

UEMS Training Requirements for Angiology and Vascular Medicine: European Standards of Postgraduate Medical Specialist Training (ETR Document)

Mariella Catalano, Pavel Poredos, Marianne Brodmann, Jean-Claude Wautrecht, Patrick Carpentier, Karel Roztocil, Sigrid Nikol, Evangelos P. Dimakakos, George Marakomichelakis, Zsolt Pecsvarady, Anita Carlizza, Aleksander Sieron, Aagata Stanek, Dan Olinic, Viera Stvrtinova, Matija Kozak, Stefan Agewall, Beatrice Amann-Vesti, Augusto Gallino, Patricia Fitzgerald, Mary-Paula Colgan

Division of Angiology and Vascular Medicine, Board of the Union Européenne des Médecins Spécialistes, Brussels, Belgium

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Preamble

The UEMS (Union Européenne des Médecins Spécialistes — European Union of Medical Specialists) is a non-governmental organization representing national associations of medical specialists at the European Level. With a current membership of 37 national associations and operating through 43 Specialist Sections and European Boards, the UEMS is committed to promote the free movement of medical specialists across Europe while ensuring the highest level of training, which will pave the way to the improvement of quality of care for the benefit of all European citizens. The UEMS areas of expertise notably encompass Continuing Medical Education, Post Graduate Training and Quality Assurance.

It is the UEMS' conviction that the quality of medical care and expertise is directly linked to the quality of training provided to the medical professionals. Therefore, the UEMS committed itself to contribute to the

improvement of medical training at the European level through the development of European Standards in the different medical disciplines. Regardless of where doctors are trained, they should have at least the same core competencies [1].

In 1994, the UEMS adopted its Charter on Post Graduate training aiming at providing the recommendations at European level for good medical training. Made up of six chapters, this Charter set the basis for the European approach in the field of Post Graduate Training. With five chapters being common to all specialties, this Charter included a sixth chapter which each Specialist Section was to complete according to the specific needs of their discipline.

More than 20 years after the introduction of this Charter, the UEMS Specialist Sections and European Boards have continued working on developing these European Standards in Medical training that reflects modern medical practice and current scientific findings.

Address for correspondence: Mariella Catalano, Division of Angiology and Vascular Medicine, Board of the Union Européenne des Médecins Spécialistes, and Angiology Unit, Vascular Disease Research Center, University of Milan, L. Sacco Hospital, via G.B. Grassi, 20157 Milan, Italy, e-mail: mariella.catalano@unimi.it

In doing so, the UEMS Specialist Sections and European Boards did not aim to supersede the National Authorities' competence in defining the content of postgraduate training in their own State but rather to complement these and ensure that high quality training is provided across Europe. At the European level, the legal mechanism ensuring the free movement of doctors through the recognition of their qualifications was established back in the 1970s by the European Union. Sectorial Directives were adopted and one Directive addressed specifically the issue of medical Training at the European level. However, in 2005, the European Commission proposed to the European Parliament and Council to have a unique legal framework for the recognition of the Professional Qualification to facilitate and improve the mobility of all workers throughout Europe. This Directive 2005/36/EC established the mechanism of automatic mutual recognition of for medical doctors according to training requirements within all Member States; this is based on the length of training in the Specialty and the title of qualification.

Given the long-standing experience of UEMS Specialist Sections and European Boards on the one hand and the European legal framework enabling Medical Specialists and Trainees to move from one country to another on the other hand, the UEMS is uniquely in position to provide specialty-based recommendations. The UEMS values professional competence as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reaction in daily practice for the bene of the individual and community being served" [1]. While professional activity is regulated by national law in EU Member States, it is the UEMS understanding that it has to comply with International treaties and UN declarations on Human Rights as well as the WMA International Code of Medical Ethics.

This document derives from Chapter 6 of the Training Charter and provides definitions of specialist competencies and procedures as well as how to document and assess them [2]. For the sake of transparency and coherence, it has been renamed as "Training Requirements for the Specialty of X". This document aims to provide the basic Training Requirements for each specialty and should be regularly updated by UEMS Specialist Sections and European Boards to and medical progress. The three-part structure of this documents the UEMS approach to have a coherent pragmatic document not

only for medical specialists but also for decision-makers at the National and European level interested in knowing more about medical specialist training.

Angiology/Vascular Medicine in Europe

Angiology/Vascular Medicine is the medical specialty dealing with vascular diseases (arterial, venous, lymphatic and microcirculatory diseases) and focuses on prevention, diagnosis, therapy and rehabilitation as well as research and education, to patients and the general population. Angiology and Vascular Medicine are synonyms in many countries.

In numerous countries (Austria, Czech Republic, Germany, Hungary, Poland, Slovakia, Slovenia, Switzerland) this specialty is recognized either as a primary specialty or following a common trunk. In other countries there are National Diplomas or Masters.

Therefore, at the moment Angiology/Vascular Medicine still does not reach the requirements for a primary specialty. In fact, the process required for the European Union to include A/VM as a specialty in the annex V first requires recognition in at least two-fifths of the Member States (article 25), by a "qualified" majority and submitted to the committee on of the European Commission. Secondly, to create a Specialist Section for A/VM within the UEMS, A/VM has to be recognized as an independent specialty by more than one third of the EU Member States and must also be registered in the Official Journal of the European Commission (Directive 205/36/EC). However, in most European countries Angiology exists in the NHS and these Centers are entrusted with the care of vascular patients in the medical area. There is expertise defined by this medical area to respond to the requests in demand from an increase in vascular diseases, the need for a prevention program also in terms of evolution of the diseases, both linked to the ageing population and the social burden of chronic disease.

