

## ワークショップWS4-8 Return to Diving after Decompression Sickness

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**Introduction** An important question that must be answered after an episode of decompression sickness (DCS) is when can the diver return to SCUBA diving? The treating physician has the responsibility for informing the diver when it is safe, if ever, to resume diving. Unfortunately criteria for return to diving are not clearly established. This paper describes a template I have generated that provides an objective, simple to use guide for making decisions about return to diving after an episode of DCS.

**Historical Considerations and Basis for Our Return to Diving Recommendations** A review has failed to find definitive information about return to diving after a DCS “hit.” There are, however, some historical antecedents that have been used for making recommendations. Dr. Behnke, stated that a diver could return to diving after an episode of DCS when able to resume “full running activity.” While insightful for episodes of DCS with significant neurological presentations, it does not apply to the majority of divers who present with less severe DCS symptoms.

Another guideline that had been used by the U.S. Navy was if the U.S. Navy Treatment Table 1 was successful in resolving the diver’s symptoms, return to diving was permitted after one week. If Table 2 was required, then two weeks before returning to diving; three weeks for Table 3 and four weeks for Table 4. This information is outdated since Navy Treatment Tables 1 - 4 are no longer used.

An Undersea and Hyperbaric Medicine Society workshop in 1986 was convened to answer the question when could a commercial divers could return to diving after an episode of pain only DCS. Because of economic considerations and possibly prevention of delayed sequela of DCS such as osteonecrosis and neurological ramifications, the recommendation was made that commercial divers, if adequately treated and their symptoms fully resolved, could return to diving the day after becoming asymptomatic. While this recommendation was proactive in getting highly motivated commercial divers “back in the water,” it does not take into account newer decompression science information that it may take days or even weeks to resolve the inert gas-vascular endothelium reactions that are believed to occur with DCS.

During the past 34 years, at Long Beach Memorial Medical Center (LBMMC), Long Beach California, USA has treated nearly 400 patients with DCS. Usually the first question asked after treatment,

is “When can I return to diving?” To standardize our responses, I generated a 4-quadrant matrix to provide answers to this question. The foundations for this template include my experiences, collaboration with colleagues in undersea medicine and the historical information cited above.

**The LBMMC Guidelines** My 4-quadrant matrix requires answers to two questions: First, was the DCS event deserved or underserved and second, is the patient asymptomatic or do residuals exist after hyperbaric oxygen recompression treatment (Table 1)? If deserved and asymptomatic, the diver may return to diving after counseling including a discussion why the event occurred and how to prevent future DCS occurrences with safe diving practices. The patient is advised not to resume diving for a two week period in order to mitigate any inert gas-blood vessel endothelium reactions.

For the three other permutations, return to diving is not advised. If the diver is determined to resume diving and is asymptomatic, a comprehensive work-up including a thorough history and physical with special emphasis on cardiac and neurological components, a neurological consultation with brain and spinal cord magnetic resonance imaging, and a cardiac consultation with a cardiac stress test and a bubble study are obtained. Finally a trial “dive” in a hyperbaric chamber to 2.8 atmospheres absolute for 60 minutes breathing air and ascending over a five minute period of time is done.

If the above studies are negative, the diver is then OK’d to resume diving using conservative diving practices. Advice includes limiting maximum depths to 60 FSW, using conservative settings on the dive computer, diving in optimal conditions (that is, nil currents, warm water and good visibility), ascending at rates less than one foot every two seconds, using a three minute rest stop at 15 FSW, avoiding diving when fatigued, dehydrated or chilled and limiting consecutive days of diving to three.

**Conclusions** Sensible, consistent and objective advice can be provided to divers who have experienced DCS and want to return to diving by utilizing our LBMMC 4-quadrant decision-making matrix.

Figure 1: Guideline for Return to Diving after an Episode of DCS

		Question 1: Was DCS Deserved?	
		Yes	No
Question 2: Do Residuals Exist? (after HBO-Recompression)	No	May return to diving	Return to diving discouraged*
	Yes	Return to diving not advised**	Return to diving strongly disapproved

**Legend** Questions 1 and 2 must be answered before making a decision whether or not a diver returns to diving after an episode of DCS. \*If a diver is determined to resume diving after an undeserved DCS “hit,” a comprehensive work-up is required (see text). \*\*If residuals exist, exceptions are sometimes made to allow commercial divers to do sports SCUBA diving

**Key** DCS = Decompression sickness, HBO = Hyperbaric oxygen