潜水员医疗健康 | 参加者问卷

休闲水肺潜水和自由潜水都需要良好的身心健康。下面表格中列出的医疗健康状况在潜水时可能会带来危险和伤害，对于已经存在或可能存在这些医疗健康状况的人，应该由医生进行医疗评估检查。本潜水员医疗健康参加者问卷包括最基本的信息以协助判断你是否需要就医进行医疗评估检查。如果你对有关你的潜水健康状况有疑虑但未在本问卷中提及，请在潜水前咨询你的医生。如果你感觉生病了，不要潜水。如果你认为你可能患有传染性疾病，为了保护你自己和他人不要参加任何潜水培训或潜水活动。 本表格中提到的“潜水”包括休闲水肺潜水和自由潜水。本表格主要的设计目的是给新潜水员进行初始的医疗检查，但是也同样适用于潜水员进行进阶教育培训。为了你和其他同你一起潜水的人的安全，务必如实回答以下所有问题。

说明指引

完成本问卷是参加休闲水肺潜水活动和自由潜水活动的先决条件。女性请注意：
如果你已经怀孕，或计划怀孕中，请不要潜水。

1. 我的肺部/呼吸系统、心脏及/或血液曾经布过又或是现在仍然有问题继而影响了我正常的身体或精神表现。	是 ☐ *去到栏目 A*	否 ☐
2. 我已经超过45岁。	是 ☐ *去到栏目 B*	否 ☐
3. 我完成中等强度运动很吃力（比如连续在14分钟内步行1.6公里/1英里或游泳200米/码）或我在过去12个月内因为身体状况或健康原因不能参加普通的体能活动。	是 ☐*	否 ☐
4. 我的眼睛、耳朵、或鼻腔/鼻窦存在问题。	是 ☐ *去到栏目 C*	否 ☐
5. 我在过去12个月做过手术，既往手术给我留下了持续存在的后遗症。	是 ☐*	否 ☐
6. 我曾有过意识丧失、偏头痛、癫痫、中风、严重头部损伤，或患有持续性的神经损伤或疾病。	是 ☐ *去到栏目 D*	否 ☐
7. 由于心理问题，人格障碍，恐慌发作，或毒品和酒精成瘾，我现在正在接受治疗（或在过去5年内因为上述问题接受过治疗）；或我被确诊有学习或发展障碍。	是 ☐ *去到栏目 E*	否 ☐
8. 我有背部健康问题、疝气、溃疡或糖尿病。	是 ☐ *去到栏目 F*	否 ☐
9. 我有胃肠问题，包括最近的腹泻。	是 ☐ *去到栏目 G*	否 ☐
10.我正在服用处方药（不包含避孕药或除甲氟喹以外的抗疟疾药物。	是 ☐*	否 ☐

参加者签名

如果 对于以上10个问题的回答都是“否”，则不需要进行医疗评估检查。请你阅读以下的参加者声明，并签字和填写日期，以表示你同意。

参加者声明：我如实地回答了所有问题，并确认我愿意承担因我回答问题不准确或没有公开披露任何我现有或过去的健康状况而导致的任何后果。

参加者签名（如果未成年，须由参加者家长/监护人签名）　　日期（日/月/年）

参加者姓名（正楷）　　生日（日/月/年）

教练姓名（正楷）　　机构名称（正楷）

* 对于问题3、5或10，**如果你的回答为*是* 或** 第二页的任何问题**回答为*是*，** 请阅读以上的参加者声明，并签字和填写日期以表示你已同意*然后* **携带本问卷的所有三页（包括参加者问卷和医生评估表）去见你的医生**进行医疗评估检查。 参加潜水课程必须要有医生的书面同意。

© 2020

参加者姓名 _____ 生日 _____

(正楷) 日期 （日/月/年）

潜水员医疗健康 | 参加者问卷续

栏目 A - 我有/我有过：		
胸部手术，心脏手术，心脏瓣膜手术，植入式医疗装置（例如支架、起搏器、神经刺激器，气胸，和/或慢性肺病。	是 ☐*	否 ☐
哮喘，哮鸣，严重过敏，花粉症或呼吸道阻塞有在最近的12个月内且限制了我的身体活动/锻炼。	是 ☐*	否 ☐
存在心脏有关问题或疾病，例如：心绞痛，劳累性胸痛，心力衰竭，浸入性肺水肿，心脏病发作或中风。或者因任意心脏疾病正在服用药物。	是 ☐*	否 ☐
在最近的12个月内有复发性支气管炎和持续咳嗽症状，或被诊断患有肺气肿。	是 ☐*	否 ☐
在过去 30 天内出现影响我的肺部、呼吸、心脏和/或血液的症状，这些症状会损害我的身体或精神表现。	是 ☐*	否 ☐

栏目 B - 我已超过45岁并且：		
我目前有吸烟或者通过其方式吸入尼古丁。	是 ☐*	否 ☐
我的胆固醇水平高。	是 ☐*	否 ☐
我有高血压。	是 ☐*	否 ☐
我有一个直系血缘亲戚50岁之前突然死于心脏病或中风，或在50岁之前我的家族有心脏病史（包括心律失常，冠心病或原发性心肌病）。	是 ☐*	否 ☐

栏目C-我有/我有过：		
在最近6个月内接受过鼻窦手术。	是 ☐*	否 ☐
耳部疾病或耳朵手术、听力丧失、或身体平衡问题。	是 ☐*	否 ☐
在最近的12个月内曾患有复发性鼻窦炎。	是 ☐*	否 ☐
在最近的3个月内接受过眼部手术。	是 ☐*	否 ☐

