

Certified Diver Medic

Instructor Application Criteria



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National Board of Diving & Hyperbaric Medical Technology

www.nbdhmt.org

Diver Medic Instructor Application Criteria

Pre-requisites

Applications must provide written documentation of formal and appropriate training in the physics, physiology and anatomic aspects of diving medicine. *This should be identified as Exhibit A.*

Applicants must provide written documentation of previous and appropriate teaching experience. Examples included BCLS, ACLS, and ATLS Instructor status; graduation from military instructor training programs, with subsequent assignment to duties utilizing these skills; faculty from previous diving medical training programs, such as the NOAA/UHMS Diving Medical Officer Course; and other teaching responsibilities as approved by the Board. *This should be identified as Exhibit B.*

Applicants must provide written documentation of previous training in multiplace chamber operations. Further, such documentation should include multiplace chamber operational experience. *This should be identified as Exhibit C.*

Applicants must provide written documentation of clinical case management experience involving diving and related decompression accidents, with particular reference on onsite/early patient assessment and therapeutic compression. *This should be identified as Exhibit D.*

Applicants must provide a list of at least three individuals, and their respective addresses, which can support the above referenced pre-requisites. *This should be identified as Exhibit E.*

Application Procedure

Individuals applying for certification as a DMT Instructor must apply in writing to Board headquarters.

The letter of application should include detailed curriculum vitae, a recent (within two years) passport size photograph, signed on its reverse, and an application fee of \$150.00.

Pre-requisite Exhibits A through E should be provided (see next page).

Each applicant is required to submit a DMT training course curriculum that the applicant intends to teach. The curriculum should utilize the guidelines provided in "Module 16" as a minimum standard (page 2). The curriculum should include a list of topics, subject matter to be covered, subject time frames and the CVs of any additional faculty members, and a description of the teaching facility, including chamber type.

Further, the application package should include a narrative of how and where the prospective DMT Instructor intends to provide diver medic training, and with what estimated frequency. Specific reference to program promotion and the likely source of DMT students will be helpful.

Review Procedure

Once the complete application package has been received by Board headquarters it will be forwarded to the Committee on DMT Instructor Certification, for review and disposition. A decision will be made, and the applicant notified, within forty-five (45) days of Board receipt of the completed application package.

Where the applicant is successful, they will be designated a DMT Instructor. A probationary period of two years will take effect from the application approval date. At the completion of the probationary period the DMT Instructor Committee will consider full DMT Instructor status, based upon DMT student course/instructor critiques, teaching activities and program audit, where necessary.

Should the Committee consider an extension of probationary period for any reason, the chairman of that committee will notify the Instructor, in writing. Specific concerns will be identified and recommendations suggested.

The second probationary period will again last for two years. During this time it is anticipated that the Instructor will work to resolve any considered deficiencies. Upon completion of the second

probationary period, the DMT Instructor Certification Committee will again take the activities of the Instructor under review.

Disposition will be to either advance to full Instructor status or, if in the opinion of the Committee, delinquencies have not been resolved, withdraw the individuals DMT Instructor certification. If this latter step is deemed necessary, then the Committee chairman will notify the individual in writing, and provide specific documentation to support the decision.

Instructor Re-registration

DMT Instructors are required to re-register every three years. Re-registration is based upon teaching activities and documentation of continuing education. Each DMT Instructor will be provided with appropriate compilation forms, in order to document re-registration requirements. These forms, and a \$100.00 re-registration fee, should be forwarded to Board headquarters 30 days prior to the re-registration date.

Appeal Procedure

Where an applicant is denied DMT Instructor status and does not agree with the written assessment provided by the DMT Instructor Certification Committee Chairman, the applicant can appeal this decision. The appeal, in writing, should be forwarded to the Appeals Committee at Board headquarters. The applicant should clearly outline the basis for his disagreement, and provide supportive documentation, where appropriate.

