugs or a transdermal patch, which is a medicated patch that delivers medication through the skin. A physician should evaluate persistent or unusually severe nausea, especially if other symptoms are present.

Oral drugs to treat motion sickness vary in their effectiveness and side effects among individuals. Use such drugs with caution during certain activities because most of them cause mild drowsiness and inhibit mucous secretions.

Transdermal delivery of the prescription drug scopolamine can be effective in many people. Known by the brand name Transderm Scop, the patch contains 1.5 milligrams of scopolamine and delivers the drug at a constant



rate for three days when placed on the skin (typically just behind the ear). Remove the patch after three days. You can apply another patch if needed, but never wear more than one patch at a time, even if you think one is exhausted, to prevent too much medication from entering your bloodstream and causing undesirable side effects.



Transdermal delivery of the prescription drug scopolamine can be effective in many people.

Side effects of scopolamine include dry mouth, drowsiness and blurred vision or a dilated pupil that could prompt an unnecessary evacuation or chamber treatment. Disorientation, memory disturbances, dizziness and restlessness may occur less frequently. Patients with narrow-angle glaucoma, a pyloric obstruction or a urinary bladder neck obstruction (such as an enlarged prostate)

should use scopolamine with caution. Rare side effects include hallucinations, confusion, difficulty urinating, skin rashes and eye pain.

There is no way to know in advance who will be affected and how, so it is advisable to wear a scopolamine patch for at least 24 hours to test its effects before you need it to prevent motion sickness. Do not consume alcohol while wearing a patch.

After opening the foil wrapper, avoid touching the patch under the plastic strip; if you get medication on your finger and accidentally touch your eye, the drug could cause dilation of the affected pupil and be absorbed too rapidly.

If side effects occur, remove the patch. Withdrawal symptoms can occur when a patch is removed if it is worn for more than three days. These symptoms can include dizziness, nausea, vomiting, headache and balance disturbances and generally do not occur until 24 hours after patch removal.

Although mostly anecdotal and in many cases not scientifically proven, other remedies that might work against motion sickness include acupuncture, acupressure bands that stimulate certain pressure points on the wrist,¹⁸ avoiding histamine-rich foods before and during the trip, taking vitamin C or eating vitamin C-rich foods and making sure that you are well rested before the trip.^{19,20} If you are susceptible to motion sickness, you will need to find your own way to handle and mitigate it since there is no 100 percent effective solution for everyone.



Prevention: Closing your eyes or sitting where a boat's rocking motion is not visible can help prevent motion sickness. Gazing at the horizon rather than at objects in your immediate vicinity can also help. Stay away from areas with strong fumes, particularly fuel, and any other smell that you usually consider obnoxious.

Considerations for divers: Motion sickness can be hazardous in scuba divers, who may want to quickly get into the water to reduce the disorder's effects, thereby lessening the care they take in setting up their equipment or attending to their buddy. Vomiting underwater can be a real problem if divers foul their regulator's second stage or inhale water. It is not true that vomiting underwater is necessarily followed by an uncontrollable inhalation reflex, but



coughing or choking can occur. Removing a regulator to vomit into the water keeps it clean but must be done with great care. Divers who are seriously affected by motion sickness should avoid starting a dive until their symptoms improve.

Divers should be cautious when using oral drugs for motion sickness, because the possible side effects of mild drowsiness and decreased mucous secretions can be a problem in diving. A scopolamine patch is the preferred treatment; the U.S. Navy has evaluated the patch and found it to have minimal adverse effects in divers

Withdrawal symptoms such as dizziness, nausea, vomiting, headache and balance disturbances — which can occur if a patch is used too long — are also associated with decompression sickness (see [also Section 5: Scuba Diving](#)). A diagnosis can be complicated if a diver removes a patch right after making a deep dive. Tell medical personnel if you develop these symptoms after diving and if you wore a transdermal patch at any time.

Although mild motion sickness is often relieved once you get underwater, exercise caution if you experience severe nausea. It may be best to cancel the dive.





DEEP VEIN THROMBOSIS

Deep vein thrombosis (DVT) is an acute condition in which a blood clot (thrombus) forms in one or more of the body's deep veins, usually in the legs. These blood clots can then break free, travel through the bloodstream and cause life-threatening conditions such as a pulmonary embolism (PE), which is a blood clot that lodges in the lungs.

Symptoms: While approximately half of all DVTs cause no noticeable symptoms, symptoms may include the following:

- swelling of the affected leg, ankle and foot
- pain in the calf that spreads to the ankle and foot
- warmth across the affected area
- a change in skin color to pale, red or blue

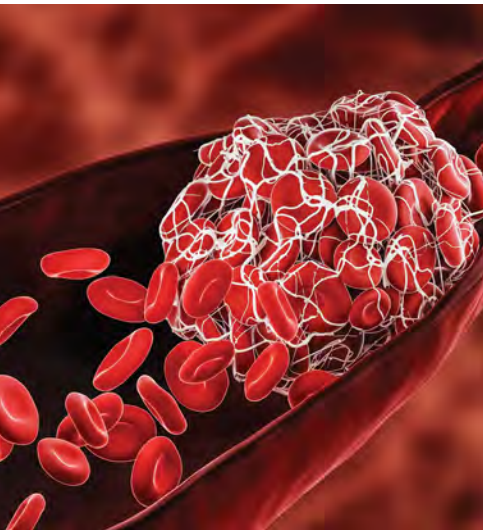
DVTs are often recurrent; individuals who have experienced a DVT frequently endure long-term complications such as postthrombotic syndrome or pulmonary hypertension after a PE.

Travel may increase the likelihood of a DVT. Most air-travel-related DVTs occur within the first two weeks after a flight and resolve within eight weeks. In about 25 percent of cases, an untreated DVT of the calf can spread



upward into the thigh and pelvis veins. If a DVT of the thigh or pelvis is left untreated, there is a risk of a life-threatening PE if the blood clot becomes lodged in a pulmonary vessel. Symptoms of PE include the following:

- sudden onset of shortness of breath
- chest pain or discomfort that worsens with a deep breath or cough
- lightheadedness, dizziness or fainting
- rapid pulse
- sweating
- coughing up blood
- anxiety or nervousness



Anyone who develops a PE immediately needs emergency care. The diagnosis can be confused with dive-related injuries in divers. An emergency medical evacuation may be needed in remote locations.

Another DVT complication is a paradoxical embolism, in which a traveling blood clot passes into arterial circulation instead of lodging in or being filtered out in the pulmonary circulatory system. The paradoxical embolism may occur in individuals with a congenital condition such as patent foramen ovale (PFO), which is a hole in the wall that separates the heart's right and left chambers. A PFO enables venous blood to pass to the arterial system. A paradoxical embolism that enters the brain may cause a stroke.

The risk of DVT in healthy people is small. Most DVT cases occur in people with preexisting risk factors who are forced to sit still for a long time — such as travelers who take long plane, car or train journeys; bedridden patients; and office workers who sit at their desks for many hours. Immobility slows the blood flow in the veins (venous stasis), and pressure exerted on the calf by poorly designed seats can injure the vein walls. After sitting for 90 minutes, the blood flow in the calf drops by half, which doubles the chance of a clot developing. For every hour spent sitting, the risk of a blood clot increases by 10 percent.



The incidence of DVT in the general population is only 0.1 percent, but it is greater in high-risk subpopulations. Long-distance air travel is thought to increase the risk of DVT two- to fourfold. Although DVT is often referred to as the “economy-class disease,” travelers in business class are not spared

About 75 percent to 99.5 percent of individuals who develop a travel-related DVT have more than one of the following risk factors:

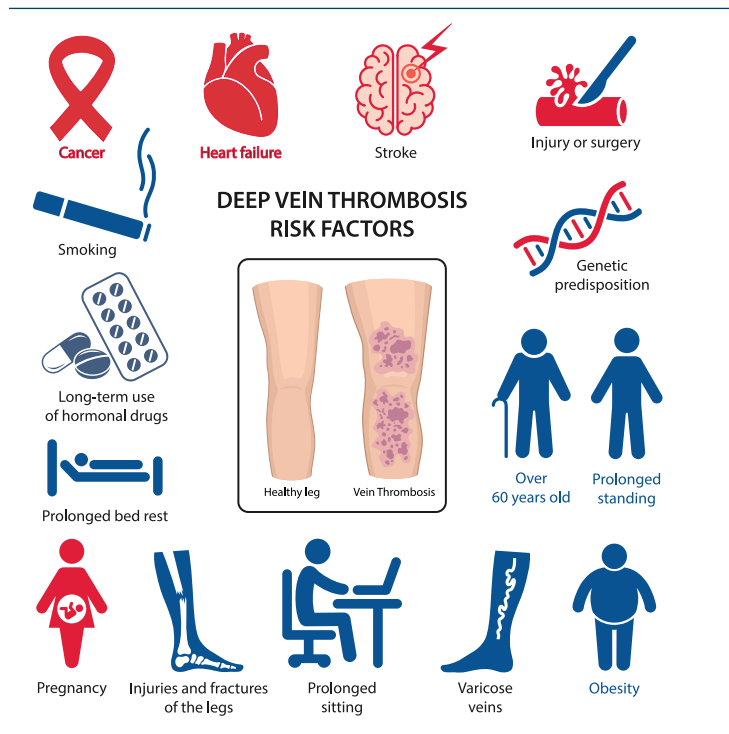
- age (risk increases after age 40)
- obesity (risk increases in individuals with a **body mass index** (BMI) more than 30 kg/m²)
- estrogen use (either hormonal contraceptives or hormone replacement therapy)
- pregnancy or recent childbirth (within two to three months)
- thrombophilia (an abnormally increased tendency to develop clots)
- a previous DVT or family history of DVT
- active cancer
- serious medical illness
- recent surgery, hospitalization or trauma
- limited mobility
- central venous catheterization



Treatment: Anticoagulants (blood thinners) are medicines that inhibit your blood's ability to clot, thus reducing your risk of developing a clot. They range from over-the-counter medications such as aspirin to more potent prescription drugs such as warfarin (Coumadin).

Patients who can't take anticoagulants, who have a DVT recurrence despite taking anticoagulants or who have repeated pulmonary embolisms can have a filter inserted in their inferior vena cava, which is the vein that returns blood from the lower body to the heart. Individuals with vena cava filters may return to normal daily life.

Regular use of compression socks or stockings can help prevent the swelling associated with DVT. It is usually advisable to wear compression footwear for at least a year after experiencing a DVT.



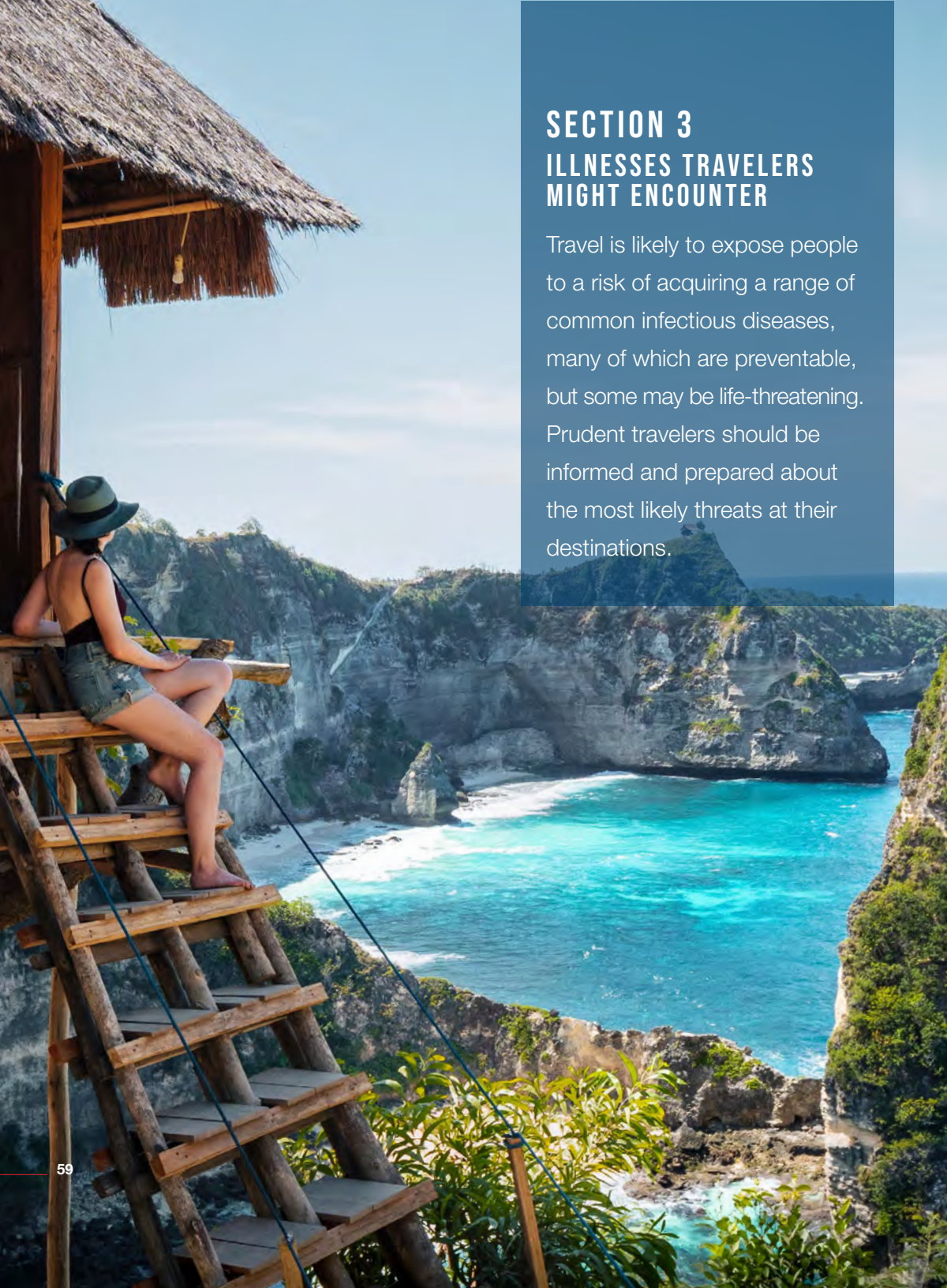
Prevention: People with a predisposition to blood clots should wear knee-high compression socks or thigh-high stockings when flying and consult their physician regarding the use of an anticoagulant medication such as aspirin. Compression footwear reduces the chance that blood will pool and clot, and anticoagulants inhibit the blood's ability to clot. There is no evidence that healthy people without preexisting risks for DVT benefit from compression footwear or aspirin. Everyone should avoid long periods of immobility; it is good to stand up periodically and walk around while traveling, but this may not be allowed on the airplane during times of pandemic. It also helps to exercise or flex your feet and calf muscles while seated and to stay well hydrated.



Considerations for divers: During the acute phase of a DVT or while taking anticoagulants, it is highly inadvisable to dive. A return to diving after a DVT is possible, but the evaluation must be made on an individual basis. The same is true of returning to diving after a stroke. A return to diving after a pulmonary embolism is less likely, but your physician may approve it if your recovery has been satisfactory and your risk of a repeated embolism is minimal.

For a referral to a physician near you who has expertise in dive medicine, contact DAN Medical Services at apps.DAN.org/ **Ask-a-Medic.**



A woman wearing a hat and shorts is sitting on a wooden staircase that leads down from a thatched-roof structure. She is looking out over a stunning tropical coastline. The scene features a vibrant turquoise ocean, white sandy beaches, and dramatic, rocky cliffs. The sky is clear and blue. The overall atmosphere is serene and scenic.

SECTION 3

ILLNESSES TRAVELERS MIGHT ENCOUNTER

Travel is likely to expose people to a risk of acquiring a range of common infectious diseases, many of which are preventable, but some may be life-threatening. Prudent travelers should be informed and prepared about the most likely threats at their destinations.

COMMON INFECTIOUS DISEASES

The most common transmissible diseases vary in their worldwide prevalence and severity. Table 5 is a summary of the infectious illnesses that travelers are likely to encounter.

Disease	Incidence and Prevalence	Severity and Mortality
diarrhea ^{21,22}	1.7 billion cases per year	1.6 million deaths in 2017
respiratory infections ²³	1 billion cases per year	3.9 million deaths per year
malaria ²⁴	229 million cases in 2019	409,000 deaths in 2019, 94% in Africa; causes respiratory distress in up to 25% of adults and 40% of children
dengue fever ²⁵	3 billion people at risk; 400 million infected and 100 million symptomatic cases each year; treated as an emerging disease due to its recent expansion into new geographic areas	22,000 deaths annually from severe dengue
schistosomiasis (bilharzia, snail fever, swimmer's itch, Katayama fever) ²⁶	more than 236.6 million cases worldwide in 2019	200,000 deaths per year; can cause liver damage and kidney failure if untreated
COVID-19 ^{27,28}	more than 224 million confirmed cases worldwide and more than 40.8 million confirmed U.S. cases as of Sept. 12, 2021	more than 4.6 million deaths globally and more than 656,000 deaths in the U.S. as of Sept. 12, 2021
lymphatic filariasis ²⁹	859 million people globally are at risk	51 million people infected in 2018



Disease	Incidence and Prevalence	Severity and Mortality
river blindness (onchocerciasis) ³⁰	20.9 million cases in 2019; 1.15 million had vision loss; 99% of cases are in Africa	It can cause blindness if not treated. While it's not deadly, infection reduces the host's immunity and resistance to other diseases.
Lyme disease ³⁵	Estimated 476,000 people treated in the U.S. each year	Early treatment is usually curative; delayed diagnosis and treatment can lead to disability.
leishmaniasis ³¹	350 million people at risk; 1.5 to 2 million new cases per year	70,000 deaths per year
Chagas disease (American trypanosomiasis) ³²	6–7 million people infected, mostly in Latin America	Symptomatic cases (determinate chronic Chagas) can lead to cardiac insufficiency, including life-threatening heart rhythm disturbances.
yellow fever ³³	200,000 cases per year	30,000 deaths per year, 90% of them in Africa
sleeping sickness (African trypanosomiasis) ³⁴	65 million people at risk in sub-Saharan Africa	992 cases in 2019, which is a 96% reduction over the past 20 years, thanks to sustained control efforts; the disease can be fatal if untreated





COMMON VECTOR-BORNE DISEASES

Many infectious illnesses are vector-borne, meaning that transmission of the disease is indirect — through an insect or animal that transmits the infectious agent from some reservoir in nature to a human host. Table 6 lists some of the most common vector-borne diseases and how to protect yourself against them.

KEY FACTS³⁶

- Vector-borne diseases account for more than 17 percent of all infectious diseases, causing more than 700,000 deaths annually.
- More than 3.9 billion people in more than 129 countries are at risk of contracting dengue, and an estimated 96 million cases and 40,000 deaths occur each year.
- Malaria causes more than 400,000 deaths every year globally, most of them children younger than 5 years old.
- Other diseases such as Chagas disease, leishmaniasis and schistosomiasis affect hundreds of millions of people worldwide.
- Many of these diseases are preventable through informed protective measures.





PROTECTIVE MEASURES AGAINST MOSQUITO BITES

- Avoid endemic areas.
- Protect yourself.
 - Cover your skin.
 - Use repellents and permethrin on clothing.
 - Carry netting with you where insects are prevalent or are a hazard.
- Stay in air-conditioned and screened spaces.
- Get a vaccine if available.
- Use prophylactic medicine.
- Use netting if staying in housing without air conditioning.
- Seek medical help if you are ill.





MANAGING TRAVEL-RELATED ILLNESSES

While you may hope to never need to know about the causes, symptoms and treatments for travel-related illnesses, the information is important to have if a need arises. The following text provides detailed information on travelers' diarrhea, the most common travel-related illness, and malaria, the most serious threat to people traveling to tropical and subtropical regions, as well as a brief synopsis of other conditions you might encounter while traveling.

TRAVELERS' DIARRHEA

Travelers' diarrhea (TD), the most common complaint of travelers, can be contracted anywhere in the world. While travel involves some risk of acquiring diarrhea, the risk is much higher in certain areas. The CDC estimates that between 30 percent and 50 percent of travelers will develop TD during a one- to two-week stay in high-risk areas.



Table 6.
Common
Vector-Borne
Diseases

Vector	Diseases	Protection
aquatic snails	schistosomiasis (bilharzia, snail fever, swimmer's itch, Katayama fever)	Avoid swimming in or consuming untreated water from rivers, lakes or ponds known to contain water snails or in endemic areas.
black flies	river blindness (onchocerciasis)	Avoid fast-flowing rivers in endemic areas. Use repellents containing DEET or permethrin. Support public health efforts such as the Onchocerciasis Control Program, which involves the use of larvicides on rivers in endemic countries.
fleas	plague	Avoid contact with rat fleas. Control infested areas with insecticides. Don't allow family pets to roam in areas where plague is common.
mosquitoes	dengue fever malaria lymphatic filariasis yellow fever Rift Valley fever chikungunya Zika Japanese encephalitis West Nile fever	Use repellents containing DEET or permethrin. Some mosquito species are more active during dusk and dawn. At night use nets treated with repellents or insecticides while sleeping. Control breeding grounds by eliminating standing water.
sand flies	leishmaniasis sandfly fever (pappataci fever, three-day fever)	Use repellents containing DEET or permethrin. Sandflies are particularly active during dusk and dawn. At night use nets treated with repellents or insecticides while sleeping. Control breeding grounds by eliminating standing water.



ticks	Lyme disease Rocky Mountain spotted fever Tickborne encephalitis Crimean-Congo hemorrhagic fever tularemia (rabbit fever, deer fly fever) typhus (jail fever)	Use repellents containing DEET or permethrin. When walking outdoors, wear long sleeves, boots and socks. Immediately check for ticks after returning from a walk. Light-colored clothes make ticks more visible.
triatomine bugs, bedbugs (also transmitted congenitally and by contaminated food, transfusions and transplants)	Chagas disease (American trypanosomiasis)	Avoid contact with triatomine bugs (kissing bugs). Repellents with DEET or permethrin may not be effective. At night use nets treated with repellents or insecticides while sleeping. Avoid sleeping outdoors or in mud houses in endemic areas.
tsetse fly	sleeping sickness (African trypanosomiasis)	Use insect repellent, and wear long-sleeved clothing in endemic areas.

The risk for TD varies by destination. Generally, the world may be divided into low-, intermediate- and high-risk zones.

- **Low-risk zones** include the United States, Canada, Australia, New Zealand, Japan and Northern and Western Europe.
- **Intermediate-risk zones** include Eastern Europe, South Africa and some Caribbean islands.
- **High-risk areas** include most of Asia, the Middle East, Africa, Mexico, and Central and South America.

TD can be mild, moderate or severe (Table 7). One type of TD is dysentery, which is characterized by diarrhea containing blood or mucus and is usually associated with painful abdominal cramps, vomiting and fever higher than 100.4°F (38°C). It occurs in tropical areas and is caused by shigella bacteria or amoebas.



One of the worst forms of diarrheal disease is cholera, with 1.3 million to 4 million cases occurring annually.³⁷ It is caused by *Vibrio cholerae* and characterized by profusely watery stools and progressive dehydration.

Severity of Diarrhea	Description
Mild	diarrhea that is tolerable, is not distressing and does not interfere with planned activities.
Moderate	diarrhea that is distressing or interferes with planned activities
Severe	diarrhea that is incapacitating or completely prevents planned activities; all dysentery cases in which blood is in the stool are considered severe, and those suffering this condition should seek help promptly; cholera is severe in 5 percent to 10 percent of cases and may be life-threatening if not treated promptly.

Symptoms: TD is typically caused by bacteria (80 percent to 90 percent of cases), viruses (5 percent to 8 percent) or protozoa (up to 10 percent in longer-term travelers), which enter the body through the mouth. Infections occur primarily due to contaminated food, drinks or dirty hands. Diseases can also be transmitted by utensils, glasses, swimming in contaminated waters or using contaminated water for washing or tooth brushing. Bacterial and viral infections can last for a few hours (intoxications) or days (infections) and may occur more than once during a single short trip. The symptoms of protozoan infections usually manifest a few weeks after infection and are likely to affect you upon returning home from a two- or three-week trip. For most forms of TD, symptoms occur shortly after infection while the traveler is still on the road. In other cases, the incubation period is days.

Treatment: While TD may cause discomfort, it usually is not life-threatening, it is easily treated with over-the-counter medications, and it will eventually go away even without any treatment. Most travel physicians do not advise taking antibiotics to prevent diarrhea because severe reactions to the antibiotics are about as common as severe diarrhea, and the widespread use of antibiotics has led to significant microorganisms' resistance, making treatment less effective for individuals who become ill.





The CDC does not recommend that travelers take prophylactic antimicrobial agents to prevent TD but suggests some specific medications for physicians to consider when treating individuals with TD symptoms. Bacterial causes of TD far outnumber other microbial causes, so practical treatment with an antibiotic directed at intestinal bacterial pathogens remains the best therapy.

An antimicrobial's effectiveness depends on the specific microbe that's causing the ailment and its antibiotic sensitivity. First-line antibiotics include ciprofloxacin, levofloxacin and other members of the fluoroquinolone family of drugs. Increasing microbial resistance to fluoroquinolones, however, may limit their usefulness at some destinations such as Thailand and Nepal. The U.S. Food and Drug Administration (FDA) warns about these drugs, noting a significant risk of tendon rupture; DAN has received reports of several Achilles ruptures potentially associated with the drugs. The FDA has approved azithromycin and rifaximin as alternatives for the treatment of TD caused by noninvasive strains of *E. coli*.

The standard treatment regimen for TD is three days on an antibiotic. If treatment is initiated promptly, however, a shorter course, sometimes just a single dose, may reduce the duration of the illness to a few hours.