栏目D - 我有/我有过：		
在过去5年内曾因头部受伤而出现过意识丧失。	是 ☐*	否 ☐
持续性神经损伤或疾病	是 ☐*	否 ☐
在过去12个月内，曾患复发性偏头痛或服用药物预防复发性偏头痛发生。	是 ☐*	否 ☐
在过去的5年内发生过昏倒或晕厥（造成完全/部分意识丧失）。	是 ☐*	否 ☐
癫痫症、癫痫发作、或抽搐、或通过服用药物预防上述疾病或症状发生。	是 ☐*	否 ☐

栏目 E - 我有/我有过:		
因行为健康、精神健康、或者心理问题需要进行医学/精神病学治疗。	是 ☐*	否 ☐
重度抑郁症、自杀倾向、恐慌发作、不受控制的躁郁症需要进行医学/精神病学治疗。	是 ☐*	否 ☐
被诊断患有精神疾病或学习/发展障碍需要接受持续的治疗或特殊看顾。	是 ☐*	否 ☐
在过去5年内因毒品或酒精成瘾接受过治疗。	是 ☐*	否 ☐

栏目 F – 我有/我有过:		
在过去6个月内曾因复发性背部问题限制了我的每日活动。	是 ☐*	否 ☐
在过去12个月内接受过背部或脊柱手术。	是 ☐*	否 ☐
在过去12个月内患有需要药物控制或饮食控制的糖尿病，或妊娠糖尿病。	是 ☐*	否 ☐
未治愈的疝气限制了我的身体活动。	是 ☐*	否 ☐
在过去6个月内有过活跃或未治疗的溃疡、有问题的溃疡伤口、或溃疡手术。	是 ☐*	否 ☐

栏目 G - 我有过:		
造瘘手术且没有得到允许进行游泳或其他身体活动的医学许可。	是 ☐*	否 ☐
在过去7天内有过需要医学治疗的脱水症状。	是 ☐*	否 ☐
在过去6个月内有过活跃的或未治疗的肠胃溃疡、或溃疡手术。	是 ☐*	否 ☐
经常的烧心、反流、或胃食管反流症状(GERD)。	是 ☐*	否 ☐
活跃的或无法控制的溃疡性结肠炎或克罗恩(Crohn)病	是 ☐*	否 ☐
在过去12个月内接受过肥胖症治疗手术。	是 ☐*	否 ☐

*表示需要医生的医疗评估检查（见第一页）

潜水员医疗健康 | 体检医師评估检查表

参加者姓名_____ 生日 _____

(正楷) 日期 （ 日/月/年 ）

以上姓名的人士要求你提供有关是否适合其参加休闲水肺潜水或自由潜水训练或活动的医学意见。 请访问uhms.org 以获取与潜水有关的医学状况的医学指导， 在评估过程中查阅与你的病患有关的部分。

评估检查结果

☐ 批准 – 我并未发现任何不适合休闲水肺潜水或自由潜水的症状。

☐ 未批准 – 我发现不适合潜水的症状，我不建议此人参加休闲水肺潜水或自由潜水。

_____ _____

经认证的医生或其他合法认证的医疗提供者签名 日期（日/月/年）

体检医師姓名 _____

(正楷)

专业 _____

临床学位/证书 _____

地址 _____

_____

电话_____ 电子邮件 _____

医生/医院盖章(可选)

由Diver Medical Screen Committee 主要开发以及以下单位协同开发：

The Undersea & Hyperbaric Medical Society
DAN (US)
DAN Europe
Hyperbaric Medicine Division, University of California, San Diego

10346 ZH-HANS

Diving Medical Guidance to the Physician

These guidelines are typically used by physicians who have been approached by an individual wishing to take part in recreational scuba diving or freediving. They will usually have completed a WRSTC Diver Medical Participant Questionnaire.

Recreational scuba diving and freediving (hereafter "diving") is performed safely by many people. The risks associated with diving may be increased by certain physical conditions, and the relationship to diving may not be readily appreciated by candidates. Thus, it is important to screen divers for such conditions.

A physical examination for diving focuses on conditions that may put a diver at increased risk for decompression sickness, pulmonary overinflation with subsequent arterial gas embolization, and other conditions such as loss of consciousness, which could lead to drowning. Additionally, divers must be able to withstand some degree of thermal stress, the physiological effects of immersion, and have sufficient physical and mental reserves to deal with normal diving and possible emergencies.

The history, review of systems, and physical examination should include as a minimum the points listed below. The list of conditions that might adversely affect the diver is not exhaustive, but contains the most commonly encountered medical problems. The brief introductions serve as an alert to the nature of the risk posed.

The potential diver and his or her physician must weigh the benefits to be had by diving against an increased risk of injury or death due to the individual's medical condition. As with any recreational activity, there are limited data for diving with which to calculate the mathematical probability of injury. Experience and physiological principles only permit a qualitative assessment of relative risk.

For the purposes of this document, **Severe Risk** implies that an individual is believed to be at substantially elevated risk of injury compared with the general population. The consultants involved in drafting this document would generally discourage a candidate with such medical problems from diving. **Relative Risk** refers to a moderate increase in risk, which in some instances may be acceptable. To make a decision as to whether diving is contraindicated for this category of medical problems, physicians must base their judgment on an assessment of the individual candidate. **Temporary Risk** refers to medical problems which may preclude diving but are temporary in nature, allowing the individual to dive after they have resolved.

