

Medical assessment of fitness to dive – comparing a questionnaire and a medical interview-based approach

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Key words

Fitness to dive, recreational diving, questionnaire, medicals – diving

Abstract

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Introduction: In Queensland, most entry-level recreational diving students have to complete two diving medical forms (the Recreational Scuba Training Council (RSTC) or similar, and the appendix to Australian Standard 4005.1), as well as undergoing a medical consultation by a medical practitioner experienced in diving medicine. This provides an opportunity to evaluate the performance of the health questionnaire compared to the medical interview.

Methods: We conducted a retrospective analysis of 1,000 consecutive entry-level scuba-diving students assessed by one doctor (CM). Using the medical consultation as the reference standard, we analysed the number of incorrect or inconsistent answers in each of the forms. The main outcome was the number of individuals who were found 'unfit to dive' following the medical, but who appeared fit according to their responses on the RSTC form.

Results: Of the 1,000 students, 3.7% failed the medical, 9.4% gave inconsistent answers and 29.9% gave incorrect answers. 63.2% had answered 'no' to all the questions on the RSTC form, and nine of these students (1 in 70) were assessed at the medical as 'unfit' for scuba diving, (0.9% of the total). Logistic regression could not identify factors that reliably predict those at high risk of failing the medical consultation after passing the RSTC questionnaire. Those who gave incorrect responses were more likely to fail (8.4% versus 2.0%, $P < 0.0001$).

Conclusions: One in 70 candidates failed during the medical consultation after indicating they had no relevant medical problems on a questionnaire. Face-to-face medical interview does identify individuals who are at risk while diving, where two commonly used medical screening forms do not. The practical significance of these conclusions remains unclear.

Introduction

Hundreds of thousands of people flock every year to North Queensland, Australia, to dive on the Great Barrier Reef (GBR), one of the seven natural wonders of the world. This heritage-listed area is the largest coral reef system in the world, composed of over 2,900 individual reefs and 900 islands and stretching for 2,600 kilometres over an area of approximately 344,400 square kilometres. Cairns, in Far North Queensland, is a major hub for these divers and among them are entry-level candidates in all shapes and sizes and from all corners of the world.

In most countries, an individual contemplating any form of compressed gas diving will have a medical assessment of some sort. The purpose of this assessment is the identification of individuals who have a medical condition that would present a substantial risk if they were to undertake compressed-gas diving. For recreational scuba diving, this assessment is usually a self-declaration medical questionnaire. The complexity of the questionnaire varies according to whether the person is about to embark on a full scuba course or a guided introductory dive.

The medical clearance of recreational divers is usually undertaken by the diving training agencies.¹ Only rarely are there statutory guidelines in place, and Australia is one of those rarities. The Australian Standard (AS) 4005.1-2000 outlines how entry-level scuba diving training should

be conducted and includes an appendix outlining the medical assessment recommended for all candidates for training.² Not all Australian states have regulations for employed divers that govern how diving or dive training is to be conducted.³ Queensland does, and in that state the Workplace Health and Safety Act 1995 directs the worker to adopt and follow a stated code of practice.⁴ The Recreational Diving, Recreational Technical Diving and Snorkelling Code of Practice 2010, outlines how these activities should be conducted in Queensland and also directs that medical assessments should be made in accordance with the Australian Standard.⁵ The Code of Practice mandates that a medical practitioner with experience in diving medicine conducts the assessment. Thus, all would-be recreational divers in Queensland are required to have a medical consultation with a detailed questionnaire that informs a face-to-face interview and examination by a medical practitioner with experience in diving medicine.

In many other countries, only the self-declaration health questionnaire is required. Most commonly, when a candidate gives a positive response to any question they are directed to have a medical assessment with a doctor. The Recreational Scuba Training Council (RSTC) Medical Statement has been widely used, including by many Queensland dive training operators.⁶ Thus, in Queensland, candidates often have to complete both forms and have a medical consultation. This provides a unique opportunity to compare the way in which candidates complete these two health questionnaires, and

to compare the RSTC form with the medical consultation process. It is important to recognise that the two forms are designed for different purposes. The RSTC consists of 34 questions asking for a yes or no response and is designed to identify those who may be at medical risk from diving and require a medical consultation. On the other hand, the appendix to the Australian Standard is a screening tool designed to assist and direct the face-to-face component of the medical consultation. It asks more questions (98) and many may require a short narrative response. There is also a space for medical notes on these responses. Thus, the two forms differ significantly from each other, both in the number of questions and their wording, and may perform quite differently in practice.

