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The Australian diving medical. A look at the standards in Australia and overseas

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Abstract

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This paper outlines the requirements for diving medicals in Australia and the differences between the States. It also looks at the requirements in Australia, the United Kingdom and the internationally-used Recreational Scuba Training Council diving medical form and compares the advice given for diving candidates with a history of asthma, diabetes, hypertension and epilepsy.

Introduction

There are two Australian standards covering diving medicals. These are AS 4005 for recreational diving and AS 2299 for occupational diving.^{1,2} In Queensland, however, unlike the other states, there are three documents relevant to recreational diving. The first is the diving medical written and produced by the South Pacific Underwater Medicine Society (SPUMS).³ The second is the Australian Standard 4005.1, minimum requirements for entry-level scuba diving. The medical appendage is based on the SPUMS Diving Medical, and is formulated after consultation with a committee comprising representatives from the diving and tourism industries, Workplace Health and Safety, the Australian Medical Association and SPUMS. The third publication is the compressed-air recreational diving and recreational snorkelling industry Code of Practice.⁴ In Queensland, the Code directs the industry to follow the Australian Standard. Not all states have a code of practice, but each state has its own regulations (Table 1). In Queensland, the industry Code of Practice also covers workers in the recreational diving industry, i.e., diving instructors and dive masters.

Medical fitness-to-dive assessments

In Queensland, the certificate of medical fitness to dive provided to the applicant must follow the specified guidelines set out in the Code of Practice as follows.

RECREATIONAL DIVING

“The Medical Certificate should be provided in English, preferably by a medical practitioner with experience in diving medicine.”

OCCUPATIONAL DIVING

“The certificate is issued by a doctor who has satisfactorily completed training in diving medicine approved by the Board of Censors of SPUMS.”

SPUMS no longer has a Board of Censors, this having been replaced by an Academic Board in 2000. This gives some idea of how long it takes for legislation once in place to be changed. Thus the medical certification of divers in Australia appears complex at first sight, but generally defers to a medical standard based on the SPUMS medical for recreational divers and AS 2299 for occupational divers.

There are differences around the world with regard to the requirements for a pre-dive medical. Some examples are given here.

In Queensland, the requirements are clearly outlined in the Code of Practice.⁴

“1.3 2C Entry-level certificate divers

The employer/self-employed person should ensure that any person training for an entry-level recreational diving certificate is certified as being medically fit for diving in accordance with Appendices A and B of Australian Standard AS4005.1-2000 Training and certification of recreational divers – Part 1: Minimum entry-level SCUBA diving. The two appendices, that is A and B, give medical information and show the medical form which should be used for a pre-diving medical examination for prospective recreational scuba divers. The medical certification should be provided in English, preferably by a medical practitioner with experience in diving medicine, within 90 days prior to the commencement of training.”

Table 1
Australian state regulations for employed divers

• ACT	Does not regulate
• New South Wales	Occupational Health and Safety Regulation 2001
• Northern Territory	Work Health Regulations 1996
• Queensland	Workplace Health and Safety Regulation 1997
• South Australia	Occupational Health, Safety and Welfare Regulation 1995
• Tasmania	Annotated Workplace Health and Safety Regulations 1998
• Victoria	Does not regulate
• Western Australia	Occupational Safety and Health Regulations 1996

In the USA, the Recreational Scuba Training Council (RSTC) medical statement is used.⁶ On this form, under the heading of *Divers Medical Questionnaire*, are directions to the participant as follows:

“To the Participant:

The purpose of the 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 pre-existing condition that may affect your safety while diving and you must seek the advice of your physician prior to engaging in dive activities.”

In the United Kingdom, the UK Sport Diving Medical Committee (UKSDMC)⁷ advises the British Sub-aqua Club, Sub-aqua Association and Scottish Sub-aqua Club on diving medicine issues, including assessment of fitness to dive. This is conducted through a national network of medical referees with accredited diving medicine expertise, using a uniform set of medical standards that are continually reviewed as new research is published.

Recently, the UK moved to a questionnaire-based system. The UKSDMC self-declaration medical system recommends that:

- *“A newly designed Medical Declaration Form has to be completed annually on renewal of membership. The Form is a legal document and the signed declaration confirms that the answers are truthful.*
- *If the response to all questions on the Medical Declaration Form are answered ‘No’ the form can be signed and is to be held by the SAA Club/BS-AC Branch until the following year.*
- *The member should retain a copy of the form with their qualification book.*
- *If the response to any of the questions on the Medical Declaration Form is ‘Yes’ or the diver has a query on any of the questions; if the member has not previously seen a medical referee and has answered ‘Yes’ or has a query on any question on the Medical Declaration Form, the member should not sign the form but telephone their local medical referee for advice.”*

From this telephone inquiry, the medical referee may need only to endorse this form on the diver’s behalf. However, if the medical referee advises further assessment and needs to see a diver for assessment, this is performed at the member’s expense, although this will only be required in a minority of cases. Such assessment may include physical examination or specialist investigations, such as breathing tests or heart scans for example. The expense, over and above the initial consultation fee (British Medical Association guidelines suggested £61.50 for an initial consultation in 2000) is a matter between the medical referee and the member concerned. For members holding a current ‘Certificate of Fitness to Dive’ signed by a medical referee, a copy should accompany the annual Medical Declaration Form.

