EDUCATIONAL AND TRAINING STANDARDS FOR THE STAFF OF HYPERBARIC MEDICAL CENTRES

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for the
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FOREWORD

These educational and training standards are the result of some years of international discussion which began prior the 1st European Consensus Conference on Hyperbaric Medicine, Lille, in September 1994 where one session was devoted to "Personnel education and training policies". A comprehensive paper and the subsequent debate defined the 5 different personnel categories ideally involved in the staff of a Centre of Hyperbaric Medicine.

A working group being formed to define the requirements for medical doctors in the fields of diving and hyperbaric medicine. An important feature of this project was the collaboration between the European Committee for Hyperbaric Medicine (ECHM), which is primarily a medical committee, and the European Diving Technology Committee (EDTC) which is a 15-nation committee with not only government, industry and trades union representatives but also with a doctor nominated from each member country. This joint subcommission was formed by J. Desola (Spain), D.Elliott (United Kingdom), P. Longobardi/ P. Pelaia (Italy), F. Wattel (France), and J. Wendling (Switzerland). It was chaired by J.Desola on behalf of the ECHM and J.Wendling by the EDTC.

The Goal-setting Principles for Harmonised diving Standards in Europe was published by the EDTC in 1997 and includes a section on the "Qualifications, education and training of medical doctors"(appendix 2).

The work presented here has been done by the Joint Medical Subcommittee of these two main committees and, from time to time, reports by this Subcommittee have been submitted to and approved by each of the two parent bodies.

It is the purpose of this paper to summarise what has been accomplished and to look at the future tasks of a Joint Medical Subcommittee of the ECHM & EDTC.

INTRODUCTION

A Hyperbaric Centre must guarantee the best use of its equipment, and services.
Depending on the kind of facility and of the final aim of its services, the Hyperbaric Centre can function on a continuous (24 hours a day) basis or intermittently, during periods of time scheduled in advance.
Depending on its technical availability's, the location, and the available medical services, the Hyperbaric Centre can be a hospital facility, or an open self standing Centre.
A hospital Hyperbaric Centre must guarantee its assistance 24 hours a day, and must be able to offer adequate treatment for all kinds of diseases, including those requiring critical care inside the Chamber.
A self standing Hyperbaric Centre might have a certain work schedule, and must limit its services to those patients not in emergency situation. It must be in functional relation or contact with a general hospital.
In cases that a transportable hyperbaric chamber is used, the schedules, profiles, staff and regulations will be the same of a self standing centre.
Staff requirements affecting these types of facilities should agree with the aforementioned conditions of availability and system of work.
This work aims to review the kind of staff needed by the Hyperbaric Centre, to define their behaviour and giving some general rules to be applied in each situation, depending on the conditions of each Centre. In the final items, the minimal personal requirements of a Hyperbaric Centre will be mentioned.
In order to develop its functions correctly, a hyperbaric Centre needs different professional qualifications. These could be summarised as follows:

1) The Medical Director and Physicians/Medical Doctors
2) Nurses
3) Attendants
4) Chamber Operators
5) Technicians
6) Others

Characteristics, functions and background which should be followed by the whole staff will be reviewed. In each category the following items will be detailed:

A) Definition of functions
B) Background
C) Specific educational profile
D) Academic requirements and degrees
E) Continuous Education
F) Dedication

1 – THE MEDICAL DIRECTOR
THE PHYSICIANS / MEDICAL DOCTORS

A) Functions.

The Medical Director is responsible for all functions developed in the Hyperbaric Centre. This includes the following aspects.

1. Supervision of the correct operation of the hyperbaric facilities.
2. Medical care to the patients inside the Chamber, if a multiplace facility is used and whenever it might be necessary, due to reasons of critical care depending on the severity of the case, or special controls during therapeutical procedures.
3. Quality assurance.
4. Follow up of patients.
5. Definition of protocol procedures for treatment.
6. Organisation and participation in multicentric over all protocols and treatments.

The functions of the main Medical Director are complemented by a variable number of collaborators of the same or similar background and education, in which the Medical Director can delegate some responsibilities, but always under his control.

