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### HEALTH SURVEILLANCE IN THE 21ST CENTURY

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#### Key Words

Health, occupational diving, risk.

#### Modern health surveillance

Conventional health surveillance has its origins in the screening of military recruits and in actuarial determinations for insurance companies. Consequently, such surveillance is often in conflict with various legislation and good medical practice.

The relevant legislation includes at least the following

- 1 Health and Disabilities Acts;
- 2 Human Rights Acts (which usually include statements such as "Employment cannot be denied on the basis of a disability unless...");
- 3 Health and Safety in Employment Acts (which state that "Employers must exercise a duty of care"); and
- 4 Privacy Acts.

#### The basis of good health surveillance

Good health surveillance requires the assessment to have a functional orientation and that the primary risk taker needs to be the primary risk acceptor.

A functional orientation is essential if the health surveillance is to be either sensible or if it is to comply with Human Rights and Disabilities legislation.

For example, the Royal New Zealand Navy (RNZN) has a screening procedure for career divers that requires them to be able to run 2 miles in less than 11 minutes. This excludes almost all women.

Is this good health surveillance? To answer this question one has to ask another question. What is it about naval diving that requires a diver to run 2 miles in less than 11 minutes? The answer is quite simple, nothing. This is an example of inappropriate surveillance, unless the object of the test is to exclude women from becoming divers.

In this context, an example of good health surveillance would be a screening test that required the candidate to swim 400 metres against a 1 knot current. This is a test which is directly applicable to being able to be an efficient naval diver.

#### Design of health surveys

Before any health survey can be designed, a functional task or job description is required. Unfortunately a conventional job description defines responsibilities and does not include how to carry out responsibilities.

A functional job description defines what tasks are required to undertake a job and is the basis of vocational rehabilitation. But how are such functional job descriptions translated into a health survey?

#### Screening requirements

Firstly, to be worthy of screening, a health condition (disease and or its treatment, state of aerobic fitness, anthropometric measure etc.) must be important. There are four questions to be asked

- 1 Will the condition impair the person's ability to do the job?
- 2 Will the job make the condition worse?
- 3 Will the condition compromise the person's or their workmate's safety when doing the job?
- 4 Will the condition predispose to a job-related illness or injury?

If the answer is "Yes" to any of these the health condition is important.

Using asthma and diving as an example, when one asks these questions the answers would be:

- 1 Yes: a person's ability to do the job is affected by a reduced exercise tolerance.
- 2 Yes: the condition is worsened by exercise, anxiety, breathing cold dry gas and or a salt water aerosol.
- 3 Yes: safety can be compromised by reduced exercise tolerance and drowning.
- 4 Yes: air-trapping will predispose divers to lung injury.

Secondly, a health condition must be prevalent. Another example of a poor health survey in this context was the Royal Australian Navy (RAN) AIDS screening "program". A decision was made, without considering the existence of the latent period after HIV infection nor the very low clinical incidence in the service, in the 1980s that to maintain the RAN as a blood bank "on the hoof" every member of the RAN was to be tested for HIV every year. This was never achieved. What was achieved was a number of false positive test results, many more than the true positives, which ruined the lives of those misdiagnosed.

When selecting a health condition for screening, a screening tool with a good predictive power needs to be chosen. This is easy for parameters such as height, visual acuity, colour vision and hearing. However for most conditions, no such screen exists.

### **Common traps in screening**

One of the most common mistakes is medicalisation of a physical competency. An example is the RAN Obesity Screening "Program" carried out after the sinking of HMAS Voyager. The reason for this program was the belief that many of those who were trapped below and drowned were trapped because they could not get through the escape hatches. This disability was mistakenly attributed to obesity rather than to the size of the person. The jamming factor in a hatch is not the size of the person's fat abdomen, which is compressible, but the distance across the shoulders which are relatively incompressible. Many sailors had their lives made miserable, and many hours of medical staff time were wasted, in attempts to thin down overweight people. The correct solution to the problems would have been to weed out those who could not fit through an escape hatch by requiring all personnel to be observed passing through an escape hatch. That physical competency test (PCT) would have solved the problem.

Is a person with an internally fixed fractured femur fit to dive? This is not a problem that can be resolved in a doctor's rooms. The relevant questions are, can the person swim satisfactorily with fins, handle the necessary equipment and climb out of the water? Again a PCT and not a medical process will provide the answer.

Is a person with a total hip joint replacement fit to work in a store where ladders may have to be climbed? Only a PCT, based on ladder climbing, will provide an answer.

Another common trap is reliance on a medical examination. This is illustrated by a long standing defence force medical activity, annual medicals. Most of them show that there is very little change from year to year. However these examinations allow the medical officers to meet their patients when they are fit and sometimes allow early diagnosis of hypertension. But the yield of abnormal results is low.