Angiology/Vascular Medicine has extensive training background in Europe, with the EWGMA (European Working Group on Medical Angiology) and then as VAS (VAS — Vascular Independent Research and Education — European Organization, becoming VAS — Vascular Medicine and Angiology European Independent Foundation). Educational programs (European Master in Angiology/Vascular Medicine, European Fellowship in

Angiology/Vascular Medicine and EU Advanced Postgraduate Courses) [3] are offered with formal agreements thanks to the cooperation of VAS with European Universities and centers. Exchange and International collaboration are encouraged within these projects in close co-operation with UEMS.

Recognized in 2007 as a Division within the UEMS, it has produced a Chapter 6 that guided the evolution and in 2013, following the UEMS-CESMA indications, created, in collaboration with VAS, a European Board for the European Exam in Angiology/Vascular Medicine, to become one of the specialties that today offer a CESMA–UEMS European Exam in Angiology/Vascular Medicine to obtain the UEMS Diploma in Angiology/Vascular Medicine. The UEMS Division of A/VM has published the first Requirements for the Specialty [2], of which this document represents a further improvement and consolidation. The previous document remains valid, unless modified or covered herein.

I Training requirements for trainees

The ultimate goal of training is to provide the best quality for care, in accordance with the principles of equity for patients, citizens and for the specialists in the right to education.

Europe still has major differences in its training and the programs provided. The differences are even more profound for Angiology/Vascular Medicine [4].

It is crucial that the European population and patients have the same quality in medical care and prevention. This is only possible by providing high quality training programs, to European standards, offered by and validated centers and should be based on training, standard methods and with appropriate equipment independently from the wealth of the individual countries.

This also responds to the aims of harmonization coordinated by the UEMS.

I. Content of training and learning outcome

This Document statements of mission and outcomes must describe the competency-based training process to create a medical doctor able to undertake comprehensive up-to-date medical practice in Angiology/Vascular Medicine in a professional manner,

unsupervised and independently or within a team, in keeping with the needs of the health care system.

Appropriate innovation in the training process is encouraged to develop broader competencies than minimal requirements, and to constantly strive to improve patient care, ensuring that it is appropriate, effective, and respectful of human rights, dignity and equity in dealing with health problems and promotion of health. The training should prepare specialists for life-long, self-directed learning and readiness for continuing medical education and professional development.

I.1. Professionalism and autonomy

The training process must strengthen professionalism of the doctor. The training should foster professional autonomy to enable the doctor to act in the best interests of the patient and the public.

I.2. Training outcome

Competences, which must be achieved by trainees as a result of the training programs are described in the Curriculum. The extent of competence achieved by trainees should be used as feedback for program development.

I.3. Learning approaches

Postgraduate training must follow a systematic training programme, which describes both the general and specialist components of training. The training must be practice-based involving the personal participation of the trainee in the services and responsibilities of patient care activities in the training institutions (taking into consideration the national rules). The training program must encompass integrated practical and theoretical instruction.

Training programs include a defined curriculum to enable trainees to achieve the program's learning outcomes. The curriculum includes specific learning outcomes and a syllabus of knowledge, skills and professional attitudes and behavior.

Training must include considerable experience with patient care in appropriate clinical settings, involving trainees in the supervised delivery of service and providing regular formal educational sessions that cover topics of value and of interest to the trainee.

Trainees should also have opportunities for self-directed learning and to create a personal development plan.

1.4. Scientific methods

The trainee must achieve knowledge of the scientific basis and methods of Angiology/Vascular Medicine including understanding of research methodology, through exposure to a broad range of relevant clinical/practical experience in different settings, become familiar with evidence-based medicine and critical clinical decision-making.

The trainees should be involved in research projects. No-profit European collaborative projects that facilitate exchange of experience and expertise are recommended.

1.5. Training content

The training process must include extensive clinical work and relevant theory of the basic biomedical, clinical, behavioral and social sciences; clinical decision-making; communication skills, medical ethics, public health policy, medical jurisprudence and managerial disciplines required to demonstrate professional practice in the specialty.

1.5.1. Competencies required of the trainee

Specialists in Angiology/Vascular Medicine should possess a defined set of knowledge, skills, and assessments, aiming to offer the best quality of care to patients.

Specialists should take care of the patient in a holistic way, taking into account ethical indications, social situations, characteristics and individual needs of the patient along with their theoretical and practical expertise. The patients should be made fully aware of their situation and provided with the tools to improve it, be helped to follow their therapy to prevent the evolution of the disease and complications.

A/VM specialists should apply their competencies to stimulate and understand the information provided by the patient, make appropriate clinical choices also through diagnostic and therapeutic interventions.

Therefore it is necessary for the specialist to possess sound knowledge not only in the context of specific expertise, but also within the framework of the local Health Services and the services available. They should have knowledge on communication, on patient education, ability in problem-solving and team-working.

In addition to this, specific knowledge about:

1.5.1.1. Clinical conditions (pathophysiology, epidemiology, natural history, prognosis, clinical aspects, differential diagnosis, treatment):

1. Peripheral arterial diseases.
2. Deep venous thrombosis.
3. Superficial phlebitis.
4. Chronic venous insufficiency
 - a) varicose veins,
 - b) venous ulcers.
5. Cerebral vascular diseases.
6. Primary and secondary Raynaud phenomenon.
7. Microcirculatory disorders
 - a) other vasospastic disorders,
 - b) diabetic microangiopathy.
8. Buerger's disease.
9. Vasculitis.
10. Lymphedema.
11. Renal vascular diseases.
12. Mesenteric vascular diseases.
13. Aortic and other arterial aneurysms.
14. Arterial dissections.
15. Main risk factors, in particular:
 - a) HT,
 - b) dyslipidemia,
 - c) hypercoagulative states,
 - d) metabolic syndrome,
 - e) smoking.
16. Vascular malformations.
17. Vascular involvement in rare diseases.
18. Prevention.

