

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 those 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. **Asymetric 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 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 however subject to pressure changes. 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**