One or two people will not be enough to guarantee a 24 hours a day service, as the long stays inside the Chamber (when a multiplace facility is used) that they must often endure, renders them incapable of further decompressions in the following hours. A whole hyperbaric medical staff working in shifts would therefore be necessary.

B) Background.

The Medical Director is a Medical Doctor with a wide multidisciplinary education. Internal Medicine, Critical Care and/or Intensive Medicine, Reanimation and Anaesthesiology, can provide the best background.

Other specialisation might also be adequate, if the candidate has documented experience and he has received the necessary education and training in Hyperbaric Medicine.

Sport or commercial diving can give to the Medical Director a great deal of additional knowledge. This also provides awareness of the whole problem concerning this specialisation and it can add some complementary knowledge on diving and hyperbaric technology and practice. However this actual diving experience will not be required for the recognition of the Medical Director.

C) Educational profile.

The Medical Director should have followed a full Medical Educational Multidisciplinary Programme, in different fields of Medicine. A Medical Doctorate in Medicine is the basis. The medical education must be completed with Postgraduate courses in both Diving and Hyperbaric Medicine, preferably followed in University Departments.

D) Academic requirements and degrees.
The Medical Director, like all the medical staff in a Hyperbaric Centre, will be subjected to all regulations of WORK UNDER PRESSURE established by the European Community.
Even if Medical Directors have received a good self-trained education, they need a specific titulation degree, in order to avoid legal problems concerning the possible responsibilities deriving from the practice.

Definition of jobs
The training objectives of each job need to be defined in relation to the competencies that are expected from the incumbent. A number of the jobs in diving and hyperbaric medicine have tasks and objectives in common and so it is possible to optimise the efficiency of the educational program and avoid too much overlap by adopting a modular structure.

I. The Medical examiner of divers

- Competent physician to perform the periodic "Fitness to dive assessments" of working and recreational divers and compressed air workers, except the initial assessment of novice professional divers.

IIa. The Diving medicine physician

- Competent to perform the initial and all other assessments of working and recreational divers or compressed air workers.
- Can manage diving accidents and advise diving contractors and others on diving medicine and physiology* (with the back-up of a hyperbaric expert or consultant).
- Should have knowledge in relevant aspects of occupational health. (He or she does not need to be certified specialist in occupational medicine to be in accordance with the standards).

IIb. The Hyperbaric oxygen physician

- Responsible for HBO sessions at the treatment site (with backup of a hyperbaric expert or consultant)
- Should have appropriate experience in anaesthesia and intensive care in order to manage the HBO patients (he or she does not need to be certified specialist in anaesthesia to be in accordance with the standards)
- Competent to assess and manage clinical patients for HBO treatment

III. The Hyperbaric expert or consultant (hyperbaric and diving medicine)

- Competent as chief of a hyperbaric facility (HBO centre) and/or to manage the medical and physiological aspects of complex diving activities[1].
- Competent to manage research programs.
- Competent to supervise his team (HBO doctors and personnel, health professionals and others).

[1] optional additional qualification for bell diving (saturation, mostly off-shore)

- Competent to teach relevant aspects of hyperbaric medicine and physiology to all members of staff.

IV. The Associated specialists

This title is not a job qualification, but rather a function. It covers experts, consultants and specialists of other clinical specialities who can be nominated as competent to advise within their own speciality upon specific problems in the diving and hyperbaric field.

