Editorial

«Interventional Neuroradiology: a Neuroscience sub-specialty?»

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Summary

Interventional Neuroradiology (INR) is not bound by the classical limits of a speciality, and is not restricted by standard formats of teaching and education. Open and naturally linked towards neurosciences, INR has become a unique source of novel ideas for research, development and progress allowing new and improved approaches to challenging pathologies resulting in better anatomo-clinical results. Opening INR to Neurosciences is the best way to keep it alive and growing. Anchored in Neuroradiology, at the crossroad of neurosciences, INR will further participate to progress and innovation as it has often been in the past.

Endovascular treatments of vascular or tumour diseases of the central nervous system (CNS) have been developed since the late 60's and have now reached a phase of maturation.

Initially such treatments were performed by neurologists, neurosurgeons, anatomists, as well as radiologists. «Interventional neuroradiology» «Surgical neuroangiography», «Endovascular neurosurgery» or «Minimally invasive neurological therapy» is nowadays still practiced by physicians coming from various medical backgrounds. In Europe it is mostly performed by interventional neuroradiologists, in North and South America embolization is shared mainly by neurosurgeons and neuroradiologists, while in Japan most procedures are performed by neurosurgeons. This multidisciplinary aspect has resulted in tremendous vitality and richness, which remains rather unique in the field of modern medicine. Interventional Neuroradiology (INR) is therefore not bound by the classical limits of a speciality, and is not restricted by

standard formats of teaching and education. Open and naturally linked towards neurosciences, INR has become a unique source of novel ideas for research, development and progress allowing new and improved approaches to challenging pathologies resulting in better anatomo-clinical results.

In the early 80's, the INR pioneers decided to meet to share their experiences in order to improve patient outcome. The first international gathering was the "Working group in Interventional Neuroradiology" (WIN) which was organized for the first two years in the USA (1981-1982). Since then, and for now more than thirty years, the WIN is held annually in Val d'Isère (France). It has grown from its early beginnings with about 15 physicians to almost five hundred practitioners representing diverse neuroscientific and radiological communities from all over the world. This international group has spread to many countries, and resulted in 1990 in the creation of the World Federation of Interventional and Therapeutic Neuroradiology (WFITN). This federation holds regular scientific meetings and provides guidance for INR as a developing speciality to achieve high standards of practice and quality of care.

The WFITN was instrumental to provide recommendations of training that were initially published in 1998 [1], and recognized as standards in 2007 by the European Society of Neuroradiology (ESNR), the European Board of Neuroradiology (EBNR), the Union of European Medical Specialists (UEMS) and its section of Neurosurgery, and the European Association of Neurological Surgeons (EANS) [2]. They were further modified and expanded in 2009 [3]. These recommendations are currently used worldwide. They are meant to "provide the bases for the development of a harmonised, comprehensive, structured and balanced training program in "Therapeutic NeuroInterventions (TNI)". The goal of such an education program is to gain "a broad knowledge base, the procedural skills and experience, and the professional judgement needed for independent TNI practice" [3]. It was indeed considered fundamental and necessary to possess the neuroscientific knowledge applicable to the practice of TNI (from genetics to anatomy, from biology to angioarchitecture…) to be able to carry out endovascular treatment in addition to the technical requirements related to the use of the devices. However, while the various backgrounds of the neurointerventionists represented a tremendous opportunity for development, it also demanded a modern organizational structure because the classical medical specialities were not able to provide the necessary requirements essential for this new "speciality". It became then apparent in time that, to properly practice INR, it was more important to acquire a broad knowledge in the field of Neurosciences than was provided by General Radiology.

All congresses and seminars organized by the WFITN as well as the annual ABC WIN meetings have thus included specific working groups to envision the evolution and practice of INR. Consequently, organizational and education rules were established: they have gained worldwide acceptance and were used to build professional organizations in line with the specific circumstances in each country.

