

Guidelines for RECREATIONAL SCUBA DIVER'S PHYSICAL EXAMINATION

Instructions to the Physician:

Recreational scuba (self contained underwater breathing apparatus) diving has an excellent safety record. To maintain this status it is important to screen student divers for physical deficiencies that could place them in peril in the underwater environment.

The Recreational Scuba Diver's Physical Examination contains elements of medical history, review of systems and physical examination. It is designed to detect conditions that put a diver at increased risk for decompression sickness, pulmonary overinflation syndrome with subsequent cerebral gas embolization and loss of consciousness that could lead to drowning. Additionally, the diver must be able to withstand some degree of cold stress, cope with the optical effects of water and have a reserve of physical and mental abilities to deal with possible emergencies.

The history, review of systems and physical examination should include, as a minimum, the points listed below. The list of contraindications, relative and absolute, is not all inclusive. It contains the most commonly encountered medical problems only. The brief introductions should serve to alert the physician to the nature of medical problems that put the diver at risk, and (lead him) to consider the individual patient's state of health.

Diagnostic studies and specialty consultations should be obtained as indicated to satisfy the physician as to the diver's status. A list of references is included to aid in clarifying issues that arise. Physicians at the Divers Alert Network (DAN) are available for consultation by phone (919) 684-2948 during normal business hours. For emergency calls, 24 hours, 7 days a week, call (919) 684-8111.

Some conditions are absolute contraindications to scuba diving. Conditions that are absolute contraindications place the diver at increased risk for injury or death. Others are relative contraindications to scuba that may be resolved with time and proper medical intervention. Ultimately the physician should decide with the individual, based on his knowledge of the patient's medical status, whether the individual is physically qualified to participate in scuba diving.

Remember at all times that scuba is a recreational sport, and it should be fun, not a source of morbidity or mortality.

CARDIOVASCULAR SYSTEMS

Relative Contraindications: The diagnoses listed below potentially render the diver unable to meet the exertional performance requirements likely to be encountered in recreational diving. The diagnoses listed may lead the diver to experience cardiac ischemia and its consequences. Formalized stress testing is encouraged if there is any doubt regarding physical performance capability. The suggested minimum criteria for stress testing in such cases is 13 METS. Failure to meet the exercise criteria is disqualifying. Conditioning and retesting may make later qualification possible.

- **History of CABG or PCTA for CAD**
- **History of myocardial infarction**
- **Hypertension**
- **History of dysrhythmias requiring medication for suppression**
- **Valvular regurgitation**
- **Asymptomatic mitral valve prolapse**
- **Pacemakers** -- The pathologic process that necessitated pacing should be addressed regarding the fitness to dive. Finally in the instances where the problem necessitating pacing does not preclude diving, will the diver be able to meet the performance criteria?

Note: Pacemakers must be certified by the manufacturer as able to withstand the pressure changes involved in recreational diving (to depths of 130 feet of sea water).

Absolute Contraindications: Venous gas emboli produced during decompression may cross intracardiac shunts and enter the cerebral circulation with potentially catastrophic results. Asymmetric septal hypertrophy and valvular stenosis may lead to the sudden onset of unconsciousness during exercise.

- **Congestive heart failure**

PULMONARY

Any process or lesion that impedes air flow from the lung places the diver at risk for pulmonary overinflation with alveolar rupture and the possibility of cerebral air embolization. Asthma (reactive airway disease), COPD cystic or cavitating lung diseases all may lead to air trapping. Spirometry, provocative tests such as methacholine challenge and other studies to detect air trapping should be carried out to establish to the examining physician's satisfaction that the diver is not at risk. A pneumothorax that occurs or recurs while diving is catastrophic. As the diver ascends, air trapped in the cavity expands rapidly producing a tension pneumothorax.