Contents of the Modules

Levels of competence:
a - basic
b - need to know
c - must be expert

Modules of formation and subjects

	Jobs:	I	IIa	IIb	III
1	**Physiology & pathology of diving and hyperbaric exposure:**				
1	Hyperbaric physics	**b**	**c**	**c**	**c**
2	Diving related physiology I (functional anatomy, respiration, hearing and equilibrium control, thermoregulation)	**b**	**c**	**b**	**c**
3	Hyperbaric pathophysiology (Immersion effect, blackout mechanism incl apnoea, psychology, working performance/endurance under water)	**b**	**c**	**a**	**c**
4	Hyperbaric pathophysiology (decompression theories, bubbles)	**b**	**c**	**b**	**c**
5	acute Dysbaric disorders, DCI (Barotrauma, DCS)	**b**	**c**	**b**	**c**
6	chronical Dysbaric disorders (Long term effects)	**b**	**c**	**a**	**b/c**
7	HBO-Basics (effects of hyperbaric oxygen)	**-**	**b**	**c**	**c**
8	O2 Intoxication	**a**	**c**	**c**	**c**
9	Inert gas-effects (Narcosis/HPNS)	**a**	**c**	**a**	**c**
10	medicaments under pressure	**b**	**c**	**c**	**c**
11	non-dysbaric diving pathologies (Hypothermia, near drowning, fauna&flora effects, injuries and accidents in water, the sick diver)	**a**	**c**	**-**	**c**
12	diving fatalities	**a**	**a**	**-**	**b/c**
2	**Diving technology and safety:**				
1	diving procedures (Bell diving)	**b**[1]	**b**[1]	**-**	**a /c**
2	Diving procedures (SCUBA, surface supplied, bell, TUP, SURD, 02-Deco, mixed gas diving	**b**	**c**	**a**	**a/ c**
3	Divers (Recreational SCUBA diving, technical and deep diving, Apnoea-diving, professional diving: offshore, inshore, scientific, media, recreational diving instructor, Caissonwork, astronauts)	**b**	**b**	**a**	**a/c**
4	Diving gear (SCUBA, SSUBA, mixed gas, rebreathers, monitoring equipment, working tools, suits)	**b**	**b**	**a**	**a/c**
5	Diving tables and computers (incl altitude and interval)	**b**	**b**	**b**	**a/c**

[1] as required

6	Regulations and standards for diving	**b**	**b**	**-**	**a/c**
7	Safety planning / management (monitoring)	**b**	**b**	**-**	**a/c**
3	**Fitness to dive**				
1	Fitness to dive criteria and contraindications (for divers, tunnel workers and HBOT patients and chamber personnel)	**c**	**c**	**c**	**c**
2	Fitness to dive assessment (diagnostics)	**c**	**c**	**c**	**c**
3	Fitness to dive standards and regulations (prof and recreational d.)	**c**	**c**	**b**	**c**
4	**Diving accidents:**				
1	Diving accidents / incidents (assessment and preclinical treatment incl. ORL, barotraumas, CPR)	**a**	**c**	**a**	**c**
2	Diving accident management clinical (Diagnostics, patient care, follow-up)	**-**	**c**	**c**	**c**
3	Diving accident management: Differential diagnosis	**a**	**c**	**c**	**c**
4	HBO-T for diving accidents (Tables and strategies)	**a**	**c**	**c**	**c**
5	Rehabilitation of disabled divers	**-**	**a**	**a**	**b/c**
5	**Clinical HBO:**				
1	Chamber technique (multiplace, monoplace, transport chambers, wet recompression)	**-**	**b**	**c**	**c**
2	HBO: Mandatory Indications	**-**	**a**	**c**	**c**
3	HBO: Recommended Indications	**-**	**-**	**c**	**c**
4	HBO: experimental and anecdotal Indications	**-**	**-**	**b**	**c**
5	Data collection / statistics / evaluation	**-**	**b**	**b**	**c**
6	general basic treatment (nursing)	**-**	**b**	**c**	**c**
7	Diagnostic, monitoring and therapeutical devices in Chambers	**-**	**c**	**c**	**c**
8	Risk assessment, incidents monitoring and safety plan in HBO-Chambers	**-**	**b**	**c**	**c**
9	Safety regulations	-	**c**	**c**	**c**
6	**Diverse:**				
1	Research standards	**-**	**a**	**a**	**c**
2	Paramedics teaching program	**-**	**b**	**a**	**c**
3	Management /Organisation of HBO facility	**-**	**a**	**a**	**c**
7	**Practical training:**				
1	Fitness for chamber-dive test (of the course participants)	**-**	**+**	**+**	**+**
2	CPR	**-**	**+**	**+**	**+**
3	Practice in field first aid (diving accidents)	**-**	**+**	**-**	**+**
4	Practical training FTD exam (skills)	**+**	**+**	**+**	**+**
5	Demo : professional diving	**+**	**+**	**-**	**+**