The Appeals Committee will take this disagreement under review. The majority decision of the Appeal Board is necessary to overrule the DMT Instructor Certification Committee. The applicant will be provided with a decision within forty-five (45) days of the Board's receipt of the appeal.

Instructor Approval Requirements

1. Written application
2. Curriculum vitae
3. Passport photograph
4. Application fee
5. DMT course curriculum
6. Narrative summary of plans to teach
7. Exhibit A: diving medical training verification
8. Exhibit B: documentation of teaching activities
9. Exhibit C: multiplace chamber training
10. Exhibit D: clinical case management experience
11. Exhibit E: list of references

Curriculum – Diving Medicine Module 16

The following material outlines the content of an NBDHMT approved course in diving medicine. The material is organized into three sections.

1. Instructor Responsibilities
2. Content Outline
3. Knowledge and Skills Objectives

Instructor Responsibilities

1. Provide or require adequate reading material for class work and homework
 - a. Appropriate chapters from USN and NOAA Diving Manuals
 - b. Field Guide for the Diver Medic
 - c. Recognized books on diving medicine
 - d. Articles from related medical journals

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2. Prepare lectures and demonstrations based on Content Outline and Knowledge and Skills Objectives
 3. Inform students as to instructor's policies and expectations concerning reading assignments, homework, lectures, demonstrations and examinations
 4. Prepare written interim and final examination based on lectures, reading assignments, and homework
 5. Prepare skills demonstrations and practice sessions
 6. Prepare a series of interim and final sham treatments of realistic simulated diving emergencies (suggest four as a minimum) to demonstrate assessment, triage, management and sequencing of treatment steps, records and reporting
 7. Assemble adequate equipment and materials
 - a. Medical, such as pen light, blood pressure cuff, otoscope, stethoscope, simple emergency medical kit
 - b. Sample records forms, treatment sheets, neuro sheets
 - c. Audiovisual equipment, handouts, case histories, books, manuals, journal

NBDHMT Approved Course Outline

This content outline addresses the core aspects of diving medicine and related operations. It represents the scope of information that should be taught. The outline summarizes a standardized curriculum in diving accident management. It is designed to prepare the prospective DMT to evaluate and initiate treatment of diving accidents and injuries.

1. Introduction

- d. Preview of skill and knowledge objectives, major topics in course
- e. Preview of demonstrations and sham treatments
- f. Attendance, grading, evaluation and examination policies
- g. Review of gas laws, diving physics and physiology (optional)

2. Role of the Medic

- a. Responsibilities
 - i. Responsibilities as a diver (where applicable)
 - follow safe practice standards
 - set example
 - teach and instruct others
 - ii. Responsibilities as a medic
 - emergency care, basic life support, stabilize
 - report accidents and treatment to medical authorities
 - perform tasks and give aid as directed by proper authorities
 - in absence of specific orders, carry out treatment and triage according to training and ability
 - encourage fitness in diving community
 - maintain proficiency in diving (where applicable) and emergency medicine
 - keep accurate, informative records (send with patient as applicable)
 - b. Liaison with others
 - i. Knowledgeable physicians in medic's own company/region- protocols, standing orders
 - ii. Local hospitals and chamber facilities
 - iii. Local EMS system
 - iv. Law enforcement, fire departments, U.S. Coast Guard, etc.
 - v. Communications system
 - vi. Divers Alert Network (DAN)
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3. Records and Fitness (variable according to medic's status, industry, and employer)

- a. Baseline records
 - i. Knowledge of disqualifying conditions (permanent and temporary)
 - ii. Review of diver's medical history or previous physicals
 - iii. Record family and emergency data
 - iv. Routine exam (basic)
 - vital signs
 - ENT
 - heart and lungs
- b. Pre-dive evaluation (where applicable)
 - i. Current or recent medical conditions
 - ii. Current prescribed drugs or medications
 - iii. Recent lifestyle or personal habits
 - iv. Recent dive history
 - v. Brief physical exam (vital signs, ENT, heart and lungs)
- c. Post-dive evaluation (where applicable)
 - i. Dive and decompression history
 - ii. Brief physical
 - iii. Neuro and mental status evaluation