Our primary purpose in this study was to establish and characterise any cohort of candidates who pass through the RSTC screening, but who would be found unfit on medical consultation. These individuals are a group at risk of diving-related morbidity and mortality should Queensland move to a questionnaire-based system. We also aimed to examine in detail any differences in the way individual candidates filled out the two questionnaires.

Methods

We conducted a retrospective analysis of the questionnaires filled out by 1,000 consecutive recreational diving students who attended one of the authors (CM) for a diving medical during 2008. Each candidate had completed two medical questionnaires prior to being seen: the AS4005.1 (1992 version) and the RSTC Medical Statement (1998 version) as required by the Queensland Code of Practice and a recreational diving training agency respectively. Both forms were available in English, Japanese, Korean and German. The Human Research Ethics Committee, Cairns and Hinterland Health Service District granted ethical committee approval for the study.

All analyses were made on the assumption that the information found during the face-to-face medical (interview and examination) was correct (a 'gold standard'). We compared the findings of the medical assessment to the answers indicated by the candidates on each of the forms. We evaluated four aspects:

- the number of individuals with incorrect answers on each form (absolute and proportion);
- the number of individuals with answers that were inconsistent between the two forms;
- the identification of additional medical information during the face-to-face interview and examination;
- the candidates who failed at the face-to-face medical who did not indicate a problem on the RSTC form.

To facilitate an appropriate comparison, we entered the two questionnaires into a spreadsheet (Microsoft Excel 2003) and grouped together all questions with the same or very similar meaning. CM made these groupings and they were reviewed by MB. Disagreements were settled by consensus. We identified 11 sets of questions and used these to determine inconsistent responses (Table 1).

For each individual, the responses given were transferred in a de-identified form to an Excel™ spreadsheet. This spreadsheet was then re-sorted and imported into a statistical package for analysis (StatsDirect version 2.7.8, StatsDirect Ltd). We defined the outcomes of interest as below:

- Incorrect responses: If the student answered 'no' to a question on either form, but at the medical examination it was found that the correct answer should have been 'yes', the answer has been identified as 'incorrect'. Note that we did not examine the responses for those who answered 'yes' when the answer should have been 'no' because we are interested primarily in those who would pass the questionnaire despite a medical problem.
- Inconsistent responses: If the student has answered 'yes' to a question on one form but 'no' to a question with the

Table 1

The eleven questions on each form that were deemed to have the same meaning; * we excluded from comparison parts of the questions that do not have the same meaning, e.g., agoraphobia in the question on RSTC form.

Australian Standard 4005.1

Have you ever had or do you now have any of the following?

Claustrophobia
Asthma or wheezing
Hernia or rupture
Fainting or blackouts
Convulsions, fits or epilepsy
Heart disease
High blood pressure
Pneumothorax (collapsed lung)
Diabetes
Blood disease or bleeding problem
Are you now pregnant or planning to be?

Recreational Scuba Training Council (RSTC)

Have you ever had or do you currently have...?

Claustrophobia or agoraphobia* (fear of closed or open spaces)
Asthma, or wheezing with breathing or wheezing with exercise
History of any type of hernia
History of blackouts or fainting (full/partial loss of consciousness)
Epilepsy, seizures, convulsions or take medications to prevent them
History of any heart disease
History of high blood pressure or take medicine to control blood pressure
Pneumothorax (collapsed lung)
Any history of diabetes
History of bleeding or other blood disorders
Could you be pregnant, or are you attempting to become pregnant

same meaning on the other form, the answer has been identified as ‘inconsistent’.

- Failed medical: If the student was not cleared to undertake dive training. This included both those who were found ‘unfit to dive’, and those who required further specific investigation but were unwilling or unable to undertake this.