6	Demo : HBO-T	-	+	+	+
7	Introduction to (wet)-Diving	(+)[2]	+[4]	-	+
8	Practice in HBO-T (including pressure test)	-	+	+	+
9	Practice in attendants teaching	-	+[3]	-	+

Standards for course organisation and certification

Teaching courses

In order to comply with this EDTC/ECHM standard the person responsible for the professional contents of the course must be a hyperbaric medical expert or consultant (job type III)

1. The course curriculum should be declared as being ”in conformity with the ECHM/EDTC standards” and the educational objective (jobs I and IIa, IIb) stated.
2. The course organisers are invited to send a copy of the curriculum to the joint medical subcommittee of ECHM/EDTC (through the national co-ordinator).
3. The final tests for individual evaluation are mandatory, and should cover all the taught subjects (see list) at the level of competence required for each subject.

The standards do not prescribe the status of the teaching institution but it is strongly recommended that courses are university based, are approved for such training courses by national health authorities, speciality training boards or are under the auspices of the national scientific society for diving medicine and/or hyperbaric medicine.

How a course is to be organised is not prescribed in these standards. Evenings, week-ends or full weeks are possible. For clinical teaching, an internship or residency may be appropriate. The acknowledgement of a high teaching standard is based on a credible final test of the candidates.

Modules and course organisation

The actual organisation and conduct of the modules will be influenced by local factors and so it is proposed that these details can be decided on a national basis and probably left to the individual course directors. The following proposal indicates the total teaching hours considered necessary to achieve appropriate competencies in the following jobs.

[2] recommended
[4] exceptions possible, if important reasons of unfitness to dive
[3] as required

I	Medical examiner of divers	25 lecture hours + 3 hours practical
IIa	Diving medicine physician	The above + 30 additional lectures + 10 hours practical
IIb	Hyperbaric medicine physician	60 hours + a practical phase (5 different types of clinical cases with different indications for treatment)
III	Diving and hyperbaric medicine expert or consultant	This needs further review (see below)

The proposal serves as a guideline and is not mandatory. When one of these teaching programmes includes topics covered elsewhere a reduction in the number of lecture hours may be justifiable.

Recognition of an expert

The experience needed to become an expert cannot be learned from a course. The essentials have already been described in general terms. The candidate should already be an accredited specialist or equivalent.

Except in those countries where some equivalent or higher standards already exist, those who wish to be acknowledged as experts or consultants in the fields of diving and hyperbaric medicine should send their curriculum to their national co-ordinator (representing the Joint Medical Subcommittee or to that subcommittee itself if that nation has no co-ordinator) who may decide on the basis of the agreed standards. The Joint Medical Subcommittee will be informed by the national co-ordinator and can issue a list of experts if required. In the future the verification of achieved qualifications will be done by a national health authority or a scientific body (EU legislation). The aim is to achieve a recognition of the standards by those so that they automatically could take over the role of the national co-ordinator.

E) Continuous Medical Education (Quality Control and Competency).

The Medical Director should undertake a periodic Continuous Education programme, about the main aspects of Underwater and Hyperbaric Medicine. Participation in Courses, Workshops and Conferences organised by International Societies well-known in this field, such as the European and Baromedical Society (EUBS), the Foundation for the International Congress on Hyperbaric Medicine, the Undersea & Hyperbaric Medical Society (UHMS), or other courses approved or reviewed by the ECHM, could also be adequate.

Professional ethics and medical deontology oblige all Medical Directors to communicate their observations and improvements in the different fields of Diving and Hyperbaric Medicine to their colleagues of the international scientific community. In addition, the Medical Director must take advantage of the experiences of his international colleagues, and must take part in the wide-spread studies that might be performed.

The highest qualified Hyperbaric Centres should organise Courses, Workshops and periodical activities aiming to improve the education of specialised staff at all levels.