1.5.1.2. Disease management:

- manage clinical, diagnostic and therapeutic protocols for vascular diseases,
- apply commonly used scoring systems for assessment of severity of illness/risk,
- evaluate each time the balance of the prescribed treatment report,
- manage the care of the critically ill vascular patient with acute medical condition,
- identify the implications of relevant chronic and co-morbid disease,
- identify and minimize risk of adverse events and complications,
- critically apply guidelines and protocols,
- identify and manage risk factors,

- interact with General Practitioners and organize patient's follow-up,
- organize and take part in patient education,
- take active part in preventive measures and promote safe life styles for patients and population,
- facilitate multidisciplinary collaboration.

1.5.1.3. Diagnosis:

- obtain a history and perform an accurate clinical examination,
- undertake timely and appropriate investigations,
- perform and interpret vascular ultrasound and other vascular and microvascular assessments,
- interpret clinical vascular imaging,
- define investigations for multi-organ localization also in collaboration with the other specialists,
- integrate clinical with instrumental and laboratory investigations,
- obtain appropriate microbiological samples and interprets results,
- stimulate interaction and collaboration with other bordering Specialists (Vascular Surgeons, Cardiologists, Neurologists, Nephrologists, Radiologists, Diabetologists, Dermatologists, etc.) in respect of each reciprocal competence.

1.5.1.4. Practical procedures:

- perform ultrasound assessment for peripheral arteries,
- perform ultrasound assessment for carotid and vertebral arteries,
- perform ultrasound assessment for deep and superficial veins,
- perform ultrasound assessment for abdominal arteries,
- perform Ankle Brachial Index, segmental pressures and Toe Index,
- perform walking distance (WD) evaluation and treadmill test,
- perform microcirculatory assessment (capillaroscopy, laser Doppler, pO₂/tcpCO₂ techniques),
- perform transcranial Doppler,
- describe indications for laboratory risk assessment,
- apply venous contentive bandages,
- give indications for treatment of venous ulcers,
- perform or indicate sclerotherapy for varicose veins,

- perform or indicate thermoablation for varicose veins,
- perform or indicate arterial interventional therapy,
- manage the assessment, prevention and treatment of pain and other distress,
- stimulate interdisciplinary approach to establish indications for vascular surgery, preoperative work-up, aftercare,
- basic medical intensive care, especially in pulmonary embolism, acute limb and visceral ischemia.

1.5.1.5. Professionalism:

- communicate effectively with patients and relatives,
- communicate effectively with members of the health care team,
- maintain accurate and legible records/documentation,
- involve patients in decisions about care and treatment,
- demonstrate respect of cultural and religious beliefs and an awareness of their impact on decision making,
- respect autonomy, privacy, dignity, confidentiality and legal constraints on the use of patient data,
- collaborate and consult; promote team-working,
- ensure continuity of care through effective handover of clinical information,
- take responsibility for safe patient care,
- formulate clinical decisions with respect for ethical and legal principles,
- seek learning opportunities and integrate new knowledge into clinical practice,
- maintain independence from economical interest.

2. Organization of training

2.1. Composition and duration of training

The European Core Curriculum could be considered for the basic content of the national training program. The Core Curriculum recommends 5 years of training and the direct participation in collaborative European research projects. Optimal training would be:

- at least 2 years of Common Medical Trunk training in Internal Medicine,
- 3 years' training in an accredited Angiology/Vascular Medicine Center.

The Core Curriculum foresees the training on all the aspects of competence in Angiology/Vascular Medicine and the minimum requirements for the main

skills. One additional year is requested for each of the further Additional Competencies/Curricula.

2.2. Curriculum of training

As usual, three Levels of Autonomy are foreseen: Level 1 (able to choose the procedure and interpret the results; no experience in performing the procedures; needs direct supervision); Level 2 (same competences as Level 1 plus able to perform procedures; limited supervision in routine); Level 3 (autonomy in all the competences, also in complicated cases; no supervision needed).

Decision-making autonomy (Level 3) in the management of vascular disorders and risk factors, from the diagnostic, therapeutic and organizational points of view must be reached through training. The trainee should follow clinical cases on all the relevant specialist diseases. All activity will be recorded in a Log Book and evaluated in terms of acquired expertise.

2.2.1. Skills

Number of procedures required to reach autonomy:

- perform ultrasound assessment for peripheral arteries,
- perform ultrasound assessment for carotid and vertebral arteries,
- perform ultrasound assessment for venous deep,
- perform ultrasound assessment for abdominal arteries, minimum 1000 personally performed (minimum 200 per category) to reach Level 3,
- perform ABI, segmental pressures and Toe Index,
- perform FI evaluation and treadmill test, minimum 100 personally performed to reach Level 3,
- perform microcirculatory assessment (capillaroscopy, Laser Doppler, pO_2/pCO_2), minimum 200 personally performed to reach Level 3,
- perform transcranial Doppler, minimum 60 assisted to reach Level 2 or 100 personally performed to reach Level 3,
- perform venous bandaging, minimum 60 personally performed to reach Level 3,
- give indications and supervise treatment of venous ulcers,
- perform or indicate sclerotherapy for varicose veins,
- perform or indicate thermoablation for varicose veins, minimum 10 as observer (including the

possibility to follow recorded training sessions) for Level 1, 100 personally performed (if additional Curriculum 2) to reach Level 3,

- performs or indicates arterial interventional therapy, minimum 10 as observer (including the possibility to follow recorded training sessions) for Level 1), 100 personally performed (if additional Curriculum 1) to reach Level 3,
- patient education sessions, minimum 40 personally performed to reach Level 3,
- describe indications for laboratory risk assessment, Level 1 is required to provide guidance and interpretation,
- angiography, angio-CT, angio-NMR, phlebography, lymphography and nuclear medicine techniques also in interaction with Radiologists.

