PREDIVING MEDICAL EXAMINATION FOR PROSPECTIVE RECREATIONAL SCUBA DIVERS

(Normative)

A1 INTRODUCTION

The medical criteria discussed in this Appendix are relevant only to examination of individuals considering recreational SCUBA diving and are addressed to registered medical practitioners. The medical criteria discussed in this Appendix are in no way exhaustive. The trained personnel carrying out the medicals are expected to use their own discretion. Criteria for medical examination of persons intending to train for occupational diving are given in AS/NZS 2299.1.

The medical examination should be conducted by a medical practitioner who has done an approved course of training for medically examining candidates for recreational diving training. In the absence of regulation by the relevant regulatory authority for approval of training courses, the Board of Censors of the South Pacific Underwater Medicine Society (SPUMS) shall be the authority approving courses.

NOTE: SPUMS publishes a list of its members who have received appropriate qualifications and who carry out diving medicals.

In the event of any difficulty in interpreting the Standard or if it is considered that the candidate may not be suitable for diving, consultation should occur with a specialist diving physician, that is, one who holds the Diploma of Diving and Hyperbaric Medicine (DDHM) or an acceptable overseas equivalent, who may also, if appropriate, refer the candidate to a specialist in the medical area under question, e.g. otologist, cardiologist or respiratory physician, if such a specialist also has an appreciation of the requirements of compressed air diving.

The examination shall be carried out before the candidate first uses compressed air underwater. Preferably it should be carried out prior to commencement of any training in case a decision of unfitness disqualifies the candidate. Results of any necessary chest X-ray and specialist tests or opinion shall be known before a statement of fitness to dive is issued. These results should be available at the time of examination.

The record of examination shall be retained by the medical practitioner. A statement of fitness to dive, unfitness or temporary unfitness, pending further examination, shall be given to the candidate. The statement shall show the date of examination, the medical practitioner's name, contact details and signature. A typical medical form with the statement at the end of the medical form is shown in Appendix B. Any medical problems likely to influence the diver's safety should be included in the section marked 'Advice' on the medical examination form.

The training establishment shall hold a record of the statement of fitness to dive, and the name and address of the medical practitioner who performed that examination.

A2 NEED FOR FITNESS CRITERIA

Although recreational diving may be undertaken in a relatively non-arduous fashion, survival of unexpected emergencies underwater, or on the surface, will depend upon training, mental stability, and physical and medical fitness.

Physical fitness is not synonymous with fitness to dive. Any disorder which causes an increased risk of sudden death, impaired consciousness, impaired judgement, risk of disorientation, impaired mobility, risk of barotrauma or risk of decompression sickness may render a person unfit for SCUBA diving.

Divers are exposed to pressures and related physiological changes which do not apply to persons involved in other activities. Ambient pressure at 10 m depth in seawater is double that at the surface, and pressure changes capable of causing tissue tearing in unvented lung regions can occur upon ascent from as little as 1 m depth.

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

Specific standards are therefore required. Certain conditions are absolute contraindications
to diving (some relative contraindications exist which may not permanently preclude diving). If in the course of a medical examination any such risk factors are identified, the prospective diver shall be told of the conditions and informed as to the hazards and advisable restrictions associated with these conditions as regards diving.

A3 ADVISORY NOTES

Conditional statements of health should not be given. Advice
with regards to limitations may be given to the candidate and should be written on the medical examination form as advice only. As the greatest proportionate pressure changes occur in water close to the surface, certificates restricting candidates to shallow water only, or interim certificates for 'training dives only' shall not be issued. Severe pulmonary overpressure incidents have occurred in as little as 1 m of water.

Limitations may be applied to depths in excess of 18 m, or decompression requirements, as long as these restrictions do not prevent the candidate from being certified according to the instructor organization's requirements.

A4 FITNESS CRITERIA

A4.1 General

The bodily systems outlined in Paragraphs A4.2 to A4.14 should be evaluated from the diver's history and the medical examination. The example form and medical statement given in Appendix B may be copied for use by medical practitioners. The information and questions on the form shown in Appendix B shall form the minimum content of any alternative form used for the medical examination.

