

The New Zealand process for certification of medical fitness for occupational diving.

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Background

New Zealand has had a process for certification of medical fitness for occupational diving that involves an initial assessment by a doctor who has completed a course in diving medicine – now referred to as a Designated Diving Doctor (DDD) - and a subsequent audit by a specialist in diving medicine, for more than 40 years.

Initially, the process was managed by the then Department of Labour (DOL) and the diving medical specialist was engaged as a contractor to the department. The first three such specialists were naval medical officers. Almost 30 years ago, the Navy withdrew from any role in the process because of concerns about conflicts of interest, and a private company - Diving and Hyperbaric Medical Services (DHMS) - was contracted by the DOL (and subsequently by OSH and WorkSafe) to undertake the central audit on the basis that there were then only two diving medical specialists in New Zealand and that both these specialists would be engaged by DHMS. The rationale was that a specialist assessment was needed but, with only two such specialists, the only way in which occupational divers could have reasonable access to a medical assessment was for the existing “hub and spoke” process to be continued; that is, a national network of trained doctors, DDD’s, and a central audit by one of the two diving medical specialists. There are still only two diving medical specialists in New Zealand and both undertake the audits for DHMS.

There are a number of significant advantages of a centralised repository and audit system, which will be outlined below. However, the decision to persist with the existing system was based essentially on diver-access.

The necessity for such a “hub and spoke” system has been reinforced twice subsequently. The first of these was a review of the revised New Zealand Civil Aviation Authority (CAA) process of assessing pilots’ fitness to fly that did away with any central audit by allowing some examining doctors to directly issue a certificate of fitness to fly.¹ This is analogous to the process that

exists for occupational diver medical assessments in Australia. The review found that the CAA process had become highly unreliable: more than half of the pilots' files were flawed and the flawed files contained between five and six errors each; and, almost 10% of pilots had a health problem that should have "grounded" them. The review led to a legislative reform of the process such that the CAA once again employs a form of central audit. A follow-up review showed that the central audit of pilot fitness assessment restored the reliability of the process.²

The second experience that reinforced the need for a "hub and spoke" model was one of the research projects commissioned by DHMS (the research that DHMS has undertaken is listed in Table One). Twenty scenarios involving particular diver medical problems were sent to the DDDs and they were asked to determine the fitness for diving for such a candidate.³ Overall, the DDDs did little better in regard to these assessments than would be obtained by chance. To a large extent, this is due to most DDDs only assessing one or two divers per annum such that they do not develop relevant expertise. As such, a central expert audit was determined to be essential and DDDs have subsequently been involved in ongoing refresher training.

Development of the New Zealand process of certifying occupational divers' medical fitness

The commonplace international approach to certify occupational divers' medical fitness for diving is for them to answer some questions about their health, to be physically examined, and then to undergo some tests, on an annual basis. These invariably include tests of lung function and hearing, and sometimes also chest X-rays, ECGs, EEGs, blood tests, chest scans and psychometric tests. New Zealand is the only country in which the utility of the specific elements of the process have been examined, that is, the extent to which the questions, physical examination and tests affect the outcome of whether or not the diver is considered medically fit for occupational diving.³⁻⁷ The results of these studies have been published and the publications are summarised in Table One. In summary, the key findings were that: the Australian Standard AS 2299 questionnaire was poorly understood by most divers and consequently of little value; neither physical examination nor tests added much value if there were no health problems declared in response to the questions; and, that for divers who did not have a significant and relevant health problem, undertaking physical examinations on a 5-yearly basis did not affect either their safety or wellbeing.

The New Zealand process for certifying occupational diver medical fitness has consequently been revised in accordance with these analyses. A Diving Industry Reference Group oversaw the process reform – similarly, the amount of the processing fee was determined by DHMS in consultation with OSH and this reference group. The reference group is described below and has subsequently been transformed into the Diving Industry Advisory Group (DIAG).