Level 1 is required for procedures and Level 3 to monitor (in collaboration with other Specialists, when necessary) the follow-up of vascular reconstructive surgery, venous surgery, lymphatic surgery, abdominal vessel surgery, major and minor amputations.

2.2.2. Additional optional curricula

Further expertise is available for specialists that have already completed the training in A/VM in:

- arterial interventional therapy,
- venous procedures.

2.2.2.1. Additional curriculum in arterial interventional therapy

Arterial interventional therapy is an area of treatment which is common to multiple specialties (Vascular Surgery, Radiology, Cardiology and Angiology/Vascular Medicine). For Angiology/Vascular Medicine, this treatment is commonly practiced and is part of the Training Curricula of this Specialty in Austria, Germany and Switzerland, and is now expanding to selected Centers in some other European Countries.

Indications for endovascular re-opening procedures in:

- patients with advanced form of peripheral arterial disease (Fontaine III, IV),
- with rest pain or non-healing ischemic ulceration,
- lifestyle limiting claudication despite risk factor, modification antiplatelet treatment and appropriate exercise program.

Endovascular revascularization procedures:

- endovascular revascularization procedures include balloon angioplasty with or without stent placement, atherectomy, laser atherectomy, cryoplasty, cutting-balloon angioplasty, drug-eluting balloons, reabsorbable stents, and drug-coated stents.

2.2.2.2. Additional curriculum in venous procedures

Venous procedures, too, are an area of treatment which is common to multiple specialties (Vascular Surgery, Radiology, Dermatology and Angiology/Vascular Medicine). For Angiology/Vascular Medicine, this treatment is commonly practiced in many countries, such as Switzerland, France, Italy, and Germany, with training programs. The procedures require an in-depth knowledge of ultrasound and clinics and are also suitable for specialists in the medical area.

Techniques concerned:

- radiofrequency (RF),
- endovenous laser treatment (EVLT).

Prerequisites:

- extensive clinical knowledge of venous disease and preliminary training in venous ultrasound are required,
- practice venipuncture under ultrasound guidance (e.g. ultrasound-guided sclerotherapy) and practice the technique of phlebectomy is also recommended.

Contents:

Theoretical education:

- theory
 - physical principles of different techniques,
 - therapeutic indications,
 - therapeutic strategy,
 - complications,
 - contraindications;
- conditions
 - environment,
 - hygiene,
 - specific equipment.

Teaching practice:

- ultrasound-guided puncture,
- overview of puncture's material (introducers),
- puncture phantom.

Use of devices:

- presentation of different materials: RF, EVLT, etc.,
- hands-on phantom (guides, catheter fibers).

Tumescent anesthesia:

- how to do it (syringe pump),
- hands-on phantom (if possible).
 - Analysis procedures (video and live)
 - Tips and tricks
 - Management of technical (navigation, etc.) and patient-related (stress, needle phobia, etc.)
 - Management of complications
 - Clinical cases:
 - discussion of the technique,
 - discussion of practical modalities of realization,
 - attending "live" procedures in SSV and GVS,
 - intervening actively in procedures (all or part of the proceedings: vein puncture under ultrasound guidance, navigation of the thermal probe, tumescent anesthesia, firing and pull back).

2.3. Assessment and evaluation

Postgraduate medical training must include a process of assessment. The methods used for assessment of trainees, including the criteria for passing examinations or other types of assessment, must emphasize formative in-training methods and constructive feedback. Assessment principles, methods and practices must be clearly compatible with training objectives. The methods used should encourage a constructive interaction between clinical practice and assessment. Assessment should include methods that cover knowledge, skills and attitudes in order that a broad picture of a trainee's clinical competence and ability to practice safely is obtained. It gives evidence that the trainee meets the curriculum and in the meantime identify areas for additional training. Personal Logbook is part of the evaluation.

2.3.1. CESMA — UEMS European Exam

Trainees are invited to apply for the UEMS European Exam to obtain the UEMS European Diploma in Angiology/Vascular Medicine, following the application criteria by the European Board Examination in Angiology/Vascular Medicine (EBEAVM) formed by representatives from VAS and Board of the UEMS Division of Angiology/Vascular Medicine.

Candidates should one of the following criteria:

- 1) be a specialist in Angiology/Vascular Medicine in a European country where the specialty of Angiology/Vascular Medicine exists;
- 2) if already a Specialist in

another bordering specialty, should have obtained European Master in Angiology/Vascular Medicine Diploma or the VAS Fellowship in Angiology/Vascular Medicine; 3) have at least 3 years' experience at one Accredited European Angiology center.

The Exam consists of two parts: one taken on the computer and consisting of 100 multiple choice questions, and an oral part consisting in the discussion of clinical cases.

