The Diving Medical Advisory Committee

DMAC, 66 Buckingham Gate, London SW1E 6AU, UK
Tel: +44 (0) 20 7824 5520

www.dmac-diving.org
info@dmac-diving.org

The Provision of Emergency Medical Care for Divers in Saturation

DMAC 28 Rev. 3 – Jan 2024

Supersedes DMAC 28 and DMAC 28 Rev. 1 and Rev. 2, which are now withdrawn
DMAC 28 also superseded DMAC 25 and DMAC 27

1 Background

DMAC has published guidance over a number of years aimed at providing divers in saturation with a level of medical care which is as similar as possible to the level of medical care available to other personnel who work offshore.

In the early days of the offshore diving industry, it was considered desirable to transport (under pressure) an ill or injured diver in saturation from an offshore location to an onshore facility which would provide specialised medical care. As experience has been gained however, it has become clear that the most viable concept is to stabilise the patient until suitable decompression is possible, whilst bringing the vessel into nearest port where further medical assistance will be more easily obtained, and which then allows the casualty to receive definitive care under atmospheric pressure. This eventuality should be planned for by the detailed preparation of a project specific Medical Emergency Response Plan (MERP). All Saturation diving operations should also have a carefully prepared Hyperbaric Evacuation Plan (HEP).

DMAC published Guidance Note 25 in October 1993 (Recommendations for the provision of emergency care for the seriously ill or injured diver when in saturation) and raised this to Revision 1 in March 1996. Guidance Note 27 was published in April 1996 (An industry standard for the provision of equipment for emergency medical care in saturation diving systems). Guidance Note 28, published in November 1997, superseded all three previous notes, and aimed to combine the advice which they contained in to one succinct source which can be applied anywhere in the world. This revision of DMAC 28 updates that advice to reflect current practice and equipment.

Whilst this document gives general guidance, detailed arrangements should exist for each work site, agreed and documented between the diving company and its specialist medical adviser.

2 Geographic Limitations

It is recognised that the location of the diving operation will determine the facilities which are readily available to provide expert medical care. For example, in the North Sea such skilled care may be available within an hour or two while in other parts of the world specialised doctors may be thousands of miles away from the diving site.

Prior to the commencement of any diving operation the diving company should consult with its medical adviser (possibly also with the client's medical department) and assess what facilities and equipment maybe be available in relation to the specific location.

Whilst the advice given in this document is intended to apply anywhere in the world, it is recognised that there will be differences in the ability to implement its recommendations dependent on the exact location and circumstances.

3 Contingency Planning

The equipment that each of the various personnel with a role in providing medical care in an emergency (e.g. Diver Medical Technician (DMT), vessel Medic and members of the medical and life support team) is capable of using should be agreed by the diving company and their medical adviser, and this should be taken into account when developing the contingency plan. Anyone expected to use a certain piece of equipment should be familiar with, trained and current in the use of that equipment.

4 On Site Medical Arrangements

The equipment available at site and the ability of those present to start adequate resuscitation and subsequent first aid within the first few minutes of an incident will ultimately determine the outcome for the patient. However, follow-up care may be necessary to increase the chances of a good outcome after a medical incident.

DMAC has published guidance on the equipment and medication which should be held at an offshore worksite (see DMAC 15).

The use of properly trained DMTs is now widespread but the selection and training of suitable personnel from among the divers to provide advanced first aid is also crucial to the success of any medical treatment.

If a Medic is part of the crew of the diving vessel, he should be familiar with diving operations (see IMCA D061) and the challenges of treating a diving casualty or illness. Consideration should be given to having the Medic suitably certified to go under pressure to render treatment in extreme cases.

The diving company should prepare, in conjunction with its medical adviser, a well-documented plan to provide initial first aid to an injured diver while at the same time contacting specialist medical personnel for advice. A qualified and experienced Duty Diving Doctor is mandatory for all diving operations and should be on call 24/7 to give advice. This plan is intended to stabilise a casualty until such time as a decision is taken as to what further treatment may be needed.

It is recognised that diving accidents and incidents are rare and thus it is likely that there will be significant skill fade amongst both offshore Medics and DMTs. The diving company should therefore also prepare, in conjunction with its medical advisors, a continuous program of professional development and training to prevent skill fade for both the Medics and DMTs working for them. This should ensure they are as current and as competent as possible in the tasks required to be performed in the immediate and ongoing treatment of a casualty, whilst seeking further medical support.

Training aids (equipment and videos) are available and should be used regularly to maintain key skills. Furthermore, regular and documented familiarisation sessions using the equipment listed in section 9 should be implemented.

5 Suitability of Medical Teams

The highest level of medical care will be provided by a medical team which is trained and experienced in handling casualties under saturation conditions. This level of specialist knowledge is not widespread throughout the world and is often concentrated in specific locations which may be a significant distance away from the work site.

Medical care involves a very wide range of specialist expertise and no single diving medical team will have a complete range of expertise. As a result, medical teams providing support to saturation diving operation need to be able to access a wide range of specialist expertise for guidance and assistance. It is recognised that the need for such specialist expertise occurs very rarely and hence is unlikely to be met by a contractual arrangement.

