We did have one case of decompression sickness in member of the nursing staff. She completed a 10 m dive as the attendant and then after a surface interval of only 30 minutes did the first part of an 18 m dive to practice diving with a patient on a ventilator. This dive was aborted as soon as it was realised that it was her second dive and so was very brief. That evening, she complained of pain in the elbow and in the index finger. She presented next morning at the Unit and was found to be depressed, with a labile affect, the sensory defect was confirmed and the sharpened Romberg was limited to about 12 seconds. Treatment with RN table 62 resulted in rapid improvement in her mood and by the second oxygen period at 18 m all the symptoms and signs had disappeared. She was given one further treatment with a Table 61 and after 24 hours was declared fit for routine ward duties. She was able to return to the Unit after one week.

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THE SPUMS DIVING MEDICAL SUBMISSION TO STANDARDS AUSTRALIA

John Knight

History

In 1972 the Standards Association of Australia published Australian Standards CZ18, Rules for Underwater Air Breathing Operations and Z67, Specification for Underwater Air Breathing Apparatus.[1] These were applicable to employed divers only and laid down in Section 2.1 that

"No person shall employ, instruct or allow any person to be employed as a diver and no dive shall be carried out unless the diver-

(a) has passed all medical requirements set out in Appendix A; and

(b) has practical experience, has a knowledge of diving practice, and has a full understanding of the diving apparatus in use: and

(c) is undergoing training under immediate supervision of a diver who has the necessary experience, knowledge and understanding required by (b) above."

SPUMS, as an organisation, had no input into the preparation of this Standard, but some founding members, Carl Edmonds (first President of SPUMS) and Bob Thomas, provided the medical input which produced Appendix A. The Medical Standards for Divers were copied from those in use in the Royal Australian Navy (RAN). At that time the RAN School of Underwater Medicine (RANSUM) at HMAS PENGUIN was the only establishment with full time medical staff devoted to diving and hyperbaric medicine. In Appendix C appeared the telephone numbers of both the Diving Officer and the OIC RANSUM. This was the first beginning of the current Diver Emergency Service (DES) now based at the Royal Adelaide Hospital.[2] The only other unit in Australia which had 24 hour hyperbaric treatment facilities was at Prince Henry Hospital in southern Sydney. Here Ian Unsworth (founding Secretary of SPUMS) was employed as an anaesthetist as well as part-time Director of the Hyperbaric Unit.

In those far-off days none of the diving instructor organisations considered that a diving medical was needed before a student commenced diving. Owing to the hard work of Carl Edmonds and Bob Thomas and those who were taught by them the message slowly got out to diving instructors. The publication of the early Stickybeak reports[3-7] by Douglas Walker, showing that people, who would have been advised not to dive if they had had a medical, were dying unnecessarily added to the educational effort. In the early 1970s the dive shops were taking over from club instruction, but not always safely. In Victoria these training accidents led a group of club instructors to form the the Underwater Instructors Association of Victoria (UIAV). They wrote to the Navy asking for help in training themselves to be safe diving instructors. I have seen a copy of a letter which the then President of FAUI (Federation of Australian Underwater Instructors) wrote requesting that the RAN refrain from assisting UIAV. However the task of teaching was delegated to the Diving Team of the RAN Reserve at Port Melbourne. I was the Medical Officer for DT 6. To the best of my knowledge this 1973 course was the first, certainly the first in Victoria, to teach basic diving medicine and physiology, up to the standards used by the RAN, to budding scuba instructors. Shortly afterwards FAUI, in Victoria, ran its first instructor training course where a doctor, myself, was invited to present the diving medicine and physiology parts of the course. This happy state of affairs lasted for some years and then the training instructors again took over diving medicine and physiology. One major result of my involvement in training FAUI instructors was that an appreciation of the need for diving medicals spread through the diving community in Victoria.

AS 2299

In 1979 the revised Standard AS 2299 - 1979 was published.[8] This covered the same topics as the previous standards, but without such antiquities as the diagrams of the construction of the hand-driven pumps that had supplied air to divers in standard suits in the days before air compressors. This standard was a much more useful production and contained much more information. Again SPUMS was not represented but the medical input was from RANSUM and Appendix A was much enlarged from the previous standard. It is this appendix which has been the basis for sport diving medicals for the last 12 years.