Guidelines for specific medical conditions

Guidelines for assessing candidates with various medical conditions differ from country to country. Examples are given here of the recommendations for assessing candidates with diabetes mellitus, asthma, hypertension and epilepsy from the relevant bodies in Australia, the UK and USA.

DIABETES MELLITUS

The Australian SPUMS Diving Medical states:

“A4.14 General

(a) Dip-stick test of urine shall be performed and urine tested for albumin and sugar. Glycosuria calls for investigation before acceptance. Albuminuria may be innocent, but acceptance should be considered after 24 hour protein excretion studies. Any abnormal findings should be fully investigated. Diabetes requiring medication with insulin is a contraindication to diving. Any haematological abnormality should be fully assessed.”

The British UKSDMC recommends:

“General - diabetes mellitus

A diver with diabetes mellitus may have a hypoglycaemic attack while in the water, which may be fatal to himself or to his diving partner. The hypoglycaemic attack may be brought on by poor

control of the diabetic condition or by an increase in physiological stress due to exercise, cold, etc.”

The UKSDMC has decided that diabetics may be allowed to dive provided that they are able to pass the standard medical examination and, in addition, satisfy the following criteria:

- 1 *“The diabetic has not experienced any hypoglycaemic attack within the last year.*
- 2 *The diabetic has not been hospitalised for any reason connected with diabetes in the last year.*
- 3 *The physician in charge of the diabetic at the diabetic clinic must consider the level of control to be satisfactory. This implies that the long-term control of the diabetic condition must be good. A guide to this may be obtained from the HbA or fructosamine level. The physician must also be able to state that he/she considers the potential diabetic diver to be mentally and physically fit to undertake the sport of diving.*
- 4 *There must be no microalbuminuria present. Any degree of retinopathy beyond background retinopathy is not allowed. There must be no evidence of neuropathy (sensory, motor or automatic), nor of vascular or microvascular disease beyond the background retinopathy in the eye.”*

Two forms, completed annually, together with a leaflet, are provided. One form is completed by the diver and the other by the physician in charge of the diabetic diver. Copies of both forms are sent to a member of the UKSDMC. The examining physician is meant to discuss the risks of diving with diabetes with the diver to ensure they have a good understanding.

The American RSTC is more succinct, stating:

“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, unless associated with a specialized program that addresses these issues.”

ASTHMA

The Australian SPUMS Diving Medical states:

“A4.10 Respiratory System

(a) A full history and examination should be normal. Any abnormal findings should be fully investigated. Such investigations should include provocation testing if any doubt concerning the possibility of bronchial hyperreactivity exists.

Particular attention must be paid to any condition that might cause retention and trapping of expanding gas in any part of the lungs during recompression (e.g. asthma)

(b) The following conditions may 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 generalised or localised lack of compliance in lung tissue.*
- (iv) Any evidence of obstructive airways disease e.g. current asthma, chronic bronchitis, allergic bronchospasm.”*

The British UKSDMC recommends:

“Respiratory – asthma

Asthma may predispose to air-trapping leading to pulmonary barotrauma and air embolism, which may be fatal. An acute asthma attack can also cause severe dyspnoea which may be hazardous or fatal during diving. These theoretical risks should be explained fully to the asthmatic diver. There is little if any evidence that the mild controlled asthmatic who follows the guidelines below is at more risk

- *Asthmatics may dive if they have allergic asthma but not if they have cold, exercise or emotion induced asthma.*
- *All asthmatics should be managed in accordance with British Thoracic Society Guidelines.*
- *Only well-controlled asthmatics may dive.*
- *Asthmatics should not dive if he/she has needed a therapeutic bronchodilator in the last 48 hours or has had any other chest symptoms.”*

The American RSTC states:

“Pulmonary

Any process or lesion that impedes airflow from the lungs places the diver at risk for pulmonary overinflation with alveolar rupture and the possibility of cerebral air embolization. Many interstitial diseases predispose to spontaneous pneumothorax: Asthma (reactive airway disease), Chronic Obstructive Pulmonary Disease (COPD), cystic or cavitating lung diseases may all cause air trapping. The 1996 Undersea and Hyperbaric Medical Society (UHMS) consensus on diving and asthma indicates that for the risk of pulmonary barotrauma and decompression illness to be acceptably low, the asthmatic diver should be asymptomatic and have normal spirometry before and after an exercise test. Inhalation challenge tests (e.g.: using histamine, hypertonic saline or methacholine) are not sufficiently standardized to be interpreted in the context of scuba diving.”

HYPERTENSION

The Australian SPUMS Diving Medical states:

“A4.9 Cardiovascular System

(a) A full examination of the CVS should be normal. There must be no evidence of heart disease or arrhythmias. Any abnormalities should be fully investigated.

