ORIGINAL PAPERS

FITNESS FOR DIVING
A review of the critical issues

Des Gorman

The nature of the problem

Despite romantic illusions that humans may have significant dormant "reflexes" that remain from their evolutionary past and that adapt them to underwater activities, in reality, humans are poorly equipped to dive or swim underwater. This is not to say that they are not attracted to diving. New Zealand, and then Australia, has relatively the greatest number of active divers (Table 1). The Australasian diving exposure is even greater still, in relative terms, because of the local mild winters and the coastal predominance of communities. Many other Australasians dive for employment or science.

TABLE 1

THE NUMBER OF ACTIVE RECREATIONAL DIVERS IN DIFFERENT COUNTRIES

Country	Number	% of population
Australia	450,000	2.8
Great Britain	60,000	0.1
New Zealand	150,000	5.0
USA	2,500,000	1.0

The role of a diving fitness assessment is as either a pre-diving screen or as an ongoing health-surveillance. These exercises will vary according to the nature of the diver, that is, whether the diver is or intends to use diving as an occupation. In most western countries, the assessment of occupational divers is prescribed, the medical practitioners are designated according to relevant post-graduate training, the minimum fitness standards are defined and the frequency of the assessments is set. There is a major program underway to produce an uniform international standard because of the "migratory" nature of the working diver. It follows that this is an actuarial exercise.

In contrast, in most countries, the assessment of the fitness of a candidate for recreational diving is essentially discretionary and either does not involve, or can be performed by, any medical practitioner.

This distinction is nonsensical. The ultimate need for training of a medical practitioner is in the conduct of a discretionary assessment. Here there is no prescription of fitness and the role of the medical practitioner is to determine and explain the risk to the risk acceptors (the diving candidate and the intending instructor). In comparison to determining the compliance of a candidate with a prescriptive standard, an assessment of individual risk requires that the medical practitioner be able to use an understanding of the special physical environment of diving and the consequent effects on the diver's physiology in an estimation of absolute (if possible) or relative (more common) risk.

The ability of an Australasian medical graduate to perform such a risk assessment, without special training, is controversial. Some branches of the Australian Medical Association (AMA) have argued that this could be done adequately by any medical practitioner and that no extra training is needed. This is contrary to the experience of physicians with a special interest in diving medicine, the New Zealand and Australian Divers Emergency Services and the South Pacific Underwater Medicine Society (SPUMS). Published surveys of local medical practitioners who have had no training in diving medicine have shown that they have little intrinsic knowledge in the area and that their assessments of diving fitness are neither prescriptive nor discretionary.[1]

The need for post-graduate training courses in diving medicine in Australasia has been established by the large number of aspiring and existing divers requesting an assessment of fitness for diving and by the (essential) absence of diving medicine in undergraduate medical courses. Given the extraordinary competition for teaching time in medical student programs, it is naive to believe that this situation will change soon.

A risk related approach to the determination of fitness

In any assessment of risk, the first step must be to identify the risk acceptors. In the context of occupational diving, this is the employer and the diver and is variously defined in Health and Safety legislation as a "duty of care". In some Australian States, self-employed divers are exempt. This is at best a curious anomaly given that relevant medical and rehabilitation services are available at no cost to the diver. Because of the artificial description of candidates as either "fit" or "unfit" that arises from the use of a prescriptive occupational standard, a review or arbitration system is required. In New Zealand, for example, this arbitration is performed by the Medical Directorate of the Department of Labour. A change from a prescriptive occupational diving fitness standard to a discretionary "standard" in Australasia is not possible given the need for international reciprocity.

No such independent arbitration exists for recreational diving candidates, nor is any probably needed. It is essential then that recreational candidates and their medical examiners understand the determination of their fitness. A didactic and dogmatic pronouncement by a medical practitioner does not impress most candidates. Indeed, it is well established that the usual response to such treatment is for the candidate to present to another medical practitioner and not report the "problem" that generated the negative response from the first practitioner. It follows that the candidate must be included in the risk determination and fully understand the prevalent rationale. Not only will this reassure them that the risks presented to them are real, but it will also help them to explain their consequent decision to their peer group. This is a major consideration and it is recommended that all candidates be asked about their motivation to learn to dive.

Given the nature of the process outlined above it can be seen that the extent of the assessment will either be prescribed or discretionary. There is a need here to discuss only the logic of the latter. Any part of the assessment must be a cost-effective use of both the medical practitioners' and the candidates' time. In general, the criteria for any effective health surveillance activity can be used. For an activity (eg. chest X-ray) to be useful as a diving health screen it must be able to sensitively and selectively identify conditions that are both relevant to diving fitness and are prevalent in the subject community being screened. In this context, in many parts of Australasia, a chest X-ray would not be cost-effective as a screen unless the candidate had a personal or family history of respiratory disease or the medical practitioner found some relevant abnormality on examination of the candidate.