Relative Contraindications:

- **History of prior asthma or reactive airway disease (RAD)***
- **History of exercise/cold induced bronchospasm (EIB)***
- **History of solid, cystic or cavitating lesion***
- **Pneumothorax secondary to:** thoracic surgery,* trauma or pleural penetration,* previous overinflation injury*
- **Restrictive Disease****

(*Air Trapping must be excluded)

(**Exercise Testing necessary)

Absolute Contraindications:

- **Active RAD (asthma), EIB, COPD or history of the same with abnormal PFT's or positive challenge**
- **Restrictive diseases with exercise impairment**
- **History of spontaneous pneumothorax.**

NEUROLOGICAL

Neurologic abnormalities that affect a diver's ability to perform exercise should be assessed individually based on the degree of compromise involved.

Relative Contraindications:

- **Migraine headaches whose symptoms or severity impair motor or cognitive function**
- **History of head injury with sequelae other than seizure**
- **Herniated nucleus pulposus**
- **Peripheral neuropathy**
- **Trigeminal neuralgia**
- **History of spinal cord or brain injury without residual neurologic deficit**
- **History of cerebral gas embolism without residual neurologic deficit where pulmonary air trapping has been excluded**
- **Cerebral palsy in the absence of seizure activity**

Absolute Contraindications: Abnormalities where the level of consciousness is subject to impairment put the diver at increased risk of drowning. Divers with spinal cord or brain abnormalities where perfusion is impaired are at increased risk of spinal cord or cerebral decompression sickness.

- **History of seizures other than childhood febrile seizures**
- **Intracranial tumor or aneurysm**
- **History of TIA or CVA**
- **History of spinal cord injury, disease or surgery with residual sequelae**
- **History of Type II (serious and/or central nervous system) decompression sickness with permanent neurologic deficits**

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 subject to pressure changes, however. Previously ruptured but healed round or oval window

membranes are at increased risk of rupture due to failure to equalize pressure or due to marked overpressurization during vigorous or explosive Valsalva maneuvers.

The larynx and pharynx must be free of an obstruction to airflow. The laryngeal and epiglottic structure must function normally to prevent aspiration.

Mandibular and maxillary function must be capable of allowing the patient to hold a scuba mouth piece. Individuals who have had mid-face fractures may be prone to barotrauma and rupture of the air filled cavities involved.

Relative Contraindications:

- **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**

Absolute Contraindications:

- **Monomeric TM**
- **Open TM perforation**
- **Tube myringotomy**
- **History of stapedectomy**
- **History of ossicular chain surgery**
- **History of inner ear surgery**
- **History of round window rupture**
- **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**
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GASTROINTESTINAL

Relative Contraindications: As with other organ systems and disease states, a process that debilitates the diver chronically may impair exercise performance. Additionally, diving activity may take place in areas remote from medical care. The possibility of acute recurrences of disability or lethal symptoms must be considered.

- **Peptic ulcer disease**
- **Inflammatory bowel disease**
- **Malabsorption states**
- **Functional bowel disorders**
- **Post gastrectomy dumping syndrome**
- **Paraesophageal or hiatal hernia**

Absolute contraindications: Altered anatomical relationships secondary to surgery or malformations that lead to gas trapping may cause serious problems. Gas trapped in a hollow viscous 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.

- **High grade gastric outlet obstruction**
- **Chronic or recurrent small bowel obstruction**
- **Entero-cutaneous fistulae that do not drain freely**
- **Esophageal diverticula**
- **Severe gastroesophageal reflux**
- **Achalasia**
- **Unrepaired hernias of the abdominal wall potentially containing bowel**

METABOLIC AND ENDOCRINOLOGICAL

Relative Contraindications: With the exception of diabetes mellitus, 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. Generally divers with altered hormonal status should be in as near an optimal physiologic state as is possible. It should be noted that obesity predisposes the individual to decompression sickness and is an indicator of poor overall physical fitness.