(b) *The resting blood pressure should not exceed 150/95*

(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, elevated serum lipids and positive family history."*

The British UKSDMC recommends:

"Cardiovascular system – hypertension and diving

Hypertension may predispose to pulmonary oedema when diving (1) and is a risk factor for other cardiovascular events, (e.g. stroke and myocardial infarction) which could prove fatal if they occurred in the water.

Diving is permitted by mild hypertensives if their diastolic blood pressure does not exceed 90 mm Hg in new entrants or 100 mm Hg in established divers and their systolic blood pressure does not exceed 160 mm Hg. These pressures are acceptable if they are attained without treatment or by means of approved treatment.

Approved treatments consist of dietary measures including salt restriction, diuretic therapy (when being used to treat hypertension but not if also being used to treat cardiac failure) and low doses of mild vasodilators (e.g. prazosin, nifedipine or ACE inhibitors). Occasionally a medical referee may approve the use of a low dose of a beta-blocker (preferably cardioselective) or other antihypertensive agent to control hypertension provided the heart rate response to exercise stress is unimpaired. The diver should be able to attain a heart rate which is at least 90% of (220 minus his age in years) beats/minute. If beta-blockers are used there must be no evidence of bronchospasm, preferably assessed by lung function tests performed on and off treatment.

Diving is not permitted even if blood pressure control is adequate if there is evidence of end organ damage resulting from hypertension (i.e. renal, eye or cardiovascular complications, including cardiac enlargement)."

The American RSTC states:

"Relative Risk Conditions

- *History of Coronary Artery Bypass Grafting (CABG)*
- *Percutaneous Balloon Angioplasty (PCTA) or Coronary Artery Disease (CAD)*
- *History of Myocardial Infarction*
- *Congestive Heart Failure*
- *Hypertension*
- *History of dysrhythmias requiring medication for suppression*
- *Valvular Regurgitation"*

EPILEPSY

The Australian SPUMS Diving Medical states:

"A4.8 Central Nervous System

- (a) *A full examination of the central nervous system should show normal function. Any abnormalities should be accurately documented for future reference.*
- (b) *A candidate with a history of fits (apart from childhood febrile convulsions), or unexplained blackouts, or a history of migraine requires further assessment."*

The British UKSDMC recommends:

"Neurological – epilepsy

An epileptic attack occurring underwater while using conventional scuba equipment is usually a fatal event, since the mouthpiece is likely to be lost and large quantities of water inhaled during the clonic phase of the fit. It is therefore imperative that no epileptic should dive if there is any serious possibility of an attack occurring underwater.

A second factor which has to be considered is the nature of the drugs used to control epilepsy, which are all, to some degree, sedative in nature and would thus exacerbate nitrogen narcosis or cause it to come on at an unexpectedly shallow depth. For this reason, it is not considered safe for any epileptic to dive if he/she is currently taking any anti-epileptic medication.

Since hyperbaric oxygen is known to provoke convulsions in normal individuals, it was formerly considered that epileptics would be at increased risk when exposed to the raised partial pressure of oxygen in compressed air breathed at depth. However, it is now known that the mechanism of the attack is different, and epileptics are not more susceptible to convulse under pressure. Thus, this factor can be disregarded.

The relapse rate in epileptics who are taken off medication decreases exponentially, with the majority of those relapsing doing so within the first eighteen months of ceasing treatment and the rate of relapse becoming insignificant after three years (1,2).

The suggested requirements for an epileptic to be permitted to dive are therefore set at five years free from fits and off medication. Where the fits were exclusively nocturnal, this can be reduced to three years.

A past history of petit mal should not disqualify, provided that no attacks have occurred for five years and that the condition has not progressed to epilepsy. Pyrexial convulsions in childhood may be disregarded if not followed by epilepsy.

Post traumatic epilepsy: see medical standard on Head Injury and Diving."

The American RSTC states:

"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:

- *History of seizures other than childhood febrile seizures*
- *History of Transient Ischaemic Attack (TIA) or Cerebrovascular Accident (CVA)"*

It is easy to see that there are many differences within Australia as well as between countries in the way the diving candidate is assessed. This usually means that there is no single best way. Problems arise when a diver has been assessed overseas as fit to dive, but does not comply with the Australian recommendations. What happens then? Hopefully with time, the medical standards in Australia will become more discretionary and include a risk assessment and risk acceptance of all the parties involved: the diving candidate, dive operator or instructor and the diving doctor.

References

- 1 *Australian Standard AS4005.1-2000*. Training and certification of recreational divers. Part 1: Minimum entry-level SCUBA diving.
- 2 *Australian Standard AS2299.1 1999*. Occupational diving operations.
- 3 *The SPUMS diving medical*. Melbourne: South Pacific Underwater Medicine Society; 1999.
- 4 *Compressed air recreational diving and recreational snorkelling. Industry Code of Practice*. Queensland Government, Workplace Health and Safety. Effective, February 2000.
- 5 *Workplace health and safety regulations 1997*. Publisher Qld Government Printing Office, 1997. Part 12 Underwater Diving Work.
- 6 *Recreational Scuba Training Council. Medical Statement 2001*. Reprinted *SPUMS J.* 2002; 32: 226-30.
- 7 *UK Sport Diving Medical Committee* web site: <<http://www.uksdmc.co.uk>>

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