In most countries, the conditions for maintaining the active status of an individual are defined by some system of continuous medical education credit points (CME, as introduced in the USA some time ago). The ECHM & EDTC need to define the minimum requirement for this in a flexible way that provides enough freedom for the national bodies to establish a more detailed system. It is expected that these national requirements will be compatible with this guidance.

The following procedure is proposed:

Job I:
A minimal activity of 10 medical assessments of divers fitness per year is needed plus attendance at one refresher course (usually 2-days) in two years. Reactivation after a lapse needs participation in two 2-day refresher courses or a repeat of the full basic course.

Job IIa:
Continuing experience in the field of professional diving (e.g. advising a professional diving contractor or some equivalent activity) and participation in a course or congress previously approved by the national co-ordinator. Reactivation after a lapse should be on the basis of a specifically approved course. Where this cannot be achieved, the candidate should submit an alternative training programme to the national co-ordinator for approval.

Job IIb:
Active employment in an HBO facility (or equivalent activity) and attendance at one national and/or international congress on hyperbaric medicine per year. Reactivation after a lapse needs a 10 working days in a HBO facility and attendance at two congresses in two years.

Job III:
Will rely on the decision of the national co-ordinator

The refresher seminars can serve to update the participants in order to confirm their active status and to reactivate those who temporarily have not maintained their required activity. They can also serve as an introduction to doctors of other specialities who may also gain CME credits in their own specialities. This not only can help the financing of a course but can be a chance for promoting HBO to those who would not attend the HBO scientific congresses.

F) Dedication.

All Hyperbaric Centres should have a permanent Medical Director, with partial or full-time dedication depending on the characteristics of each Centre, complemented by a variable number of collaborators of the same or similar background and education. Hospital centre treating patients in situation of emergency will probably need more than three medical doctors.

2 – NURSES

A) Functions.

As in all fields of Medicine, nurses complete medical treatment and they are responsible for the practical implementation of patient treatment.

The Hyperbaric Nurses perform the usual functions of their profession with some variations due to the characteristics of the hyperbaric activity :

1. Nursing measures belonging to the common pathologies of the Hyperbaric Therapeutics to be applied to the patients in a self standing chamber.
2. Nursing assistance of patients inside the hyperbaric chamber, taking special care of the specific conditions of the hyperbaric environment.
3. Adaptation of conventional medical techniques and specific treatments of each illness to the hyperbaric environment, so the other treatments that the patient is habitually receiving have not to be interrupted while in the chamber.
4. In some cases, operating the external controls of a Monoplace Hyperbaric chamber according to the compression and decompression schedules established.

B) Background.

The Hyperbaric Nurse must have the corresponding degree of her profession. Specific education in Critical Care Nursing will be very useful. Knowledge of other specialisation like angiology, traumatology, and wound care will also be appropriate.

Special courses on Diving and Hyperbaric Medicine are essential.

The nurse may receive the necessary training in the same institution from the Medical Director.

C) Specific educational profile.

Hyperbaric Nurses should also receive a complementary education, according to their professional level, in the following matters:

1. General principles of Decompression Theory, Diving Technique, and Pneumatics.
2. Hyperbaric Technique.
3. Safety and preventive measures.
4. Operation of monoplace hyperbaric chambers.
5. Intensive critical care of patients.
6. Other aspects inherent in both Diving and Hyperbaric Medicine, concerning her profession.

D) Academic requirements and degrees.

A basic education and a nursing degree will be required.

Special courses for hyperbaric nurses are highly recommended but they will not be strictly required.

The hyperbaric nurse will be subjected to the regulations on WORK UNDER PRESSURE established by the European Community.

E) Continuous Education.

As in all fields of Health and Medicine, Hyperbaric Nurses must complete and continue their education by reading specialised texts, and attending Courses and Congresses. Their affiliation to specialised professional societies, such as the Nurses Baromedical Association or to other entities that might be created, would be of the greatest interest.

F) Dedication.

All hospital based Hyperbaric Centres should have a permanent team of Nurses, with partial or full-time dedication depending on the needs of each Centre.

