

Guidance on Health, Fitness and Medical Issues in Diving Operations



The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are five core committees that relate to all members:

- ◆ Competence & Training
- ◆ Contracts & Insurance
- ◆ Health, Safety, Security & Environment
- ◆ Lifting & Rigging
- ◆ Marine Policy & Regulatory Affairs

The Association is organised through four distinct divisions, each covering a specific area of members' interests – Diving, Marine, Offshore Survey and Remote Systems & ROV.

There are also five regions which facilitate work on issues affecting members in their local geographic area – Asia-Pacific, Europe & Africa, Middle East & India, North America and South America.

IMCA D 061

www.imca-int.com/diving

If you have any comments on this document, please click the feedback button below:

feedback@imca-int.com

| Date | Reason | Revision |
|--------------|---------------------|-----------------|
| October 2018 | Initial publication | |

The information contained herein is given for guidance only and endeavours to reflect best industry practice. For the avoidance of doubt no legal liability shall attach to any guidance and/or recommendation and/or statement herein contained.

Guidance on Health, Fitness and Medical Issues in Diving Operations

IMCA D 061 – October 2018

| | | |
|-----------|---|-----------|
| 1 | Introduction | 1 |
| 1.1 | Key Factors Identified by Members | 1 |
| 2 | Aims | 2 |
| 3 | Application | 3 |
| 4 | List of Abbreviations and Acronyms | 4 |
| 5 | Glossary of Terms | 5 |
| 6 | The Medical and Physical Fitness of Commercial Divers – Roles and Responsibilities of Key Persons | 6 |
| 6.1 | Divers | 6 |
| 6.2 | Diving Contractors | 7 |
| 6.3 | Diving Supervisors..... | 7 |
| 6.4 | Clients | 7 |
| 6.5 | Life Support Supervisors | 8 |
| 6.6 | Installation/Vessel Medics..... | 8 |
| 6.7 | Diver Medical Technicians | 10 |
| 6.8 | Medical Examiner of Divers..... | 10 |
| 6.9 | Diving Medical Physician..... | 10 |
| 6.10 | Regulatory Authorities..... | 11 |
| 7 | The Medical Fitness of Commercial Divers – Current Situation..... | 12 |
| 7.1 | The Compelling Need for Commercial Divers to be Medically Fit..... | 12 |
| 7.2 | Measures Used by Industry to Assure the Medical Fitness of its Commercial Divers | 12 |
| 7.3 | Effectiveness of the Measures Used by Industry to Assure the Medical Fitness of its Commercial Divers..... | 14 |
| 8 | The Medical Fitness of Commercial Divers – Recommendations to Diving Contractors for Assuring the Initial and Continuing Medical Fitness of Commercial Divers | 17 |
| 8.1 | Annual Medical Examinations of Divers | 17 |
| 8.2 | Other Measures..... | 17 |
| 9 | The Physical Fitness of Divers to Dive and Work Underwater – Current Situation | 21 |
| 9.1 | The Compelling Need for Commercial Divers to be Physically Fit..... | 21 |
| 9.2 | Measures Used by Industry to Assure the Physical Fitness of Commercial Divers..... | 21 |
| 9.3 | Effectiveness of the Measures Used by Industry to Assure the Physical Fitness of Commercial Divers | 22 |
| 10 | The Physical Fitness of Divers to Dive and to Work Underwater – Recommendations to Diving Contractors for Assuring the Physical Fitness of Divers to Dive and to Work Underwater | 24 |

| | | |
|-----------|---|-----------|
| 10.1 | Annual Medical Examinations of Divers | 24 |
| 10.2 | Other Measures..... | 24 |
| 11 | Diver Nutrition and Hydration | 29 |
| 11.1 | Nutritional Recommendations..... | 29 |
| 11.2 | Hydration and Electrolytes | 29 |
| 11.3 | Summary | 29 |
| 12 | Dealing with Failure to Report Pre-Existing Medical Issues | 31 |
| 12.1 | The Duties of Divers..... | 31 |
| 12.2 | Understanding Why Divers Fail to Declare Medical Issues | 32 |
| 12.3 | The Need to Do the Right Thing..... | 33 |
| 12.4 | Recommendations to Diving Contractors for Dealing with Failure to Report Pre-Existing Medical Issues | 33 |
| 12.5 | Search Programmes and Drugs and Alcohol Testing Programmes..... | 34 |
| 13 | Medications and Other Substances that May Not be Used by Diving Personnel Without Specialist Medical Advice..... | 36 |
| 13.1 | Prescription and Non-Prescription Drugs..... | 36 |
| 13.2 | Leisure/Lifestyle Substances..... | 36 |
| 14 | Installation/Vessel Medics and Diving..... | 38 |
| 14.1 | Training/Familiarisation in Diving Medicine for Offshore Medics | 38 |
| 14.2 | Communication/Chain-of-Command Issues for Offshore Medics Working with Divers | 39 |
| 14.3 | Accessing Support from Diving Medical Physicians | 40 |
| 14.4 | Recording and Logging of Diving Medical Matters..... | 41 |
| 15 | Accessing Specialist Hyperbaric Medical Advice and Assistance..... | 42 |
| 15.1 | The need for contracts/agreements with specialist medical support organisations | 42 |
| 16 | References | 43 |
| | Appendix 1 | 44 |
| | Appendix 2 | 47 |
| | Appendix 3 | 50 |
| | Appendix 4 | 52 |

I Introduction

This guidance has been prepared in response to concerns about how best to address certain problematic diver health, fitness and medical issues that have been identified by IMCA Diving Division members during the course of their work.

A number of IMCA members have become increasingly concerned that workplace incidents connected to diver health (medical fitness) and physical fitness issues appear to be increasing. This unsettling trend suggests that there is a need for diving contractors, and divers themselves, to manage the question of diver health and physical fitness more effectively.

I.1 Key Factors Identified by Members

IMCA members consider that the following key factors underlie many of the workplace incidents connected to diver health and physical fitness issues that they have been seeing:

- ◆ Excessive weight and poor levels of physical fitness amongst divers;
- ◆ The concealment of known medical conditions by divers;
- ◆ The use of prescribed/non-prescribed drugs or leisure/lifestyle substances (such as steroids, vitamins, protein and electrolyte drinks) by divers without the knowledge of those in control of the diving operations;
- ◆ The dubious quality of the annual medical examinations carried out by some medical examiners of divers;
- ◆ Lack of competence or excessive leniency amongst some medical examiners of divers;
- ◆ Failure to employ clear pass/fail criteria when carrying out medical examinations of divers;
- ◆ Medical in confidence concerns preventing appropriate access for employers to the medical histories of divers;
- ◆ Inadequate training of worksite medics, leading to poor communication between medics and those in control of the diving operations;
- ◆ Organisational failures by diving contractors to manage diver health, fitness and medical issues effectively;
- ◆ A poor culture amongst divers and dive teams that permits problems with diver health and physical fitness to develop and worsen.

The guidance in this document is intended to assist:

- ◆ Divers;
- ◆ Diving Contractors;
- ◆ Diving and Life Support Supervisors;
- ◆ Installation/vessel medics;
- ◆ Diver Medical Technicians (DMTs);
- ◆ Medical examiners of divers;
- ◆ Commercial diving medical specialists;
- ◆ Clients/Operators;
- ◆ Regulatory authorities; and
- ◆ Anyone else with an interest in ensuring the health and physical fitness of commercial divers.

2 Aims

The guidance document aims to:

- a) Emphasise to divers that they have an obligation not to endanger themselves, or other members of the dive team, by:
 - ◆ failing to declare significant health (medical fitness) issues to those in control of diving operations; or by
 - ◆ allowing their levels of physical fitness to decline significantly;
- b) Encourage a culture of good health and high levels of physical fitness amongst divers;
- c) Provide diving contractors with information about management system options that can help them deal with commonly encountered diver health, fitness and medical issues; and
- d) Assist diving contractors seeking to develop arrangements for managing diver health, physical fitness and medical issues effectively.

3 Application

The advice given in this document applies to all diving operations (surface supplied and closed bell).

It is recommended that this document is used by dive schools to educate their students on diver health and physical fitness issues.

This guidance is intended to apply internationally, but it is recognised that some countries will have legislation that requires different standards or practices to be followed. Where local or national laws are more stringent than the advice contained herein, they will always take precedence over this guidance.

When instituting arrangements to manage health, physical fitness and medical issues it is particularly important for employers to ensure that they always comply with local medical confidentiality laws and with any local restrictions on the provision of medicinal drugs.

Local legislation may mean that in some parts of the world it will not be possible to implement all of the advice given in this document.

4 List of Abbreviations / Acronyms

| | |
|---------------------|---|
| AAS | Anabolic-androgenic steroids |
| ADCI | Association of Diving Contractors International |
| AMEDS | Approved Medical Examiners of Divers |
| BMI | Body mass index |
| CST | Chester Step Test |
| D&A | Drug and alcohol |
| DCI | Decompression illness |
| DMAC | Diving Medical Advisory Committee |
| DMT | Diver Medical Technician |
| EDTC | European Diving Technology Committee |
| EDTCmed | European Diving Technology Committee Medical Subcommittee |
| GP | General Practitioner |
| LSS | Life Support Supervisor |
| MAI | Medical Examination and Assessment of Commercial Divers (MAI) |
| OIM | Offshore Installation Manager |
| OPM | Offshore Project Manager |
| UK HSE | UK Health and Safety Executive |
| VO ₂ max | Maximal oxygen uptake |

5 Glossary of Terms

| | | |
|---------------------------------|---|--------|
| Medical examiner of divers | A doctor who is trained and competent to perform the annual assessment of fitness to dive for divers. Medical examiners of divers may not possess knowledge of the treatment of diving accidents. | IMCA |
| Diving medical physician | A doctor who has the experience background and training (competence) to manage the treatment of diving accidents and illnesses, including, where appropriate, mixed gas and saturation diving accidents. Such a doctor will have undergone specialised training and have demonstrated experience in this field. | IMCA |
| Diver Medical Technician | Also known as a Diver Medic or DMT. A member of the dive team who is trained in advanced first aid and basic paramedical techniques. | IMCA |
| Installation/Vessel Medic | The on-site medics who care for the health and well-being of the workforce on the installation or vessel. | IMCA |
| Medically fit (healthy) divers | Divers who are free of disqualifying medical conditions in accordance with relevant medical fitness standards and guidelines. | IMCA |
| Physically fit divers | Divers who are able safely and effectively to perform tasks which they may reasonably be expected to undertake during diving projects (including the rescue of incapacitated divers). | IMCA |
| Fit to dive personnel | Divers considered to be medically fit, physically fit and mentally prepared for the nature of the diving operations they will be expected to undertake. | IMCA |
| Fitness Verification Scheme | A company run scheme designed to provide confidence that all divers employed by the diving contractor maintain a good level of physical fitness. Periodic exercise testing between annual diving medicals will be an integral part of any such scheme. | IMCA |
| Maximal effort exercise test | An exercise test requiring the subject to exercise to the point of exhaustion. | UK HSE |
| Submaximal effort exercise test | An exercise test not requiring the subject to exercise to the point of exhaustion. | IMCA |

6 The Medical and Physical Fitness of Commercial Divers – Roles and Responsibilities of Key Persons

The detailed structure of dive teams working on diving projects will vary depending on the nature of individual company management systems. In addition to diving supervisors, there may well be a senior diving supervisor, diving superintendent, or offshore project manager (OPM) present who should be consulted as a matter of course if any fitness to dive concerns with the divers emerge. The vessel master and other members of the vessel's senior management will also need to be kept informed. The aim is to ensure that good communications are maintained between all the key players involved so that, when necessary, properly informed decisions can always be made with respect to diver health and medical issues.

It is recognised that a number of persons have key parts to play in ensuring that only the medically and physically fit are permitted to dive on commercial diving projects. The roles and responsibilities of such persons are set out in this section.

6.1 Divers

Like all workers, divers have a duty of care to themselves and their colleagues. They should take reasonable care of their own health and safety and the health and safety of other persons who may be affected by their acts or omissions at work. Divers also have a duty to co-operate with their employers in the employers' efforts to deliver safe diving projects.

It is therefore essential that divers do all that they can to ensure that they are medically fit when they report for diving duties, and that they are also physically fit enough to carry out the tasks they may be reasonably expected to undertake while underwater safely, effectively and without undue fatigue.

Prior to entering the water on a commercial diving project, divers should:

- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Declare in writing that they feel they are medically fit and sufficiently physically fit for diving duties.

Only divers themselves know their own immediate health status at a given time and they have a responsibility to themselves and others not to conceal anything which they think may make them unfit to undertake diving duties. Divers should not put other persons at risk (e.g. members of the dive team who may be required to perform a rescue) by diving at work when they know of something (including any illness or medical condition) which makes them unfit to dive.

Divers who believe their medical or physical fitness may be in doubt for any reason, (for example, fatigue, emotional stress, minor injury, or recent medical treatment) or who are taking any medication, must inform their supervisor immediately. Even a minor illness, such as the common cold or a dental problem, can have serious effects on a diver under pressure, and should be reported to the supervisor before the start of a dive. Medications routinely taken may have significant side effects in hyperbaric environments.

Divers and diving project team members must disclose matters that can affect the health and safety of the team. They should never collude in hiding a colleague's illness, or any medical conditions that may make that person unfit to dive, out of a misplaced sense of loyalty. They must always report any concerns they have over the fitness of other divers to the diving supervisor. It is in the best interests of everyone involved with the diving project, including medically or physically unfit divers, to do so.

Note: Diving is an activity which places unavoidable physical, physiological and psychological stresses upon participants. Mental as well as physical illnesses may cause divers to be considered medically unfit to dive.

If a diving supervisor has any reason to doubt the medical and physical fitness of a diver, that diver must not be permitted to dive. Supervisors should seek guidance from the diving contractor and the company's medical adviser if there is doubt about a diver's medical or physical fitness to dive.

6.2 Diving Contractors

The diving contractor is the company in overall control of the diving project and the employer of the divers taking part in the project. The diving contractor has the main responsibility for ensuring that a safe diving project is carried out, although others also have responsibilities e.g. the diving supervisor, client companies etc.

Because the diving contractor has responsibility for ensuring that all parts of a diving project are managed in such a way as to ensure the health and safety of all the people involved, it is essential that diving contractors do everything that they reasonably can to ensure that their divers are medically fit whenever they dive, and that they are always also physically fit enough to carry out the tasks they may be reasonably expected to undertake while under pressure or in the water safely, effectively and without undue fatigue.