The written exam is a multiple choice answers examination. There are 100 questions, with 4 or 5 answers for each question, only one of which is correct. Questions cover the whole spectrum of Angiology: fundamental etiopathogenetic knowledge, clinics, diagnostics (both non-invasive and invasive), therapeutics (both with drugs and interventional), and prognostic and statistic interpretation of medical studies. The exam covers diseases of peripheral, cervical and abdominal arteries, diseases of veins, superficial and deep, as well as microcirculatory and lymphatic diseases. A database of 200 questions is created, with each of the commission members preparing 40 questions. One week before the exam, a referee selects 100 questions, which are sent to the central IT management engineer, who uploads them on a dedicated server. Once in the form, access to the 100 questions database is given to the 5 commission members, for revision. Finally, the 100 questions are validated. In the multiple choice question (MCQ) exam, computers are connected to a central server via internet. The standard duration of the MCQ exam is two hours. During this time, answers are directly submitted by computer and centrally gathered on the server. Then the results of the written exam are communicated to the commission, after the clinical exam. The results are expressed as a number of correct answers (out of 100). The grade is expressed as the number of correct answers divided by ten. The minimum accepted grade is 6.

The second part of the exam is the clinical case. Three members of the EBEAVM prepare the clinical cases: they consist of presenting to the candidates the clinical history of a real patient. Cases complex clinical conditions, mostly emergency ones. Candidates should evaluate the clinical history and offer their interpretation. Candidates should ask for additional information: clinical exam biological results, non-invasive

and invasive explorations etc. Based on these results, candidates should hypothesize a diagnosis, including future evaluation and therapeutic options. The oral exam lasts 30 minutes. At the end of the clinical case exam, each candidate is graded from 1 to 10.

The final exam grade for each candidate is expressed as the average of the grades from the two parts of the examination. A grade of 6.5 or higher (on a 1–10 scale) is required in order for the exam to be validated by the commission.

II

Training requirements for trainers

I. Appointment policy

I.1. Obligations and development of trainers

Teaching activities must be included as responsibilities in the work schedules of trainers and their relationship to work-schedules of trainees must be described. The ratio between the number of recognized trainers and the number of trainees should ensure close personal interaction and monitoring of the trainee.

I.2. The Program Director

The Program Director must:

- have at least 5 years of participation as an active faculty member in an Angiology/Vascular Medicine program,
- be in Angiology/Vascular Medicine (Specialty or CESMA-UEMS European Diploma),
- be responsible to the sponsoring organization,
- oversee and organize the activities of the educational program in all institutions that participate in the program,
- ensure the implementation of fair policies, grievance procedures, and due process are in place in all institutions that participate in the program,
- have appropriate dedicated time to devote to the program,
- ensure that all training institutions participate in the required quality assurance.

I.3. The educational supervisor

Each trainee must have an educational supervisor.

The person on this role is responsible for all trainees at one site or, alternatively, supervises only a smaller group. The educational supervisor must:

- be in Angiology/Vascular Medicine (Specialty or CESMA-UEMS European Diploma),
- arrange to meet with each trainee at the beginning, middle and end of each placement or every 2–3 months,
- assess progress and professional development of the trainee,
- ensure that the trainee has access to the training and clinical experience necessary to meet curricular requirements,
- ensure that there is an appropriate balance between service and training,
- check that the necessary work-based assessments are carried out,
- receive feedback from the trainee about the training provided and make necessary changes,
- provide trainees with counselling as appropriate.

III Training requirements for training institutions

The European Training Centers (ETC), formerly called European Teaching Centers,² offer training programs which in the European quality criteria and programs suitable for the European Curriculum.

They take part on the educational European programs (European Master, European Fellowship, etc.) and are the reference centers for training programs to the UEMS Exam for the UEMS European Diploma in A/Vascular Medicine.

They can be formed from one Center, or from more institutions with a Center of reference coordinating smaller Centers or institutions with expertise, in order to offer a complete range of educational opportunities. In the case of multicenter organization, the Center of reference must create an Educational Committee (including Trainers from different institutions) to coordinate and monitor the educational program.

I. Process for recognition as European Training Center

Training must be carried out in Centers.

Since the ETC might involve various institutions cooperating with the Angiology/Vascular Medicine referee Center, part of the training could take place in other relevant hospitals or institutions and commu-

nity-based facilities. European Training Centers must have clinical facilities and infrastructures to support the delivery of training. Training locations must have a number of patients and an appropriate case-mix to meet training objectives. They must have adequate teaching staff. The training must expose the trainee to a broad range of experience.

The number of patients and the case-mix should allow for clinical experience in all aspects of Angiology/Vascular Medicine including training in health promotion and disease prevention. The quality of training settings should be regularly monitored.

2. Angiology/Vascular Medicine expertise and organizational integration

In addition to the general characteristics previously outlined in this document, the Center must have a study format relevant to the training of Tutors which covers the major specialist skills for A/MV. Collaboration with Centers is admissible so that any areas not covered by a single Center can be covered by one or more complementary Centers.

3. ETC structure

A ETC can be represented by:

- only one Center offering the entire spectrum of training, or
- a Reference Center by other Centers (which will be part and parcel of an A/VM ETC) with specific complementary skills, or
- by one of the preceding solutions with the integration of minor Centers, no matter how small but of quality, to broaden the clinical training in its more advanced stages. These facilities will be considered part of the ETC.

Coordinated multi-site training must be ensured to gain exposure to different areas and management of the discipline.

The training should include an acceptable number of clinical cases within the area of:

- arterial disease (peripheral, CVD, abdominal),
- venous diseases (TED and IVC),
- microcirculation disease,
- lymphedema,
- major risk factors,
- vascular malformation,
- preventive activities.