NOTE: If the medical form is not accompanied by a copy of this Standard, the advice to the examining physician shown in Appendix C, or similar information, should be included as part of the form.

A4.2 Age

The minimum age for entry-level SCUBA diving should be 14 years.
Children under the age of 16 should only be medically examined after consultation by the doctor with a parent or guardian to establish the child's physical and psychological maturity. Between the ages of 16 and 18 it is preferable to consult with a parent or guardian before medically examining the child. No upper age limit applies provided that all medical standards can be met.

The cardiovascular fitness and pulmonary reserves of persons over 45 years of age should be examined carefully; emergency situations may demand a high degree of fitness. In addition, older divers have an increased susceptibility to dysbaric illness and cardiac death. A reduction in decompression stress is required with increasing age.

A4.3 Physical fitness

Consideration shall be given to the candidate having adequate reserves of physical fitness to cope with the unexpected demands inflicted by adverse weather or sea conditions, surfacing away from a boat, having to aid a distressed buddy, or other emergencies.

A4.4 Obesity

Obesity may imply a lack of physical fitness and it also represents a particular hazard to divers by causing increased risk of decompression sickness. Reduction in decompression stress is required with obesity.

A4.5 Vision

Although methods of using corrective lenses underwater are available, unaided vision should be adequate to allow location of a dive boat or a dive buddy if a diver surfaces without mask, corrective lenses, or both. Corrected near-vision shall allow reading of gauges, timing devices and decompression tables. A risk of corneal ulceration exists if non-permeable contact lenses are used.

A4.6 Ear, nose and throat

The following shall apply:

(a) Both tympanic membranes should be seen to be intact and mobile. The Eustachian tubes shall be patent.

(b) Any evidence of chronic outer or middle ear discharge may be cause for rejection.

(c) Any evidence of chronic or recurrent sinusitis, catarrh or severe allergic conditions of the respiratory tract may be cause for rejection.

(d) Any history of middle ear surgery (including tympanoplasty) should be referred for diving specialist opinion before any decision is made.

(e) *Audiometry* Baseline audiometric examinations should be done. If conducted, frequencies tested shall include 500, 1000, 2000, 4000, 6000 and 8000 Hz. An abnormal audiogram should be noted in the diver's logbook. If there are any significant abnormalities in either audiometry or labyrinthine functions, the candidate should be referred to a diving specialist.

Hearing loss is not necessarily a contraindication to diving.

A4.7 Dental

Dental fitness and jaw function should be assessed for ease of retention of a diving regulator or snorkel mouthpiece. Carious teeth, or teeth with incompletely filled caries are at risk of dental barotrauma. Recent extractions can lead to air entering the tissues and causing subcutaneous emphysema.

A4.8 Central nervous system

The central nervous system shall be examined as follows:

(a) A full examination of the central nervous system should be normal. Any abnormalities should be fully investigated. The abnormality shall be accurately documented for future reference.

(b) A candidate with a history of fits (apart from childhood febrile convulsions), unexplained blackouts or migraine requires further assessment.

(c) Candidates with a history of head injury involving significant unconsciousness or concussion associated with repeated headaches, or intracranial surgery should be individually assessed.

(d) The sharpened Romberg test is useful in assessing vestibular and cerebellar function and should be tested as a baseline. It is performed as follows:

  (i) Candidate stands on a hard floor, barefoot, with feet heel to toe in a straight line, arms crossed on chest and eyes closed.

  (ii) Ability to maintain balance is timed and recorded in seconds as objectively as possible, e.g. number of seconds stable, number of 'falls' in 60 seconds.

A4.9 Cardiovascular system

The following items shall be investigated for this system:

(a) A full examination of the cardiovascular system should be normal. Any abnormalities should be fully investigated.

(b) The resting blood pressure should not exceed 150/95 mm Hg.