Pepto-Bismol is also helpful in the treatment of diarrhea, but less so than antibiotics. The dosage for treating TD is 1 ounce of Pepto-Bismol every 30 minutes, not to exceed 8 ounces in 24 hours or a total of eight doses. Wait



at least two hours after taking an antibiotic before taking Pepto-Bismol since it will otherwise delay the absorption of the antibiotic. Note the prohibitions regarding Pepto-Bismol listed in the prevention section.

Self-treatment of TD is possible with some preparation.

The following items are required:

- thermometer
- antidiarrheal medication such as loperamide (Imodium) or diphenoxylate (Lomotil)
- Pepto-Bismol
- antibiotic prescribed by a physician

Any sign of illness requires quick action. Immediately take your temperature after having a bloody or watery stool.

- If you have a fever — a temperature at or above 100°F (38°C) — or a bloody stool, take only the antibiotic.
- If you have no fever or bloody stool, take both an antidiarrheal medication and Pepto-Bismol (1 ounce or 30 ml of the liquid form or two tablets every 30 minutes for a total of eight doses).
- If you have nausea, vomiting or cramps, take an antibiotic along with Pepto-Bismol and an antidiarrheal.

This regimen will usually relieve symptoms in 12 to 15 hours. Avoid using antidiarrheal medication in children younger than 2 years old.

Significant dehydration usually does not occur in adults, but be sure to drink plenty of fluids. If you have fewer than eight watery stool episodes per day, continue with your regular diet supplemented with clear broth, salted crackers and 2 to 3 quarts or liters of clean water daily. Avoid dairy products and beverages that contain high levels of sugar, such as nondiet soft drinks.

Rehydration beverages containing electrolytes, such as Gatorade, are also appropriate in cases of TD. The best strategy is to take liberal quantities of oral rehydration salts (ORS). World Health Organization ORS solutions are widely available at stores and pharmacies in most developing countries and can often be purchased at open-air stores.



If your symptoms do not improve within 48 hours, seek medical attention for the possibility of a parasitic infection. TD treatments do not eradicate parasites such as *Giardia intestinalis*, which causes the diarrheal disease giardiasis; antimicrobial drugs are needed to get rid of *Giardia*.

Be prepared by doing the following:

- Learn about specific risks at your destination, and mitigate them.
- Use hand sanitizer that is at least 60 percent alcohol.
- Carry loperamide with you.

Prevention: The best defense is to develop safe eating and drinking habits when you are visiting high-risk areas. Most cases of TD can be avoided by eating only food that is not just cooked but is steaming hot, that has a high acid content (such as citrus fruits — oranges, grapefruits, etc.), that has a high sugar content (such as jellies or syrups) or that is dry (such as bread).

Any foods that are moist and warm or served at room temperature are potentially unsafe. This includes sauces, salads and anything served on a buffet. Citrus and other fruits that *you* peel are safe, assuming your hands and utensils are clean. Unpeelable fruits, such as grapes and berries, are not safe. An unpeeled tomato is not safe, but a tomato that *you* peel is safe. Watermelons are sometimes injected with water to make them heavier, so consider them unsafe, particularly when they are sold by weight instead of by size or unit.

Untreated water is not safe, but bottled drinks, wine and beer can be considered safe. Bottled water must have an intact seal at the time of purchase to be considered safe. Be aware that in some locations, local people will sometimes refill empty water bottles at a town well and resell them as supposedly safe water, so make sure your bottles have an intact seal, and purchase water only from reputable sources.



TRAVELERS' DIARRHEA TREATMENTS

MILD TD

- Self-treatment is possible.
- Consider using an antidiarrheal medication such as loperamide or a balanced salt solution.
- Consume plenty of fluids, especially oral rehydration solutions.
- The CDC does not recommend antibiotic treatment for people with mild TD.

MODERATE TD

- Seek medical consultation in person or by phone.
- Your personal physician or a travel clinic may prescribe antibiotics in advance of your trip and provide instructions for how and when to use them.
- An antibiotic such as fluoroquinolones, azithromycin or rifaximin may be necessary.
- You can use an antidiarrheal medication such as loperamide on its own or in conjunction with other interventions for diarrhea.
- Consume plenty of fluids, especially oral rehydration solutions.

SEVERE TD

- Go to a medical professional for evaluation and treatment.
- An antibiotic treatment is necessary.
 - Azithromycin is preferred to treat severe TD.
 - Fluoroquinolones or rifaximin can treat severe, nondysenteric TD.
 - Single-dose antibiotic regimens may be used.
- Consume plenty of fluids, especially oral rehydration solutions.





Bottled water must have an intact seal at the time of purchase to be considered safe.

Following these simple precautions will give you a better chance of avoiding diarrhea, even in high-risk areas. Antidiarrheal medication can slightly improve your odds, but the remedy is not without its risks; side effects can include dizziness, constipation and nausea. Between 30 percent and 50 percent of travelers in high-risk areas who don't take preventive medication get diarrhea, but not taking the medication offers different benefits: It is more convenient, you avoid any side effects, and it costs you nothing.

Bismuth subsalicylate (Pepto-Bismol) significantly decreases diarrhea incidence when taken as a preventive measure; the standard prophylactic regimen is 2 ounces (60 milliliters) of liquid or two tablets four times a day for no longer than three weeks. Because of the possible risk of Reye's syndrome, do not give Pepto-Bismol to children younger than 12 years of age or to those between 12 and 19 years old if they have chicken pox or the flu. Avoid taking Pepto-Bismol if any of the following conditions pertain to you:

- You are allergic to or intolerant of aspirin.
- You are taking an anticoagulant (blood thinner).
- You have renal insufficiency or gout or are taking probenecid or methotrexate.
- You have any type of bleeding disorder.
- You have a history of peptic ulcer.

Considerations for divers: Do not dive if you have diarrhea, and allow at least 24 hours for recovery after your last loose stool.

MALARIA

Causing more deaths worldwide than any other infectious disease, malaria is the most serious infectious disease threat for anyone traveling to the tropics. It is found primarily in the world's subtropical and tropical regions, where environmental conditions favor a stable, infected population of *Anopheles* mosquitoes. Malaria is prevalent in large areas of Central and South America, Mexico, Hispaniola, Haiti, the Dominican Republic,



sub-Saharan Africa, the Middle East, the Indian subcontinent, South and Southeast Asia, and Oceania. The CDC reports that while major cities in Asia and South America are almost free from malaria, cities in Africa, India and Pakistan are not. There is usually less risk of malaria at altitudes above 4,900 feet (1,500 meters).

The serious health risk of malaria cannot be overemphasized. Preventive measures are essential and include both the avoidance of mosquito bites and the administration of prophylactic medication. The malaria parasite is a protozoan that is transmitted to humans by the bite of an infected female *Anopheles* mosquito, usually occurring between dusk and dawn.



The serious health risk of malaria cannot be overemphasized.

Symptoms: Fever and flulike symptoms — including headache, muscle aches, chills, fatigue and possibly nausea, vomiting or diarrhea — usually appear within 10 days to four weeks after infection but can occasionally occur sooner or even up to a year later. If left untreated, the disease can become life-threatening.

Treatment: Despite the most stringent preventive measures, it is still possible to contract malaria. The symptoms may not develop until long after your trip, so continue prophylaxis for four weeks following your return home. If you develop flulike symptoms such as chills, fever and headache during a trip to a malarious area or within several months after your last exposure, immediately seek medical attention. It is essential to mention your possible exposure to malaria. The appropriate treatment, usually an antimalaria drug, will depend on several factors, including the severity of your symptoms and the malaria parasite strain causing your disease.

Prevention: Personal protection is the best way to prevent malaria and other insect-transmitted diseases. Stay in well-screened areas when you are indoors, wear clothes that cover most of your body including the feet and ankles when you are outdoors, and use mosquito nets when you are sleeping. You should also use insecticides and repellents on your clothing, tents and nets as well as personal repellents containing at least 30 percent DEET; concentrations above 30 percent, however, do not add significantly to its protective effect or duration. Standard preparations last about four hours, but longer-acting preparations are available. Picaridin is an effective alternative.



Travelers to malarious areas should also take prophylactic prescription drugs. Dosage recommendations may vary depending on the drug susceptibilities of local malaria strains. Most medications used for prophylaxis are safe and well-tolerated, but some severe side effects and toxic reactions may occasionally occur as with any drug. The severity of malaria, however, justifies any temporary mild side effects.

Considerations for divers: The prophylactic antimalarial drug mefloquine (Lariam) occasionally causes side effects that mimic symptoms of decompression sickness. Some countries prohibit diving by individuals taking mefloquine, so ask your physician about possible drug substitutions.

If a diver traveling to an area with a high risk of malaria cannot take any prophylactic antimalarial medication due to side effects, the trip should be canceled. The risk is too high that the diver may contract malaria and even die because of the lack of appropriate prophylaxis.



OTHER CONDITIONS

Amebiasis: The most common symptom of amebiasis is diarrhea, which may become painful and bloody. Caused by the protozoan *Entamoeba histolytica* that is found in areas with poor sanitary conditions, the disease is transmitted by person-to-person contact through the fecal-oral route or by ingesting contaminated food or water. There is no vaccine, making **safe food and water practices** key to preventing the disease. Obtain treatment from a specialist in infectious diseases or tropical medicine.

Cholera: A bacterial disease, cholera is transmitted through eating food or drinking water contaminated with *Vibrio cholerae*. Modern sanitation practices have drastically reduced its incidence in most parts of the world. Some countries still require cholera vaccination, but it is not medically justified because travelers rarely develop cholera, even in endemic areas (there are only two cholera cases for every 1 million travelers to endemic



areas). The vaccine is no longer available in the U.S., but there are two manufacturers of oral cholera vaccines in other countries. Both variants require two doses and an interval of two to four weeks for immunity to develop. The vaccines offer insufficient protection, however, and should not replace standard protective measures such as regular handwashing, good sanitation practices, and **safe food and water practices**.

Giardiasis: People who eat and drink in areas with poor sanitation are at increased risk of this parasitic disease caused by *Giardia intestinalis*. Symptoms — which include diarrhea, abdominal cramps, bloating, fatigue, weight loss, flatulence, anorexia and nausea — usually occur one to two weeks after ingestion and last more than five days. There is no vaccine or prophylaxis, so **safe food and water practices** are key to preventing the disease. Consult a specialist in infectious diseases or tropical medicine for treatment.

Hepatitis A: This highly contagious liver disease is transmitted via contaminated food and water. It is a global problem: The most luxurious resort in a major nation or the most humble dwelling in an impoverished country can harbor the hepatitis A virus, although it is more prevalent in poor sanitation areas. Routine vaccination against hep A, typically in a two-dose series, is recommended in the U.S. and other developed nations. Indigenous populations in undeveloped countries are most likely to acquire hep A; such infections generally occur early in life and then persist as a chronic condition with few clinical manifestations. If an adult traveler from a developed nation contracts the disease, however, serious complications can occur. The CDC suggests that travelers to areas with high rates of hep A consider getting revaccinated. Complete immunity develops two to four weeks after the vaccine is administered, so individuals traveling sooner should also consider getting a preventive dose of immune globulin at a different injection site. A blood test that screens for antibodies to the hep A virus is available; a positive result can prevent unnecessary reimmunization or prophylaxis.

Hepatitis B: This form of hepatitis, which is also a viral liver disease, is transmitted by contact with infected blood or blood-derived fluids. An effective hep B vaccine is available and is administered routinely in the



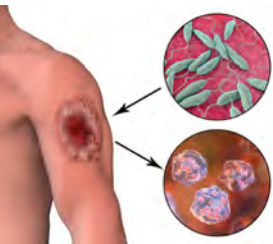
U.S. and other developed nations, typically in a three-dose series. The CDC suggests revaccination for travelers to areas with high rates of hep B as well as for those who might have close personal or sexual contact with an infected individual or who might receive a blood transfusion, share hypodermic needles (or anything else that breaks the skin, such as acupuncture needles), get a tattoo or piercing, or come in contact with unsterilized surgical or dental instruments in an area where the disease is endemic.

Hepatitis C: Like hep B, hepatitis C is also a viral liver disease that is transmitted by contact with infected blood or blood-derived fluids. Symptoms are usually mild or nonexistent, but no vaccine is available. The risk to travelers is low in general, but people visiting areas where the disease is endemic should avoid close personal or sexual contact with individuals who might be infected and refrain from receiving blood transfusions, sharing hypodermic needles (or anything else that breaks the skin, such as acupuncture needles), getting a tattoo or piercing, or coming in contact with unsterilized surgical or dental instruments.

Hepatitis E: Another viral liver disease, hepatitis E is transmitted by the fecal-oral route, mainly through contaminated drinking water but in some cases through undercooked meat. It can be distinguished from other forms of hepatitis by a blood test. There is no vaccine. The best prevention is to follow **safe food and water practices** in endemic areas.

Japanese encephalitis: This mosquito-borne disease is relatively rare and mostly confined to Southeast Asia. A vaccine is available in the United States but should be considered only for individuals visiting high-risk areas for 30 days or longer.

Leishmaniasis: This parasitic disease is transmitted by the bite of phlebotomine sand flies. The skin form of leishmaniasis is characterized by open or closed sores that develop weeks to months after the bite. The disease's visceral form affects the internal organs and is characterized by fever, anemia and enlargement of the liver and spleen; these symptoms develop months to years after the bite. Individuals at greatest risk are those who engage in outdoor activities at night in endemic areas. High-risk areas



Leishmaniasis



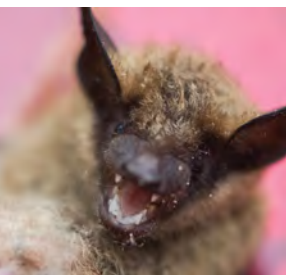
are Bangladesh, Brazil, India and Nepal. Cases have also been reported from northern Argentina to southern Texas, northern Asia, the Middle East, and eastern and northern Africa. Preventive measures include wearing long-sleeved clothing, using insect repellents (preferably containing DEET) on the skin, using permethrin-containing insecticides on clothing and avoiding outdoor activities at night when sand flies are active. There is no vaccine; the disease requires treatment from a specialist in tropical diseases.

Leptospirosis: Caused by a bacterium in the *Leptospira* genus, leptospirosis affects humans and wild and domestic animals. Animals excrete the bacterium in their urine and feces, contaminating the soil and water. Humans acquire the disease through contact with infected soil or water or with the body fluids of an infected animal. Symptoms of leptospirosis are similar to those of other tropical diseases and include fever, chills, myalgia (muscle pain), nausea, diarrhea, cough and conjunctival suffusion (redness of the membrane covering the eye). If untreated, the disease may result in kidney or liver failure or other serious complications. Leptospirosis is found worldwide but has a higher incidence in tropical climates. Travelers who engage in water sports in endemic areas are at increased risk, especially during flooding periods. There is no vaccine. The CDC recommends that travelers who plan to engage in water sports in tropical or subtropical area consider taking 200 milligrams a week of the antibiotic doxycycline as a preventive measure beginning one to two days before the expected exposure.



Meningococcal meningitis: Caused by either a bacterium or a virus, this inflammation of the membranes around the brain and spinal cord can be fatal. Spread via saliva and other oral secretions, meningococcal meningitis is rare in the U.S. but endemic in certain regions, especially in the meningitis belt of sub-Saharan Africa, stretching from Senegal in the west to Ethiopia in the east. Symptoms include sudden high fever, a severe and persistent headache, a stiff neck, nausea or vomiting, sensitivity to light, drowsiness, joint pain and confusion. A vaccine that confers some protection against several forms of meningococcal disease is recommended in the U.S. and other developed nations. The World Health Organization issues a **weekly bulletin** on the incidence of meningitis in endemic areas.





Rabies: Rabies is a viral disease transmitted by the bite of or contact with the saliva of an infected animal — often a bat, raccoon, skunk, fox or other wild animal. In humans, rabies is rare in the U.S. but prevalent in developing countries, where dogs and wild animals often transmit the disease. The virus infects the central nervous system, and untreated rabies is almost always fatal. Infection can be prevented by administration of the rabies vaccine immediately after exposure to a rabid animal. The vaccine is not recommended for routine, preexposure administration but should be considered by anyone who may come into contact with possibly rabid animals or who is traveling in endemic areas, including Africa, Asia or Central and South America. Regardless of your vaccination status, immediately seek medical advice if you have contact with a possibly rabid animal.

Schistosomiasis: Also known as bilharzia or snail fever, the disease is found in rural tropical and subtropical areas, including in the Middle East, Africa, eastern South America (especially Amazonia and Pantanal), Southeast Asia (including Philippines) and parts of the Caribbean (including Puerto Rico and St. Lucia). The *Schistosoma* parasite has a life cycle that relies on a freshwater snail. If you bathe in or drink fresh water that harbors an infected snail, you may encounter larvae that could penetrate your skin. Schistosomiasis can have serious consequences, including liver and bladder damage. Chlorinated water and salt water are usually safe for swimming. Reduce or eliminate the risk of infection by swimming, bathing in or drinking water that has been chemically treated, that has been allowed to stand for more than 48 hours or that has been heated to 122°F (50°C) for more than five minutes.

Smallpox: A sometimes fatal viral disease, smallpox was declared eradicated worldwide in 1980 by the World Health Assembly following a concerted global vaccination effort. It is the only infectious disease ever eradicated by vaccines. As a result, vaccination is no longer required or available.

Tuberculosis: A bacterial disease, tuberculosis (TB) usually manifests in the lungs and can be fatal if untreated. *Mycobacterium tuberculosis*





spreads through the air, usually as a result of an infected person coughing or sneezing. The disease's airborne transmission makes it a risk, especially in developing countries. The Bacille Calmette-Guérin (BCG) vaccine for TB is not widely used in the U.S., but it is often given to infants and small children in endemic countries to minimize the risk of the most serious forms of TB. BCG vaccination could be considered on an individual basis for those who travel to endemic regions such as Africa, South America and Asia and will be heavily exposed to at-risk populations. The purified protein derivative (PPD) tuberculin skin test can determine if an individual has been infected with tuberculosis. A PPD may be required before a trip to certain regions, with a repeat test about 12 weeks following the trip if the first test was negative. If a positive post-trip test follows a negative pretrip test, preventive treatment may be indicated. If a pretrip test is positive, reinfection is unlikely. An immunity impairment such as HIV-positive status can affect the PPD test results, so be sure to inform your physician of any such condition.

Typhoid fever: Though rare in the U.S., this life-threatening bacterial illness is still endemic in many areas of the world. It is predominantly a disease of school-age children and a major public health problem. Symptoms include sustained fever, stomach pain, headache or loss of appetite. The disease can usually be treated with antibiotics. Travelers are unlikely to contract typhoid fever, but anyone who will be exposed to potentially contaminated food or water in rural or undeveloped areas — especially in Africa, Asia or Latin America — should consider getting vaccinated. Three typhoid vaccines are currently available: one oral and two by injection. They confer protection in only 50 percent to 80 percent of recipients, however, so travelers should follow [safe food and water practices](#).



Visiting some countries in the endemic zone requires a yellow fever vaccination certificate called a “yellow card.”

Yellow fever: This mosquito-borne viral illness is potentially fatal, and there is no known treatment other than rest and good hydration. A vaccine is available and is advised for anyone visiting an endemic area, including parts of South America and Africa. Visiting some countries in the endemic zone requires a yellow fever vaccination certificate called a “yellow card.” Some countries outside the endemic zone require a yellow card from anyone traveling from that zone. Preventing mosquito bites is important in the endemic zone.





MEASLES

Measles is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available.

Between 2000 and 2018, vaccination resulted in a 73 percent drop in measles deaths worldwide. In 2018 about 86 percent of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 72 percent in 2000 – but less than 70 percent of children received the recommended second dose. From 2000 to 2018, the measles vaccine prevented 23.2 million deaths, making the measles vaccine one of the best buys in public health. In 2016 there were 89,780 measles deaths globally, marking the first year measles deaths fell below 100,000 per year. That number surged back to more than 140,000 deaths in 2018, however, and half of the cases that year occurred in five countries: Democratic Republic of the Congo (DRC), Liberia, Madagascar, Somalia and Ukraine.³⁸

Measles is highly contagious and spreads through the air when an infected person coughs or sneezes. It is so contagious that if one person has it, 9 out of 10 people of all ages around them will also become infected if they are not protected.





NEW AND EMERGING DISEASES: THE THREAT OF PANDEMIC

Microbial disease agents are constantly evolving, especially now with the ubiquity of global travel and thus the ease with which microbes can spread.

Before the 2014 Ebola virus disease outbreak in West Africa, for example, few people outside of the infectious diseases community had ever heard of the potentially deadly illness, and then suddenly it was in the news. Public health professionals have been concerned for a long time that one of these new diseases may turn into a pandemic, with the number of ill people surpassing the health care capacity to treat them, causing a large number of deaths and disrupting the global economy. That is what recently happened with COVID-19.

A pandemic is a contagious disease outbreak that typically affects multiple continents and countries and involves various groups of people. Devastating diseases have ravaged the world's populations throughout history. Widespread diseases have included bubonic plague, leprosy, smallpox, measles, Ebola, HIV, dengue, malaria, influenza, yellow fever, tuberculosis, typhus, cholera and COVID-19.





The outbreak often starts as an epidemic that affects one area of the world and the people living there. With the availability of rapid and readily available global transportation, it is easy for a local contagious disease to spread worldwide before health authority surveillance programs can identify such a threat and quickly enact effective measures to contain and prevent its spread. With COVID-19, for example, infections were first identified in Wuhan, China, and quickly spread to areas across the globe before it could be contained.

The desire to continue the flow of unrestricted travel and free trade can provide some resistance to timely public health efforts, particularly when they appear unnecessary at the early onset of a disease outbreak when all the facts are still being gathered and interpreted. Pandemics end when large numbers of people worldwide are no longer affected. This can happen when many people die and effective immunity develops in those who survive (such as with the Spanish flu in 1918–19), when an effective vaccine is developed (polio, smallpox) or when the population lives with the disease by employing effective treatments and preventive measures (tuberculosis).

Such infections often start when an infectious agent found in animals makes the necessary changes to cross over to human infection and then humans transmit it to other humans. Respiratory transmission is highly effective, especially when augmented by environments with close proximity between persons.

When a disease is first identified with a high probability of rapid spread, measures are taken initially to limit that spread. The severity and contagiousness of the disease affect the spread and the required extent of preventive measures. Close monitoring for specific vulnerable populations (extremes of age, underlying medical conditions, gender, ethnicity, etc.) makes surveillance particularly challenging when making this important early observation. Minimizing the number of healthy people who are subsequently infected by one who is ill is the goal and related to the term



R_0 . Getting R_0 below 1 is the goal of ongoing efforts. Those efforts can include the following:

- hygiene measures — both personal and environmental
- physical distancing — increasing the physical distance between individuals
- adequate personal protection — implementing barriers to keep infectious material away from the uninfected
- contact tracing — isolating infected individuals from the general population
- restricting specific environments — including close-quartered, poorly ventilated gathering rooms
- protecting vulnerable populations — isolation, additional barriers

Herd immunity occurs when large segments of the population acquire antibody protection by recovering from the disease or by being vaccinated.



You are one of the most critical people in successfully combating a pandemic. Trusted public health resources can provide valuable information. Please do not fault efforts and recommendations too harshly early in the epidemic as officials gather and analyze information, initially relying on successful measures that were developed for previous yet different infections and complicated by a world that

has grown more crowded, mobile and vulnerable. As more facts are known and the situation changes, recommendations may also change. Be able to adapt. All individuals should continuously monitor and comply with updated public health guidelines from internationally recognized authorities such as the CDC, WHO, state and local health officials, and academic institutions.

The following specific recommendations for both divers and travelers are in addition to other recommendations for the general population during a pandemic:

- Closely monitor public health authorities in the areas where you are traveling as well as potential connecting locations and regions where medical emergencies are being evacuated. The CDC monitors outbreaks globally and offers recommendations for travelers to all destinations.



- Understand the health care capabilities and facilities in the area you are visiting and the medical evacuation options available should you become ill or injured during your travels.
- Be aware of epidemiological outlooks at times of traveling to avoid travel restrictions, lockdowns, quarantines, etc. Otherwise you might find yourself for a prolonged time in substandard accommodations and places where you usually would not choose to stay.
- Avoid unnecessary travel during a pandemic. The threat of the asymptomatic or mildly ill traveler bringing the infection to a relatively naïve or uninfected remote location or acquiring the infection from contact at the travel destination or during congested connections to get there is real. It may be difficult or even impossible to evacuate you should you become ill or injured in that location. You may have to depend on the limited or nonexistent local medical services there. Many remote areas have limited resources and might be quickly overwhelmed by their ill citizens and other visitors to that area.
- If you need to travel during a pandemic, consider the following additional recommendations:
 - Ensure that you do not have any serious medical conditions and that any other medical conditions are mild and well-controlled. Remember, your sleep, hydration, diet, environmental exposure and activity levels will be significantly different during travel and may exacerbate any underlying conditions. Conditions such as obesity, diabetes, high blood pressure and a weakened immune system may make you more susceptible to infection and a severe course of illness. Even extremes of age may be an important factor. Discuss the impact of any medical conditions with your physician during a pretravel or predrive checkup. Do not travel if you are feeling unwell; see your physician instead.
 - Wear an FDA-approved face mask, maintain distance between yourself and other passengers, regularly disinfect your hands, and follow all other recommended measures.
 - Optimize your physical fitness.
 - Ensure you have an adequate supply of medical equipment and medications.



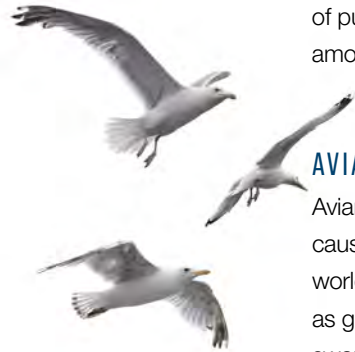
- Make sure your gear is well serviced and maintained.
- Avoid activities and adventures for which you are not trained or that make you uncomfortable.
- Avoid high-risk activities.
- If you scuba dive, dive conservatively to avoid a dive-related illness. The few hyperbaric facilities that usually exist may be closed during a pandemic. Specialized medical evacuation flights may be curtailed, restricted or not available at all.