4. Decompression Sickness (DCS)

- a. Pathophysiology
 - i. Evolution of inert gas from soluble phase to gas phase
 - intravascular bubbles
 - tissue/extravascular bubbles
 - ii. Bubble effects
 - direct – possible obstructed blood flow, ischemia; possible effects on tissue, neural tissue
 - indirect – hematological reactions to bubble surface, platelet and other effects, capillary permeability, hemoconcentration and edema, hypovolemia
 - iii. Complications
 - cardiopulmonary – bubbles clogging pulmonary artery, right-to-left shunting of bubbles, tachypnea, reduced cardiac output
 - neurological – possible cerebral and spinal emboli
 - b. Predisposing factors – concept of lowered resistance to DCS
 - i. Dehydration
 - ii. Poor physical fitness
 - iii. Related illnesses
 - iv. Role of exercise during dive and decompression
 - v. Increasing age
 - vi. Temperature variances
 - vii. Rapid inert gas switching
 - c. Signs and Symptoms
 - i. “Type I” – minor
 - pain only – joint pain (rule out central or peripheral nervous system involvement),
 - skin – itching, mild rash, ‘cutis marmorata’
 - ii. “Type II” – serious
 - sensory abnormalities, radicular pain
 - weakness, paralysis
 - vestibular symptoms – hearing, balance
 - mood, intellect, personality changes
 - visual symptoms
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- i. Vague, generalized symptoms
 - flu-like symptoms
 - unusual fatigue
 - headache, difficulty concentrating
 - DCS as “great imitator” – may mimic everyday illnesses
 - role of test of pressure – done where symptoms don’t seem to indicate decompression sickness, neuro is normal
 - index of suspicion
 - d. Treatment
 - i. Treatment tables
 - USN tables – 5, 6, 6-A, 7, 9 and saturation decompression sickness table
 - Comex 30
 - concept that treatment tables are specialized decompressions, treatment table is dose of medicine (oxygen). Respective treatments for variable severity of DCS
 - ii. Fluids and drugs
 - importance of hydration – oral or IV fluids, good urine output
 - possible role of drugs, usual doses (Valium, Decadron, Dextran, etc)
 - emphasize basic treatment for bends is pressure, oxygen, fluids, and time; role of medications is debated; given by medic on direct or standing order
 - iii. In-water oxygen treatment (controversies)
 - iv. Role of the monoplace hyperbaric chamber, limitations, etc (optional)

5. Barotrauma

- a. Squeeze
 - i. Sinus – signs and symptoms, need approximately 3-10 days to resolve; possible secondary sinus infection
 - ii. Middle ear – signs and symptoms; perforation of eardrum; possible secondary otitis media other squeeze – suit, “reverse” squeeze, etc
 - iii. Inner ear (differential diagnosis)
 - iv. Other squeeze – suit, “reverse” squeeze, etc.
- b. Lung overpressure
 - i. Review usual causes- rapid ascent, pressure reduction and wave surge, panic and breath holding; lung diseases
 - ii. Pathology – rupture alveolus, expanding air transects to pleural surface, or tracks along tissue planes, or enters pulmonary circulation and left ventricle
 - iii. Mediastinal emphysema
 - air tracks along lung tissue planes and ruptures into mediastinal space or pericardial sac
 - signs and symptoms – midchest pain or pressure, resonant or crunching heart sounds, cardiac tamponade (distended veins, narrow pulse pressure, low blood pressure and cardiac output), possible mild cyanosis, irregular pulse
 - treatment – varies from none (observation), to breathing oxygen, to recompression (seldom), according to patient’s status and symptoms
 - iv. Subcutaneous emphysema
 - lung trauma, leads to air tracking along upper bronchi, into and above clavicle