It was realised that AS 2299 did not cover commercial diving operations adequately as it was confined to air diving and did not cover mixed gas and saturation diving.. Committee SF/17 produced draft standards for public review in 1983 which covered Restricted Commercial Air Diving, Professional Air Diving with Surface Compression Facilities and Bell Diving.[9]

Committee CS/83

In 1984 the Australian Underwater Federation (AUF) requested the Standards Association to produce a Standard for scuba divers and a start was made by Committee SF/17. However when the draft standard was circulated, the diving instructor organisations, who were unhappy with being excluded from the preparation of the standard, requested representation. In 1989 Committee CS/83 was set up.[10] Its brief was to produce a standard for the training of entry level scuba divers. To quote from the letter announcing its formation:

"As this Standard's aim is to protect consumers rather than commercial divers it was proposed to set up a separate project in the Consumer Standards section of Standards Australia. This proposal has been reviewed by Standards Australia's Consumer Standards Advisory Board and Safety Standards Board, both of which have endorsed the proposal.

It is envisaged that the proposed standard will deal primarily with the basic course syllabus contents and minimum training activities required for training and accreditation of recreational scuba divers. Other aspects which may be included are medical examinations for candidates, basic first aid and rescue procedures, equipment requirements and underwater communication signals."

For the first time SPUMS was represented, by me, on an Australian Standards Committee. The first meeting of this committee was on May 16th and 17th 1989. The Committee's composition is shown in Table 1. When the meeting opened there were statements from the diving community that there was no need for the Victoria Police and the various government departments to be on the committee. The Police reply was that they had a great interest in scuba training as they had to risk their lives looking for the bodies of scuba divers, which I thought was a very valid point.

Draft Standard

The draft circulated for comment was used as the basis of the new document. Among the many comments from the public was a submission from FAUI for a diving medical, based on discussions with Des Gorman about how the AS 2299 medical needed to be altered for scuba trainees. The vast majority of the comments and suggestions were from members of PADI (Professional Association of Diving Instructors) and could be summarised, not too unkindly, as "Adopt the PADI training scheme as the Standard".

The basis of Standards produced by Standards Australia is compromise. Votes are taken but only when progress has stalled. Compromise, when the training standards of the various organisations differ, is fraught with danger if one settles for the lowest common denominator. The reasons for this are that some of the diver training organisations appear to have failed to appreciate the lessons of studies of diving deaths and continue to place their students at risk of death, from air embolism during free ascent training and from undetected medical problems. In addition the commercial pressure to shorten the training to the minimum, so maximising the returns to the dive shop, means that sensible training, such as teaching a student to monitor his depth and time underwater, learning to dive from a boat as well as from the shore and teaching expired air resuscitation to the students, is excluded. All these things were left out of the practical side of the draft Standard. Learning to monitor the depth and time of the dive was included in the theory side of the Standard but in the draft neither a depth gauge nor a waterproof timing device was required to be provided to each student !

The Standard is written in sections. Section 1 sets out the scope, purpose, application, reference documents, definitions and selection criteria for the training and certification of minimum entry level scuba divers. The scope, "This Standard specifies the minimum training activities and terminal objectives for training and accreditation of persons who wish, for recreational purposes, to (a) dive safely and competently using self-contained underwater breathing apparatus (scuba); and (b) engage in openwater scuba diving with a diver of similar qualifications without supervision." had to be reduced by inserting "in the area in which training was undertaken" after (scuba) when it was pointed out that divers trained on the Barrier Reef, without wet suits, often got into trouble in cold water when first wearing a wetsuit as did those mainly taught to dive from boats when making surf entries.

Section 2 sets out tables of terminal objectives and training objectives, under the headings of physics of diving, general requirements for diving, the physiology of diving

and first aid and use of scuba diving equipment. Section 3 covers training plan, assessment, equipment and open water diving. Appendices A to C deals with medical examination for scuba divers, the form to be used, and where to get advice.

Progress

Of the diver training organisations (BS-AC, FAUI, NAUI, PADI) represented on the committee only FAUI and the BS-AC considered a diving medical necessary. The position was worse than this as the representatives of the Diving Industry and Travel Association and the Queensland Dive Tourism Association, one of whom represented a fifth diver training body (Scuba Schools International or SSI), were also against the need for a diving medical.

