

Diving Medical Information Sheet

The purpose of the diving medical is to assess the medical risks of diving and to communicate these to the candidate, diver or legal guardian. This includes assessment of both general risks related to compression and breathing compressed gases, and specific risks relating to the health of each individual.

The main risks associated with diving are related to the effects of pressure on the diver from the surrounding water. For every 10 metres of depth, the ambient pressure increases by 1 atmosphere.

Figure 1 demonstrates the relationship between increasing pressure as diving depth increases. Note that the actual lung volume does not change as depth increases, because the pressure within the lungs is equal to ambient pressure during continuous breathing. Whereas a balloon will continue to shrink as the depth increases due to compression from the surrounding water.

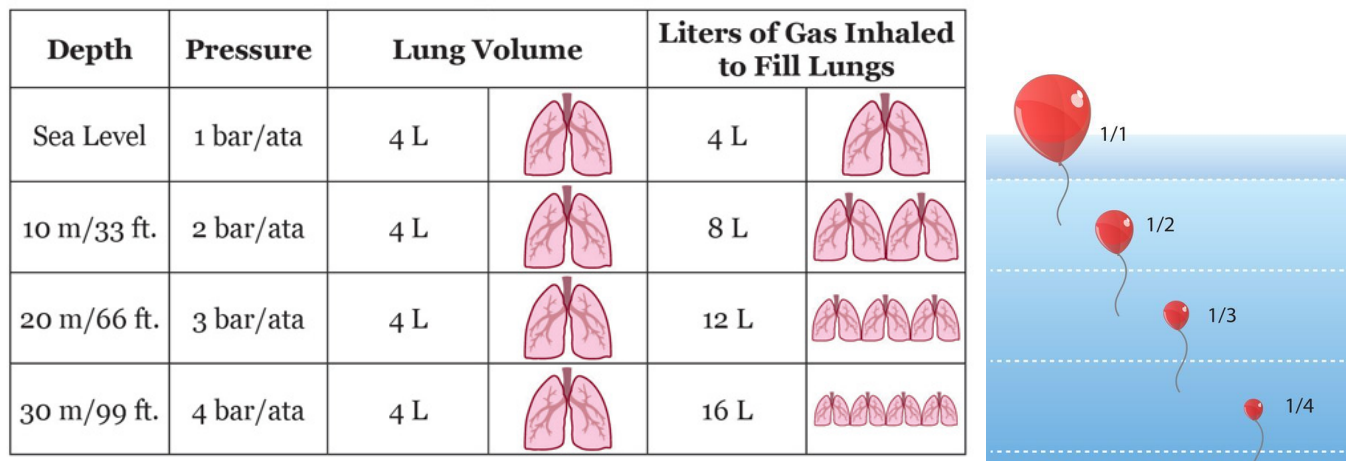


Figure 1. Relationship between pressure and gas volume with increasing depth (Sources: www.scubadiver-ed.com, www.50ftbelow.com)

Air contained within the SCUBA tank is delivered to the diver through a regulator, which reduces the pressure from the tank to match the ambient pressure. As a result, the pressure of gas breathed into the lungs and airways will be equal to ambient pressure. This leads to more gas dissolved in the body, which is the basis for complications such as oxygen toxicity, nitrogen narcosis and decompression illness.

Medical Issues Associated with Diving

a) Decompression Illness (DCI)

Breathing air under pressure causes excess inert gas (usually nitrogen) to dissolve in and saturate body tissues. The amount of gas dissolved is proportional to, and increases with, the depth and time a diver is below the surface. DCI can occur if you ascend from deep water to the surface too quickly. Your body releases nitrogen gas that forms bubbles in your bloodstream. The bubbles can damage your body tissues and block blood vessels.

Decompression illness can affect your lungs, inner ear, skin, joints, brain, and spinal cord. Symptoms include chest pain, joint pain, trouble breathing, bladder problems, confusion or paralysis. Flying after scuba diving can precipitate or worsen this condition.

DCI can occur even in divers who have carefully followed the standard decompression tables and the principles of safe diving.

b) Barotrauma

Barotrauma is an injury to soft tissues resulting from a pressure differential between an airspace in the body and the pressure of the surrounding environment. The resulting expansion or contraction of gas within the space can cause injury. There are several types of barotrauma:

Ears and sinus barotrauma

- Ear barotrauma is the most common injury in divers and usually occurs on descent when ambient pressure exceeds the air pressure in the middle ear to an extent which causes injury or even rupture to the eardrum. To avoid this, divers must learn proper equalisation techniques.
- Paranasal sinuses, because of their relatively narrow connecting passageways, are also susceptible to barotrauma on descent. This risk is increased in the presence of a recent cold, hay fever or sinus infection.