Significant disease outbreaks manifesting as epidemics and pandemics have been recorded throughout history. Many factors may make future outbreaks more deadly and spread more rapidly. But markedly better surveillance, mitigation, prevention and treatment techniques should equalize or even lessen the enormous costs of inevitable future threats. Remember, an informed traveler is a critical part of this epic human battle's success.

Today's current knowledge may be tomorrow's old news, but at the time of publishing this guide the following diseases (aside from COVID-19) were among those relatively new on travelers' radars.

AVIAN INFLUENZA

Avian influenza, also known as bird flu, is a disease primarily in birds that is caused by influenza A viruses. It is present in more than 100 bird species worldwide. The primary hosts for avian influenza A are aquatic birds — such as gulls, terns and shorebirds — and waterfowl — such as ducks, geese and swans. Avian influenza A can also infect domestic poultry and some other animals. The risk to humans is low, but there have been cases of human infection in some Asian countries. Travelers to that region should avoid contact with wild birds, dead or sick-looking domestic birds and surfaces or objects contaminated with droppings from ill birds.



CHAGAS DISEASE

Chagas, also known as American trypanosomiasis, is a dangerous disease caused by the parasite *Trypanosoma cruzi*. This protozoan is typically transmitted to animals (including humans) by insect vectors found only in rural areas of the Americas, from the southern U.S. states to Argentina's northern provinces.



Avoiding Mosquito Bites

- **Stay in screened areas when indoors, especially from dusk to dawn.**
- **Sleep under mosquito netting.**
- **When outdoors, wear clothing that covers most of your body, including the feet and ankles.**
- **Use the insect repellent DEET (N,N-diethyl-meta-toluamide) on yourself and the insecticide permethrin on your clothing and mosquito nets.**

The typical vector is a triatomine bug, often referred to as a kissing bug, but its common name varies from country to country. Triatomines are gregarious; they typically come out at night but take refuge during the day in dark, cool crevices between rocks and in tree bark and cracks on mud houses. In some areas, however, their behavior is changing, and they are out during daylight hours as well. These blood-sucking insects are guided to their prey by odor, heat and carbon dioxide emissions. Recent studies suggest that bedbugs may also be a vector for the Chagas parasite.

Chagas can also be transmitted via blood transfusions (including organ transplants), through foods contaminated with an infected bug's feces, congenitally (from mother to fetus) or by lactation (from mother to nursing baby). The parasite's usual reservoirs are opossums, raccoons, armadillos and small rodents, but domestic animals such as cats and dogs can also harbor the parasite.

The kissing bug defecates as it bites to suck blood. The subsequent scratching at the bite site allows the parasite to enter the host through the tiny bite wound. The bite site usually does not show any significant inflammatory process and is not painful. The acute phase of the infection, which lasts for a few weeks to a few months, may pass unnoticed because symptoms are typically nonexistent or mild, vague and unspecific. The chronic phase develops over several years. Between 60 percent and 80 percent of individuals with chronic Chagas never develop any other symptoms (known as indeterminate Chagas). remaining 20 percent to 40 percent may develop cardiac or digestive complications that can be life-threatening.



There are no vaccines against Chagas disease, and current treatment options are mainly ineffective. Travelers should focus on avoiding contact with kissing bugs, which unfortunately have become resistant to first-line repellents and insecticides such as DEET and permethrin in some areas. Mechanical barriers such as mosquito nets and screens can be effective, but avoiding sleeping outdoors, at hostels and in mud houses in endemic areas is the best way to prevent contact with Chagas vectors.

CHIKUNGUNYA

This mosquito-borne infection is a viral illness with an incubation period of several days. It causes fever, significant joint pain and sometimes a rash or headache. “Chikungunya” means “that which bends up” in the Makonde language in Tanzania. The pain from the disease can be severe enough to cause those afflicted to bend forward. The bent-over gait and joint pain of chikungunya can be confused with symptoms of decompression sickness, also known as “the bends,” for it too causes sufferers to assume a bent position due to pain. Chikungunya has spread from Africa and Asia to the Caribbean and parts of the Americas.

There is no vaccine against chikungunya and no known treatment other than rest and good hydration. Primary preventive measures are protection against mosquito bites (see [Protective Measures Against Mosquito Bites](#) under the Common Vector-Borne Diseases heading earlier in this section).

DENGUE FEVER

Dengue fever is a viral disease transmitted by the *Aedes aegypti* mosquito, which bites during the day, mainly after sunrise and around sunset. The disease has a sudden onset, with symptoms including fever, severe frontal headache, and joint and muscle pain; nausea, vomiting and a rash may also occur. The disease is usually self-limited and benign, but it may require a long convalescence. Dengue fever can also occur in a severe, fatal form called dengue hemorrhagic fever.



Dengue is found in tropical and subtropical climates worldwide, mostly in urban and semiurban areas. The global incidence of dengue has grown dramatically in recent decades. The CDC reports that about 3 billion people are at risk of dengue, up to 400 million people get infected, about 100 million people become ill, and approximately 22,000 people die from severe dengue each year.³⁹ Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries.

In recent years dengue outbreaks have occurred in the Caribbean and Central America. Areas with widespread dengue include the South Pacific, Southeast Asia, India and the Middle East. The distribution of dengue fever is similar to that of malaria and yellow fever.

There is no vaccine available and no known treatment other than rest and good hydration, so preventive measures are targeted at avoiding mosquito bites.

EBOLA

Ebola is a rare and deadly hemorrhagic viral illness that affects humans as well as monkeys, gorillas and chimpanzees. Six *Ebolavirus* species have been identified in several African nations; bats are their most likely reservoir. Ebola was first discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo (DRC). In succeeding decades, relatively small outbreaks appeared sporadically in Africa. Modern travel may now be helping to disseminate the disease to other countries. A 2014 outbreak in West Africa lasted through part of 2016 and resulted in more than 28,600 cases and 11,325 deaths — most of them within West Africa but a few in other countries. More recent outbreaks occurred in DRC in June–November 2020 and in Guinea in February–June 2021.

Ebola is acquired through direct contact with an infected individual — via broken skin or the mucous membranes in the eyes, nose or mouth, for example — or through contact with the blood or other bodily fluids of an infected person, with a contaminated object or with fruit infected by bats or primates.



Symptoms may appear from two to 21 days after exposure to the *Ebolavirus* and can include fever, severe headache, muscle pain, weakness, fatigue, diarrhea, vomiting, abdominal pain and unexplained hemorrhaging (bleeding or bruising). There is no vaccine or medication effective against Ebola. Current treatment options include care to address symptoms and to support the patient's immune system.

Protection against Ebola's spread includes controlling traffic and screening air passengers coming from affected regions. If you must travel to a country affected by Ebola, get current detailed information about the disease on the [CDC website](#).

HAND, FOOT AND MOUTH DISEASE

Hand, foot and mouth disease (HFMD) is a common viral illness that usually affects infants and children younger than 5 years old, although it sometimes affects adults. Outbreaks of HFMD occur occasionally in all parts of the world, including the United States. Japan, for example, reported more than 350,000 HFMD cases in 2017.

HFMD is caused by various types of *Enterovirus* present in the population worldwide. Transmission is from person to person via excretions from infected individuals, who may not necessarily appear ill. The virus is spread by close personal contact with infected individuals, coughing or sneezing, or direct contact with infected secretions or contaminated surfaces such as doorknobs.

The typical course of HFMD starts with a fever, reduced appetite, sore throat and malaise (a feeling of being unwell) followed by painful sores in the mouth a day or two later. A skin rash with red spots and sometimes with blisters may also develop on the palms of the hands, the soles of the feet, the knees and elbows or the buttocks and genital area. In rare cases, patients can develop meningitis (inflammation of the membrane around the brain) or encephalitis (an inflammation of the brain).

There is no vaccine and no specific treatment other than for symptom relief. Mitigate the risk of infection by frequent handwashing and refraining from touching your eyes and mouth.



METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of *Staphylococcus* bacteria that is resistant to many antibiotics used to treat ordinary staph infections. In the United States, about 33 percent of the population carry ordinary staph that is still sensitive to usual antibiotics — known as methicillin-sensitive *Staphylococcus aureus* (MSSA) — while 2 percent carry MRSA without showing symptoms.⁴⁰ When the surface of the skin gets damaged, however, the bacteria cause an infection.

Hospital-acquired MRSA (HA-MRSA): In hospital settings, about 5 percent of patients carry MRSA on their skin or nose without showing signs of the disease. It may cause severe infections in patients who have had surgeries, artificial joints or intravenous tubings, such as patients on dialysis or life support. The most dangerous situation is when MRSA staph enters the bloodstream (bacteremia), causes sepsis and possibly affects many organs. The incidence of MRSA infections in hospitals worldwide varies, but it is present in any world region. In 2017 there were nearly 120,000 cases of invasive MRSA infections in the U.S., and 20,000 resulted in the patient's death.⁴¹ MRSA is also a significant problem in Europe, with a higher incidence in southern European countries than in northern ones. The problem is also widespread in Asia, but the incidence is unknown.

Community-associated MRSA (CA-MRSA): These MRSA infections occur outside of health care facilities and in the broader community among healthy people. The condition often begins as a painful skin infection spread by skin-to-skin contact or by contact with contaminated objects such as towels, floor mats or beach sand. At-risk populations for CA-MRSA include athletes in contact sports, childcare workers and people living in crowded conditions. Staph bacteria, including MRSA, have been found in seawater and sand.

Livestock-animals MRSA (LA-MRSA): MRSA can also be present among animals and may cause severe damage to the livestock industry. Contact with infected animals is a potential source of infection. Avoid contact with domestic and wild animals, especially when traveling.



Staph skin infections usually cause swollen, painful red bumps and boils or pimples. The affected skin is red and typically warm to the touch and may cause fever, produce superficial pus or cause deep abscesses that require surgical draining. The infection may remain limited to the skin, but it can penetrate deep into the body; affect bones, joints and surgical wounds; cause sepsis; and damage heart valves and lungs. It may be difficult to tell the difference between MRSA skin infections and other skin infections based only on appearance.

It is essential to seek medical care with any form of skin infection. Do not poke or try to squeeze the pus out of a warm, red bump in the skin. Cover it with a dry, clean bandage, and seek professional help. If using a disinfectant, make sure that the label indicates it is effective against staph.

The following measures can help prevent the spread of CA-MRSA:

- **Wash your hands with soap for at least 15 seconds.** Dry them with a disposable towel, and use another towel to turn off the faucet in a public bathroom. If you do not have access to soap and water, use hand sanitizer, but be aware that some MRSA subtypes are resistant to disinfectants.

- **Keep wounds covered.**

Regardless of how insignificant skin damages such as

scratches, abrasions and cuts may seem, keep them clean and covered with sterile, dry bandages until they heal. Wash your hands after cleaning your wounds or skin. Do not swim with open wounds, and abstain from contact sports if you have a skin infection.

- **Keep personal items to yourself.** Avoid sharing personal items such as towels, sheets, razors, clothing and athletic equipment. Carry your own manicure sets when traveling.





- **Avoid walking barefoot on the beach.**
- **Shower after participating in athletic games or going to the beach.** Use soap and warm water. The sooner you remove possible contamination from the skin, the less likely infection will occur. Don't share towels.
- **Launder gym and athletic clothes after each wearing.** Wash your hands after handling dirty laundry or athletic equipment.
- **Use barriers between your skin and public surfaces such as toilet seats and mats.** Disinfect seats, benches and handles of gym equipment before use.

MIDDLE EAST RESPIRATORY SYNDROME (MERS)

First reported in Saudi Arabia in 2012, Middle East respiratory syndrome (MERS) is a severe illness caused by a coronavirus that affects the respiratory system. Symptoms include fever, cough and shortness of breath; some people also experience diarrhea, nausea and vomiting. The mortality rate is very high, between 30 percent and 40 percent).⁴²

MERS is spread from person to person through close contact in health care settings. The disease has spread from the Middle East to Asia. In 2014 two cases were reported in the United States — both in health care workers who had recently returned from working in hospitals in an affected country.

There is no vaccine against MERS. Current information about the disease is available on the [CDC website](#).

SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

Severe acute respiratory syndrome (SARS) was the first severe emergent transmissible disease of the 21st century. Like MERS, it is a respiratory illness caused by a coronavirus. Initially reported in Asia in February 2003, SARS spread to more than two dozen countries in North America, South America, Europe and Asia before the outbreak was contained in July 2003.

More than 95 percent of SARS cases occurred in the Western Pacific region. The World Health Organization reported 8,098 SARS cases worldwide in



2003, resulting in 774 deaths. The last reported outbreak was in China in early 2004. Nevertheless, the CDC and other agencies remain alert to the possibility of a renewed outbreak in humans. More information about SARS is available on the [CDC website](#).



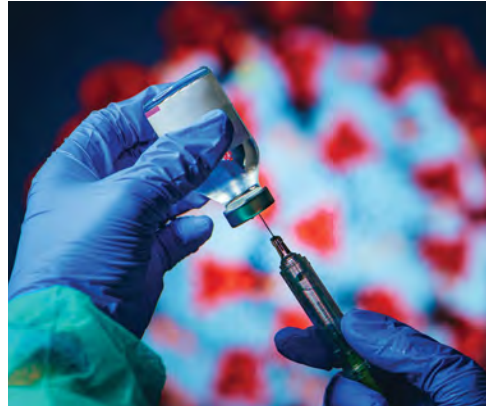
COVID-19

In comparison to MERS and SARS, COVID-19 — which is also caused by a coronavirus (SARS-CoV-2) — is less contagious, less severe and less fatal. Nonetheless, it has infected hundreds of millions of people, caused several million deaths, disrupted travel and devastated economies.

Symptoms range from mild to severe and often include fever, chills, cough, shortness of breath, fatigue, muscle or body aches, headache, loss of taste or smell, sore throat, congestion, runny nose, nausea, vomiting and

diarrhea. More serious symptoms include difficulty breathing, persistent pain or pressure in the chest, confusion, inability to awaken or stay awake, or pale, gray or blue skin, lips or nail beds.

With safe and effective vaccines developed at an unprecedented speed, people can once again resume travel. Scientists, however, are monitoring the emergence of SARS-CoV-2 variants. Get the most current information about COVID-19 on the CDC website, [cdc.gov/coronavirus](https://www.cdc.gov/coronavirus).





SEXUALLY TRANSMITTED DISEASES

Travelers who practice high-risk sexual behaviors should be aware of their likelihood of encountering sexually transmitted diseases (STDs). This likelihood may be much higher in certain countries than in others.

AIDS is the most serious of those STDs. Currently, 147 countries report to the Joint United Nations Program on HIV/AIDS (UNAIDS) about their progress in combating HIV/AIDS. Statistics from 2020 show that about 38 million people worldwide were infected with HIV; new cases continue to be reported worldwide, with 67 percent of them in sub-Saharan Africa. The worldwide prevalence rate is less than 1 percent, but the rate is more than 6 percent in Eastern and Southern Africa and 27 percent in Eswatini. In 2020 women and girls accounted for about 50 percent of all new HIV infections and for 63 percent of all new HIV infections in sub-Saharan Africa. More than one-third of women worldwide have experienced physical and/or sexual violence at some time in their lives. The wide availability of effective antiretroviral therapy has helped keep AIDS deaths comparatively low in recent years. In 2020 about 690,000 people worldwide died from AIDS-related illnesses, compared with 1.7 million in 2004 and 1.1 million in 2010.⁴³

Several other sexually transmitted diseases — including hepatitis B, syphilis, chlamydia and gonorrhea — are also widespread. Travelers are advised to be aware of the risks of these diseases. Treatment is frequently complicated





by antibiotic resistance on the part of the organisms involved or the lack of effective treatment. Prevention is the best strategy. Other than abstinence, the most effective prophylactic measure is the conscientious use of condoms.

Some diseases that are often transmitted through sexual contact can also be acquired by other means, such as contact with contaminated needles. In developing regions, the equipment

used for tattooing, piercing, acupuncture and other procedures that involve breaking the skin may not be subject to the same health regulations as in developed nations. If you partake of such activities in a developing region, ensure that any needles and other instruments used are in single-use, disposable, sterile packaging. If there is any question about sterility, avoid these activities.





FOOD SAFETY

Trying new and different cuisines is an exciting and enjoyable aspect of traveling. In certain parts of the world, however, both eating and drinking may carry considerable health risks.

GENERAL RECOMMENDATIONS

Figure 5 presents the CDC's guidance regarding what's safe to eat and drink — and what's not. Table 8 provides the U.S. Peace Corps recommendations.

SEAFOOD SAFETY

Many natural toxins in seafood can cause seafood poisoning. Such toxicity can be inherent to a species, such as with the Japanese pufferfish known as fugu, or can result from external contamination, such as the neurotoxin ciguatera. Gastrointestinal problems attributed to seafood poisoning, however, often are the result of infections caused by ingesting harmful bacteria, parasites or viruses. For more information on these disease agents, see [Managing Travel-Related Illnesses](#) earlier in this section.

Ichthyosarcotoxism is a form of food poisoning resulting from the ingestion of fish flesh containing natural toxins. Ichthyosarcotoxism is derived from the Greek words *ichthyo* (meaning “fish”), *sarx* (“flesh”) and *toxism* (“intoxication” or “poisoning”). The three main ichthyosarcotoxisms are ciguatera, scombroid fish poisoning and tetrodotoxism.



Ciguatera: Microscopic reef organisms produce a neurotoxin that causes ciguatera. Small fish feed on these organisms, and bigger fish eat the small fish. The bigger the fish, the more toxic the meat. Large predators such as barracudas, eels and groupers contain more toxins due to food-chain bioaccumulation. Symptoms are primarily neurological, such as numbness, tingling and dizziness; gastrointestinal symptoms such as nausea, vomiting and diarrhea may also occur. Symptoms can last for a few days or may persist for months or even years but are rarely fatal. Infected fish appears, smells and tastes normal — it has no unusually fishy odor. Cooking does not diminish the potency of the toxin, so travelers should avoid eating large reef-based predators. For more information on ciguatera, see DAN.org/ciguatera.

Table 8.
U.S. Peace Corps
Recommendations
for Food Safety

Scombroid poisoning: The scombroid family of fish includes tuna, mackerel, mahi-mahi and jack. Scombroid poisoning is caused by eating any of these fish that have not been properly refrigerated after being caught. Once such a fish is dead, bacteria that is naturally present in its gut translocate and break down a component of the meat, releasing

Safe	Avoid
<ul style="list-style-type: none"> • boiled, cooked and peeled foods • hot and steaming foods • bread • rice and noodles (if steaming hot) • fruit (if freshly peeled by you) • factory-sealed bottled water • factory-sealed carbonated drinks 	<ul style="list-style-type: none"> • buffets • room-temperature foods • previously peeled fruit, raw produce and salads • raw or poorly cooked seafood • unboiled tap water, even for brushing teeth • beverages not in factory-sealed containers • ice cubes, unless made with safe water • milk products, unless boiled or pasteurized

an immune-system compound called a histamine. Ingestion of large quantities of histamine-contaminated meat triggers an allergic-like reaction. Scombroid poisoning can easily be confused with and misdiagnosed as a seafood allergy. Contaminated fish looks, smells and tastes normal — perhaps with a slight peppery or metallic taste but not unpleasant or foul. Cooking does not eliminate histamines and will not prevent symptom occurrence. While traveling, avoid eating these kinds of

fish unless you are sure it was properly chilled immediately after being caught and then kept at a temperature below 40°F (4.4°C) until it was cooked. For more information on scombroid poisoning, see DAN.org/scombroid.



Pufferfish poisoning: Pufferfish poisoning, also known as tetrodotoxism (TTX), is caused by eating a highly potent neurotoxin contained in certain fish — such as pufferfish, triggerfish, mola mola and Japanese fugu — from the order Tetraodontiformes. Initial symptoms usually involve numbness around the mouth shortly after ingestion. TTX can be deadly because it leads to progressive systemic paralysis, which can result in respiratory failure. Cooking does not alter the potency of the toxin, so travelers should avoid eating these fish in any form or preparation.

Shellfish such as mussels, clams, oysters and scallops can also cause various forms of seafood poisoning. These are bivalve mollusks (with a two-part shell) and not fish, however, so such poisonings are not considered ichthyosarcotoxisms. For more information on shellfish poisoning, see DAN.org/redtide.

Figure 5.
CDC Food
and Beverage
Safety



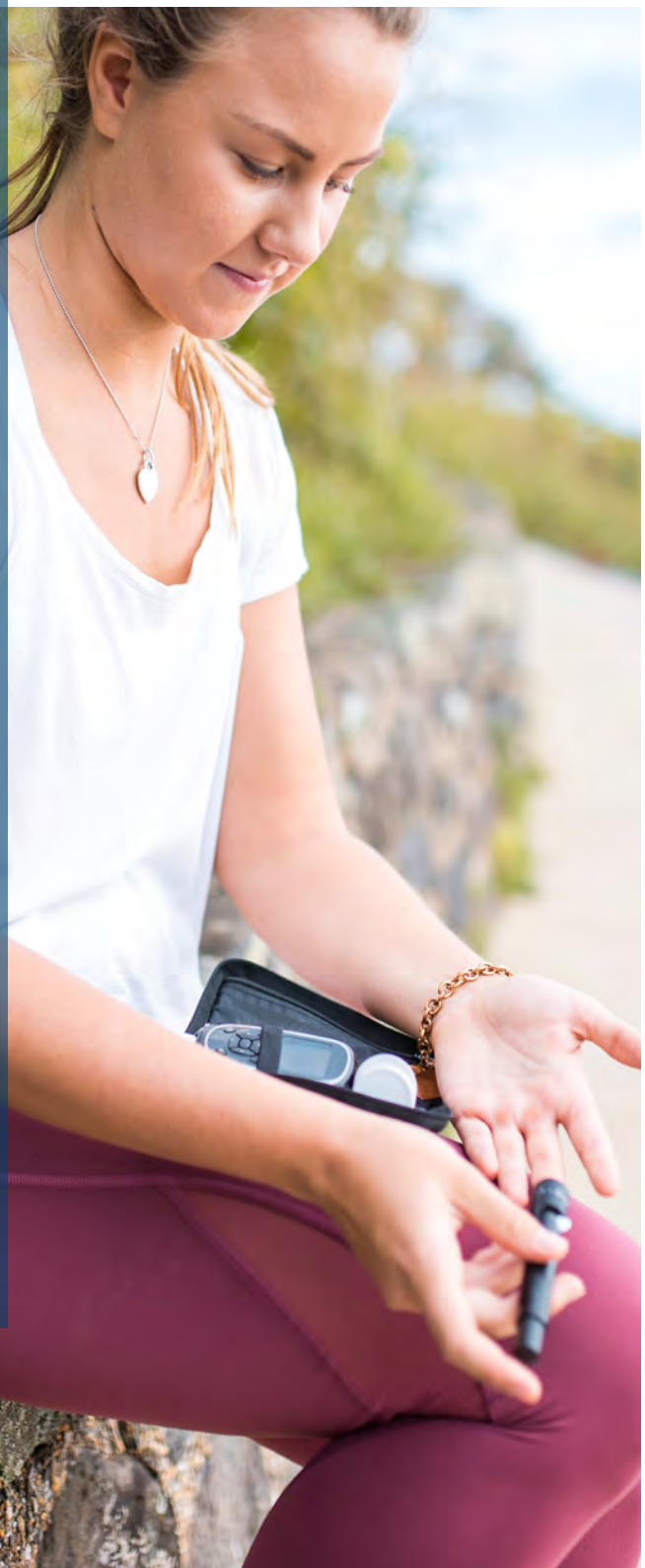
Source: U.S. Centers for Disease Control and Prevention

SECTION 4

TRAVELING WHEN DIAGNOSED WITH A CHRONIC ILLNESS

The World Health Organization reports that 41 million people die each year from chronic diseases such as diabetes, heart disease, asthma and other conditions. But many millions more people live with chronic illnesses — many of them with ease. If you have such an illness, there may be some limits on where and how you should travel, but with certain precautions you can likely still travel safely, even internationally.

Detailed here are travel-related considerations for individuals who have been diagnosed with one of the four most common chronic health conditions: diabetes, heart disease, asthma and chronic obstructive pulmonary disease.

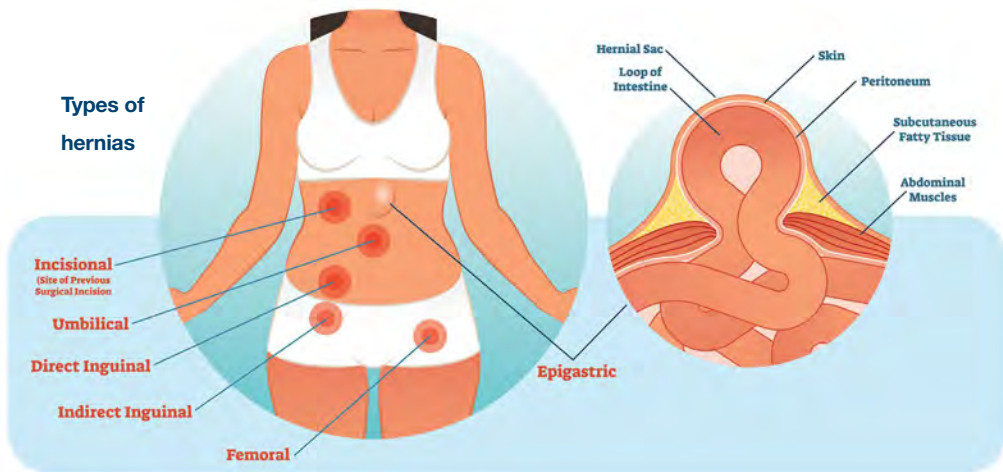


ABDOMINAL WALL HERNIA

Abdominal wall hernias are among the most common problems that may require a surgical solution. An estimated 10 percent of the population may suffer from a hernia in their lifetime, and the FDA reports that more than 1 million people in the United States have hernia repairs each year.

