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WHY FITNESS? WHO BENEFITS FROM DIVER MEDICAL EXAMINATIONS?

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Is the assessment of recreational diver fitness important?

Polo, show-jumping, fox-hunting and indeed most forms of horse riding are perceived as being at the pinnacle of social acceptability. Yet, among all recreational activities, riding on the back of a horse is one of the most hazardous pleasures. A rapid descent may be accomplished safely but sometimes will result in quadriplegia or death. All sport and recreational activities carry some risk of injury, but at the amateur level, how many sports other than diving require medical screening for fitness to participate? We need to review what we are doing and why.

This need to exclude those with a medical, mental or physical factor that has a potential role in an accident is, in part, because diving is a group activity. Few would dispute that the primary objective of the medical examination of a diver is to minimise his or her personal hazards underwater. Also important is that, like when piloting a plane but unlike when riding a horse, good medical screening beforehand should reduce the risk of later loss of life or serious injury to others.

Fitness to dive therefore benefits
the diver,
his or her buddy and
other divers who may become involved in a rescue.

A logical extension of individual freedom might say therefore that the solo diver has no buddies and so a solo diver (who has already accepted the risk of facing a life-threatening incident without a buddy present to try and save him) should not be required to demonstrate medical fitness. Would that be accepted as a consensus agreement?

For most divers that is academic because most of us dive with a buddy. However on several occasions when a diving fatality has occurred the buddy has been scrutinised, to say the least, by the deceased's lawyers even after the most heroic, if not foolhardy, attempts of rescue. So, confirmed fitness of the other member of a buddy pair seems a reasonable personal objective.

For dive shops, boats and guides who cater for recreational divers, the benefits of screening are slightly different. The exclusion of a few high-risk customers would reduce their exposure to risk of bad publicity and adverse litigation. This is perfectly legitimate but some opinions would suggest that this approach is a restriction upon the freedom of the individual. Some would regard as unreasonable the exclusion, by a dive shop, of a quiescent and stable asthmatic who possesses no significant trigger factors and who has unimpaired pulmonary function after hard exercise. Having to remain on the beach could be attributed by them to the terms of the dive shop's insurance policy and the screening procedures that this imposes. Are there any data to prove the insurers wrong? Maybe, were the data known, the answer would be found among those who are unfit but less honest in completing the self-declaration form and yet dive without problems.

A sort of answer should be available from looking at underwater accidents. In this context we need not look at the decompression illnesses too closely because there is no known condition, except perhaps ethanol excess, that would predispose to decompression sickness (to use the terminology of pathology intentionally). Also, most of them occur after surfacing and thereby do not affect the safety of a buddy. Only when one considers the possibility of gas embolism, which may cause the victim to lose consciousness near the surface and sink back down again, might other divers be exposed to the hazards of making an emergency recovery. So, if only for the sake of the diver's own health, the presence of factors affecting the likelihood of pulmonary barotrauma does need to be considered in such a screening. Most underwater fatalities have died of drowning and it is not easy to find out what was the trigger for the sequence leading to that terminal event and to what extent medical unfitness may have played a part.

I have been asked to look at asthma and diabetes in particular and, although I am not a clinical specialist in either field, I will therefore focus on these two while reserving the inclination to wander into other medical disqualifying conditions from time to time.

Any data?

Data is not easy to acquire. Commercial diving and military diving in the UK provides useful information on many topics and they are required to provide reports on all diving incidents. In spite of this, and perhaps because their divers have to pass an annual medical assessment, there are only a few isolated examples of illness as a contributory factor in diving incidents and, in working divers, no consistent evidence that could benefit recreational divers.

Recreational diving cannot provide better information. For example, a problem with the BSAC annual reports of diving incidents is that this is necessarily a voluntary system largely dependent upon receiving incident reports. Nevertheless, among the fatalities, the trend is clear. Of fifteen cases in 1998 in whom it was possible to make an assessment of causal factors, there were twelve in whom there were failures of safe diving practice and three who had heart attacks underwater. The indications are that each of them was unaware of their potential problem and that a cardiac death could equally well have happened at the surface.¹

The annual data collected for around the same period by DAN is also necessarily limited by the voluntary nature of its reporting procedures but is more extensive.² A finding of 8 cardiac deaths among 82 fatalities is almost the same proportion as those found in the UK. Also, various conditions, predominantly cardiac, were listed as pre-existent in 25 other fatalities but their contribution to a death remains uncertain. Only one of these 82 was listed as having bronchial asthma. The word "diabetes" did not appear. Alas, other than reminding us of the potential for myocardial infarction in the exercising elderly male, this can tell us nothing useful.

Undoubtedly, the best source for detailed accident data is that compiled by Walker, a collection of 301 diving deaths over a 22-year span.³ The report includes an analysis of these fatalities by Knight, Pescod & Lippmann that is both informative and depressing. Everyone who wishes to be a diving instructor should read it. Carl Edmonds reminds us in the Foreword, "*he who does not know history, is doomed to repeat it*". The lessons to be learned are consistent and predictable: the major cause of diving deaths is diving beyond one's competence and in disregard of the accepted safe practices. The recurring phrase is "gross inexperience".

