PAPERS PRESENTED

SAFE LIMITS
AN INTERNATIONAL DIVE SYMPOSIUM

Des Gorman

Introduction

Underwater diving is employed in industry and by the military, and is an increasingly common recreation. Indeed, based on the number of air cylinders being inspected, between 2.5 and 5% of Australasians dive with self-contained underwater breathing apparatus (SCUBA) for enjoyment more than 10 times each year. This is more per capita than any other region. For example, this is true for only about 1% of North Americans and 0.1% of Europeans. The relative diving exposure of Australasians is even greater still when it is considered that local mild climates allow year-round diving, that most people live close to the coast and that many tourists come to Australia, at least in part, to dive. The Great Barrier Reef is obviously the major tourist attraction in this context. In one year it has been estimated that about 1 million tourist dives occur in this region. When this is added to the estimates of Australian Nationals diving in Australia (400,000 x 10 dives/annum = 4 million dives), the total diving exposure is considerable, 5 million recreational dives per annum. As each dive (including preparation etc) takes about one hour, this translates directly to about 5 million hours of exposure each year for recreational divers alone.

The importance of this estimate of exposure is that such a denominator is required to place the morbidity and mortality associated with recreational diving into perspective and to underline the concern that exists in organisations such as the South Pacific Underwater Medicine Society (SPUMS) about some current trends in diving.

Each year about 350 Australian recreational divers are treated for a decompression illness (DCI) by one of the country's hyperbaric units. This results in a cumulative risk of DCI of 0.7 episodes for each 10,000 hours exposure. Even if the worst treatment outcome data available from Australasian hyperbaric units are used (50% of patients in some series have not recovered fully from an episode of DCI), the risk of long-term problems from DCI is about 0.35 refractory episodes of DCI for each 10,000 hours exposure. The number of recreational divers dying varies considerably from year to year, if the worst of the recent years are considered (about 35 deaths) to determine an upper risk estimate for mortality, the risk of a lethal event is about 0.07 per 10,000 hours exposure. It is clear then that recreational diving has a low associated risk of DCI, morbidity from DCI and a very low associated mortality. Even though a similar treatment can not be performed for aural barotrauma and other diving injuries (the number of cases is not known), a conclusion that

conventional recreational diving is "safe" is obviously reasonable.

Any consideration of future limits for recreational diving must be considered in the context of the current low level of risk. Similarly, the impact of new diving practices on this risk must be carefully considered before they are endorsed either privately or publicly. Finally, aspiring divers need to be aware of the risks involved in any diving activity so that they can make a sensible risk-benefit decision.

Three issues will be discussed here in greater detail, these are the need for an informed assessment of fitness for diving, the dangerous use of dive computers and the risks of uncontrolled "technical diving", as they are considered to be good examples of the risk-related philosophy described above.

Assessments of fitness for diving

SPUMS has long argued that any diving candidate requires an assessment of their fitness for diving and that such an assessment must be performed by a medical practitioner with training in diving medicine. The recent acquiescence of the Australian Medical Association to this point of view is a significant victory for the Society.

The need for an assessment of fitness in recreational diving candidates is so that the individual can make an informed judgement about the health risks for them inherent in diving. The need for training of medical practitioners is because of the complexity of the physiological and physical effects of the underwater environment and the essential absence of diving medicine from medical school curricula (this problem is not going to be corrected in the short-term as competition for teaching time in these curricula is actually increasing). SPUMS has published surveys of the ability of medical practitioners, who have not been trained in diving medicine, to perform diving fitness assessments; in general, these practitioners were unable to reasonably determine the candidate's health risks relevant to diving. Indeed, the most famous of these surveys described the assessments performed by the untrained cohort of medical practitioners as "Mickey Mouse".

