

Core curriculum for a specialist training program in adult neurology

Revised version November 2014

Introduction

The European Union of Medical Specialists (UEMS) commits itself to contribute to the improvement of medical training at the European level through the development of European Standards in the different medical disciplines. Most specialist sections of the UEMS set up a core curriculum to define their post-graduate training as an addendum to the 'Chapter 6' of the Charter on Post Graduate Training.

This document contains a core curriculum for European residents in adult neurology. The structure of this description follows the format as proposed by the UEMS.

A neurology specialist is an individual who has undertaken successfully a recognized program of postgraduate training within neurology. The appointment as a neurologist is made by an institution within the individual's country of training and takes due note of satisfactory completion of training as required within that country as related to the domains of knowledge, clinical skills, experience and professional behaviors.

The underlying principle as regards this document is that it promotes high standards of care for patients with neurological conditions throughout the European Union and sets the basic requirements in the domains listed below to enable specialists to move across European country borders for professional purposes. The data that would be provided to a receiving country/employer about a doctor is shown in the Appendix at the End of this document.

Competencies to be acquired in a post-graduate training in Neurology

It is widely accepted that properly going through a consultation process requires knowledge, skills and attitude. These three abilities come together in the concept 'competency'. The current document summarizes knowledge and skills, attitudes are not yet explicitly defined, as they are for example in CanMEDs based curriculum descriptions.

The UEMS values professional competence as 'the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served'.

1. General Competencies

To be appointed as a specialist an individual should show a level of competence sufficient to allow independent clinical practice and be able to care for patients both in acute and chronic situations. Such a level of performance may vary from country to country and from post to post but the lists and competencies in this document describe the basic requirements one would expect of a 'European Neurologist'

In addition to the knowledge and skills in practical procedures detailed below an applicant for a specialist post in Neurology would be expected to show evidence of having been personally and continuously involved with the care of patients with a wide a range of common neurological problems as possible.

A European specialist in Neurology should be well informed in research principles: principles and methods of epidemiological research, principles of clinical research, evidence-based medicine, data analysis and medical informatics, laboratory techniques, ethics of clinical and basic research, critical review.

A 'European Neurologist' would be expected to demonstrate ethical behavior, in keeping with the requirements of their country's medical registry/statutory body, and provide evidence to this effect.

A 'European Neurologist' would be in good standing with their relevant National Registration Body.

2. Specific Competencies

a. Theoretical and clinical knowledge

Knowledge of basic science includes:

- Anatomy and biology of the central and peripheral nervous system as well of the musculoskeletal system.
- Immunology
- Neurobiology of pain
- Pharmacology
- Neurophysiology
- Genetics
- Neurochemistry
- Epidemiology
- Research methodology
- Ethics and Law
- Principles of Public and Global Health

Theoretical knowledge of Neurology includes the following aspects.

- Knowledge of specific clinical neurological topics as given in section A.
- Knowledge of (interpretation of) laboratory tests as summarized in section B.

- Knowledge to be shared with Other Specialties as described in section C. The separation with some of these neighboring specialties, especially pediatric neurology, may be different in various countries, therefore some items in section C may need a transfer to A and vice versa, according to the country under concern.
- Ability to face problems as described in section D.

These conditions define the basis of the core curriculum. By the time an individual is appointed as a specialist he/she would be expected to have the following attributes:

- Knowledge and understanding of the relevant and topical underpinning medical sciences, population health sciences, pathophysiology and principles of management and care of patients with any of the core clinical conditions
- Ability to indicate and interpret diagnostic testing: laboratory test, diagnostic imaging techniques, test performance characteristics.
- An understanding of the modes of action and potential adverse effects of therapies and experience in advising patients about the risks and benefits of such therapies.
- Ability to analyze and utilize research finding in neurology so that their clinical practice is, as far as possible, based upon evidence.
- Be able to provide evidence that they are maintaining their general medical as well as their neurological knowledge sufficient to ensure a high standard of clinical practice.
- An understanding of the healthcare system(s) within their country of training.
- Be prepared for their role as future clinical leaders.
- Be able to be an effective member and a leader of a multidisciplinary team.

We will use here a subdivision of the curriculum in two phases, to wit an initial phase (the first 2 years) and an advanced phase comprising the remaining years of the curriculum.

According to others¹ we will use the levels

Applied clinical knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally (able to make a complete diagnosis)
4. Knows specifically and broadly (competent to treat as far as possible), knowledge on own capacities and limitations, ready for referral to other specialists.

These levels should be considered as minimal requirements for residents in neurology after 2 years and at the end of their training. Local habits may dictate modifications in this level-setting, especially where clinical neurophysiology and neuropediatrics are concerned.

