The Diving Medical Advisory Committee

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Accelerated Emergency Decompression (AED) from Saturation

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Contingency planning for managing a situation in which the safety of a diving support vessel (DSV) is at risk normally involves hyperbaric evacuation using a hyperbaric rescue system (HRS). However, the circumstances of the emergency may put the hyperbaric evacuation system (HES) out of action, the sea state may prohibit launch of the HES or reception facilities for an evacuation system may not be available. In any of these situations an emergency decompression from saturation may offer the best opportunity for the divers' survival. Although many diving manuals contain emergency rapid decompression procedures, in many situations these are too slow to be of value, and decompression over the estimated time available in the emergency may be the only option.

This guidance note is based on the conclusions of a workshop set up to consider the issues involved in rapid decompression from saturation. It is important to recognise that accelerated emergency decompression is a last resort when alternative means of evacuation from the hyperbaric system at risk is not possible. The knowledge underlying the guidance is limited and the objective of this guidance is to reduce mortality and it is recognised that there may be a high risk of injury.

The following conclusions may be helpful in the management of such an emergency.

A risk evaluation exercise should be conducted in any circumstance in which the safety of divers in a decompression chamber system is put at risk as a result of fire or mechanical damage to the vessel or chamber system, which may result in loss of the vessel (sinking) or inability to provide continued support to the divers under pressure. Such circumstances have the potential to result in multiple fatalities amongst the divers.

The chances of an emergency situation resulting in fatalities may range from a possibility to an absolute certainty. Both level of risk and the timescale of progression of an emergency situation are difficult to assess but prediction of the outcome is likely to be more accurate as time progresses.

Actions to remove the divers to safety need to be considered at the earliest stage possible.

Two possible actions may be available. These are evacuation using a hyperbaric rescue vessel (HRV) or emergency decompression. Both carry risks of illness, injury and even a fatal outcome for the divers depending on conditions.

It has proved possible to evacuate divers using a hyperbaric lifeboat in calm seas when a vessel was at risk and to return the divers to the same vessel when the emergency had been resolved. Conversely, evacuating divers into an HRV in rough sea when there is no facility for recovery within 48 hours is likely to carry a risk of fatality.

Emergency decompression will carry a relatively lower risk when storage depth is shallow, divers have made no recent excursions (i.e. within 24 hours) and when there is a longer time window of opportunity in which to conduct the decompression.

The safest evacuation procedures are likely to be available early in the development of the emergency when the final outcome of the emergency may be most difficult to predict.

In using an accelerated decompression it will always be safer to reduce the rate of decompression (or stop and recompress), in the event that the emergency resolves, than to speed up the rate of decompression if the emergency scenario progresses more rapidly than anticipated.

This guidance is not considered appropriate for use in a hyperbaric rescue unit (HRU).

Chamber decompression issues:

- Where rapid decompression in a chamber facility is considered, a risk evaluation exercise is required to assess the threat to the divers of remaining in the chamber compared to the risks associated with a rapid decompression, taking into account the storage depth (see below).
- The decompression should be planned to take place at the slowest rate consistent with a safe evaluation of the emergency timescale.
- In planning a rapid decompression the selection of either a linear decompression or commencing with an upward excursion (1 msw per minute) should take into account the divers' recent excursion dive (pressure profile) exposure.
- During the decompression a high ppO_2 in the divers' breathing gas is advantageous. The level of ppO_2 selected will depend on anticipated duration of exposure. At deeper depths, the chamber ppO_2 could be raised to 1.0-1.5 ata. Use of a built-in breathing system (BIBS) would be required for higher ppO_2 mixtures and at shallow depths.
- Decompression rates as fast as 10-20 msw per hour using a high ppO_2 may be possible with divers who have not done any excursion in the previous 24 hours.
- Breathing a high ppO_2 gas mixture before starting decompression may be helpful if the opportunity exists without reducing total time available for decompression.
- All attempts should be made to obtain assistance from another dive vessel with chamber facilities for the recompression of divers completing decompression at the earliest available opportunity.
- Maintaining adequate hydration is considered important. This will require an adequate oral fluid intake. Some advocate the administration of higher volumes of fluid by mouth or by intravenous route if practical. The volumes taken or administered will be dependent on the duration of the decompression, but oral intakes as high as 1 litre per hour might be reasonable during a short decompression. For oral hydration water or oral rehydration mixture should be locked into the chamber shortly before use.
- Thermal control of the chamber should be maintained. If environmental control is compromised, this may increase the risk of the procedure.
- Where practical, divers should be encouraged to move around but not undertake vigorous exertion during the decompression.
- There is no human evidence that any drug would offer benefits but analgesia may be valuable. Glyceryl trinitrate, non-steroidal anti-inflammatory agents and clopidogrel may all offer some advantage in protection against decompression illness and are unlikely to increase the risk.
- A plan for the management of complications arising during and after the decompression should include access to analgesia and antiemetics, the availability of continued surface oxygen therapy after completion of decompression and access to recompression elsewhere for treatment of decompression illness.