(c) Further cardiovascular assessment, including ECG, exercise ECG or specialist opinion may be indicated where any doubt concerning a candidate's cardiac fitness for exercise exists. The exercise ECG may be a valuable addition to the medical examination of all divers over the age of 45 and even those younger where significant coronary risk factors are present. These factors include obesity, smoking, cholesterol, serum lipids and family history.

A4.10 Respiratory system

The respiratory system shall be examined as follows:

(a) A full history and examination should be normal. Any abnormal findings should be fully investigated. Such investigations should include provocative testing if any doubt concerning the possibility of bronchial hyperreactivity exists. Particular attention shall be paid to any condition that might cause retention and trapping of expanding gas in any part of the lungs during decompression, e.g. asthma.

(b) The following conditions may automatically disqualify:

  (i) Any chronic lung disease, past or present.

  (ii) Any history of spontaneous pneumothorax, penetrating chest injuries, or open chest surgery.

  (iii) Any fibrotic lesion of the lung that may cause generalized or localized lack of compliancy in lung tissue.

  (iv) Any evidence of obstructive airways disease, e.g. current asthma, chronic bronchitis, allergic bronchospasm.

(c) Pulmonary function tests shall be conducted as follows:

  (i) Equipment shall be capable of reading to 7 L.

  (ii) All divers shall have a pulmonary function test to establish forced expiratory volume at 1 s (FEV1) and forced vital capacity (FVC).

  (iii) An FVC or FEV1 of more than 20% below predicted values, FEV1/FVC ratio of less than 75%, or both, requires further assessment.

A4.11 Gastro-intestinal tract

The following shall be investigated:

(a) A full history and examination should be normal.

(b) Any abdominal herniation may be a cause for rejection until satisfactory treatment has taken place. Candidates should be free of significant acute or chronic gastro-intestinal problems that may cause acute crisis, or which might cause incapacity in a remote situation, e.g. peptic ulceration.

A4.12 Musculo-skeletal

Any impairment of musculo-skeletal function should be carefully assessed against the potential requirements of emergency situations, which might occur in the water. The mass of diving equipment out of the water can represent a significant hazard to those with pre-existing back or other joint injury or disease.

A4.13 Female

The safety of diving while pregnant has not been established. Pregnancy shall be considered a contraindication to diving.

A4.14 Other criteria

The following criteria shall be applied:

(a) Dipstick test of urine shall be performed and urine tested for albumin and sugar. Any abnormal findings should be fully investigated. Diabetes requiring medication with insulin is a contraindication to diving. Any haematological abnormality should be fully assessed.

(b) Candidates taking medication of any type, including non-prescription drugs, require individual consideration. Many medications have altered effects or risks underwater, or may increase decompression sickness risk, or the effects of nitrogen narcosis. Drugs that may affect the cardiovascular, respiratory or neurological system are contraindicated. In particular, cardiac or central nervous system drugs require careful assessment.

(c) Cigarette smoking has deleterious effects on cardiac, pulmonary and upper respiratory systems and should be strongly discouraged in divers.

(d) The effects of alcohol can be detrimental to divers, increasing the tendency to vomiting, narcosis, dehydration and decompression sickness. Dehydration following alcohol intake is a risk factor for decompression sickness.

NOTE: If the medical is done by someone inexperienced in diving medicine then any abnormalities detected, in either the candidate's history or examination, should result in the candidate being classified as unfit to dive until specialist medical advice, or an examination by a diving medical examiner, has been sought.

A5 ACCREDITED TRAINING IN DIVING MEDICINE FOR MEDICAL PRACTITIONERS

In the absence of action by the relevant regulatory authority to approve training courses, the Board of Censors of SPUMS shall approve specific courses in the teaching of medical practitioners to perform diving medical examinations.