¹ A Competency Based Curriculum Specialist Training in Trauma and Orthopaedics, British Orthopaedic Association 2007

b. Clinical Skills

List of conditions: see Section E

Trainees should demonstrate competence of the required skills prior to being appointed as a specialist. It may be that in some countries specialists will be required to demonstrate the retention of such skills for reaccreditation purpose.

Again, we will use here a subdivision of the curriculum in two phases, to wit an initial phase (the first 2 years) and an advanced phase comprising the remaining years of the curriculum.

Applied clinical skills

1. Has observed or knows of
2. Can manage with assistance
3. Can manage whole but may need assistance
4. Competent to manage without assistance including complications, knowledge on own capacities and limitations, ready for referral to other specialists.

These levels should be considered as minimal requirements for residents in neurology after 2 years and at the end of their training. Local habits may dictate modifications in this level-setting, especially where clinical neurophysiology and neuropediatrics are concerned.

Organization of training

1. Schedule of training

A duration of at least 4 years of core neurology training is recommended. The training period in neurology will be in keeping with EU requirements and in any case sufficient to ensure that a trainee has met all the required educational and training needs. Specific arrangements for the overall training for any individual trainee would be decided locally and be influenced by relevant national requirements. The list of conditions shown above is a guide to the knowledge base required of a specialist/consultant. The clinical experience should encompass all common neurological clinical conditions as shown in the list above.

For a trainee to be able to apply for a post in another EU country it would be necessary for there to be a published curriculum which has been followed by the trainees with details as to how it is known that the curriculum has been followed by both trainees and their trainers. The curriculum would contain details about the required nature and extent of clinical experiences, the methods by which a trainee is supported in their development and how judgments are made about their progress as regards the development of their knowledge and understanding, the progression of their clinical work and their development as a professional.

2. Curriculum of training

The curriculum is outcomes focused but with sufficient flexibility to allow personal development distinguished by the needs of the individual, the center in which they are training and the country where this is occurring.

Training should include teaching skills for generic competences and neurology specific competences.

Thus, the curriculum would be based on the following principles.

A European Neurologist would:

- be a pluripotent specialist and a multi-system disease expert
- be competent in history taking, physical examination, management and continuing care of patients with common and a number of other neurological conditions
- communicate effectively with patients, their families and with professional collaborators
- practice evidence-based care
- practice cost-effective care
- understand the nature of and degree of risk taken in their clinical practice
- maintain the quality of their practice by being aware of developments in the subject
- undertake multi-disciplinary team (MDT) work
- provide clinical leadership also ability to be led and work as part of a multi-disciplinary team
- demonstrate a lifelong commitment to reflective learning
- promote the health and well-being of individual patients, communities, and populations
- have an understanding of specialty-based Public Health
- teach and support trainees
- be committed to the health and well-being of individuals and society through ethical practice, profession-led regulation and high standards of personal behavior and clinical practice
- have a portfolio of evidence that they have achieved the above goals; especially should they wish to seek employment in a country different from the country in which they trained.

Different countries will have different approaches to achieve these outcomes but the evidence that they have been achieved should be increasingly of a homogeneous nature that facilitates the learning and experiences of trainees, the engagement of clinical supervisors and ease of recognition of progress and achievements across EU member countries. In addition, such an approach will help provide surety to the public and to individual countries that the training has been of an appropriate standard and that the performance of doctors is likewise of a satisfactory standard.

3. Assessment and evaluation

Countries will use assessment strategies appropriate to their needs. Progressively, there will be a move to a common approach to determining whether an individual is suitable to be recognized as a European Neurologist. Thus, there will need to be an assessment of knowledge which would be through a written examination.

This examination would sample from the list of core clinical conditions shown in this document and test knowledge in the areas of relevant science (basic medical and clinical sciences, population health sciences and behavioral sciences) and clinical practice (diagnosis, investigation and treatment). This testing will be in a multiple choice format. These tests would be delivered across Europe on a regular basis. There will be an assessment of knowledge (formative) after one or two years of training and a second (summative) assessment towards the end of the period of training. Trainees will be able to retake the summative assessment should they fail it initially.

Further testing in order to judge other competencies than theoretical neurology are recommended.

Trainees will be supported at a number of levels.

A trainee's clinical work will be supervised by a trainer. The trainer will be responsible for providing the trainee with regular feedback as regards their performance and guidance in matters related to the clinical care that they are delivering.

In addition, all training programs in neurology will be led in an institution (or in a group or network of allied institutions) by a Program Director.