Prior to committing divers to pressure in a company diving project, diving contractors should be satisfied that all the divers:

- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Have declared in writing that they are medically fit and sufficiently physically fit for diving duties;
- ◆ Appear to be medically fit and sufficiently physically fit for diving duties.

If a diving contractor has any reason to doubt the medical and physical fitness of a diver, that diver must not be permitted to dive. In such circumstances diving contractors should seek guidance from their commercial diving medical specialists.

6.3 Diving Supervisors

Diving supervisors are responsible for the health and safety of the divers taking part in the diving operations that they are appointed to supervise. They are also responsible for the health and safety of other persons who may be affected by the diving operations they are appointed to supervise. It is therefore essential that diving supervisors do all that they reasonably can to ensure that the divers they will supervise are medically fit, and that they are also physically fit enough to carry out the tasks they may be reasonably expected to undertake while under pressure or in the water safely, efficiently and without undue fatigue.

Prior to committing divers to the water, diving supervisors should be satisfied that all the divers:

- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Have declared in writing that they are medically fit and sufficiently physically fit for diving duties;
- ◆ Appear to be medically fit and sufficiently physically fit for diving duties.

Note: Diving is an activity which places unavoidable physical, physiological and psychological stresses upon participants. Mental as well as physical illnesses may cause divers to be considered medically unfit to dive.

If a diving supervisor has any reason to doubt the medical and physical fitness of a diver, that diver must not be permitted to dive. In such circumstances diving supervisors should seek guidance from the diving contractor and its commercial diving medical specialists.

6.4 Clients

The client is a person who has placed a contract with a diving contractor to deliver a diving project. On offshore diving projects the client will usually be the operator or owner of proposed or existing installations, control umbilicals, power cables, wellheads or pipelines where diving work is going to take place, or a contractor acting on behalf of the operator or owner.

The actions and activities of clients can affect the safety of the dive team even though they are not members of the dive team. Client companies should consider carefully the actions required of them to support the diving contractor in delivering a safe diving project.

Prior to, and during the course of, diving projects that they have commissioned, clients should satisfy themselves that the diving contractor has a process in place to ensure that all divers:

- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Have declared in writing that they are medically fit and sufficiently physically fit for diving duties;
- ◆ Appear to be medically fit and sufficiently physically fit for diving duties.

If a client has any reason to doubt the medical and physical fitness of a diver, the client should inform the diving contractor of its concerns. In such circumstances the client should seek guidance from the diving contractor and its commercial diving medical specialists.

6.5 Life Support Supervisors

Life support supervisors (LSS) are responsible for the health and safety of the divers in their care when they are under pressure inside a saturation diving system. It is therefore essential that life support supervisors do all that they reasonably can to ensure that the divers they will supervise in saturation are medically fit, and that they are also physically fit enough to carry out the tasks they may be reasonably expected to undertake while in saturation safely, efficiently and without undue fatigue.

Prior to committing divers to saturation, the LSS should be satisfied that all the divers:

- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Have declared in writing that they are medically fit and sufficiently physically fit for saturation diving duties;
- ◆ Appear to be medically fit and sufficiently physically fit for saturation diving duties.

Note: Saturation diving is an activity which places unavoidable physical, physiological and psychological stresses upon participants. Mental as well as physical illnesses may cause divers to be considered medically unfit to dive in saturation.

If an LSS has any reason to doubt the medical and physical fitness of a diver, that diver must not be permitted to begin a saturation dive, i.e. the diver should not be blown down into saturation, and the LSS should immediately raise the matter with the diving supervisor. If an LSS has any reason to doubt the medical and physical fitness of a diver already committed to saturation, the LSS must immediately raise the matter with the diving superintendent/offshore manager and the diving supervisor should be informed as soon as practicable. In such circumstances, diving supervisors should seek guidance from the diving contractor and its commercial diving medical specialists.

6.6 Installation/Vessel Medics

Medics based on installations or vessels are 'remote medics', i.e. they operate in an environment where there is no means of rapidly accessing shore-based hospitals capable of providing definitive emergency care. Installation/vessel medics are very often the best qualified and most experienced medical personnel readily available offshore. They represent a very valuable source of medical expertise that is immediately available in the field.

When based on an installation or a vessel where diving is one of the work activities, it is desirable for medics to have received training/familiarisation in diving medicine. Such training will maximise the usefulness of the installation/vessel medic to members of the dive team who may suffer diving related illnesses or traumatic injuries during the course of diving operations (see Section 1413).

The primary responsibility of installation/vessel based medics is, within the limits of their competence, to care for the health and well-being of the workforce on the installation or vessel. The typical duties of the installation/vessel based medic are as follows:

- ◆ The provision of first aid;
- ◆ The management of ailments and injuries;
- ◆ The storage, replenishment and administering of medicines;
- ◆ The provision of emergency care at the scene of an emergency;
- ◆ The preparation of accurate medical records and maintenance of a suitable medical log system.

In addition, suitably trained installation/vessel medics who work with divers should be able to:

- ◆ Keep the diving supervisor(s), diving contractor and the diving contractor's shore-based diving medical specialists informed of all matters relevant to the medical fitness of the divers (including medicines administered);
- ◆ Verify that hygiene conditions on board the vessel are in accordance with regulatory authority, client and company requirements, paying particular attention to diving related hygiene and health conditions;
- ◆ Recognize the signs and symptoms of diving related illnesses and assist with the treatment of diving illnesses;
- ◆ Ensure that they are familiar with the diving contractor's relevant diving operational and emergency procedures;
- ◆ Ensure that they understand which medical equipment is suitable for use in a hyperbaric environment;
- ◆ Ensure that they are competent to use the medical equipment they are expected to operate;
- ◆ Ensure that only those medicines considered suitable for use by divers are administered to divers as necessary;
- ◆ Ensure appropriate liaison with the diving contractor's commercial diving medical specialists ashore as necessary;
- ◆ Provide advice and support to DMTs as necessary;
- ◆ If appropriate, enter a pressurised chamber when necessary to provide medical assistance/perform medical procedures.
- ◆ Perform objective and professional pre and post dive medical checks on divers as specified in the diving contractor's procedures;
- ◆ Conduct any physical fitness testing for divers as specified in the diving contractor's procedures in an objective and professional manner.

The requirements for medical confidentiality can present some challenges for the vessel/installation medic. However, the medic's duty to care for the health and well-being of the workforce on the installation or vessel takes precedence over an individual diver's right to complete medical confidentiality. It is essential that the diving supervisor(s) and life support supervisor(s) are told of any medications issued to diving personnel. If the medic is aware of any medical problems with a diver, the diving supervisor(s) and life support supervisor(s) must be told. Failure to inform those in charge of the diving operations, for reasons of medical confidentiality, or for any other reasons, may put the diver and other members of the team at significant risk.

The supervisors and other members of the dive team share the onus of medical confidentiality and it has to be recognised that at an offshore dive site, the observance of normal confidentiality rules may need to be appropriately adjusted to ensure the most effective treatment of an ill diver and/or ensure the safety of others.

If an installation/vessel medic has any reason to doubt the medical and physical fitness of a diver, the medic should immediately raise the matter with the diving supervisor. In such circumstances, diving supervisors should seek guidance from the diving contractor and its commercial diving medical specialists.

6.7 Diver Medical Technicians

DMTs are divers who have been trained in advanced first aid and basic paramedical techniques. A DMT is a commercial diver with some training in emergency medicine, whereas an installation/vessel medic is usually a health professional who may have received some training/ familiarisation in diving medicine.

IMCA guidance recommends that at least one person in the dive team per shift, who is not diving, is trained as a diver medic. This person should not be the supervisor because of the supervisor's need to be in direct control of the diving operation at all times. There are circumstances where additional members of the dive team should be qualified as diver medics. This will include situations where the diver requiring first aid is inside a compression chamber and immediate emergency medical assistance cannot be provided by anyone other than another diver. The diving contractor's risk assessment will consider the number of diver medics required for specific diving projects.

The responsibilities of a DMT can be similar or even identical to those of the installation/vessel medic as set out in Section 6.6, except that the focus of the DMT is on members of the dive team rather than on the installation or vessel workforce as a whole. On some worksites, the DMT may be required to act as the site medic within the limits of his/her competence. On many diving projects, there will be no installation/vessel medic with advanced training in emergency medicine, and DMTs may find that they are the most highly trained medics onboard. DMTs are very often best placed to provide the initial response to unforeseen or emergency medical events involving divers, but if there is a well-qualified and experienced installation/vessel medic available, DMTs should always seek advice and support from the installation/vessel medic as necessary.

If a DMT has any reason to doubt the medical and physical fitness of a diver, the DMT should immediately raise the matter with the diving supervisor. In such circumstances diving supervisors should seek guidance from the diving contractor and its commercial diving medical specialists.

6.8 Medical Examiner of Divers

IMCA guidance recommends that all divers at work must have a valid certificate of medical fitness to dive issued by a suitable doctor. The certificate of medical fitness to dive must be renewed prior to expiring if a diver wishes to continue diving at work. The certificate of medical fitness to dive is a statement of the diver's medical fitness to perform work underwater and is valid for as long as the doctor certifies, up to a maximum of 12 months.

A medical examiner of divers is a doctor who is trained and competent to perform the annual assessment of fitness to dive for divers at work. However, it should be noted that while they are competent to perform annual medical assessments of working divers, medical examiners of divers may not possess knowledge of the treatment/management of diving accidents or illnesses (see Section 6.9).

IMCA has provided its members with guidance (set out in information note [IMCA D 20/01](#)) on identifying appropriate medical examiners of divers. The most widely recognised training course for medical examiners of divers is the *Level 1 - Medical assessment of divers (Medical Examiner of Divers)* course. This training course for medical examiners of divers has been jointly approved by the Diving Medical Advisory Committee (DMAC) and European Diving Technology Committee Medical Subcommittee (EDTCmed).

It is imperative that medical examiners of divers carry out their duties objectively and professionally in accordance with a suitable standard. The primary responsibility of medical examiners of divers is to ensure that, following medical examination, anyone issued with a valid certificate of medical fitness to dive is indeed medically fit and sufficiently physically fit for diving duties.

If a medical examiner of divers has reason to doubt the medical and physical fitness of a diver, no certificate of medical fitness to dive should be issued. Any diver who fails the annual assessment of fitness to dive should be given appropriate medical advice and, if necessary, referred to a doctor who is recognised as a specialist in diving medicine.

6.9 Diving Medical Physician

A diving medical physician is a doctor who is competent to act as a medical examiner of divers and to manage the treatment of diving accidents and illnesses, including, where appropriate, mixed gas and

saturation diving accidents. In addition, diving medical physicians have a reliable knowledge of the offshore diving industry and commercial diving operations. They are also competent to advise on fitness to dive issues. Such doctors will have undergone specialised training and have demonstrated experience in this field.

The most widely recognised training course for diving medical physicians is the *Level 2D - Medical management of diving accidents and illnesses (Diving Medical Physician)* course. This training course for diving medical physicians has been jointly approved by DMAC/EDTCmed. To be eligible for the Level 2D course, doctors must have already attended and successfully completed the *Level 1- Medical assessment of divers (Medical Examiner of Divers)* course.

The responsibilities of a diving medical physician who has a contract with a diving contractor can vary and hence should be clearly defined in a contractual agreement (see section 15).

6.10 Regulatory Authorities

A number of regulatory authorities in various countries have assumed responsibilities for establishing legal systems/requirements designed to verify the medical and physical fitness of divers at work. For example, in the UK, Norway, Holland, South Africa, Australia, and a number of other countries, it is a legal offence for a person to dive in a commercial diving project without being in possession of a valid certificate of medical fitness to dive issued by a medical examiner recognised by the relevant regulatory authority.

Although, the main responsibility for ensuring that a safe diving project is carried out rests with:

- ◆ The diving contractor in control of the overall project; and
- ◆ The diving supervisor(s) appointed to supervise particular diving operations for the diving contractor.

It is clear that all the persons mentioned in this section have significant roles to play in seeking to ensure the continuing medical and physical fitness of commercial divers.

7 The Medical Fitness of Commercial Divers – Current Situation

7.1 The Compelling Need for Commercial Divers to be Medically Fit

Diving is an activity which places unavoidable physical, physiological and psychological stresses upon participants. When people dive they are exposed to stresses that are unique to the underwater environment, i.e. terrestrial counterparts of the stresses do not exist, or they are ordinarily so minimal that they go unnoticed while a person is on land. When stresses cause harm to an individual, they are labelled pathological.

Many stresses for divers arise from the physical properties of water, including its density, pressure, viscosity and thermal conductivity. In comparison to the terrestrial environment all of these physical properties are greatly increased during immersion:

- ◆ Density – Water density is approximately 775 times greater than air.
- ◆ Pressure – The hydrostatic pressure (weight of the water column) effects of the underwater environment are due to the density of water. Descent through the water column leads to a rapid increase in ambient pressure for divers. A few feet of descent in water is equivalent to many hundreds of feet of descent in the atmosphere.
- ◆ Viscosity – The density of water means that it is also considerably more viscous (thicker) than air, and this greater viscosity causes resistance when moving through water. Water is in fact some 790 times more viscous than air and provides 12 times the resistance to exercise performed on the surface.
- ◆ Thermal conductivity – The specific heat of water is one thousand times greater than that of air. As a result, water conducts heat away from an object about 25 times as rapidly as air. This is why immersion in cold water is so challenging to the body's heat-conserving mechanisms.

The well-known hazards of diving stem from the physical properties of water. There is an ever-present risk of drowning, decompression sickness, barotrauma, and gas toxicity when diving. In comparison to working on the surface, there is also an increased risk of hypothermia and exhaustion when working underwater. The very act of breathing gas at great pressure means that the work capacity of divers is greatly reduced because of the increased work of breathing the dense gas. In addition to fatigue and exhaustion, currents, swells, waves, surges and turbulence may also cause traumatic injuries to divers.

In order to meet the rigours of the underwater environment, it is essential that commercial divers are medically fit people. If they suffer from pre-existing medical disorders, it is likely that the excessive stresses of the underwater environment will bring these to the fore. A diver who suffers from an anxiety disorder is more likely to panic than a healthy diver. A diver who is athletically unfit will be more prone to fatigue and exhaustion than a diver who is physically fit. A diver with coronary artery disease is much more likely to suffer sudden (cardiac) death syndrome while diving than a diver with normal coronary arteries.

