

RAN MEDICAL OFFICERS' TRAINING IN
UNDERWATER MEDICINE

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THE PRESENT SITUATION

Underwater Medicine, like many other branches of medicine, places us in the realm of the ever-changing and ever-developing. The increasing complexity of the associated therapeutic kit mirrors the corresponding advances in the world of International Diving, as man strives to go deeper for longer and not just once, but repeatedly, and to live there for days and weeks at a time, ensconced in a hyperbaric goldfish bowl from which individual forays into the murky subaquatic unknown are made.

Against this however, is contrasted the comparative lack of sophistication of Royal Australian Navy Diving in comparison to that of other navies and the commercial diving industry at large. I do not imply that Navy diving is bad, it is quite excellent and has an excellent safety record, but in terms of sophistication, as to what it can do and what it has done, it is literally a babe in arms. It is however, a fairly rough babe, and is rapidly growing up.

Underwater Medicine in the RAN was originally introduced to provide medical support for Navy Diving. ABR 1991 lists the following as existing underwater medicine activities:

1. Care for diving personnel including therapeutic treatment for Service and civilian divers and submarine escapees.
2. Diving related research.
3. Training/education in underwater medicine.
4. Submarine suitability testing.
5. Investigation of suspect diving equipment.

The commitment to civilian diving has recently received greater emphasis by the formal tasking of the Navy to provide emergency care and advice. The situation has virtually always been like this but was formalised some four years ago by the then Minister of Defence, was re-affirmed in the middle of last year by the Minister Assisting the Minister of Defence, and at the end of last year was ratified by the Chief of Naval Staff in a letter to the Naval Support Commander. In fact, most of the therapy conducted at the School of Underwater Medicine (SUM) is on civilians. Most of these are sports divers, with a sprinkling of commercial abalone divers, and very rarely have we the requirement to treat Service divers. Our running score is around 80 cases per year, which although less in total than that seen by the United States Navy, still represents the greatest number of diving cases in the world dealt with by one small unit of this size and capacity. In Hawaii they deal with a comparable number of diving cases, but these are shared amongst some fifteen doctors and we have only three.

Naval Doctors trained at SUM have been intimately involved in the treatment of diving casualties throughout the whole of the Australian continent and beyond. Along the lengths of the East and West coasts, from Mt Gambier in the South to the Katherine Gorge, deep in the heart of the Northern Territory, and from the waters beyond the Great Barrier Reef to the Islands of New Guinea.

In a consultative capacity the School of Underwater Medicine has been called upon to advise:

All State Health Departments, many other State bodies,
eg. Police, Paramedics, Emergency Services.
Hospitals, Civilian Doctors, other Armed Services.
The National Safety Council of Australia.
The Australian Underwater Federation.
The Australian Institute of Marine Science.
Commercial Divers.
Individual sports divers, Diving Clubs and Instructor bodies.

THE FUTURE

Our patient numbers are increasing and diving casualties are presenting with worse disease, as diving continues to become even more popular and is pursued to even greater adventure.

We have already been tasked to support the imminent Deep Diving Phase of the RAN, to verify and amend existing decompression schedules and to develop new ones to meet this requirement, and this has already been started.

We will be involved with the Australian Submarine Escape Training Facility (SETF) at HMAS STIRLING. We are already required to support existing submarine escape, and with the new generation submarines for the Australian Fleet with a dive capability of several days, we will almost certainly be involved in their environmental monitoring and control.

In order to satisfy these requirements, we need experts and specialists. I would urge with the greatest powers of my persuasion that Underwater Medicine is not a minor sub-specialisation which one can casually drift in and out of. It is without doubt a major entity in its own right requiring much training, a very significant depth of understanding and literally years of dedication.

THE UNDERWATER PHYSICIAN

The Underwater Physician must have qualities and training to assist him in his activities.

Diving

As a diver, the doctor has a far better understanding of the problems facing another diver. He will well understand the piercing, throbbing of sinus pain over the forehead, the problems associated with clearing the ears, the almost incomprehensible weight of his diving set as he climbs out of the water onto a heaving boat, the uncomfortable constrictions of a diving suit, and the murk, the cold and the

lonely isolation of the man beneath the sea. He will understand the difficulties of buoyancy, both on the way up and on the way down, of disorientation, communication, and of the strange curiosities of vision caused by light refraction.

Physiology

The whole of diving medicine is based on a sound knowledge of physiology and more than that, physiopathology. The knowledge of what happens to the body after varying conditions determined by the hyperbaric environment, when they are likely to happen, how they are likely to present, and what the prognosis is likely to be. In respiratory physiology particularly, his training and understanding will be verging on that of the biophysicist and the anaesthetist.