It is not possible to "rule out" all potential problems that may interfere with diving fitness, a stance which would limit diving fitness to individuals with gills. This approach would also have all diving candidates being subjected to a glucose tolerance test, haemoglobin analyses, repeat provocative EEGs and MRI bone surveys. It is important to retain the perspective of the exercise, which is an informed assessment of risk. The concept of "safe to dive" for a human is a nonsense.

Critical questions in determining fitness

In part, those AMA Branches that argue that any medical practitioner can determine diving fitness, mistakenly see diving fitness as an absolute phenomenon. If so, then a list of contraindications (e.g. Dilantin controlled epilepsy) would be all that was required. However, the "real" world is populated by people with conditions such as hypertension and within the hypertensive population are subjects at every conceivable level of fitness. It is not possible to be didactic about such a heterogeneous group and an individual risk assessment is needed. In addition to a knowledge of the underwater environment, the medical practitioner must also have a systematic approach to any condition (disease, disability, level of fitness, morphology) that the candidate may possess and that may be relevant to diving. The following questions provide a suitable framework (asthma is used as an example here):

a Will diving make the condition worse (or interact with any medication to worsen side-effects)?
   i Aspiration of salt-water, breathing a dry cold gas and exercise may all precipitate asthma.

b Will the condition (or its treatment) compromise the diver's or their companion's safety in the water?
   i It is essential that the hostile non-respirable nature of the environment be the basis of this consideration.
   ii The concept of mutually dependent diving pairs intrinsic to modern diving training is also relevant.
   iii The work-load in even recreational diving is often unpredictable and extreme. Asthmatics are over-represented in diving fatalities. They die on the surface trying to swim to safety in adverse conditions.

c Will the condition (or its treatment) predispose the diver to a diving-related illness or injury?
   i If there is any air-trapping in an asthmatic's lungs, then this could precipitate barotraumatic lung damage.
   ii Most bronchodilators are also vasodilators and hence limit the ability of the lungs to filter bubbles from the blood.

These questions also provide a suitable template to explain the risks of diving to an individual candidate.

The role of the diving school

Much of the assessment of a candidate's fitness for diving cannot be performed in a medical practitioner's rooms.

For example, water fitness can only be determined by the diving instructor. Claustrophobia and aquaphobia, both common and incompatible with successful diving, will become apparent, usually during the first pool training session, and previously undeclared problems such as asthma may become apparent. Diving-related phenomena (eg. middle-ear barotrauma) may require referral of the candidate back to the medical practitioner. The diving instructor must also be sensitive to the motivation of the candidate to become a diver.

It follows that there is a pivotal role for the diving instructor in the overall determination of a candidate's fitness for diving and that the medical practitioner and the

diving instructor should have an established liaison. This will require the consent of the candidate, but such consent is usually forthcoming when it is requested.

The emphasis on needing to determine water-fitness in this discussion is deliberate and appropriate because of the changing demography of recreational diving candidates. Twenty years ago, the diving candidate was usually young, male and an already established snorkel/breath-hold diver. This, fortunately, is no longer true and all ages, both sexes and candidates of varying water-skills are requesting training as divers.

Summary

The assessment of a candidate's fitness for diving is either an actuarial exercise (occupational divers) or a determination and discussion of risk (recreational divers). The former is based on a prescriptive standard and the latter on an understanding of the underwater environment and the consequent effects on human physiology. Training for the latter is essential and available at different centres in Australasia (Table 2).

References

1 Edmonds C. MMM, the Mickey Mouse medical. SPUMS J 1986; 16 (1): 3-4

Suggested reading

Edmonds C, Lowry C and Pennefather J. *Diving and Subaquatic Medicine*. London: Butterworth Heinemann, 1992.

Postscript

Since this paper was submitted for publication the Australian Medical Association has acknowledged the need for training in underwater medicine for those who do diving medicals. See the letter on page 24.

Surgeon Commander D.F.Gorman, BSc, MB ChB, FAFOM, DipDHM, PhD, is Director of Medical Services, Royal New Zealand Navy. His address is RNZN Hospital, Naval Base, Auckland 9, New Zealand.

TABLE 2

COURSES IN UNDERWATER MEDICINE IN AUSTRALASIA

Australia

Adelaide	Royal Adelaide Hospital (twice a year) (61)-(0)-224 5116
Sydney	RAN School of Underwater Medicine (annually) (61)-(0)8-960 0333

New Zealand

Auckland	RNZN Hospital (annually) (64)-(0)9-445 5972

COURSES TO PREPARE DOCTORS TO DO DIVING MEDICALS FOR RECREATIONAL DIVERS

Australia

Eastern Australia	Diving Medical Centre (as required) For details contact Dr Bob Thomas Diving Medical Centre 132 Yallambee Road, Jindalee, Queensland 4047.
Phone	(07) 376 1056 / 1414
Western Australia	Hyperbaric Medicine Unit Fremantle Hospital (annually) For information contact Hyperbaric Medicine Unit Fremantle Hospital Fremantle, Western Australia 6160
Phone	(09) 431 2233
Fax	(09) 431 2819