Safety during diving projects is largely dependent on the medical, mental, and physical fitness of participating commercial divers. Lack of medical fitness represents a hazard not just for the diver but also for other members of the crew.

7.2 Measures Used by Industry to Assure the Medical Fitness of its Commercial Divers

7.2.1 Annual Assessments of Fitness to Dive

For the reasons set out in section 7.1, the commercial diving industry has always considered the demonstration of 'fitness to dive' as a cornerstone of diving safety. There is complete agreement that the good health of commercial divers must always be assured.

In a number of countries, it is a legal requirement for all divers at work to have a valid certificate of medical fitness to dive issued by a medical examiner of divers. The certificate of medical fitness to dive is a statement of the diver's fitness to perform work underwater and is valid for as long as the doctor certifies, up to a maximum of 12 months. This effectively imposes a legal requirement in such countries for all commercial divers to undergo an annual assessment of fitness to dive carried out by a medical examiner of divers.

IMCA's guidance on medical checks for working divers is contained in [IMCA international code of practice for offshore diving \(IMCA D 014\)](#), section 6.4:

“6.4 Medical Checks

All divers at work must have a valid certificate of medical fitness to dive issued by a suitable doctor. The certificate of medical fitness to dive must be renewed prior to expiring if a diver wishes to continue diving at work. If the examination is carried out during the last 30 days of the validity of the preceding medical then the start date of the new certificate will be the expiry date of the old certificate.

The certificate of medical fitness to dive is a statement of the diver's fitness to perform work under water and is valid for as long as the doctor certifies, up to a maximum of 12 months.

The medical examination looks at the diver's overall fitness for purpose. It includes the main systems of the body – cardiovascular system, respiratory system, central nervous system – and ears, nose and throat, capacity for exercise, vision and dentition.”

IMCA's guidance on the identification of suitable doctors to carry out medical examinations of divers is contained in [IMCA international code of practice for offshore diving \(IMCA D 014\)](#), section 6.2;

“6.2 Suitable Doctors

The physiology of diving and the problems encountered by an ill or injured diver are not subjects which most doctors understand in detail. For this reason it is necessary that any doctor who is involved in any way with examining divers or giving medical advice in relation to divers has sufficient knowledge and experience to do so (Ref. DMAC 17).

Diving contractors need to identify suitable doctors to carry out medical examinations of divers, and doctors who can provide advice on medical management of diving medical emergencies. Some countries have regimes in place for the approval of doctors to carry out medical examinations of divers.

A number of initiatives have seen diving contractors in particular regions mutually recognise doctors for diver medicals. IMCA has published such agreements, on its members' behalf, which are available on the IMCA website. Although IMCA publishes such information, IMCA does not approve or recognise any doctors for diving medicals.

DMAC 29 provides guidance for those who seek international approval for the recognition of courses in diving medicine for physicians. At present this recognition is available for only two specific types of courses that DMAC has selected as needed to provide medical support for working divers. They are for:

- ◆ *Medical assessment of divers (Medical Examiner of Divers);*
- ◆ *Medical management of diving accidents and illnesses (Diving Medicine Physician).*

Diving doctors who provide advice on diving emergencies should, when appropriate, be medically fit to go under pressure in a hyperbaric chamber.”

One of the most commonly used, internationally acknowledged, set of standards and guidelines for the medical examination of divers by a suitable doctor is contained in the UK Health and Safety Executive (UK HSE) document entitled, 'The medical examination and assessment of commercial divers (MAI)'. The MAI document can be found on the HSE website, <http://www.hse.gov.uk/pubns/mai.pdf>.

The HSE states that the standards and guidelines in the MAI:

“... reflect the need to protect the health, safety and welfare of divers at work. They take account of the mental and physical requirements for meeting reasonably foreseeable underwater emergencies and the physiological effects of working in a hyperbaric environment.”

Alternative appropriate standards and guidelines for the medical examination of divers by suitable doctors are available, for example:

- ◆ Australia & New Zealand – *Occupational Diving Operations Part 1: Standard Operational Practice* Australian/New Zealand Standard, AS/NZS 2299: 2007, Appendix M). This document is available from www.standards.org.au and www.standards.co.nz;
- ◆ France – *Prise en charge en santé au travail des travailleurs en conditions hyperbares*. This document is available at this [web address](#);
- ◆ Norway – *IS 1879 Guidelines to Regulations regarding health requirements for persons working on installations in petroleum activities offshore (including health requirements for commercial divers)*. This document is available at this [web address](#);
- ◆ USA – *ADCI Consensus Standards for Commercial Diving and Underwater Operations*; section 2.0 *Diving Personnel Medical and Training Requirements*. This document is available at this [web address](#).

The above list is not exhaustive. The EDTCmed publication entitled, “*Medical Assessment of Working Divers: Fitness to Dive Standards*” also contains very useful guidance on the subject.

7.2.2 Pre and Post Sat Medicals

In addition to the annual assessments of fitness to dive carried out by medical examiners of divers, [IMCA international code of practice for offshore diving](#) (IMCA D 014), section 6.4.2 recommends the following:

“6.4.2 Responsibility of the Supervisor

Before saturation exposure, the supervisor will need to ensure that the divers have had a medical examination within the previous 24 hours. This will confirm, as far as reasonably practicable, their fitness to enter saturation. In addition, on completion of the saturation diving period a post-dive medical may be carried out. The medical examination will be carried out by a nurse or a diver medic. The content of the examination and the format of the written or electronic record will be decided by the diving contractor and will be specified in the contractor’s diving manuals.

Before any dive not involving saturation, the supervisor will need to ask the divers to confirm that they are fit to dive and will record this in the diving records.”

7.3 Effectiveness of the Measures Used by Industry to Assure the Medical Fitness of its Commercial Divers

7.3.1 Annual Assessments of Fitness to Dive

The experience of IMCA members suggests that the diving industry may have placed too much faith in the annual assessment of fitness to dive system as the main means of assuring the initial and continuing medical fitness of its divers. The following specific problems are regularly encountered:

- a) Annual medical examinations of divers are point-in-time assessments. This means that the state of an individual’s medical fitness may change in the period between annual medicals. As described in section 6.1, divers should declare any pre-existing medical conditions, recent operations, or significant medical occurrences (including bends) since their last annual diving medical, but experience has shown that they do not always do so. Divers should also declare any medication/drugs they are taking (prescribed or otherwise). Again, experience has shown that they do not always do so. Section 12 of this guidance provides recommendations for diving contractors on dealing with the concealment of medical issues.
- b) Medical examiners of divers normally do not have access to the medical histories of the divers they assess. In Great Britain, for a diver’s first medical assessment, the HSE does require the completion of a medical questionnaire by the candidate diver and his General Practitioner (GP) (family doctor) to confirm medical history. However, after the initial diving medical assessment, there is no requirement for medical examiners of divers to contact family doctors and access the recent medical history of divers.

The worldwide situation appears to be that medical examiners of divers normally do not have access to the medical histories of the divers they assess. This means that if divers choose not to tell their medical examiners about any medications/drugs they are taking, or

about significant medical occurrences since their last annual diving medicals, the medical examiners of divers will not have access to this pertinent information.

- c) The quality of the annual medical examinations carried out by some medical examiners of divers appears to be dubious. IMCA members report that there are divers in possession of valid certificates of medical fitness to dive, who report for work when it is clear even to a layman that they are overweight and have quite poor levels of physical fitness. Failure to employ clear pass/fail criteria when carrying out medical examinations of divers appears to be evident. This situation suggests that there is either a lack of competence or a tendency for inappropriate leniency amongst some medical examiners of divers.
- d) Divers who fail an annual assessment of fitness to dive carried out by one medical examiner of divers are sometimes known to 'shop around' until they find another (lenient) examiner prepared to issue them with a valid certificate of medical fitness to dive. This practice is known as 'doctor shopping' in the industry. In most parts of the world, there is no way for an employer or for a medical examiner of divers to check to see if a diver has ever failed an annual diving medical examination.

7.3.2 Pre and Post Sat Medicals

Other than the annual diving medical, the only formal medical checks that have been routinely carried out on commercial divers over the years are the pre and post sat medicals. These checks are of questionable value because, prior to the publication of this guidance, there has been no industry agreed content for a pre and post sat medical examination and no agreed format for the written or electronic record. This means that the quality of the pre and post sat medical examinations is likely to have been variable.

It should also be noted that prior to the publication of this guidance, surface divers have not been routinely subject to a medical examination to confirm that they are still medically fit to dive shortly before they are accepted for diving duties offshore, even though the demands of surface diving can be no less rigorous than saturation diving. In addition, surface divers have not been routinely medically examined when their involvement in specific diving projects comes to an end.

7.3.3 Confirmation from Divers that they are Fit to Dive

The diving industry expects and requires divers to:

- ◆ Take reasonable care of their own health and safety and the health and safety of other persons who may be affected by their acts or omissions at work;
- ◆ Co-operate with their employers in the employers' efforts to deliver safe diving projects;
- ◆ Inform their supervisor of any medications they are taking;
- ◆ Do all that they can to ensure that they are medically fit when they report for diving duties, and that they are also physically fit enough to carry out the tasks they may be reasonably expected to undertake while underwater safely, efficiently and without undue fatigue;
- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Declare in writing that they feel they are medically fit and sufficiently physically fit for diving duties;
- ◆ Report any concerns they have over their own fitness to dive to the diving supervisor;
- ◆ Report any concerns they have over the fitness to dive of other divers to the diving supervisor.

The diving industry expects and requires divers not to:

- ◆ Conceal anything which they think may make them unfit to undertake diving duties;

- ◆ Put other persons at risk (e.g. members of the dive team who may be required to perform a rescue) by diving at work when they know of something (including any illness or medical condition) which makes them unfit to dive;
- ◆ Collude in hiding a colleague's illness, or any medical conditions that may make that person unfit to dive.

Even though all divers have been trained to be fully aware of their responsibilities, experience shows that some divers still wilfully conceal medical issues from those in charge of diving operations, and in doing so put themselves and others at serious risk of harm. It is likely that they are willing to commit these workplace violations because from their perspective the perceived benefits outweigh the perceived penalties. The main concern for many divers is the ability to keep on diving and earning their livelihoods (see section 12 for further information and guidance on this subject).

IMCA members have reported numerous examples of undisclosed significant medical conditions amongst some of their divers that have caused severe problems in saturation. These include: diabetes; cardiovascular disease; mental health problems; and alcohol withdrawal. In order to try to control their disorders, the divers concerned had in some cases covertly taken a variety of medications (such as diabetes and cardiac drugs) into saturation and self-administered them under pressure, sometimes with the collusion of other divers in the team. There have been examples of diabetic divers passing out in the water or in the bell. A small number of divers have died from natural causes when diving.

All of this means that the industry cannot rely on all divers to be honest about their medical fitness.

Conclusions

It is clear from the above that the measures currently used by industry to assure the medical fitness of its commercial divers are not fully effective. This guidance recommends that in addition to the measures already in use, diving contractors may wish to take a more proactive role in managing diver medical and physical fitness issues than has been the case in the past. Effective management arrangements capable of providing diving contractors with regular and reliable information about the ongoing fitness to dive of their diving staff are desirable.

While it is certainly important to have measures in place to monitor the medical fitness of all commercial divers, diving contractors may consider it especially important to monitor the medical fitness of older divers closely. This is because the incidence of age-associated diseases (such as atherosclerosis and cardiovascular disease, cancer, arthritis, type 2 diabetes and hypertension) increases with aging.

8 The Medical Fitness of Commercial Divers – Recommendations to Diving Contractors for Assuring the Initial and Continuing Medical Fitness of Commercial Divers

8.1 Annual Medical Examinations of Divers

As noted in Section 7 of this guidance, it may well be inadvisable for diving contractors to place too much faith in the annual diving medical as the main (or perhaps only) means of assuring the initial and continuing medical fitness of the commercial divers they employ.

Having said that, diving contractors should certainly continue to ensure as a minimum that all the divers they employ hold valid certificates of medical fitness to dive, issued by medical examiner of divers recognised as competent to carry out such examinations.

In some countries, it is a legal requirement for all divers at work to have a valid certificate of medical fitness to dive issued by a medical examiner of divers, and in such countries regulatory bodies may approve doctors to carry out annual diving medical examinations. However, there is no international approval scheme for medical examiners of divers.

In the absence of a suitable international approval scheme (although recognising and deferring as required to certain national systems), diving contractors themselves need to identify suitable doctors to undertake medicals of their diving personnel. IMCA has provided its members with guidance on identifying appropriate medical examiners of divers (see information note [IMCA D 20/01](#)).

A number of initiatives have seen diving contractors in particular regions agree to mutually recognise certain doctors for the purpose of carrying out annual medical examinations of divers, and IMCA has publicised such agreements on its members' behalf via a series of information notes. Full details are available at <http://www.imca-int.com/diving-division/diver-medicals.aspx>.

Where it is practicable to do so, diving contractors may wish to instruct their divers to have their annual medicals with particular named medical examiners (in whom the contractors have confidence) rather than leave the selection of medical examiners of divers to the discretion of the employee. Such an arrangement could help decrease the practice of 'doctor shopping', and it could also help to ensure that diving staff undergo consistently high quality annual diving medicals.

8.2 Other Measures

8.2.1 Periodic In-house Medical Checks

As noted previously, annual medical examinations of divers are point-in-time assessments and the state of an individual's medical fitness may change in the period between annual medicals. A question that diving contractors should constantly ask themselves is, "*Are my divers medically fit now?*"

A year is a long time in commercial diving. In view of this, contractors may consider it advisable to set up a regime of additional in-house medical checks for divers to be carried out between their annual diving medicals. Such an arrangement would be likely to enhance a diving contractor's confidence that its divers are actually medically fit whenever they are asked to dive at work.

Diving contractors who choose to develop a regime of in-house medical checks should consider including the following management arrangements in their schemes:

- 1) Require all divers joining the company for the first time to undergo a pre-mobilisation standard medical check. This medical check should be carried out onshore by a competent person nominated by the diving contractor. The medical check form should include a declaration by the diver that the information he has given is true/correct and he knows of no reason why he should not take part in the planned diving operations.
- 2) Require all surface divers embarking for, or arriving at, a company dive site to undergo a standard pre-dive medical check prior to enrolment on the dive list and prior to the commencement of diving duties. Surface divers should only be authorised to begin diving duties following successful completion of the pre-dive standard medical check. The medical

check should be performed by the most medically well-qualified person available (e.g. an offshore medic or a DMT) and will be a competent person nominated by the diving contractor. The standard pre-dive medical check may be done onshore, just before departure for the offshore dive site, or it may be done after arrival at the dive site offshore. The medical check form should include a declaration by the diver that the information he has given is true/correct and he knows of no reason why he should not take part in the planned diving operations.