Moreover, the training must ensure:

- educational programs (also by the existing certified VAS European platform for e-learning), meetings,
- research activity,
- computerized bibliographic research and consultation areas,
- interdisciplinary confrontation to include either meetings on topics or discussion of selected clinical cases,
- patient and population education programs,
- contacts/meetings with Family Doctors.

The activities listed below must include the use of appropriate instruments. All equipment should be registered. Some marginal differences exist in European countries. The list below will be automatically updated to include affirmed scientifically accepted innovative methods:

- vascular ultrasound to study the arteries and veins of the upper and lower limbs, neck and abdomen,
- capillaroscopy and at least one of the other methods to study microcirculation (such as laser Doppler, $TcpO_2/pCO_2$),
- Doppler for ABI and segmental pressures measurement,
- Doppler or laser Doppler for Toe Index,
- treadmill for tests and rehabilitation,
- transcranial Doppler,
- plethysmography (can be replaced by ultrasound or, for the study of microcirculation, by microcirculation methods),
- MAP (also within the host hospital),
- coagulation/RF monitoring facilities.

Additional services (mandatory for Training Centers requesting Additional Accreditation in this areas):

- arterial interventional area and facilities,
- facilities for VV treatment (thermoablation, sclerotherapy).

Services related to multidiscipline approaches must be available in the ETC to facilitate interactions. In fact, interdisciplinary collaboration with other Units/Depts. or Specialists are considered part of modern medicine and essential for good training. In particular it will be stimulated interactions with vascular surgery, radiology, diabetology, neurology, cardiology, dermatology, rheumatology and epidemiologists/statisticians.

4. Minimum number of case studies and exams

In terms of the minimum number of case studies and exams required for a ETC, the entire offer should be considered. However, the minimum criteria to be considered should be:

- inpatients at the Center itself or from other departments for consultations or hospitalization (this joint offer has been considered in view of the different organizations or organizational trends of NHS on hospital stays): minimum/year N = 1000,
- outpatient instrument examinations: minimum/year N = 4000,
- outpatient visits: minimum/year N = 1000.

All vascular diseases should be covered, with obvious respect for the epidemiological distribution. From the instrumental point of view, each district of Vascular Ultrasound must be present, again with respect to epidemiology. Only data from records (computerization of the structure) will be considered for the Validation Process.

5. Defining a transition period

The development of A/VM is not the same in all EU countries, even if it is progressing everywhere. On the other hand every applicant should have the same training curriculum and the same chance in each country independently from the current situation.

In order to offer a transition period for those countries which are working hard on the development of A/VM, following European standards and at the same time guaranteeing equity for the trainees, projects can be developed in the single countries during the Validation phase. These projects could include:

- recognition of a National European Training Centre ETC formed by more than one Centre, — specific training programs should be made available to have one or more supporting countries where the students can frequent (to complete the formation not available locally/nationally),
- apart from the general program, particular attention will be paid to the formation of the Trainers in those countries.

6. Additional Accreditation in arterial intervention therapy

What has previously been mentioned in section 2.2.2.1. in Chapter I (Additional Curriculum in arterial interventional therapy) on the bordering areas among different specialties and on the existence of consolidated practice in different countries should be taken into account.

The applying Center must already be Accredited as a European Training Centre in Angiology/Vascular Medicine.

6.1. General requirements

The minimum of medical service available must be a functional interventional/endovascular unit. This might be ideally available and located in an angiology, cardiology or radiology catheter laboratory. The minimum used to do arterial endovascular procedures and which is able to store and reproduce all the images taken during the procedure. Images must be at least printed out in paper form, although it is better if hard copies or digital can be reproduced. If the manpower and expertise exists in one center, meaning experienced interventionalists as being below, this can also be anchored in any ward or medical suite, e.g. in an intensive care unit with a special surgical theatre.

Another important acquisition at a minimum level at such a place must be a that the radiation protection rules at the place are fulfilled.

Such a training place must have at least one experienced interventionalist who is able to the training skills. The minimum number of patients treated a Training Centre is 50 per year for each main disease area.

6.2. Equipment

The minimum equipment must include a able to capture and store images of the procedure. It must all necessary legal conditions referring to international radiation protection conditions. Furthermore the endovascular unit must be equipped with an ECG and blood pressure measurement facility, so that the patient can be monitored during the procedure. First-aid equipment must be within reach, so that in emergency cases the patient can be taken care of.

A Duplex ultrasound machine is necessary for diagnostic procedures (retroperitoneal hematoma,

immediate follow-up after the procedure in case of suspicion of acute re-occlusion, etc.).

Experienced staff with a surveillance facility to take care of the patient in the time span before and after the procedure is also needed.

6.3. Tutors and qualified endovascular specialists

The minimum number of tutors for a Training Center is one, who must have a that allows her or him to perform endovascular procedures on her/his own and she/he must provide at least a 2 year's self-standing experience in endovascular procedures. The numbers of doctors with the same requirement as that of the tutor can be the same. It is also if the tutor and the qualified doctor are the same person.

Experienced nurses or technicians are a must and there must be at least one available.

6.4. Qualification of the person responsible and/or tutor

— for teaching purposes:

the person who is responsible for the teaching process must have theoretical knowledge about endovascular arterial interventions also practical by having at least assisted during these interventions.

— for arterial interventional treatment:

the person who is responsible for arterial interventional treatment must provide evidence of one year training and one year self-standing experience in endovascular interventions. The required number of is 100 interventions in each main arterial disease region assisted.