A trainee will meet with their Program Director on a regular basis, which typically would be every six months, to discuss their work. Such discussions will take the format of an appraisal with the trainee providing information about how they are progressing, accompanied by documented evidence of clinical engagement and achievement of their learning and training outcomes.

The purpose of the appraisal is to enable a constructive discussion about how the learning needs of the trainee should be met. Subsequent appraisals will revisit earlier appraisals to determine progress in achieving these needs. The appraisals are not part of any summative assessment process but are designed entirely to support the trainees.

Assessment of skills in practical procedures will be in the training establishment. Such assessments may include, where appropriate, the use of simulation prior to an assessment in clinical practice.

Clinical experience will be assessed by a review of the patients seen by a trainee and for whom the trainee has had a personal responsibility as regards care. Evidence of such engagement will be maintained in a clinical log-book or equivalent. The log-book will be reviewed by the trainee's trainer together with the trainee in a formative manner. This will enable the trainee to see and be involved with the care of an appropriate number and range of patients. The log-book will be reviewed in a summative manner, separately, by the local Program Director together with relevant trainers with whom the trainee has worked.

Professional behaviors would be part of the assessment strategy too and typically a 360- degree multi-source feedback (MSF) would occur at the end of the first or second year of training and at the start of the final year of training. Such assessments may occur more frequently in some countries. The Program Director would be central to the discussion and reflection undertaken after each MSF and provide guidance and support in response to comments made by those providing the MSF to a trainee. Additional MSFs would occur if the initial MSF demonstrated a less than adequate performance by the trainee. Local national standards as regards an individual's suitability for clinical practice would determine whether or not a trainee was employable as a consultant/specialist.

In order to be eligible to apply for a post in a country other than the country in which one has trained or to be recognized as a European Neurologist all aspects of the above assessment approaches will need to be completed satisfactorily.

4. Governance

The governance of an individual's training program will be the responsibility of the Program Director and the institution(s) in which the training program is being delivered. A trainer will be responsible to the Program Director for delivering the required training in their area of practice.

Training requirements for trainers

1. Process of recognition as trainer

a. Required qualification and experience

A trainer would be a registered medical practitioner and registered too as a neurology specialist/consultant within his or her own country. They will have satisfied any relevant national requirements as regards accreditation/appraisal/training to be a trainer. A Program Director would be someone who has been/is a trainer and who has considerable knowledge and experience of training doctors. Trainers and Program Directors must be in active clinical practice and engaged in training in the training center or network. Their appointments would be for five years in the first instance. In some countries their work would be reviewed within the training-network on a regular basis at staff appraisals (or equivalent) but in any case it would be a requirement that their training activities are reviewed in the fifth year of their appointment. Subject to mutual agreement their position may be continued for a further five years and so on. It would be unlikely for a Program Director to hold this position for more than two five-year appointments. This would enable a turnover and refreshment of appointees.

Recognition across the EU as regards competence to be a trainer despite practitioners coming from different countries and having different routes and extents of training is covered by Directive 2005/36/ EC (Paragraph C2/20).

b. Core competencies for trainers

A trainer will be:

1. Familiar with all aspects of the overall neurology curriculum as it relates to practice within their country
2. Experienced in teaching and in supporting learners
3. Skilled in identifying the learning needs of their trainees and in guiding the trainees to achieve their educational and clinical goals
4. Able to recognize trainees whose professional behaviors are unsatisfactory and initiate supportive measures as needed
5. Trained in the principles and practice of medical education

2. *Quality management for trainers*

It is hoped that trainers and Program Directors will have their job description agreed with their employer which will allow them sufficient time each week for support of trainees and in the case of Program Directors, sufficient time for their work with trainers. It would be unusual for a trainer to have more than four trainees. The number of trainees would determine the amount of time each week that would be allocated to their support.

Trainers will collaborate with trainees, the Program Director and their Institution to ensure that the delivery of training is optimal. Feedback from trainees will assist in this regard.

The educational work of trainers and Program Directors will be appraised typically on no less than an annual basis within their Department/Institution as local circumstances determines.

Educational support of trainers and Program Directors will be provided by their Department and Institution and through the Section and Board of Neurology of UEMS.

Training requirements for training institutions

1. *Process for recognition as training neuro*

a. *Requirement on staff and clinical activities*

A 'Training Center' is a place or number of places where trainees are able to develop their neurological competences. Such provision may include sites which are condition specific and thus not offer a wide clinical experience such as that provided by a large neuro.