- 3) Require all surface divers who have been diving on a company diving project to undergo a standard post-dive medical check when they leave the dive site (e.g. to go on leave). The medical check should be performed by the most medically well-qualified person available (e.g. an offshore medic or a DMT) and will be a competent person nominated by the diving contractor. The standard post-dive medical check may be done at the offshore dive site, or it may be done shortly after arrival onshore. The standard post-dive medical check should always be completed before divers begin travelling to their home locations. The medical check form should include a declaration by the diver that the information he has given during the course of the standard post-dive medical check is true/correct.
- 4) Require all saturation divers to undergo a standard pre-sat dive medical check offshore prior to entry into saturation. Saturation divers should only be authorised to enter saturation following successful completion of the pre-sat dive medical check. The medical check should be performed by the most medically well-qualified person available (e.g. an offshore medic or a DMT) and will be a competent person nominated by the diving contractor. The medical check form should include a declaration by the saturation diver that the information he has given is true/correct and he knows of no reason why he should not take part in the planned saturation dive.
- 5) Require all saturation divers to undergo a standard post-sat dive medical check offshore after being brought to surface pressure following the completion of a saturation dive. Saturation divers should only be authorised to leave the dive site following completion of the post-sat dive medical check. The medical check should be performed by the most medically well-qualified person available (e.g. an offshore medic or a DMT) and will be a competent person nominated by the diving contractor. The medical check form should include a declaration by the saturation diver that the information he has given during the course of the standard post-sat dive medical check is true/correct.

The completion of a post-dive medical check form can provide diving contractors with useful medico-legal evidence that divers they have employed were in good health (medically fit) when they completed their diving duties and/or left the company.

An example of a pre-diving medical check form is attached to this document as Appendix 1. An example of a post-diving medical check form is attached to this document as Appendix 2. These documents may be used to undertake and record all of the in-house medical checks outlined in points 1–5 above. Alternatively, diving contractors and their medical advisers may wish to develop their own medical check forms.

Persons who carry out in-house medical checks of divers should perform their duties objectively and fairly. The medical check forms record factual information and provide clear instructions for the person carrying out the medical check to follow. If certain criteria are met the person conducting the check is obliged to consult with the diving supervisor and a company diving medical specialist. It is in the interests of all parties that this is the case.

8.2.2 Recording of Annual Diving Medicals and Relevant Medical Events in Diver Log Books

8.2.2.1 Annual Diving Medicals

In the past, it was normal practice on successful completion of an annual diving medical for a medical examiner of divers to fill in a page in a diver's log book indicating that the diver in question had passed an annual commercial diving medical examination and was considered fit to dive. The date of the medical examination, and the expiry date of the medical certificate's validity would be entered on the log book page, as would the name of the examining physician. The physician would also sign and stamp the record of medical examination in the log book.

Nowadays this practice is less widespread. In some parts of the world, for example the UK, divers are often only issued with a paper certificate containing these details, and no entries are made in the divers' log books.

IMCA considers it important for the link between the annual diving medical and the diver's log book to be retained. Diver log books are routinely closely reviewed by diving contractors and by others onshore and offshore with responsibilities for planning and conducting safe and efficient diving projects.

This guidance recommends that, in addition to issuing any medical certificates required by national legislation and/or regulatory authorities, medical examiners of divers should also be asked, by diving contractors and divers themselves, to fill in Part 2A of the IMCA Professional Diver's Logbook (or the equivalent parts of other types of commercial divers' log books). This is because it is useful for those with responsibilities for checking the medical fitness of divers to be able to cross-check medical certificates presented by divers against corresponding records of medical examinations in diver log books.

In addition, if medical examination records are made in log books, diving contractors and medical examiners of divers themselves will be able to see where, when and by whom previous annual diving medicals were conducted, together with any comments that may have been made by previous examining physicians.

Important Note: medical examiners of divers should revoke/cancel the latest medicals of divers in their log books when they are found unfit to dive.

8.2.2.2 Relevant Medical Events

It is useful to record medical issues that arise during divers' careers in their log books. Persons managing diving projects and those who are responsible for checking the medical fitness of divers should always consult records of relevant medical events documented in diver log books before the commencement of diving projects.

This guidance recommends that when noteworthy medical events affecting divers arise, such occurrences should be recorded in Part 7 of the IMCA Professional Diver's Logbook (or the equivalent parts of other types of commercial divers' log books). For example, the occurrence of decompression illness (DCI) episodes, traumatic injuries (including barotraumas), any significant illnesses, episodes of unconsciousness, skin infections, ear infections and other noteworthy medical events should all be captured in the diver's log book. There is no need for detailed or overly sensitive entries to be made. A simple statement identifying the type of medical event and the date it occurred is really all that is necessary. It may also be appropriate to record events such as contaminated gas incidents, chemical exposures etc.

At present noteworthy medical events affecting individual divers are very seldom entered into diver log books. Some divers actually avoid recording medical events in their log books because they worry that such records may have a detrimental effect on their employability. In truth, it is actually in everyone's interests to record the occurrence of relevant medical issues. Only medically fit people should dive at work.

The present widespread failure to record relevant medical events in log books is not good practice. Diving contractors are advised to include requirements in their company procedures for diving superintendents, diving supervisors, LSSs, DMTs, vessel/installation medics, medical examiners of divers, diving medical physicians and divers themselves to ensure that relevant medical events are always recorded in divers' log books when they occur.

There should be a history of at least two years available for diving contractors and medical examiners to review in diver log books. It is recommended that when requested to do so, divers should provide diving contractors with access to their current (unfinished) log book and their last finished log book as a minimum. When attending annual commercial diving medical examinations, the current and last

finished log books should be presented to the medical examiner of divers so that he/she will be able to review the information recorded in Part 7 and also ascertain the identity of the previous examining physician.

8.2.3 Improving Contact Between Medical Examiners of Divers and Family Doctors

It may be possible for the health of commercial divers to be monitored more effectively if more frequent contact between medical examiners of divers and the family doctors of divers can be achieved (see Section [12 Dealing with Failure to Report Pre-Existing Medical Issues](#) for more details).

9 The Physical Fitness of Divers to Dive and Work Underwater – Current Situation

9.1 The Compelling Need for Commercial Divers to be Physically Fit

For the reasons already noted in Section 7.1 of this guidance, diving is an activity which places unavoidable physical, physiological and psychological stresses upon participants. In order to meet the rigours of the underwater environment it is essential that persons wishing to work as commercial divers should not only be medically fit but also possess a high degree of physical fitness. A diver who is unfit will be more prone to fatigue and exhaustion than a diver who is physically fit.

A lack of physical fitness in divers has been identified as a significant contributory factor in a number of diving incidents. Lack of physical fitness may not only affect the safety of the diver himself; it may also have a serious impact on the safety of his colleagues, e.g. when an unfit person acting as a standby diver is required to perform a diver rescue. Safety during diving projects is largely dependent on the medical, mental, and physical fitness of participating commercial divers.

The following extracts from a well-known diving medical textbook¹ underline the importance of a good level of physical fitness for safe and successful diving:

“[Divers should be] psychologically stable, medically and physically fit individuals ... [They] should not be overtly worried by diving hazards, and [have] the desire and ability to perform in the water environment.

[They should be] free of medical disorders. Physical fitness, and especially aquatic fitness, are considered important characteristics for successful diving.

[For divers] physical attributes such as stamina, athletic fitness and an affinity for strenuous effort [are] important ...

Fatigue is a common contributor to diving deaths (28%) and accidents, either due to personal, equipment or environmental problems which impose excessive demands on physical effort and result in exhaustion ...

Adequate physical fitness is essential in diving activities, which invariably, sooner or later, impose considerable physical demands ... Age is associated with a reduction in physical fitness ...

[Diving equipment is bulky and causes] excessive drag when swimming, regulators limit respiration, and protective suits limit movement. Greater swimming effort is required to overcome negative buoyancy (making mid-water work particularly demanding). Even experienced divers without assistance, supporting a 5 kg negative buoyancy (weights held above the water), can only remain on the surface for less than 10 minutes, before submerging ...”

... tidal currents in excess of 1 knot are beyond the capability of many divers for more than a few minutes. Cold exposure and hypothermia will aggravate fatigue.”

In addition to the above, it should be noted that there is now conclusive evidence that physical inactivity/poor physical fitness is an important cause of many chronic diseases. On the other hand, physical activity and high levels of physical fitness can help to prevent or delay the onset and progression of some chronic diseases.

In view of the observations above, it would appear to be highly advisable for diving contractors and their company diving medical specialists to do all that they can to:

- 1) monitor the physical fitness levels of their commercial divers; and
- 2) promote a culture among their dive teams which values and positively encourages high levels of physical fitness.

9.2 Measures Used by Industry to Assure the Physical Fitness of Commercial Divers

9.2.1 Annual Assessments of Fitness to Dive

For the reasons set out in section 7.1 and 9.1 the commercial diving industry has always considered the demonstration of ‘fitness to dive’ as a cornerstone of diving safety. There is

¹ *Diving and Subaquatic Medicine*; Third Edition; Edmonds, Lowry and Pennefather

complete agreement that the medical fitness and physical fitness of commercial divers must always be assured.

The most commonly used internationally acknowledged sets of standards and guidelines for the medical examination of divers require those physicians conducting annual diving medicals to gather information that can be used to assess an individual's physical fitness and help predict future health risks. This can include:

- ◆ The measurement of waist circumference and/or calculation of body mass index (BMI) to help determine those most likely to be overweight or obese;
- ◆ Lung function testing (spirometry) to help determine respiratory fitness;
- ◆ The measurement of blood pressure to help determine the condition of the cardiovascular system; and
- ◆ Exercise testing to help determine aerobic capacity and cardiorespiratory fitness.

9.2.2 Pre and Post Sat Medicals

Pre and post sat medicals only gather limited information. For example, spirometry and exercise testing are not normally part of pre and post sat medical checks. This means that pre and post sat medicals cannot be used to monitor physical fitness levels in saturation divers.

9.3 Effectiveness of the Measures Used by Industry to Assure the Physical Fitness of Commercial Divers

9.3.1 Annual Assessments of Fitness to Dive

The experience of IMCA members suggests that the diving industry may have placed too much faith in the annual assessment of fitness to dive system as the main means of assuring the physical fitness of commercial divers. The following specific problems are regularly encountered:

- a) Annual medical examinations of divers are point-in-time assessments. This means that the state of an individual's physical fitness may change in the period between annual medicals. Some divers are known to make a concerted training effort in the immediate period leading up to their annual medical examinations. However, once they obtain a valid medical certificate, these divers often let their physical fitness levels decline markedly for another eleven months or so, before repeating the cycle once again.
- b) As described in section 6.1, divers should declare any pre-existing medical conditions, recent operations, or significant medical occurrences since their last annual diving medical that could have an adverse effect on their physical fitness. Experience has shown that they do not always do so. Divers should also declare any medication/drugs they are taking (prescribed or otherwise). Again, experience has shown that they do not always do so. Section 12 of this guidance provides recommendations for diving contractors on dealing with the concealment of medical issues.
- c) The quality of the annual medical examinations carried out by some medical examiners of divers appears to be dubious. IMCA members report that there are divers in possession of valid certificates of medical fitness to dive who report for work when it is clear even to a layman that they are overweight and have quite poor levels of physical fitness. Failure to apply pass/fail criteria adequately when assessing physical fitness during medical examinations of divers appears to be evident. This situation suggests that there is either a lack of competence or a tendency for inappropriate leniency amongst some medical examiners of divers.
- d) Divers who fail an annual assessment of fitness to dive carried out by one medical examiner of divers are sometimes known to 'shop around' until they find another (lenient) examiner prepared to issue them with a valid certificate of medical fitness to dive ('doctor shopping'). In most parts of the world there is no way for an employer or for a medical examiner of divers to check to see if a diver has ever failed an annual diving medical examination for any reason (including a lack of adequate physical fitness).

Conclusions

It is clear from the above that reliance on the annual diving medical as the sole means of assuring a continuing appropriate level of physical fitness among commercial divers is not a fully effective strategy.

This guidance recommends that in addition to the annual medical, diving contractors may wish to take a more proactive role in managing diver physical fitness issues than has been the case in the past. Effective management arrangements capable of providing diving contractors with regular and reliable information about the ongoing physical fitness levels of their diving staff are desirable.

While it is certainly important to have measures in place to monitor the physical fitness of all commercial divers, diving contractors may consider it especially important to monitor the physical fitness levels of older divers closely. This is because age is associated with a reduction in physical fitness and an increased risk of aging-associated diseases. Maintaining the necessary fitness level for commercial diving work becomes more difficult with increasing age.

10 The Physical Fitness of Divers to Dive and to Work Underwater – Recommendations to Diving Contractors for Assuring the Physical Fitness of Divers to Dive and to Work Underwater

10.1 Annual Medical Examinations of Divers

As noted in Section 9 of this guidance, it may well be inadvisable for diving contractors to place too much faith in the annual assessment of fitness to dive system as the main means of assuring an appropriate level of physical fitness in their divers.

Where it is practicable to do so, diving contractors may wish to instruct their divers to have their annual medicals with particular named medical examiners (in whom the contractors have confidence) rather than leave the selection of medical examiners of divers to the discretion of the employee. Such an arrangement could help decrease the practice of ‘doctor shopping’ and it could also help to ensure that diving staff undergo consistently high quality annual diving medicals where suitable assessments of physical fitness levels are consistently made.

10.2 Other Measures

10.2.1 Diving Contractor Physical Fitness Assessment Schemes

As noted previously, annual medical examinations of divers are point-in-time assessments and the level of an individual’s physical fitness may change in the period between annual medicals. A question that diving contractors should constantly ask themselves is, “*Do my divers have an appropriate level of physical fitness now?*”

A year is a long time in commercial diving. In order to assure a high level of physical fitness in their commercial divers, diving contractors may consider it advisable to set up a company Physical Fitness Assessment Scheme for their divers. Any such scheme would need to include a requirement for company divers to undergo one or more additional exercise test between their annual diving medicals. Such an arrangement would be likely to enhance a diving contractor’s confidence that its company divers actually possess an appropriate level of physical fitness whenever they are asked to dive at work.