In an attempt to avoid wasting medical and patient time, questionnaires have been promoted as a suitable replacement for medical examinations. However there is the problem of invalid questionnaires, those where the questions mean something different to the person filling it in from the meaning the composer of the questionnaire used. When we in New Zealand considered whether to do away the annual medical for occupational divers we tested out questionnaires on occupational divers. To our horror most of the questions were misunderstood by our target

population. It took over a year, and four or five revisions of the wording, to reach the stage where our divers actually understood and answered the questions we were asking. It is essential that any questionnaire be tested for interpretation validity on the population which will be surveyed. In other words it must mean the same to the examiner and the respondents, who will almost certainly use different words to describe the same phenomenon.

Recurrent screening of phenomena that are not affected by age or activity etc. is extremely unlikely to produce useful results and can be described as a waste of time.

### **Useful health surveys**

The basis of good health surveillance includes the need for assessment to have a functional orientation and the fact that the primary risk taker needs to be the primary risk acceptor. The choice of assessment must be made with consideration of the strengths and weaknesses of prescribed and discretionary assessments of fitness.

### **Prescribed assessments of fitness**

An example of prescribed assessments of fitness in the world of diving is AS/NZS 2299 Part 1 (1992). Here the doctor is faced with a series of yes or no decisions. This is the strength of the system as there is no need for a medical practitioner to have had any training. However the weaknesses are that the primary risk taker is excluded, there are inconsistent outcomes as many conditions can not be defined for prescription and there is non-sensible certification. A method of audit and arbitration are needed for fairness.

### **Non-sensible certification**

Diving is an excellent example of such certification. A poorly water-adapted terrestrial air breathing mammal such as man can never be fit to dive.

### **Discretionary assessments of fitness**

The strengths of discretionary assessments of fitness include the fact that the primary risk taker is central to the process. Also there is appropriate medical practice and sensible medical certification (less medico-legal risk).

The weaknesses include the fact that the medical practitioner needs expertise. In addition to general training in occupational health surveillance and in the specific occupational environment, there is also a need for continuing medical education and for ongoing audit. Other

weaknesses are that other risk takers are potentially excluded and that objective data may not exist so precluding quantitative advice.

The modern approach is to identify those conditions that are thought by the appropriate society to be incompatible with the activity (e.g. diving) and to prescribe against them. In diving this would include epilepsy, insulin dependent diabetes mellitus, active asthma, ischaemic heart disease etc. Otherwise the approach is to allow discretion.

### Does such an approach work?

The New Zealand Occupational Diving Medical Directorate adopted this approach in 1999. Acceptance is high from:

- 1 Divers, whose replies to the questionnaire shows increased veracity.
- 2 Medical practitioners, who avoid "wasting time" on annual medicals but who might suffer a loss in income.
- 3 Employers, whose costs are reduced.

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### RESTRICTED DIVING FOR THE UNFIT

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#### Key Words

Diving medicals, fitness to dive, medical conditions and problems, recreational diving, standards.

#### Definitions

We have already defined for our purposes that a person fit to dive is a person in whom no medical condition has been found that is incompatible with unrestricted diving as an amateur within the recreational envelope. A time limit upon this clearance might seem wise but is rarely given. Although the boundaries of that envelope may vary between individual divers, according to their training, physical abilities and diving skills, the hazards within this activity envelope are very similar and so the required medical standards should be the same.

It is then easy to define the category of *unfit* as everybody else.

This category includes those in the conventional category of "Disabled Diver". These are typified by those with major amputations or the wheel-chair divers who are fit to dive, other than being also challenged with probably some autonomic deficits. Their limitations can be assessed and they dive in accordance with guidelines made by one of many organisations dedicated to diving for the disabled. For the purposes of our discussion persons who have primarily physical limitations of any kind ranging from quadriplegia to hearing deficits, need no further consideration at this stage.

The unfit divers to be considered further here are those who would fail the initial self-declaration form and who then, rightly or wrongly, may be unable to get a doctor's fitness certificate for *unrestricted* recreational diving. As a whole, the medically disabled can be categorised in several ways:

#### CAPABLE OF INDEPENDENT UNRESTRICTED DIVING

We have already discussed that some persons with a history of asthma may be excluded from diving by some organisations but, in accordance with particular criteria, are accepted by others.

They should have a time-limited clearance but, once declared fit, need no further restrictions upon their activity.

#### THOSE WITH A PHYSICAL DISABILITY AND MAY BE DEPENDENT ON OTHERS IN THE WATER

The disabled diver with no medical complications.

#### RESTRICTED DIVING BUT NEEDING NO OTHER CONSIDERATION WHEN IN THE WATER

This group includes those who for some reason, such as previous decompression illness, have been told that they should confine themselves to diving with safer decompression schedules.

#### RESTRICTED DIVING BUT CONDITIONAL ON THE PRESENCE OF A SUPPORT TEAM

An example is that of the stable insulin-dependent diabetic who has met the strict medical criteria of the UK Sport Diving Medical Committee (UKSDMC) and who complies with its special procedures.

#### Restricted only, with no other in-water consideration

Occasionally, the restriction of a diver to only shallow diving is wrongly recommended by hospital doctors who do not know about diving. They may not understand that Boyle's Law is at its worst near the surface and that the air-water interface can be physically very challenging. Such decisions need to be made by a doctor who is familiar with the hazards of the diving environment.