Thus, neurology training may take place in a single institution or in a network of institutions working together to provide training in the full spectrum of clinical conditions and skills detailed in the curriculum. This should include a hospital or institution that provides academic activity and is also recognized for training in internal medicine and surgery. Each participating institution in a network must be individually recognized as a provider of a defined section of the curriculum. The training of a trainee will be led and managed by a specialist/consultant neurologist. This specialist will be active in the practice of clinical neurology with personal responsibility for the management of patients with a wide range of neurological conditions. Within a training centre there would be a number of specialist/consultant neurologists (trainers) who would be able to supervise and personally train a trainee. Whilst the trainer will not manage patients with all the diagnoses listed above he/she will be able to ensure, by working with the Program Director and other local trainers that the clinical experience of the trainee will prepare them for clinical work as a specialist. The preparation for being a specialist in one country may be different from that needed if the trainee wishes to practice in another country as a specialist.

It is essential that as part of their training trainees will be responsible for caring for patients on both an emergency and routine basis. This may need the involvement of multiple training sites that offer different 'opening hours'. The trainee should be involved in the management of new patients, follow up of patients and in-patients.

A trainee must have progressively increasing personal responsibility for the care of patients with neurological conditions and retain their general medical skills so as to be able to identify patients who present to a neurology service but whose underlying clinical problems are not neurological.

The staff of a training center will engage collaboratively in regular reviews of the neuro's clinical activity and performance. There will be regular multi-disciplinary meetings to determine optimal care for patients and such meetings will involve both medical and other healthcare staff. There will be clinical engagement outside of the center with other clinical groups such as rehabilitation medicine, orthopedics, pediatrics, neurosurgery, immunology, cardiology, pulmonology, geriatrics and rheumatology.

Within a neurology training center there should be a wide range of clinical services available so that a trainee will be able to see and contribute to the care of all common neurological problems. In addition, the patient numbers and specialist numbers should be sufficient so that trainees will be able to be instructed and then supervised in the clinical procedures required of a specialist. The balance between in-patient and out-patient numbers is constantly changing as neurology becomes more out-patient based than in the past. Thus, no specific in- or out- patient numbers are stated as being necessary to be seen by a trainee during their training.

Specialist staff appointed to a training center will have completed all training requirements themselves and will have been trained also in teaching and mentoring trainee staff. Specialists already in post will undertake training, if they have not already completed this, to enable them to support trainees optimally. Such training and maintenance of skills and knowledge in this area will be part of their job-plan and subject to appraisal (see above).

It would be unacceptable for a trainee to have only one trainer during their entire training period. It would be more usual for a trainee to have a number of named trainers with whom they work on a day-to-day basis. Each trainer would cover different aspects of a trainee's clinical training but this individual will not be the only person who will provide educational support for a trainee. (See above for comments about the Program Director and his/her role). In addition to medical staff supporting a trainee's development it is likely that non- medical members of staff will also be engaged. It would be expected that the specialists in a training neuro(s) represent a wide range of neurological expertise and that such individuals demonstrate that they remain up to date with their clinical practice, knowledge and educational skills.

There is no specific trainee/trainer ratio that is required but it would be unusual for there to be less than three specialists in a training center or clinical network and for a trainer to have more than four trainees attached to them at any one time. If a trainee moves between a number of centers for their training it is recommended that whenever possible although their trainers may change, their Program Director should remain the same. Program Directors may also be trainers.

It is not a requirement that a training center is also an academic center for neurology but it is desirable that a training center would have strong academic links and contribute to research and an aspiration that that all training centers will become so involved in the future.

It would be expected that a training center as described in this document will have been recognized/accredited by the relevant national authority as being suitable for training specialists/consultants in neurology. Confirmation of such

status of training centers will be by National Representatives to the Section and Board.

When a neurology department/center wishes to be recognized as a training center they will submit a report to the UEMS Section and Board of Neurology through their National Representative(s). This will demonstrate that all the necessary educational and training provisions are available in a sustained manner.

Subsequently, on a biennial basis a training center will provide a brief report on its activities, to the Section and Board, again through their National Representative(s). This will demonstrate the maintenance of the education and training provision and allow examples of good practice to be disseminated.

There should be appropriate quality assurance systems in place that involve regular objective assessment of the quality of medical care as well as evaluation of the program and outcomes of training.

b. Requirement on equipment, accommodation

A training center would have sufficient equipment and support to enable the clinical practice that would be expected of a training center and thus provide the necessary educational opportunities for trainees.

Trainees would have suitable accommodation for their work and if required to be resident suitable accommodation for this too.

Computing and Information Technology and library resources must be available. All trainees must engage in clinical audit and have the opportunity to engage in research.