Physics

He must have total familiarity with the concept of gases, bubbles and liquids, their actions and interactions together, as described by the laws of Boyle, Charles, Dalton, Henry, Hagan, Poiseuille, la Place, to name but a few, and how all this effects the diver.

Electrodiagnostics

He will need a working knowledge of cardiac monitoring, cortical evoked responses, the electroencephalogram, and electronystagmogram. Obviously his expertise will not be to the same degree as the relevant specialist, but it is nevertheless of paramount importance that he should have a good working knowledge of these facilities, not only for diagnoses but also as a measurement of the efficacy of his treatment.

Therapeutics

He will need to understand how decompression tables are constructed and be able to evaluate critically whether decompression schedules should be used as they are published or whether in a given situation he should modify them on the basis of his clinical findings and experience. He must know why the various types of intravenous therapy are used, the pros and cons of surface oxygen, and when to treat and when to wait.

Research

In the concept of research, he will be fulfilling part of his initial tasking as defined in ABR 1991. Of even greater importance is the fact that here he will acquire the capability of asking the right questions of the right people at the right time, in order to pursue a point of contention. As a researcher he will have a great deal of background information and also will acquire the capability of scientific evaluation of the efficacy of new techniques.

New techniques

With the new deep diving chamber, scheduled to be functional later this year, a whole new concept in diving medicine has opened up to us. No longer are we restricted to the use of air, oxygen or various prescribed mixtures from cylinders, but we now have the capability of creating any given atmosphere with whatever partial pressures we choose, using any combination of nitrogen, helium and oxygen. Our depth capability has increased from 50

metres to more than four times that. With the new chamber the modern concept of saturation therapy will soon be common practice as opposed to the state in our existing recompression facilities where, in spite of ingenious adaptation, based on the best of scientific reasoning, a young man died in May 1984 when we simply ran out of chamber as his therapeutic requirements far exceeded those which were available.

Political

The Underwater Physician must also act in a political sense. This is particularly relevant as OIC of the School of Underwater Medicine, and as CMO or SMO of HMAS STIRLING, where continual exposure to the searching questions of Senior Officers, the media, and civilian pressure groups, have to be handled with diplomacy. Ideas have to be transformed to the written word and couched in a form which is both correct Service writing and which carries the greatest diplomatic persuasion.

Experience

Experience can never be learned from a book, only by being there, seeing what is happening and participating to the full. There is no substitute for this and without it the academic can never aspire to be a clinician. The concept of experience exists in everything we do and its importance can never be over-emphasised.

Career

If we wish to have good people in the medical branch of the RAN, we must persuade them to stay and the same applies to underwater medicine. I believe that it is vital that a career should be planned for those interested in spending a large part of their working life in this subject. This career must be meaningful, based on a programmed career plan with progressive training and jobs. Obviously as much training as possible should be in Australia, although even with the new Submarine Escape Training Facility, some training will almost certainly have to take place overseas. The career should encompass academic and research involvement as I have already mentioned, and could profitably extend over a period of 14 or 15 years. We should work in close co-operation, and be involved, with national and international underwater medicine organisations such as the Undersea Medical Society in the United States, the European Underwater Biomedical Society and here in Australia the South Pacific Underwater Medicine Society.

Specialisation

Almost hand in glove with a programmed career is the concept of specialisation. Recognised specialisation with appropriate academic qualification will be beneficial to the Navy, the individual, and the diving community at large. Such qualification should almost certainly come from the Australian College of Occupational Medicine which already accepts that it has a role to play in the regulation of underwater medicine and in this capacity has already recognised a member of SUM with the award of a Fellowship.

Credibility

This is the one concept that we all seek to achieve. We all hope that one day we will aspire to the professional respect

which we feel is owed to us by those around us and by our colleagues. Without credibility, nobody will believe you, or trust your judgement. Each is vital to the practice of any form of medicine and the only way to achieve it is to do the right sort of training in the correct sequence in order to gain the appropriate experience so as to make wise decisions, and to be seen to be so doing.