STATISTICAL METHODS

No sample-size calculation was undertaken prior to commencing this study and an ad hoc decision was made to complete the study at 1,000 individuals. In order to ensure appropriate statistical methods, the demographic characteristics were plotted where appropriate (e.g., age) in order to determine the pattern of distribution. For univariate analyses, we compared the number of incorrect and inconsistent responses using a Chi-square test for significance for two by two, two by three and two by four tables as appropriate. Multivariate analysis was undertaken where appropriate using logistic regression. Potentially important factors were included in the multivariate analysis if the univariate analysis suggested the *P*-value for an association between factor and outcome was <0.1. A step-wise backward elimination technique was then employed in order to determine the most predictive model. Statistical significance was accepted if the chance of a type-I error was less than one in twenty (*P* <0.05).

Univariate analysis was performed using first language (English, European, or Asian), age (four subgroups), sex, previous diving or occupational group as the predictor variables for inconsistent and incorrect responses. Multivariate analysis was undertaken as appropriate to the methodology above. We took a similar statistical approach to determine the likelihood of failing the medical if there were inconsistent, incorrect or all negative responses for the whole group and all the subgroups indicated above.

Results

DEMOGRAPHICS

Of the 1,000 student divers whose questionnaires were analysed, 46.2% were female and 53.8% were male. The mean age was 25 years (range 13–65 years; 70% of the students were aged 20–29 years). There were no significant differences in the sex ratio across age groups. 79% admitted to consuming alcohol, with a median weekly consumption of six units per week (range 1–60). 18% admitted to smoking a median of eight cigarettes per day (range 1–30). The mean body mass index (BMI) for the group was 25 (range 16–40 for females, and 16–35 for males; 3.8% were obese (BMI > 30) and 9.6% were underweight (BMI < 20).

Most of the candidates were international tourists, mainly from Continental Europe and Scandinavia (33%), followed by Japan (16.6%), the United Kingdom (14.8%) and USA (8.9%). Only 8.6% were from Australia. Overall, 40.6% were English-speaking, 30.5% spoke a European language, and 28.9% spoke an Asian language.

FAILED MEDICALS, INCONSISTENT AND INCORRECT ANSWERS ON QUESTIONNAIRES

Of the 1,000 candidates, 37 (3.7%) failed the medical, 9.4% had inconsistent answers and 29.9% had incorrect answers. Of the latter, 26.1% had ‘no’ on a form, when the answer should have been ‘yes’, and 5.8% answered ‘yes’ when the answer should have been ‘no’; 2% made both errors. We did not examine this latter group any further, as discussed in methods above. Of those eventually identified as having a history of asthma, 26% failed to mark this on their questionnaires. Overall, clinically significant medical history was missed on the AS form in six (0.6%) cases and on the RSTC form in 47 (4.7%) and some additional information was found during consultation in 110 (11%) of the cohort. Those who answered at least one

Table 2
The reasons given in nine cases for being declared unfit following a face-to-face medical in the group who answered ‘no’ to all questions on the RSTC form. (n = 632)
***spirometry required by AS4005.1: FVC and FEV₁ ≥80% of predicted values, FEV₁/FVC ≥75%²**

System affected	Details recorded at medical consultation	Requires further specialist investigation to determine if permanently unfit
ENT	Eardrums pink, recent URTI, unable to equalise; temporarily unfit	No
ENT	Eardrums red, recent skydiving, unable to equalise; temporarily unfit	No
ENT	Congenitally narrowed ear canals, possible atresia	Yes
Respiratory	Failed spirometry*, smoker, recent URTI	Yes
Respiratory	Failed spirometry*, ex smoker, wheeze on auscultation	Yes
Respiratory	Failed spirometry*	Yes
Cardiovascular	Heart murmur on auscultation, history of hole in the heart or great vessels	Yes
Cardiovascular	History of palpitations, ECG shows sinus tachycardia	Yes
Other	Fainted in classroom and on the way to the toilet; bradycardia	Yes

question incorrectly were more likely to fail the medical consultation (8.4% versus 2.0%, Chi square = 20.4, $P < 0.0001$). The relative risk (RR) of failing for this group was 2.4 (95% confidence interval (CI) 1.7 to 3.1).

Six-hundred-and-thirty-two candidates (63.2%) answered 'no' to all questions on the RSTC form and were less likely to be failed at medical consultation (1.4% versus 7.1%, Chi square = 20.8, $P < 0.0001$. RR 0.38, 95% CI 0.21 to 0.63). Of the 632, nine candidates (1.4%) then failed the medical. Table 2 documents the reasons given on the medical forms for this.