A hernia is a protrusion of part of an internal organ from the cavity where it normally resides through a preexisting or acquired defect in the wall. Most common abdominal wall hernias are external and may be visible as a permanent or periodic bump in groins (inguinal and femoral hernia), around the navel (umbilical hernia) and along the middle line of the belly (ventricular hernia). Internal abdominal hernias are protrusions of abdominal organs into another internal space. The most known is a hiatal hernia, which is a protrusion of the stomach (gaster) through the diaphragm into a chest cavity.

The most common abdominal wall hernia is an inguinal hernia, which is a protrusion of the intestines through the abdominal wall in the groins and sometimes into the scrotum. Inguinal hernias may be indirect and occur due to an incomplete closure of a passage through which the testicles descend from the abdomen into the scrotum. The condition usually occurs early in life



but may manifest at any time. The FDA reports that about 800,000 surgical inguinal hernia repairs occur in the United States each year.⁴⁴

Adult males more often have a direct inguinal hernia, which happens due to a weakening of the muscular wall. The incidence increases in males over age 40 and may affect 25 percent of males and 2 percent of females.⁴⁵ Risk factors are being male, lifting heavy objects and straining such as with chronic coughing or overcoming constipation.

Most inguinal hernias appear as a painless swelling or bulge in the groin that may occur gradually or suddenly after heavy lifting. In the beginning it may be reversible when the affected person reclines, or it may be reduced with light manual pressure. With time, however, it becomes larger and does not reduce easily. The occurrence of pain and tenderness requires urgent evaluation.

When the hernia cannot be reduced at all, it is incarcerated (trapped) and requires surgical repair. If the intestines in the hernia get twisted, a painful emergency condition called strangulation occurs. The blood flow to the intestine gets interrupted, and the affected part of the intestine will die due to lack of oxygen if not corrected within hours. The patient will develop inflammation and infection, which can be fatal if not treated.

ASTHMA

Asthma is an inflammatory disorder of the airways that results in the production of excess mucus, spasms in the smooth muscle tissue of the

bronchial tubes and reduced airflow in the lungs. Many of the same cells responsible for allergic reactions come into play during an asthmatic episode. An asthma attack can be triggered by smoke, dust or various allergens that may be more abundant in certain environments where you plan to travel. It is advisable to consider air-quality factors before making travel plans, especially if your asthma is severe.



An asthma attack may begin with the onset of wheezing, difficulty breathing and a cough. The use of inhaled corticosteroids may be beneficial as a



preventative prior to exertion. Before you travel, be sure that your asthma is under good control (episodes occurring no more than once or twice a week) and that you have an ample supply of both maintenance and emergency, quick-relief medications.

Drugs recommended for some travel ailments — including aspirin and other nonsteroidal anti-inflammatories such as ibuprofen (Advil) — can initiate an asthma attack, so avoid these drugs if possible.

CHOLELITHIASIS

Cholelithiasis is a chronic condition characterized by a presence of gallstones in the biliary ducts and gallbladder. Gallstones may cause obstruction of the biliary system and prevent excretion of bile into duodenum.

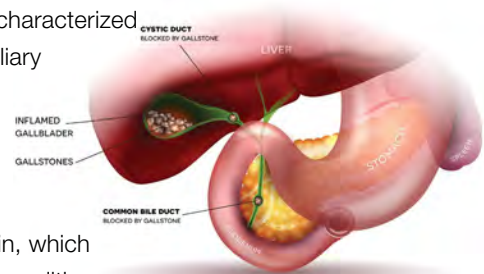
Pressure will increase and cause pain, which can be episodic and transitory. The condition may worsen and result in prolonged, acute painful episodes. Cirrhosis, diabetes, hemolysis and Crohn's disease have been associated with gallstones.

The gallbladder may generate pain and cramping to the right upper quadrant just below the right rib cage and can radiate to the right shoulder and scapula. It is classically seen in obese females and people older than 40, but it also occurs in a much wider range of the general population. Gallstones occur in more than 5 percent of asymptomatic people.

The characteristic right upper-quadrant pain radiating to the back is often associated with a fatty meal, but this pain can occur at other times, often at night, and is usually unaffected by position, bowel movement or flatus. Nausea and vomiting may also occur. Imaging often confirms the diagnosis.

Should the gallbladder become infected, accompanied by increased pain, fever and chills, seek prompt medical attention as these worsening symptoms can be cholecystitis. Palpation just under the right rib cage with a

GALLSTONES



deep inspiration may elicit sharp pain, which is due to inflammation caused by infection. Simple cholelithiasis seldom illicit such pain with palpation.

If cholelithiasis is suspected, the pain can be managed with analgesics. Avoid fatty foods during this period as the symptoms may recur or worsen.

If cholecystitis is suspected when the pain is accompanied by generalized symptoms that include fever and chills, seek prompt medical care. Medical attention should include an IV to enable hydration and possible antibiotic administration if possible.

Avoid foods that cause or exacerbate symptoms. Obesity and a sedentary lifestyle as well as rapid weight loss may increase risk. Consumption of coffee, vitamin C, polyunsaturated fat and nuts has been linked to the prevention of gallstones.



CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Chronic obstructive pulmonary disease (COPD) encompasses several significant lung disorders that affect the flow of air in the lungs and the gas-exchange process — the diffusion of inhaled oxygen into the blood for circulation to the body's tissues and of carbon dioxide into the lungs' alveoli for exhalation. There are several types of COPD, including chronic bronchitis and emphysema. Symptoms of COPD include a chronic cough and excessive production of sputum (saliva and mucus from the respiratory tract). Infections of the lungs and airways are common in individuals with COPD. Sufferers also have a reduced ability to exercise due to the diminution of their breathing capacity.

Inhaled corticosteroids can improve affected individuals' breathing and provide some symptom relief, though mainly at rest. Prompt attention to early signs of respiratory infections is important to prevent the development of pneumonia. More advanced cases of COPD significantly impair affected individuals' exercise tolerance, and severe cases usually require the use of supplemental oxygen.

If you have COPD and wish to travel, discuss your proposed trip with your physician to be sure that the likely rigors don't exceed your ability



to cope with them. Review your medications, and devise an emergency action plan. Travel with extra inhalers, sufficient oxygen supplies for your condition and possibly with prescription antibiotics in case they're needed. Although oxygen is often carried on board planes and large ships, it is usually reserved for emergency use and may not be enough for someone with COPD. Traveling with individual oxygen canisters on a plane is typically restricted, so make arrangements with your carrier well in advance of your trip if you must travel with supplemental oxygen.

DIABETES

About 422 million people worldwide (8.5 percent of the global population)⁴⁶ — and about 34.2 million Americans (10.5 percent of the U.S. population) — are currently living with diabetes. Of the 34.2 million Americans with the disease, about 26.8 million cases (8.2 percent of the U.S. population) are diagnosed and 7.3 million are undiagnosed.⁴⁷ Officially known as diabetes mellitus, the disease has two forms: In type 1 (also known as insulin-dependent) diabetes the body fails to produce enough insulin, which helps



regulate blood glucose (blood sugar) levels. In type 2 diabetes the body develops a resistance to insulin. Of Americans with diabetes, the vast majority have type 2, with only about 1.6 million having type 1.

The prevalence of diabetes increases with age, with 26.8 percent of Americans age 65 and older having the disease. Every year about 1.5 million new diagnoses of diabetes are made in the U.S. In addition, 88 million Americans age 18 and older have prediabetes, which is characterized by blood glucose levels that are higher than normal but not high enough for a diabetes diagnosis.⁴⁸ For more information, see [diabetes.org](https://www.diabetes.org).

Symptoms of untreated diabetes include weight loss, excessive urination, excessive thirst and increased hunger. Both types of diabetes are treatable with dietary measures and/or administration of insulin by injection. Other medications are available for type 2 diabetes. Weight control or weight loss, a nutritious diet and exercise can help prevent type 2 diabetes.



Many people with diabetes travel regularly without major problems. Some people with diabetes also participate in extreme sports, although it's often against medical advice. When traveling abroad, people with diabetes — particularly those with type 1 diabetes — must take extra precautions.



The two major travel concerns for people with insulin-dependent diabetes are the availability of insulin and their ability to control their diet. Insulin may not be readily available in some locations and not all countries follow the same quality standards. Travelers must carry extra insulin with them in case they encounter travel delays.

The availability of healthy and safe-to-eat foods at your destination is a concern for people with both types of diabetes

since following a consistently healthy diet is a key factor in managing the condition. It is essential that travelers with diabetes research the available cuisine and its safety in any countries they expect to visit and plan ahead about how they will meet their dietary needs.

Traveling also induces stress that can cause variations in individuals' daily needs for insulin, so they must be more vigilant in monitoring their blood sugar levels. Those with recently diagnosed diabetes should not travel until they have mastered good control of their blood sugar levels.

Individuals with diabetes who plan to scuba dive face other issues of particular concern. In previous years individuals with diabetes (especially type 1) who chose to dive typically did so against medical advice by hiding their condition. More recently, however, there has been a shift away from a blanket prohibition on diving with diabetes, due in part to antidiscrimination laws and to the growing record of safe diving by individuals with diabetes. It is now possible in many countries for people with diabetes to receive dive training and to dive safely.



Participants in an international workshop sponsored by DAN and the Undersea and Hyperbaric Medical Society in 2005 reached agreement that prospective divers who are able to control their diabetes with either dietary measures or medication and who are otherwise qualified to dive may undertake recreational scuba diving provided they meet certain criteria. The Recreational Scuba Training Council in the United States ratified this conclusion.

The criteria are detailed in the full consensus guidelines, which consist of 19 points that are divided into three sections:

- Selection and surveillance
- Scope of diving
- Glucose management on the day of diving



For a summary of the guidelines, see [DAN.org/diabetes](https://dan.org/diabetes).

For the full text of the guidelines, see [DAN.org/DiabetesSummary](https://dan.org/DiabetesSummary). DAN also offers a free online seminar on diving safely with diabetes at [DAN.org/education-events/elearning](https://dan.org/education-events/elearning).

The guidelines contain practical recommendations for medications and procedures in case a diver develops hypoglycemia (low blood sugar) underwater. Individuals with diabetes, as well as their buddies and dive leaders, should be aware of the status of any divers with diabetes and knowledgeable about the signs and symptoms of hypoglycemia and the procedures that may be required in case a problem arises.

Divers with diabetes can be very sensitive to manifestations of hypoglycemia. Many people will feel early warning signs such as weakness, nausea, blurred vision, sweating, anxiety or trembling. As the diver's blood sugar continues to drop, fatigue will set in and changes in mental status can occur. An affected diver may eventually become combative or unaware of their surroundings. In severe cases, they may lose consciousness or have seizures. Episodes of hypoglycemia that lead to changes in mental status or seizures can result in drowning.



GASTROINTESTINAL ISSUES

CONSTIPATION

Usually a chronic condition that arises from a gradual change in bowel habits, constipation is characterized by small, hard stools, increased straining to pass stool and decreased frequency of bowel movements. This condition may lead to pain and the sensation of needing to defecate but being unable to pass stool. Some diseases such as multiple sclerosis, diabetes and Parkinson's disease increase the risk for constipation. Medications that may cause constipation include iron-containing supplements, antacids, antihistamines (used for allergies and motion sickness), antidepressants, blood pressure medications and narcotic pain relievers. Consuming alcohol and caffeine may promote dehydration, which contributes to constipation.

Even people with regular bowel movements may experience constipation while traveling because of changes in daily routines, different foods, internal body clock disruptions due to jet lag, dehydration, travel-related stress, limited bathroom access and aversion to using public bathrooms.

Similarly, boating conditions may contribute to constipation due to diet changes, a more sedentary lifestyle, insufficient hydration, inconvenience of passing stool in close quarters or side effects of motion sickness medications.

Symptoms: Common symptoms are lower abdominal cramping on the left side and rectal pressure. Pain often varies throughout the day and is relieved with bowel movements. People often feel bloated and sometimes nauseated. An exam of the rectum may reveal a hard lump of stool. Palpation of the abdomen may mildly increase pain, but severe pain with palpation should not be present. Bleeding should not occur when having a bowel movement but may arise from constipation complications such as rectal fissures. Blood in the stool (not around the stool or on the toilet paper) should prompt further evaluation by a physician if accompanied by other blood loss symptoms or severe abdominal pain.

Treatment: When constipation is suspected, increase water consumption and consume 20–35 grams of dietary fiber per day. Good sources of fiber



include fruits (prunes), vegetables, nuts and whole wheat bread. If these foods are not helpful, laxatives are an option. Some laxatives such as Metamucil, Citrucel, FiberCon and Benefiber work similarly to fiber in your diet. Others such as MiraLax, GlycoLax, magnesium citrate and magnesium hydroxide work by drawing more water into your stool. Laxatives such as senna and bisacodyl work by stimulating your bowels to move. Other medications delivered by enema (through a tube inserted into the rectum) may also help treat constipation.



Prevention: Avoid medications that may cause constipation, and participate in regular activity and exercise. Stay hydrated by drinking at least eight 8-ounce glasses of water a day, and include fiber-rich foods in your diet. Moving your bowels when you feel the urge can also help prevent constipation.

Impact on boating: Pain associated with constipation may limit daily activities but should resolve with a return to regular bowel habits. Taking over-the-counter medications and supplementing your diet should help with symptoms. See a physician if constipation leads to bloating and severe, unremitting abdominal pain with associated nausea and vomiting.

Considerations for divers: Prolonged constipation usually diminishes the desire to engage in physical activities. If divers with constipation feel up for diving, however, they should consider their discomfort and whether they feel any bloating. Abdominal organs and their fatty mantels may produce a lot of bubbles after decompression, which may impair circulation and lymph drainage.

HEARTBURN/REFLUX (GERD)

Despite its name, heartburn has nothing to do with the heart; it is a symptom of gastroesophageal reflux disease (GERD). GERD is caused by leakage of acidic fluids from the stomach into the lower portion of the esophagus, which causes a burning sensation in the center of the chest



and esophagus. The esophagus cannot tolerate the acid as well as the stomach can, resulting in inflammation and pain. Heartburn is often worse following large meals, after eating certain foods or when bending forward, straining or lying flat (especially after meals or in the morning). Reflux is common, especially in pregnant women, obese people, people who eat spicy foods or eat late at night and people who drink lots of alcohol.

Symptoms: The most common GERD symptom is a burning sensation in the center of the chest that typically moves up the esophagus toward the back of the throat. It is often associated with belching, nausea, a chronic dry cough, a sour or bitter taste in the back of the mouth, discomfort when swallowing and occasionally hoarseness. The abdominal pain is usually worse after meals and is associated with a sensation of fullness or bloating, but this is not true for everyone. Over time, this leaking of acidic fluids into the esophagus can lead to permanent damage. GERD is diagnosed primarily based on history, except in extreme circumstances in which a procedure called endoscopy is performed in a doctor's office.

Treatment: The best treatment for GERD is avoidance of foods and habits that can worsen reflux. Once symptoms start, the treatments are primarily associated with lifestyle. They include the following: (1) elevating the head of the bed at least 6 inches to allow gravity to assist in preventing leakage of acidic stomach contents upward, (2) eating smaller meals at least three to four hours before lying down or going to sleep, (3) avoiding late-night snacks and alcohol before bedtime, (4) limiting foods that may worsen reflux, (5) refraining from smoking, (6) wearing loose-fitting clothing to reduce abdominal pressure (which may increase reflux) and (7) maintaining a healthy weight.

Medications that may help reduce acid reflux include over-the-counter antacids, but some antacids may cause side effects such as constipation, diarrhea and decreased absorption of other medications, so chronic use is not recommended. Other antacids include H₂ blockers and proton pump inhibitors. These are effective medications, but they work gradually and may not be best for people who want immediate relief of acute symptoms. Emergency treatment is warranted only when reflux is associated with severe, unremitting abdominal pain or bloody vomiting.



Prevention: The best way to avoid GERD is to avoid foods that lead to increased acid production in the stomach. To avoid worsening your reflux, limit consumption of foods such as citrus fruits, chocolate, caffeine, spicy foods, fatty foods, fried foods, garlic, onions, peppermints and tomatoes. The lifestyle modifications listed in the treatment section may also be helpful.

Considerations for divers: Diving may provoke reflux, which could be dangerous while underwater.

HEMORRHOIDS

Hemorrhoids are swollen blood vessels in the rectum and may present in several ways, but they are often associated with itching, burning, pain or swelling. Symptoms can occur during defecation or while at rest. Hemorrhoids can be either internal or external. Internal hemorrhoids are inside the rectum and cannot be seen in an external exam, while external hemorrhoids can be seen and felt on external examination. Hemorrhoids are common in pregnant women, people who deal with chronic constipation, the elderly and people with diarrhea. Straining during bowel movements or sitting for too long on a toilet can worsen existing hemorrhoids.

Symptoms: Hemorrhoids are often associated with itching around the anus, rectal pain, swelling of the tissue around the anus and painless rectal bleeding. Examination of the rectum will reveal a swollen, flesh-colored or purplish lump (in cases of external hemorrhoids). Bleeding associated with hemorrhoids usually involves only a small amount of bright red blood that is seen in the toilet or on toilet paper after wiping, but any person with rectal bleeding should see a physician to determine the definite cause. Intermittent bright-red blood from the rectum and blood surrounding stools (not bloody stools) can typically be managed at a later date, but significant blood loss — causing lightheadedness, generalized weakness, fatigue, headaches or passing out for no other apparent reason — warrants immediate medical attention.

Treatment: Hemorrhoids are often easily treatable at home. If they are caused by problems such as constipation, treat the underlying cause with



stool softeners or laxatives as well as a diet rich in fiber, whole grains and plenty of water. Relieve pain from hemorrhoids with pramoxine ointment, hydrocortisone rectal cream or benzocaine ointment. Soaking the area in warm water can also help with pain and irritation. Hemorrhoids that are extremely painful or not responding to normal treatment may need treatment by a physician.

Prevention: The best way to prevent hemorrhoids is to avoid constipation and straining when having a bowel movement. Eat plenty of fruit and vegetables, take fiber supplements, or use stool softeners if needed.

Impact on boating: Hemorrhoids may become painful, but they are not life-threatening. Pain is often worse after bowel movements but topical medications, rest and avoiding further constipation and/or straining with bowel movements can provide relief.

GOUT

An intensely painful and disabling inflammatory arthritis, gout usually affects a single joint at a time, but more than one joint can be affected simultaneously. It most commonly affects the big toe but can also involve the knees, elbows and other joints. An acute attack of gout usually resolves after a few days to weeks, but it can sometimes be chronic with recurring episodes.

Gout develops in people with chronically elevated blood uric acid levels and affects up to 4 percent of adults in the U.S. Men with gout usually develop it between ages 30 and 45, while women usually experience it after age 55. Risk factors include obesity, hypertension, kidney disease, excessive alcohol intake and consumption of significant amounts of meat, seafood and high fructose corn syrup. Travel can also contribute to a flare-up of gout due to changes in diet, dehydration or lack of physical activity.

Symptoms: Often occurring overnight, gout attacks are characterized by the sudden onset of severe joint pain with redness, swelling and tenderness of the joint. Pain usually restricts movement, and people



experiencing a flare-up may keep their foot out of the bedsheets as even the pressure from the linens can illicit pain. They may still be able to walk but often with a lot of pain. Pain reaches peak intensity within 12 to 24 hours and usually resolves after a few days to a week.

Many illnesses, including infection, rheumatoid arthritis, pseudogout and inflammatory conditions, can cause joint pain and inflammation. A physician can tentatively diagnose gout based on a physical examination and the person's symptoms, but a definitive diagnosis comes after finding elevated uric acid in the joint fluid.

Treatment: For acute attacks, the goal is to quickly and safely reduce pain, inflammation and disability. Medications usually depend on a person's



kidney function, risk of bleeding and response to previous treatments. Nonsteroidal anti-inflammatory drugs (NSAIDs) are usually the first line treatment for people with no history of stomach ulcers or kidney disease. Start these medications as soon as possible after an attack, and continue taking them for a day or two after resolution. For people who are unable to take NSAIDs, a physician may prescribe corticosteroids such as prednisone.

Prevention: Medications that decrease uric acid levels may help prevent gout attacks from occurring, and dietary changes

and weight loss may lessen their frequency. People with gout should eat low-fat dairy, whole grains, brown rice, oats, vitamin C, cherries and moderate amounts of coffee. They should avoid beer, liquor, organ meats and foods containing high fructose corn syrup and limit serving sizes of beef, lamb, pork and seafood such as sardines, shellfish and mackerel.

Impact on boating: The majority of people who suffer from gout or acute gout attacks can safely go boating, but they should make sure they have their appropriate medications on board for any prolonged excursions. NSAIDs may not be available over the counter in some parts of the world, so be sure to bring an adequate supply of them and any prescription medications on any boat trip.



If an acute gout attack occurs during travel, be especially careful when walking on a boat deck since the pain can severely limit one's ability to move about safely. If a first-time attack is suspected, seek medical attention for a definitive diagnosis. Seek emergency medical care if pain becomes intolerable, the diagnosis is not definitive or a joint infection is possible.

HEART DISEASE

Travel may adversely affect individuals who have forms of heart disease that reduce their capacity for exercise and their ability to handle stress. There are numerous forms of heart disease, including congenital (present since birth) or acquired structural abnormalities, infectious or inflammatory conditions, ischemic heart disorders (that restrict the blood supply to various parts of the body) and serious rhythm abnormalities. All of these conditions can affect the heart's ability to pump blood through the circulatory system and to

oxygenate the body's tissues and can raise the risk of a heart attack. Simply carrying your luggage at a brisk pace through a large airport may provoke a heart attack.

People with known heart disease should consult their cardiologist before deciding to travel. Symptoms that might indicate a cardiac issue include shortness of breath, dizziness, gastrointestinal upset and pain in the chest, arm or jaw. If you experience any of those symptoms, even if you've never been diagnosed with heart disease, see your doctor before going on a trip.

The doctor may order certain diagnostic tests to see if you have a cardiac disorder. While in a remote location or even in a city far from home is not the time to discover an insidious blockage of

your coronary arteries. If your doctor detects a cardiac condition, appropriate medications will need to be prescribed, adjusted and optimized many weeks before you leave home. Be sure to bring extra amounts of any prescription



medications with you in case of travel delays. If you have an implanted pacemaker, have the device tested before departure.

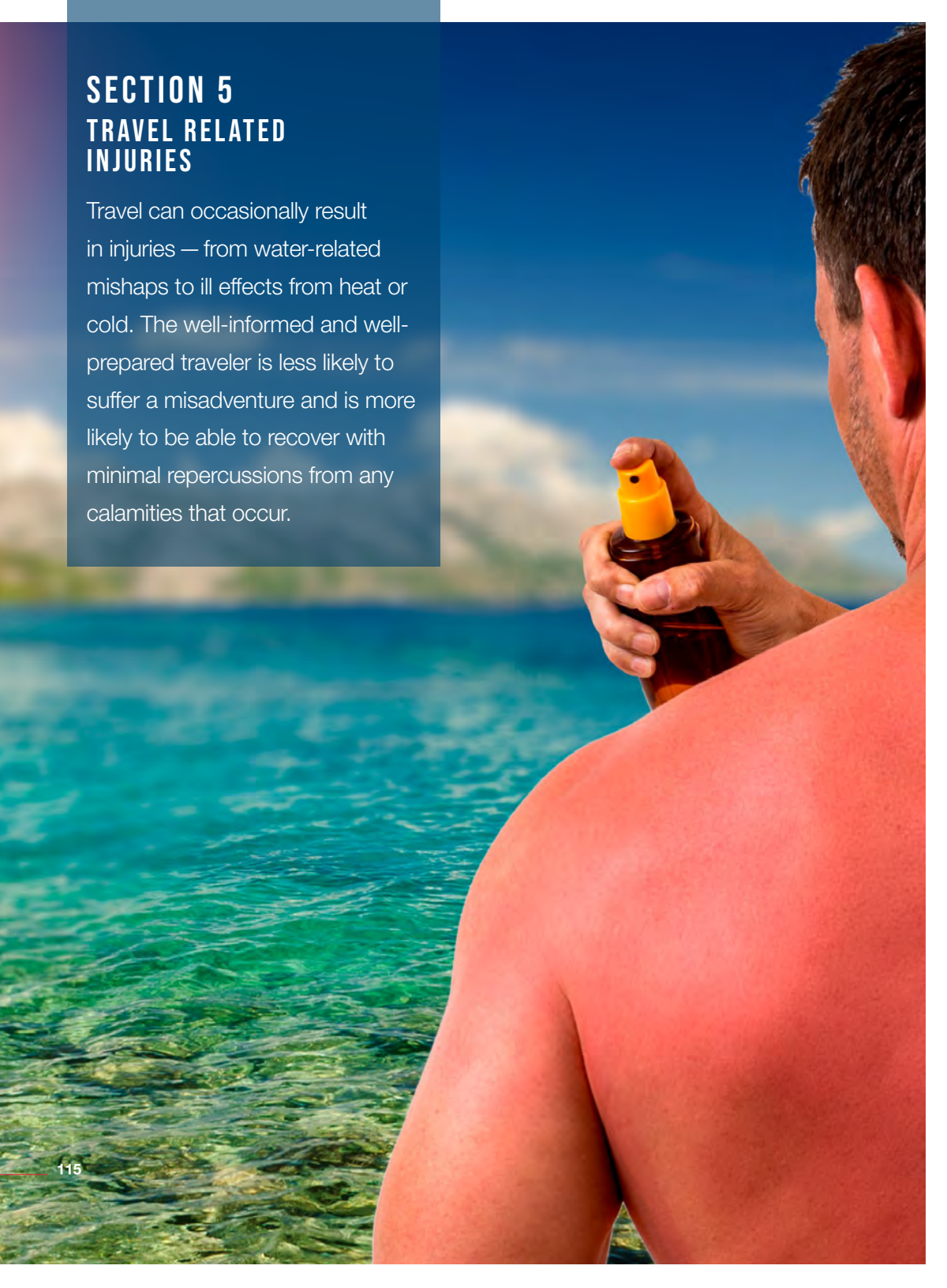
Sleep apnea, which is a concern for some individuals with heart disease, may be exacerbated by certain over-the-counter medications often used to treat travel ailments. Discuss with your physician any medications you might use. Travel to high altitudes may be inadvisable for individuals with severe sleep apnea that requires use of a continuous positive airway pressure (CPAP) machine. If you plan to travel with a CPAP machine, especially to a high-altitude location, consult your respiratory technician before you leave home to make sure that your machine will function properly at reduced atmospheric pressure and to learn how to make any necessary adjustments.