Application can be made to SPUMS for recognition of training or information on currently approved courses. The address of the Board of Censors of SPUMS is—

C/- The Australian and New Zealand College of Anaesthetists
630 St Kilda Road
MELBOURNE VIC 3004

At the time of publication of this Standard, the Censors had approved the following courses:

Christchurch Hospital Basic Course
Diving Medical Centre Medical Examiner Course
Fremantle Hospital Medical Assessment of Divers Course
Institute of Naval Medicine (U.K.) Medical Examiner Course
James Cook University School of Public Health and Tropical Medicine Course in Diving Medicine
Royal Adelaide Hospital Basic Course
Royal Adelaide Hospital Advanced Course (preceded by the basic)*
Royal Australian Navy Diving Medical Course*
Royal New Zealand Navy Basic Course
Townsville General Hospital Diving Medical Course
United States Navy Diving Medical Officer Course*

ADVICE TO THE EXAMINING PHYSICIAN

(Informative)

Issuing an itemized account, which enables the patient to claim Medicare benefits for diving medical examinations, has been prohibited since 1st February 1984.

Diving is a sport carried on in a non-respirable environment, which requires the use of either self-contained or surface supplied breathing apparatus. Sudden unconsciousness underwater is usually fatal when using SCUBA equipment, as the relaxation of muscle tone accompanying unconsciousness results in the breathing regulator falling from the victim's mouth. The diver's next breath will then be water. This makes any condition, which can cause sudden unconsciousness an absolute contraindication to diving. Such conditions may include epilepsy and diabetics on insulin.

A further problem with the water environment is that pressure increases very rapidly with descent, i.e. by one atmosphere of extra pressure for every 10 m of depth in the sea. The use of breathing apparatus, providing gas at ambient pressure, prevents problems of pressure-volume imbalance in the lungs during descent. However, the middle ears and sinuses will develop problems on descent unless the pressure in these spaces equals the ambient pressure. There is no way of establishing the patency of sinus ostia by clinical examination. However, patency of the Eustachian tubes, and so the ability to equalize the middle ear pressures, can be established easily. Observation of the tympanic membrane while the patient holds his (or her) nose, closes the mouth and blows (Valsalva manoeuvre) will reveal inflation of the middle ear by movement of the drum. The nasopharyngeal opening of the Eustachian tube is normally closed but is opened by swallowing. Therefore, a combination of a Valsalva and swallowing during the manoeuvre will give the best chance for air to travel up the Eustachian tube. Another way of opening the Eustachian tube is to protrude the jaw and wriggle it from side to side while performing a Valsalva manoeuvre. Failure to demonstrate an ability to inflate a middle ear is an absolute bar to diving until the person can auto-inflate.

A further set of pressure related problems also occur during ascent when the ambient pressure is decreasing. If an air-filled space cannot vent when the surrounding pressure is reduced, two things may happen. A space with elastic sides can expand but if the space has rigid walls, the pressure in the space remaining at the original pressure becomes higher than ambient pressure. The chest wall is elastic, but after a certain expansion the stretching of the lungs results in tears of the lung substance. Air can then enter the pulmonary venous drainage, pass through the left portion of the heart and be carried to the brain as air embolism. Unconsciousness and death can result. Thus, any condition preventing normal emptying of the lungs is an absolute contraindication to diving.

Asthma, lung cysts, bullae, and other areas that empty slowly or not at all are an absolute contraindication to breathing air under pressure. These conditions are best detected by taking an X-ray of the chest in full inspiration and another in full expiration. To detect expiratory airway obstruction, a Vitalograph (or similar) test is required. Experience in the navies of the world with submarine escape training of many thousands, has shown that a disproportionate number of those suffering burst lungs have FEV1/FVC ratios of below 75%. Such people do not need to hold their breath on ascent to damage their lungs; all they have to do is rise too rapidly. A FEV1/FVC ratio below 75% may be an exclusion from diving and should be further investigated.

A normal FEV1/FVC ratio but clinical signs of bronchospasm, especially on forced deep, rapid ventilation, is an indication of unfitness to dive. Treatment with drugs is not suitable as the effects can wear off underwater and the combined effects of pressure and broncho-dilator drugs are uncertain.