Univariate analysis

We examined the predictive value of language spoken, age, sex and occupation on the likelihood of failing the medical, giving incorrect or inconsistent answers, answering 'no' to

all questions on the RSTC and answering 'no' to all, but failing after the face-to-face medical examination. The results are summarised in Table 3. The only statistically significant relationships were a higher proportion of those aged more than 39 years gave at least one incorrect answer when compared to other age groups (59.5% versus 24.8%, Chi-square = 22.2, $P < 0.0001$), those in the medical and allied professions were more likely to give inconsistent answers ($P = 0.008$, Fisher's exact test), men were more likely to answer all 'no' on the RSTC (43.3% versus 31.2%, Chi-square = 15.55, $P < 0.0001$) and women more likely to give inconsistent and incorrect answers (12.1% vs 7.1%, Chi-square = 6.88, $P = 0.009$; 31% vs 22%, Chi-square = 10.62, $P = 0.002$). Although the overall Chi-square test for age as a potential predictor of failing after answering all 'no' on the RSTC was not statistically significant, we noted that all such cases were in the 20–29 year age group. When tested against all other groups, this age group was more likely to fail after answer all 'no' (2% versus 0%, $P = 0.48$, Fisher's exact test).

Multivariate analysis

We used the results of the univariate analyses to construct our initial models for prediction of the outcomes of interest. The final models and predictive values are summarised in Table 4. We did not identify any such factors for failure at the medical consultation or for those who answered all 'no' on the RSTC and failed at the consultation. Only sex was found to predict the likelihood of answering all 'no' (see above). Potential predictive factors for supplying inconsistent answers were age, sex and occupation, but only occupation and sex were significant predictors, suggesting that the odds of a female health worker to give inconsistent answers on the two forms were 2.4 to 1 ($P = 0.001$). Similarly, both age and sex were predictors of giving an incorrect answer, suggesting the odds of a female greater than 39 years old giving such an answer to be 2.2 to 1 ($P < 0.001$).

Discussion

The International Organization for Standardization (ISO), of which Australia is a member, is a network of the national standards institutes of 157 countries with a central secretariat in Geneva. In 2007, the ISO accepted a common medical standard for fitness to dive, ISO 24801-2:2007. This standard requires the student to have documentary evidence of medical screening by appropriate questionnaire or medical examination.⁷ During the development of this standard, it became evident that most countries did not have a compulsory diving medical examination, but depended on the self-declaration questionnaire.

Although both options have been included in the ISO standard, there is ongoing discussion as to whether the Australia Standard should adopt the self-declaration questionnaire and discard the compulsory face-to-face diving medical in order to fall in line with common practice

Table 3

Univariate analysis of potential predictors for the outcomes of interest: deemed unfit after medical evaluation; gave inconsistent answers; gave incorrect answers; gave all 'no' responses on RSTC form; failed and gave all 'no' responses; * statistically significant

Potential predictor	Outcome	Chi square	P-value
Language group (English/Euro/Asian)	Not fit	0.15	0.52
	Inconsistent	0.48	0.89
	Incorrect	1.15	0.32
	All 'no'	1.88	0.17
	All 'no' but failed	0.45	0.9
Age group (<20yrs/20–29yrs/ 30–39yrs/>39yrs)	Not fit	1.05	0.77
	Inconsistent	2.62	0.08
	Incorrect	5.15	<0.0001*
	All 'no'	2.33	0.14
	All 'no' but failed	1.96	0.28
Occupation (medical/other)	Not fit	2.2	0.09
	Inconsistent	(Fisher's)	0.008*
	Incorrect	0.35	0.55
	All 'no'	0.74	0.39
	All 'no' but failed	(Fisher's)	0.7
Previous experience (yes/no)	Not fit	0.33	0.24
	Inconsistent	0.36	0.55
	Incorrect	0.20	0.65
	All 'no'	0.66	0.20
	All 'no' but failed	(Fisher's)	0.46
Sex	Not fit	2.19	0.14
	Inconsistent	6.88	0.009*
	Incorrect	10.62	0.002*
	All 'no'	15.55	<0.0001*
	All 'no' but failed	(Fisher's)	0.47