SECTION 5

TRAVEL RELATED INJURIES

Travel can occasionally result in injuries — from water-related mishaps to ill effects from heat or cold. The well-informed and well-prepared traveler is less likely to suffer a misadventure and is more likely to be able to recover with minimal repercussions from any calamities that occur.



EXPOSURE-RELATED INJURIES

The opportunity to enjoy the scenic splendor of the great outdoors is one of the major attractions of traveling, but it comes with a risk of injury due to exposure. The following are some of the primary dangers.

HYPERTHERMIA

In temperate weather, the human body naturally regulates its core temperature to an average of 98.6°F (37°C), but an individual's actual core temperature varies with daily sleep-wake cycles (and women's monthly cycles) as well as from individual to individual.

Hyperthermia results when the body's temperature is elevated well above normal, which can occur in an environment with a temperature much higher than the normal range. The lower limit of hyperthermia is poorly defined. Heat stroke can occur when a person's core temperature exceeds 104°F (40°C). Extreme ultramarathon runners, however, have been known to sustain core temperatures as high as 108°F (42°C).

The state of acclimatization (adaptation to repeated or sustained high temperatures), the arduousness of any physical work and the relative humidity of the environment influence how a person's core temperature responds to heat. Heat stress associated with high relative humidity increases dramatically at higher air temperatures. The body's cooling mechanism relies not on sweating but on the evaporation of sweat — and the higher the relative humidity, the more evaporation is inhibited. To account for the effect of relative humidity, in 1990 the U.S. National Weather Service developed a heat index scale as a calibration of the *apparent* temperature.

Immersion in water represents the highest level of relative humidity. Because immersion prevents evaporative cooling and because of water's huge capacity for holding heat, water temperatures that exceed 97°F (36°C) are not well tolerated by humans, particularly if they must also exert themselves. Recreational scuba divers rarely experience water temperatures that high, so hyperthermia typically occurs during surface- or land-based activities.

Symptoms: The signs and symptoms of hyperthermia vary according to the severity of the condition. Heat-stress disorders can be divided into the following five categories:



- **Heat edema:** Edema is the accumulation of excess fluid in the body's tissues and cavities. Heat causes the blood vessels to dilate (expand), so fluid tends to pool in the arms and legs, resulting in a condition known as peripheral edema.
- **Heat cramps:** Heat, especially in combination with exercise, can cause a loss of water and electrolytes in the body, resulting in muscle cramps and spasms, especially in the calves, arms and abdomen.
- **Heat syncope:** Syncope is fainting or a temporary loss of consciousness. When heat leads to dilation of the peripheral blood vessels, blood pressure can drop and the amount of blood flowing to the brain can decline, which can result in fainting.
- **Heat exhaustion:** Heat exhaustion is caused by dehydration — the loss of water and electrolytes from the body. It is characterized by headache, nausea, vomiting, low blood pressure, dizziness, fatigue or temporary loss of consciousness. The victim's mental status remains normal, and their rectal temperature remains below 104°F (40°C).
- **Heat stroke:** A more severe form of heat exhaustion, heat stroke is characterized by a pronounced change in mental status, severe headache, nausea, vomiting, loss of consciousness, often a cessation of sweating and a rectal temperature exceeding 104°F (40°C).

Treatment: Remove victims from the overheated environment as soon as signs or symptoms of hyperthermia are apparent. The greater the magnitude of the malady, the more aggressive the efforts to cool the victim should be.

- Heat edema is easily resolved with rest and elevation of the extremities.
- Heat cramps can be managed with an ice massage (rubbing an ice cube on the affected area for five minutes at a time), stretching and oral fluids.
- Heat syncope can be managed by placing victims in a resting, supine position (lying on their back, face up), with their extremities slightly elevated, and by monitoring their vital signs (blood pressure, heart rate, temperature and respiration).
- Heat exhaustion requires monitoring victims' vital signs and core temperature, administering electrolyte-rich fluids such as Gatorade and



ensuring rest and cooling. If victims become dizzy or their blood pressure drops when they stand up, intravenous fluids may be required.

- Heat stroke requires urgent cooling, monitoring of victims' vital signs and core temperature, administering intravenous fluids and encouraging rest.

Cooling measures can be as simple as finding a seat in the shade for victims of minor heat maladies but as drastic as immersion in ice water for victims of heat stroke. Immediate cooling is critical in serious cases. Even though ice-water baths are uncomfortable, they have proven to be safe and effective for heat stroke victims. If a victim's signs and symptoms do not begin to abate after treatment, especially if the individual appears to be getting warmer, immediately seek medical aid.

Prevention: Water temperatures high enough to cause hyperthermia are typically not a problem during a dive. More common stressors for divers are exposure to hot surface conditions, particularly when wearing insulated suits (especially drysuits) designed to protect them in cool or cold underwater conditions as well as when exerting themselves while carrying dive equipment on land.

Preventive measures for divers include adequate hydration, sufficient shade and the ability to rest and adjust or remove attire as required. Adequate hydration requires continual awareness of water intake when in hot environments — especially in hot and humid environments. The need for good hydration is increased for divers who experience a diuretic effect (promoting the production of urine) from wearing tight wetsuits or from immersion. Changes in diet, activity level and thermal status can influence the concentration of urine, but passing nearly clear, colorless urine several times per day is generally considered evidence of adequate hydration. If urine volume is reduced or its color darkens, drink more water or other stimulant-free fluids.

Preventive measures for nondivers are similar: Maintain good hydration, stay in the shade outdoors or in air-conditioned spaces indoors, pace activity levels, and dress appropriately for the heat (in light colors, for example). In conditions of extreme heat, it may be necessary to drink electrolyte-rich fluids.



HYPOTHERMIA

Hypothermia results when the body's core temperature drops below 95°F (35°C), which can occur in an environment with a temperature much lower than the normal range.

In a cold environment, your body loses heat faster than it can produce it — at a rate that is affected by the temperature gradient between your skin and the environment, the heat capacity of the environment (which is much greater for water than for air), the presence of wind or water movement (tides and currents hasten cooling), your body composition (both a higher lean-to-fat ratio and a lower body-mass-to-surface-area ratio hasten cooling) and how much protective clothing you are wearing.

Hypothermia often results from immersion in cold water, because water conducts heat away from the body 20 to 27 times faster than air does. If you are suddenly immersed in water colder than 59°F (15°C) without thermal protection, the shock can cause an inhalation gasp response, which can induce you to inhale water. The stress response also triggers an extremely rapid heart and breathing rate. The cold shock may be accompanied by pain and mental disorientation, which can lead to fear and panic. Good thermal protection such as a wetsuit, drysuit or other survival-type gear will dramatically lessen the immediate effects of immersion in cold water, but heat loss will still occur over time.

You can increase the rate at which your body produces heat by exercising or shivering; if you are immersed in cold water while wearing little or no thermal protection, however, swimming actually increases your exposed surface area and thus elevates the rate at which your body heat is transferred to the water. In general, you can maintain your core temperature by swimming only in water that's warmer than 75°F (24°C). An unprotected swimmer's core temperature will usually drop in water colder than that. An inability to continue swimming — a condition known as swimming failure — typically develops more rapidly in cold water than one expects.

If you are not wearing thermal protection when immersed in cold water but have buoyancy support such as a life jacket and a chance of rescue,



remain still in a position that minimizes your exposed surface area. Pull your knees together and up to your chest in what is known as the heat-escape-lessening position (HELP) or the rescue position; it provides improved protection of the body's high-heat-loss areas, which are the armpits, groin, chest and thighs.



Immersion-related hypothermia can also occur in relatively warm or even tropical waters as a result of the body slowly cooling over time. This may happen if you are in water as warm as 84°F to 91°F (29°C to 33°C) if you are not wearing any thermal protection. In such circumstances, you may not be aware of the slow heat drain for some time.

Hypothermia can also occur in surface or land settings. The same factors — including the temperature of your environment, the presence of wind and how appropriately you are dressed for the conditions — are key in whether you

are likely to develop hypothermia and how soon it might happen. Similarly, even a slightly cool temperature can result in cold stress, depending on an individual's age, health status, body-fat ratio and body mass.

Symptoms: The signs and symptoms of cold stress vary according to how severe the condition is. Table 9 describes the various gradations of hypothermia.

Treatment: Individuals with **mild hypothermia** will be awake, conversing lucidly, complaining about the cold and probably shivering. Assuming no other injuries are present, mildly hypothermic victims can be rewarmed with a variety of passive or active techniques and with minimal risk of complications. If travelers suffer hypothermia in a remote setting, many rewarming options, particularly more aggressive and invasive techniques, likely will not be available; nevertheless, rescuers must do what they can to protect victims from further injury.

The essential first step is to remove any wet clothing and replace it with a dry insulating inner layer and a windproof outer layer, including covering the head. Shivering can provide effective rewarming in cases of mild





hypothermia. Exercising can also increase the rewarming rate, but it will slightly increase afterdrop — a continued decline in victims’ core temperature even after their removal from the cold stress — but this is typically not problematic in cases of mild hypothermia. Fully alert and cooperative victims of hypothermia can also drink warm liquids, which deliver negligible amounts of heat but help offset associated dehydration and provide a sense of comfort. Most beverages are suitable, but avoid alcohol, which can compromise victims’ awareness and exacerbate dehydration and vasodilatation (expansion of the blood vessels). Food can improve victims’ energy reserves, but it is not a critical immediate need for well-nourished victims.

Individuals with **moderate hypothermia** will be conscious but may be confused, apathetic or uncooperative and may have difficulty speaking. Their condition demands more caution, because cardiac arrhythmias (disturbances of the heart’s rhythm) are possible. Gentle handling and

Table 9.
Signs and
Symptoms of
Hypothermia

Mild Hypothermia	Moderate Hypothermia	Severe Hypothermia
Core temperature 90°F–95°F (32°C–35°C)	Core temperature 82°F–90°F (28°C–32°C)	Core temperature below 82°F (28°C)
<ul style="list-style-type: none"> • increased heart rate • impaired coordination • feeling uncomfortably cold • impaired ability to concentrate • shivering • introversion/ inattentiveness • decreased motor activity • fatigue 	<ul style="list-style-type: none"> • increasing muscular incoordination • stumbling gait • slurred speech • confusion • amnesia • diminished or no shivering • weakness • drowsiness • hallucinations 	<ul style="list-style-type: none"> • inability to follow commands • decreased heart rate • inability to walk • loss of consciousness • decreased respirations • absence of shivering • dilated pupils • decreased blood pressure • deathly pallor • muscle rigidity





active rewarming techniques — such as using heated blankets, forced-air rewarming, and heated and humidified breathing gas — are all desirable if available. Exercise is not recommended for individuals with moderate hypothermia because of the victims' compromised physical coordination and the potential for increasing afterdrop. Afterdrop can raise the risk of physiological collapse, especially during or shortly after a rescue from immersion-related hypothermia. Keeping victims supine (lying face up on their back), with their heart and head at similar levels, and completely at rest will reduce the risk of collapse.

Use the most effective alternatives available when rewarming. Take care to insulate victims from the ground or other cold surfaces (consider using a dry wetsuit as an insulated mattress). A warm-water bath is another good option for victims of moderate hypothermia, but it is essential to physically support them throughout their transfer to the bath and their immersion. The initial bathwater temperature should be lukewarm, not more than 105°F (41°C), to minimize the sensation of burning that victims may experience. After immersing the victim in the bath, you can progressively increase the water temperature to no more than 113°F (45°C). If hot water isn't available, use chemical packs or electric pads to rewarm moderately hypothermic individuals, but avoid burns by never applying these items directly to the skin.

Individuals with **severe hypothermia** may be unconscious, have a slowed heart rate and respiration or may even appear dead, with no detectable heartbeat. Look carefully for signs of life such as breathing, movement or a pulse in the carotid artery (neck). First assess their breathing and then their pulse for at least one minute to confirm either respiratory arrest or pulseless cardiac arrest, which would necessitate CPR. If hypothermia is caused by cold-water immersion, death usually results from loss of consciousness and subsequent drowning. If drowning precedes hypothermia, successful resuscitation is unlikely. But if victims show breathing or movement, their heart is still beating, even if at a slow rate. Spending sufficient time to check for a pulse is essential. If there is either breathing or a heartbeat, external heart massage (chest compression) is not needed.



For the unconscious hypothermic individual, the main goals are to maintain adequate blood pressure and respiration and to prevent further heat loss. Severe hypothermia leaves victims susceptible to cardiac arrest, so it is essential to provide extremely gentle handling — putting them in a supine position with their head and heart at the same level, fully supporting them and keeping them from all physical activity — as well as aggressive, often invasive rewarming strategies. Cardiac arrhythmias may result from severe hypothermia or even from rewarming a severely hypothermic individual. Providing basic life support takes precedence over efforts to rewarm a victim.

If a hypothermic individual shows no signs of life, begin CPR and make arrangements for emergency transport to the nearest medical facility. Rewarming victims of severe hypothermia is unlikely in the field, but it is essential to protect them against further heat loss. If CPR is required, continue performing it until medical assistance arrives. There have been successful resuscitations after prolonged CPR, in part because of some naturally protective effects of hypothermia. Victims who appear clinically dead due to marked decline in their brain and cardiovascular function can sometimes be fully resuscitated with their neurological functions intact. For more information about performing CPR, see cpr.heart.org/en/resources/what-is-cpr, or learn about DAN first aid courses at DAN.org/education-events/instructor-led-courses. The outlook is poor for adults who have a core temperature below 82°F (28°C), have been immersed for more than 50 minutes, have life-threatening injuries or are more than four hours away from definitive medical care.

Discontinue CPR for hypothermic individuals only under the following conditions:

- The person is successfully resuscitated.
- The rescuers become too fatigued to continue.
- The person has been completely rewarmed but is still unresponsive to properly administered CPR.
- A medically qualified individual arrives at the scene, examines the victim and declares the person dead.
- We advise following these steps after a cold-water immersion incident:



- Determine the cause of the immersion to reduce risk to the rescuers.
- Handle the victim as gently as possible.
- Assess the victim for responsiveness and normal breathing, and be aware of the increased risk of cardiac arrest while the victim is being handled and removed from the water.
- If you think an injury occurred, support and immobilize the victim's neck as well as possible.
- If breathing is absent, begin CPR, and continue performing it until medical personnel arrive.
- Give the victim as much oxygen as possible.
- Arrange transport to a medical facility.
- Prevent further heat loss.
- Rewarm as needed and as the situation allows.

The protocol for aiding victims of nonimmersion-related hypothermia are the same, except for the steps related specifically to immersion.

Prevention: If you plan to swim or dive in cool or cold water, preventing hypothermia requires preparation. It is essential that divers understand the proper use of protective garments to conserve their body heat and control heat loss. Most divers will benefit from wearing thermal protection in water cooler than 80°F (27°C). Significant thermal stress can be expected in water colder than 75°F (24°C). Divers should ensure that they have the proper protective equipment as well as training and experience in how to dive safely in cool or cold water. Immersion in cold water without thermal protection results in incapacitation more quickly than one might expect. An additional aspect of preparation involves training and readiness in case a rescue (or self-rescue) is necessary; rapid action greatly increases the likelihood of a successful outcome.

If you plan to engage in surface- or land-based activities, preventing hypothermia requires wearing appropriate clothing for the conditions; dressing in layers and wearing a hat to prevent body heat from escaping from your head are especially beneficial. It is important to stay dry and avoid overexertion, which can cause you to sweat and get chilled if the sweat cools before it evaporates.



EFFECTS OF INCREASING ALTITUDE

HIGH ALTITUDE: 8,000–12,000 FEET (2,438–3,658 METERS)

- Commercial aircraft cabin pressure is typically equivalent to the pressure at about 8,000 feet (2,438 meters).
- Altitude sickness is common above 8,000 feet (2,438 meters).
- The availability of oxygen is only 65 percent to 90 percent of the amount at sea level.
- Arterial P_aO_2 is significantly diminished.
- Exercise performance decreases, and ventilation (the exchange of air between the lungs and the atmosphere) increases due to lower arterial P_aCO_2 .

SEA LEVEL

- Atmospheric pressure is 765 mmHg (millimeters of mercury, the unit of measure for pressure in gases and liquids).
- The partial pressure of atmospheric oxygen is 160 mmHg.
- Arterial oxygen pressure (P_aO_2) is 80 mmHg to 100 mmHg.
- Arterial carbon dioxide pressure (P_aCO_2) is 38 mmHg to 42 mmHg.

VERY HIGH ALTITUDE: 12,000–18,000 FEET (3,658–5,486 METERS)

- Atmospheric pressure is 483 mmHg or less.
- The availability of oxygen is only 50 percent to 65 percent of the amount at sea level.
- Arterial P_aO_2 falls below 60 mmHg.
- Extreme hypoxemia (an abnormally low concentration of oxygen in the blood) may occur during exercise and sleep.
- Severe altitude sickness occurs most commonly in this range.

EXTREME ALTITUDE: ABOVE 18,000 FEET (5,486 METERS)

- The availability of atmospheric oxygen drops below 50 percent of the amount at sea level.
- Marked hypoxemia, very low P_aCO_2 and alkalosis (excessive alkalinity of the body fluids) are likely to occur.
- All physiological functions progressively deteriorate.
- No permanent human habitation exists above 20,000 feet (6,096 meters).



ALTITUDE SICKNESS / ACUTE MOUNTAIN SICKNESS

Traveling to high altitudes exposes people to increasingly rarefied air and progressively decreasing amounts of oxygen, resulting in declining levels of oxygen in the blood and thus impaired physical and mental performance. The response to high altitudes varies from individual to individual, but most people can operate normally at heights up to 8,000 feet (2,438 meters) above sea level. At altitudes greater than 8,000 feet, the oxygen deficit can begin to cause acute mountain sickness (AMS). At elevations

higher than 10,000 feet (3,048 meters), 75 percent of people will experience at least mild AMS symptoms.

Symptoms: The onset of AMS symptoms varies according to the altitude, rate of ascent and individual susceptibility to the condition. A slow ascent will more likely allow your body to acclimate by establishing a more rapid spontaneous breathing rate to make up for the decreased oxygen in the atmosphere. Symptoms usually start 12 to 24 hours after your arrival at altitude and begin to decrease in severity by about your third day at a given elevation.

Mild AMS causes travelers to feel generally unwell. They may suffer headache, lightheadedness, fatigue, breathlessness, rapid heartbeat, nausea, difficulty sleeping or a loss of appetite. Symptoms tend to be worse at night. Mild AMS does not interfere with normal activities, and symptoms generally subside within two to four days as the body acclimates.

Severe AMS manifests itself in the form of serious conditions known as high-altitude pulmonary edema (HAPE) or high-altitude cerebral edema (HACE), which is the accumulation of excess fluid in the lungs (pulmonary) or brain (cerebral). The symptoms of severe AMS include a gray or pale complexion, a blue tinge to the skin (cyanosis), chest tightness or congestion, coughing



or coughing up blood, difficulty walking, shortness of breath when at rest, withdrawal from social interaction, confusion or decreased consciousness. Severe AMS can be fatal if not treated or if the victim is not returned to a lower altitude.

Treatment: Responding promptly to signs or symptoms of AMS is essential. Immediately call emergency medical services (EMS) if you or someone else experiences any of the following symptoms:

- severe breathing problems
- altered level of alertness
- coughing up blood

If you cannot get EMS assistance, take the affected individual to a lower altitude as quickly and as safely as possible, and administer oxygen if it is available. Keep victims warm, and be sure they stay well hydrated if they're conscious.

Prevention: To avoid altitude sickness, it is important to ascend slowly enough to allow time for your body to acclimate. Some people also find it beneficial to take prophylactic medication to help with the acclimatization process or to prevent some ill effects. If you plan to travel to a high-altitude location, ask your doctor or a travel clinic to evaluate your risk of altitude sickness, and obtain prophylactic medication that may prevent or alleviate AMS. If you plan to dive at a high-altitude site, make sure the medication is safe to use when diving.

AMS can affect anyone. Individuals are at higher risk if they

- live at or near sea level and travel to a high altitude
- have had AMS before
- have preexisting medical conditions
- ascend quickly to a high elevation

Do not travel to a high-altitude location without consulting your doctor if you have a heart, lung or blood disorder. You may need to travel with supplemental oxygen.



The following strategies can help prevent and/or moderate AMS:

- Do not ascend quickly above 8,000 feet.
- If you travel to high altitudes, choose a slow transportation method or walk.
- If you get there by flying, do not overexert yourself or travel higher for the first 24 hours.
- If you travel above 10,000 feet (3,048 meters), increase your altitude by no more than 1,000 feet (305 meters) per day.
- After every 3,000 feet (914 meters) of elevation gained, take a rest day.
- After daily excursions, return to a lower altitude for the night, if possible.
- Don't go higher if you experience any AMS symptoms; wait for the symptoms to subside.
- If your symptoms increase, go to a lower elevation.
- Stay properly hydrated. Drink at least three to four quarts of fluids per day, and be sure you are urinating regularly.
- Performing light activity during the day is better than sleeping, because respiration decreases during sleep, which can exacerbate AMS symptoms.
- Avoid tobacco, alcohol and depressant drugs (such as barbiturates, tranquilizers and sleeping pills), all of which worsen AMS symptoms.
- Eat a high-carbohydrate diet while at altitude, but do not overeat.

DEHYDRATION

Dehydration occurs when the body's level of water and other fluids falls below normal. Humans lose water through sweating, breathing and waste elimination. Medical problems that cause vomiting, diarrhea, edema or bleeding markedly increase this loss.

Symptoms: Even mild dehydration can result in poor judgment, weakness, headache and lack of energy; it can also make people more susceptible to infections, hyperthermia or decompression illness. Marked dehydration can cause imbalances in electrolytes (salts and other minerals in blood and other body fluids).



Individuals suffering from dehydration may also have a loss of elasticity in their skin, excessively dry mucous membranes (in the nose and throat, for example) and urine output that darkens in color and declines in quantity.



If you have been swimming or diving, however, your first urine output after immersion may be clear even if you are dehydrated, which is due to immersion diuresis — that is, an increased production of urine during immersion due to vasoconstriction (narrowing of the blood vessels), which results in your urine being more diluted than it would be otherwise.

Dehydration is often suspected when someone feels unwell after having been physically active and sweating profusely in a hot, humid environment. The condition is much more difficult to detect in cooler environments, where an individual's fluid intake still may not keep up with the loss of body fluids. Dehydration in such conditions can be gradual; victims may not be aware of their depleted state until an emergency arises, which can be especially dangerous if they are traveling in a remote area.

Treatment: Treatment of dehydration involves replacing the lost fluids and electrolytes — orally in cases of mild to moderate dehydration but intravenously in more severe cases. Administering frequent, small amounts of water is the best approach.

Prevention: Travelers in hot and humid environments may need to increase their fluid intake beyond the recommended 8 cups (almost 2 liters) of water per day. Don't restrict your salt intake when traveling in such climates, because the loss of salts during prolonged exposure to heat and humidity may result in hyponatremia, which is characterized by abnormally low levels of sodium in the blood and can cause lethargy, headaches, seizures and even death if the brain swells due to ingestion of water but not enough salts and other electrolytes. This does not mean you should drink salt water, which can cause more dehydration. Studies of shipwreck survivors demonstrate that those who survived were those who refrained from drinking salt water.





OTHER EXPOSURE CONCERNS

While this guide cannot detail all possible sources of exposure-related injuries, the following are a few other serious or common problems.

Lightning: The Earth receives an estimated 100 lightning strikes per second, so it is not surprising that lightning sometimes strikes humans. The U.S. National Weather Service reports there were 20 fatalities from lightning strikes in the U.S. in 2019 and 17 fatalities in 2020.⁴⁹ Worldwide estimates of lightning fatalities range from 6,000 to 24,000 cases per year.⁵⁰ An individual's lifetime odds of being killed by lightning are 1 in about 15,300.⁵¹

The CDC recommends the following strategies to avoid being struck by lightning:

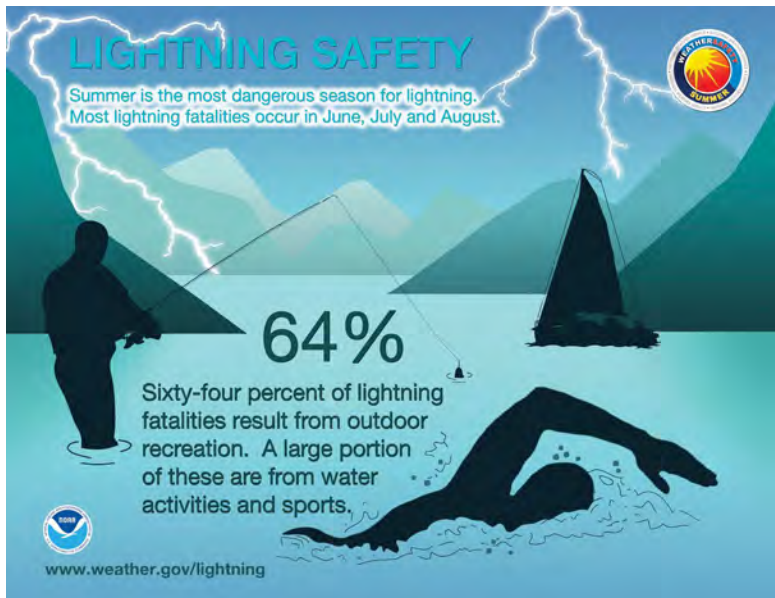
- Check the weather forecast before leaving for an outdoor excursion.
- If you hear thunder, seek shelter in an enclosed building or a hard-topped vehicle with the windows rolled up. Avoid open structures or vehicles such as porches or golf carts.
- Avoid ridgelines, mountain summits and isolated trees or other tall items such as power poles. If you are in the woods, stay near shorter trees.
- Stay away from water such as swimming pools, ponds, rivers and even puddles.
- Avoid tall structures.
- Avoid contact with anything metal. If you are in a concrete structure, avoid leaning against the walls, because lightning can travel through the metal reinforcement in concrete.