The assessment of a diving candidate is not only essential, it must also be focused on whether the diver is to dive occupationally or recreationally. The procedure for occupational divers is prescriptive (a standard of fitness is decided and imposed, although central arbitration is needed), while that for recreational divers is often discretionary (the medical practitioner determines the risks associated with diving for the individual and then explains these risks so that the candidate can make an informed decision). Considerable training is required for a medical practitioner to perform such a risk-benefit exercise for the candidate. In this context, it is difficult then to defend the stance that medical practitioners need only to be trained if they are to examine occupational divers. A dogmatic approach to fitness for recreational divers based on a list of absolute contraindications is completely unacceptable for the following reasons. First, most candidates will not have a clear absolute contraindication to diving (eg. medication-controlled epilepsy), but rather will have relative (un)fitness which has to be individually assessed (eg. hypertension, being overweight). Second, the primary risk acceptors in recreational diving are the divers themselves and hence they need to be involved in the risk-benefit decision making. Third, the response of many recreational diving candidates to a dogmatic statement of not being fit to dive (i.e. without detailed explanation and involvement of the diving candidate), is simply to visit another medical practitioner and to not report the problem that induced the negative response in the first practitioner. It must be conceded that the dive instructor has a major role to play in the determination of a candidate's fitness for diving and consequently there needs to be a close relationship between medical practitioners who perform diving fitness assessments and the diving schools in their area. Also, while the need for ongoing assessments of fitness is described in occupational diving standards, this does need to be determined on an individual basis for aspiring recreational divers. The age of the diver will be a major determinant of the desirable frequency of re-assessments.

The dangerous use of dive computers

Any activity that increases the risks of diving, and especially recreational diving, is likely to have one or more of the following consequences:

individual morbidity and mortality will be increased;

relevant health, life and travel insurance premiums will increase; and

external regulation (legislation) will be introduced/ increased.

The desirability of external regulation of a recreation is debatable, but certainly many precedents exist. It must also be noted that such control is usually a reflection on the inability of the recreational group involved to self-regulate.

In this context, the current use of decompression computers is disconcerting. With the exception that the actual risk of DCI associated with the use of these apparatus has not been established to any level of confidence, there is nothing intrinsically wrong with decompression computers. The danger lies in the way in which they are being used for multiple day, multiple dives per day diving beyond 30 msw. The inevitable consequence is a significant increase in the incidence of DCI. Such an increase is probably already being seen by

Australasian hyperbaric units and by the North American Divers Alert Network.

SPUMS has just conducted a Workshop on the use of decompression computers. The primary finding of this Workshop was the need for dive planning and "safe" diving practice to have priority, hence the term borrowed from the recreational diving instructor organisations, "computer-assisted diving". An urgent education program is needed to establish adequate diving practice in the context of such computer assisted diving. Not only should this education be the responsibility of Symposia such as this, organisations such as SPUMS and the recreational diving instructor organisations, but also it should be the responsibility of retailers of this equipment. In the context of the latter group, this must also include a more responsible approach to advertising (eg. it is only reasonable to market an apparatus as being able to extend underwater exposures, if it is also noted that such an extension will increase the risk of DCI). The potential conflict between commerce and "safety" in diving is considerable. It is self-evident that "safety" deserves priority here, in addition, retailers of diving equipment should remember that their best strategy for increasing sales is to market "safe" diving.

A final note about this desirable education is the ongoing need to encourage divers who feel unwell after a dive to present to a hyperbaric unit as soon as is possible. The usual delay (on average of more than a day) for recreational divers with DCI to present for treatment in comparison to military and offshore occupational divers who present for treatment within hours of the onset of DCI, probably explains the invariable good outcome in the military and offshore divers and the frequent failure of treatment to obtain a complete resolution in recreational divers.

Technical recreational diving

The range of diving activities described as technical diving (scuba below 50 msw, surface-supplied breathing apparatus (SSBA), oxygen/nitrogen mixture diving, oxygen/helium mixture diving and oxygen/nitrogen/helium mixture diving) represent a greater threat to the integrity of conventional recreational diving (scuba air diving to 40 msw) than any other phenomena; a significant effect is certain unless there is an early introduction of controls of training and conduct. Already, uncontrolled technical diving has been responsible for many diving fatalities, including in Australia. It would be a tragedy if the "safe" aspects of conventional recreational diving were inappropriately regulated because of uncontrolled diving practice by a small part of the recreational diving community.

All of the techniques described above as technical diving are well known to the military and off shore occupational diver, as are the associated risks. Consequently, diver selection processes, diver training programs and diving conduct procedures have been developed by the military and diving companies that result in low levels of risk (eg. a DCI risk of less than 2% and a oxygen convulsion risk of less than 1%). These processes, programs and procedures are available to the recreational diving community, albeit very expensive. The argument here then is that the approval of a type of diving should not be based on the intent of the diver (ie. whether the diver is doing the dive for enjoyment or is being employed), but rather on the actual technique of diving to be employed. This is also the stance being adopted by the United Kingdom's Health and Safety Executive (HSE) (The HSE is the most influential regulatory body in diving worldwide). Recreational divers wishing to undertake technical diving then can choose between a variety of suitable models (for which the associated risks have been quantitatively determined), including those of the military (e.g. Royal Australian Navy), scientific organisations (e.g. National Oceanographic and Atmospheric Administration (NOAA) of the United States Department of Commerce) and offshore diving authorities (e.g. HSE). Unfortunately, while those recreational groups currently wishing to undertake technical diving have well developed and thorough training programs, candidate selection processes and diving conduct are not adequate. The imposition of standards for recreational technical diving is essential to protect the conventional aspects of recreational diving (and the prospective technical divers themselves). These standards can be internally regulated, the Cave Divers Association of Australia is a recreational diving group that could act as a suitable role model in this context. This Association has introduced and imposed sound controls on cave diving, indeed, cave diving was rescued from the same brink that technical recreational diving has now reached. It is nevertheless likely that external standards will be required, those of the HSE are recommended.