2. Quality management within training institutions

a. Accreditation

Training neuros would be recognized within their own country as being suitable for being such and for being suitable for the care of patients with a wide range of neurological conditions. It would be expected that training neuros would be subject to regular review within their country and this would include data relating to the progress of trainees and their acquisition of specialist accreditation.

b. Clinical Governance

Training neuros will, almost certainly, undertake internal audits of their performance as part of the requirements for continuing national recognition/accreditation. It is anticipated that any national evaluation of a training neuro's performance will also include the demonstration that it is:

1. Providing care for patients with a wide range of neurological conditions
2. Providing educational and training support for trainees and others
3. Part of a healthcare system that provides immediate access to relevant laboratory and other investigations as well as providing when necessary immediate access to other clinical specialties that may be required by their patients.

The outcomes of such national evaluations will be made available to the Section and Board by the National Representative(s).

Training centers should keep records of the progress of their trainees, including any matters relating to Fitness to Practice or other aspects that might affect a trainee's registration with the relevant national body. The Program Director has specific responsibilities in this regard (see above).

c. Transparency of training programs

It would be expected that a training center would publish details of the training provision available with details of the clinical service it provides and the specialist and other staff. Such information would include the training program, the nature of the clinical experiences with which a trainee would be engaged and the support and interaction with the trainer and Program Director. There would be a named individual whom a prospective trainee might contact and discuss the program.

d. Structure for coordination of training

There should be a national (or equivalent) program for training leading to recognition as a specialist within that country.

The trainee's job plan should allow sufficient time for developmental activities separate from their involvement with clinical service provision.

The job plans of trainers and of Program Directors should include sufficient time for them to fulfil their educational and training responsibilities.

Training centers will be recognized and approved by the relevant national authority.

To assist a neurology specialist moving from one EU country to another it would be expected that they have satisfactorily completed a training program in neurology thus demonstrating that he/she has the required knowledge, clinical skills and competences as well as having demonstrated appropriate professional behaviors and has been engaged with sufficient amount of clinical work for employment in the post they are seeking. Such accomplishments would be verified both by relevant documents and comments made by referees (Appendix).

A Specific Learning Objectives in Neurology

For all of the diseases in this paragraph the following issues should be considered

- Anatomy and pathophysiology
- Clinical semiology
- Clinical course
- Comorbidity
- Disability
- Epidemiology
- Radiological and neurophysiological aspects
- Psychological and behavioural aspects

and furthermore as far as relevant:

- Causes and environmental influences
- Pharmacological therapy
- Non-pharmacological interventions
- Diagnosis and management of treatment complications
- Rehabilitation
- Psychological care
- Genetics and counseling
- Primary prevention
- Secondary prevention

Applied clinical knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally (able to make a complete diagnosis)
4. Knows specifically and broadly (competent to treat as far as possible), knowledge on own capacities and limitations, ready for referral to other specialists.

Initial Advanced

1 Neuro-oncology

1.1	Intracranial tumors including the brain stem	2	3
1.2	Intracranial metastasis including leptomeningeal metastasis	2	3
1.3	Intracranial paraneoplastic syndromes <i>see also A5.6</i> Spinal cord <i>see A12.3, A12.9</i>	2	4

2 Neurological trauma

2.1	Head trauma without brain injury	3	4
2.2	Mild and moderate brain injury	3	4
2.3	Severe brain injury	2	4
2.4	Secondary neurological complications of brain injury	2	4
2.5	Intracranial hematoma including epidural, subdural, intracerebral	3	4
2.6	Decompression sickness (barotrauma)	2	3
2.7	Fractures of skull and skull base	2	4
2.8	Flexion-extension trauma of the neck	2	4
	Spinal cord trauma <i>see A12.1</i>		
	Peripheral nerve trauma <i>see A14.3</i>		

3 Problems with circulation of CSF

3.1	Hydrocephalus (including reversible types)	2	3
3.2	(Idiopathic) Intracranial Hypertension	2	4
3.3	Intracranial Hypotension	2	4
	Syringomyelia <i>see A12.4</i>		

4 Neurological infections

4.1	Acute and chronic meningitis	3	4
4.2	Cerebral abscess and epi/sub-dural empyema	2	3
4.3	Encephalitis, particularly Herpes Encephalitis	2	4
4.4	Spinal myelitis	2	4
4.5	Neuroborreliosis	2	4
4.6	Neurotuberculosis	2	3
4.7	Sexually transmitted infections including HIV/AIDS	2	3
4.8	Tropical infections	2	3
4.9	Prion diseases	1	3
4.10	Post-infectious neurological syndromes	1	4
4.11	Diseases caused by bacterial toxins (tetanus, botulism)	1	3

5 Immune mediated diseases

5.1	Multiple Sclerosis	2	4
5.2	ADEM	2	4
5.3	Neuromyelitis Optica	2	4
5.4	Vasculitis, anti-phospholipid syndromes	2	4
5.5	Sarcoidosis	2	4
5.6	Auto-immune encephalitis	2	4
	Transverse myelitis, <i>see A12.11</i>		
	Immunemediated peripheral neuropathies, <i>see A13.2 and A16.3</i>		