- Do not wear or carry anything metal.
- If you are in a group, separate from each other.

If lightning strikes you or someone with you, immediately call for emergency medical assistance and then take the following steps:

- Minimize the risk of further strikes, and move the victim to a safer location if necessary.
- Check to see if the victim is breathing and has a heartbeat. If not, immediately start chest compressions. Initiate rescue breathing if anyone in your group has CPR training. For more information about performing chest compressions and administering CPR, see **Administering CPR** in Section 6.
- Continue chest compressions and CPR until medical personnel arrive.
- Assess the victim for other injuries such as burns or blunt trauma, and administer first aid as possible and appropriate.
- If there is risk of hypothermia, place an insulating layer between the victim and the ground.





Sunburn: The depletion of the Earth's ozone layer has made sunburn an increasingly common hazard of outdoor activities.

The National Cancer Institute reports that 35 percent of adults and 57 percent of adolescents in the U.S. get at least one sunburn a year.⁵² The risk of melanoma, the most serious form of skin cancer, doubles after five or more blistering sunburns. Prevention is much more important than treatment.

The Skin Cancer Foundation provides the following tips for avoiding sunburn:

- Stay in the shade or indoors, especially between 10 a.m. and 4 p.m. and particularly in tropical and polar latitudes and at high altitudes.
- Use a sunscreen with a sun protection factor (SPF) of at least 15 for short intervals in the sun and 30 or higher for longer periods or when the sun is strongest. Apply it liberally to all exposed skin 30 minutes before going outdoors, and then reapply it every two hours. Use eco-conscious sunscreen without ecosystem-harming chemicals.
- Wear sun-protective clothing, including a broad-brimmed hat and sunglasses that block ultraviolet (UV) radiation.
- The sun reflects off water, sand or snow, increasing the intensity of the UV rays.
- You can get a sunburn on a cloudy day; some cloud formations can magnify the effect of the sun's UV rays.
- Do not use tanning booths.
- Do the following if you get too much sun:
 - Take a cool shower or bath.
 - Apply moisturizing lotion.
 - Stay well hydrated.
 - Consider using a pain reliever such as ibuprofen (Advil) if the sunburn is painful.
 - Seek medical attention if a blistering sunburn covers more than 20 percent of your body.

It is a good idea to check your skin for unusual moles or other signs of potential skin cancer at least once a month.



Poison ivy, oak and sumac: Poison ivy, oak and sumac are the most common contact-poisonous plants in the United States, but there are others within the U.S. and elsewhere around the world. Learn to recognize the leaves of noxious plants to avoid the misery of the highly itchy rashes they can cause. For information about identifying poison ivy, oak and sumac, see [CDC.gov/Niosh/Topics/Plants](https://www.cdc.gov/Niosh/Topics/Plants). Before you engage in wilderness activities in other parts of the world, research what plants to avoid there.

Exposure to urushiol, the natural chemical that causes the allergic rash, is possible by direct contact with the plant, indirect contact with a surface that has touched the plant or inhalation of particles from burning plants that contain the substance.

The CDC recommends the following steps for avoiding contact with such plants:

- Cover up: Wear long sleeves, long pants and gloves.
- Consider using a barrier lotion containing bentoquatam, but such lotions must be washed off and reapplied twice a day.
- Use rubbing alcohol (isopropanol or isopropyl alcohol) or soap and water to clean any gear that may have come in contact with such plants. Urushiol can remain potent on the surface of objects for up to five years.
- Do not burn plants that may contain urushiol or similar substances.

If despite your best efforts you come in contact with poisonous plants, the CDC recommends the following steps:

- Immediately wash the area well with rubbing alcohol, a specialized plant wash or a degreasing soap (such as dishwashing liquid) and lots of water, and then rinse well.
- Scrub under your nails with a brush.
- If you have a blistering rash, apply wet compresses, calamine lotion or hydrocortisone cream to mitigate the itching. An oatmeal bath or oral antihistamines such as Benadryl may also relieve itching.
- Seek medical attention in cases of a severe allergic reaction or severe itching or blistering.





WATER-RELATED INJURIES

Recreational activities in, on or near the water are extremely popular — from scuba diving to simply sitting on the beach. Some risks of such activities are obvious, but some are less so. Table 10 lists a few of the injuries that can occur during water sports — from the common swimmer’s ear to drowning or the greatly feared but very rare phenomenon of an unprovoked shark attack.

Drowning is defined as a process of respiratory impairment due to submersion in water. Worldwide, drowning is the third-leading cause of death due to unintentional injury; an estimated 236,000 people die by drowning each year, accounting for about 7 percent of all injury-related deaths.⁵⁷ In the United States there are on average 3,960 unintentional drowning deaths.⁵⁶

Take every nonfatal drowning victim to a medical facility for a thorough evaluation, no matter how trivial the episode may have seemed. Nonfatal drownings can cause serious complications. Anyone who plans to go out on a boat or to participate in activities near a body of water should be familiar with the factors involved in drowning and with accepted rescue and resuscitation techniques. (See also “What Drowning Really Looks Like,” Q1 2020 *Alert Diver*, [DAN.org/alert-diver/article/what-drowning-really-looks-like](https://dan.org/alert-diver/article/what-drowning-really-looks-like)).

If drowning victims remain submerged, they eventually die from anoxia — a lack of oxygen. Drowning occurs in the following stages:

- Victims struggle to stay afloat while hyperventilating, which may result in negative buoyancy.
- Victims drop below the surface of the water and begin reflexively



(involuntarily) holding their breath. The urge to breathe becomes stronger and stronger as victims consume all the oxygen remaining in their lungs.

- After two to three minutes, the combination of lack of oxygen and accumulation of carbon dioxide results in an uncontrollable urge to breathe; victims eventually inhale water, though usually very little.
- Victims, though now unconscious, begin to reflexively swallow water. Consequently, some drowning victims have a stomach full of water.
- More carbon dioxide accumulates, and the urge to breathe becomes even stronger. Reflexive swallowing gives way to a strong, deep breath. With the lungs then emptied of all air, victims become more negatively buoyant.



Treatment of drowning depends on restoring the victim's breathing and heartbeat using CPR or basic life support (BLS) methods and promptly obtaining assistance from qualified medical personnel. Every second counts in recovery from drowning, and an onlooker's knowledge of CPR is often crucial.

If you are the only person present with a drowning victim and you don't know how to perform CPR, it is still beneficial to administer chest compressions. Using the heel of your hand on the center of the victim's chest, press down about 2 inches at a rate of about 100 compressions per minute, letting the chest rise fully after each compression. After every 30 compressions, stop to give two rescue breaths. For more information about performing CPR, see [Administering CPR](#) in Section 6.

Even if a drowning victim appears to recover, they should receive a medical evaluation because delayed pulmonary edema (accumulation of excess fluid in the lungs) is a frequent complication.

Risk factors for drowning include alcohol use near or in the water, medical conditions such as epilepsy and lack of familiarity with local water hazards and features. Prevention requires several measures. Everyone who participates in water-related activities or travels on small boats should wear a life jacket, avoid alcohol, learn CPR and never swim unattended.

The following sections list popular water-related activities and the injuries most commonly associated with them.



SNORKELING

Snorkeling is swimming while using a mask and snorkel and sometimes other equipment such as a wetsuit or fins. Snorkelers typically stay just below the water's surface, but they may make breath-hold dives to lower depths. In contrast to scuba diving, which is generally perceived as a risky activity that requires training and certification, snorkeling is considered harmless. As a result, most snorkelers do not receive proper training.

Most people get involved with the sport on an opportunistic basis without much planning or forethought. It is possible to start snorkeling on your own or through a resort recreation program. Such programs typically rent snorkeling equipment and take snorkelers to interesting areas but don't offer much instruction, assistance or emergency preparedness. A preparticipation health screening is rarely required or is conducted ad hoc by nonmedical personnel.

The major risk for snorkelers is drowning, which can occur due to sudden cardiac arrest, immersion pulmonary edema, hypoxic blackout, water inhalation, being struck by a watercraft, strong water movement from tides or currents, and other mishaps.

Table 10.
Incidence
of Water-
Related
Injuries

Injury	Annual Incidence in the U.S.	Annual Incidence Worldwide	Risk
Swimmer's ear (acute otitis externa) ⁵³	2.4 million cases		8.1 cases per 1,000 people (U.S.)
Shark attacks ⁵⁴	33 unprovoked attacks and 3 deaths (2020)	57 unprovoked attacks and 10 deaths (2020)	1 attack per 11.5 million beachgoers, 1 death per 264.1 million beachgoers (U.S.)
Recreational boating injuries ⁵⁵	2,559 injuries and 613 deaths (2019)		5.2 deaths per 100,000 registered recreational vessels (U.S.)
Drowning	3,960 deaths ⁵⁶	236,000 deaths ⁵⁷	



Sudden cardiac arrest and immersion pulmonary edema can affect any swimmer but are more likely to occur in older people and in people with preexisting medical conditions — especially hypertension (high blood pressure) and heart disease. For more information about cardiac health and water sports, see [DAN.org/health-medicine/health-resource/dive-medical-reference-books/the-heart-diving](https://www.dan.org/health-medicine/health-resource/dive-medical-reference-books/the-heart-diving).

Hypoxic blackout is a loss of consciousness due to lack of oxygen and can be caused by long breath-holding underwater. Average healthy young people can typically hold their breath for one to two minutes while resting on the surface; older people and those unaccustomed to physical activity generally have less breath-holding capability. Simultaneous exercise significantly reduces anyone's breath-holding capacity, because exertion causes the body's tissues to burn more oxygen. This means the duration of a breath-hold is much shorter while you are swimming underwater, especially if you are a weak or inefficient swimmer.

The warning sign that termination of a breath-hold should be imminent is an urge to breathe, which is caused by the accumulation of a critical level of carbon dioxide in the body. In some individuals, however, this urge can be very weak. It can also be postponed by repeated deep and fast breathing (hyperventilation) before submersion. Voluntary hyperventilation reduces the level of carbon dioxide in your blood far more than it adds oxygen.

As a consequence, it takes longer to reach a critical level of carbon dioxide — but during that extended time, your oxygen levels continue



to drop, and unconsciousness can occur without the natural warning sign. To reduce hypoxic blackout risk, snorkelers should not practice hyperventilation. Even in the best circumstances, limit hyperventilation to one or at most two deep breaths before submersion.

Water inhalation can occur due to difficulty holding the snorkel in place or due to wave action. Dental issues may also contribute to water inhalation. The sudden inhalation of water can cause coughing, uncontrolled breathing, laryngospasm (an involuntary spasm of the muscles that control the windpipe, or larynx), flooding of the lungs with water, or the development of cardiac arrhythmia — any of which can render a snorkeler unconscious and result in drowning.

Being struck by watercraft is not uncommon for snorkelers or swimmers in high-traffic areas. Snorkelers should stay within visibly marked protected areas and pay attention to the boat traffic around them.

Strong water movement such as waves or currents can also overcome snorkelers, sweep them out to sea, tow them under the surface or throw them onto rocks. Snorkelers should always seek information about local water conditions and hidden hazards. Novice snorkelers should not swim in remote and unpopulated areas.

SCUBA DIVING

Diving can be an inspiring and enjoyable recreational activity, but many disorders can afflict divers who don't take proper precautions. This guide will

briefly discuss the two primary conditions — decompression illness and barotrauma — plus a few other concerns. DAN offers numerous publications that cover dive-related disorders in considerable detail; for more information, see [DAN.org/health-medicine/health-resources](https://www.dan.org/health-medicine/health-resources).



Decompression illness (DCI): There are two forms of DCI: decompression sickness (DCS) and arterial gas embolism (AGE). DCS, also known as “the bends,” is one of the main hazards of compressed-gas diving. When a diver is breathing in an environment of elevated pressure, such as when scuba diving, inert gases such as nitrogen move into the body’s tissues and dissolve there. The body’s absorption of these inert gases, a process known as uptake, increases progressively with the dive’s depth and length. The longer a diver stays at depth, the more inert gases accumulate in the body. When the diver ascends toward the surface, the pressure decreases, and the gas starts to leave the body’s tissues. A diver’s ascent must be controlled to allow for the orderly elimination (or washout) of the accumulated gases as they’re transported by the blood to the lungs and exhaled. A slow ascent, conducted either continuously or in stages, usually allows for safe decompression, while a rapid ascent can result in the development of gas bubbles in the tissues and sometimes in symptoms of DCS.

DCS symptoms primarily reflect the effects of the gas bubbles in the affected tissues. The condition’s secondary effects can compromise the function of a broad range of tissues, further jeopardizing the affected diver’s health. Signs and symptoms of DCS include mild to moderate musculoskeletal pain and mild cutaneous (skin) sensory changes. More severe symptoms include neurological deficits (such as weakness in the lower extremities), an abnormal gait, paralysis, vertigo, altered mental function and cardiopulmonary instability. For more information about DCS, see [DAN.org/Health/Decompression](https://www.dan.org/Health/Decompression).

Characterized by rapidly advancing neurologic symptoms following a dive, AGE is often a consequence of a rapid ascent to the surface while deliberately holding the breath — something that may happen when a diver panics. Certain medical conditions that cause intrapulmonary air trapping (the retention of excess air in the lungs), such as asthma or chronic obstructive pulmonary disease, can also increase the risk of AGE.

The appearance of any of these symptoms following a dive should prompt immediate attention and a call for assistance — including a call to DAN.



Administer oxygen, check the victim's hydration status, and arrange for evacuation if needed.

Barotrauma: Barotrauma is an injury caused by a difference in pressure between the ambient environment — whether on the surface or underwater — and an air-filled space in the body such as the middle ears and the sinuses. It is possible to have barotrauma of the lungs when scuba diving; other barotraumas can occur both in scuba and in freediving. Most common barotraumas affect ears and sinuses, but there are rare cases of dental and gastrointestinal barotrauma.



Symptoms of barotrauma include vertigo (dizziness), respiratory distress and cardiovascular instability. Prevent barotrauma by performing proper equalization — adjustment of middle-ear or sinus pressure to the ambient pressure by any of several techniques that enable air passage into the middle-ear cavity and sinuses.

Other concerns: Scuba divers need to understand the effects on the body of the various gases involved in respiration.

- **Nitrogen:** Nitrogen narcosis, sometimes called “the martini effect,” can result from breathing nitrogen at the higher partial pressure of compressed air, which increases with increased depth. It is characterized by an altered mental state that has been likened to mild intoxication.
- **Carbon dioxide:** An elevated level of carbon dioxide in the body due to exertion, incomplete exhalation or breath-holding can result in dyspnea (difficulty breathing), headache or an altered level of consciousness.
- **Oxygen:** Hypoxia, or lack of oxygen, can cause loss of consciousness, while hyperoxia, or elevated oxygen levels, can result in seizures (acute oxygen toxicity). Elevated carbon dioxide levels, immersion or exercise can intensify the latter effect. It is important to pay strict attention to oxygen levels, especially at maximum diving depths.
- **Carbon monoxide:** Carbon monoxide — a highly poisonous, odorless, colorless gas — is a product of incomplete combustion that can be found



in exhaust from the engines of improperly ventilated boats, for example; it can occasionally be introduced into scuba tanks if they are carelessly filled. Symptoms of carbon monoxide poisoning initially include headache, nausea and fatigue and can progress to dizziness, seizures, respiratory arrest and even death. First aid should include the administration of supplemental oxygen.

Odor from a breathing gas can indicate a toxic compound. Immediately report any odors, no matter how faint, to a dive professional or the filling station.

It is also vital for divers to understand the implications of flying or driving to a high elevation soon after diving. The lower pressure in an aircraft cabin or at altitude may cause decompression illness in previously asymptomatic divers or worsen existing symptoms. Divers without any DCI symptoms can use the following guidelines for surface intervals before flying in an unpressurized aircraft at altitudes of 2,000 to 8,000 feet (610 to 2,438 meters) or in a pressurized aircraft cabin:

- A preflight surface interval of at least 12 hours following a single no-decompression-stop dive
- A preflight surface interval of at least 18 hours following multiple dives per day or multiple days of diving
- A preflight surface interval of at least 24 hours following dives that require decompression stops

These suggested preflight surface intervals do not guarantee that a diver will avoid DCI, but longer surface intervals will further reduce the risk.



Tips for Boating Safety

- Don't drink alcohol while boating.
- Turn on your emergency radio, and keep it on.
- Don't go faster than the speed limit.
- Make sure your boat is properly maintained.
- Don't overload your boat.
- Mind the weather.
- Use and wear Coast Guard-approved life jackets.
- Take a boating safety course.
- Know what to do in case of an emergency.



BOATING

Boating is a popular recreational activity. In 2019 there were an estimated 11.88 million registered vessels in the United States.⁵⁸ Most boats stay in domestic coastal or inland waters, but some sail abroad. Boating can involve hazards associated with the vessel itself as well as with the destination. Boaters also need to watch for swimmers and divers.

Boaters who undertake long, oceangoing voyages are most at risk because they may be isolated and out of reach of help in case of emergency. Boaters who anchor in remote destinations that are uninhabited or lack emergency medical services similarly need to be self-reliant. Such intrepid travelers must be ready to face emergencies that include a range of acute illnesses and injuries that threaten life, limb or function.

In 2019 the U.S. Coast Guard received reports of 4,168 boating accidents with 2,559 injuries and 613 deaths. The fatality rate is 5.2 deaths per 100,000 registered recreational vessels.⁵⁹ Table 11 lists some causes of recreational boating deaths in 2019.

Drowning caused 79 percent of these boating deaths; 86 percent of drowning victims were not wearing a life jacket, and 80 percent of the boaters who drowned were on a vessel less than 21 feet in length. Capsizing and falling overboard were common accidents that resulted



in death. Alcohol use was the leading known contributing factor in fatal boating accidents and was identified in 23 percent of the deaths. Other contributing factors included operator inattention, improper lookout, operator inexperience and excessive speed.⁶¹

Rank	Cause of Death	Number of Deaths
1	Drowning	439
2	Trauma	92
3	Cardiac arrest	17
4	Carbon monoxide	5
5	Hypothermia	4

Source: U.S. Department of Homeland Security and U.S. Coast Guard⁶⁰

Table 11. Causes of Death Among U.S. Recreational Boaters, 2019

If an emergency occurs during offshore sailing, it is important to have some means of communication with other vessels or the shore to alert rescuers. Sometimes it is impossible to establish a connection, however, reducing the chance of rescue. In such cases, survival at sea depends on many factors, and any search and rescue must start as soon as possible. Many boaters file “float plans” just as pilots file flight plans. Float plans are not filed with

the Coast Guard or its equivalent in other countries but rather with a friend or relative so that person knows where to start searching if anything should happen while a boat is at sea.

Boaters must be well prepared and equipped for a range of medical emergencies. DAN offers a suite of first aid courses and a variety of medical kits appropriate for boating. For offshore sailing, boaters must meet international regulations as well as country-specific requirements at all their ports of call and at their final destination. For more information, call DAN (+1-919-684-2948) or a boating organization.



Contents of a Float Plan

- WHERE the boat is launching and its proposed route
- WHEN it will leave and return
- WHO is aboard

When boaters return to their home port, they should notify the person with whom they filed their float plan.





BEACHGOING

Despite their often pristine look, beaches can harbor several health hazards — especially those that are popular, in densely populated areas or in developing countries. Walking barefoot on a beach, for example, may expose you to injuries from washed-ashore debris, needles used by drug addicts, pet waste, and parasitic, bacterial or viral infections.

Swimming may present other hazards. Water pollution typically increases after big rains due to sewage backups and spills into coastal waters, leading to increased concentrations of disease-causing bacteria that may be swallowed with seawater. Many viruses, bacteria and other microbes can survive for some time in seawater, so avoid swimming after a big rain. There's no guarantee that clear-looking water is sanitary, but the risks are more significant if the water looks murky.

The spectrum of possible swimming diseases includes hepatitis, diarrhea, Legionnaire's disease, swimmer's ear, *Vibrio vulnificus*, conjunctivitis and even methicillin-resistant *Staphylococcus aureus* (MRSA). Soft-tissue infections with *Vibrio vulnificus* are also possible and can be fatal in certain cases.

If you plan to spend time at a beach, especially if you plan to swim, visit the CDC's Healthy Swimming website at [cdc.gov/healthywater/swimming](https://www.cdc.gov/healthywater/swimming) to learn about the germs where we swim, how these germs could make us



sick and how to protect yourself and others. The website also provides the following information:

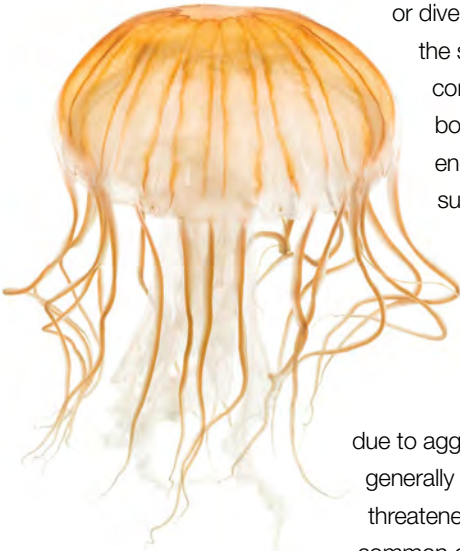
- **Health benefits of water-based exercise:** Did you know swimming can improve your health — and your mood?
- **How to swim healthy:** Learn how to protect yourself and others before getting in the water.
- **Recreational water illnesses:** Did you know chlorine and other disinfectants don't instantly kill all germs?
- **Drowning, injury and sun protection:** Understand how to avoid injuries.
- **Oceans, lakes and rivers:** Learn how to stay healthy when visiting natural bodies of water.

MARINE ANIMAL INJURIES

The sea is filled with creatures that may appear harmless, but some are capable of wounding, poisoning or even killing an unlucky swimmer or diver. Despite the extreme rarity of serious shark attacks, the shark is the most well-known of marine perils. Far more common but less well-known are tiny animals armed with both defensive and offensive weapons that are potent enough to cause human injury. The best protection against such injuries is a healthy respect for these animals. When in doubt, keep your distance.

Most marine animal injuries are the result of a chance encounter (such as swimming inadvertently into a jellyfish) or a defensive maneuver by the animal (such as a stingray wound). Injuries are rarely due to aggressive action on the animal's part. Marine animals are generally harmless unless they're either deliberately or accidentally threatened or disturbed. When wounds occur, they share many common characteristics despite differing in type and severity.

Such wounds are nearly always contaminated with bacteria, frequently with foreign bodies and occasionally with venom.



Swimmers and divers who are concerned about marine animal injuries can lessen their risk of an adverse encounter by showing respect for the undersea environment and knowing the damage that humans can do — and have done — to living marine organisms. Most divers are now aware of these issues and use personal diving techniques that respect the sea and its living creatures. “Look but don’t touch” is the most conservative and considerate approach.



If a marine animal injury occurs, identification of the animal responsible is helpful. Symptoms may not appear until hours after the contact, however, or you may not have seen or recognized the animal at the time of the injury. As a result, treatment must frequently be based on the presentation of the injury, and careful examination of the wound’s characteristics may indicate the most likely cause.

Avoiding contact with marine animals is key, which sounds simple, but it may be more difficult if you have poor buoyancy control or visibility or are in a confined area, experiencing currents or coping with other environmental limitations. The following tips can help you minimize the chance of a hazardous marine life encounter or simply one that might damage the environment:

- Do not attempt to handle, tease, feed or annoy any marine animal.
- Do not explore a crevice with your hand; a concealed animal might try to defend itself.
- Strive to develop excellent buoyancy control, and remain aware of your surroundings.
- Do not allow a current to force you against a fixed object; it may be covered with marine animals.
- Wear protective clothing.
- Research animals you may encounter and learn about their characteristics and habitats before beginning the dive.

Several publications cover in detail both the identification of marine life that can be hazardous to divers and the management of injuries that may follow



encounters with such animals. For more information, see [DAN.org/Health/Hazardous-Marine-Life](https://www.dan.org/Health/Hazardous-Marine-Life). The ability to recognize and identify animals commonly encountered at a chosen dive site will add to the pleasure of a dive and help divers avoid animals that could inflict harm. Some useful guides include the following:

- *A Medical Guide to Hazardous Marine Life*, 3rd ed. Auerbach PS. Best Publishing, 1997.
- *Auerbach's Wilderness Medicine*, 7th ed. Auerbach PS. Elsevier, 2017.
- *Dangerous Marine Creatures*. Edmonds C. Best Publishing, 1995.
- Marine Animal Injuries. Edmonds C. in *Bove and Davis' Diving Medicine*, 4th ed. Bove AA, Davis J, eds. Saunders, 2004; pp. 287-318.
- *Medicine for the Outdoors*, 6th ed. Auerbach PS. Saunders, 2015.
- *Pisces Guide to Venomous and Toxic Marine Life of the World*. Cunningham P, Goetz P. Pisces Books, 1996.

sea snake
(poisonous)
crawling along
the ocean
shore



SECTION 6

KEY FIRST AID PRINCIPLES

Prevention is better than treatment for travel-related injuries and illnesses, but sometimes it is impossible to avoid an untoward event, no matter how careful you are. In such cases, the next-best approach is preparation and ensuring that you have sufficient training and knowledge, given the places you plan to visit.