A “hub and spoke” model with a central repository and expert audit function was retained to enable both easy access for divers to a DDD and in response to both the audit of the New Zealand CAA and the DHMS survey of fitness to dive opinions of DDDs and general practitioners.³

Earlier and current studies by DHMS of the effect of diving on lung function,^{8, 9} is likely to lead to a further reform of the process by way of not requiring lung function testing as regularly as currently. Similar research by DHMS on hearing function in divers is also likely to result in a reduced requirement for hearing tests.¹⁰

Other DHMS projects that might result in changes in the certification process include research to: find out why divers leave the industry,¹¹ and in particular if there is a medical reason for them doing so; and, review of the diver health questionnaire. To date, those questions that do not affect the outcome of the diver's certification have been identified and withdrawn. The remaining questions are now being evaluated for how well they are understood by the divers and will be revised to ensure that the diver "thinks they are answering the same question that the medical expert thinks they are asking".¹² This is essential in New Zealand given that questionnaire is the cornerstone of the assessment process.

Overall, the DHMS research and the consequential reform of the New Zealand process of certifying occupational diver medical fitness has led to a significant revision of the way in which occupational health surveillance is undertaken in industries other than diving.¹³

Outline of the New Zealand process of certifying occupational divers' medical fitness

Initial assessment. When someone wants to enter the diving industry as a diver in New Zealand, they must be certified medically fit for occupational diving. The process consists of registering on the DHMS website, completing a questionnaire, which can be done online, and then undergoing both a physical examination by a DDD (listed on the WorkSafe website) and some mandated tests (i.e., lung function and hearing testing). All records are uploaded onto the DHMS website and one of the diving medical specialists uses this information to determine if the diver is medically fit for occupational diving.

If a candidate's condition is complex and the outcome is uncertain, the DHMS specialist will usually consult a panel of international experts.

If the outcome is that further tests are required in order for their risks in occupational diving to be determined, then the diver candidate is informed by email and referred back to their DDD for the tests to be arranged.

If the outcome is either that the diver candidate is not medically fit for occupational diving or that certification might go ahead if certain conditions are met and agreed by all parties who have a duty of care for that candidate (i.e., in addition to the diver candidate, this could be employers, dive schools, as well as DHMS and WorkSafe), then the candidate will be recommended to make an appointment for a meeting with one of the diving medical specialists. There is no additional cost for these subsequent meetings. The reason for this is to ensure that there is no financial barrier to diver candidates reporting their situation honestly. Ensuring as much as is possible the truthfulness of reporting is also the reason why discretionary and conditional certification occurs.

Conditional certification. Discretionary and conditional outcomes are usually the result of an initial meeting between a diving medical specialist and the

diver candidate, and then subsequent meetings with the candidate, and any employers and dive schools. The health condition involved and the related risks are defined, the diving practice to be employed and the ways in which the impact of the health condition can be mitigated are agreed, and, assuming unanimous agreement, then the certification of medical fitness for diving occurs on the basis that the diver has an acceptable risk in diving providing the conditions are always met. DHMS issues several such conditional certificates every month.

Ongoing assessments. The default option is that every occupational diver in New Zealand repeats all elements of the initial assessment, and any other tests that were imposed, annually. However, if no significant health problems were found in the context of diving, then the need for the physical examination and tests can be reduced to 2-yearly or 5-yearly; such that the only annual requirement is to complete the online questionnaire. Most occupational divers in New Zealand are consequently only required to undergo a comprehensive medical assessment 5-yearly. The safety of this approach has been well validated by the DHMS research projects cited above and in Table One. A diving medical specialist undertakes a comprehensive annual audit of every diver - even if all the diver is required to complete is a questionnaire.

Processing Fee. A fee of \$97 inclusive of GST is payable. For the significant majority of occupational divers in New Zealand the lifetime cost of their occupational diving medical assessments is significantly lower than in any other jurisdiction in the OECD. In the context of conditional and discretionary certification, this is not a feature of any other OECD nation such that cost comparisons are not possible.

