

Professional diver routine health surveillance and certification: an internet-based satisfaction survey of New Zealand divers

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Key words

Diving industry; Fitness to dive; Health surveillance; Medicals – diving; Occupational diving; Occupational health; Survey

Abstract

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Introduction: Professional divers, like many other specialised occupational groups, are subject to regulatory constraints that include mandatory initial medical certification and routine recertification. The New Zealand system of diver certification and health surveillance has undergone modifications in recent years, but its acceptance among end-users has never been formally assessed. Because of the wide variety of tasks, circumstances and personalities encountered in the diving industry, unanimous satisfaction is an unrealistic expectation, but establishing the current mood of divers in this regard and canvassing opinions on possible improvements is an important step towards optimising the certification process.

Method: A multi-choice satisfaction questionnaire was added, as a quality assurance measure, to the on-line health questionnaire completed annually by all New Zealand professional divers. A complete 12-month dataset was analysed to determine levels of satisfaction, areas of dissatisfaction and suggestions for improvement. Comparison of the opinions of various diver groups was achieved by stratification into employment-type sub-groups and those working locally, overseas or both.

Results: The responses of 914 divers who completed the survey established an 85% satisfaction rate with the existing diver certification system. Dissatisfaction was independent of diving locality. Compliance cost was the most common area of dissatisfaction, particularly among recreational diving instructors.

Conclusions: Most New Zealand professional divers consider the current certification system satisfactory. Effective communication between the regulating authority and divers was identified as an important area for further development.

Introduction

Professional divers comprise a specialised group of workers whose occupation is regulated in most countries by government authorities responsible for workplace health and safety standards. For involved divers, this means mandatory compliance with a set of regulations regarding fitness for work and level of experience and/or training in order to achieve or maintain certification. Each jurisdiction is responsible for developing its own set of regulations and has authority to demand compliance from any diver entering its zone for work purposes. Many New Zealand divers seek employment in other countries to supplement their local work and, because there is no globally accepted set of regulations for this industry, there may be additional cost and duplication of certification processes such as medical examinations.

The New Zealand professional diver certification system has adopted changes over the past 15 years aimed at providing an efficient, cost-effective and evidence-based process.

First, and probably most notably, there was relaxation of the typical requirement for a full medical examination from annually to five-yearly. To clarify, the default position regarding the requirement for a full medical examination remains annual but, without a compelling health reason, divers are deemed exempt and only require the examination five-yearly. Although this evolution was based on sound evidence, it placed the New Zealand system at odds with most other countries that have retained the traditional annual requirement with no exemptions,¹ though there is some global variability in the frequency of mandated medical examinations, dependent on type of diving and/or diver age.

Second, in addition to the full five-yearly medical examination, the New Zealand system requires completion of an on-line health questionnaire in each of the four intervening years. The questionnaire has been modified from the original Standard (AS/NZS 2299) version which was shown to be unfit for purpose, and it may be modified again pending the outcome of an ongoing study investigating the utility and wording of the component questions.^{1,2} Responses to the questionnaire are centrally audited by diving medicine experts.

Finally, routine chest and long bone X-rays were abandoned for lack of evidence of utility. Routine spirometry and audiometry may soon follow, based, in part, on the evidence of recent studies on the New Zealand professional diving population.³⁻⁵

However, the above changes were instigated in the context of a centrally audited system, so they may not be generalizable to systems that do not operate as such. Central audit involves review by a diving medicine expert of each diver's health questionnaire and medical examination before certification is issued. The advantage of central auditing is that it provides objective, consistent and expert advice on fitness to dive, but some divers have criticised administrative delay and cost, and also, such a system simply may not be feasible in some countries.

In New Zealand, in addition to the medical requirements, full certification for professional diving work requires successful application for a Certificate of Competence (CoC) on a five-yearly basis. This is assessed and awarded by the regulating authority, WorkSafe New Zealand, a department of the Ministry of Business Innovation and Employment, previously known as Occupational Safety and Health, a branch of the then Department of Labour. Application for the CoC involves submitting proof of training qualifications appropriate for a particular branch of diving and also evidence of a specified minimum level of recent diving activity.

The aim of this study was to canvass opinions of the end-users, New Zealand professional divers, regarding satisfaction with each of the above components of the current evaluation and certification system, to determine the prevailing sentiment and inform future modifications.