Very few specific medical conditions as a significant factor in the diving fatalities were found over this period.³ But that may simply indicate the success of medical screening because the majority of persons with such conditions have been excluded from diving as a recreational activity for them. How does that compare with the 828 fatalities reported by DAN over 9 years in an area where such screening is less formal?⁴ Age, gender, certification, out-of-air and equipment problems are graphed but on fitness, other than a mention that cardiovascular factors were found in an average of about 10% each year, no details are given. However in the 83 fatalities of 1998, the subject year being reported in more detail, 19 divers out of 46 for whom data were available shared 20 medical problems.⁴ There is, of course, no data offered on the extent to which these were relevant to the cause of death. Cardiovascular problems were found in more than 10% of this small group, diabetes in 6% and asthma, allergies, nervous disorders, etc. were equal at about 2% each among the also-rans.

Eighteen diving fatalities (perhaps not the same divers for the report does not say) were reported as using medications, but when one looks at this, one wonders about the relevance of the use of birth control drugs to underwater deaths. Some 4% of those about to die were using motion sickness drugs, so does that mean that those drugs are associated with risk, or is there a greater risk associated with not taking them? Perhaps it means that most fatal dives are done in calm water. Who knows? Among the rest, 25% were classified as cardiovascular medications; decongestants 14%; anti-histamines 12%; insulin 11%; asthma 7%; et cetera. It is not easy to interpret that predigested information and not possible to compare it statistically with the Project Stickybeak data.³

In a separate bar chart, the DAN report suggests about 8% of the deaths were cardiac, but no details are given.⁴ The comparable figure in Project Stickybeak is 14 cardiovascular related deaths in 178 scuba divers, also 8%. Interesting perhaps, but this only leads back to the need for more data. However, as stated by the editors,⁴ "*seldom was there any adverse medical record available, which is natural ... lest he be advised not to dive.*" Also, "*it is not known how many divers have a history of diabetes, epilepsy, coronary heart disease, asthma or other contraindications to diving but who are never identified because they suffer no critical misadventure.*" Although asthma was identified as a possible factor in 9 of the Australian scuba fatalities (5%), it was considered to be significant in only two (1%).

Is what is presented in these reports sufficient evidence that some types of diving accident are indeed more common in association with particular medical conditions?

It could be said by some that the desire for medical screening of the candidate diver is no more than paternalistic caution, but does the knowledge that medical screening is required before scuba diver training discourage potential fatalities from pursuing this activity? Indeed, among those not so discouraged, what are the rejection rates of those attending for a SPUMS medical examination? That figure (potential lives saved would be putting it too strongly perhaps, but that is what it is about) could be a justification for all the screening.

An interpretation of all these reports is that a number of deaths were:

- due to previously known medical conditions such as asthma;

- due to unforeseen medical events (such as haemorrhage from an acute gastric ulcer, ruptured aortic aneurysm, but cardiac events predominantly) which might, or might not, have been detected by prior medical screening depending on how meticulous that would have been;

- associated with medical factors that may have influenced the course of events or which may have been totally irrelevant;

associated with medical factors not detected at autopsy and concealed before the dive.

It would be wrong to conclude from the reviewed data that because medical factors played only a minor role in these fatalities, there is no need for screening. The culture and practice of diving is such that those who have had conditions regarded as disqualifying have been excluded from the population at risk. To justify screening, one needs to know how many candidates for training are turned away as unfit? Each one of them could have been a fatality avoided.

Non-medical factors predominated in these hundreds of deaths and it seems that only a few were perhaps unavoidable but, alas, "*there is no screening test for stupidity*".⁵

If needed, what sort of fitness?

Excluded from the dive boat solely by their honesty in having admitted a past history of "asthma", an emotive word, some persons may in fact be fit to dive but are not allowed to do so. For the purposes of our discussion, such an individual is not a "perfect specimen" and so needs to be considered as a variety of disabled diver. Together with others eliminated by basic screening, they form a category of disability that will be discussed tomorrow

What is fitness? Is it merely the absence of detectable illness? No. For safe diving, it is more than that.

One definition of health, and certainly the state to have attained before being confronted by a life-threatening emergency, is that "*Health is that state of moral, mental and physical well-being which enables a man to face any crisis in life with the utmost facility and grace*" (attributed to Pericles, 430 BC).

No-one would deny that for diving one needs to have full mental, medical and physical fitness. However that is largely the responsibility of the individual diver and, except for some forms of commercial deep diving and military diving, no assessment of fitness to dive goes quite that far.