The following are some first aid skills, strategies and principles that travelers should know.





ESSENTIAL SKILLS

Travelers, especially those who engage in outdoor pursuits in remote areas, may need to stabilize and deliver care to an injured companion before medical assistance arrives. Major medical publications provide instruction in greater detail, but the following text provides a distillation of the essential points.

PROVIDING FIRST AID

The following are the key steps for helping individuals who have been injured but are still responsive (conscious and aware):

- Maintain and/or assist with airway control.
- Control severe bleeding.
- Prevent shock or administer treatment for it.

Individuals who are breathing but unresponsive should be assumed to be in respiratory failure (respiratory insufficiency) — that is, having an inadequate exchange of oxygen for carbon dioxide. For these individuals, immediately do the following:

- Protect their airway.
- Carefully monitor them to determine if they require artificial respiration such as CPR.

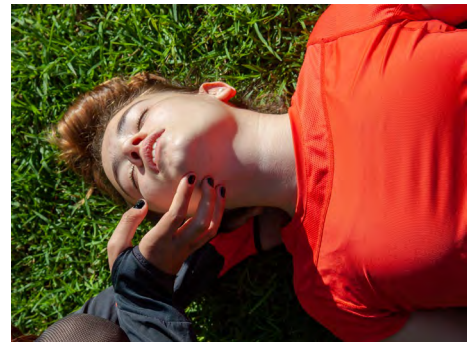
If individuals are unresponsive and show no signs of life — no breathing, movement or response to an attempt to rouse them — immediately start chest compressions. Anyone can safely perform CPR, with or without training.



ADMINISTERING CPR

For individuals who are unresponsive and not breathing, the crucial priority is to reestablish their circulation. The American Heart Association (AHA) uses the mnemonic “CAB” in its CPR guidelines as a reminder for the most effective order of steps for administering CPR: compressions, airway and breathing.

- **Compressions:** Push hard and fast on the center of the victim’s chest. Using the heel of your hand, press down about 2 inches at a rate of at least 100 compressions per minute (more than one per second), letting the chest rise fully after each compression. After every 30 compressions, give two rescue breaths.
- **Airway:** Tilt back the victim’s head and lift the chin to open the airway.
- **Breathing:** Give mouth-to-mouth rescue breaths. Pinch shut the victim’s nose, cover his or her mouth with your mouth, and blow until you see the chest rise. Give two breaths, taking about one second for each breath. Then administer another 30 chest compressions. Minimize delay between compressions and rescue breaths. CPR **barrier masks** and **devices** are available to provide protection when delivering rescue breaths.



Anyone, regardless of training, can safely perform chest compressions, now often called hands-only CPR. As the AHA says, “Any attempt at CPR is better than no attempt.” Learn more about hands-only CPR at [CPR.Heart.org/En/CPR-Courses-and-Kits/Hands-Only-CPR](https://www.heart.org/en/cpr/courses-and-kits/hands-only-cpr).



Although administering chest compressions and/or rescue breathing in a remote location can be difficult, if a victim is in cardiac arrest, continue chest compressions with minimal interruption until the following occurs:

- The victim's circulation has been restored and they are moving, breathing and speaking normally.
- Emergency medical care is available.
- Those present are unable to continue due to exhaustion or conditions that place them at risk.
- Reliable criteria indicates irreversible death is present.
 - The victim has not been restored to spontaneous circulation after three full rounds of CPR and automated external defibrillator (AED) analysis. An AED is a device that analyzes the heart's rhythm and, if appropriate, delivers a shock to try to restore its normal rhythm.
 - Three consecutive AED analyses have resulted in no shocks.
 - Advanced life support (ALS), if available, has been administered but has not resulted in spontaneous circulation restoration.



For more information about CPR and current AHA guidelines, see [cpr.heart.org](https://www.cpr.heart.org).

Learning the full CPR procedures is not difficult, but it requires training and practice with qualified instructors. This guide is not a substitute for such instruction. Even if you have had CPR training, review your course manual's basic steps before a trip, especially if you'll be going to a remote area. Consider taking a refresher course to ensure your skills are current.





RESCUING DIVERS AND SWIMMERS

Use this information only to supplement skills and knowledge obtained in a formal training course. Do not attempt to rescue injured or distressed divers or swimmers or provide emergency oxygen without formal training.

PERFORMING A WATER RESCUE

Early recognition and response are critical to a successful outcome in any water rescue. The following are the recommended procedures for making a rescue.

- Ensure your own safety and the safety of the injured swimmer or diver. Be aware of high-risk conditions such as strong currents or tides, limited visibility and hazardous marine life.
- Provide assistance from the surface or shore without entering the water if possible. Try throwing the victim a line, a flotation device or even a small watercraft — all of these items are safer for the rescuer than attempting an in-water rescue.
- Rescues that require in-water assistance can be complicated and typically require knowledge and skills beyond the scope of this guide. The following points, however, highlight a few fundamentals of in-water rescues.
 - Solicit topside assistance from observers.
 - Enlist bystanders to help spot and track the victim's position.
 - Summon help from emergency medical services or the coast guard.



- Equip the rescuer with appropriate personal safety equipment such as fins, a mask, a snorkel and floatation gear. A rescuer needs to be properly equipped to safely and effectively perform a rescue.
- Assess the distressed swimmer, and communicate with them if possible; this will dictate the following:
 - the rescuer's manner of approaching the swimmer
 - the need for physical contact with the swimmer
- Gain control of the situation through verbal communication and/or physical contact with the swimmer.
 - Avoid unnecessary physical contact with the swimmer. If they can understand and follow commands, it is sometimes possible to talk someone through a self-rescue.
 - Remember that making physical contact with a panic-stricken diver or swimmer can put the rescuer at significant risk.
- Establish positive buoyancy.
 - Remove any weight belts and/or drop any heavy loads.
 - Inflate both the rescuer's and the distressed diver's buoyancy compensators.
- Transfer the swimmer or diver to a boat or the shore while ensuring the following:
 - the airway is protected
 - everyone maintains positive buoyancy
 - the rescuer remains in control
 - topside support is ready to assist as necessary
- Begin CPR and rescue breathing, if necessary, as soon as the victim is on a stable surface. Administering CPR in the water is ineffective and will only delay the victim's extrication from the water.

In general, safe and effective in-water rescues require a degree of skill that can be achieved only through proper training. Numerous organizations offer such courses.





ADMINISTERING EMERGENCY OXYGEN

Respiratory arrest, cardiac arrest, drowning and many dive-related injuries interrupt or impair the cardiovascular system's ability to supply oxygen to the body's tissues. In such cases, it is important to administer supplemental oxygen. Victims of dive injuries should receive the highest possible oxygen concentration available. Providing emergency oxygen first aid for injured divers is one of the most important measures to take before professional medical care and hyperbaric treatment are available.

The first step is to assess the diver's breathing status and then determine the oxygen delivery device that will provide the highest concentration of oxygen possible in the circumstances.

- For breathing injured divers, use one of the following devices:
 - a **nonbreather mask** with a minimum oxygen flow rate of 15 liters per minute (L/min)
 - a **demand inhalator valve** with an oronasal mask or intraoral mask (Recent research shows that a demand valve with an intraoral mask provides the highest tissue and inspired oxygen levels and is easiest to use.^{62,63,64})
 - any other oxygen delivery device capable of providing high concentrations of oxygen, such as a closed-circuit oxygen rebreather
- For nonbreathing injured divers, use an **ornasal resuscitation mask** (also referred to as a DAN mask) with a minimum oxygen flow rate of 15 L/min.



Any of the devices provides great value in supporting dive activity in remote areas, where long delays in reaching definitive medical aid are likely.



The next step is to properly position the diver to facilitate delivery of CPR and oxygen first aid. The appropriate position depends on the diver's condition.

- Place injured divers who are responsive (able to communicate) in either the recovery position (on one side with their head supported) or a semirecumbent position (comfortably reclining).
- Place injured divers who are unresponsive but still breathing in the recovery position (on either side with their head supported) to help maintain an open airway and to reduce the likelihood that they will aspirate vomitus in their lungs.
- Place injured divers who are unresponsive and not breathing in a supine position (on their back, face up) so rescuers can perform CPR.

The use of supplemental oxygen should always take place within the context of basic life support (BLS) procedures and should not delay lifesaving techniques such as CPR. DAN highly recommends formal training in administering oxygen first aid, and the information in this guide is not a substitute for such training. For information about training near you, see [DAN.org/education-events/instructor-led-courses](https://www.dan.org/education-events/instructor-led-courses). Keep in mind that oxygen is a prescription drug in many countries and that the improper handling and maintenance of oxygen equipment can cause serious injury, including death, to both victims and rescuers.

Be aware of the following when using supplemental oxygen on private boats:

- Be sure you have enough oxygen on board to allow for transporting an injured diver from the farthest dive site to the nearest emergency medical services.
- Oxygen first aid is not a substitute for definitive care by a trained health care provider.
- Do not overlook the priority of monitoring the victim's circulation, airway and breathing while providing emergency oxygen.



COMMON MEDICAL EMERGENCIES

If your travels are primarily to urban areas in developed countries, you may not need to self-treat anything more complex than a hangnail or a headache. If your travels take you to wilderness settings, remote rural areas or developing countries — out of easy reach of definitive medical care — consider bringing with you a practical book about common medical problems and emergencies. For a list of reliable travel medical guides, see [Resources](#) in Section 1.

The following are a few issues that may arise when you are traveling.



ABDOMINAL OR PELVIC PAIN

Pain in the abdomen or pelvis may be a simple stomachache, or it can indicate a significant underlying problem — especially if it is associated with prolonged pain, hypotension (low blood pressure), fever, rigidity of the abdominal wall or bleeding within the gastrointestinal system. Among the diagnoses to consider are a ruptured bowel, diverticulitis (an inflammation within the intestine or colon), appendicitis, kidney stones, ulcers or a bowel obstruction.

Evacuation to a medical facility may be necessary to diagnose and treat the underlying condition.

If there will be a considerable delay in arranging for evacuation, it is important to pay close attention to the patient's hydration status. It might be necessary to administer a course of antibiotics.

DISLOCATED JOINT

Dislocation of a large joint, such as a shoulder, hip or jaw, can be caused by a variety of trauma as well as relatively minor forces. A dislocation can cause intense pain, swelling, bruising, numbness and instability of the affected joint. In cases of an apparent dislocation, it is essential to check



for neurovascular compromise — to see if the dislocated joint has pinched a nerve or blood vessel.

There are several effective methods for relocating joints, depending on which joint is affected; adventure enthusiasts should become familiar with them. A successful relocation is usually possible in the field and typically results in pain relief and even improved neurovascular symptoms.

GASTROINTESTINAL BLEEDING

Gastrointestinal (GI) bleeding is a relatively common, potentially life-threatening disease with an overall mortality rate of up to 10 percent.^{65,66,67} It is usually classified as either upper GI bleeding — which tends to originate in the esophagus, stomach or first part of the intestines — or lower GI bleeding — which usually originates in the distal small intestines or colon or from brisk bleeding in the upper GI tract.

The most common causes of upper GI bleeding include gastritis, peptic ulcers, esophageal tears from vomiting, varices and abnormal blood vessels. Lower GI bleeds can be from hemorrhoids, diverticulosis, tumors, abnormal blood vessels and brisk bleeding in the upper GI tract.

The most common symptoms of upper GI bleeding include chest or abdominal pain, vomiting blood, weakness, shortness of breath, nausea, dark tarry stools and red blood in the stool. Doctors can typically diagnose an upper GI bleed based on the person's medical history and a physical examination, laboratory testing and an upper endoscopy (a camera placed into the stomach through the mouth).

Symptoms of lower GI bleeding include dark, red blood in the stools, abdominal pain, rectal pain or bleeding, change in bowel patterns, nausea, weakness and malaise. Severe bleeding may lead to shock. Doctors can typically diagnose a lower GI bleed through a physical examination, laboratory testing, CT scans and an endoscopy (a camera placed into the rectum to determine the source of bleeding). Patients with severe bleeding may need both an upper and lower endoscopy or tagged red blood cell scans to determine the source of the bleeding.





Treatment is based on the cause of the bleeding. All patients with significant bleeding will need a full evaluation to determine the severity of bleeding and to treat any reversible causes. Significant bleeding requires resuscitation with intravenous fluids and possible blood products depending on severity. People

who take blood thinners would require reversal of anticoagulation. Most patients with significant bleeding will need to be admitted to the hospital to find and treat the source.

To help prevent GI bleeds, continue taking any prescribed antacids, proton-pump inhibitors (PPIs) and antihistamines, and avoid consuming alcohol and tobacco. While there is no definitive data to determine which type of diet is best for patients who are prone to GI bleeding, it may be best to avoid foods that cause upset stomach.

HEADACHE

Everyone is likely to have a headache at some time. Headaches may be relatively mild and transient or crushing and long-lasting. They are a very vague manifestation and can be caused by a wide array of conditions or situations ranging from psychological stress or mild dehydration to migraine, a stroke or a brain tumor. The most common causes of headaches in travelers are stress, fatigue and dehydration. Other possibilities to consider are caffeine withdrawal, sinus abnormalities and carbon dioxide retention (especially in divers). Headache can also be associated with decompression illness, but it is usually not the leading symptom, and it is not enough alone to consider DCI.

Symptoms that may indicate a serious underlying condition include accompanying neurological abnormalities and continuous vomiting. A stiff neck and a fever accompanying a headache can signal meningitis. A severe, sudden-onset headache — often described as “the worst headache of my life” — can





signal intracranial bleeding (bleeding in the brain). A headache that increases slowly over time with neurological symptoms can indicate an intracranial mass (brain tumor).

For information about conducting a field neurological examination, see [Neurological Assessments](#) later in this section.

HEART ATTACK

A heart attack, also known as a myocardial infarction (MI), is an interruption in blood flow to the heart and is usually caused by a clot lodging in the coronary arteries, which supply the heart with blood. The most common symptoms of a heart attack are chest pain or discomfort, shortness of breath and discomfort radiating to the arms, back, neck, jaw or other parts of the upper body. Other symptoms can include nausea, dizziness

and a cold sweat. Women may experience different symptoms — often vaguer and/or milder.



An MI should be suspected in anyone who experiences such symptoms, especially people who have risk factors such as hypertension (high blood pressure), hyperlipidemia (high cholesterol), obesity, diabetes, a personal or family history of MI or a history of smoking. Individuals with any of those risk factors should get a thorough cardiac evaluation before traveling because access to good, timely care is difficult or impossible in some locations.

When an MI is suspected, especially in people experiencing shortness of breath, immediate medical evaluation at the closest medical facility could be lifesaving. If available, consider administering supplemental oxygen; if the person is not allergic to aspirin and hasn't been told they shouldn't take it, one could offer them 324 milligrams of aspirin. Cardiac patients who have been prescribed nitroglycerin to treat angina (chest pain caused by a reduction in the flow of blood to the heart) can consider taking one or more doses of that drug as needed. Patients who have been prescribed an anticoagulant (a drug



that reduces the blood's tendency to clot) or a beta blocker (a class of drugs used to treat angina, high blood pressure and heart rhythm disturbances) should take such medications if they haven't already done so.

Place any such patients in a comfortable, supine position (flat on their back, face up), with their head elevated if congestive heart failure is a concern. Then plan to evacuate the patient to the nearest medical treatment facility.

STROKE

A stroke is an interruption in blood flow to the brain, usually caused by a clot lodging in the cerebrovascular system, and it typically manifests itself through a variety of neurological abnormalities. A stroke's symptoms can be as mild as subtle changes in mental capability or as marked as paralysis of one side of the body (hemiplegia), blindness or loss of consciousness. For information about conducting a field neurological examination, see **Neurological Assessments** later in this section.

Prompt evacuation to a medical facility, preferably one with expertise in treating strokes, is essential. The recommended therapy varies depending on the cause of the stroke. If the affected individual did any recent diving, be sure to mention the possibility of decompression illness to all medical personnel.



TOOTHACHE

Dental trauma, an infection of the teeth or gums, or an infection of the sinus cavities are possible causes of toothaches. Trauma can result from a direct blow to the mouth as well as from barotrauma due to a differential in pressure between the ambient environment when diving and the gas-filled space in a tooth with a cavity.

A dislodged tooth can often be reimplanted; see instructions at [AAE.org/patients/dental-symptoms/knocked-out-teeth](https://www.aae.org/patients/dental-symptoms/knocked-out-teeth). If the cause of a toothache is an infection or abscess, antibiotic treatment may be required. If a toothache



is accompanied by swelling and rapidly expanding pain, consider it an emergency since it may result in obstruction of the airway in severe cases.

URINARY TRACT INFECTIONS

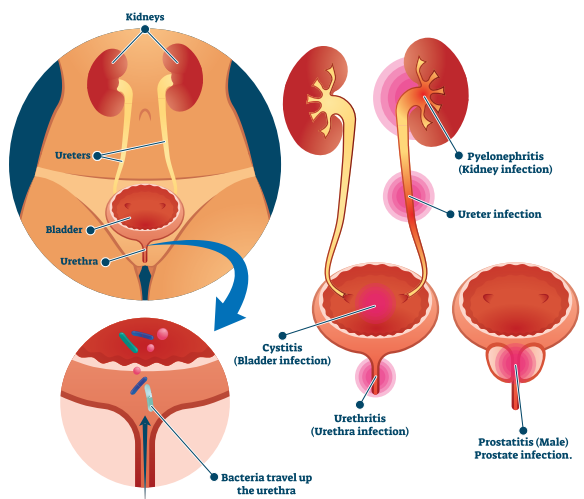
The urinary tract is composed of the kidneys, the ureters, the urinary bladder and the urethra. Urinary tract infections (UTIs) are quite common, affecting 150 million people worldwide each year.⁶⁸ This condition is usually self-diagnosable, although lab tests and imaging are sometimes required, and definitive treatment involves prescription antibiotic drugs.

UTIs are rare in children and are more common in women than men. Women have much shorter urethras than men, which makes their urinary tracts more susceptible to bacterial infection.

The upper urinary tract consists of the kidneys and ureters, while the lower urinary tract consists of the urinary bladder and the urethra.

- Upper UTIs usually affect the kidneys (pyelonephritis is an infection of the kidney itself and the “renal pelvis”), which can cause fever, nausea, vomiting and other severe symptoms.
- Lower UTIs involve the bladder (cystitis) and the urethra (urethritis).

Symptoms of UTI usually involve a variable degree of pain in the pelvic area and an increased urge to urinate. Symptoms sometimes involve pain or a burning sensation during urination (dysuria), and there may or may not be dark-colored urine or traces of blood in the urine. It is



also quite common for people to feel they cannot empty their bladder after urination. Signs and symptoms of upper UTI may also include lower back pain, cramping, nausea, vomiting and fever.

If a UTI is suspected, it is important to seek medical care and maintain adequate hydration. Prescription antibiotics are necessary to definitively treat a UTI, but maintaining a good flow of urine all through the urinary tract may help to displace some bacteria and prevent the infection from spreading before you can reach a doctor.

UTIs are so common that any medical doctor should be able to diagnose and treat it regardless of their specialty or your location. Treatment typically consists of a course of oral antibiotics, but a neglected UTI may become complicated and require hospitalization if you delay care.



WOUNDS

Stop bleeding by applying steady, direct pressure to a wound. Once bleeding has slowed or stopped, clean the wound of debris and generously irrigate it — preferably with saline solution or some other sterile liquid, especially if the wound will be closed.

There are a variety of methods for closing wounds, including butterfly bandages (Steri-Strips), topical adhesives, staples and sutures. Some experts recommend loose closure of a wound to allow for drainage in case an infection develops during the healing process. Depending on the circumstances, it is also worth considering a prophylactic (preventive) tetanus booster and antibiotics to forestall infection.

Hand injuries can be particularly serious, because long-term functional impairment can result from some wounds. Injuries near joints, tendons and nerves are also of particular concern and may warrant consultation with a specialist as soon as possible.



NEUROLOGICAL ASSESSMENTS

If you spend a lot of time in remote areas, you may eventually need to conduct a neurological assessment of a traveling companion. Knowing how to conduct neurological assessments is especially useful for divers because dive-related maladies such as decompression illness can often have neurological manifestations.

The following links are aimed primarily at divers, but much of the information is also relevant to nondiving situations.

FIELD NEUROLOGY FOR DIVERS

An article titled “Field Neurology for Divers” published in DAN’s *Alert Diver* magazine contains detailed advice on conducting a neurological exam in the field. Read the article at [DAN.org/alert-diver/article/field-neurology-for-divers](https://dan.org/alert-diver/article/field-neurology-for-divers).

A video showing how to conduct a neurological assessment is available at youtu.be/NUzwPOeyI74.

NEUROLOGICAL ASSESSMENT COURSE

DAN offers a course in conducting neurological assessments that divers and other travelers may find useful. For more information, see [DAN.org/education-events/instructor-led-courses](https://dan.org/education-events/instructor-led-courses).



SECTION 7

ASSEMBLING A TRAVEL MEDICAL KIT

A sound base of knowledge will be the most powerful item in your travel medical kit, but it is also important to bring certain supplies and equipment with you. The farther from emergency medical services or definitive medical care you plan to travel, the more well-equipped your medical kit should be.

The following are some items to consider including in your kit. This isn't a comprehensive list, and these items are just suggestions. Customize your travel medical kit based on where you plan to travel and your health status.



MEDICATIONS

- regular prescription medications
- special prescriptions for traveling
 - medication to prevent malaria if necessary
 - antibiotic prescribed by your doctor for self-treatment of moderate to severe diarrhea
 - EpiPen if you have training in its use
- over-the-counter medications for traveling
 - antidiarrheal such as bismuth subsalicylate (Pepto-Bismol) or loperamide (Imodium)
 - antihistamine such as diphenhydramine (Benadryl) or loratadine (Claritin)
 - decongestant to take alone or in combination with an antihistamine
 - motion sickness medication
 - saline eye drops
- over-the-counter medications used regularly at home
 - medication for pain or fever such as acetaminophen (Tylenol), ibuprofen (Advil) or aspirin
 - mild laxative
 - cough suppressant, alone or in combination with an expectorant
 - cough drops
 - antacid such as calcium carbonate (Tums)
 - antifungal ointment or cream
 - antibacterial ointment or cream
 - 1% hydrocortisone cream
- water purification tablets





PROTECTIVE ITEMS

- insect repellent containing DEET (30 to 50 percent solution) or picaridin (up to 15 percent solution)
- sunscreen (preferably SPF 15 or greater and safe for the environment) with both UVA and UVB protection
- antibacterial hand wipes or an alcohol-based hand sanitizer containing at least 60 percent alcohol
- lubricating eye drops
- ear plugs
- personal protective equipment such as face masks and nitrile gloves
- personal safety equipment appropriate for your plans, such as helmets, car safety seats, protective glasses, work gloves, etc.

FIRST AID SUPPLIES

- first aid quick-reference card
- basic first aid items such as various-sized bandages, gauze, elastic bandage, antiseptic, tweezers, scissors and cotton-tipped swabs
- moleskin for blisters
- butterfly bandages (Steri-Strips) for loose wound closures
- aloe gel for sunburns
- digital thermometer
- oral rehydration solution packets

OTHER ITEMS

- mild sedative or other sleep aid such as melatonin
- gloves, preferably sterile
- medication to prevent altitude sickness
- splinting material for extremity injuries
- commercial suture and/or syringe kits (for use by a local health care provider; these items will require a letter on your prescribing physician's letterhead)
- latex condoms



DOCUMENTS

Travelers should carry the following documents with them at all times and also leave copies of them with a family member or close friend at home in case of an emergency:

- proof of vaccination on an International Certificate of Vaccination or Prophylaxis (ICVP) card or a medical waiver if specific vaccinations are required at your destination(s)
- copies of the prescriptions for all your medications, eyeglasses and/or contact lenses, and any other prescription medical supplies; include the generic names of medications in English and if possible translated into the language of your destination(s)
- documentation of any preexisting conditions such as diabetes or allergies in English and if possible translated into the language of your destination(s)
- proof of your health insurance coverage, supplemental travel health insurance, medical evacuation insurance and travel insurance; carry contact information for all insurance providers as well as copies of claim forms
- a contact card that you carry on your person at all times, which includes street addresses, phone numbers and email addresses for the following:
 - a family member or close friend who will remain at home
 - health care provider(s) at home
 - where you will be staying at your destination(s)
 - hospitals or clinics and emergency medical services at your destination(s)
 - U.S. embassy or consulate at your destination(s)

REFERENCE BOOKS

For a list of suggested titles, see [Resources](#) in Section 1.



APPENDIX PREPARTICIPATION SCREENING QUESTIONNAIRE

To quickly assess your need for medical evaluation, use the preparticipation screening questionnaire below. It is of utmost importance to be honest with yourself when it comes to the conditions and symptoms in the questionnaire. Remember, you hold the key to your safe participation in physical exercise or scuba diving.



Section 1: History

Do you have a history of any of the following?

- heart attack
- heart surgery
- cardiac catheterization
- coronary angioplasty (PCI)
- pacemaker/implantable cardiac defibrillator/rhythm disturbance
- heart valve disease
- heart failure
- heart transplantation
- congenital heart disease

Do you experience any of the following?

- chest discomfort with exertion
- unreasonable breathlessness
- dizziness, fainting, blackouts

Mark any of the following statements that apply:

- You have musculoskeletal problems.
- You have concerns about the safety of exercise.
- You take heart medications.
- You take prescription medication(s).
- You are pregnant.

If any of the statements in Section 1 apply to you, consult your health care provider before engaging in exercise. You may need to use an exercise facility staffed with medically qualified personnel.