6 Neurovascular disorders

6.1	Ischemic stroke including Transient Ischemic Attacks	3	4
6.2	Cerebral small vessel disease	3	4
6.3	Intracerebral haemorrhage	3	3
6.4	Subarachnoid haemorrhage	3	3

6.5	Occlusion/dissection carotid and vertebrobasilar system	2	3
6.6	Cerebral vasculitis	2	4
6.7	Cerebral venous thrombosis	3	4
6.8	Hypertensive encephalopathy, posterior reversible encephalopathy syndrome.	2	4
6.9	Postanoxic encephalopathy	2	4
6.10	CADASIL	2	4
7 Epilepsies and other paroxysmal disorders			
7.1	In adults	4	4
7.2	In children	3	4
7.3	Non-epileptic attacks simulating epilepsy	4	4
7.4	Cardiac and Reflexsyncope	3	3
8 Sleep disorders			
8.1	Narcolepsy	2	4
8.2	Idiopathic hypersomnia a.o. disturbances of the Sleep-Waking cycle.	2	3
8.3	Sleep Apnea Syndrome	2	3
8.4	Parasomnia and the differentiation of epilepsy.	2	3
8.5	Restless legs and periodic limb movements	2	4
9 Headache			
9.1	Acute headache syndromes	3	4
9.2	New daily persistent headache	3	4
9.3	Tension type headache, chronic daily headache	3	4
9.4	Analgesic overuse headache	3	4
9.5	Migraine	3	4
9.6	Facial pain syndromes and trigeminal autonomic cephalalgias	3	4
9.7	Cranial Arteritis	3	4
9.8	Secondary headache (e.g. internal diseases a.o.)	2	4
10 Cognitive disorders			
10.1	Dementias including Alzheimer, frontotemporal lobular degeneration, Lewy body, CJD	2	4
10.2	Vascular dementia	2	4
10.3	Infectious disorders	2	4
10.4	Dementia associated with metabolic deficiencies, endocrine disorders and biochemical disturbances Auto-immune encephalopathies <i>see</i> A5.6	3	4
11 Neurodegenerative and Movement disorders			
11.1	Parkinson's disease and Parkinsonism	3	4
11.2	Other dyskinesias, a.o. Huntington's Disease	3	4
11.3	Multiple system atrophy	2	4
11.4	Ataxias	2	4

11.5	Syndromes with spasticity, a.o. spastic paraplegia	2	4
11.6	Motor neuron disease	2	4
11.7	Leuco-encephalopathy, metabolic, adrenoleukodystrophy and other leukodystrophies, i.e. Krabbe, metachromatic	2	3

12 Spinal cord diseases

12.1	Spinal cord compression		
	- Cervical spondylotic myelopathy	3	3
	- Traumatic	3	3
	- In infectious diseases (tuberculosis, abscess)	2	3
12.2	Vascular problems		
	- Infarction, incl. anterior spinal artery syndrome	4	4
	- Hemorrhage	2	3
	- Vascular malformations	2	3
12.3	Spinal cord tumor (epi- and intradural, intramedullar)	3	3
	- Leptomeningeal metastasis	2	3
12.4	Syringomyelia	3	3
12.5	Nutritional deficiencies (a.o. B ₁₂)	2	4
12.6	Toxic myelopathies	2	4
12.7	Radiation damage	3	4
12.8	Paraneoplastic myelopathies	2	4
12.9	Transverse myelitis of unknown cause	2	4
	Demyelinating and immune mediated diseases <i>see A5</i>		
	Spinal cord infections <i>see A4</i>		

13 Poly(radiculo)neuropathies

13.1	Hereditary	4	4
13.2	Inflammatory and infectious	2	4
13.3	Infectious neuropathies (incl. HIV)	2	4
13.4	Metabolic and Toxic	3	4
13.5	Paraneoplastic polyneuropathy	2	4
13.6	Idiopathic	2	4

14 Mono(radiculo)neuropathies

14.1	Radiculopathies		
	- Compression	2	4
	- Traumatic	3	4
	- Infectious	3	4
	- Tumor (e.g. neurinoma)	2	3
14.2	Plexopathies		
	- Compression	2	3
	- Traumatic	3	3
	- Infectious	3	4
	- Hereditary	2	4
	- Radiation	2	4
	- Associated with diabetes	2	4
	- Idiopathic	2	4
	- Tumor (e.g. neurinoma)	2	3