So what is needed? The late Jefferson Davis emphasised the need for medical standards and reminded us that, in contrast to professional diving, there are many things favourable to recreational diving, particularly that the sport diver can choose the time, place and water conditions of the dive.⁶ On a given day, with a temporary illness that makes diving more hazardous, a sport diver can abort the dive without any repercussions. The sport diver can simply avoid cold water, rough seas or low visibility diving if not adequately experienced, or just not feeling up to it.

If one needs fitness screening, how should it be done?

There is a need to confirm the absence of any detectable illness that may have an adverse effect on the safety of a diver and, first, we must review the procedure for assessment.

In many systems the assessment comes in two phases: a self-declaration form and an examination by a doctor. One extreme example is found with the working diver who may be asked to complete a detailed form covering past medical history and diving accidents. This is then reviewed by the Medical Examiner of Divers and signed by the diver. This has an additional purpose, not appropriate in recreational diving, of documenting episodes of decompression illness (or possibly their concealment). The annual examination may be lengthy but is straightforward and is conducted by a doctor who has been approved as being knowledgeable about diving. With ageing and after illness or injury, pass/fail criteria are not appropriate and a careful assessment of the individual and his or her diving hazards is required by a doctor who knows the environment and its demands.

The other extreme takes the form of no medical screening at all among those who may be self-taught and who have access to all the necessary equipment including a compressor. In many countries there is no law against this, even for the working diver.

For the recreational diver the system is usually voluntary, but relevant regulations do exist in a number of countries such as France, Norway, Portugal and Israel. In many countries the sport is self-regulated by one of its training agencies. The British Sub-Aqua Club was one of the first to set medical standards and has recently joined with the Sub-Aqua Association and Scottish Sub-Aqua Club in currently revising its procedures through the UK Sport Diving Medical Committee (UKSDMC). The diver is required to complete a medical questionnaire and sign it. There is some printed guidance to help the diver in this task. Should any of the answers to these questions be positive then the diver is directed to a Medical Referee, a doctor who is usually an experienced recreational diver, for detailed assessment. The Committee also maintains for these Referees a set of guidance notes on the principal issues in diving medicine. An important feature is that this self-declaration form is valid for only 5 years, after the age of 40 for only 3 years and, after 50, only 1 year. These medical certificates are retained by the club.

I have no personal experience of the SPUMS Diving Medical. An important feature of it is that only doctors who have been approved after attending a suitable instructional course can carry it out. The medical guidance is written for entry-level recreational scuba diving and, other than a suggestion that it should also be carried out prior to any training, the duration of a fitness certificate's validity appears to be unlimited.

A similar but arguably less stringent system for use worldwide has been created in the USA by the Recreational Scuba Training Council (RSTC). Again, the diver is required to complete a self-assessment form and only if a positive answer is made to any of a short set of questions will the diver be sent to see a doctor. A difference that may be considered significant is that any doctor will do. No understanding of diving is required by the doctor but only the ability to read a short set of Guidance Notes that is provided, together with the DAN telephone numbers in case of doubt. If the diver is considered fit and then passes his training course there is, again, no requirement for him or her ever to have another medical check up.

These three examples are not far apart for entry level diving as long as the diver is healthy or, at the other extreme, has one of the obvious absolute disqualifications. The differences between them become apparent in those persons with something close to the pass/fail border.

Without any diving background the non-diving doctor is likely to err on the side of caution and decide in favour of unfitness.

More important, other than for clubs such as BS-AC, there is no procedure for reviewing the continued health of someone who trained many years ago.

A dive resort can request that a customer repeats the basic questionnaire. If the diver has had an injury or illness since certification, this reassessment could be important. If it is needed, then it is not acceptable that *any* doctor can do this review. Essential are an understanding of the environment and of what the diver is likely to be doing, of relevant applied physiology and of diving illness pathology.

Among the most rigorous requirements are those found in Malta, where the doctors check all those who apply for a local diving certificate. Those vacationing divers who opt to dive with local diving schools or instructors, and not independently, have to present a valid diving medical to the school/instructor which/who is obliged to forward a copy to the Health Department's Hyperbaric Unit within the week. Random checks of these are made.

There is much published opinion on the wisdom of allowing or not allowing persons with some specified condition to dive, with or without a restriction. Some examples of these difficult assessments will be reviewed over the next few days. What needs to be mentioned here, in closing these introductory remarks, is that sadly too many doctors with no diving experience may voice erroneous opinions. This may mean that either someone is deprived of a relatively safe activity or, at the other extreme, becomes exposed to an inappropriate risk with unforeseen consequences.

Conclusions

In summary therefore, my opinion is that the recreational diver needs:

- a pre-training medical assessment to exclude the presence of illness that may be incompatible with the underwater exposure;
- periodical assessment thereafter to ensure that ageing has not impaired his or her potential safety in an unforgiving environment;
- specific review is required after significant illness, surgery, diving incidents and other accidents for the same reason;
- all this to be done by doctors who understand the hazards of diving.

How this should be achieved is another matter but the fact is that none of the systems in current use fully meets all of these basic objectives.

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