Following many of the sections is a short list of references that give more information on the topic. The lists are not exhaustive, but examples that may be of particular relevance.

Diagnostic studies and specialty consultations should be obtained as indicated to determine the candidate's status. A list of references is included to aid in clarifying issues that arise.

The following sections are included in this document (click to jump to section):

BEHAVIORAL HEALTH CARDIOVASCULAR SYSTEMS GASTROINTESTINAL HEMATOLOGICAL
METABOLIC AND ENDOCRINOLOGICAL NEUROLOGICAL ORTHOPEDIC OTOLARYNGOLOGICAL PULMONARY

BEHAVIORAL HEALTH

Behavioral health is one of the most difficult aspects of diver candidate evaluation, because many relevant potential problems may not be apparent and are not easily assessed in an office consultation. This is also an aspect of evaluating suitability for diving in which the diving instructor, who observes the candidate in the field, must also play a part.

The diving candidate must be capable of learning and applying a theoretical knowledge base for diving. Significant intellectual handicap is incompatible with independent diving. Medical examiners need to be attuned to both safety and pragmatic considerations associated with learning and developmental disabilities that require special accommodations and/or medication(s). Prospective divers who have been formally diagnosed with a learning or developmental disability may seek medical advice regarding their fitness to dive and can benefit from insight into the potential safety and educational accommodations that may be required. A medical clearance does not constitute a mandate to an instructor to take an individual as a student. Nor does it imply that the prospective diver has undergone a formal learning/developmental disability evaluation, which is outside the scope of these examinations.

The decision to eventually certify an individual as a diver, taking account of a learning/developmental disability and the candidate's capacity to accommodate it in diving is, ultimately, up to the instructor, who will have the opportunity to assess knowledge acquisition and observe the candidate's behavior and performance in the instructional setting.

Motivational and behavioral traits should be considered if there is obvious related history or problems become apparent during training. Candidates who appear unmotivated, irresponsible, or prone to distraction or panic should be discouraged from diving.

A history of psychiatric disease is not in and of itself disqualifying. Psychotropic medications can be problematic if they are associated with altered level of awareness or sedation, or may alter seizure threshold, (e.g., benzodiazepines, narcotics). What is of primary importance is the individual's current psychological state, and anticipated impact of their mental/psychological history relative to their ability to navigate the potential and anticipated challenges and stresses of diving. The level of baseline mental health, with or without medication, is therefore of greater importance than the theoretical effects of a given medication or class of medications while diving.

Candidates with major depression, bipolar disorder, psychoses, or current drug or alcohol abuse should not dive. Even if a candidate is well controlled on medication (see below for discussion of SSRIs), there may be risks associated with the use of potent antidepressant and antipsychotic drugs in the underwater environment. The tendency for potent psychotropic drugs to impair concentration and cause drowsiness is of particular concern, as is their potential to lower the seizure threshold, and the lack of research data evaluating potential interactions with the pressure environment. Candidates with a past history of major psychiatric problems or drug/alcohol abuse who are stable without medication and withdrawn from drugs and alcohol can be considered on a case-by-case basis, preferably by a physician trained in diving medicine.

Perhaps the most challenging group of candidates from a behavioral perspective in the modern context is those with "mild" depression (those who have never been hospitalized for psychiatric treatment or placed on psychiatric hold or attempted self-harm) or those with mood disturbances treated with selective serotonin reuptake inhibitors (SSRIs). The general use of SSRIs has increased dramatically over recent years in many countries. There are no data describing use of SSRIs among divers, but anecdotally the numbers are significant. Concerns over diving while using SSRIs relate to the disorder being treated and to the potential interaction between the drug and diving. There are many candidates taking these drugs whose mild mood disturbance would not of itself constitute a reason to avoid diving. Evaluation of the potential for an interaction between SSRIs and diving is more difficult. There are no published reports of apparent problems despite what is almost certainly a large number of divers using them. Diving while taking an SSRI is probably acceptable provided that: the treated mood disturbance was mild prior to treatment and has been well controlled by the drug; the drug has been used for at least one month without evidence of relevant side effects; and the candidate is fully counseled about (and accepting of) the relevant risks. If the candidate is considering diving beyond the traditional recreational envelope or using gases other than air, he or she should consult an appropriate diving medicine specialist.

There are also potential risks associated with other drugs used to treat psychiatric conditions, including serotonin-norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs), and atypical agents (including bupropion). Candidates on these medications should be evaluated on a case-by-case basis.

Severe Risk Conditions

- Active major depression, bipolar or psychotic disorder
- History of panic attacks
- Drug or alcohol abuse
- Severe intellectual handicap

Relative Risk Conditions

- Questionable motivation to dive – solely to please spouse, partner or family member, or to prove oneself in the face of personal fears
- Developmental delay/Cognitive impairment
- Anxiety disorder
- History of drug or alcohol abuse
- History of major depression, bipolar, or psychotic disorder
- Use of psychotropic medications
- Claustrophobia or agoraphobia

CARDIOVASCULAR SYSTEMS

Diving places increased demands on the heart. Immersion itself results in an increase in cardiac preload, as does peripheral vasoconstriction with an increase in blood pressure. These changes are typically accompanied by sustained mild to moderate exercise. Perhaps not surprisingly, almost 30% of recreational diving fatalities have a cardiac event as the disabling injury. It follows that the primary goals of evaluating the cardiovascular system in a diving candidate are to identify those who appear to be at risk of myocardial ischemic events, myocardial insufficiency, or other cardiac events (such as arrhythmias) that might disable a diver underwater, and to establish that the candidate has an adequate exercise capacity for diving.