6.5. Facilities

The facilities needed for a European Training Centre in arterial intervention already exist as they are accredited ETCs. There are outpatients clinic where patients can be screened and assessed before the procedure with at least one duplex ultrasound machine and an ABI measurement facility. During the screening process the physical exam, the medical history and ABI as well as ultrasound of carotid arteries must be captured. Therefore, a PC to collect patient data as well as a substitute a paper patient record is necessary. Concerning the after the endovascular procedure treatment and surveillance the Training Centre must be equipped with a ward, where experienced and trained nurses, as well as medical doctors who have at least a training in recognizing

and handling complications after an endovascular procedure, are available.

6.6. Surrounding conditions

A Training Centre must cover all the necessary “surrounding conditions”, therefore the presence of an hematology laboratory is necessary, as before the procedure necessary lab assessments as creatinine and coagulation levels are mandatory.

Active collaboration is necessary and mandatory with a special vascular surgical department, as in case of emergencies a vascular surgeon must be on standby. Furthermore there must be an active collaboration with a radiology suite which must provide the expertise on diagnostic images (MRI, CT).

7. Additional Accreditation in venous procedures

What has previously been mentioned in section 2.2.2.2. in Chapter I (Additional Curriculum in venous procedures) on the bordering areas among different specialties and on the existence of consolidated practice in different countries should be taken into account.

The applying Center must already be Accredited as a European Training Centre in Angiology/Vascular Medicine.

7.1. Techniques

Thermal ablation techniques:

- radiofrequency (RF),
- endovenous laser treatment (ELT).

Sclerotherapy:

- sclerotherapy under direct vision with liquid or foam,
- ultrasound-guided foam sclerotherapy (USGFS).

7.2. Instructors

Instructors must be vascular doctor (or equivalent depending on country) who are not subject to any judicial procedure or liable of any criminal offence, and who have been practicing the technique in question for at least 3 years, with at least 100 procedures performed over the last year (thermal ablation) and at least 200 procedures of USGFS performed over the last year (sclerotherapy).

Practice of one or several alternative techniques (surgical, thermal or chemical) and experience in the of education (providing training to trainers in order to homogenize the educational aspect — of skills and

items to provide full guidance for the trainer in all his actions) are recommended.

7.3. Environment

7.3.1. Area

Reception, archives, examination rooms, treatment rooms, recovery, etc., in compliance with the legislation in force in the country concerned.

7.3.2. Equipment and materials

Non-specific equipment: general medical equipment, appropriate emergency equipment, containers for medical waste disposal, according to current legislation, etc.

Equipment suitable for venous Doppler exploration, especially superficial:

— specific tools for thermal ablation techniques:

- generators comply with current maintenance,
- goggles and probes for laser,
- suitable probes, puncture material, catheters, long and short guides,
- masks, caps, scrubs,
- sterile drapes, sterile gowns,
- materials for local anesthesia, tumescent pump;

— specific equipment for sclerotherapy:

- syringes, needles,
- equipment for the manufacture of sterile foam or not (according to legislation).

7.3.3. Personnel

None for sclerotherapy; scrub nurse and assistant (runner) during thermal procedures.

7.3.4. Reception of students

One or two students per trainer. Opportunity should be provided for students to attend the consultation and the process leading to the indication of the technique and the conduct of the procedure and the follow-up consultation. The grouping of 2–3 procedures in the same unit of time (e.g. 1 day or half-day) should be encouraged. The student should be allowed to actively take part in the diagnosis, indication and during the procedure; work should be done on the incident/accident during the procedure for the student to be ready to react properly in case of periprocedural difficulties.

Evaluation of the training: control theory, practical control (development of a uniform evaluation procedure applicable in all Centers).

Further Additional Accreditation of the ETC in venous procedures will be carried out in collaboration with UEMS MJC Phlebology.

8. Training structure

8.1. Clinical training

The core experience of trainees must provide training in vascular in- and outpatients (investigation, treatment and education) and in the prevention of vascular diseases. The learning environment must be favorable and the trainee must have stable of reference. Trainees must have substantial experience of conducting ward rounds, both under direct supervision of a training physician and independently. Trainees early in the program will require considerable supervision, which will gradually decrease as experience is obtained. All trainees must be able to seek help from a more experienced colleague who must be available to provide on-site support.

Trainees must have primary responsibility for a sufficient number of unselected patients.

Clinical experience in Angiology/Vascular Medicine must be gained as well as in other related disciplines (for defined periods).

Trainees must have experience of follow up clinics in order that they understand the natural history of acute illness and care of chronic illness.

8.2. Procedures

Trainees must receive instructions in relevant procedural skills. They must be aware of the indications, contraindications, complications, limitations, and interpretations of findings of the procedures commonly undertaken by specialists. They must be given the opportunity to perform the relevant procedures under supervision prior to being judged competent to perform these independently.

8.3. Educational program

Formal teaching sessions in the form of seminars, grand rounds and case conferences as well as e-learning material should cover the whole Angiology/Vascular Medicine curriculum.

International/European and National Guidelines must be available and discussed.

9. Structure and human resources

The Reference Centers for the ETC should be a public facility (Hospital or University) accredited to

the NHS. The Head of the Unit should be employed full-time, a specialist in Angiology/Vascular Medicine or relevant discipline, should have at least 10 years curriculum and publications in this area, given the differences in the distribution of this specialty in Europe. The reference Center will coordinate the entire ETC. Medical staff must be minimum Head + 3 tutors to train each candidate. Each tutor should, as a rule, follow a maximum of 3 trainees.

A Program Director and an educational supervisor should be identified.

Technical and nursing staff must be available.