- **Hormonal excess or deficiency**
- **Obesity**
- **Renal insufficiency**

Absolute Contraindications: The potentially rapid change in level of consciousness associated with hypoglycemia in diabetics on insulin therapy or oral anti-hypoglycemia medications can result in drowning. Diving is therefore contraindicated.

PREGNANCY

Venous gas emboli formed during decompression may result in fetal malformations. **Diving is absolutely contraindicated during any stage of pregnancy.**

HEMATOLOGICAL

Abnormalities resulting in altered theological properties may increase the risk of decompression sickness.

Relative Contraindications:

- **Sickle cell trait**
- **Acute anemia**

Absolute Contraindications:

- **Sickle cell disease**
- **Polycythemia**
- **Leukemia**

ORTHOPEDIC

Relative impairment of mobility particularly in the small boat environment or ashore with equipment weighing up to 40 pounds must be assessed. The impact of exercise ability is also an important consideration.

Relative Contraindications:

- **Chronic back pain**
- **Amputation**
- **Scoliosis -- must also assess impact on pulmonary function**
- **Aseptic necrosis -- possible risk of progression related to adequacy of decompression**

BEHAVIORAL HEALTH

Behavioral: The diver's mental capacity and emotional makeup are important to safe diving. The student diver must have sufficient learning abilities to grasp information presented to him by his instructors, be able to safely plan and execute his own dives and react to changes about him in the underwater environment. The student's motivation to learn scuba and his ability to deal with potentially dangerous situations is also crucial to safe diving.

Relative Contraindications:

- **Developmental delay**
- **History of drug or alcohol abuse**
- **History of previous psychotic episodes**

Absolute Contraindications:

- **Inappropriate motivation to dive -- solely to please spouse or partner, to prove oneself in the face of personal fears**
- **Claustrophobia and agoraphobia**
- **Active psychosis or while receiving psychotropic medications**
- **History of panic disorder**
- **Drug or alcohol abuse**

BIBLIOGRAPHY

1. Physician's Guide to Diving Medicine. Shilling et al, Plenum Pub. 1982
2. Diving and Subaquatic Medicine, 2nd Ed., Edmonds, Lowry, Pennfeather, Diving Med Centre, 1978
3. Fitness to Dive 34th UHMS Workshop, Vorosmarti (ed.), Chaired by Linaweaver, UHMS Pub No#70, 1987
4. Medical Examination of Sport Scuba Divers, 2nd Ed., Davis Medical Seminars Inc., 1986
5. Hyperbaric and Undersea Medicine, Davis, Medical Seminars Inc. 1981

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This form has been
developed in conjunction with the Recreational Scuba Training Council

Medical Statement

PARTICIPANT RECORD - CONFIDENTIAL INFORMATION

Please read carefully before signing.

This is a statement in which you are informed of some potential risks involved in scuba diving and of the conduct required of you during the scuba training program. Your signature on this statement is required for you to participate in the scuba training program offered by:

(INSTRUCTOR) _____

and (FACILITY) _____

located in the city of _____

and state of _____.

Read and discuss this statement prior to signing it. You must complete this Medical Statement, which includes the medical-history section, to enroll in the scuba training program. If you are a minor, you must have this Statement signed by a parent.

Diving is an exciting and demanding activity. When performed correctly, applying correct techniques, it is very safe. When established safety procedures are not followed, however, there are dangers.

To scuba dive safely, you must not be extremely overweight or out of condition. Diving can be strenuous under certain conditions. Your respiratory and circulatory systems must be in good health. All body air spaces must be normal and healthy. A person with heart trouble, a current cold or congestion, epilepsy, asthma, a severe medical problem, or who is under the influence of alcohol or drugs should not dive. If taking medication, consult your doctor and the Instructor before participation in this program. You will also need to learn from the Instructor the important safety rules regarding breathing and equalization while scuba diving. Improper use of scuba equipment can result in serious injury. You must be thoroughly instructed in its use under direct supervision of a qualified instructor to use it safely.

If you have any additional questions regarding this Medical Statement or the Medical History section, review them with your Instructor before signing.