With the above in mind, some cardiac diagnoses are considered to render a candidate unsuitable for diving, including: untreated symptomatic coronary artery disease, dilated or obstructive or previous stress cardiomyopathy, congestive heart failure, moderate or worse pulmonary hypertension, long QT syndrome or other arrhythmia-inducing channelopathies, paroxysmal arrhythmias causing unconsciousness or impairment of exercise capacity, poor exercise capacity of apparent cardiac origin, moderate to severe valvular lesions, complex congenital cardiac disease, atrial septal defect, and the presence of an implanted cardiac defibrillator.

Potential candidates with any of the following should be investigated to exclude a disqualifying condition:

- Exertional chest pain, dyspnea, palpitations, or syncope
- Unexplained syncope/near syncope
- Heart murmur
- Hypertension
- Family history of premature death (sudden/unexpected or cardiac) before age 50, cardiac disease before age 50, cardiomyopathy, arrhythmia, or channelopathy

It is strongly recommended that these candidates be evaluated in consultation with a physician trained in diving medicine and possibly a cardiologist. Successful treatment of disqualifying cardiac disorders may result in a candidate becoming suitable for diving. For example, a candidate with coronary artery disease (including previous myocardial infarction) who has been successfully revascularized may be suitable for diving if inducible ischemia can be excluded and adequate exercise capacity demonstrated (for example, in an exercise stress test). The capacity to sustain exercise at 6 MET (metabolic equivalent of task; 1 MET approximates resting metabolic rate, assumed to approximate an oxygen consumption of 3.5 mL/kg/min; 6 MET approximates an effort of six times resting metabolic rate, approximating an oxygen consumption of 21 mL/kg/min is a pragmatic expectation for a recreational diver, but there may be an occasional need to exercise transiently at higher levels during diving. Similarly, a candidate with a history of paroxysmal arrhythmia who has undergone successful pathway ablation may

be suitable for diving. Candidates with any of the above diagnoses who wish to consider diving after appropriate treatment are best referred to a physician trained in diving medicine for evaluation.

Asymptomatic candidates over 45 years of age with risk factors for coronary artery disease should undergo evaluation by a physician. Individuals with a predicted 5-10 year risk of a cardiovascular event >10% using a cardiac risk calculator should be investigated for coronary disease unless they provide a credible history of exercise capacity which renders significant coronary disease very unlikely. A coronary calcium score is a suitable initial investigation, and a myocardial perfusion scan, stress echocardiogram, or CT coronary angiogram should be considered in following up a positive calcium score. Consideration of a tailored investigation pathway for the individual diving candidate is ideally undertaken by a cardiologist in consultation with a physician trained in diving medicine. Candidates who prove to have inducible ischemia or obstructive lesions justifying intervention should not dive until completion of the intervention and demonstration of its success. Candidates with non-obstructive coronary disease not requiring invasive intervention should have aggressive management of risk factors and may be suitable for diving if adequate exercise capacity can be demonstrated. Although an exercise ECG is relatively insensitive to early coronary disease, it has the advantage of demonstrating exercise capacity and can be modified to test sustained exercise at 6 MET.

Left ventricular hypertrophy (LVH) is a risk factor for arrhythmias, which may be induced by exercise or immersion. Candidates for diving with this condition should be counseled about the risks of diving.

A patent foramen ovale (PFO) that exhibits right-to-left shunting with no or minimal provocation is a risk factor for serious neurological decompression sickness. In established divers, such lesions are usually discovered by bubble contrast echocardiography conducted after a relevant episode of decompression sickness. These divers are usually advised either to cease diving, modify their diving to reduce venous bubble formation (venous bubbles crossing from right to left are almost certainly the vectors of harm in this setting), or to have the PFO repaired. Occasionally, new diver candidates have a previously discovered PFO, and in such cases an objective assessment of the shunting behavior of the lesion is required in order to adequately counsel the candidate about the implied risks in diving. If not already done, this is best achieved using bubble contrast transthoracic echocardiography at rest and with provocative maneuvers. It is strongly recommended that the results of such tests are discussed with a physician trained in diving medicine. Routine screening of all diving candidates for PFO is not recommended.

In relation to some specific cardiovascular diagnoses: Treated hypertension with adequate control is acceptable in diving in the absence of other risk factors that would meet a risk threshold indicating screening for coronary artery disease. Atrial fibrillation that is adequately rate-controlled in a candidate without inducible myocardial ischemia and who exhibits adequate exercise capacity is acceptable in diving. However, many such candidates are anticoagulated and the risks of diving whilst anticoagulated would need to be understood and carefully considered by the candidate. This is best achieved through discussion with a physician trained in diving medicine.

Immersion pulmonary edema is a problem that has been seen in swimmers, compressed gas divers, and freedivers. The condition may be under-diagnosed. Risk factors include hypertension, valvular disease, diastolic dysfunction, cardiomyopathies, pulmonary hypertension, hyperhydration, immersion, cold stress, constrictive garments, exercise, and for compressed gas divers, increased breathing resistance (affected by equipment, gas density, and body position), and for freedivers, pulmonary squeeze due to compression during descent. A single episode of immersion pulmonary edema may contra-indicate further diving if no modifiable risk factors are found. Repetitive cases represent a strong contra-indication. A diver or new diving candidate with such a history should be referred to a physician trained in diving medicine for discussion of the relevant issues.