Section 2: Cardiovascular risk factors

Mark any of the following statements that apply:

- You are a man older than 45.
- You are a woman older than 55 or you have had a hysterectomy or are postmenopausal.
- You smoke.
- Your blood pressure is greater than 140/90 or you do not know your blood pressure.
- You take blood pressure medication.
- Your cholesterol level is greater than 240mg/dl or you do not know your cholesterol level.
- You have a close relative who had a heart attack before age 55 (father or brother) or 65 (mother or sister).
- You have diabetes or take medicine to control your blood sugar.
- You are physically inactive (i.e., you get less than 0 minutes of physical activity at least three days each week).
- You are more than 20 pounds overweight.

If any two or more of the statements in Section 2 apply, consult your health care provider before engaging in exercise. You might benefit from using a facility with a professionally qualified staff to guide your exercise program.

If none of the above statements in Section 1 and 2 are applicable, you should be able to exercise safely in almost any facility that meets your exercise program needs without consulting your health care provider.

Adopted from Balady GJ, et al. Recommendations for Cardiovascular Screening, Staffing, and Emergency Policies at Health/Fitness Facilities. *Circulation* 1998; 97:2283-2293. doi.org/10.1161/01.CIR.97.22.2283



ACRONYMS AND ABBREVIATIONS

The following are among the acronyms and abbreviations that you may encounter in this guide as well as in other publications regarding travelers' health. See the [glossary](#) for definitions of these and other terms.

AED: automated external defibrillator

AGE: arterial gas embolism

AIDS: acquired immunodeficiency syndrome

ALS: advanced life support

AMS: acute mountain sickness

BLS: basic life support

CAGE: cerebral arterial gas embolism

CDC: Centers for Disease Control and Prevention (U.S.)

CPR: cardiopulmonary resuscitation

DAN: Divers Alert Network

DCI: decompression illness

DCS: decompression sickness

DEET: N,N-diethyl-meta-toluamide (an insect repellent)

DVT: deep vein thrombosis

EMS: emergency medical services

ENT: ear, nose and throat

fsw: feet of seawater

HELP: heat-escape-lessening position

HIV: human immunodeficiency virus

IDDM: insulin-dependent diabetes mellitus

msw: meters of seawater

NOAA: National Oceanic and Atmospheric Administration (U.S.)

ORS: oral rehydrating solution/salt

OSHA: Occupational Safety and Health Administration (U.S.)

PPD: purified protein derivative (a tuberculosis skin test)

TB: tuberculosis

TD: travelers' diarrhea

UHMS: Undersea and Hyperbaric Medical Society

WHO: World Health Organization



GLOSSARY

The following are definitions of some terms you may encounter while researching travel-related health matters.

afterdrop: a continued decline in the body's core temperature, even after a hypothermic patient has been warmed

alternobaric vertigo: extreme dizziness and disorientation resulting from unequal pressure in the left and right middle ears (Failure to equalize symmetrically, typically during ascent after a dive, can cause the brain to erroneously perceive the difference as movement.)

alveoli: the tiny air sacs in the lungs where gas exchange (intake of oxygen and elimination of carbon dioxide) takes place

antihistamine: a drug that inhibits natural compounds called histamines, which are released by the body's cells during allergic and inflammatory responses (Antihistamines are typically used to treat allergies and colds; some can cause drowsiness.)

arterial gas embolism (AGE): a condition in which dissolved gases come out of solution and form bubbles in the arterial circulatory system (AGE is often caused by a sudden reduction in ambient pressure, such as during a rapid ascent without exhalation. The organ most often affected is the brain, although AGE can also affect the lungs or other organs. Typical signs and symptoms include a rapid onset of stroke-like symptoms within 15 minutes of reaching the surface.)

barotrauma: any injury, typically of the ears or lungs, caused by a differential between the ambient pressure and the pressure in a gas-filled space in the body (If gas is trapped in a closed space, it will be compressed if the ambient pressure increases — such as during the descent phase of a dive — and will expand if the ambient pressure decreases — such as during ascent. Barotrauma injuries of descent include ear squeeze, tympanic membrane rupture and sinus squeeze. Injuries of ascent include pulmonary barotrauma, which can result in air embolism, pneumothorax and pneumomediastinum.)



carbon dioxide: an odorless, colorless gas produced as a waste product by the metabolism of oxygen in the body's cells; returned to the lungs through the venous blood system and then exhaled

carbon monoxide: a highly poisonous, odorless, colorless gas that's a product of incomplete combustion (Carbon monoxide is toxic when inhaled because it competes with oxygen in binding to hemoglobin in the blood, resulting in diminished availability of oxygen for the body's tissues.)

cardiac arrest: a sudden though sometimes temporary cessation of the heart's function; also known as cardiopulmonary arrest; see also *heart attack* (It results in immediate cessation of the heartbeat, blood circulation and, unless reversed, breathing and consciousness. Cardiac arrest, which is different from a heart attack, is often caused by a disturbance in the heart's electrical system.)

conjunctival suffusion: redness of the conjunctiva, the mucous membrane that covers the eye; often caused by infection with bacteria of the *Leptospira* genus

coronary thrombosis: a blockage in the flow of blood to the heart due to a blood clot in one of the coronary arteries that supply the heart with blood; see also *heart attack*

cyanosis: a bluish discoloration of the skin and the body's mucous membranes due to inadequate oxygenation of the blood

decompression illness (DCI): a broad term that encompasses both decompression sickness (DCS) and arterial gas embolism (AGE); commonly used to describe any systemic disease caused by a reduction in ambient pressure (The signs and symptoms of DCS and AGE can be similar, and recompression is the treatment for both.)

decompression sickness (DCS): a syndrome caused by inert gases coming out of solution in the body and forming bubbles in the tissues and the bloodstream during or after a sudden ascent from a compressed-gas dive; also referred to as "the bends" (Symptoms may include itching, rash, joint pain, muscle aches or sensory changes such as numbness and tingling. More serious symptoms include muscle



weakness, paralysis or disorders of the higher cerebral functions, including memory and personality changes.)

dehydration: depletion of the body's water reserves to a level below normal, caused by giving off more water — through excretion, breathing or sweating — than is taken in (Mild dehydration may go unnoticed; more severe dehydration can cause dizziness, rapid heartbeat and low blood pressure.)

edema: an accumulation of excess fluid in any of the body's tissues or cavities

heart attack: a sudden blockage of the flow of blood within the heart, usually due to a blood clot in one of the coronary arteries; also known as a myocardial infarction (A heart attack often results in damage to the heart muscle and can be fatal.)

hyperoxia: excessive oxygen supply to the body

hyperthermia: a condition in which the body's core temperature is elevated above normal; effects range from edema to syncope and can be seen beginning at 104°F (40°C)

hypoglycemia: a condition in which one's blood glucose (blood sugar) is lower than normal

hypothermia: a condition in which the body's core temperature drops below normal; effects range from shivering and fatigue to hallucinations and loss of consciousness and can be seen beginning at 95°F (35°C)

hypoxia: an inadequate supply of oxygen to the body tissues

initial assessment: a first responder's initial evaluation of ill or injured patients, especially of their breathing and circulation, to evaluate any immediate threats to their lives

liters per minute (L/min): a unit used to measure the flow rate of a gas or liquid

mediastinal emphysema: a condition characterized by gas bubbles trapped within the mediastinum; usually the result of pulmonary barotrauma



but can also occur as a result of perforation of the esophagus, stomach or intestine; also known as pneumomediastinum; see also *mediastinum*

mediastinum: a membranous partition between two cavities in the body or two parts of an organ; most often refers to a space within the chest located between the lungs and containing the heart, the major blood vessels, the trachea (windpipe) and the esophagus

myalgia: muscle pain

myocardial infarction: see *heart attack*

no-decompression dive: a dive after which direct ascent to the surface at a rate of 30 to 60 feet (9 to 18 meters) of seawater per minute is allowed at any time during the dive without a decompression stop; also called a no-stop dive

nystagmus: involuntary, rapid, rhythmic movement of the eyes; can be a symptom of certain pressure-related disorders

oxygen: a colorless, odorless gas essential to life; makes up approximately 21 percent of the Earth's atmosphere at sea level

oxygen toxicity: a condition caused by breathing oxygen at a pressure greater than normal atmospheric pressure, such as from a diver's compressed-air tank; primarily affects the central nervous system and the lungs (The latter effects, known as pulmonary oxygen toxicity, are caused by inflammation of the lung tissue, resulting in shortness of breath, cough and a reduced ability to perform exercise.)

parenteral: introduced into the body by a means other than through the mouth and digestive tract, such as by an injection

pneumomediastinum: see *mediastinal emphysema*

pneumothorax: the presence of air or other gases in the chest cavity, outside the lungs; can cause the collapse of one or both lungs

pulmonary edema: an accumulation of excess fluid in the lungs



pulmonary overexpansion: abnormal distension or enlargement of the lungs; can be a complication of breathing compressed air while diving as well as of receiving supplemental oxygen therapy; can cause rupture of the alveoli and penetration of gas into surrounding spaces, causing mediastinal emphysema, pneumothorax or an arterial gas embolism; see also **alveoli**, *arterial gas embolism*, *mediastinal emphysema* and *pneumothorax*

rapid ascent: an ascent rate fast enough to put a diver at risk of decompression illness — usually a rate of more than 60 feet (18 meters) of seawater per minute

recovery position: a first aid technique for positioning patients who are unconscious or injured but breathing to help keep their airway clear if they begin to vomit; placement is lying on their side and leaning slightly forward in what is also called a semiprone or a three-quarters prone position

respiratory arrest: the cessation of normal breathing, often caused by cardiac arrest; see also *cardiac arrest* (Once breathing ceases, the body is no longer taking in oxygen for delivery to the body's tissues. If the condition isn't reversed in a few minutes, it results in unconsciousness and death.)

sign: an objective indication of illness or injury, such as temperature or pulse, that can be detected by a doctor

supine: lying flat on the back, face up

symptom: a subjective indication of illness or injury, such as pain or fatigue, that can be detected by a patient

syncope: fainting or a temporary loss of consciousness



ENDNOTES

1. Angelo KM, Kozarsky PE, Ryan ET, Chen LH, Sotir MJ. What proportion of international travelers acquire a travel-related illness? A review of the literature. *Journal of Travel Medicine* 2017; 24(5). doi.org/10.1093/jtm/tax046
2. Buss I, Genton B, D'Acremont V. Aetiology of fever in returning travellers and migrants: a systematic review and meta-analysis. *Journal of Travel Medicine* 2020; 27(8). doi.org/10.1093/jtm/taaa207
3. Leder K, Torresi J, Libman MD, Cramer JP, Castelli F, Schlagenhaut P, et al. GeoSentinel surveillance of illness in returned travelers, 2007-2011. *Annals of Internal Medicine* 2013; 158(6):456-68. doi.org/10.7326/0003-4819-158-6-201303190-00005
4. Haggmann SHF, Han PV, Stauffer WM, Miller AO, Connor BA, Hale DC, et al. Travel-associated disease among US residents visiting U.S. GeoSentinel clinics after return from international travel. *Family Practice* 2014, 31(6):678-687. doi.org/10.1093/fampra/cmu063
5. Wu Y, Liu M, Wang J, Zhang H, Sun Y, Yuan Y, et al. Epidemiology of imported infectious diseases, China, 2014-18. *Journal of Travel Medicine* 2020; 27(8). doi.org/10.1093/jtm/taaa211
6. Rack J, Wichmann O, Kamara B, Günther M, Cramer J, Schönfeld C, et al. Risk and spectrum of diseases in travelers to popular tourist destinations. *Journal of Travel Medicine* 2005; 12(5):248-53. doi.org/10.2310/7060.2005.12502
7. Liew CH, Flaherty GT. Experiences and Attitudes of International Travelers with Cardiovascular Disease: A Qualitative Analysis. *American Journal of Tropical Medicine and Hygiene* 2020; 102(3):689-697. doi.org/10.4269/ajtmh.19-0793
8. Guse CE, Cortés LM, Hargarten SW, Hennes HM. Fatal injuries of US citizens abroad. *Journal of Travel Medicine* 2007; 14(5):279-287. doi.org/10.1111/j.1708-8305.2007.00133.x



9. Parker EM, Sauber-Schatz EK, Sleet DA, Ballesteros MF. Injury and trauma. In: GW Brunette and JB Nemhauser, eds. *CDC Yellow Book 2020: Health Information for International Travel*. Oxford University Press, 2019. wwwnc.cdc.gov/travel/yellowbook/2020/noninfectious-health-risks/injury-and-trauma
10. Tonellato DJ, Guse CE, Hargarten SW. Injury deaths of US citizens abroad: new data source, old travel problem. *Journal of Travel Medicine* 2009; 16(5):304-310. doi.org/10.1111/j.1708-8305.2009.00318.x
11. Hu JS, Smith JK. In-flight Medical Emergencies. *American Family Physician* 2021; 103(9):547-552. www.binasss.sa.cr/mayo2021/3.pdf
12. Sauber-Schatz EK, Parker EM, Sleet DA, Ballesteros MF. Road and Traffic Safety. In: GW Brunette and JB Nemhauser, eds. *CDC Yellow Book 2020: Health Information for International Travel*. Oxford University Press, 2019. wwwnc.cdc.gov/travel/yellowbook/2020/travel-by-air-land-sea/road-and-traffic-safety
13. Road Safety: Don't Wreck Your Vacation. U.S. Centers for Disease Control and Prevention. Updated: January 8, 2018; accessed: July 11, 2021. wwwnc.cdc.gov/travel/page/road-safety
14. Boating Fatality Facts. American Boating Association. Accessed June 4, 2021. americanboating.org/boating_fatality.asp
15. American Boating Association, americanboating.org/boating_fatality.asp
16. What the Department of State Can and Can't Do in a Crisis. U.S. Department of State. Updated: April 7, 2020; accessed July 11, 2021. travel.state.gov/content/travel/en/international-travel/emergencies/what-state-dept-can-cant-do-crisis.html
17. Eynan M, Biram A, Mullokandov M, et al. The transition from day-to-night activity is a risk factor for the development of CNS oxygen toxicity in the diurnal fat sand rat (*Psammomys obesus*). *Chronobiology International* 2017; 34(5):578-586. doi.org/10.1080/07420528.2017.1281822



18. Stern RM, Jokerst MD, Muth ER, Hollis C. Acupressure relieves the symptoms of motion sickness and reduces abnormal gastric activity. *Alternative Therapies in Health and Medicine* 2001; Jul-Aug; 7(4):91-4. PMID: 11452572.
19. Koch A, Cascorbi I, Westhofen M, Dafotakis M, Klapa S, Kuhtz-Buschbeck JP. The neurophysiology and treatment of motion sickness. *Deutsches Ärzteblatt International* 2018; 115:687-96. doi.org/10.3238/arztebl.2018.0687
20. Jarisch R, Weyer D, Ehlert E, et al. Impact of oral vitamin C on histamine levels and seasickness. *Journal of Vestibular Research* 2014; 24(4):281-88. doi.org/10.3233/VES-140509.
21. Diarrhoeal disease. World Health Organization. Updated May 2, 2017; accessed July 8, 2021. [who.int/news-room/fact-sheets/detail/diarrhoeal-disease](https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease)
22. Dadonaite B, Ritchie H, Roser M. Diarrheal diseases. Our World in Data. Updated November 2019; accessed July 8, 2021. ourworldindata.org/diarrheal-diseases
23. Forum of International Respiratory Societies. *The Global Impact of Respiratory Disease*, second ed. European Respiratory Society, 2017. [who.int/gard/publications/The_Global_Impact_of_Respiratory_Disease.pdf](https://www.who.int/gard/publications/The_Global_Impact_of_Respiratory_Disease.pdf)
24. Malaria. World Health Organization. Updated April 1, 2021; accessed June 8, 2021. [who.int/news-room/fact-sheets/detail/malaria](https://www.who.int/news-room/fact-sheets/detail/malaria)
25. About Dengue: What You Need to Know. U.S. Centers for Disease Control and Prevention. Updated May 3, 2019; accessed June 9, 2021. [cdc.gov/dengue/about/index.html](https://www.cdc.gov/dengue/about/index.html)
26. Schistosomiasis. World Health Organization. Updated May 18, 2021; accessed August 14, 2021. [who.int/news-room/fact-sheets/detail/schistosomiasis](https://www.who.int/news-room/fact-sheets/detail/schistosomiasis)
27. World Health Organization Coronavirus (COVID-19) Dashboard. Updated September 13, 2021; accessed September 13, 2021. covid19.who.int



28. COVID Data Tracker. U.S. Centers for Disease Control and Prevention. Updated September 12, 2021; accessed September 13, 2021. covid.cdc.gov/covid-data-tracker
29. Lymphatic filariasis. World Health Organization. Updated May 18, 2021; accessed August 14, 2021. who.int/news-room/fact-sheets/detail/lymphatic-filariasis
30. Onchocerciasis. World Health Organization. Updated June 14, 2019; accessed August 14, 2021. who.int/news-room/fact-sheets/detail/onchocerciasis
31. Torres-Guerrero E, Quintanilla-Cedillo MR, Ruiz-Esmenjaud J, Arenas R. Leishmaniasis: a review. *F1000 Research*. 2017 May 26; 6:750. doi: 10.12688/f1000research.11120.1. ncbi.nlm.nih.gov/pmc/articles/PMC5464238
32. Chagas disease (also known as American trypanosomiasis). World Health Organization. Updated April 1, 2021; accessed August 14, 2021. [who.int/news-room/fact-sheets/detail/chagas-disease-\(american-trypanosomiasis\)](https://who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis))
33. Yellow Fever. U.S. Centers for Disease Control and Prevention. Updated September 14, 2018; accessed August 14, 2021. cdc.gov/globalhealth/newsroom/topics/yellowfever/index.html
34. Trypanosomiasis, human African (sleeping sickness). World Health Organization. Updated May 18, 2021; accessed August 14, 2021. [who.int/news-room/fact-sheets/detail/trypanosomiasis-human-african-\(sleeping-sickness\)](https://who.int/news-room/fact-sheets/detail/trypanosomiasis-human-african-(sleeping-sickness))
35. How many people get Lyme disease? U.S. Centers for Disease Control and Prevention. Updated January 13, 2021; accessed August 14, 2021. cdc.gov/lyme/stats/humancases.html
36. Vector-borne Diseases. World Health Organization. Updated March 2, 2020; accessed June 10, 2021. who.int/news-room/fact-sheets/detail/vector-borne-diseases



37. Cholera. World Health Organization. Updated Feb. 5, 2021; accessed June 10, 2021. [who.int/news-room/fact-sheets/detail/cholera](https://www.who.int/news-room/fact-sheets/detail/cholera)
38. Measles. World Health Organization. Updated Dec. 5, 2019; accessed June 17, 2021. [who.int/news-room/fact-sheets/detail/measles](https://www.who.int/news-room/fact-sheets/detail/measles)
39. About Dengue: What You Need to Know. U.S. Centers for Disease Control and Prevention. Updated May 3, 2019; accessed June 18, 2021. [cdc.gov/dengue/about/index.html](https://www.cdc.gov/dengue/about/index.html)
40. Methicillin-resistant *Staphylococcus aureus*: Healthcare Settings. U.S. Centers for Disease Control and Prevention. Updated Feb. 28, 2019; accessed June 21, 2021. [cdc.gov/mrsa/healthcare/index.html](https://www.cdc.gov/mrsa/healthcare/index.html)
41. Kourtis AP, Hatfield K, Baggs J, et al. Vital Signs: Epidemiology and Recent Trends in Methicillin-Resistant and in Methicillin-Susceptible *Staphylococcus aureus* Bloodstream Infections — United States. *Morbidity and Mortality Weekly Report (MMWR)* 2019; 68(9):214–219. Accessed June 21, 2021. dx.doi.org/10.15585/mmwr.mm6809e1
42. Middle East Respiratory Syndrome (MERS). U.S. Centers for Disease Control and Prevention. Updated Aug. 2, 2019; accessed June 21, 2021. [cdc.gov/coronavirus/mers/about/index.html](https://www.cdc.gov/coronavirus/mers/about/index.html)
43. Fact Sheet 2021. UNAIDS. Accessed June 21, 2021. [unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf](https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf)
44. Hernia Surgical Mesh Implants. U.S. Food and Drug Administration. Updated Feb. 4, 2018; accessed June 24, 2021. [fda.gov/medical-devices/implants-and-prosthetics/hernia-surgical-mesh-implants](https://www.fda.gov/medical-devices/implants-and-prosthetics/hernia-surgical-mesh-implants)
45. Inguinal Hernia. Cleveland Clinic. Updated Sept. 27, 2018; accessed June 24, 2021. my.clevelandclinic.org/health/diseases/16266-inguinal-hernia
46. Diabetes. World Health Organization. Updated April 13, 2021; accessed June 24, 2021. [who.int/news-room/fact-sheets/detail/diabetes](https://www.who.int/news-room/fact-sheets/detail/diabetes)
47. National Diabetes Statistics Report, 2020. U.S. Centers for Disease Control and Prevention. Updated Aug. 28, 2020; accessed June 23, 2021. [cdc.gov/diabetes/data/statistics-report/index.html](https://www.cdc.gov/diabetes/data/statistics-report/index.html)



48. Statistics About Diabetes. American Diabetes Association. Accessed June 24, 2021. diabetes.org/resources/statistics/statistics-about-diabetes
49. National Weather Service Lightning Fatalities in 2020. Accessed July 2, 2021. weather.gov/safety/lightning-fatalities20
50. Holle RL. The Number of Documented Global Lightning Fatalities. 24th International Lightning Detection Conference and 6th International Lightning Meteorology Conference, San Diego, Calif., April 18-21, 2016. Accessed: July 2, 2021. vaisala.com/sites/default/files/documents/Ron%20Holle.%20Number%20of%20Documented%20Global%20Lightning%20Fatalities.pdf
51. How Dangerous Is Lightning? National Weather Service. Accessed: July 2, 2021. weather.gov/safety/lightning-odds
52. Sunburn. National Cancer Institute Cancer Trends Progress Report. Updated: July 2021; accessed: July 7, 2021. progressreport.cancer.gov/prevention/sunburn
53. Hygiene-Related Diseases. U.S. Centers for Disease Control and Prevention. Updated: Aug. 2, 2016; accessed July 7, 2021. cdc.gov/healthywater/hygiene/disease/swimmers_ear.html
54. Yearly Worldwide Shark Attack Summary. Florida Museum of Natural History International Shark Attack File. Updated January 2021; accessed June 9, 2021. floridamuseum.ufl.edu/shark-attacks/yearly-worldwide-summary/
55. American Boating Association, americanboating.org/boating_fatality.asp
56. Drowning Facts. U.S. Centers for Disease Control and Prevention. Updated June 17, 2021; accessed July 7, 2021. cdc.gov/homeandrecreationalafety/water-safety/waterinjuries-factsheet.html
57. Drowning. World Health Organization. Updated April 27, 2021; accessed June 9, 2021. who.int/news-room/fact-sheets/detail/drowning



58. American Boating Association, americanboating.org/boating_fatality.asp
59. American Boating Association, americanboating.org/boating_fatality.asp
60. 2019 Recreational Boating Statistics. Table 1. U.S. Department of Homeland Security and U.S. Coast Guard, June 4, 2020. uscgboating.org/library/accident-statistics/Recreational-Boating-Statistics-2019.pdf
61. American Boating Association, americanboating.org/boating_fatality.asp
62. Blake DF, Pollock N. Evaluating oxygen delivery with a demand valve. *Alert Diver*, Q4 Fall 2019. DAN.org/alert-diver/article/evaluating-oxygen-delivery-with-a-demand-valve/
63. Blake DF, Naidoo P, Brown LH, Young D, Lippmann J. A comparison of the tissue oxygenation achieved using different oxygen delivery devices and flow rates. *Diving and Hyperbaric Medicine* 2015; 45(2):79-83.
64. Blake DF, Crowe M, Lindsay D, Brouff A, Mitchell SJ, Pollock NW. Comparison of tissue oxygenation achieved breathing oxygen from a demand valve with four different mask configurations. *Diving and Hyperbaric Medicine* 2018; 48(4):209-17.
65. Wilcox CM, Cryer BL, Henk HJ, Zarotsky V, Zlateva G. Mortality associated with gastrointestinal bleeding events: Comparing short-term clinical outcomes of patients hospitalized for upper GI bleeding and acute myocardial infarction in a US managed care setting. *Clinical and Experimental Gastroenterology* 2009; 2:21–30. doi.org/10.2147/CEG.S4936
66. National Clinical Guideline Centre (UK). Acute upper gastrointestinal bleeding: management. NICE Clinical Guidelines, No. 141. London: Royal College of Physicians, 2012 June. ncbi.nlm.nih.gov/books/NBK247794/pdf/Bookshelf_NBK247794.pdf



67. Balaban DV, Strâmbu V, Florea BG, Cazan AR, Brătucu M, Jinga M. Predictors for in-hospital mortality and need for clinical intervention in upper GI bleeding: a 5-year observational study. *Chirurgia (Bucur)*. 2014 Jan-Feb; 109(1):48-54. PMID: 24524470. pubmed.ncbi.nlm.nih.gov/24524470
68. Flores-Mireles AL, Walker JN, Caparon M, Hultgren SJ. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature Reviews Microbiology* 2015; 13:269-284. doi.org/10.1038/nrmicro3432





6 West Colony Place
Durham NC 27705 USA

CUSTOMER SERVICE

+1 (919) 684-2948

DAN EMERGENCY HOTLINE

+1 (919) 684-9111

WEBSITE

DAN.org

EMAIL

member@dan.org

EXPLORE WITH DAN



Divers Alert Network



[@diversalertnetwork](https://www.instagram.com/diversalertnetwork)



[@DANGlobalSafety](https://twitter.com/DANGlobalSafety)



[DiversAlertNetworkTV](https://www.youtube.com/DiversAlertNetworkTV)