Effective monitoring of the patient by the onsite DMT using simple monitoring equipment, coupled with direct communications (e.g. audio, video, photographic links and email) between the specialist doctor ashore and the Medic on the vessel will form the basis of care given to the casualty in the first instance.

Since local medical personnel might not possess the specialised knowledge to provide the necessary medical support, consideration should be given to involving a specialist medical team from one of the world's recognised centres to support incident management which might include mobilisation of support personnel to the site of the incident.

Personnel with appropriate medical training should be on the diving worksite at all times. However, if during the project planning phase, a significant safety risk to divers and surface support personnel is identified then the need for additional medical resources should be considered. This risk severity determination will be significantly driven by the scope of work and the anticipated evacuation time to definitive medical care – as necessarily created by the saturation decompression time and the remoteness of the diving site.

6 The Saturation System

Since the diving system may vary from a single chamber on the simplest transportable system to a multi-chamber complex on a large DSV, it is not appropriate to give specific technical specifications. The basic requirement, however, is to provide a facility where an injured diver can be given medical treatment while still under pressure.

It is recommended that one chamber be identified as the chamber in which any medical treatment will be carried out, before commencing diving operations. This chamber must be accessible by any diver in the system within a reasonable time (30-60 minutes), taking into account any need to change chamber pressure.

This chamber should have the following:

- a minimum internal diameter of 1.8 metres (6 feet) but preferably exceeding 2.15 metres (7 feet)
- the ability to remove, or move out of the way, bunks and other equipment normally fitted to the chamber but not needed directly for a medical emergency
- a bunk for the patient which should:
  - be waist high
  - have access from preferably both sides, from the head end, have a firm base and be able to tilt the patient to 30° both at the foot and head ends
  - be provided with a mattress
- a tray or working surface for medical instruments
- a means for suspending IV/IO drips overhead the patient (magnetic hooks or similar)
- a convenient medical lock of at least 300mm diameter
- a good communications system with connections in a suitable location for personnel beside the casualty
- suitable extra lighting for the area of the casualty
- sufficient additional gas and electrical hull penetrations (in order to ensure that in an emergency appropriate gas and electrical supplies can be rapidly connected) as agreed with the specialist medical adviser (see sections below)
- sink facilities (with foot or elbow operated taps).

7 Communications

Good communications are extremely important. Ideally the doctor onshore should be able to speak directly to the patient and person inside the chamber who is treating the patient. Communication links, which enable effective communication between the offshore worksite and medical support onshore, are essential.

It is important to be aware that the arrangement where those inside the chamber communicate with personnel outside (e.g. supervisor/LST/Medic) who are used to understanding heliox distorted speech, who then relay the information to a doctor onshore, may lead to omission and misinterpretation of critical information. The option of transmitting communications through an unscrambler should be considered.

Electronic transfer of information, data, still and video images and speech using the internet and satellite communications systems should be standard practice. Where available, direct video conference facilities between the chamber and doctor onshore provide the best method of communication.

Patient confidentiality requirements should be considered when using communication systems and national regulations must be taken into account.

8 Electrical Equipment

Ideally electrical equipment should not be used inside a chamber unless it has been specifically manufactured for such use. However, the range of items of medical equipment built and tested for use in hyperbaric conditions is very small, restricting the provision of medical care. Where equipment to be used in the chamber has not been specifically manufactured for such use, a risk analysis should be undertaken and its results documented. Where appropriate, local testing of the equipment might be undertaken, and in such cases the results documented.

9 Equipment to be Held at Site

The exact list and detailed specifications of all medical equipment to be held offshore at a saturation site is a matter for assessment and agreement between the diving company and their medical adviser.

This will depend on a number of factors including: communications available, remoteness of location, the first aid competence of personnel on site, ability to maintain and keep secure the equipment, etc.

Included in the items which might be held at site are:

- necessary gas supplies for a ventilator including patient's breathing gas (likely provided via BIBS pipework system) and any gas supply required to power a ventilator
- a suction system and equipment
  - Systems which utilise the suction available from the BIBS dump system or Venturi systems that operate in a controlled manner are appropriate.
  - Simple manual aspirators sometimes promoted for acute emergency airway suction are insufficient.
- a free flow hood for therapeutic gas
- additional lighting
- a saturation rated telemedical patient monitoring system (for blood pressure, ECG, pulse, temperature, SAO2)
- an automated external defibrillator (AED) that has undergone safety and functional assessment for saturation related hyperbaric use
- DMAC 15 medical equipment.

NB. The dive contractor should have a regular inspection and auditing routine to ensure items are in good condition, functional and any medications are within their expiry date.

10 Future Developments

Advances in technology provide new equipment which may assist in the treatment of an injured or sick diver in saturation and should always be considered by both the diving company and its specialist medical adviser on a regular basis.

The concept of clinical governance requires that those responsible for the provision of medical care ensure that measures are in place to maintain the highest possible standards of care taking into account new developments in health care and equipment.

11 Conclusion

The ability to provide good quality medical treatment to an ill or injured diver in saturation is constantly being increased as new equipment, technology and communications systems become available. The basic requirements however remain the training and abilities of those personnel offshore who will be required to care for a casualty during the early stages of an incident, coupled with the appropriate arrangements to obtain specialist medical advice or treatment quickly.