A further step towards the achievement of appropriate education in INR was reached in 2009 when, taking in consideration the WFITN recommendations, the "Union Européenne des Médecins Spécialistes" (UEMS) took the initiative to establish a "particular qualification" in INR. After three years of discussions and multiple working seminars within the UEMS, a training charter to acquire such a particular qualification in INR was proposed and approved by the UEMS Division of Neuroradiology and the sections of Radiology, Cardiology, Neurosurgery, and Neurology. Both WFITN and UEMS recommendations recognize that there are a number of structural and operational differences in the health care systems, and training systems in the different countries [3,4]. The charter's aim is to provide the bases for the development of a harmonised comprehensive, structured and balanced education program in INR [4]. This charter opened the training and the practice of INR to the medical community under precise conditions: the plan to become specialist physician with particular qualification in INR would be 4 years requiring full time study in a qualified INR training program (core of INR of 24 months, clinical neuroscience for 12 months and diagnostic neuroradiology for 12 months). It has been considered by the neurointerventional community to be a major advancement in the characterization of what had progressively become a true speciality at the crossroad of Neuroradiology, Neurosurgery, Neurology and Neurosciences. The UEMS charter described and discussed in "Stroke" by officers of the involved UEMS sections and divisions [4] was subsequently accepted by the European Society of Minimally Invasive Neuroendovascular Therapy (ESMINT) and the full text published in its official E-journal EJMINT [5].

The charter is not organized to replace the current courses in INR existing in Europe. Most of the teachers participating in these courses are indeed recognized interventional neuroradiologists, members of ESNR, ESMINT and WFITN, who have put important efforts together to build up strong education programs. They are all concerned about their speciality and their goal is thus to improve teaching and training for the best of INR, of future practitioners, and most importantly their patients. The UEMS charter is not sectarian or designed to compete with what already exists. Its aim is at the contrary to allow physicians interested in

the endovascular treatment of CNS vascular disorders not only to be fully trained technically, but also (and perhaps mainly) to be ready to deal with the overall management of patients, in order to become a complete and independent neurointerventionist. An interventional "neurotherapist" should indeed without doubt be fully responsible for his patient, from the first consultation and the management performed to the long term follow up. He should not be considered simply as a technician performing a procedure requested by another physician. Such a consideration would not only be totally unacceptable, but would lead to the end of INR as a respected specialty in the eyes of the Neuroscience community. Any misinterpretation of these goals proves the need for a proper training program that will allow to "independently perform, conduct, interpret, understand and communicate with referring physicians and patients regarding the role of neurointerventional procedures"[3,4]. It would further emphasize the necessity to "acquire knowledge in basic and clinical neurosciences"[3,4], and confirm that "a specialist in therapeutic neurointerventions should advise other clinicians and should carry the main responsibility for diagnostic and therapeutic methods used within the domain of neurointervention"[3,4].

One cannot consider that INR only belongs to Radiology because the environment in which INR is performed is the angiographic suite usually located in the Radiology department. Such views appear to be outdated, as the evolution and experience around the world has shown this. Neuroradiology and INR have gained respect from the clinicians throughout the world because they all speak the language of Neurosciences. The originality of the neuroradiological language is that it uses an alphabet created with the help of radiological tools. Neuroradiology has in the past scientifically enriched both Radiology and the Neurosciences. Neuroradiology and INR should not be separated as they belong to the same scientific environment. Neurosciences and INR have mutually participated to the progresses in the understandings of the vascular diseases of the CNS and Head and Neck. This has been successful because of their close collaborations. The future of INR as a speciality relies in these ongoing collaborations, and needs to be open to other clinical disciplines. «Whoever has the best ability to perform a specific procedure should be the one performing it» [4]. No specialist shall be excluded from practicing INR as long as they have been properly trained. The charter has no retroactive impact, and it has been recognized that a number of specialists in Europe today are already performing all or some of the INR activities detailed in the charter. This charter of UEMS represents the opportunity to harmonize training programs, to avoid isolation, and to improve the care of the patients.

INR must not be sectarian or focus only on techniques, materials, or devices as this would surely mean the death of this growing speciality. Opening INR to Neurosciences is the best way to keep it alive and growing. Inclusion does not mean separation: anchored in Neuroradiology, at the crossroad of neurosciences, INR will participate to progress and innovation as it has often been in the past. We must continue the advances started by our pioneers. It is the best tribute to pay to their works and efforts, but, more importantly, it will lead to the best service provided to the patients who trust us.