Method

The determination of the Health and Disability Ethics Committee was that review was not required for this survey. A brief multi-choice survey was added to the on-line, routine health questionnaire completed annually by all registered divers. The original intention of this addition was to conduct a regular 'user satisfaction' audit as a quality control measure. Apart from type and area of diving, no

personal, demographic or health data were collected, and only anonymised, collated data were provided for this study.

The eight-question survey was designed to determine the level of satisfaction and areas of dissatisfaction with the current system of certification and health surveillance of New Zealand professional divers. Questions one and two sought information about principal category of diving and whether work was conducted exclusively in New Zealand, overseas or a mixture of both. The purpose of these questions was to determine any differences in level of satisfaction between the various groups of divers. Question three enquired about general satisfaction with the current certification system. A positive response meant that no further questions needed to be answered. However, it was anticipated that some divers who were satisfied with the system 'in general', but still felt a minor level of dissatisfaction, might respond to the remaining questions. Question four asked which aspect(s) of the certification system was/were thought to be unsatisfactory, with various options given. Questions five to seven expanded on aspects of the three main components of the system, namely; the five-yearly full medical examination, the annual on-line health questionnaire and the CoC requirement. Finally, question eight invited divers to proffer suggestions for any improvements they considered necessary or desirable. Divers completed the survey on a diver-dedicated secure website, and a de-identified dataset comprising all of the data covering a 12-month period was collated.

STATISTICS

Statistical analysis was performed using SAS® v9.4 software (SAS Institute Inc., Cary NC, USA). Frequency and proportion (%) were used for describing the categorical variables of the questionnaire, such as type of diving, main place of work and satisfaction. 95% confidence intervals (95% CI) were estimated for the key categorical variables.

Results

The responses from 914 divers over the 12-month period to April 2019 represented a survey of all New Zealand professional divers completing their registration over that period.

A summary of the non-free-text response rates to questions one to four, and question eight, from the 914 divers, is presented in Table 1. A small group of divers (20) responded to questions five, six and seven, despite having expressed that they were satisfied with the system. The response rates for questions five to seven, from only the 137 divers who claimed to be dissatisfied with the current system, are presented in Table Two. The primary finding was that 85% (95% CI: 83–87%) of divers were satisfied with the current certification system. There was no significant difference in

Table 1

Responses of 914 New Zealand professional divers to Questions 1–4 and Question 8 of an on-line, eight-question survey to assess satisfaction with the current health surveillance and certification system

Questions	Category / response	n	%
Q1. Type of diving?	Construction	210	23.0
	Recreation/Instructor	243	26.6
	Scientific/Photography	177	19.4
	Aquaculture	45	4.9
	Military/Police/Customs	103	11.3
	Other (Commercial)	43	4.7
Q2. Main place of work?	Multiple types	93	10.2
	In NZ	708	77.5
	Overseas	54	5.9
Q3. Satisfied with current diver certification system in NZ?	Both	152	16.6
	Yes	777	85.0
Q4. Main problem if not satisfied?	No	137	15.0
	The 5-yearly full medical	14	1.5
	The annual on-line questionnaire	39	4.3
	The 5-yearly CoC requirement	34	3.7
	More than one of the above	40	4.4
Q8. Comments	Other (see Q8)	23	2.5
	Comment made	228	24.9
	No comment made	686	75.1

Table 2

Responses to questions 5, 6 and 7 of the eight-question on-line survey from 137 New Zealand professional divers who reported dissatisfaction with the health surveillance and certification processes; these responses include: * 38; ** 40, and *** 39 divers from the 40 who answered Question 4 “*More than one of the above*” (see Table One) positively

Issue of concern	Problem area		
	5-yearly full medical <i>n</i> = 47*	Annual questionnaire <i>n</i> = 76**	5-yearly CoC <i>n</i> = 67***
Cost	25	35	8
Delay in processing	3	-	8
Not accepted by other jurisdictions	9	9	-
Can't see need for it	-	-	16
Easy to forget	-	6	-
More than one of above	7	17	22
Other	3	9	13

the level of dissatisfaction among those who worked in New Zealand or overseas or a mixture of both (15.4%, 14.8%, 13.2% respectively). However, compared with other types of divers, a larger proportion of recreational diving instructors and divers who engaged in multiple diving roles comprised the ‘dissatisfied’ group (18.1%, 20.4% respectively).