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- signs and symptoms – pain in neck or upper chest “sore throat”, pain with swallowing, change in voice, palpable air under skin (“rice crispies”)
 - treatment – same as 3.c (recompression seldom needed, minimal depth only)
 - v. Pneumothorax
 - expanding air ruptures through lung surface; free air present in chest cavity, outside lung
 - small leak and/or occurring near surface will be simple pneumothorax
 - if not near surface, any pneumothorax during decompression may become a tension pneumothorax
 - signs and symptoms of simple and tension pneumothorax same as non-diving causes (chest pain, splinting, dyspnea, shortness-of-breath, cyanosis, tracheal deviation, hypotension diminished breath sounds); *improves with compression*
 - treatment of simple pneumothorax – varies from observation only to 100% oxygen (recompression seldom needed)
 - treatment of tension pneumothorax:
 - recompression to depths of significant relief
 - needle decompression
 - after compression, use of saturation decompression schedule and oxygen breathing to resorb trapped air (avoids chest wall puncture)
 - insertion of indwelling cannula or chest tube with seal or one-way valve
 - vi. Cerebral arterial air embolism
 - expanding alveolar air enters tributaries of pulmonary vein, transported to left heart, into aorta and cerebral arteries, causing stroke-like injury
 - signs and symptoms – usually rapid and dramatic; unconsciousness; convulsion; apnea; paralysis and hemiparesis; hemiplegia; hemoptysis
 - possible concurrent air embolism and pneumothorax
 - treatment standards

6. Oxygen Toxicity

- a. Current and generally accepted concepts of oxygen toxicity
 - b. Concepts of oxygen limits
 - i. Lung vs. CNS
 - ii. Dry vs. in-water, working vs. at-rest
 - c. Pulmonary toxicity
 - i. Disruption of alveolar surfactant, small airway and alveolar closure, lung edema, disrupts gas transfer by lung
 - ii. Results are similar to pneumonia or respiratory distress syndrome
 - iii. Signs and symptoms
 - iv. Varies from mild tracheal irritation, cough, painful breathing, dyspnea, cyanosis, death
 - v. Lungs sound relatively normal until advanced
 - vi. Treatment – lower pO₂ unless end of treatment or decompression is near
 - vii. UPTD (optional)
 - concept – amount of damage from 100% oxygen at 1 ATA for one minute
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- typical UPTD dose causing 10%, 20%, loss of vital capacity, relationship to usual treatment tables
 - UPTD is only additive; role of air breaks in permitting high-dose oxygen treatment
 - Clinically, an historic concept, rarely incorporated into modern treatment decisions
- d. CNS toxicity
- i. state of cerebral irritability
 - ii. sign and symptoms – restlessness, irritability, twitching, tingling, visual symptoms, nausea, hiccups, convulsion; “VENTED”
 - iii. management – remove mask/lower pO₂, protect from harm during seizure, resume treatment fifteen minutes after resolution and from point of interruption

Optional Material

The following are examples of subject matter which instructors may wish to include in basic diving medicine training, refresher classes, or both. Suitability for these options will depend on previous training, geographic location, ability to learn quickly, employer and industry, and interest in peripheral material. Instructors should try to keep the training relevant to the needs and abilities of each class

Options should not be included at the expense of core lecture material, practice sessions and sham treatments. The instructor should be satisfied that the class is mastering basic material and save options for students with special needs, or where the pace of instruction is clearly moving faster than expected, or allow extra time in scheduling the entire course

1. Marine Hazards

- a. common marine hazards
- b. signs, symptoms, acute treatment

2. Environmental Accidents

- a. emergency management of near-drowning
- b. emergency management of hyper-, hypo-thermia

3. Carbon Dioxide Toxicity

4. Tropical Medicine

5. Ear Hygiene, Otitis Externa

6. Review of Basic Life Support, Non-diving Emergency Medicine

7. Review of Gas Laws, Diving Physics and Physiology

Concerning review material, instructors may prefer to utilize assignments sent to the students prior to class, particularly for diving physics and gas laws