The UEMS charter represents therefore a fundamental advancement and progress in the recognition and branding of INR. As defined and recommended by the WFITN, it puts in concrete form a common spirit that exists between several specialities interested in pathologies of the Central Nervous System within the neuroscientific community. It could lay the foundation stone for a vast educational common trunk for the study of neurovascular diseases, and could thus possibly incite important neuroscientific societies (as the WFITN, the World Federation of Neurosurgery, the World Federation of Neurology and the World Federation of Neuroradiological Societies) to think about elaborating such a pathway.

Disclosure Statement

The authors of the paper entitled "Interventional Neuroradiology: a neuroscience subspeciality?" have no conflict of interest.

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Section of Radiology, Division of Neuroradiology

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The work on the UEMS Charter of training in Interventional Neuroradiology – INR, started in the fall of 2009 when representatives of the UEMS Section of Neurosurgery proposed a joint effort with the UEMS Division of Neuroradiology in producing guidelines for training in INR. The project was approved by the General Secretary of UEMS and the real work in assembling the guidelines started in the spring of 2010 following approval in January by the Executive Committee of the European Society of Neuroradiology – ESNR.

The task force charged with this work consisted of Professor Bernd Richling, neurosurgery, Professor Wolfgang Grisold, neurology, Professor Laurent Pierot, neuroradiology, Professor Harald Mudra, cardiology and Professor Peter Pattynama, radiology, all formally mandated by their respective UEMS Section and Division. Chairing this group was Professor Olof Flodmark, President of the UEMS Division of Neuroradiology. Source documents for this work were founds among publications originating from members of WFITN - World Federation of Therapeutic and Interventional Neuroradiology [6,7].

After four meetings in the task group, the document had reached its final version and the process of finding support and approval for the concept was initiated. Members of the task force met with the UEMS sections of radiology, cardiology, neurology and neurosurgery during the spring and summer 2011. Meetings were also held with German and British neuroradiologists as well as the Executive Committee of ESNR. The guidelines found support and approval by all these institutions.

The Guidelines for training in INR were submitted for approval by the UEMS Council in October 2011. They were presented in the meeting by Professor Flodmark and received a preliminary approval with acclamation .

The European concept of training in INR, four years of training in the core of INR (24 months), diagnostic neuroradiology (12 months) and clinical neuroscience (12 months) became the subject of a paper published in Stroke in August 2012 [8].

The UEMS Guidelines for training in INR have, since their publication in Stroke, generated a fair amount of discussion [9]. However the Guidelines have been very well received among the most concerned, those practicing INR, particularly within the WFITN.

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UEMS recommendations for acquiring competence in Endovascular Interventional Neuroradiology - INR

"Chapter VI"

Foreword

This document sets out standards and guidelines for training in Interventional neuroradiology (INR) in Europe with the aim to acquire competence and if possible, "particular qualification", in INR. The aim is that this curriculum in INR will constitute an approved training program in all member, and associated member, countries within UEMS. 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 interventional neuroradiology for trainees wishing to obtain competence in INR.

It is recognised that there are a number of specialists in Europe performing all or some of the INR activities detailed in this Training Charter. These specialists will have the acquired right to continue this practice.

Article 1: *Goal of training program*

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

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 Interventional Neuroradiology (INR) practice.

1.2 Definition and scope of Interventional neuroradiology: Interventional neuroradiology is 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 interventional neuroradiology. Although percutaneous spinal procedures are usually included in interventional neuroradiology, these procedures will not be dealt with in this document but will be defined in a separate charter. In this document the term interventional neuroradiology (INR) refers to endovascular interventional neuroradiology only.

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

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 INR using UEMS standards based on this training charter.