It is hoped that the foregoing makes the following list of absolute and relative ontraindications to diving logical and comprehensible:

ABSOLUTE CONTRAINDICATIONS (*Conditions causing unconsciousness)*

Epilepsy
Diabetes where the patient requires insulin

ENT conditions
Inability to auto-inflate the middle ears. Previous middle ear surgery with insertion of prosthesis to replace any of the ossicles

Lung conditions
Asthma
Lung cysts
Previous spontaneous pneumothorax
Obstructive lung disease
Lungs which empty unevenly (X-ray appearance)
Previous thoracotomy

RELATIVE CONTRAINDICATIONS

FEV1/FVC ratio less than 75%
Poor physical condition
Previous myocardial infarction
Pregnancy

Further information about medical standards for minimum entry-level SCUBA divers can be found in AS 4005.1, available from Standards Australia, Phone: 1300 654 646 Website: www.standards.com.au

If in doubt about a candidate's fitness, it is safer for the candidate to be classed as unfit than fit to dive. Difficult decisions should be referred to a doctor experienced in diving medicine. These are to be found in each State. The South Pacific Underwater Medicine Society* maintains a list of its members with training in diving medicine. Enquiries should be addressed to the Secretary of SPUMS, C/- The Australian and New Zealand College of Anaesthetists, 630 St Kilda Road, Melbourne, Victoria 3004.

URGENT specialist advice can be obtained from the major hospital hyperbaric units in each State and the RAN School of Underwater Medicine, HMAS Penguin, Balmoral, N.S.W. 2091, Phone: (02) 9960 0555.
For diving emergencies, contact the Diving Emergency Service (Australia), C/- Hyperbaric Medical Unit, Royal Adelaide Hospital, Phone: 1800 08 8200.

Recommended reading:
THE SPORTS DIVING MEDICAL Parker, J., 1996. Melbourne: J.L. Publications.
DIVING AND SUBAQUATIC MEDICINE Edmonds, C., Lowry, C., and Pennefather, J., 3rd Edition, 1992.
Butterworth–Heinemann.
* The South Pacific Underwater Medicine Society exists—
(a) to promote and facilitate the study of all aspects of underwater and hyperbaric medicine; and
(b) to provide information on underwater and hyperbaric medicine.

Please note Australian Standard dive medical is only valid for 90 days from issue date in Queensland

STATEMENT OF HEALTH FOR RECREATIONAL DIVING

This section to be completed by a medical practitioner, preferably with appropriate training in diving medicine.

This is to certify that I have today interviewed and examined:
Name . . . . . .
Address . . . . . .
. . . . . .
Date of birth . . . . ./ . . . . ./ . . . . .

Initial the statements that apply:

. . . . . I have assessed the candidate in accordance with AS 4005.1.
. . . . . I can find no conditions which are incompatible with compressed gas, SCUBA, surface supplied breathing apparatus (SSBA) and/or breath-hold diving.
. . . . . I have explained the health risks of diving disclosed by this examination to the candidate and we have discussed how these risks may be reduced. The candidate appears to have a good understanding of these risks.
. . . . . Based upon my assessment, the candidate is not medically fit to dive with compressed gases (SCUBA and SSBA).
. . . . . Based upon my assessment, the candidate is not medically fit to breath-hold dive.

. . . . .	. . . . .	. . . . ./ . . . ./ . . .
Signature of medical practitioner	Name, address and phone number of medical practitioner (Stamp should be used)	Date

This section to be completed by the candidate. Initial the statements below:

. . . . . I understand the health risks that I may encounter in diving and how these risks may be reduced.
. . . . . I also understand that the medical practitioner's recommendation herewith is based, in part, upon the disclosure of my medical history.
. . . . . I agree to accept any responsibility and liability for health risks associated with my participation in underwater diving, including those that are due to or are influenced by a change in my health and/or my failure to disclose any existing or past health condition to the medical practitioner.
. . . . . I hereby authorise the medical practitioner to supply information with regard to my medical fitness to dive to the diving instructor.

. . . . .	. . . . .	. . . . ./ . . . ./ . . .
Signature of candidate	Name of candidate	Date

This statement is valid for 12 months.