While I am certain that it is not official policy of any of the diving training organisations to assume that they, and only they, know anything about diving and diving training, there were questions from some of the representatives as to whether the SPUMS representative had the right to make comments about diving training ! Inspite of this I was able to persuade the committee that it was illogical to prescribe teaching the student to monitor the depth and time of the dive if the teacher did not provide a both depth gauge and a waterproof timing device for each student. Unfortunately FAUI's requirement that students be taught expired air resuscitation was defeated on the grounds that it took too long to do (which only means that the teacher does not know how to teach EAR or is trying to teach too many students) to be economically viable.

The major struggle, to be repeated at other meetings, was about the need for a diving medical. SPUMS has always held that this is essential before starting a diving course. The U.S. based training organisations hold that a questionnaire is an adequate sieve and that medicals are for those caught by the sieve. The rationale is to keep the cost to the student down, presumably to encourage other students to replace any who fail to survive their medical problems when diving. I was glad of the presence of the non-diving members of the committee who were sufficiently impressed by the case for a medical to make certain that it stayed in. However the minutes of that meeting devote just over seven A4 pages to amendments to Appendices A and B.

The next meeting was on September 6th 1990 and as I had been overseas, and only found out about the meeting five days before it was due, I was lucky to get Carl Edmonds to attend in my place. He was less satisfied with the medical wording that I had been and as a result there was a meeting, in November 1990, of Carl Edmonds, Chris Lowry (authors of "Diving and Subaquatic Medicine"), Bob Thomas (co-author of "The Diver's Medical Companion"), John Williamson, Chris Acott (Royal Adelaide Hospital), Mike Loxton (OIC RANSUM) and myself (convener) where all the supposedly contentious issues were sorted out. This consensus was presented to the meeting of CS/83 on December 13th 1990 by Bob Thomas and Carl Edmonds as I was required (fortunately only as an expert witness) in the Melbourne Coroner's court that day.

This meeting brings different accounts from those who were there, depending on whether the speaker was present as a representative of three diving training organisations or of SPUMS. To simplify, there was a determined effort to undo the previous agreement to include a diving medical in the Standard and replace it with a questionnaire. This was defeated by a narrow margin. After considerable discussion Bob Thomas agreed to various alterations in the medical, actions which the Committee of SPUMS approved at their next meeting. These changes are to be voted on by Committee CS/83, and now that the AMA (Australian Medical Association) has been granted a seat on the committee for Ian Millar the chances of acceptance have been increased.

The wording of Standards is clearly laid down by the Standards Association. When "shall" is used the procedure is compulsory and when "should" is used it is recommended. This should be borne in mind when reading the numerous quotations from the Standard that appear in this paper.

Changes from AS 2299 - 1979

The new Standard applies only to entry level scuba divers. After many years of encouraging diving instructors to send their students to doctors who know something of diving medicine we have been able to persuade the Committee that examination by "a medical practitioner who has done an approved course of training for medically examining candidates for recreational diving training" should be mandatory and the medical should be carried out "before the candidate first uses compressed air underwater". The trade off, dictated by claims from diving organisations that there was an insufficient number of properly qualified doctors in Queensland, is that this provision will not come into effect for two years from the date of publication of the Standard. This will allow time for those interested to do an approved course. In the mean time it is recommended in the Standard that properly trained doctors should do the medicals wherever possible.

At present the standards of training for doctors doing diving medicals remains safely in diving medical hands. The Standard states that "In the absence of a relevant regulatory authority, the Board of Censors of the South Pacific Underwater Medicine Society Incorporated (SPUMS) shall be the authority approving courses." It is up to the States and the Commonwealth to appoint regulatory authorities if they wish to. At present none has done so. Courses which have been approved include the RANSUM and Royal Adelaide Hospital Diving Medicine courses and the Diving Medical Centre Diving Medical Examiner courses. Forty

one doctors have completed the latter courses. Last year SPUMS published a list of members who do diving medicals. Only about 40, of the 150 doctors who appeared in that list, had notified the Secretary of their diving medical qualifications by the beginning of May1991. Notification of diving medical qualifications is a sine qua non of being on the next list.

One of the concessions made was to delete a minimum age for diving training. However the compromise was that "Children under the age of 16 shall only be medically examined after consultation by the doctor with a parent or guardian to establish the child's physical and psychological maturity." This allows the doctor to keep the immature child out of diving. At the same time the maximum age limit was removed subject to the candidate meeting the medical standards.

It is now recommended that "unaided vision should be adequate to allow location of a dive boat or a diver's buddy if a diver is without a mask, corrective lenses, or both." One diving doctor I know would fail this sensible requirement ! Colour vision is of no interest to the recreational diver but being able to read his or her gauges is, so "Corrected near-vision must allow reading of gauges, timing devices and decompression tables." appears in the Standard.