14.3	Mononeuropathies		
	- Compression	3	3
	- Traumatic	3	3
	- Infectious	3	4
	- Tumor (e.g. neurinoma)	2	3
	- Associated with systemic disease, e.g. diabetes, amyloidosis, hypothyroidism	2	4

15 Cranial nerve disorders

15.1	Neuro-ophthalmology		
	- Optic neuritis	2	3
	- Optic nerve ischemia	2	4
	- Optic nerve compression	2	3
	- Other optic neuropathies including hereditary (Leber)	2	3
15.2	Neuro-otology		
	- Vestibular Neuronitis	2	2
	- Benign Paroxysmal Positional Vertigo	2	2
	- Ménière's disease	2	2
	- Sensory deafness	2	3
15.4	Facial nerve disturbances	3	4
15.6	The trigeminal nerve and its diseases	3	4
15.7	Diseases of remaining cranial nerves	2	4

16 Myopathies

16.1	Congenital and hereditary myopathies, myotonia, muscle dystrophies, and channelopathies	1	2
16.2	Metabolic, endocrine and toxic myopathies	2	3
16.3	Inflammatory and paraneoplastic myopathies, incl Inclusion Body myositis	2	3

17 Myasthenias (Neuromuscular Transmission disorders)

17.1	Postsynaptic	3	4
17.2	Presynaptic	2	3

18 Neurologic manifestations and complications of non-primary neurological diseases/conditions

18.1	Neurological complications of biochemical dysregulation	3	3
18.2	Neurological complications of pregnancy	3	4
18.3	Neurological complications of endocrine disease	3	3
18.4	Neurological complications of cardiovascular disease	3	3
18.5	Neurological complications of connective tissue disorders	2	4
18.6	Metabolic deficiencies	3	4
18.7	Alcohol and other substances abuse	3	4
18.8	Intoxications a.o. carbon monoxide	3	4
18.9	Complications of therapy a.o. chemotherapy	2	4

18.10 Mitochondrial diseases, Peroxisomal diseases	2	3
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19 Disorders of consciousness

19.1 Metabolic coma	2	4
19.2 Coma in intoxications	2	4
19.3 Delirium	2	4
19.4 Pseudocoma	2	4
19.5 Locked-in syndrome	2	3
19.5 Traumatic coma <i>see A2.3</i>		
19.6 Vegetative state	2	4
19.7 Brain death	2	4
Coma caused by intracranial space occupying lesions <i>see A1</i>		
Coma caused by in vascular disease <i>see A6</i>		
Coma caused by infections and auto-immune encefalitis <i>see A4 and A5.6</i>		
Postictal coma <i>see A7</i>		
Brain death and organ donation <i>see C3.14</i>		

20 Other diseases

20.1 Orphan diseases not previously mentioned	1	2
20.2 Neurological diseases related to occupation	2	4
20.3 Neurological diseases due to toxic exposures	2	3
20.4 Neurological diseases due to environmental factors	2	3

B Learning Objectives in Laboratory Investigations

Levels of knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally (able to make a complete diagnosis)
4. Knows specifically and broadly (competent to treat as far as possible) , knowledge on own capacities and limitations, ready for referral to other specialists.

	<u>Initial</u>	<u>Advanced</u>
1. General laboratory knowledge		
1.1 Interpretation of laboratory data of blood, CSF and other bodyfluids or –tissue as relevant for neurology	2	3
1.2 Investigation techniques on CSF.	2	2
2. Neurophysiology		
2.1 Electroencephalography		
2.1.1 Basic concepts, recording, technical problems	2	4
2.1.2 Interpretation, limitations and normal findings at different ages.	2	3
2.1.3 Optional special techniques: video EEG, telemetry, polysomnography and multiple sleep latency, depth recording and cortical mapping.	1	1
2.2 Nerve conduction tests, thermal thresholds.	2	3
2.2.1 Reflex techniques (H-, F-, C-responses)	2	3
2.3 Electromyography and SFEMG	1	2
2.4 Evoked potentials.	1	2
2.5 Magnetic stimulation.	1	2
2.6 Autonomic function tests	1	2
3. Imaging		
3.1 Basic principles, techniques, limitations in neuroradiology including CT, MRI, SPECT and PET scanning.	2	3
3.2 Vascular investigations: Digital, MR and CT angiography.	2	2
3.3 Interventional neuroradiology.	1	2
3.4 Extra and transcranial Doppler/Duplex.	2	2
3.5 Nerve and muscle ultrasound	2	2
3.6 Indications, cost, value and risks of different investigations.	2	4
3.7 Reading CT/MRI for acute intervention in vascular disorders	3	4
4. Neuropathology		