Medical History

To the Participant:

The purpose of this medical questionnaire is to find out if you should be examined by your doctor before participating in recreational diver training. A positive response to a question does not necessarily disqualify you from diving. A positive response means that there is a preexisting condition that may affect your safety while diving and you must seek the advice of your physician.

Please answer the following questions on your past or present medical history with a YES or NO. If you are not sure, answer YES. If any of these items apply to you, we must request that you consult with a physician prior to participating in scuba diving. Your Instructor will supply you with a medical statement and guidelines for recreational scuba diver's physical examination to take to your physician.

- _____ Are you pregnant or do you suspect you may be pregnant?
- _____ Do you regularly take prescription or nonprescription medications? (with the exception of birth control)
- _____ Are you over 45 years of age and have one or more of the following?
 - currently smoke a pipe, cigars, or cigarettes
 - have a high cholesterol level
 - have a family history of heart attacks or strokes

HAVE YOU EVER HAD OR DO YOU CURRENTLY HAVE...

- _____ Asthma, or wheezing with breathing, or wheezing with exercise?
- _____ Frequent or severe attacks of hayfever or allergy?
- _____ Frequent colds, sinusitis or bronchitis?

- _____ Any form of lung disease?
- _____ Pneumothorax. (collapsed lung)?
- _____ History of chest surgery?
- _____ Claustrophobia or agoraphobia (fear of closed or open spaces)?
- _____ Behavioral health problems?
- _____ Epilepsy, seizures, convulsions or take medications to prevent them?
- _____ Recurring migraine headaches or take medications to prevent them?
- _____ History of blackouts or fainting (full/partial loss of consciousness)?
- _____ Do you frequently suffer from motion sickness (seasick, carsick, etc.)?
- _____ History of diving accidents or decompression sickness?
- _____ History of recurrent back problems?
- _____ History of back surgery?
- _____ History of diabetes?
- _____ History of back, arm or leg problems following surgery, injury or fracture?

- _____ Inability to perform moderate exercise (walk one mile within 12 minutes)?
- _____ History of high blood pressure or take medications to control blood pressure?
- _____ History of any heart disease?
- _____ History of heart attacks?
- _____ Angina or heart blood vessel surgery?
- _____ History of ear or sinus surgery?
- _____ History of ear disease, hearing loss or problems with balance?
- _____ History of problems equalizing (popping) ears with airplane or mountain travel?
- _____ History of bleeding or other blood disorders?
- _____ History of any type of hernia?
- _____ History of ulcers or ulcer surgery?
- _____ History of colostomy?
- _____ History of drug or alcohol abuse?

The information I have provided about my medical history is accurate to the best of my knowledge.

SIGNATURE

SIGNATURES OF PARENTS OR GUARDIANS WHERE APPLICABLE

APPLICANT

(Please print legibly)

Name _____ Birth Date _____ Age _____

Mailing Address _____

City _____ State/Province _____

Country _____ Zip/Postal Code _____

Home Phone _____ Business Phone _____

Fax _____ E-mail _____

Name and address of your family or primary care physician:

Physician _____ Clinic/Hospital _____

Address _____ Phone _____

Date of last physical examination _____

Name of examiner _____ Clinic/Hospital _____

Address _____ Phone _____

Were you ever required to have a physical for diving? Yes No If so, when? _____

Physician

This person is an applicant for training or is presently certified to engage in scuba (self contained underwater breathing apparatus) diving, Your opinion of the applicant's medical fitness for scuba diving is requested, Please review Guidelines for Recreational Scuba Diver's Physical Examination,

Physician's Impression:

I find no medical conditions that I consider incompatible with diving.

I am unable to recommend this individual for diving.

Remarks _____

I have reviewed Guidelines for Recreational Scuba Diver's Physical Examination.

_____, M.D. Date _____

Physician _____ Clinic/Hospital _____

Address _____ Phone _____