Candidates with pacemakers may be able to dive, though pacemaker-dependent candidates should consider the risks carefully. The pathologic process that necessitated the pacemaker should be considered as should the candidate's functional capacity (see above). Pacemakers must be certified by the manufacturer as able to withstand the pressure changes involved in recreational diving. Devices vary in this regard, but diving beyond 30 meters/100 feet with any of them is unwise.

Severe Risk Conditions

- Untreated symptomatic coronary artery disease
- Dilated or obstructive cardiomyopathy
- Heart failure
- Pulmonary hypertension
- Long QT syndrome or other arrhythmia-inducing channelopathies
- Paroxysmal arrhythmias causing unconsciousness or impairment of exercise capacity
- Poor exercise capacity of apparent cardiac origin
- Moderate to severe valvular lesions
- Complex congenital cardiac disease
- Atrial septal defect
- Presence of an implanted cardiac defibrillator
- Multiple episodes of immersion pulmonary edema

Relative Risk Conditions

- Treated coronary artery disease
- Collectively, risk factors such as age >45 years, hypertension, smoking, elevated cholesterol and a positive family history may indicate investigation for coronary artery disease
- History of dysrhythmias requiring medication for suppression
- Mild valvular lesions (need periodic re-evaluation)
- Cardiac prostheses or arrhythmias requiring anticoagulation
- Pacemakers
- Single previous episode of immersion pulmonary edema
- Marfan syndrome or other connective tissue disorder (severe risk if there is a history of dissection)
- Left ventricular hypertrophy

References

Denoble PJ, Holm JR, eds. Patent Foramen Ovale and Fitness to Dive Consensus Workshop Proceedings. Durham, NC: Divers Alert Network, 2015; 160 pp.

Kumar M, Thompson PD. A literature review of immersion pulmonary edema. Physic Sportsmed. 2018; 47(2):148-151.

Lafay V, Trigano JA, Gardette B, Micoli C, Carre F. Effects of hyperbaric exposures on cardiac pacemakers. *Br J Sports Med.* 2008;42(3):212-216

Mitchell SJ, Bove AA. Medical screening of recreational divers for cardiovascular disease: Consensus discussion at the Divers Alert Network Fatality Workshop. Undersea Hyperb Med. 2011; 38(4), 289-296.

Moon RE, Bove AA, Mitchell SJ. PFO statement. In: Denoble PJ, Holm JR. eds. Patent Foramen Ovale and Fitness to Dive Consensus Workshop Proceedings. Durham, NC: Divers Alert Network, 2016; 156-160.

Pollock NW. Aerobic fitness and underwater diving. Diving Hyperb Med. 2007; 37(3): 118-124.

Smart D, Mitchell SJ, Wilmshurst P, Turner M, Banham N. Joint position statement on persistent (patent) foramen ovale and diving. South Pacific Underwater Medicine Society (SPUMS) and the United Kingdom Sports Diving Medical Committee (UKSDMC). Diving Hyperb Med. 2015; 45(2), 129-131.

GASTROINTESTINAL

In general terms, there should be no gastrointestinal conditions present that increase the likelihood of vomiting, reflux, bleeding, perforation, diarrhea, or pain. Altered anatomical relationships secondary to surgery or malformations that lead to gas trapping may cause serious problems. Trapped gas expands as the diver surfaces and can lead to rupture or, in the case of the upper GI tract, emesis. Emesis underwater may lead to drowning. Dive activities may take place in areas remote from medical care, and the possibility of acute recurrences of disease must be considered.

Severe Risk Conditions

- Active inflammatory bowel disease
- Gastric outlet obstruction of a degree sufficient to produce recurrent vomiting
- Chronic or recurrent small bowel obstruction
- Severe gastroesophageal reflux
- Achalasia
- Paraesophageal hernia
- Gastroparesis

Relative Risk Conditions

- Inflammatory bowel disease when quiescent
- Functional bowel disorders

Temporary Risk Conditions

- Peptic ulcer disease associated with pyloric obstruction or severe reflux
- Unrepaired hernias of the abdominal wall large enough to contain bowel within the hernia sac could incarcerate

References

Bennett PB, Cronje FJ, Campbell E, Marroni A, Pollock NW. Assessment of Diving Medical Fitness for Scuba Divers and Instructors. Flagstaff, AZ: Best Publishing. 2006; 241 pp.

Vote D. Gastrointestinal issues – consider them before returning to diving. https://www.diversalertnetwork.org/medical/articles/Gastrointestinal_Issues

US Navy Diving Manual, Volume 2, Revision 7. Gastrointestinal distension.NAVSEA 0910-LP-115-1921. Naval Sea Systems Command: Washington, DC, 2016: 3-31-3-32.

HEMATOLOGICAL

Abnormalities resulting in altered rheological properties may theoretically increase the risk of decompression sickness. Bleeding disorders could worsen the effects of otic or sinus barotrauma and exacerbate the injury associated with inner ear or spinal cord decompression sickness. Spontaneous bleeding into the joints (eg, in hemophilia) may be difficult to distinguish from decompression illness. Thrombophilic disorders (hereditary or acquired) may facilitate vascular thrombosis and susceptibility to DCS.