Diving contractors who choose to develop a Physical Fitness Assessment Scheme for their divers should consider including the following management arrangements in their schemes:

- 1) Establish an arrangement with a competent medical adviser to whom referrals can be made should any of the results from the assessment programme raise doubts about physical fitness.
- 2) Make it a contractual condition of service that persons employed as divers must agree to undergo periodic physical fitness testing as specified by the diving contractor and allow the diving contractor access to the results of any such tests.
- 3) Specify appropriate limits with clear pass/fail criteria for BMI and waist size.
- 4) Specify appropriate limits with clear pass/fail criteria for aerobic capacity e.g. maximal oxygen uptake (VO₂ max) measurements.
- 5) Ensure that diving contractor arranged exercise testing of divers is carried out on a six-monthly basis.
- 6) Ensure a standard methodology is used for exercise testing. Make sure the exercise test method selected is capable of providing a VO₂ max figure with an associated measurement error of not more than 15%. One such standardised methodology is the Chester Step Test (CST) – see UK HSE MAI form.
- 7) Where practicable use an approved provider company to conduct and record the exercise tests.
- 8) Ensure the exercise testing methodology includes a traffic light system so that more frequent physical fitness testing can be set up for those who record results in the ‘amber zone’.
- 9) Make it company policy that where a diver does not meet the VO₂ max level, or other relevant parameters required by the diving contractor, the diver in question will be

referred to a company diving medical physician for further investigations and specialist advice.

- 10) Make it clear to the divers that, subject to specialist medical advice, the company reserves the right not to employ people as divers if they fail to meet the standards of physical fitness set by the company.

Note: Other aspects that could be assessed as part of a diving contractor's Physical Fitness Assessment Scheme might include: power; strength; balance; co-ordination and flexibility.

10.2.2 Aerobic Capacity Testing

10.2.2.1 Identifying a Suitable Aerobic Capacity Limit for Commercial Divers

Cardiovascular fitness is important because without adequate cardiovascular fitness other aspects of an individual's overall physical fitness are unlikely to perform sufficiently.

VO₂ max is widely accepted as the single best measure of cardiovascular fitness and maximal aerobic capacity. VO₂ max is the maximum rate of oxygen consumption as measured during incremental exercise. Maximal oxygen consumption reflects the aerobic physical fitness of the individual and is an important determinant of endurance capacity during prolonged, sub-maximal exercise.

VO₂ max is expressed either as an absolute rate in (for example) litres of oxygen per minute (l/min) or as a relative rate in (for example) millilitres of oxygen per kilogram of body mass per minute (ml/kg/min). The latter expression is most often used in connection with the physical fitness testing of commercial divers.

The identification of a suitable VO₂ max level for commercial divers to achieve during exercise testing is a matter that has provoked considerable debate. The difficulties begin when one tries to take age and experience into account. The ability to undertake physical work declines markedly between the ages of 18 and 65, and the ability to maintain a high level of physical fitness becomes more difficult. Any diver may need to call upon all his reserves of effort in a life-threatening emergency. The required duration for that effort is unpredictable.

This makes it difficult to specify a required VO₂ max level. Functional goals should be independent of age and gender and would need to allow for the fact that the experience of older divers may make them more effective than younger divers. Meanwhile, diving contractors need assurance that their divers are sufficiently physically fit to carry out their work underwater effectively and cope with the demands of reasonably foreseeable emergency situations that might arise during the diving operations.

The UK HSE MAI document specifies that:

"133. Working divers should be able to achieve a minimum VO₂ max of 45 ml/kg/min ... This is equivalent to an energy expenditure of 13 METS (metabolic equivalent of task). As a comparison, the recommended aerobic capacity standard for UK firefighters, who undertake work that can be physically demanding and requires periods of sustained effort in arduous conditions, is 42 ml/kg/min."

Regulatory authorities in other countries specify different minimum VO₂ max levels for commercial divers. Internationally, there is no single accepted figure and many countries do not specify a minimum VO₂ max for divers to achieve during exercise testing at all.

This guidance recommends that working divers should be able to achieve a minimum VO₂ max of 40 ml/kg/min. Divers who cannot achieve a minimum VO₂ max of 40 ml/kg/min should be referred to a company diving medical physician for further investigations and specialist advice.

Note that where local or national laws are more stringent, they will always take precedence over this guidance, and must be followed.

10.2.3 Accuracy of Aerobic Capacity Measurements

Accurately measuring VO_2 max involves a physical effort sufficient in duration and intensity to fully tax the aerobic energy system. In general, clinical and athletic testing, this usually involves a graded exercise test (either on a treadmill or on a cycle ergometer) in which exercise intensity is progressively increased while measuring ventilation and the oxygen and carbon dioxide concentration of the subject's inhaled and exhaled air. VO_2 max is reached when oxygen consumption remains at a steady state despite an increase in workload.

The use of a modern metabolic cart during a graded exercise test provides a very accurate direct method of measuring an individual's VO_2 max (2% confidence). However, exercise testing of this nature involves access to expensive equipment and expert personnel. Such methods are generally judged to be too complex and costly to be considered as a routine. For most diving contractors, direct methods of measuring VO_2 max are not a reasonably practicable option.



Figure 1: Direct VO_2 max measurement through a modern metabolic cart during a graded exercise test on a treadmill aboard DSV Deep Arctic

Fortunately, indirect methods of estimating an individual's VO_2 max are available. While they are not as accurate as direct exercise testing protocols, such as the method shown in Figure 1, indirect exercise-testing protocols are used successfully by many organisations (e.g. the military, police and fire services) for routine monitoring of staff physical fitness levels. Indeed, the UK HSE MAI document specifies that one such indirect exercise testing protocol, the CST, should be used by HSE Approved Medical Examiners of Divers (AMEDs) to estimate VO_2 max during annual diving medicals.

The following extract from UK HSE MAI document is instructive:

“Testing

131. At each initial and annual medical, AMEDs should perform a Chester Step Test (CST) to estimate the maximal oxygen uptake (VO_2 max). This is a measure of aerobic capacity and cardiorespiratory fitness. Other methods for evaluating VO_2 max are available, each with its limitations. The CST has several advantages. It requires minimal equipment, is inexpensive, is relatively easy to perform and standardise, and requires little skill from the participant.

132. The measurement error associated with the CST is around 12–15% but accuracy of the results can be improved by careful standardisation of pre-test conditions and test procedures. Therefore, it is important AMEDs adopt a standardised approach when following the appropriate protocol for

performing the test and estimating VO₂ max. When properly conducted, the CST is reliable on a test-retest basis, reasonably valid for estimating aerobic capacity and suited to monitoring changes ...”

While recognising that other methods for evaluating VO₂ max are available and may be used, this guidance recommends the CST as an exercise test protocol for use as part of a company Physical Fitness Assessment Scheme for divers. This is because the CST:

- ◆ Is a standard exercise test method capable of providing a VO₂ max figure with an associated measurement error of not more than 15%;
- ◆ Is a submaximal exercise test;
- ◆ Requires minimal equipment;
- ◆ Is inexpensive;
- ◆ Is relatively easy to perform and standardise; and
- ◆ Requires minimal training for the person who will conduct the test.

The CST was developed by the University of Chester in the UK. All resources including manuals, steps, software and complete test kits are available from the official supplier at <http://www.cartwrightfitness.co.uk/chester-fitness-tests/>.

10.2.4 Exercise Testing Safety Considerations

The following extracts from UK HSE MAI document should be noted:

“Safety

129. Before proceeding to an exercise test, the AMED should conduct an assessment of the risk and suitability of undertaking the test. This should take account of the diver’s medical history, examination findings, investigation results, general fitness and the presence of any cardiac risk factors. Appendix 2 contains a cardiac screening tool that the AMED can use.

130. Those undertaking exercise testing of divers should have up to date training in basic life support and resuscitation skills following the standards of the Resuscitation Council (UK). Resuscitation equipment (e.g. an automated external defibrillator (AED)) should be provided, depending on the findings of the risk assessment. There should be a clear procedure to follow in the event of a collapse. AMEDs should consider the approach in the Resuscitation Council (UK) document Quality standards for cardiopulmonary resuscitation and training ...

A maximal exercise test requiring the subject to exercise to the point of exhaustion should only be undertaken after a careful and detailed assessment of the risk and suitability of performing the test (see paragraphs 129–130). In addition, the individual may require close monitoring while undertaking the test.”

This guidance recommends that maximal effort exercise tests are not conducted as part of a company Physical Fitness Assessment Scheme for divers without the presence of competent medical personnel.

Diving contractors who are considering setting up a company Physical Fitness Assessment Scheme should discuss with their medical advisers which protocol would be most appropriate for their particular divers and operations. Those wishing to set up a company Physical Fitness Assessment Scheme for divers should always do so with the advice and assistance of their company medical advisers.

10.2.5 Exercise Testing by Third Parties

Diving contractors who develop Physical Fitness Assessment Schemes for their divers may choose not to carry out the necessary exercise test protocols themselves. Arrangements can be made for the divers to ensure that they undergo appropriate periodic exercise tests that are carried out by third-parties, e.g. suitably qualified staff at clinics, health clubs or gymnasias. It is perfectly acceptable for divers to have ownership of their own exercise testing.

In such circumstances, when asked, a diver should be able to produce a suitable fitness certificate provided by an exercise testing organisation recording that he has achieved a minimum VO_2 max of 40 ml/kg/min within the period specified in the diving contractor's Physical Fitness Assessment Scheme, e.g. within the last six months. The diving contractor will need to put arrangements in place to verify the validity of any such certificates.

II Diver Nutrition and Hydration

II.1 Nutritional Recommendations

Diving in any mode can be strenuous and it is obvious that energy and fluids intake (food and drink) must be of sufficient quantity and quality to meet the demands of the work and the well-being of the diver. Surface-supplied divers generally have less restricted access to a free choice of food than saturation divers and are not faced with challenges of the saturation environment and the conditions inherent in it. It is especially important therefore that divers living in saturation remain adequately nourished. Dietary requirements will be different during the bottom phase and the decompression phase. For instance, during bottom phase, where the diver may perform physically demanding work, nutritional demand prior to a dive and during the dive will be different from the post-dive main meal as working on a full stomach is not going to be comfortable or even advisable. During the decompression phase, where physical activity is low, meals will be lighter and potentially more frequent due to inactivity and the monotony of the day. Hence, it is important that the meals are nutritious, presentable and healthy and are appropriate for the divers' required energy levels.

The diving contractor should liaise with the catering crew to the extent practicable to establish a system for provision of adequate nutrition, including adequate fluids combining culinary creativity with current knowledge about requirements for nutrients, divers' preferences and irregular eating patterns within their shift rotations.

Research into divers' nutritional requirements has been performed and detailed information on recommendations for food composition and quantities can be found in Deb et al and Ikeda et al (references 7 and 8). Energy demand is individual and subjective. Feelings of fatigue, energy and hunger must be taken into consideration. During the bottom phase, the energy requirements may be high due to strenuous work and thermo-physiological factors. The aim for energy intake may be as high as 44 to 53 kcal/kg body mass per day, depending on duration and intensity of the work performed and individual factors. Energy requirements are lower during the decompression phase of the dive.

Most micronutrients (vitamins and minerals) are covered by a normal, varied diet in accordance with general recommendations with respect to meat, fish, fruit, vegetables etc. However, diving contractors may wish to consult their medical advisers on the possible advantages of providing supplements containing:

- ◆ Vitamin D (to counteract the effects of lack of sunlight);
- ◆ Vitamins C, E and Catechins (anti-oxidants);
- ◆ Vitamin B12 and Folate (counteracts effects of reduced red blood cell production).

II.2 Hydration and Electrolytes

The increased ambient pressure experienced during saturation, immersion in water and exposure to a cold environment will all increase diuresis (fluid loss through urine). Also, fluid loss during lock-out is increased due to excessive sweating (hard physical labour and use of hot water suits) and through respiration due to dry breathing gas. A minimum of 2 L/day of fluid is recommended to compensate for fluid loss, but the actual need may be higher depending on activities and individual factors.

Prior to lock-out, the diver should be well hydrated, with the consumption of easy digestible food and fluids (preferably containing sodium to facilitate fluid retention). In the break between lock-outs, water or an isotonic electrolyte drink is recommended. Post lock-out, it is advantageous to continue hydration to ensure best possible restoration for the next 12-24 hours. Coffee and tea should be avoided prior to and during dives as this may increase the fluid loss.

II.3 Summary

The contractor should, based on the recommendations above, identify various foodstuffs and dishes suitable for meeting the varying nutritional needs of divers in saturation. Some suggestions for a full day's menu containing a variety of nutritious dishes are shown below:

| Meal | Bottom phase | Decompression phase | |
|----------------|--------------|---------------------|---|
| Breakfast | ✓ | ✓ | Normal |
| Pre-dive snack | ✓ | | Light, energy dense food with slow energy release to body. Carbohydrate level between 16g/h – 60g/h based on work intensity. Wrap, soup, sandwich. Drinks containing sodium. |
| Bellfood | ✓ | | |
| Lunch | | ✓ | Normal |
| Hot Main meal | ✓ | ✓ | Bottom phase: A meal rich in moderate to high glycaemic index carbohydrates, along with dietary fats, are recommended post lockout to facilitate recovery between bell runs. |
| Supper | ✓ | ✓ | Alternative for suppressed appetite during bottom phase ; availability of a liquid based energy dense meal may be a suitable alternative (hot or cold). |
| Snacks | ✓ | ✓ | Smoothies, fresh fruit, veggies, berries, energy bars, wrap, soup, sandwich. Energy drinks available. |

Hydration during the bottom phase should be given particular emphasis.

Most divers look after themselves with regards to what they eat and drink both in and out of saturation. The use of nutritional additives, sports drinks or other leisure/lifestyle substances should not replace the intake of company provided food and drink. Any use of these substances should be declared and approved by the contractor management (see Section 13.2).

Likewise, it is vital that divers who are performing athletes in their spare time do not use the saturation period as a period for dieting. Dieting in saturation can be hazardous. Fatigue is an obvious hazard for the dieting diver as he may not maintain the correct intake of nutrients or remain properly hydrated. NB: the use of anabolic-androgenic steroids (AAS) by divers is not to be permitted in any circumstances (see Section 13.2).