Table 4
Multivariate analysis of potential predictors for the outcomes of interest

Outcome	Potential predictors	Final model	Odds ratio	P-value
‘Not fit’	Nil	Nil		
Inconsistent	Age/occupation/sex	Health worker/female	2.4	0.01
Incorrect	Age/sex	>39 years/female	2.2	<0.001
All ‘no’	Sex	Univariate		
All ‘no’ but failed	Nil	Nil		

throughout the rest of the world. Independently, the SPUMS has been considering the same question for the past five years. The prospect, as described elsewhere in this issue, that both the Australian Standard and the SPUMS recommendations might change has created some debate both in the region and more widely. There is little evidence upon which to base any such decision. This study was devised in an attempt to answer some of the questions raised by the debate.

We have compared the ability of the RSTC screening questionnaire and the SPUMS approach, involving the AS 4005.1 questionnaire and a medical consultation, to identify medical problems that might prevent a candidate from safely undertaking scuba diving training. Of our cohort of 1,000 consecutive and unselected candidates, only nine individuals indicated no problems on the RSTC form, but then revealed information during the medical consultation that may have posed a risk of misadventure such that they were found unfit to undertake training. Of these nine, two were probably only temporarily unfit whilst the other seven needed further investigations or specialist review to determine their fitness to dive. The two students with equalisation problems would likely have been identified by the instructor during pool training; it is unlikely that the student with congenitally narrow canals and hearing loss would ever have been assessed as fit to dive. While it is not possible to know if any of the nine would have suffered morbidity or died during or after their dive training, it is important to recognize that the absolute numbers of individuals in this category might be quite large. In 2008, the year of the study, approximately 20,000 people trained to dive in Queensland, suggesting nearly 200 of these would fall into this ‘at risk’ category, based on our data.

In addition, we have examined the predictive ability of a number of potential factors that might identify a group at risk of misadventure if screening were based solely on a medical questionnaire such as the RSTC form. While there were some statistically significant determinants of the likelihood of giving either inaccurate or inconsistent responses, there were no such predictors of the small numbers of candidates who were failed during medical consultation. We are, therefore, unable to suggest a subgroup in which compulsory medical consultation would be particularly useful.

The usefulness of medical consultation has been questioned

elsewhere. In the United Kingdom until March 2000, a diving candidate needed to answer a questionnaire and attend a medical consultation with a registered medical practitioner. Trained diving doctors were available in the case of a potential problem, but the examining medical officer did not require any training in the area.⁸ Since that time, the United Kingdom Sport Diving Medical Committee (UKSDMC) has moved to a self-declaration medical system with a form being completed at entry and at between one- and five-year intervals, depending on the medical condition and age of the diver. An answer of ‘yes’ to any of the questions mandates a review from a medical officer trained and experienced in diving medicine (a ‘medical referee’).⁹ This change was made in response to a study that reviewed the information found on the medical forms of the Scottish Sub-Aqua Club (SSAC) between 1991 and 1998.⁸ The authors evaluated 2,962 forms and concluded that face-to-face medical examinations were of little added value. All conditions preventing the subjects from diving were detected by the questionnaire and no important and unexpected abnormalities were found on clinical examination. A review of the new approach after three years in operation concluded that the self-administered questionnaire was an effective screening tool for the detection of divers requiring further detailed assessment.¹⁰

In Australia, the situation is further complicated by coronial inquest findings that need to be addressed. Rather than relaxing the current process as in the UK, several such inquests over the last few years have recommended more stringent diving medical fitness standards. Most recently, in April 2008, the NSW coroner recommended compulsory diving medical examinations, preferably annually, but not less frequently than every two years.¹¹

When using a self-declaration health questionnaire as the screening method, the honesty and accuracy with which the form is completed are clearly important. There are many factors that might influence the frankness with which individuals approach this task. For example, to what extent does each individual understand the risks posed by concealing information? Even if the risk is conveyed accurately, responses may vary depending on the risk acceptance of the candidate. Further, it is not clear that a person is more likely to be honest during a face-to-face interview than when filling out a self-declaration

questionnaire. Our difficulty in understanding the extent of any problems is compounded by the fact that there is likely to be both a time and financial penalty incurred if an affirmative answer is given to a question. In a 1991 paper, Parker considered the relative importance of different parts of the diving medical in identifying fitness to dive and observed it was surprising that many questions were not answered correctly by the diver.¹² When the condition was detected and admitted to, varying reasons for the omissions were given including: “*I didn’t think it mattered*”, “*I forgot*” and “*I didn’t see it*”.