Relative Risk Conditions

- Sickle cell disease
- Polycythemia vera
- Leukemia
- Hemophilia/Impaired coagulation
- Recent blood transfusion
- Recent thrombotic episodes
- Hereditary hypercoagulability conditions
  - Factor V Leiden
  - Prothrombin 20210A
  - Protein C deficiency

- Protein S deficiency
- Antithrombin deficiency

Temporary Risk Conditions

- Prescription of anti-coagulant drugs of any kind, including platelet aggregation inhibitors

References

Bennett PB, Cronje FJ, Campbell E, Marroni A, Pollock NW. Assessment of Diving Medical Fitness for Scuba Divers and Instructors. Flagstaff, AZ: Best Publishing. 2006; pp 97-104.

Parker J. Haematology. In: The Sports Diving Medical, 2nd Edition. JL Publications, Melbourne 2002, pp 100-102.

Wendling J, et al. Haematological disorders. In: Medical Assessment of Fitness to Dive. International Edition. Hyperbaric Editions CH 2502 Biel, 2001, pp 126. ISBN 3-9522284-1-9.

METABOLIC AND ENDOCRINOLOGICAL

States of altered hormonal or metabolic function should be assessed according to their impact on the individual's ability to tolerate the moderate exercise requirement and environmental stress of sport diving. Obesity may predispose the individual to decompression sickness, can impair exercise tolerance and is a risk factor for coronary artery disease.

Severe Risk Conditions

- The potentially rapid change in level of consciousness associated with hypoglycemia in diabetics on insulin therapy or certain oral hypoglycemic medications can result in drowning. Diving is therefore generally contraindicated, except when conducted according to the consensus guidelines for recreational diving with diabetes.
- Pregnancy: The effect of venous emboli formed during decompression on the fetus has been proven to be potentially detrimental to fetus health. Diving is therefore not recommended during any stage of pregnancy or for women actively seeking to become pregnant. (Note that in cases where pregnancy is discovered after diving, it is not considered grounds for termination.)

Relative Risk Conditions

- Hormonal excess or deficiency
- Obesity
- Renal insufficiency

References

Damnon F, de Rham M, Baud D. Should a pregnancy test be required before scuba diving? Br J Sports Med. 2016; 50(18): 1159-1160.

Dear GdeL, Pollock NW, Uguccioni DM, Dovenbarger J, Feinglos MN, Moon RE. Plasma glucose response to recreational diving in divers with insulin-requiring diabetes. Undersea Hyperb Med. 2004; 31(3): 291-301.

Held HE, Pollock NW. The risks of diving while pregnant - reviewing the research. Alert Diver. 2007; Mar/Apr: 48-51.

Pollock NW, Uguccioni DM, Dear GdeL. Diabetes and recreational diving: guidelines for the future. Diving Hyperb Med 2006; 36(1): 29-34.

NEUROLOGICAL

Neurological illnesses, especially those affecting the spinal cord and peripheral nerves, should be assessed according to the degree of functional compromise present. Any condition that diminishes the reserve capacity of the spinal cord may reduce the likelihood of a full functional recovery, should an episode of spinal decompression sickness occur. Conditions in which there can be a waxing and waning of neurological symptoms and signs, such as migraine or demyelinating disease, may contraindicate diving, because an exacerbation or attack of the pre-existing disease (eg, migraine headache with aura) may be difficult to distinguish from neurological decompression

sickness. A history of head injury resulting in unconsciousness should be evaluated for risk of seizure. A diagnosis of epilepsy is considered an absolute contraindication for diving.

Severe Risk Conditions

Any abnormalities where there is a significant probability of unconsciousness, hence putting the diver at increased risk of drowning. Divers with spinal cord or brain abnormalities where perfusion is impaired may be at increased risk of decompression sickness.

Some conditions are as follows:

- Epilepsy or history of seizures, other than childhood febrile seizures
- History of transient ischemic attack (TIA) or cerebrovascular accident (CVA)
- History of serious (central nervous system, cerebral or inner ear) decompression sickness with residual deficits
- Recurrent episodes of loss of consciousness or fainting

Relative Risk Conditions

Complicated migraine headaches, particularly if severe, frequent or presenting with neurological manifestations eg, motor, sensory or cognitive disturbance.

- History of head injury with sequelae other than seizure
- Herniated nucleus pulposus
- Intracranial tumor or aneurysm
- Peripheral neuropathy
- Multiple sclerosis
- Trigeminal neuralgia
- History of spinal cord or brain injury
- Parkinson's disease

References

Bennett PB, Cronje FJ, Campbell E, Marroni A, Pollock NW. Assessment of Diving Medical Fitness for Scuba Divers and Instructors. Flagstaff, AZ: Best Publishing. 2006; 241 pp. 173-188.

Burkett JG, Nahas-Geiger SJ. Diving Headache. Curr Pain Headache Rep. 2019;23(7):46.

Massey EW, Moon RE. Neurology and diving. Handb Clin Neurol. 2014;120:959-969.

Rosinska J, Łukasik M, Kozubski W. Neurological complications of underwater diving. Neurol Neurochir Pol. 2015;49(1):45-51.

UK Diving Medical Committee, Neurological disease. http://www.ukdmc.org/medical-conditions/neurological-disease/

ORTHOPEDIC

Mobility above and under the water is an essential requirement for any sport or recreational diver. Entering the water from shore or a dive boat, underwater propulsion and exiting into a dive boat or onto shore should be possible without great difficulty.

Relative impairment of mobility, particularly on a boat or ashore with equipment weighing up to 30 kg/66 lb (or significantly more in the case of cold water or for more equipment intensive activities, for example), must be assessed. Orthopedic conditions of a degree sufficient to impair exercise performance may increase the risk.