Free-text comments were contributed by 24.9% of the total group. Of those who identified themselves as being dissatisfied (137) with the overall registration process, 75.2% contributed comments, compared with only 16.1% of satisfied (777) divers. Nevertheless, most comments (54.8%) were from satisfied divers. Of the comments from dissatisfied divers, 34% concerned the cost of the overall process, particularly the annual questionnaire. Some of those who counted themselves among the ‘satisfied’ also complained about the cost, although a predictably smaller proportion (12%). A reduction in overall cost was requested by 21.9% of all those who commented.

Positive comments such as: ‘it works well’, ‘it’s a good system’, ‘no changes are needed’, etc. comprised 25%, while the remaining 75%, representing 18.7% of all respondents, provided comments that were constructively critical, and generally helpful suggestions for improvement (such as: ‘send reminder texts or emails’). Recreational dive instructors accounted for 26.6% of respondents but they represented 69%, 43.9% and 61.5% of answers to questions 5, 6 and 7 relating to the costs of the full medical, the questionnaire and the CoC respectively.

Discussion

This 12 month survey of the currently registered New Zealand professional divers showed that a large majority was satisfied with the current certification system. The following discussion is in the context of a 15% dissatisfaction rate and focuses on the main themes raised by the survey, but comments may be applicable to the entire group and, possibly, to other occupational groups required to

undertake routine re-certification, including medical fitness examination.

The most reported area of dissatisfaction was 'cost'. Some comments on cost were simply that the overall compliance costs were too high for a group of workers described by some as 'relatively poorly-paid'. Others questioned the 'value for money' aspect, particularly in regard to the annual on-line health questionnaire, which some suggested should cost nothing to complete. Such comments indicate a discrepancy between the perception of some divers, and the reality of both the logistic challenges and the role of the central auditing process in the questionnaire system. The perception appears to be that, because the annual health questionnaire is completed on-line, analysis of diver responses and issuing of certificates must be an automated function. Automation would only be possible if the process were entirely prescriptive. In reality, each completed annual questionnaire, together with the additional documentation of a full dive medical on a five-yearly basis, is examined by a diving medicine expert and compared with previous responses or results before a determination of medical fitness is made.

If the perceived automation were possible and implemented, it would obviate the need for any involvement of an expert whose principal role is discretionary in determining fitness, based on knowledge of the diver's medical record and of the tasks involved in the diving industry. Cost savings could result, but the process would not be robust. For example, purely prescriptive systems are at risk of reduced veracity because of manipulation (such as withholding of important health information) in order to achieve the desired outcome (certification). As well as putting divers at risk, such systems are likely to increase the exposure of other principal risk acceptors such as the employer or insurance company (or the Accident Compensation Corporation (ACC) in New Zealand). Because of the discretionary nature of the current system, divers are not unfairly denied certification if they admit to a health condition that is not incompatible with diving safely, possibly in a modified version of their particular diving role. In such cases, an accommodation can usually be reached with all involved risk acceptors at a face-to-face meeting, where, if limitations are deemed necessary, a modified job description can be negotiated. This approach, involving facilitation of informed choice by all interested parties, is consistent with the principles of occupational health surveillance.^{6,7} No additional cost is incurred by the diver for the conduct of such meetings.

Internationally comparative costs for diver certification are not easy to ascertain, as they are not published, and are likely to vary within any country. However, we believe current costs to New Zealand divers are reasonable, and likely to be lower than in many, if not most, jurisdictions, particularly in those countries where a full dive medical is required annually.

Some divers suggested that the central auditing component of the process should be abandoned in favour of devolving certification authority to 'designated diving doctors' who are usually general practitioners (GPs) with additional training in diving medicine. The perceived advantage for the diver is a reduction in both cost and delay to certification. This system prevails globally (apart from in New Zealand), and is consequently accepted as the 'norm', especially by those divers who live in New Zealand but work overseas. It is a popular system, not least because the diver can be issued with a fitness certificate 'on the spot'. However, weaknesses in such a 'devolved' system have been exposed by studies on certification processes for pilots and professional divers.⁸⁻¹¹ The former demonstrated potentially dangerous deterioration in the quality of unaudited pilot fitness certifications partly because of practice drift as a result of loss of physician objectivity (or possibly corrupt or 'inappropriate advocacy behaviour'). The latter two studies showed that even GPs with additional training in diving medicine were poor at discriminating between fit and unfit divers based on diver applicant scenarios.^{10,11} Therefore, it appears that a central auditing system, where feasible, is likely to be safer for divers and associated risk acceptors. It also has the advantage of providing a repository of divers' medical records from which useful material can be retrieved to inform policy on diver certification and health surveillance.