Due to the provision of frequent high carbohydrate and energy rich food and drinks, it is vital that divers practice good dental hygiene after the main meals (breakfast, main meal and last snack) in order to prevent caries and other dental issues from arising.

12 Dealing with Failure to Report Pre-Existing Medical Issues

12.1 The Duties of Divers

Sections 6.1 and 7.3.3 of this document set out the industry requirements and standards of conduct that commercial divers are required to meet insofar as fitness to dive issues are concerned.

In particular, Section 7.3.3 noted that the diving industry expects and requires divers to:

- ◆ Take reasonable care of their own health and safety and the health and safety of other persons who may be affected by their acts or omissions at work;
- ◆ Co-operate with their employers in the employers' efforts to deliver safe diving projects;
- ◆ Inform their supervisor of any medications they are taking;
- ◆ Do all that they can to ensure that they are medically fit when they report for diving duties, and that they are also physically fit enough to carry out the tasks they may be reasonably expected to undertake while underwater safely, efficiently and without undue fatigue;
- ◆ Have a valid certificate of medical fitness to dive issued by a competent medical examiner of divers;
- ◆ Have undergone any pre-dive medical checks specified by the diving contractor in its own procedures;
- ◆ Declare in writing that they feel they are medically fit and sufficiently physically fit for diving duties;
- ◆ Report any concerns they have over their own fitness to dive to the diving supervisor;
- ◆ Report any concerns they have over the fitness to dive of other divers to the diving supervisor.

Section 7.3.3 also noted that the diving industry expects and requires divers not to:

- ◆ Conceal anything which they think may make them unfit to undertake diving duties;
- ◆ Put other persons at risk (e.g. members of the dive team who may be required to perform a rescue) by diving at work when they know of something (including any illness or medical condition) which makes them unfit to dive;
- ◆ Collude in hiding a colleague's illness, or any medical conditions that may make that person unfit to dive.

The following extract from Section 6.4 of [IMCA international code of practice for offshore diving \(IMCA D 014\)](#) also provides advice on the responsibilities of divers and diving supervisors insofar as fitness to dive issues are concerned:

“6.4.1 Responsibility of the Diver

Divers who consider themselves unfit for any reason, e.g. fatigue, minor injury, recent medical treatment, lack of physical and/or mental fitness, etc., will need to inform their supervisor.

Even a minor illness, such as the common cold or a dental problem, can have serious effects on a diver under pressure and should be reported to the supervisor before the start of a dive.

Divers will also need to advise the supervisor if they are taking any medication.

Supervisors should seek guidance from their company or its medical adviser if there is doubt about a diver's fitness.

Only divers themselves know their own immediate health status at a given time and they have the responsibility for ensuring their fitness before making a dive. Divers who have suffered an incident of decompression illness will need to record details of the treatment they received in their logbooks. They will need to show this to the supervisor responsible for the first dive after the treatment in order that a check can be made of their fitness to return to diving (Ref. DMAC 13).”

“6.4.2 Responsibility of the Supervisor

Before saturation exposure, the supervisor will need to ensure that the divers have had a medical examination within the previous 24 hours. This will confirm, as far as reasonably practicable, their fitness to enter saturation. In addition, on completion of the saturation diving period a post-dive medical may be carried out. The medical examination will be carried out by a nurse or a diver medic. The content of the examination and the format of the written or electronic record will be decided by the diving contractor and will be specified in the contractor’s diving manuals.

Before any dive not involving saturation, the supervisor will need to ask the divers to confirm that they are fit to dive and will record this in the diving records.”

12.2 Understanding Why Divers Fail to Declare Medical Issues

All divers and diving project team members know they have a duty to disclose matters that can potentially adversely affect the health and safety of the dive team. However, even though divers understand they have a duty of care to themselves and to others, experience shows that some divers will still wilfully conceal known issues of medical fitness that they have developed from others who have a need and right to know. These may include dive team colleagues, diving doctors and those in control of the diving operations. By concealing significant medical issues divers know they may put themselves and others at risk of serious harm, and yet some of them still do it.

It is also concerning that dive team members sometimes collude in hiding medical illnesses or conditions in colleagues that may make them unfit to dive. Presumably this is done out of a misplaced sense of loyalty.

Violations in the workplace are intentional failures to follow health and safety rules; ‘deliberately doing the wrong thing.’ The violation of health and safety rules or procedures is one of the biggest causes of accidents and injuries at work. It is likely that divers who wilfully conceal medical issues usually do so not because they do not care about the consequences, but because they feel they have no other choice. They are willing to commit these workplace violations because, from their perspective, the perceived benefits outweigh the perceived penalties. The overriding concern for many divers is the ability to keep on diving and earning their livelihoods. They are afraid they will become unemployable if they disclose their medical problems to their employers and employers’ representatives.

It is this fear of losing their livelihoods that leads some divers to take unacceptable risks with their own safety and the safety of others. IMCA members have reported numerous examples of undisclosed significant medical conditions amongst their divers that only came to light during offshore operations. Examples include: recent injuries or surgery; diabetes; cardiovascular disease; mental health problems; allergies; alcohol withdrawal effects etc. Such undisclosed ailments or conditions have directly caused divers to suffer serious illnesses, injuries and in some cases death. Very serious incidents continue to occur. The following are just a few anonymised examples of actual incidents:

- 1) A saturation diver developed type 2 diabetes and did not tell his medical examiner of divers or anyone else for more than three years. He smuggled his drugs into saturation disguised as multivitamins. During a lock-out he lost consciousness at a depth of around 80m and had to be rescued by a colleague.
- 2) A diver who was on a significant antipsychotic medication (and had also been smuggling his medication into saturation) experienced a psychotic episode that started in the water and got worse when he returned to the chamber. The whole diving project had to be aborted, and the ship had to return to port to access the necessary support.
- 3) A surface supplied diver had a seizure – luckily whilst working topside prior to diving. He was sent ashore and a brain scan showed that he had previously undergone surgery following a head injury. The scan also revealed that he had suffered brain damage from that traumatic injury. The diver admitted that he had suffered fits before, but not told any medical examiner of divers or his colleagues about this part of his medical history.
- 4) During a night dive, a diver experienced terrifying visual hallucinations while in the water and had to be assisted to surface by the standby diver. When on surface he experienced auditory hallucinations for a period of several days. The hallucinations were caused by alcohol withdrawal.

- 5) A diver suffered a fatal heart attack while in the water. It was subsequently discovered that, unbeknown to the diving contractor, the deceased diver had been covertly taking cardiac drugs for a previously diagnosed cardiac condition.

12.3 The Need to Do the Right Thing

For their own good, divers and diving project team members must disclose matters that can affect the health and safety of the team. They should never collude in hiding a colleague's illness, or any medical conditions that may make that person unfit to dive, out of a misplaced sense of loyalty or for any other reason. They must always report any concerns they have over their own medical, physical, emotional, or mental well-being, or that of the other divers, to the diving supervisor. It is in the best interests of everyone involved with the diving project, including medically or physically unfit divers, to do so. The chances of surviving a serious medical event, such as a heart attack, while actually in the water are very low indeed (virtually nil).

By failing to disclose medical and physical fitness issues divers can:

- ◆ Seriously endanger their own health and well-being;
- ◆ Seriously endanger the health and well-being of other members of the dive team; and
- ◆ Impose substantial costs on their employers should they fall ill or die from a pre-existing medical condition while at work.

Divers who conceal medical conditions from those in control of diving operations should be aware that they are not only putting themselves and others at risk, they also may be committing a crime in many countries. Furthermore, the wilful concealment of medical conditions may invalidate personal and company insurance cover.

12.4 Recommendations to Diving Contractors for Dealing with Failure to Report Pre-Existing Medical Issues

Should a diver suffer serious illness or die in the water or in a saturation complex it is likely that:

- ◆ The diving project will be halted;
- ◆ The vessel will be recalled to port;
- ◆ Saturation teams will be decompressed;
- ◆ The job will be delayed;
- ◆ There will be a police/regulatory authority investigation;
- ◆ There will be an internal investigation;
- ◆ Equipment will be taken away for testing;
- ◆ A post mortem will be undertaken;
- ◆ There will be an inquest and/or civil court proceedings.

The financial costs for diving contractors involved in such incidents have been known to reach totals that are in the millions of dollars (US).

In order to deal effectively with the issue of failure to report pre-existing medical issues, diving contractors may wish to put in place management arrangements designed to ensure that all divers:

- ◆ Have the choice, if necessary, to give consent for the company diving physician(s) to access relevant medical records held by their GP/family doctors and medical examiners of divers;
- ◆ At an agreed periodicity return a completed form very similar to the "*Diver Fact Sheet and Medical Questionnaire*" made available by the HSE (see Appendix 3) that has been validated by their GP/family doctors;
- ◆ Agree to provide all pages of their current annual diving medical examination forms to the diving contractor's diving medical specialists (not just the page stating they are considered fit to dive);

- ◆ Sign declarations on pre and post-dive medical check forms that they do not know of anything (including any illness or medical condition) which may call into question their fitness to dive (see Appendix 1 and Appendix 2);
- ◆ Sign declarations on pre and post-dive medical check forms that all/any drugs they may be taking have been declared to the vessel/installation medic and to those in control of diving operations (see Appendix 1 and Appendix 2);
- ◆ Confirm to the supervisor that they are fit to dive so that the supervisor can record this in the contractor's diving operations log sheets;
- ◆ Give consent for their personal belongings to be subject to random searches;
- ◆ Agree to participate in random drug and alcohol (D&A) tests if required by the employer.

The diving contractors' documentation should make it clear that the wilful concealment of medical issues from those in control of diving operations is a dismissible offence.

12.5 Search Programmes and Drugs and Alcohol Testing Programmes

If diving contractors decide to introduce random searches of personal belongings (including bag searches) and/or drugs and alcohol testing programmes, it may be prudent for them to employ a third-party company capable of operating the appropriate protocols. Such protocols will need to be included in the terms of engagement for employees and they should provide for local legal requirements, confidentiality, independence, privacy and the dignity of those involved.

12.5.1 Search Programmes

Search programmes may enable the discovery of undisclosed medications or other substances used by divers.

Diving contractors may wish to consider introducing bag searches or other means (such as the supervised transfer of personal belongings into company supplied bags) in order to control what goes into saturation compression chambers.

It is important for diving contractors who decide to introduce random searches of personal belongings to reassure their staff that divers are not being singled out. Search programmes are used in many industries and there are numerous examples of situations in the offshore industry where bag search protocols are used for safety and security reasons, e.g. at heliports.

12.5.2 Drugs and Alcohol Testing Programmes

It is self-evident that an individual under the influence of drugs or alcohol can present a severe risk to himself, his workmates and the assets on which he is working. Annual diving medicals do not normally include testing for alcohol or drug abuse. Therefore, contractors may wish to consider the introduction of a formal 'Drugs and Alcohol Policy' and means to monitor and implement such a policy.

A contractor's drugs and alcohol policy could include:

- ◆ Definitions of which company locations and worksites are covered by the policy;
- ◆ Defined maximum limits of alcohol measured in an individual's urine, breath or blood;
- ◆ A description of the equipment to be used to test for alcohol or drugs;
- ◆ Information and instructions on the operation and calibration of such equipment;
- ◆ Notes on the independence of the individual or organisation conducting the testing;
- ◆ Frequency of testing, possible random testing and testing 'with cause' protocols;
- ◆ Inclusion of the drug and alcohol policy in employees' terms of engagement;
- ◆ Requirements for employees to declare any prescribed and proprietary medications;

- ◆ Policies and procedures for seeking advice from onshore experts on the acceptability or otherwise of prescribed and non-prescribed or proprietary products brought to the worksite by an employee.

Some geographical locations and client organisations may have legislation or policies with which the contractor must comply. In such cases, the contractor should ensure it has a system in place to ensure compliance.

More detailed information is available in [Guidance on drug and alcohol policies and testing \(IMCA SEL 040\)](#).

13 Medications and Other Substances that May Not be Used by Diving Personnel Without Specialist Medical Advice

Not a great deal is known about the potential effects of common medications when they are taken by divers and others who are exposed to hyperbaric environments. Academic studies on the subject are simply too expensive to undertake on any scale.

However, there is limited evidence that the effects of many medications may differ significantly from the expected norms when they are used by divers in high pressure environments. In particular, the effects of a number of drugs may be enhanced or diminished in the hyperbaric environment.

13.1 Prescription and Non-Prescription Drugs

Diving contractors cannot and should not impose a blanket policy of 'no diving if taking drugs of any kind'. The correct policy to adopt may be more accurately expressed as, 'Divers should take no drugs that the diving contractor does not know about'.

Diving contractors need to know what drugs have been prescribed for their divers (or have been self-selected by the divers) so that they can arrange for an informed medical assessment to be carried out. Certain medical conditions controlled by drugs may not be a barrier to diving at work. Some medications may be used by divers providing an assessment has been made by the diving contractor's diving medical specialist(s). As emphasised previously in this guidance, all drugs must be declared to those in control of the diving operations.

When considering whether or not to provide certain medications to divers, remote medics, DMTs and those in control of the diving operations have historically tended to draw the line at prescription and non-prescription drugs, i.e. they have permitted working divers access to drugs that are generally accepted in the western world as non-prescription. This pragmatic approach has served the industry well, but it is recommended that diving contractors should agree a policy on the issue with their diving medical specialist physician(s). Such policies should clearly set out the required authorisation procedures for the provision of non-prescription and prescription drugs to divers at company worksites. Prescription drugs should not normally be issued without first consulting the diving contractor's diving medical specialist physician(s).

Over the years, diving specialist physicians have received many requests to provide definitive lists of drugs that may be provided to divers working on diving projects and definitive lists of drugs that should not normally be permitted for divers' use. Unfortunately, there is a lack of medical research and literature on the effects of medications on divers and those exposed to hyperbaric environments.

Appendix 4 contains an example of a list of medications/substances that the Association of Diving Contractors International (ADCI) considers should not normally be made available to divers at worksites unless approval has been given by the diving contractor's diving medical specialist physician(s). Because of the lack of medical literature dealing with commercial diving and drugs, the medications/substances list in Appendix 4 was developed as a consensus among diving physicians and is intended only to provide broad industry guidance to field personnel unable immediately to access specialist advice on the provision of medications for reasons outside their control. Diving medical specialist physicians may use discretion in deviating from the guidelines in Appendix 4 on an individual basis depending on the circumstances.