Pulmonary barotrauma

- Pulmonary barotrauma (barotrauma to the lungs) can occur from improper breathing during ascent or in the presence of a recent cold or chest infection. During ascent, compressed gas trapped in the lung increases in volume until the expansion exceeds the elastic limit of lung tissue, causing damage and allowing gas bubbles to escape into space surrounding the lungs, heart and airways.
- Symptoms of pulmonary barotrauma include chest pain, shortness of breath, voice hoarseness and loss of consciousness.

Arterial Gas Embolism (AGE)

- If gas bubbles from pulmonary barotrauma enter the blood vessels, these gas bubbles can then travel into the body tissues, including the heart and brain. Symptoms can range from dizziness, confusion, trouble speaking, and numbness to more extreme symptoms such as loss of vision or hearing, seizures, or paralysis.

c) *Nitrogen narcosis*

Due to breathing compressed air, the amount of nitrogen dissolved in the blood increases at greater depths. This can lead to nitrogen narcosis in divers due to the effect of nitrogen on the brain. This can be life threatening due to resultant mental impairment that this can cause and is one of the reasons that divers are advised to always dive with a buddy. Nitrogen narcosis quickly clears on ascent and is not seen on the surface after a dive.

d) *Oxygen toxicity*

At increasing depths, levels of oxygen in the blood become high enough to cause seizures. This is not commonly seen when diving on air at recreational depth limits.

e) *Dangerous Marine Animals*

Oceans and waterways are filled with marine animals, most of which are generally harmless unless threatened. Most injuries sustained by divers are the result of chance encounters or marine animals trying to escape. Resulting wounds can lead to bacterial infection, foreign bodies, and occasionally envenomation.

f) *Dehydration*

Dehydration can occur through several different ways during diving. Diving can be physically strenuous and divers often don't realise how much they're actually sweating inside their wetsuits. Breathing compressed air also leads to dehydration as the dry air needs to be warmed and humidified by the lungs. Every time a breath is taken from a compressed air tank, water is lost from the body.

Dehydration predisposes divers to decompression illness and can be exacerbated by current or recent illness, alcohol, sunburn and seasickness.

g) *Immersion pulmonary oedema*

The effect of increased ambient pressure experienced during diving can lead to increased blood pressure within the blood vessels of the lungs, causing fluid to build up in the lungs. Symptoms of pulmonary oedema usually begin on descent or at depth and include chest pain, shortness of breath, wheezing, and a moist frothy cough.

h) Exacerbation of existing medical conditions

Not only does the impact of diving on existing medical conditions need to be considered, but also the risks of complications from these conditions occurring while diving. For example, a seizure in a diver with epilepsy that occurs during a dive is significantly more dangerous than one that occurs on land.

Examples of conditions that can be dangerous in diving include:

- Asthma and other lung diseases
- Epilepsy
- Heart disease
- Diabetes
- Anxiety
- Poor vision
- Ear, nose and sinus problems
- Pregnancy
- Recent surgery

It is because of these potential complications that a medical assessment for fitness to dive should consider both the general risks associated with diving and also specific risks related to the health status of the individual diver.

i) Drowning

As diving is carried out in a non-respirable environment, any loss of consciousness or incapacitation is likely to result in drowning.

Good rules to follow for safe diving

- Obey all instructions from your dive master.
- Never dive without a buddy.
- Never dive if you have a cold or are congested in your ears or nose.
- Always plan your dive, and always dive your plan.
- Check your diving equipment to make sure it works. Use the right gear that can handle your planned dive.
- Do not drink alcohol or take drugs before diving.
- Become familiar with the underwater area and its dangers. Learn which fish, coral, and other hazards you should avoid to prevent injury. Be aware of local tides and currents.
- At depth, stay inside the parameters of the dive tables and computer. This information helps you avoid decompression sickness.
- As you descend, make sure you equalise your ears and mask.
- Never hold your breath while ascending. Your ascent should be slow and your breathing should be normal.
- Never panic underwater. If you become confused or afraid during a dive, stop, try to relax, and think through the problem. Ask for help from your dive buddy or dive master.
- Cave diving is very dangerous. Only divers with proper training and equipment should attempt it.
- If you don't feel well or if you are in pain after diving, go to the nearest emergency room right away.
- Do not fly for 12 hours after a no-decompression dive, even in a pressurised aeroplane. If your dive required decompression stops, don't fly for at least 24 hours.

If you or a dive buddy has an accident while diving, call the Divers Alert Network (DAN) on 1800-088 200 (toll free within Australia). Doctors, nurses, and emergency technicians are available 24 hours a day. They will answer your questions and provide help.

If needed, they will direct you to the nearest hyperbaric chamber or appropriate medical facility.