One or two people will not be enough to guarantee a 24 hours a day service, as the long stays inside the Chamber that they must often endure (when a multiplace facility is used) renders them incapable of decompressions in the following hours. A whole team of hyperbaric nurses working in shifts would therefore be necessary.

3 – ATTENDANTS

A) Functions.

Patients inside a multiplace chamber need always to be under the control and supervision of trained personnel. Critical patients will always be joined by a doctor, a nurse, or both.

Other patients however do not need such kind of direct and special medical and nursing assistance, and in those cases the participation of a type of staff, specially trained, although not necessarily highly qualified may be adequate.

These are some of the activities attributed to attendants:

1. Patient care in non invasive, non-specialised medical activities inside and outside the chamber.
2. Accompanying patients who are receiving treatment inside the Multiplace Chamber, but who do not need special assistance by doctors and nurses, but only by way of support, control, and to give them confidence.
3. Other activities to develop inside or outside the Chamber, indicated by the Medical Director or the Nurse.

If monoplace chambers are used, the majority of these activities may be adopted by doctors and/or hyperbaric specialists and nurses.

B) Background.

Attendants can come from different professions regarding Underwater and Hyperbaric Medicine, such as:

1. Sport or commercial divers.
2. Health auxiliaries, medical students, paramedics, or assistants.
3. Other professions preferably although not necessarily health/related.

Items **1** and **2** are the most adequate conditions or origins for working as an attendant. However, these degrees should not be necessarily requested.

Their education and training may be accomplished in the same hyperbaric institution.

C) Specific educational profile.

At a level according to their capacity, previous experience and kind of work, Attendants should be instructed in the following aspects:

1. General principles of Medicine and Therapeutics.
2. Medical First Aid.
3. General principles of Diving and Hyperbaric Medicine.

Their basic education may be received in the same institution from a hyperbaric specialist and/or doctors and nurses.

As a result of this non-specific education programme, the Attendants should meet the following requisites.

a) To feel comfortable in the hyperbaric environment.
b) Excellent practice with hyperbaric techniques and necessary manoeuvres for adapting patients to the pressure.
c) Sufficient knowledge of the main non invasive medical instruments generally used under pressure.
d) Capacity to interpret, but not to operate, the meaning of the control instruments placed inside the Hyperbaric Chamber. They must also be familiar with the pressure and control devices.
e) To give First Aid care in the case of an emergency.

D) Academic requirements and degrees.

There is no specific degree providing the requirements of an Attendant. Some entities organise educational courses adapted to this activity. However only a course on Medical First Aid should be strictly required.

The Attendants will be subjected to the regulations of WORK UNDER PRESSURE established by the European Community.

E) Continuous Education.

The Attendants will be informed in the same Institution, about any news on Underwater and Hyperbaric Medicine and Technique which could affect their activity. Their attendance at activities in the field of Diving and Hyperbaric Medicine should be encouraged.

F) Dedication.

All hospital and self standing Hyperbaric Centres using multiplace hyperbaric chambers should have a permanent team of Attendants, with partial or full-time dedication depending on the needs of each Centre. One or two people will not be enough to guarantee a 24 hours/day service, as the long stays inside the Chamber that they must often endure (if a multiplace facility is used) renders them incapable of further decompressions in the following hours.

If monoplace chambers are used, the attendants may not be necessary since all their functions are done externally by nurses and doctors and/or hyperbaric specialists.

4 - CHAMBER OPERATORS

A) Functions.

A Hyperbaric Facility may achieve a high level of sophistication that will require specialised attention and care.

The Hyperbaric Chamber itself, the air-compressors, other pressurised gas sources, or the gas reserves, have some special devices whose manipulation might be very complex.

Monoplace chambers are handled sometimes by nurses and doctors and/or Hyperbaric specialists.

When multiplace chambers are used, the Hyperbaric Centre must have qualified personnel to manage the hyperbaric facilities. These functions must be preferably carried out by specialised chamber Operators.