It should be noted that in some countries certain medications may not be permitted by the authorities. The names of drugs will also vary.

When a diver is found to be taking a particular medication the key question to consider is always, '*Why is this diver on this drug?*'

13.2 Leisure/Lifestyle Substances

Unless pre-approval to bring nutritional additives, sports drinks or other leisure/lifestyle substances into the chambers has been given in writing by the diving contractor's diving medical specialist physician(s) and the diving supervisor, the site medic will need to contact the company physician(s) and the diving supervisor for advice before permitting divers the use of such substances. Under no circumstance is

the decision to allow leisure/lifestyle substances for internal use by divers to be taken by the medic alone.

The use of anabolic-androgenic steroids (AAS) by divers is not to be permitted in any circumstances.

All medications and leisure/lifestyle items that enter a saturation chamber should be logged by saturation control. Only originally sealed packs in the original packaging and containers should be used.

14 Installation/Vessel Medics and Diving

As noted in Section 6.6 installation/vessel medics are very often the best qualified and most experienced medical personnel readily available offshore. They represent a very valuable source of medical expertise that is immediately available in the field. It is therefore desirable for diving contractors to work closely with installation/vessel medics and make the best use of such valuable personnel.

14.1 Training/Familiarisation in Diving Medicine for Offshore Medics

The primary responsibility of installation/vessel based medics is, within the limits of their competence, to care for the health and well-being of the workforce on the installation or vessel. The main duties of the installation/vessel based medic are as follows:

- ◆ The provision of first aid;
- ◆ The management of ailments and injuries;
- ◆ The storage, replenishment and administering of medicines;
- ◆ The provision of emergency care at the scene of an emergency;
- ◆ The preparation of accurate medical records and maintenance of a suitable medical log system.

The installation/vessel medic should not be assigned conflicting duties (e.g. firefighting) in emergency situations. The provision of medical treatment should always be the first concern for medics.

It is likely that installation/vessel medics will also have routine administrative duties to perform e.g. vessel inductions, cabin allocations etc. The precise administrative tasks undertaken by installation/vessel medics will differ from vessel to vessel and company to company. However, the performance of routine administrative duties should not lessen the ability of the installation/vessel medics to perform their primary duties to the standard required.

Installation/vessel medics may not have received any training in basic diving medicine even though they may regularly be present during offshore diving projects and may even conduct pre and post dive medical checks on divers. It is recognised that a typical medic onboard an installation or vessel carrying out manned diving operations is unlikely to have the necessary competence to handle a diving related emergency.

In order to make the best use of their existing expertise, it is recommended that installation/vessel medics who work with dive teams should receive suitable training/familiarisation in diving and diving medicine. Topics forming part of such training/ familiarisation in diving medicine could include:

- ◆ The role of the Offshore Medic on a diving project;
- ◆ The role of the DMT;
- ◆ The principles and history of diving;
- ◆ Diving techniques (surface diving and saturation diving);
- ◆ National diving legislation;
- ◆ Industry diving safety guidelines, including the [IMCA International Code of Practice for Offshore Diving](#) (IMCA D 014) and DMAC guidance;
- ◆ Diving physiology;
- ◆ Diving related illnesses: DCI and barotrauma resulting in lung or other organ damage;
- ◆ The neurological examination of divers;
- ◆ Gas toxicity: oxygen, nitrogen, carbon dioxide (CO₂), carbon monoxide, hydrogen sulphide and argon;
- ◆ Control and management of dive related injury/illness with emphasis on the effects of oxygen and the use of oxygen in the treatment of diving illnesses;
- ◆ Microbiological challenges in saturation diving;

- ◆ Review of DCI and trauma treatment in both saturation and surface supply environments. The issues and difficulties of access, communication, and the environment within the different chambers;
- ◆ Invasive medical procedures in saturation diving;
- ◆ Patient handling;
- ◆ Care and use of medical equipment in hyperbaric environments;
- ◆ Record keeping, including the use of DMAC 01 *Aide-mémoire for recording and transmission of medical data to shore*;
- ◆ Diving accident investigations;
- ◆ Tropical diseases and dangerous marine animals.

Note: the above list of topics is not exhaustive.

In order to retain proficiency, it is recommended that installation/vessel medics who work with divers undertake regular refresher/refamiliarisation training and continuing professional development in diving medicine. It is also advisable for installation/vessel medics to be qualified as CPR instructors in accordance with internationally recognised standards.

Situations may occur where it would greatly benefit a sick or injured diver to be treated in the chamber system by a trained installation/vessel medic rather than a DMT. Installation/vessel medics should therefore be fit to work under pressure.

Suitably trained installation/vessel medics who work with divers should be able to:

- ◆ Keep the diving supervisor(s), diving contractor and the diving contractor's shore-based diving medical specialists informed of all matters relevant to the medical fitness of the divers (including medicines administered);
- ◆ Verify that hygiene conditions on board the vessel are in accordance with regulatory authority, client and company requirements, paying particular attention to diving related hygiene and health conditions;
- ◆ Recognise the signs and symptoms of diving related illnesses and assist with the treatment of diving illnesses;
- ◆ Ensure that they are familiar with the diving contractor's relevant diving operational and emergency procedures;
- ◆ Ensure that they understand which medical equipment is suitable for use in a hyperbaric environment;
- ◆ Ensure that they are competent to use the medical equipment they are expected to operate;
- ◆ Ensure that only those medicines considered suitable for use by divers are administered to divers as necessary;
- ◆ Ensure appropriate liaison with the diving contractor's commercial diving medical specialists ashore as necessary;
- ◆ Provide advice and support to DMTs as necessary;
- ◆ If appropriate, enter a pressurised chamber when necessary to provide medical assistance/perform medical procedures;
- ◆ Perform objective and professional pre and post dive medical checks on divers as specified in the diving contractor's procedures;
- ◆ Conduct any physical fitness testing for divers as specified in the diving contractor's procedures in an objective and professional manner.

14.2 Communication/Chain-of-Command Issues for Offshore Medics Working with Divers

Experience has shown that installation/vessel medics sometimes do not understand the chain of command at an offshore diving site. For example, medics may report medical issues with divers to their own employers but fail to share key information with the Diving Superintendent and Diving

Supervisor(s). Another problem is that medics will sometimes take advice from their own medical companies rather than the diving medical support organisation appointed by the diving contractor.

Offshore medics have also been known to lock medication into individual divers in living chambers without telling anyone else in the dive team. This happens because they mistakenly believe that patient confidentiality prevents them from doing so. Concerns about patient confidentiality can also prevent medics from informing others if a diver declares to the vessel/installation medic (but no-one else) that he is taking prescribed/non-prescribed drugs.

There is broad agreement in the diving medical community that strict patient confidentiality does not apply to dive team members because if a team member becomes sick this may adversely affect the safety of others. Any relevant medical information must therefore always be shared with those in control of the diving operations.

Communications problems involving installation/vessel medics are easily solved by the definition of clear reporting lines for installation/vessel medics in contract papers and by the provision of appropriate training. In general installation/vessel medics report:

- ◆ Administratively to the Vessel Master/OIM to advise them of all relevant medical matters;
- ◆ Administratively and professionally to those in control of the diving operations – diving supervisor(s) and diving contractor offshore managers;
- ◆ Professionally to the Diving Medical Physicians working for the diving contractor's selected specialist medical support organisation.

Installation/vessel medics working with divers should note the following:

- ◆ The golden rule for offshore medics is that they must not act in isolation. They should always keep those managing the diving operations fully informed about their professional interactions with divers;
- ◆ An offshore medic's duty to care for the health and well-being of the workforce on the installation or vessel takes precedence over an individual diver's right to complete medical confidentiality;
- ◆ It is essential that the diving supervisor(s) and LSS(s) are told of any medications issued to diving personnel by the vessel/installation medic;
- ◆ If the vessel/installation medic is aware of any medical problems with a diver, the diving supervisor(s) and LSS(s) must be told. Failure to inform those in charge of the diving operations, for reasons of medical confidentiality, or for any other reasons, may put the diver and other members of the team at significant risk;
- ◆ The supervisors and other members of the dive team share the onus of medical confidentiality and it has to be recognised that at an offshore dive site the observance of normal confidentiality rules may need to be appropriately adjusted to ensure the most effective treatment of an ill diver and/or ensure the safety of others;
- ◆ If an installation/vessel medic has any reason to doubt the medical and physical fitness of a diver, the medic should immediately raise the matter with the diving supervisor. In such circumstances diving supervisors should seek guidance from the diving contractor and its commercial diving medical specialists.

14.3 Accessing Support from Diving Medical Physicians

When working with dive teams it is essential that vessel/installation medics operate within the limits of their competence. The medics should be very clear on what they are allowed to do before they need to seek advice from a Diving Medical Physician working for the diving contractor's selected specialist medical support organisation. If there is any doubt the Duty Doctor should be contacted.

The installation/vessel medic should have direct access to the Duty Doctor System operated by the selected specialist medical support organisation for consultation, guidance and supervision as necessary.

Prescription medicines should only be prescribed in accordance with the vessel/installation medic's standing orders or on the advice of the Duty Doctor. If the standing orders cover the illness/injury and the appropriate medication for that illness/injury then the vessel/installation medic can, if happy to do

so, prescribe the medication without recourse to the Duty Doctor. If there is any doubt, the Duty Doctor should be contacted.

Some hyperbaric chambers may be equipped with a medical monitoring system. Such systems permit remote medical monitoring of the patient using real-time data taken within the hyperbaric pressure chamber. Sharing this real-time data with a shore-based Diving Medical Physician may help to enable more informed and more accurate medical decision making.

Specialist medical support personnel and emergency medical equipment can be mobilised to offshore locations at short notice from some countries.

14.4 Recording and Logging of Diving Medical Matters

The offshore medic is responsible for reporting and logging the activities of the medical service on-board the vessel/installation. It is important that accurate records are made of:

- ◆ Consultations with the medic at the worksite;
- ◆ Consultations between the medic at the worksite and the advising doctor based onshore;
- ◆ Any medications dispensed.

The vessel/installation medic must maintain a medical log system. This should contain full details of consultations and examinations he has performed and any medication, equipment or advice he has dispensed during or after the consultation. The system he uses may be paper-based or electronic. However, the system should not allow records to be deleted or amended.

Doctors issuing advice to the worksite by telephonic or radio communication should confirm their instructions as soon as possible in writing through e-mail or telefax.

Medications given to divers in saturation should be logged in the saturation control logbook. Medications given to surface supplied divers should be logged in the dive operations log book. Full details should be recorded of the recipient of the medication and the dosage given on each occasion.

The requirements for medical confidentiality can present some challenges to the medic. However, it is important that the diving supervisor and LSS are aware of any divers receiving medication. The supervisors share the onus of medical confidentiality, but it has to be recognised that this may be compromised to ensure the most effective treatment of an ill diver and/or the safety of others.

Medical records are important documents and should be stored and treated as such. There should be a system in place to transfer the records from the worksite to a secure location onshore at suitable intervals. Any storage system should allow search and retrieval if required in the future. Confidentiality requirements mean that there has to be a system in place to restrict access to such records to authorised personnel. It may be appropriate for the records to be held at the premises of the contractor's specialist medical support organisation.

Some countries have very specific requirements laid down in law on the treatment and retention of medical records. It is important for contractors to understand these and if necessary, agree appropriate arrangements with their medical services providers to ensure compliance with legislative requirements.

15 Accessing Specialist Hyperbaric Medical Advice and Assistance

15.1 The need for contracts/agreements with specialist medical support organisations

Before commencing diving operations, it is essential that every diving contractor has a formal agreement in place with a suitable medical support organisation. The selected organisation should include a doctor or doctors who can provide advice and support on all medical and health issues related to commercial diving operations – including the medical examination of divers and the medical management of diving accidents and illnesses.

The selected medical support organisation should have:

- ◆ A thorough understanding of the different types of commercial diving and the particular challenges posed by each diving method;
- ◆ A detailed understanding of the effects of pressure and gases used in different diving techniques and the hazards associated with them;
- ◆ A robust on-call system capable of providing continuous cover for advice on routine and emergency medical matters (including issues related to commercial diving operations);
- ◆ Sufficient personnel with the appropriate training, knowledge and experience to deliver effective first aid and medical intervention at a diving site;
- ◆ Access to suitable and sufficient equipment and medical supplies that may be required at specific diving sites;
- ◆ Established lines of communication between the medical support organisation and the people treating the diver offshore.

Some countries have formal training requirements and defined minimum qualifications for doctors supporting diving operations. It is important for diving contractors to understand these requirements and satisfy themselves that contracted medical support organisations can comply with national requirements. In areas where there are no formal requirements for diving doctor qualifications, diving contractors must check to ensure that their chosen medical support organisations can provide competent specialist diving physicians.

It may be appropriate for large contractors, with complex medical support requirements, to nominate a dedicated individual or group within its organisation to manage medical matters.

16 References

- 1) *IMCA international code of practice for offshore diving* (IMCA D 014)
- 2) *Medical assessment of working divers* Jurg Wendling, David Elliott, Tor Nome; published by the European Diving Technology Committee (EDTC);
- 3) *IMCA D 20/01 - Medical examiners of divers*;
- 4) *Guidance on drug & alcohol policies and testing* (IMCA SEL 040)
- 5) *Diving Science: Essential physiology and medicine for divers* Michael B. Strauss and Igor V. Aksenov 2004;
- 6) *Diving and Subaquatic Medicine* Carl Edmonds, Christopher Lowry and John Pennefather 3rd edition 1992;
- 7) *Nutritional considerations during prolonged exposure to a confined, hyperbaric, hyperoxic environment: recommendations for saturation divers* Deb et al. *Extreme Physiology & Medicine* (2016);
- 8) *Supplementation of Antioxidants Prevents Oxidative Stress during A Deep Saturation Dive* Ikeda et al *Tohoku J. Exp. Med.*, 2004, 203 (4), 353-357 (2004);
- 9) *The medical examination and assessment of commercial divers (MAI)* published by the UK Health and Safety Executive. <http://www.hse.gov.uk/pubns/ma1.pdf>.

The work of DMAC is reflected in its series of guidance notes concerning various aspects of diving and diving medical practice. All current DMAC publications are available for downloading free of charge at the following web page <http://www.dmac-diving.org/guidance/>.