The fee was increased from \$20 to \$50 almost 30 years ago when DHMS had to take over the administrative role of medical certification from the then DOL. It was then increased again, more than 10 years ago, to \$97 in consultation with OSH and the Diving Industry Reference Group so as to accommodate the revised certification process, and, in particular to enable conditional and

discretionary certification in a way that did not financially penalise the diver concerned.

In addition to GST and a bankcard transaction cost, the processing fee covers the following activities:

1. Archiving and storing all physical records;
2. Maintenance and ongoing development of the DHMS website and database;
3. Providing a comprehensive set of a diver's medical records, on request from the diver, to medical practitioners who are either assessing the diver's fitness for diving and/or treating the diver for a diving-related or unrelated health condition;
4. Providing advice on appropriate wellness and health related responses to divers or diving companies who are operating in high risk environments (e.g. elevated altitudes, extreme heat or cold, regions in which mosquito and other vector-borne infections are endemic, polluted waters, water in which encounters with particular dangerous marine animals are likely, etc.);
5. Processing of medical records and issue of certification;
6. An audit by a diving medical specialist of all diver applications for medical fitness certification;
7. Organising and accommodating meetings for a diving medical specialist and individual divers, employers and dive schools in the context of discretionary and conditional certification and/or if the diver is considered medically unfit for occupational diving;
8. Ongoing continuing medical education programs for the DDD's;
9. Research on diver health and to test the efficacy of the New Zealand medical fitness certification system (see Table One); and
10. Supporting the Diving Industry Reference Group.

The Diving Industry Reference Group and the Diving Industry Advisory Group

At the instigation of the Association of Diving Contractors (ADC), a Diving Industry Reference Group was established by DHMS to oversee both the routine operation and reform of the occupational diver medical assessment process. The reference group included a representative from every sector of the occupational diving community. As cited above, the reference group was involved in the setting of the current processing fee.

With time, and as the major reforms of the occupational diver medical assessment process were successfully implemented, the reference group increasingly became involved in providing advice about diving practice in general. This shift in activity was recognised by WorkSafe and these roles were transferred to a newly established Diving Industry Advisory Group (DIAG). As compared to the original reference group, which was supported and responsive to DHMS, the DIAG is an advisory group to WorkSafe. The DIAG has also assumed the role of oversight of the diver medical assessment process.

Advantages of a central repository and audit system

In addition to being the most cost-effective for consumers, the New Zealand process for assessing occupational diver medical fitness and consequent certification has profound advantages because there is a central repository of diver health records and a centralised audit system. Of the functions performed by DHMS, the following are only possible because of this centralisation:

1. Providing a comprehensive set of a diver's medical records, on request from the diver, to medical practitioners who are either assessing the diver's fitness for diving and/or treating the diver for a diving-related or unrelated health condition;
2. Providing advice on appropriate wellness and health related responses to divers or diving companies who are operating in high risk environments (e.g. elevated altitudes, extreme heat or cold, regions in which mosquito and other vector-borne infections are endemic, polluted waters, water in which encounters with particular dangerous marine animals are likely, etc.);
3. Organising and accommodating meetings for a diving medical specialist and individual divers, employers and dive schools in the context of discretionary and conditional certification and/or if the diver is considered medically unfit for occupational diving;
4. Ongoing continuing medical education programs for the DDD's;
5. Research on diver health and tests of the efficacy of the New Zealand medical fitness certification system (see Table One).