The functions of the Chamber Operator of a Multiplace facility will be:

1. Operation of the internal and external devices of the Chamber.
2. Control and operation of the mechanisms for compression and decompression, and for delivering gas mixtures and oxygen.
3. Control and application of the safety regulations concerning prevention of fire, and oxygen toxicity.
4. Calculation, application and control of compression and decompression schedules for patients, Specialists and/or Doctors, Nurses and Attendants, applying decompression stops, when necessary.
5. Sometimes, interventions inside the Chamber under pressure, in order to control or check the correct operation of determined parts of the pneumatic circuits or devices.

6. Adaptation and checking of the medical instruments carried by the patients before being introduced into the Chamber, in order to assure their correct operation, and to avoid dangerous or undesirable effects.
7. Control and checking of the operation of auxiliary facilities of the Chamber: air-compressors, sources of compressed air or medical gases, air reserves, pneumatic circuits, control systems.
8. Maintenance of the facility. Small repair jobs or technical interventions due to problems which occasionally might occur, and which do not require the intervention of highly specialised technical staff.

B) Background.

Hyperbaric Operators usually come from a commercial diving environment, where often received specialised training. This is not indispensable and Operators can come from other areas.

Despite the fact that they come from a non-health-related profession, they will need to learn elemental principles of health since they will be in contact with patients.

Some paramedical professions and health-related activities common in hospitals, may provide a good basis from which the candidate may be trained by the same institution to become a chamber Operator.

C) Specific educational profile.

Whatever their previous experience might be, the Hyperbaric Operator need good knowledge in the following subjects:

1. General Pneumatics.
2. General Mechanics and Electromechanics.
3. Decompression Theory. Decompression schedules.
4. Diving and Hyperbaric Technology.
5. Medical First Aid
6. General principles of Medicine, and Medical Therapeutics.

Courses on Diving and Hyperbaric Medicine for auxiliary staff, will provide good training in all these matters.

D) Academic requirements and degrees.

Some diving centres, off-shore facilities, and other specialised entities, result in some countries in specific degrees adapted to the activity of a chamber Operator. However, this condition should not be regarded as indispensable until the European Community establishes a specific degree for chamber Operators.

A Degree in professional diving with a specialisation in hyperbaric systems and facilities will be adequate.

A technical speciality degree in pneumatic systems, or similar titulation, would be of great benefit although it is not absolutely indispensable.

The Chamber Operators will be subjected to the regulations of WORK UNDER PRESSURE established by the European Community.

E) Continuous Education.

Hyperbaric Operators will need to receive Continuous Education according to the advances in the field of hyperbaric technology and also in decompression theory. They must be regularly updated on the main aspects of the diseases that will be treated in the chamber.

For this reason, his periodical contact with other specialised Centres is highly recommended.

F) Dedication.

Since Chamber Operators are in charge of the operation of the Multiplace Hyperbaric Chamber, their presence is absolutely essential in all hospital or self standing Multiplace Hyperbaric Centres.

A permanent Chamber Operator, with partial or full-time dedication depending on the needs of each Centre, will therefore be needed.

In monoplace facilities, their services are also appreciated, but their functions can be also attributed to other types of trained personnel.

5 – TECHNICIANS

A) Functions.

The Hyperbaric Centre needs employ to specialised technical staff, whose functions will be the checking and control of the chamber, pneumatic circuits, gas or compressed air reserves, air-compressors and the rest of the technical parts of the facility.

B) Background.

The Hyperbaric Technician must have a high level of knowledge in high, middle and low pressure pneumatics. They should also possess a deep knowledge of diving and hyperbaric technology. Some experience in the field of medical technology would be very suitable.

Some Chamber operators can also be technicians.

C) Specific educational profile.

In some areas, real specialists in diving systems or hyperbaric facilities will probably be very difficult to find. In many cases, a high pressure Technician and some of the technical staff of a Hospital will quite easily be able to adapt his knowledge receiving some additional instruction on pneumatics and high pressure.

D) Academic requirements and degrees.