The DMAC documents listed below are considered to be particularly relevant to the matters covered in this guidance document:

- a) DMAC 09 *Fitness to dive after neurological decompression sickness*;
- b) DMAC 13 *Guidance on assessing fitness to return to diving after decompression illness*;
- c) DMAC 18 *Human Immunodeficiency Virus (HIV) Infection and Acquired Immune Deficiency Syndrome (AIDS) in Commercial Diving*;
- d) DMAC 29 *Approval of diving medicine courses*;
- e) *Workshop: Improving diver safety – current medical issues* (Report of a workshop held in October 2014);
- f) *DMAC Statement on Commercial Diving and Health* (October 2006);
- g) *DMAC Statement on Health Surveillance of Commercial Divers* (April 2008);
- h) *DMAC Statement on Exercise Testing in Medical Assessment of Commercial Divers* (October 2009).

| PRE-DIVING MEDICAL CHECK FORM | | Date: (DD/MM/YY) | Time: |
|--|----------------|--------------------------|-------|
| Diver's Name: | | Date of Birth: | Age: |
| Vessel/Site: | Area/Location: | Diving Company: | |
| Type of Diving: Surface supply/Saturation | | Planned Depth of Diving: | |
| Is the Diving medical certificate in date? | | Yes | No |
| Is the Diver's log book up to date, in order, with relevant medical pages signed (Parts 1, 2 and 7 of IMCA Professional Diver's Logbook)? | | Yes | No |
| If NO or if there are any restrictions, limitations or conditions noted on this certificate or in the log book, refer to the Diving Supervisor. | | | |

| PRE-DIVING MEDICAL HISTORY | | Yes | No |
|----------------------------|--|-----|----|
| 1 | Does the diver have any known allergies (for example, food, medication or latex)? | | |
| 2 | Does the diver have any current illness such as cough, cold, flu, or any other upper respiratory tract infection, ear infection, sinusitis, skin infection, or other infectious disease? | | |
| 3 | Has the diver presently or recently experienced abdominal pain/discomfort, diarrhoea, vomiting or nausea? | | |
| 4 | Is the diver currently taking ANYTHING that is or that could be considered as a medication (prescribed or otherwise) or undergoing treatment for ANY medical condition or symptoms? | | |
| 5 | Has the diver had any respiratory, cardiological or neurological illness since the last medical? | | |
| 6 | Has the diver had any diving related illness since his last medical? | | |
| 7 | Has the diver had any ear or sinus problems during or after his last dive, or does he have any difficulties 'equalising' his ears now? | | |
| 8 | Has the diver had any accident or incident since his last diving medical that resulted in loss of consciousness, reduced awareness or alertness, impairment of judgement, vision or hearing? | | |
| 9 | Does the diver know of anything else, past and/or present, including an illness or medical condition, which may adversely affect his fitness to dive? | | |
| 10 | Has the diver seen a doctor or received medical treatment since his last diving medical? | | |

I confirm that I consent to undergo a medical examination for the purpose of a medical assessment of fitness to dive professionally.

I declare the information I have given to be true/correct to the best of my knowledge and belief, and I know of no reason why I should not take part in the planned diving operation. I understand and accept that if I knowingly or recklessly make a false declaration or omit information that may be relevant, commit any deliberate misrepresentation or omission, this can lead to my not being allowed to work as a diver.

I consent to the vessel/site Medic or DMT sharing, as relevant and appropriate, information (medical and non-medical) with relevant members of the Company team responsible for the diving operations in the event of a medical problem or incident that involves me. I understand only relevant and appropriate information would be shared.

Diver's Name: _____ Signed: _____ Date: _____

If YES to any of the questions above, as appropriate, the Medic or DMT will consult with the Diving Supervisor AND a Company Medical Consultant or Company Diving Medical Specialist who would form part of the team who would medically manage your health, wellbeing and safety during your employment.

In compliance with relevant policies of the diving company, the Medic or DMT will make the Diving Supervisor and LSS aware of any medication or other substances being taken by divers into saturation or onto diving operations.

Separate consent to contact a named doctor can be obtained (in compliance with relevant local legislation) for the purpose of releasing medical information from this named doctor (e.g. family doctor, named specialist) to the Company Medical Consultant or Diving Medical Specialist.

This can be for the purpose of forming a decision on medical fitness to work/dive or for the purpose of medical management of an unforeseen incident at work involving the named diver.

PRE-DIVING MEDICAL EXAMINATION

| Height (M): | Weight (Kg): | BMI(W/H ²): | Waist measurement (Cms): | Yes | No |
|---|--------------|-------------------------|--------------------------|-----|----|
| B/P: Pulse: Temperature: Is BP greater than 140 systolic, or 90 diastolic, or is temperature greater than 37°C? If YES, repeat after 20 mins rest period. | | | | | |
| Repeat tests: B/P: Pulse: Temperature: | | | | | |
| General mobility: Does the diver have any: <ul style="list-style-type: none"> ▪ Difficulties touching the toes or performing trunk bends forwards and backwards? ▪ Difficulties performing a number of squat thrusts or a similar safe exercise? ▪ Difficulties performing alternate full arm rotations in both directions? <i>All of the above or similar should be carried out without pain and/or discomfort. If the diver appears to be experiencing discomfort or appears to show signs of restricted mobility reject temporarily and consult the Company Doctor.</i> | | | | | |

| | | |
|---|--|--|
| Respiratory System: Are there any abnormalities of auscultation (for example any asymmetry of air entry), percussion or any abnormal chest movements? | | |
| Skin Condition: Are there any skin cuts, abrasions or infection, rash or eczema? | | |
| Ears: Are there any abnormalities of ear canals, tympanic membrane (TM) or lack of TM movement on Valsalva? | | |
| Neurological: Are there any abnormalities of motor or sensory systems, including soft touch, sharp blunt, Romberg, central nervous system or mental state? | | |
| Abdomen: Is there any abnormality, for example hernias or tenderness of the abdomen? | | |
| Urine: Is there an abnormal urine dip-stick (protein, blood, glucose etc.)? | | |
| Dental: Are there any obvious problems with the teeth (observed or reported)? Is the diver wearing dentures? | | |
| Other: Have 'preventative ear drops' labelled R ear and L ear been declined? Is the diver using contact lenses etc.? | | |

If **YES** to any of the above, the Medic or DMT will consult with the Diving Supervisor and Company Medical Consultant or Company Diving Medical Specialist as relevant and appropriate.

Based on the above information and, as required, after consultation with the Company Doctor or Diving Medical Specialist, this diver is considered **FIT*/UNFIT*** to undertake diving work (*delete as appropriate).

Examiner: _____ Position: _____

Signed: _____ Date: _____

Additional space for conclusion/justification as why fit or unfit (as required):

| POST-DIVING MEDICAL CHECK FORM | | Date: (DD/MM/YY) | | Time: | | |
|--|--|------------------|--|----------------|------------------|--|
| <p>This should not take place before completion of the Bend Watch for Saturation diving.</p> <p><i>However if it does (for operational reasons), this must be clearly stated and explained. Appropriate follow up and review should be organised and documented.</i></p> <p>This should take place just before the diver leaves the project for a break/time off after Surface Supply (SS) diving.</p> | | | | | | |
| Diver's Name: | | Age: | | Date of Birth: | | |
| If Sat diving: | Max Storage Depth: | | Max Dive Depth: | | | |
| | Date/Time entered Sat: | | Date/Time out of Sat: | | | |
| | This Sat Exposure: | | Days: | | Hours: | |
| If SS Diving | Maximum Depth: | | Number of days Diving: | | Number of Dives: | |
| | Date Started: | | Date ended: | | | |
| POST-DIVING MEDICAL HISTORY | | | | | | |
| | Yes | No | | Yes | No | |
| Any problems during compression? | | | Any problems during Diving Operations? | | | |
| Any medication taken during Diving Operations? | | | Any problems after surfacing? | | | |
| If YES to any of the above, give explanation in comments box below (use separate sheet if necessary). | | | | | | |
| Comments | | | | | | |
| 1. Nature of problem | | | | | | |
| 2. Date and time of problem | | | | | | |
| 3. Medication taken and for what period | | | | | | |
| 4. Storage depth when problem noticed | | | | | | |
| 5. Attach any details recorded by the LSS/Supervisor | | | | | | |
| 6. Accident/Near Miss Report Number and Date of Submission etc. | | | | | | |
| POST-DIVING MEDICAL HISTORY (continued) | | | | Yes | No | |
| 1 | Is the diver presently suffering from or has he experienced any unusual aches and pains, bruising, joint discomfort, weakness, sore or stiff back/neck, skin numbness / sensation loss / rashes or itchiness, pins and needles, etc. during or since the dive? | | | | | |
| 2 | Does the diver have any current illness such as cough, cold, flu or any other upper respiratory tract infection, ear infection, skin infection, or other infectious disease, diarrhoea, nausea or vomiting? | | | | | |

| | | | |
|---|---|------------|-----------|
| 3 | Is the diver suffering from any condition/complaint at this time that he believes requires follow-up/further investigation by the company doctor or other medical services? | | |
| 4 | Does the diver report having any known adverse signs and symptoms during or following the dive not recorded/noted elsewhere in this document? | | |
| <p>If Yes to any of the above, please detail and use separate sheet if necessary.</p> <p>Make a note in the Diver's logbook (Section 7 of the IMCA Professional Diver's Logbook).</p> | | | |
| POST-DIVING MEDICAL EXAMINATION | | Yes | No |
| B/P: _____ Pulse: _____ Temp: _____ Weight (kgs): _____ Are there any abnormalities? | | | |
| <p>General mobility:</p> <p>Does the diver have any:</p> <ul style="list-style-type: none"> ▪ Difficulties touching the toes or performing trunk bends forwards and backwards? ▪ Difficulties performing a number of full knee bends or a similar safe lower body exercise? ▪ Difficulties performing alternate full arm rotations in both directions? <p><i>All of the above or similar should be carried out without pain and/or discomfort. If the diver appears to be experiencing discomfort or appears to show signs of restricted mobility, investigate further and consult the Company Doctor.</i></p> | | | |
| <p>Respiratory System:</p> <p>Are there any abnormalities of auscultation (for example any asymmetry of air entry), percussion or any abnormal chest movements?</p> | | | |
| <p>Skin condition:</p> <p>Are there any skin cuts, abrasions or infection, rashes, or signs of dermatitis?</p> | | | |
| <p>Ears:</p> <p>Are there any abnormalities of the Tympanic Membranes and are there any signs of infection?</p> | | | |
| <p>Neurological:</p> <p>Are there any abnormalities of motor or sensory systems, including soft touch, sharp blunt, Romberg, central nervous system or mental state?</p> | | | |
| <p>Abdomen:</p> <p>Is there any abnormality or tenderness of the abdomen?</p> | | | |
| <p>Any abnormalities of urine:</p> <p>Are the urine dip-stick results normal (minimum sugar, blood, protein)?</p> | | | |

Additional information:

If YES to any of the above, consult with/advise Diving Supervisor and Company Doctor

The diver may then need a more detailed examination.

I declare the information I given to be true/correct.

Diver name: _____ Signed: _____ Date: _____

Examiner: _____ Signed: _____ Date: _____

PLEASE STAPLE THIS POST-DIVE MEDICAL CHECK FORM TO THE DIVERS PRE-DIVE MEDICAL CHECK FORM

These documents should be retained as part of the diver's medical record.

Medical confidentiality legislation would be applicable and all documents/correspondence should be marked accordingly and stored appropriately.

Disclosure of personal information should be done in compliance with relevant law.

Medical questionnaire for completion by the candidate diver and their GP to confirm medical history (no examination is required)

| Question | Yes | No |
|---|-----|----|
| (Females only) Are you pregnant or likely to be pregnant? | | |
| Are you taking any prescribed or other medication? | | |
| Do you have any allergies? | | |
| Have you ever had or been treated for decompression illness? | | |
| Have you ever had or do you now have: | | |
| Cancer? | | |
| Mental health problems (including panic attacks, claustrophobia)? | | |
| Drug and/or alcohol misuse in the past 3 years? | | |
| Lung disease (e.g. chronic obstructive pulmonary disease, asthma)? | | |
| Collapsed lung (pneumothorax)? | | |
| Injury or surgery to the chest, lungs or heart? | | |
| Disease of the heart and circulation (e.g. high blood pressure, angina, heart attack, chest pains, palpitations)? | | |
| Disease of the brain or nervous system (e.g. epilepsy, stroke, multiple sclerosis, nerve damage)? | | |
| Blackouts, recurrent fainting, collapsing or dizziness? | | |
| Motion sickness? | | |
| Migraine? | | |
| Head injury with loss of consciousness or surgery to the head? | | |
| Bone or joint problems, or surgery (e.g. sciatica, spinal surgery)? | | |
| Ear, nose, throat or sinus problems? | | |
| Eye problems (e.g. loss of vision, double vision)? | | |
| Diabetes or other hormone problems? | | |
| Urinary or kidney problems or (males only) prostate problems? | | |
| Stomach or intestinal problems, or surgery (including stomas)? | | |
| Skin disease? | | |
| Blood or bleeding disorders? | | |

Medications/Substances That May Not Be Used by Diving Personnel Without Specialist Medical Advice.

1. Amphetamines (including lisdexamfetamine dimesylate) and designer drugs (substituted methylenediosyphenethylamines including MDMA, MMDA, FLEA, EDMA, EFLEA, MDOH, EBDB, MDEA, 5-methyl-MDA and others);
2. Marijuana and synthetic forms of marijuana;
3. Phencylidine (PCP);
4. Cocaine;
5. Opioids, naturally occurring and synthetics;
6. Phosphodiesterase inhibitors such as erectile dysfunction medications;
7. Immunosuppressants not recommended in saturation diving;
8. Tramadol;
9. All antidepressants except low dose sertraline used for mild situational depression;
10. All antipsychotic medications;
11. Muscle relaxants;
12. All forms of insulin;
13. Oral hypoglycemic medication;
14. Anticoagulants or platelet inhibitors;
15. Benzodiazepines;
16. Barbiturates;
17. Anxiolytic and/or hypnotic medications;
18. Nicotine patches – must be removed while diving;
19. Varenicline;
20. Bupropion;
21. Beta blockers.

Note

This is not an exhaustive list. It is indicative and only provides a basis for discussions with company Diving Medical Physicians. IMCA members are advised to draw up a medications policy as described in section 13.1 in conjunction with their diving medical specialist advisers.