Those of us who have difficulty hearing things will be glad to read that "Hearing loss is not necessarily a contraindication to diving." The ENT section of the medical is more concise than before and devotes about half its length to clearing middle ears, which is very sensible as middle ear barotrauma of descent is the commonest problem with trainee divers.[11]

The limit for blood pressure is now set as 150/95. ECGs are only needed when any doubt concerning a candidate's cardiac fitness for exercise exists.

The Standard now clearly describes the respiratory conditions which "shall automatically disqualify" from diving. These are "(i) Any chronic lung disease, past or present. (ii) Any history of spontaneous pneumothorax, perforating 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. In cases of doubt, specialist medical opinion should be sought. Such opinion should include provocative testing if any doubt concerning the possibility of bronchial hyperreactivity exists." This protocol should assure consistent decisions from medical examiners.

Chest X-rays are not compulsory unless there is "a significant past or present history of respiratory diseases, a family history of respiratory disease, abnormalities in the respiratory system on clinical examination or an abnormal pulmonary function test " Pulmonary functions tests now include referral for a further opinion if the FVC or FEV_1 is less than 20% below predicted values as well as when the FEV_1/FVC ratio is less than 75%.

The Standard clearly states that "Diabetes requiring medication is a contraindication to diving" as is sickle cell disease. We are reminded that "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." Further reminders include "drugs that may affect the cardiovascular, respiratory or neurological system, are contraindicated", that drug interactions with people "taking cardiac or central nervous system drugs require careful assessment" and that "cigarette smoking has deleterious effects on cardiac, pulmonary and upper respiratory systems and should be strongly discouraged in divers." Members who party on after the meetings should remember that "the effects of alcohol are highly dangerous to divers, increasing the tendency to vomiting, narcosis, dehydration and decompression sickness. Dehydration following alcohol intake is a risk factor for decompression sickness." This fact is overlooked by those who do not drink a litre of water before going to bed after the party. Incidentally this also prevents hangovers !

The questionnaire has been redrafted, so that the questions to follow on logically, with a prominent notice that "Positive responses to questions do not necessarily disqualify you from diving". There is a statement to be signed by the candidate that the information is true and complete and an authorisation to give an opinion about fitness to dive to the diving instructor and to supply medical information to other doctors "as may be necessary for medical purposes in my personal interest."

The medical examination form has also been redrafted and simplified. It now finishes with a detachable certificate, to be handed to the candidate, on which are to be recorded "any medical problems, likely to influence the diver's safety" and abnormal findings.

Conclusion

Thanks to the hard work of many people, both named in this paper and unnamed, we have a submission for a medical, to be included in the Australian Standard for Entry Level Certification of Scuba Divers being prepared by Committee CS/83, which meets the requirements of diving medical safety and looks likely to be acceptable to the majority of the Committee. SPUMS is deeply indebted to Carol Wright and Les Graham, both FAUI Instructors, who respectively represent FAUI and Scuba Divers Federation of Australia on the Committee. Their commitment to the concept of a diving medical before starting to dive has provided a steady base on which to build support in the

Table 1

ORGANISATIONS REPRESENTED ON THE RECREATIONAL UNDERWATER DIVING COMMITTEE (CS/83)

Originaly invited (7.12.89)	**Accepted**	**Attended May 1989**	**Attended Sept 1990**	**Attended Dec 1990**
Australian Coaching Council	9.2.89	Yes	No	No
Australian Federation of Consumer Organisations	Intended to nominate but never did			
Australian Underwater Federation	14.3.89	Yes	Yes	Yes
British SubNoAqua Club	28.4.89	Yes	No	No
Consumer Affairs Bureau, Queensland.	20.12.88	Yes	No	No
Department of the Arts, Sport, The Environment, Tourism and Territories (Commonwealth)	19.1.89	Yes	No	No
Department of Leisure, Sport and Racing, New South Wales	16.1.89	No	No	No
Diving Industry and Travel Association	2.3.89	Yes	Yes	Yes
Federation of Australian Underwater Instructors	16.12.88	Yes	Yes	Yes
James Cook University, North Queenslandd.	Never nominated			
Ministry of Sport and Recreation, Western Australia	11.5.89	Yes	Yes	Yes
National Association of Underwater Instructors	14.3.89	Yes	Yes	Yes
National Safety Council of Australia, (Victorian Division)	22.12.88	Financial collapse before first meeting		
PADI Australia Inc.	14.3.89	Yes	Yes	Yes
Queensland Dive Tourism Association	17.1.89	Yes	Yes	Yes
Scuba Divers Federation of Australia	1.5.89	Yes	Yes	Yes
South Pacific Underwater Medicine Society	18.1.89	Yes	Yes	Yes
University of Sydney	late 1989		No	Yes
Victoria Police Search and Rescue Squad	18.1.89	Yes	No	No
Requested representation				
Police Department, New South Wales	20.10.89		Yes	Yes
Department of Employment, Vocational Education, Training and Industrial Relations,Qeensland	3.7.90		Yes	Yes
Professional Divers Association of Australasia	17.7.90		Yes	Yes
Scuba Schools International	10.8.90		Yes	Yes
Australian Medical Association	21.2.91			

