

## **Recommendations for acquiring competence in Endovascular Neurointervention - ENI**

### **Foreword**

This document sets out standards and guidelines for training in Neurointervention in Europe with the aim to acquire competence in Endovascular Neurointervention (ENI). The aim is that this curriculum in ENI will constitute an approved training program in all European states. It is recognised that there are a number of structural and operational differences in the health care systems, appointment procedures and training systems in these different countries.

The purpose of this document is to define a training charter in neurointervention for trainees wishing to obtain qualification in ENI.

It is recognised that there are a number of specialists in Europe performing all or some of the ENI activities detailed in this Training Charter. However established interventional neuroradiologists who could not or have not followed these recommendations may be very well proficient in INR and may wish to be recognized for their acquired skill and knowledge. (EBNI Accreditation of Established Neurointerventionists.)

### **Article 1: Goal of training program**

This document provides the basis for the development of a harmonised, comprehensive, structured and balanced training program in ENI.

#### **1.1 The primary goal**

- The primary goal of a training program is to provide the trainee with a broad knowledge base, the procedural skills and experience as well as professional judgement and self-criticism needed for independent Neurointerventional (ENI) practice.

#### **1.2 Definition and scope of Neurointervention**

- Neurointervention is a practice using percutaneous and endovascular procedures to treat patients with diseases of the brain, sensory organs, head & neck, spinal cord, vertebral column and adjacent structures and the peripheral nervous system in adults and children.

The purpose of this charter is to define the training needed to safely perform endovascular neurointervention. Although percutaneous spinal procedures are usually included in neurointervention, these procedures will not be dealt with in this document. In this document the term neurointervention refers to endovascular neurointervention (ENI) only.

Endovascular approaches represent the most complex and potentially endangering aspects of neurointervention.

### **1.3 General rules on monitoring and accreditation**

#### ***1.3.1 Monitoring authority***

- National professional licensing bodies (responsible for the recognition of medical specialists in individual countries) may recognise training programs in ENI using European Board of Neurointervention - EBNI standards based on this training charter.

#### ***1.3.2 EBNI accreditation of training program***

- Accreditation to train the candidates within a program of ENI can only be granted or renewed if the applying program documents a minimum annual activity as defined in paragraph 4.1. Projected activity is permitted during the development phase of a service. An agreed intermediate level of activity may be defined by the accrediting authority for each applying institution.
- The teaching program should be established within a clinical neuroscience institution, or network of such institutions, with all the appropriate related specialities represented.
- The institution's patient population must have a diversity of illness (brain, head & neck, spine) from which a broad experience in ENI can be obtained.
- EBNI accreditation to teach in ENI is valid for a limited time only but may be renewed.
- Identification, visitation and subsequent recognition of a training program are procedures coordinated by the EBNI. This procedure is a joint responsibility of neuroradiology, radiology, neurosurgery and neurology.

## **Article 2: General aspects of training in Neurointervention**

### ***2.1 Selection criteria and access to the ENI qualification in an EBNI accredited training program***

#### ***2.1.1***

- Applicants must have a valid licence to practice medicine within their respective country; this licence has to be recognised by the country where he/she will train.

- The applicant must be a specialist physician with a recognised speciality listed in the directive 2005/36/EV of the European Parliament and of the Council on the recognition of professional qualifications.
- Additionally, applicants from Portugal with the nationally recognised speciality of Neuroradiology may be accepted to train in ENI according to this charter.

## **2.1.2**

- After appointment of a trainee, an individualised training program stipulating the relationships, duties and obligations on each part, should be formulated and signed by the Director of the Program and the trainee.