Medical consultation with a trained and experienced physician has utility beyond simply identifying those unfit to train for diving. Prompted by responses to the questionnaire, the medical interview may be valuable for identifying and discussing risk and risk minimisation strategies. This has certainly been the experience of the two authors. It has not been possible to estimate the practical impact of this discussion in the present study.

Both the forms used by the diving students in this study have been updated. The Australian Standard form was changed little, but there have been some improvements to the RSTC form that may reduce the observed inaccuracies. For example the question “*do you regularly take prescription or non-prescription medications?*” has been changed to “*are you presently taking prescription medications?*”, and “*are you currently receiving medical care*” has been added for candidates over the age of 45 years.

Conclusions

Approximately 1% of all the diving candidates ‘passed’ the RSTC screening questionnaire but were subsequently found on medical consultation to be ‘unfit to dive’. The impact on morbidity or mortality remains unknown. Evidence exists both in favour of face-to-face medical assessment before undertaking scuba training and that such consultations add little of value to the prospective diver. More work is needed in this area. At this time, we recommend caution before implementing changes to the current system of assessment in Australia, and the inclusion of a valid and meaningful assessment of the impact of any such change.

References

- Mitchell SJ, Bennett MH. Clearance to dive and fitness for work. In: Neuman TS, Thom SR, editors. *The physiology and medicine of hyperbaric oxygen therapy*. London: Elsevier; 2008.
- Australian Standard AS4005. 1-2000. *Training and certification of recreational divers. Part 1: Minimum entry-level SCUBA diving*. Strathfield, NSW: Standards Australia International Ltd; 2000.
- Meehan C. The Australian diving medical. A look at the standards in Australia and overseas. *SPUMS Journal*. 2004;34:137-41.
- Workplace Health and Safety Act 1995*. Queensland Government; reprinted July 2010. Part 3: Workplace health and safety obligations, Section 26: Subsection 3. Available from: <<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WorkplHSA95.pdf>>
- Recreational Diving, Recreational Technical Diving and Snorkelling Code of Practice 2010*. Queensland Government, Workplace Health and Safety Queensland; March 2010. 2.3.1.2: Medical fitness of entry-level certificate divers. Available from: <http://www.deir.qld.gov.au/workplace/resources/pdfs/divingrecreational_code2010.pdf>
- Richardson D. The RSTC medical statement and candidate screening model. *SPUMS J*. 2000;30(4):210-3. Available from: <www.wrstc.com/downloads/RSTCMedStatementGeneric.pdf>
- ISO 24801-2:2007. *Recreational diving services - Safety related minimum requirements for the training of recreational scuba divers - Part 2: Level 2 -Autonomous diver*. Geneva, Switzerland: International Organization for Standardization; 2007.
- Glen S, White S, Douglas J. Medical supervision of sport diving in Scotland: reassessing the need for routine medical examinations. *Br J Sports Med*. 2000;34:375-8.
- UK Sport Diver Medical Form*, November 2005. Available from: <<http://www.uksdmc.co.uk>>
- Glen S. Three year follow up of a self certification system for the assessment of fitness to dive in Scotland. *Br J Sports Med*. 2004;38:754-7.
- C1. Coroners Act, 1980, *Inquest held at the Court House of Kurri Kurri on the 31/3/08 & 1/4/08, Magistrate Crews, Coroner, concerning the death of Jane Majella McQuillan*.
- Parker J. The relative importance of different parts of the diving medical in identifying fitness to dive and in detecting asthma. *SPUMS Journal*. 1991;21(3):145-53.

Conflict of interest: Dr Meehan is one of several diving medical practitioners in the Cairns region listed to provide assessment services for entry-level divers, as required by Queensland state legislation and paid for by the candidates. Candidates in this study were referred by an outside organisation without active recruitment by Dr Meehan.

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