Table One: Published research commissioned by DHMS

<p>Greig P, Gorman DF, Drewry A, Gamble G. The predictive power of initial fitness to dive certification procedures for occupational divers in New Zealand. <i>SPUMS J</i> 2003; 33(4): 182-7</p>	<p>A study of the way in which occupational diver medical fitness was assessed in NZ and what elements of the assessment affected the outcome – led to the reform of the NZ process to what it is today.</p>
<p>Gorman DF, Sames C, Mitchell SJ. Routine occupational diver medical examinations. <i>Diving Hyperb Med</i> 2009; 39 (2) June 2009: 109-10</p>	<p>A follow-up study, which showed that reducing the frequency of physical examinations of divers from annually to 5-yearly, if they did not have any significant health problems, did not have any impact on diver safety or wellbeing.</p>
<p>Sames C, Gorman DF, Mitchell S, Gamble G. The long-term effects of compressed gas diving on lung function in New Zealand occupational divers: a retrospective analysis. <i>Diving Hyperb Med</i> 2009; 39(3): 133-7.</p>	<p>An initial study showing that over a five-year period diving does not damage divers' lung function. Validated NZ approach to not undertake annual lung function testing for divers who do not have respiratory problems. Note follow-up study below conducted over a longer time period that reinforces the safety of the NZ system.</p>
<p>Sames C, Gorman DF, Mitchell S, Gamble G. The utility of regular medical examinations of occupational divers. <i>Intern Med J</i> 2009; 39(11): 763-70.</p>	<p>Another follow-up study, which used a different approach and reinforced the finding that reducing the frequency of physical examinations of divers from annually to 5-yearly, if they did not have any significant health problems, did not have any impact on diver safety or wellbeing.</p>
<p>Sames C, Gorman D, Mitchell S. Postal survey of fitness-to-dive opinions of diving doctors and general practitioners. <i>Diving Hyperb Med</i>. 2012;42(1):24-29.</p>	<p>A study of designated diving doctors' ability to determine someone with a health problem's fitness for occupational diving. Showed that a central audit system was essential if a network of designated diving doctors was to be employed.</p>
<p>Sames C, Gorman D, Mitchell S, Sandiford P. An evidence-based system for health surveillance of occupational divers. <i>Intern Med J</i> 2016; 46: 1146-52 (doi:10.1111/imj.13204).</p>	<p>A comprehensive review of a much larger cohort of divers to retest the evidence base for the NZ approach to occupational diver medical fitness assessment – showed that the system was both highly sensitive and reliable.</p>
<p>Sames C, Gorman D, Mitchell S, Zhou L. Long-term changes in the lung function of occupational divers: a 10–25 year audit.</p>	<p>A follow-up study showing that over a much longer time period, 10 to 25 years, that diving does not damage divers' lung function. Will lead to a reduction in how often lung function testing is required.</p>
<p>Sames C, Gorman D, Mitchell S, Zhou L. Long-term changes in the auditory function of occupational divers: a 10-25 year audit.</p>	<p>A study showing that over 10 to 25 years, that diving does not damage divers' hearing. Will lead to a reduction in how often hearing testing is required.</p>
<p>Sames C, Gorman D, Mitchell S. Reasons for occupational divers leaving the industry.</p>	<p>An ongoing study looking at the reasons why occupational divers leave the industry with a particular emphasis on whether or not health issues are involved. Results to date indicate that most people who leave the industry do not have a health reason for doing so.</p>

Sames C, Gorman D, Mitchell S.
Review of occupational diver health
questionnaire: a prospective
qualitative study.

The first phase of this study is complete. Those questions in the questionnaire that do not influence the outcome of a diver's medical fitness for occupational diving have been identified and have been withdrawn. The remaining questions are being weighted for impact and are being reviewed in regards to how well they are understood by the diving community. The end result will be a significant refinement of the questionnaire. This is important in NZ because the questionnaire is the cornerstone of the assessment process.

References

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3. Sames C, Gorman D, Mitchell S. Postal survey of fitness-to-dive opinions of diving doctors and general practitioners. *Diving Hyperb Med*. 2012;42(1):24-29.
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13. Gorman DF. From police to health adviser: the evolution of modern occupational health surveillance. *SPUMS J* 2003; 33(3): 134-9