The two issues, certification and health surveillance, are essentially separate matters. The former is confirmation that the diver's health/medical status has been determined to be compatible with safe conduct of his/her stated diving duties for a period of one year, provided there are no intervening changes in health, until the next routine review. The latter involves a broader assessment of the diver's health, including chronic conditions that may have little or no bearing on current 'fitness-to-dive', but may, if not addressed, have long-term adverse consequences (conditions such as hypertension, hyperlipidaemia, obesity, smoking, etc.). Collection of health data, including diving exposure and specific diving-related hazards, is integral to the surveillance process.

As previously stated, we believe that a health surveillance programme should not need to be conducted 'completely separately from annual fitness assessments' for fear of divers concealing health issues that could lead to denial of certification, as proposed by the Diving Medical Advisory Committee (DMAC) in their 2008 statement.^{12,13} Designated diving doctors (and their international equivalents) are ideally placed to assist in collection of such data at the time of routine diving medical assessments, complemented by data contributed on-line by divers, and stored on an internet-based database. If privacy and other legal issues could be resolved, and there was sufficient international co-operation, as other authors have suggested, such a database (as currently exists in New Zealand) could be useful globally for this often quite mobile group of workers.¹⁴

Physical capacity and diving competence remain issues that are appropriately determined in the workplace setting, or a suitable surrogate, rather than by medical practitioners.

Finally, various aspects of the CoC process were common reasons for complaint, particularly from the largest group, the recreational dive instructors. A frequent theme of their comments questioned the role of a government department (WorkSafe New Zealand) in monitoring divers' levels of competence and training when this responsibility usually is, or should be, assumed by the employer. One of the key principles of the Health and Safety at Work Act 2015, and its equivalent in other jurisdictions, is employers' primary duty of care, to ensure the health and safety of employees.¹⁵ Consequently, it is not surprising to find that employers may wish to verify the validity of claims of training and experience. However, WorkSafe has a governance role in ensuring compliance with health and safety regulations. Thus, even though some divers may see verification of their training and experience as an annoying duplication of what has already been audited by the employer, it should be a source of comfort.

To address the obvious discrepancies between diver perceptions and reality and facilitate communication between the regulator and working divers in New Zealand, the Diving Industry Advisory Group (DIAG) was recently established. This group comprises diving medical experts as well as representatives of the regulating authority and of each of the various branches of occupational diving (e.g., scientific, construction, commercial, aquaculture, recreational instructors, etc.). Issues raised by the current survey, such as the perceived inappropriateness of requirements of the CoC for some branches of diving, are being investigated for possible modification. Because of the wide variety of tasks and expertise prevalent in this industry, a global standard of competence is inappropriate, but individual diver subgroup standards mean those divers working in multiple disciplines of professional diving will need to prove competence in each area.

The effect of any procedural changes to the certification system in response to the current survey will be measured by repeating a similar satisfaction survey after a suitable interval.

Conclusions

The current certification system is considered satisfactory by most New Zealand divers. Aspects of the process highlighted by the current survey, for modification, include refinement of the CoC requirements to be more task-appropriate, and improvement in communication with divers about costs and justification for various aspects of the process.

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The lead author (CS) and two of the co-authors of this study (DFG,

SJM) are on the directorate of Diving and Hyperbaric Medical Services Ltd, which is contracted by WorkSafe New Zealand to provide advice on, and oversight of, the medical component of professional diver certification and health surveillance. SJM's role is that of consultant on matters of policy and procedure rather than conducting diver medical examinations. In addition, SJM is the Editor of *Diving and Hyperbaric Medicine* Journal, but was not involved in the review and decision-making process to publish this study, which was managed entirely by the European Editor, Dr Lesley Blogg.

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