In some cases, like amputations resulting in various degrees of disability, it would be advisable to judge case by case by a physician trained in diving medicine.

Relative Risk Conditions

- Amputation
- Scoliosis: must also assess impact on respiratory function and exercise performance
- Aseptic necrosis: possible risk of accelerated progression due to the effects of decompression
- Disc prolapse
- Habitual luxation (eg, shoulder, hip, patella)
- Degenerative joint diseases

Temporary Risk Conditions

- Back pain
- Fractures until complete healing of bone and soft tissue and positive weight bearing tests taking into consideration the weight of the used dive gear on land
- Muscle-tendon and ligament injuries
- Completion of physiotherapy/rehabilitation regimes

References

Moeller JL. Contraindications to athletic participation. Physic Sportsmed. 1996; 24(9): 57-75.

OTOLARYNGOLOGICAL

Equalization of pressure must take place during ascent and descent between ambient water pressure and the external auditory canal, middle ear, and paranasal sinuses. Failure of this to occur results at least in pain and in the worst-case rupture of the occluded space with disabling and possible lethal consequences. The inner ear is fluid filled and therefore noncompressible. The flexible interfaces between the middle and inner ear, the round and oval windows are, however, subject to pressure changes. Previously ruptured but healed round or oval window membranes may be prone to reinjury with marked overpressurization during vigorous or explosive Valsalva maneuvers. The larynx and pharynx must be free of obstruction to airflow. The laryngeal and epiglottic structures must function normally to prevent aspiration. Mandibular and maxillary function must be capable of allowing the candidate to hold a scuba regulator mouthpiece. Individuals who have had mid-face fractures may be prone to barotrauma and rupture of the air-filled cavities involved.

Severe Risk Conditions

- Monomeric tympanic membrane (TM)
- Open TM perforation
- Tube myringotomy
- History of stapedectomy
- History of ossicular chain surgery
- History of inner ear surgery
- Facial nerve paralysis secondary to barotrauma
- Inner ear disease other than presbycusis
- Uncorrected upper airway obstruction
- Laryngectomy or status post partial laryngectomy
- Tracheostomy
- Uncorrected laryngocele

- History of vestibular decompression sickness
- Symptomatic nasal or sinus polyps
- Ménière's disease

Relative Risk Conditions

- Recurrent otitis externa
- Significant obstruction of external auditory canal
- History of significant cold injury to pinna
- Eustachian tube dysfunction
- Recurrent otitis media or sinusitis
- History of TM perforation
- History of tympanoplasty
- History of mastoidectomy
- Significant conductive or sensorineural hearing impairment
- Facial nerve paralysis not associated with barotrauma
- Full prosthodontic devices
- History of mid-face fracture
- Unhealed oral surgery sites
- History of head and/or neck therapeutic radiation
- History of temporomandibular joint dysfunction
- History of round window rupture
- Symptomatic nasal septum deviation
- Recurrent benign positional vertigo
- Otosclerosis

References

Lechner M, Sutton L, Fishman JM, Kaylie DM, Moon RE, Masterson L, et al. Otorhinolaryngology and diving - part 1: otorhinolaryngological hazards related to compressed gas scuba diving: a review. JAMA Otolaryngol Head Neck Surg. 2018;144(3):252-258.

Lechner M, Sutton L, Fishman JM, Kaylie DM, Moon RE, Masterson L, et al. Otorhinolaryngology and diving – part 2: otorhinolaryngological fitness for compressed gas scuba diving: a review. JAMA Otolaryngol Head Neck Surg. 2018;144(3):259-263.

Molvaer OI. Otorhinolaryngological aspects of diving. In: Bennett PB, Elliott DH, eds. Physiology and Medicine of Diving, 5th ed. Saunders, Edinburgh, 2003. P227-P264.

Wendling J, et al. Otorhinolaryngology. In: Medical Assessment of Fitness to Dive. International Edition. Hyperbaric Editions CH 2502 Biel, 2001. Pp25-48. ISBN 3-9522284-1-9.

PULMONARY

Any process or lesion that impedes airflow from the lungs places the diver at risk for pulmonary over inflation with alveolar rupture and the possibility of cerebral air embolization. Many interstitial diseases predispose to spontaneous pneumothorax: asthma, chronic obstructive pulmonary disease (COPD), cystic or cavitating lung diseases may all cause air trapping.

Undersea and Hyperbaric Medical Society and British Thoracic Society guidelines recommend that asthmatics should be advised not to dive if they have wheeze precipitated by exercise, cold, or emotion. Asthmatic individuals who are currently well controlled and have normal pulmonary function tests may dive if they have a negative exercise test. Many people with asthma have well controlled disease and are physically fit. They may, however, show minor abnormalities on spirometry at rest or after exercise. Those with a history of severe or unpredictable

acute exacerbations are not fit to dive. For those without such a history, the overriding consideration is that the candidate must be physically fit and not impaired after exercise or cold air breathing, which is the normal case of gas expanding from within a scuba cylinder. The best way to assess fitness is with an exercise test. Inhalation challenge tests (eg, using histamine, hypertonic saline or methacholine) are not sufficiently standardized to be interpreted in the context of scuba diving. If persons with breathing issues are cleared to dive, they need to take their regular inhalers and should not dive if suffering symptoms suggestive of exacerbation. Note that the FEV_1/FVC ratio may be reduced below predicted, but provided there is no deterioration after exercise and the person performs well on the exercise test, a mildly obstructed spirometric tracing on its own is not a contraindication to diving.