## **2.2 Duration and content of Education and Training**

- The overall purpose of training in ENI is to reach predefined goals set out in this Training Charter.
- The education and training needed to become a specialist physician with qualification in ENI is 4 years corresponding to full time study in an ENI training program.
- The 4 years consist of a core of ENI of 24 months, clinical neuroscience for 12 months and diagnostic neuroradiology for 12 months.
- Depending on previous training, the training time may be reduced as credit is given for previous training and clinical skills. The assessment of previous training and clinical skills and evaluation of remaining training time is the responsibility of the Director and each of the co-directors of the program after a thorough and careful assessment of documented and proven training and experience.
- The assessment of the applicant's background, and additional training required, will be documented in detail in the training agreement described under 2.1.2

## **2.3 Curriculum of general and specific training periods**

### **2.3.1 Training Curriculum**

- This Training Curriculum is designed to provide a diversified and balanced mix of theoretical and practical education of relevance in ENI and describes the contents and aims of the training. In the individual training program, emphasis should be placed on adequate time allocated for study independent of clinical duties. It may be necessary for some programs to formally organize specific training periods in associated diagnostic or clinical therapeutic units, if adequate experience cannot be organised internally.

### **2.3.2 Network of institutions**

- A training program can be based on a pre-organised network of accredited institutions/departments coordinated by the program director when rotation periods in these institutions/departments are necessary. These rotations should be organized in such a way as to give trainees guaranteed training according to the curriculum.

### **2.3.3 Trainee Portfolio - CV**

- Trainees should, to the Program Director, present a Trainee Portfolio, containing details of previous training posts, examinations passed, lists of publications and presentations at meetings, courses attended, cumulative procedural totals and copies of assessment forms of the different training periods.

## **Article 3: Specific aspects of training in Endovascular Neurointervention**

### **3.1 Educational and Training program**

#### **3.1.1 General objectives and goals of training**

Neurointervention should be practiced in ENI teams where exchange of experience, knowledge and research is possible. Having finished the training program, the specialist physician with qualification in ENI, will be able to perform endovascular neurointervention procedures as described in Art 4 in a team with other neurointerventionists. Thus solitary practice of ENI is not recommended.

A specialist physician with qualification in ENI shall

- have acquired knowledge in basic and clinical neurosciences, including neuroanatomy, neurobiology, pathophysiology and natural history of neurological disorders
- have the skill to consult and communicate with referring physicians, patients and their relatives
- have the skill and knowledge to independently perform, conduct and interpret common ENI procedures.
- have the skill and knowledge to advise other clinicians and carry the main responsibility for how the diagnostic and therapeutic methods are used within the domain of ENI.
- master the diagnostic and therapeutic methods used within the domain of ENI and shall be aware of their development, strengths, weaknesses and risks.
- Research should be encouraged and time and facilities made available during training.

### **3.1.2 Knowledge-based Objectives**

- Unless otherwise defined, all points below are defined in relation to vascular disease of the central and peripheral nervous system and are of relevance in the context of ENI.

#### **3.1.2.1 Basic neuroscience**

- Neuroanatomy – including embryology and functional anatomy
  - The focus is on arterial and venous functional anatomy of the brain, skull, head & neck and spine.
  - In embryology the focus is on vascular embryology of the brain and head & neck and spine.
- Neurobiology - including genetics and an overview of molecular biology
- Patho-physiology
  - The full spectrum of vascular diseases, including inflammatory and autoimmune diseases.
- Natural history of neuro-vascular diseases

#### **3.1.2.2. Clinical Neuroscience**

- Epidemiology
- Clinical history and patient assessment
- Symptomatology
- Clinical neurologic examination
- Communications
  - To discuss the indications and contraindications for diagnostic and interventional procedures
  - To appropriately report diagnostic and interventional procedures
  - To consult and to communicate with other clinicians
  - To participate in and conduct regular clinical rounds and conferences
  - To communicate with residents in training
  - To communicate with patients and their relatives

- To communicate with hospital staff and administration
- To participate in quality control programs

### **3.1.2.3. Therapeutics – general aspects**

- Selection and interpretation of ancillary tests necessary for establishing diagnosis, indications, treatment plan and follow-up.
- Selection of treatment options (indications and contraindications) has to be based on knowledge and communication in a multidisciplinary environment.
- Pre- and post procedural management
  - Immediate pre-operative diagnostic work-up
  - Patient preparation before procedure
  - Post-operative maintenance of physiological equilibrium
  - Management of hospital discharge (documentation, communication, coordination and reports)
  - Organisation of follow-up procedures.
- Clinical neuropharmacology
  - Knowledge in pharmacology including interactions of drugs
  - Pre- and postoperative usage of drugs
- Knowledge in neurointensive care