Knowledge Objectives

These knowledge and skills objectives indicate what each student is expected to know upon successful completion of the Diving Medicine Module 16. End of course testing policies are left to the discretion of the instructor staff. Testing should, however, be flexible enough to assess each individual fairly, rigorous enough to ensure an adequate understanding of course content and how it will be put into practice, and adequately balanced between didactic and practical skills. Regarding the latter, DMT training should be field-oriented, practical, and directed towards hands-on treatment of diving accidents. Specifically, it is expected that elements of patient evaluation and invasive skills training will be conducted in a hyperbaric chamber. Academic teaching should

be sufficient that the student understands the correctness of what he is to do, but should not cause confusion or doubt. Matters of scientific controversy or research interest may be introduced for variety and stimulation, but, as much in diving medicine is not fully understood even by experts, the goal should be standardized and orthodoxy at the medic or paramedic level. Where the instructor has developed strong personal preferences or practices, they should point this out and present other viewpoints, when appropriate.

In organizing and scheduling the course, instructors should keep these learning goals in mind regarding the objectives and be flexible enough to satisfy the needs of each class. After the period of instruction and rigorous, balanced, examination process, the student should satisfy the instructor staff that they understand the following:

1. Role of the Medic

- a. similarities and differences compared to non-diving
- b. record keeping
- c. relationship to diving physicians and others in the medical support system

2. Medical/Fitness to Dive

- a. baseline, pre- and post-dive exams
- b. disqualifying conditions, temporary and permanent

3. Decompression Sickness

- a. possible predisposing conditions, concept of susceptibility to an environmentally-caused disease
- b. physiologic events leading to DCS, initial and later phases of DCS, hematologic and other effects of tissue and intravascular bubbles
- c. common and unusual signs and symptoms of DCS, mild (Type I) and serious (Type II) DCS, major forms of DCS (skin, vestibular, joint, CNS, pulmonary, saturation)
- d. the test of pressure and its proper use in approaching the uncertain case of DCS
- e. concept of treatment table as a treatment or medication (ie, a dose); tables USN 5, USN 6, USN 6-A, USN 9, Comex 30 and 30-A, saturation tables; usual application of the treatment tables; follow-up after treatment
- f. the role of drugs and fluids

4. Barotrauma

- a. anatomy and physiology of the air-containing spaces, mechanism of squeeze and pulmonary over-inflation (air embolism, pneumothorax, mediastinal emphysema, subcutaneous emphysema)
- b. the principle signs and symptoms of squeeze and overpressure injuries and distinguishing features between them
- c. routine and emergency management of squeeze and over-pressure, understanding of pneumothorax and tension pneumothorax

5. Oxygen Toxicity

- a. simple concepts of causes of oxygen toxicity, signs and symptoms of CNS and pulmonary toxicity, usual CNS and pulmonary oxygen limits
- b. understanding the difference between oxygen percentage and oxygen partial pressure

Skills Objective

The student should satisfy the instructor staff that they have mastered the following:

1. Physical Examinations

- a. an adequate emergency baseline assessment, obtain and evaluate vital signs, provide basic life support, properly use basic equipment such as pen light, stethoscope, blood pressure cuff, otoscope, tuning fork
- b. use of the otoscope in performing ear exams
- c. ability to keep adequate records of exams and treatments

2. Neurological Exams (student or instructor posing as patient)

- a. the ability to do an adequate field neuro exam covering; state of consciousness and
- b. intellectual functions, cranial nerves, sensory function, motor function, and balance/coordination
- c. ability to do exam inside and outside chamber and as follow-up during and after treatment