A pneumothorax that occurs while diving may be catastrophic. As the diver ascends, trapped gas expands and could produce a tension pneumothorax. In addition to the risk of pulmonary barotrauma, respiratory disease due to either structural disorders of the lung or chest wall or neuromuscular disease may impair exercise performance. Individuals who have experienced spontaneous pneumothorax are at risk of recurrence, and should avoid diving, even after a surgical procedure designed to prevent recurrence (such as pleurodesis). Surgical procedures either do not correct the underlying lung abnormality (eg, pleurodesis, apical pleurectomy) or may not totally correct it (eg, resection of blebs or bullae). A high-resolution CT (HRCT) scan of the lungs may reveal cysts or blebs that represent a risk. Persons who have no parenchymal abnormality on HRCT and have had bilateral surgical pleurodesis (including VATS pleurodesis) may be cleared to dive. However, in most cases, a history of spontaneous pneumothorax will be an absolute contraindication to diving. Traumatic pneumothorax is not a problem as the likelihood of subsequent spontaneous pneumothorax is vanishingly low.

Structural disorders of the chest or abdominal wall or neuromuscular disorders may impair cough, which could be life threatening if water is aspirated. Respiratory limitation due to disease is compounded by the combined effects of immersion (causing a restrictive deficit) and the increase in gas density, which increases in proportion to the ambient pressure (causing increased airway resistance). Formal exercise testing may be helpful.

The emergence of COVID-19 has placed an additional layer of complexity related to fitness to dive evaluations. It is beyond the scope of this document to prescribe or mandate specific tests or timelines related to fitness to dive determinations. What is of importance is awareness of the potential body systems effected by COVID-19, and to take a thoughtful and thorough history related to disease course, time since the infection resolved, and state of physical and mental health at the time of the examination.

Clinical factors that are important to consider include symptom severity during the infection and need for intensive care (e.g., ventilator support). Disease severity likely correlates with the extent of pulmonary injury and potential cardiac involvement, and in the case of intubation, may be associated with severe deconditioning, muscle atrophy and even post-traumatic stress. As such, assessment of the diver with a history of COVID-19, may require more than just a pulmonary evaluation. At the time of this publication, the medical community does not have sufficient data to support arbitrary requirements for specific testing, nor duration of post-infection convalescence after which individuals can be considered safe to return to diving.

The following documents provide current guidance on investigation of COVID-19 patients prior to diving. This is an area that is evolving and updated often; please see these resources for more current information and considerations regarding these issues.

UC San Diego Guidelines for Evaluation of Divers during COVID-19 pandemic

Centers for Disease Control and Prevention, People Who Are at Higher Risk for Severe Illness

European Committee for Hyperbaric Medicine and European Underwater and Baromedical Society, COVID-19 Pandemic – Position Statements

For those looking for aseptic practices, the following resources may be useful:

Divers Alert Network Europe

Divers Alert Network Americas

Severe Risk Conditions

- History of spontaneous pneumothorax (see notes)
- Impaired exercise performance due to respiratory disease
- Respiratory impairment secondary to cold gas breathing
- Pulmonary hypertension

Relative Risk Conditions

- Asthma, reactive airway disease (RAD), exercise-induced bronchospasm (EIB) or COPD (see notes)
- Solid, cystic or cavitating lesion
- Pneumothorax secondary to:
  - Thoracic surgery
  - Trauma or pleural penetration (see notes)
  - Previous overinflation injury
- Obesity
- History of immersion pulmonary edema or restrictive disease
- Interstitial lung disease: may increase the risk of pneumothorax and likely to limit exertion
- Sleep apnea

References

Godden D, Currie G, Denison D, Farrell P, Ross J, Stephenson R, Watt S, Wilmshurst P. British Thoracic Society guidelines on respiratory aspects of fitness for diving. Thorax. 2003;58:3-13.

DIVERS ALERT NETWORK (DAN)

Divers Alert Network (DAN), a non-profit organization, provides medical information and advice for the benefit of the diving public. DAN is not a regulatory agency and does not set physical standards or guidelines for scuba diving. The responsibility for the decision of whether or not to dive is generally left up to the individual, the physician, as well as the dive provider. This decision, however, should be based on the most current diving medical information available.

DAN may be able to provide current medical literature and information that can be used to assist in this decision-making process. If desired, DAN may also provide referrals to local physicians who are knowledgeable in dive medicine and physiology. However, DAN cannot and does not decide whether an individual may or may not participate in the sport of scuba diving. For more information, please feel free to contact one of the DAN offices listed below.

DAN America (US)

Physicians and other medical professionals associated with DAN America are available for consultation by phone, during normal business hours Monday through Friday, 8:00 AM to 8:00 PM Eastern Time US.
+1-919-684-2948 ext. 6222
www.DAN.org

DAN Europe (Italy)

+39-085-8930333
www.DANEurope.org

DAN Asia-Pacific (Australia)

+61-3-9886-9166
www.DANAP.org

DAN Southern Africa (South Africa)

+27-11-266-4900
www.DANSA.org

DAN Japan (Yokohama)

+045-228-3066 Medical Information Line service is provided in Japanese only.
www.danjapan.gr.jp

These guidelines were created by the Diving Medical Screen Committee (DMSC). The DMSC periodically reviews them to ensure they continue to represent current best practice in hyperbaric medicine.