### **3.1.2.4. Imaging technology and Radiation**

- to master the physiological, technical, mathematical and statistical principles, strengths and weaknesses of common neuroradiological diagnostic and interventional procedures.
- Knowledge about radiation physics
- Radiation biology
  - - in diagnostic neuroradiology and ENI
  - - in radiotherapy and radiosurgery
- Radiation protection in diagnostic neuroradiology and ENI and have knowledge of the laws governing the use of medical radiation.
  - Patient protection

- Staff protection

### **3.1.2.5. Clinical Neuroradiology**

Training in clinical neuroradiology should not only focus on the neuroradiology of vascular diseases but also provide a general understanding and overview of indications and interpretation in clinical neuroradiology in its application in common neurological diseases.

- Knowledge related to technical aspects of clinical neuroradiology
  - Digital Subtraction Angiography, Computed Tomography, Magnetic Resonance Imaging and Ultrasound
- Selection of optimal diagnostic procedure using knowledge of indications, contraindications and limitations of diagnostic neuroradiology procedures
- Be able to perform and interpret diagnostic neuroradiological procedures as they relate to ENI
- Knowledge and management regarding all aspects of contrast materials, including interactions and complications, as they are used in clinical neuroradiology and ENI.

### **3.1.2.6. Therapeutics – specific objectives**

- Pre- and post procedural management
  - To explain to the patient the risks and benefits of the planned strategy (informed consent)
  - Proposed and alternate therapies
  - Immediate pre-operative diagnostic work-up
  - Patient preparation before ENI procedure
  - Organisation of clinical follow-up and diagnostic procedures.
- Clinical neuro-pharmacology
  - Per-procedural drug usage including interactions
    - Contrast materials
    - Anti-platelet and thrombolytic therapies
    - Anti-vaso spasm drugs

- Acquisition of skills and experience in ENI procedures
  - Establishment of an individual treatment strategy
    - Aim of ENI therapy
    - Defining the therapeutic goal
    - Establishing the procedural priorities and steps
    - Defining the optimal treatment strategy and technical performance
    - Considering possible complication and treatment risks
    - Pre-procedural briefing the staff and ancillary staff of the treatment plan
  - Technical and strategic components
    - Access to the vascular system
    - Usage of delivery systems; catheters, wires and flushing systems
    - Skilful management of the radiological equipment used in ENI
    - Knowledge and use of re-canalisation devices and embolic material
    - Post-procedural management of puncture site
    - Risk and procedural limitations
    - Complication management
    - Each trainee must participate in a minimum number of ENI procedures, of which a proportion should be as the principal operator. The number and diversity of these procedures is defined in Addendum # 1

### **3.1.2.7. Attitude and Ethics in ENI**

- To be able to make independent and well founded decisions in medical ethical matters within ENI
- To prioritize and optimize the use of resources
- To understand implications and priorities in management of incidentally discovered or associated lesions
- To manage medical risks and incidents
- To understand medical legal implications pertaining to ENI
- To participate in regular departmental and interdisciplinary conferences including regular reviews of morbidity and mortality and if developed, critical incident reporting systems (CIRS)

- To participate in national or international quality assurance programs in ENI is strongly recommended
- To participate in national and international courses and meetings (a minimum of 2 weeks/year during the training)

### **3.2 Research**

- The educational environment should encourage trainees to undertake investigative study in relevant clinical or basic sciences subject areas.
  - Trainees may participate in research projects conducted by the faculty or other trainees or may undertake a project as principal investigators.
  - Trainees should have a firm knowledge of the fundamentals of the experimental design, performance and interpretation of results.
  - Trainees have basic knowledge of medical statistics
  - Trainees should be encouraged to submit their work for presentation at national or international meetings and to publish in scientific journals.
  - Trainees should understand ethical aspects and what constitute conflicts of interest

### ***3.3 Training log-book and periodic progress assessment of trainees***

#### ***3.3.1 Log-book during ENI training***

Each trainee must maintain a personal Log-book for documentation of procedural experience and skills acquired. The trainee will have to demonstrate that he/she has participated in a wide spectrum of ENI procedures (See Addendum # 1) which should include a balance of supervisor assisted and personally performed procedures under supervision. Log-book entries must be monitored by regular inspection and signed off by the appropriate supervisor. The log-book must be available at Board and other summative examinations.