3. Sham Treatments (student or instructor posing as accident victim)

- a. ability to elicit symptoms of simulated DCS or barotrauma case
- b. ability to identify signs of same
- c. ability to use medical kit and equipment properly, at surface and in chamber
- d. ability to function effectively while in chamber
- e. ability to formulate and conduct a basic treatment plan
- f. ability to keep adequate records and make accurate reports to a diving physician or other appropriate authority
- g. ability to recognize and manage simulated symptoms of toxicity

4. Essential Invasive Skills

- See Appendix 1

Chamber Operations Module

The usual role of a DMT is to attend to the medical needs of the injured diver. Therefore, the primary goal of DMT training is provision of emergency medical care in and outside the chamber; there is no primary intent to make the medic an expert on chamber operations

Since chambers in many areas are thinly staffed, perhaps by persons of limited competence, the major goal of the Chamber Operations Module is to enable the DMT to see to the safety of himself and his patient while in the chamber. Secondly, the medic is taught the rudiments of chamber operations, time-keeping, dive recording, pre- and post-dive checklists, and the conduct of a chamber treatment

A Sample Course Schedule is not given, as additional available time required will vary. Much of chamber operations training can be incorporated into the Medical Module (e.g. oxygen analyzers with oxygen toxicity, chamber ventilation with sham treatments) and a few hours of lecture will suffice for the remainder. As with Diving Medicine, much will probably depend on the individual instructor staff and the needs of each class

Knowledge Objectives

The student should be able to demonstrate clear understanding of the following:

1. Chamber Safety

- a. the main codes and standards relating to chamber operations, safe handling of gases used in diving, and sources of information

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- b. the factors necessary for occurrence of chamber fires, extreme hazard of chamber fires, oxygen percentage versus oxygen partial pressure, various ignition sources, flammability of ordinary materials in chambers, zone of combustion, need for proper clothing and oil-free environment
 - c. the role of electrical systems as possible sources of fire, electrical failure as threat to safe operation of chamber
 - d. the various ways fire can be extinguished
 - e. the methods for maintaining safe levels of oxygen and carbon dioxide, ventilation requirements, use of BIBS, use of analyzers, dangers and sources of carbon monoxide
 - f. the need to protect ears from high noise levels, safe use of medical equipment in chamber, avoiding injury to medic and patient
 - g. the function of carbon dioxide scrubbers, avoidance of caustic injury

2. Chambers

- a. the main general types of chambers and main uses for each
- b. the basics of chamber construction, basic terminology of chamber operations
- c. an understanding of gas requirements for typical treatments, backup supplies, emergency procedures for supply failure; definition of treatment and emergency gases

3. Pre-Dive Checklist

- a. prepare a basic checklist and show how each item relates to the safe operation of the chamber

4. Post-Dive Checklist

- a. the essential steps necessary to ensure the chamber is left ready for safe use, properly equipped and supplied

5. Chamber

- a. the ability to perform the essential functions of chamber operation and conduct a simulated treatment under supervision

Appendix I

Essential Invasive Skills (*Required for DMT certification*)

1. Intravenous access
 - b. Fluid infusions
 - c. Drug administration
 - d. Blood draws
2. Intramuscular injection
3. Subcutaneous injection
4. Insertion of urinary catheter
5. Insertion of nasogastric/orogastric tube
6. Manual or battery powered oropharynx/orogastric suction
7. Airway control; one or more of the following:
 - a. Laryngeal mask airway
 - b. Pharyngeal-tracheal lumen
 - c. Endotracheal intubation
 - d. Needle cricothyroidotomy
8. Chest decompression capability; one or both of the following:
 - a. Pneumothorax needle
 - b. Chest tube
9. Basic Life Support

Valuable Optional Skills (*Not required for DMT certification*)

1. Use of the 'Easy IO Drill'
2. Simple suture repairs or alternate of wound closure option, e.g.,
 - a. Dermagel / Dermabond
 - b. Quickclot
 - c. Celox gauze
3. Splinting of simple dislocations and fractures
4. Advanced Cardiac Life Support
5. CO2 scrubber installation for chamber under pressure
6. **Operation of a CO2 analyzer**