UNDERWATER MEDICINE TRAINING AT PRESENT

Ships Diving Officer's Course

Basic Underwater Medicine

Advanced Underwater Medicine

Apprenticeship

One-off aspects of training:

- (1) Admiralty Marine Technical Establishment (Physiology Laboratory) [AMTE(PL)]
- (2) Institute of Naval Medicine
- (3) Submarine Escape Training Tank (SETT), HMS DOLPHIN.
- (4) RN Submarine Squadron
- (5) MV SEAFORTH CLANSMAN (RN deep diving vessel)
- (6) Clearance Diver (CD) training in Australia
- (7) Oxyhelium diving in Canada
- (8) Research PhD
- (9) Attachment to the USN
 - (a) Naval Medical Research Institute (NAMRI)
 - (b) Naval Experimental Diving Unit (NEDU)
 - (c) San Diego

All of these training activities are very valuable and each gives knowledge which is part of the large jig-saw. The one-off training activities, although each is of excellent quality, depend to a greater extent on the drive and enthusiasm of the individual doctor. It is fair to say that the more you put into it, the more you will get out of it. So far, it is only a handful of people who have been exposed to some of the one off training and only one person who has completed all of it. However, this existing training must be updated in terms of the programmed career, specialisation, and academic qualification, in order to fully prepare the Underwater Physician for the daunting tasks ahead.

At present there are four billets in Underwater Medicine. These are the OIC SUM, the 2nd MO SUM, the Junior MO SUM and the Command Medical Officer/Senior Medical Officer (CMO/SMO) HMAS STIRLING.

SUGGESTIONS FOR THE FUTURE OF UNDERWATER MEDICINE IN THE RAN

Since the Submarine Escape Training Facility is proposed for Western Australia I suggest this virtually obliges the creation of two further Underwater Medicine posts, of SETF MO and Junior MO HMAS STIRLING, which is

ironic since if it were to be built adjacent to the existing facilities at HMAS PENGUIN it might have been possible to make do with fewer doctors. This increased number of Underwater Medicine positions could make possible a combination of training and career, which I will outline below. This is my version and is not necessarily shared by the RAN.

We start with the Junior MO at SUM, who would spend a year there. He would already have done an Introductory Underwater Medicine Course which would last for 1-2 weeks, possibly as part of his Direct Entry Officers' Course or shortly thereafter. He would be a volunteer, and should be interviewed and selected when he came to HMAS PENGUIN to do his Ships Diving Officers' Course. During his year at the School of Underwater Medicine he would undergo the existing Basic and Advanced Underwater Medicine Courses and also the latest concepts in the more technically advanced phases such as saturation underwater medicine, electro-diagnostics, the use of the new deep recompression chamber, gas analysis, and on an opportunity basis would carry out experience dives on all RAN diving systems. He would then go to HMAS PLATYPUS for a short submarine acquaint course, for about 2 weeks. This is purely to show him what a submarine is, the basics of how it works, how the submariners feel about their own particular problems and their own way of handling them, such as cramped living conditions, toxic atmospheres and submarine escape. The balance of the year would be spent at SUM with on-the-job training and general experience in underwater medicine.

His next post would be to HMAS STIRLING in Western Australia as the Junior Medical Officer for 6-12 months where for about 1 month he should undergo a SETF Course. In this his knowledge of the problems of the submariner would be broadened, with a greater emphasis on the problems of submarine escape. He would undergo submarine escape training and participate fully in submarine escape activities.

Following this, when he will have 18 months to 2 years experience in Underwater Medicine, he would be sent overseas for 6 months consolidation training either in Europe or North America. At present, probably the place with greatest experience of underwater medicine in Europe is Aberdeen University in Scotland with whom we have more than a nodding acquaintance. Experience of the industrial type of diving, and diving medicine, which is practiced in Aberdeen, and which is very much of an international nature, would be quite invaluable to any aspiring underwater physician. I suggest a week is sufficient for a visit to the Institute of Naval Medicine and the Physiological Laboratory, since sadly the RN seems to have lost most of its experts in Underwater Medicine. The greatest use, however, which can be made of the Royal Navy, would be for some form of 'Sea Surge' exchange on their ship the SEAFORTH CLANSMAN, which is a deep diving support vessel with its own saturation complex. A minimum period of 5 weeks would be required since without doubt this is the direction which the Royal Australian Navy must surely go in the fullness of time. In North America, equivalent training could be acquired with the USN at NAMRI, Bethesda, or NEDU, Panama City, or preferably a combination of both.

On his return from overseas he would come back to the submarine escape training facility in HMAS STIRLING as the SETF Medical Officer. At this point he should

receive the Diploma of Underwater Medicine. This should probably be awarded by peer group election and also on the results of a running case thesis which he would have kept during the previous two years. So far the Diploma of Underwater Medicine does not really exist in Australia, however, it would be appropriate if the College of Occupational Medicine were to champion this cause.