1.3.2 UEMS accreditation of training program:

- UEMS provides a general program for accreditation of teaching institutions. This is a voluntary procedure aimed at securing high quality and good standard of practice in teaching programs.
- Accreditation to train the candidates within a program of INR 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 INR can be obtained.
- UEMS accreditation to teach in INR is valid for a limited time only and may be renewed.
- Identification, visitation and subsequent recognition of a training program is a procedure, supervised by the UEMS and coordinated by the UEMS Division of Neuroradiology. This procedure is a joint responsibility of neuroradiology, radiology, neurosurgery and neurology.

Article 2: *General aspects of training in Interventional neuroradiology*

2.1 Selection criteria and access to the INR particular qualification

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 INR 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 INR is to reach predefined goals set out in this Training Charter.
- The education and training needed to become a specialist physician with competence in Interventional neuroradiology is 4 years corresponding to full time study in an INR training program.
- The 4 years consist of a core of INR 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 in INR 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 is 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 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 Interventional neuroradiology*

3.1 Educational and Training program
3.1.1 General objectives and goals of training: Interventional neuroradiology should ideally be practiced in INR teams where exchange of experience, knowledge and research is possible. Having finished the training program, the specialist physician with competence in INR, will be able to perform endovascular procedures as described in Art 4 in a team with other interventional neuroradiologists. Thus solitary practice of INR is not recommended.

A specialist physician with competence in INR 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 endovascular INR procedures. ❍ advise other clinicians and carry the main responsibility for how the diagnostic and therapeutic methods are used within the domain of INR. ❍ master the diagnostic and therapeutic methods used within the domain of INR 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
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 INR ❍– in radiotherapy and radiosurgery • Radiation protection in diagnostic neuroradiology and INR 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 INR • Knowledge and management regarding all aspects of contrast materials, including interactions and complications, as they are used in clinical neuroradiology and INR.

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 INR 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 INR procedures ❍ Establishment of an individual treatment strategy ❍– Aim of INR 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 rinsing systems ❍– Skilful management of the radiological equipment in INR ❍– 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 of 150 endovascular INR procedures, of which at least in 50 should be as the principal operator. The diversity of these procedures is defined in Addendum # 1.

3.1.2.7. Attitude and Ethics in INR: • To be able to make independent and well founded decisions in medical ethical matters within INR • 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 INR • 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 INR 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 INR training: Each trainee must keep 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 INR 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 INR must take place in a network of institutions/departments operating in accordance with the UEMS and WFITN recommendations for good practice in INR. (Interventional Neuroradiology, 2006, 12:7-8). • An INR training program is organized in a network of institutions/departments in which the unit for INR constitutes the core surrounded by clinical and diagnostic units in 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. Commercial interests may not be involved in organisation and scientific content of training. ❍ The network should ideally be involved in active research in INR ❍ There should be ready access to general medical/neurointerventional texts and periodicals. Computerized literature search facilities should be available. • The INR core must fulfil the following conditions ❍ The faculty of the training program must include at least two members practicing INR as their principle activity. ❍ The proportion of trainers in INR to trainees must not exceed the ratio of 1:2. ❍ INR Case load (150 – 200 cases/year) of endovascular interventions ❍ INR 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 interventional neuroradiologist 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 an interventional neuroradiologist 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 Charter, 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. UEMS. • Trainees must be given an opportunity to provide a documented evaluation of the program and faculty at least once annually.

Article 6: *Certification of competence in INR*

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

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

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

Article 7: *Maintenance of competence.*

Maintenance of a competence in INR is subject to the general principles of the UEMS Charter on Continuing Professional Development. '01.

This Charter, including Addendum # 1, was unanimously approved by:
– UEMS Division of Neuroradiology in their meeting 2011-02-04.
– UEMS Section of Radiology in their meeting 2011-03-05.
– UEMS Section of Neurosurgery in their meeting 2011-05-07.
– UEMS Section of Cardiology 2011-02-24.
– UEMS Section of Neurology 2011-03-15.

Addendum # 1

List of minimum numbers of INR procedures as principle operator:

	Absolute numbers	**Proportions**
Aneurysm	10	20%
Intracerebral AVM	5	10%
Dural AV fistula	5	10%
Interventional stroke prevention and therapy	15	30%
External carotid artery embolisation	15	30%