Finally, technical diving is an activity both where a thorough awareness of the risks are essential if an informed decision is to be made by an aspiring candidate and where current advertising must become more conservative and balanced. A change in marketing strategy probably will not reduce the appeal of technical diving, as given the perversity of human nature, it is unlikely that a presentation of the risks of such diving would dissuade many of the individuals attracted to this type of pursuit.

Summary

Diving underwater is a popular recreation with an enviable "safety" record. Maintenance of this record is essential to the future of the industry that has evolved to support this recreation. Consequently, everyone in the industry must become active in the "safety" debate, guard

their "safety" record jealously, review potentially high-risk diving activities critically, develop and impose self-regulation regardless of the external legislative environment and ensure that "safety" retains a priority over commerce.

Dr Des Gorman, B Sc, MB ChB, FACOM, FAFOM, Dip DHM, PhD, is a specialist in the area of Diving and Hyperbaric Medicine. He is widely published in Medical textbooks, and has extensive experience in the issue of "Safe Limits for Diving".

Current Position

Surgeon Commander, Royal New Zealand Navy. Director, Occupational, Diving and Hyperbaric Medicine, since 1989. Director, Medical Services, since 1992. Honorary Physician to the Governor-General of New Zealand, since1992.

Current responsibilities include

Co-ordinator, Australasian Divers Emergency Service. President, South Pacific Underwater Medicine Society. Member, Australian and New Zealand Standing Committee on Hyperbaric Medicine Foreign Affairs. Committee Member, Undersea and Hyperbaric Medical Society, Bethesda, Maryland, USA. New Zealand Regional Committee Member, Faculty of Occupational Medicine, Royal Australasian College of Physicians. Executive Committee Member, Australian and New Zealand Society of Occupational Medicine.

Dr Gorman's address is RNZN Hospital, Naval Base, Auckland, New Zealand.

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DIVING IN AUSTRALIA

Terry Cummins

Introduction

The purpose of this paper is to give a brief overview of the dive industry in Australia as it is today. The reason for this approach is to give some context to the other papers which will follow during the symposium.

How big is the scuba diving industry? How many divers are trained each year? How many instructors do we have operating in Australia and in particular Queensland? What is the Dive Industry worth? These are the most common questions we are asked at PADI Australia on a dayto-day basis.

Other papers will address the general theme of the Symposium, Safe Limits in the Workplace.

There are several major elements in the Australian Dive Industry. These include: consumers, instructors, retail dive stores, wholesalers and ancillary services.

Consumers

In recent years them has been much talk about the general observation that the diving industry is growing. Unfortunately, this observation is exactly that, since objective, comprehensive and accurate data on the Australian diving industry simply does not exist. Much of the so called data is purely anecdotal and comes from many isolated sources. Most of these sources do not liaise with each other although Dive Australia is attempting to draw the industry together under a common umbrella.

If the diving industry is to progress successfully further into the 1990s the availability of true data must change from the current situation. In the context of this paper it is extremely frustrating to be unable to relate accurate industry statistics, particularly diver certifications from all agencies.

For example, in Australia, diving certification figures are relatively difficult to come by. This stems from a general reluctance by most of the certification agencies to publicly publish their certification figures.

Having said this, by reference to PADI certification figures, PADI's projected market-share (see Figure 1) and by reference to publications printed by the various certification agencies in Australia, there is absolutely no doubt that the certification of entry level divers and divers involved in continuing education programs has increased quite significantly over the last ten years.

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In 1987, the last time that all training agencies in Australia actually supplied certification figures, information gathered showed that all of the major certification agencies reported significant growth. Similarly the advanced open water course showed a significant increase in the number of individuals certified as did other continuing education programs.

On the other hand, during recent studies conducted in Australia by PADI, it has been established that the potential Australian market is extensive. That is, there are