#### ***3.3.2 Evaluation of trainee***

The program director, in consultation with the co-directors and faculty, must evaluate the qualification and progress of each trainee at least twice a year. The evaluation includes an assessment of the trainee's knowledge, technical skills, attitudes and interpersonal relationships as well as decision-making skills and clinical management skills. These evaluations should be documented and provided to and discussed with each trainee. The program director, in agreement with the co-directors, certifies the competence of the trainees at the completion of training.

**Article 4:****Requirements for training institutions/departments*****4.1 Requirements regarding equipment and educational facilities***

The optimal training program in ENI must take place in a network of institutions/departments operating in accordance with the UEMS and WFITN recommendations for good practice in ENI. (Interventional Neuroradiology, 2006, 12:7-8).

- An ENI training program is organized in a network of institutions/departments in which the unit for ENI constitutes the core surrounded by clinical and diagnostic units in clinical neuroscience.
- To qualify as a training program the following conditions must be fulfilled.
  - The director and co-directors (neurology, neurosurgery and clinical neuroradiology) must have senior appointments in recognised training institutions that may be affiliated with academic institutions or other non-profit organisations.
  - The network should ideally be involved in active research in ENI
  - There should be ready access to general medical/neurointerventional texts and periodicals. Computerized literature search facilities should be available.
  - Commercial interests may not be involved in organisation and scientific content of training.
- The ENI core must fulfil the following conditions
  - The faculty of the training program must include at least two members practicing ENI as their principle activity.
  - The proportion of trainers in ENI to trainees must not exceed the ratio of 1:2.
  - ENI case load (a minimum of 200 procedures/year) of endovascular interventions
  - ENI case mix including stroke, aneurysms, AVM's, DAVF's and spinal vascular malformations

**Article 5:****Requirements for training program director and faculty*****5.1 Criteria for Program Director, Co-directors and Faculty***

- The director of a training program must be certified according to national regulations.
- The program director must be a well experienced and an internationally well respected neurointerventionist also involved in scientific activities.
- The program director may have a senior academic appointment or a senior leading position in the non-profit training institution.
- The program director is coordinating the network which constitutes the training program.
- A co-director in a network must be well experienced and internationally well respected as a neurointerventionist or as a medical specialist in another appropriate specialty, i.e. neurosurgery or neurology.

- A director or co-director is obliged to participate in appropriate CME/CPD activities.
- The program director and co-directors in agreement are responsible for enforcing the Training Guidelines, selecting and supervising the trainee and faculty members.
- The program director is expected to ensure that the program is of required academic standard.
- The program director should seek accreditation of the program by an external authority, e.g. EBNI.
- Trainees must be given an opportunity to provide a documented evaluation of the program and faculty at least once annually.

#### **Article 6:**

##### **Recognition of qualification in ENI**

The national or regional medical authority is the responsible body for any official recognition and certification of qualification in each country.

The program director is responsible for accreditation of the training and acquired qualification dependent on a properly executed accreditation and visitation process, being national or provided by EBNI.

EBNI strongly encourages a final board examination. If an examination is offered, EBNI and UEMS guidelines should be considered and followed.

#### **Article 7:**

##### **Maintenance of competence.**

Maintenance of a qualification in ENI is subject to the general principles, different and specific from country to country, and usually is a matter for the national authorities.

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**Validated by ESMINT Ex. Board 2017-10-05**

**Addendum # 1**

**List of minimum numbers of ENI procedures the trainee has to have participated in as second operator during the full training period of 2 years:**

	Absolute numbers
Diagnostic angiography*	100
Aneurysm	75
Intracerebral AVM	30
Dural AV fistula	30
Interventional stroke therapy	100
External carotid artery embolisation	30
<b>Total</b>	<b>100*/265</b>

\* Diagnostic angiography is generally included in each interventional procedure.

**List of minimum numbers of ENI procedures as principle operator:**

	Absolute numbers
Aneurysm	10
Intracerebral AVM	5
Dural AV fistula	5
Interventional stroke therapy	15
External carotid artery embolisation	15