Committee. It is unfortunate that after the first meeting the AUF had replaced Wal Williams, a SPUMS associate member who supported compulsory medicals, with a nominee who appeared to consider that medicals were unnecessary.

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ARTICLES OF INTEREST REPRINTED FROM OTHER JOURNALS

BEING TREATED LIKE KIDS

Ben Davidson

It seems like these days dive operators are creating more and more rules, so that experienced divers are getting less and less satisfaction. We're being treated like kids.

For the moment, I'm going to pick on just on one rule. But there are plenty of others deserving attack, as well.

While we all know that cocktail hour is reserved for those who have stopped diving for the day, more and more liveaboards are extending this to mean that a single beer or a glass of wine at lunch will keep you out of the water the rest of the day.

Recently, one of our readers was so upset with the attitude of the staff of the Sea Dancer, and fact that he was kept out of the water after a lunch time beer, he is demanding his money back. If you don't tell me ahead of time about such an idiotic rule, he says, then you can't enforce it.

Excessive alcohol can impair judgement, but that is not the reason for prohibiting a lunch time beer. As Chris Wachholz, Marketing Manager for DAN, says: "alcohol dehydrates a person and that dehydration can lead to the bends. But we do not know the exact amount of alcohol that increases the risk."

We also know that caffeine dehydrates, which puts coffee and Coke on the same list. Furthermore, sun and salt water also dehydrate, as does the dry air pumped into your tank. And we also know that drinking plenty of water hydrates, putting necessary water back into the system.

Nonetheless, prohibiting a beer or a glass of wine at lunch has become de rigueur among the new moralists of diving. And that means no respect for the typical liveaboard diver, who typically has sent his or her kids off to college, is an experienced diver, and a sensible drinker. To tell him that he is grounded after a lunchtime beer is just a bit too much, folks. Would it not be wiser to establish a rule requiring a diver to drink a dozen glasses of water day?

Winston McDermott, owner of the Little Cayman Diver, told us that: "Since we've been told that alcohol can dehydrate a person we limit the intake until after the diving. Now if someone is only doing two or three tanks and wants a beer during lunch and is planning on taking a nap after lunch we would not usually deny that. But since it is the responsibility of the captain and crew to ensure the safety of the passengers it is also up to them to determine if the passenger can have a beer or not." As our review of the LCD indicates, McDermott's martinet has put his boot down.

Owners of boats under US laws are claiming that they're governed by the notion that if alcoholic beverages are made available and an accident occurs then the owner is liable, much like a bartender serving someone who gets drunk and becomes involved in an automobile accident.

So, rules get promulgated. Glen Egstrom, a past member of the NAUI Board and a member of the UCLA Kinesiology Department says that although "I don't like to see drinking and diving I also don't like to see rules like this. We have rules that have little of no basis in scientific fact then find ourselves trying to defend them in a court of law."

Wayne Hasson, Operations Manager for the Aggressor fleet told us that the Kona Aggressor has had a "no drinking and diving" rule since its inception because it is owned by Americans and operates in US waters. "We have begun a no drinking and diving rule with our other boats because of the increased risk of decompression sickness," he says.

Hasson himself got bent a couple of years ago. "I made a dive to 100 ft for 20 minutes and then came up for a two hour surface interval. During this time I had two beers. I then went back to 110 ft for 15 minutes and on the way up stopped to out-gas at 30, 20 and 10 ft. Within 30 minutes of surfacing I was beginning to be paralysed. DAN had me fill