The Hyperbaric Technician must have either an official degree with speciality in Pneumatic Systems, or an official specific degree in Hyperbaric technology, in the countries where these degrees exist. This activity should not be entrusted to persons or firms which, although experienced, might not be in a legal condition to give warranties, and cover responsibilities in case of a possible disfunction, emergency, or even catastrophe.

E) Continuous Education.

The Hyperbaric Technician, being a high level Specialist, must always be aware of the latest technological advances and new changes which might occur in his sector, in order to use the most adequate systems.

F) Dedication.

Depending on the amount of work and of the technical characteristics of each Hyperbaric Centre, maintenance of the facilities might be performed by full-time Hyperbaric Technicians or by subcontracted specialised firms or enterprises. Both conditions are equally acceptable.

6 - **OTHER STAFF**

Many other professionals with different qualifications may and should be engaged with a Hyperbaric Medical Centre, depending on the special characteristics of each and the hospital or institution where it is situated. Some of them are listed below.

1. Administrative
2. Statisticians
3. Rehabilitation
4. Fire specialists
5. Engineers
6. Others

Since the activities of these professionals do not adopt special characteristics or modifications by being carried out in a hyperbaric centre, and as their duties will be similar to their usual jobs, their functions, background, requirements, and dedication will not be detailed in this document. All these conditions will be developed as in other places or jobs.

7 - **ACREDITATIONS AND CREDENTIALS**

The ECHM will create a Subcommittee for specialist assessment or accreditation, that will establish a credential document as explained in the aforementioned criteria in section **1** of this document.

The selection and guarantee process will be established by the Subcommittee in a separate document, in which the following items will be specified:

1. Educational criteria.
2. Procedure for obtaining the credential.
3. Usefulness and validity of the credential.

In the meantime, lacking specific degrees in Underwater and Hyperbaric Medicine, the aforementioned credential will be the guarantee for a Hyperbaric Specialist.

8 - MINIMAL REQUIREMENTS

The aforementioned staff may be adapted to each facility according their particular conditions. The number of persons integrating the full staff will be enough to provide in any case at least the following persons and professions for every session of hyperbaric treatment.

A) Multiplace chambers facility.
- 1 Medical Director
- 1-3 Physicians / Medical Doctors
- 1 Nurse
- 1 Chamber Operator

B) Monoplace chambers facility.
- 1 Medical Director
- 1 Nurse or attendant

The dedication and functions of each one will be developed as explained above. Other types of staff will be included optionally according to the special characteristics of each centre and their needs.

9.- THE JOINT MEDICAL SUBCOMMITTEE OF ECHM AND EDTC

This committee will operate on the basis of the tasks outlined above. The members are the two chairmen of the education and training subcommittee of the ECHM and of the medical subcommittee of the EDTC respectively. Further two to three members are nominated by the chairmen on the basis of their special competence and experience in one of the relevant topics. As the chairmen each represent a specific subcommittee, any major changes or decisions must be discussed within these subcommittees before going to the meetings of the EDTC or ECHM respectively.

Each country interested in educational courses recognised by EDTC/ECHM should be represented by a member who has been acknowledged by the national hyperbaric medicine authority (or of all such authorities if there are more than one such authority in a country). Normally this would be either the national member of ECHM or the national medical representative on the EDTC. If not the same individual, both could attend if appropriate.

The EDTC and ECHM representatives of each country should nominate a national co-ordinator of teaching programmes, who could be the joint subcommittee member himself or who could delegate for that purpose (for instance to the national health and safety authority or any representative scientific body covering all aspects of hyperbaric medicine). The national co-ordinator will have the duty to supervise the national programs, the certification procedures and the status of the course directors.

In order to enhance credibility of certification and to help those who do not yet have the experience necessary to establish a good validation system, the Joint Medical Subcommittee will create a pool of multiple choice questions with an evaluation grid, in the main European languages. This will be available for all members. Evaluation of the answers should be done by an international group nominated by the Joint Medical Subcommittee. This Subcommittee may also certify a national teaching syllabus or educational course if desired by its organisers, thus helping the national societies or other authorities in getting accepted by their governmental health and safety department or by their speciality boards.

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