The two years as SETF MO would be essentially of a clinical, advisory, supporting nature, during which time the MO would be able to select his particular interest for the following year, where he should have the opportunity to do a year's research for an MSc. This research should be relevant to Underwater Medicine and as such would again fulfil existing commitments of the School of Underwater Medicine. It would probably not matter materially, however, whether the research was done in either the East of Australia or the West. Subjects which are particularly relevant in the field of Underwater Medicine are biophysics, physiology, and applied anaesthetics. For example, nobody has yet tried to find out how a high frequency jet ventilator or high frequency oscillator works inside a hyperbaric chamber. It is noteworthy that a member of SUM has recently designed and built a revolutionary CO₂ scrubber for use in RCCs. Industry has not yet equalled this feat to anywhere near the same efficiency.

The Medical Officer should now return to the School of Underwater Medicine as the second Medical Officer. This should probably be of the order of three years, but during this time would include the RAN Staff College Course and also the Australian College of Occupational Medicine Course of 10 weeks. The combination of these two courses would therefore take about a year, leaving two of the three years for carrying out the tasks of SUM second MO. This is a particularly important post and very much a cog-wheel position since the vast majority of education, training, research and projects in underwater medicine falls on the shoulders of the 2nd MO. It is appropriate that soon after completing the College of Occupation Medicine Course, he should be considered favourably for the award of the Fellowship of that College.

The natural progression is to become the OIC of SUM, or the CMO/SMO of HMAS STIRLING. On posting to either of these positions, which I consider to be equivalents and therefore interchangeable, the MO will have completed some 9 years of underwater medicine. If he continues to do 3 years at SUM as the OIC followed by 3 years at HMAS STIRLING or vice-versa, it will mean that he will have completed 14 years in the Navy as an Underwater Medicine doctor. I consider this is not to be sneezed at and long before he had completed that 14 years and been dragged off to Canberra to drive a desk and push a pen, this doctor would be of immense benefit to the RAN and to the diving community at large. It would certainly be possible to take him off and have him do sea time or a Deputy Medical Officer in Charge job, or some other form of administrative job, virtually at any time through this progressive career training. I do not think it would help his underwater medicine, but it could help the Navy out of a posting jam and obviously in terms of the Naval Medical Branch as a whole, such postings must be considered.

CONCLUSION

What I have tried to do has been to show you what the position is at present, to indicate current training in underwater medicine and to demonstrate that for the existing tasks confronting us, let alone those of the future, this is far from adequate. I believe the way ahead which I have shown is the correct way based on the logical principles of the appropriate training for the job with a predictable career pattern, which is obviously what we all want to have. A great deal depends on the individual resourcefulness of the Medical Officer concerned, and his willingness to work hard at the job. However, all the way through my plan there are academic carrots which are worthy rewards for continued pursuit in this subject. Further to this I feel that with the increasing complexity and responsibility in Underwater Medicine, it will sooner or later become apparent that the posts of OIC SUM and CMO of HMAS STIRLING should be occupied by Medical Officers of the rank of Commander. A lot of lessons at this Conference have been taken from the British experience in the Falklands War of 1982. We do not need a Falklands War to show us the problems or teach us the lessons. We have our Falklands here in Australia, all around us in the waters that lap the shores of this great and ancient continent, it has been with us for years and the problem is steadily getting worse. I believe the Navy must accept the problem of underwater medicine in its entirety in Australia since there is no other organisation, either State or private enterprise which has the horsepower or the potential for the backing and influence that we could have. The Navy is like a great rock, a rock of stability, a Federal rock. Our responsibility is surely to the diving community at large and so from this Federal rock, we must extend a helping hand and show the way by accepting the challenge of our rightful place as the National Authority on Diving Medicine but with an international voice.

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This paper is an edited version of a paper presented at a RAN Health Services Conference on 2 February 1985. The ideas expressed in this paper are Dr Anderson's and not necessarily the official views of the RAN.

The conditions for the award of the SPUMS Diploma of Diving and Hyperbaric Medicine are

- 1. Passing both the Basic and Advanced Courses in Underwater Medicine run by the School of Underwater Medicine.*
- 2. Passing the Hyperbaric Medicine Course run by the Hyperbaric Department of the Prince Henry Hospital.*
- 3. Six month's full time, or the equivalent as part time, experience in Underwater or Hyperbaric Medicine.*
- 4. Submitting a thesis. The examiners are the President of SPUMS, the OIC SUM and the Director of the Hyperbaric Unit at the Prince Henry Hospital.*