10. Duration of ETC Accreditation

Once the Validation Process has been completed by VAS, obtained Accreditation from the UEMS Division A/VM, the title will last for 5 years, provided that during this time no problem arises from the trainers' reports, from eventual intermediate evaluative tests or from staff working at the Center.

After this period, the Center may apply to renew its Accreditation, which will be renewed automatically in absence of negative reports from trainers and trainees and if the Center maintains its documented standard.

11. Management of training

The responsibility and authority for organizing, coordinating, managing and assessing the quality of the individual training setting and of the training process is to be attributed to the Program Director and the Training Programme team.

11.1. Requirement on equipment, accommodation

The trainee must have adequate time and opportunities for practical and theoretical study and have access to adequate professional literature as well as equipment for training of practical techniques.

The physical facilities and equipment for training should be evaluated regularly for their appropriateness and quality regarding postgraduate training.

11.2. Quality management and Accreditation

Recognition of Teachers and Training Institutions at a national level: the training in Angiology/Vascular Medicine is regulated by National Authorities/National Boards, which set standards in accordance with national rules and EU legislation The standard for recognition

of training institutions (Training Centers), teachers and trainers are defined by national authorities, in accordance with national rules and EU legislation. In countries where Angiology/Vascular Medicine centers do not exist, applicants can make motivated requests to carry out their period of training in the accredited European Training Centers from other European countries (Validation Process).

Centers applying for an European Accreditation (European Training Centers) will submit the to the Board of the UEMS Division of Angiology/Vascular Medicine. VAS, acting in the name of the UEMS Division of Angiology/Vascular Medicine, will Validate the fulfilment of criteria.

Centers applying for Accreditation could propose or receive, during the Validation Process, indication to cooperate with other Angiology/Vascular Medicine Centers or Centers with other specialist structures (consistent with the purpose and the training curriculum) to expand the training offer.

The Validation Process and the consequent Accreditation recognize the 1997 UEMS visitations Charter and its principles. Only once the ETC has obtained Accreditation can it also apply for further Additional Accreditation as a ETC for arterial interventional therapy or venous procedures (see section 2.2.2. in Chapter I and sections 6, 7 in Chapter III).

12. Clinical governance

The clinical training must include experience in working as a team with medical colleagues and other health professionals. The training process should allow learning in a multidisciplinary team resulting in the ability to work effectively with colleagues and other health professions as a member or leader of the health care team and should develop competencies in guiding and teaching other health professions. The Program should include training in Communication, Team working skills and Equality and Diversity.

Completion of training must be documented by degrees, diplomas, or other evidence of formal qualifications conferred as the basis for formal recognition as a competent medical doctor in Angiology/Vascular Medicine (National level). At EU level, application for the UEMS Exams are stimulated to obtain the UEMS European Diploma in Angiology/Vascular Medicine and VAS European Fellowship.

13. Manpower planning

Manpower planning is under the jurisdiction of each member state according to their needs for Angiology/Vascular Medicine specialists. The EBEAVM will produce proposals with a European outlook.

14. Regular report

Each year a detailed report is requested to evaluate the training period.

15. External auditing

External auditing is possible, both in the Validation and Accreditation phase, and during the activity of the Center.

16. Transparency of training programs

Training programs are published and the activities registered in a Log Book.

17. Training process evaluation

Feedback from trainees must be incorporated into the review of the program. Program evaluation should address the context of the training process, the structure and components of the program and its general outcomes.

Feedback about program quality from both trainers and trainees must be systematically sought, analyzed and acted upon. Trainers and trainees should be actively involved in using its results for program development.

18. Continuous renewal

The process of renewal should be based on prospective surveys, analyses and audits that should lead to the revisions of the policies and practices of the postgraduate medical training programs in accordance with past experience, present activities and future perspectives. In doing so, it should address the following issues:

- adaptation of the mission and outcome objectives of postgraduate training to the socio-economic and cultural development of the society,
- modification of the competencies required on completion of the postgraduate training program in Angiology/Vascular Medicine in accordance with the needs of the environment the newly trained doctor will enter,
- adaptation of the learning approaches and training methods to ensure that these are appropriate and relevant,

- development of assessment principles and methods according to changes in training objectives and methods,
- adaptation of recruitment and policy of appointment of supervisors and teachers according to changing needs in postgraduate training,
- updating of training settings and other educational resources to changing needs of postgraduate training, i.e. the number of trainees, number and of trainers, the training program and contemporary training principles,
- refinement of the process of training program monitoring and evaluation,
- adjustment of the structure, content and duration of training programs in keeping with the developments in the basic biomedical sciences, the clinical sciences, the behavioral and social sciences, and changes in the demographic and health or disease pattern of the population, and in socio-economic and cultural conditions.

Conflict of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

References

1. Epstein RM, Hundert EM (2002) Defining and assessing professional competence. *JAMA*; 287: 226–235.
2. Catalano M, Poredos P, Brodmann M et al. (2013) Requirements for Angiology/Vascular Medicine. *Int Angiol*; 32: 608–612.
3. Catalano M (on behalf of the European Working Group on Medical Angiology) (1994) European Fellowship in Medical Angiology: Program Proposal. *J Vasc Med Biol* [Internet]. Available from: www.vasint.net/images/Europeanfellowship.pdf [cited 2016, Feb 12].
4. Catalano M (on behalf of the European Working Group on Medical Angiology) (1993) Teaching an Educational Program of Medical Angiology/Vascular Medicine in Europe. *Vascular Medicine* [Internet]. Available from: www.vas-int.net/images/Teaching.pdf [cited 2016, Feb 12].