4.1	Gross and microscopic pathology.	3	3
4.2	Knowledge on techniques for brain fixation and cutting, and on staining methods including immunocytochemistry, electron microscopy.	1	2
4.3	Indications for and limitations of different techniques and correct interpretation of information obtained from biopsy, surgical and autopsy material.	1	2
4.4	Knowledge on forensic neuropathology.	1	1

5. Genetics

5.1	Molecular genetic principles	2	3
5.2	Neurogenetic modes of hereditance: see specific diseases	2	4
5.3	Neurogenetic diagnostics: see specific diseases	2	3

6. Pharmacology

6.1	Ability to apply knowledge on Pharmacodynamics and -kinetics	3	3
6.2	Knowledge on interactions of drugs in neurology	3	4

C Inter-disciplinary aspects

The value of items in this section are dependent on local habits. This holds especially for the relation between neurology and neuropaediatrics, which differs in several countries. Nevertheless it will be important for each neurologist to be familiar with many topics in neighbouring specialisms, to be able to communicate and collaborate, and to warrant a proper transition for patients moving from one specialism to another. Also here the relation between neurology and neuropaediatrics is to be regarded. Neuropaediatric patients passing the limit between puberty and adolescence will be confided to neurologists and this transition should be as smoothly as possible. Their ability for providing a smooth *transition* and optimal *collaboration* should be key competencies in this section, both for trainees as for neurologists.

Levels of knowledge

1. Knows of
2. Knows basic concepts
3. Knows generally (able to make a complete diagnosis)
4. Knows specifically and broadly (competent to treat as far as possible), knowledge on own capacities and limitations, ready for referral to other specialists.

Initial Advanced

1. Knowledge and skills concerning pain conditions

1.1	Understanding the scope of a pain problem and the assessment of quality of life, being able to outline a diagnostic work-up and treatment plan of a pain problem.	2	3
1.2	Usage of definitions of pain, nociception, allodynia, hyperalgesia, neuropathic pain, nociceptive pain.	4	4
1.3	Pain-neurological examination, specific diagnostic tests.	4	4
1.4	Assessing pain intensity and pain relief.	3	4
1.5	Pharmacology of opioids and management of side-effects. Principles of addiction, tolerance and physical dependency.	3	4
1.6	Management of neck and low back pain	3	4
1.7	Management of central pain	3	4
1.8	Understanding the principles of palliative care medicine.	3	4
1.9	Understanding diagnostic properties and indications of interventions such as sympatholytic blocks, nerve and root blocks, provocative discograms.	2	3
1.10	Pain management in pediatrics and geriatrics.	2	3

2. Neurorehabilitation

2.1	Making functional assessment and outcome measures	2	3
2.2	Working in an interdisciplinary rehabilitation team.	3	4
2.3	Knowledge about the use of orthotics, wheelchairs and other forms of adaptive equipment.	2	3
2.4	Knowledge of restorative neuropharmacology.	2	3

2.5	Management of chronic problems as spasticity, chronic pain, neurogenic bowel and bladder disturbances, cognitive and behavioral disorders, depression, eating and swallowing problems, sexual dysfunction.	2	3
2.6	Knowledge on prevention of complications of persistent disability, e.g., contractures, pressure, ulcers, deep venous thrombosis	2	3
2.7	Develop particular familiarity with the role of rehabilitation for common debilitating neurological disorders.	2	3
2.9	Palliative Care (depends on country)	2	3/4

3. Neurosurgical aspects

3.1	Knowledge of indications and limitations of neurosurgical treatment.	2	4
3.2	Ability to manage the acute neuromedical problems that can arise following neurosurgery.	2	4
3.3	Knowledge of correct indications for and harvesting of central and peripheral nervous system biopsies.	2	4

4. Psychiatric aspects

4.1	Basic skills in conducting a psychiatric interview and evaluating psychiatric symptomatology (including mental status) as far as relevant for neurology.	2	3
4.2	Knowledge of common psychiatric symptoms as derealisation, hallucination, anxiety-symptoms.	2	3
4.3	Knowledge of the common psychiatric disorders acute and chronic, especially those related to alcohol and other substance abuse, other intoxications (drug overdose, medication, water) dementia, epilepsy and confusional states.	2	3
4.4	Understanding of somatization disorders, including conversion disorders.	2	3
4.5	Skill in the use of the common psychoactive drugs, their indications, contraindications and (especially neurological) side effects	2	4

5. Neuropaediatric aspects

5.1	Knowledge of normal child development – gross and fine motor, language, cognition and behaviour.	2	3
5.2	Understanding family psychological responses to neurological illness in childhood	2	3
5.3	Knowledge of malformations and neurocutaneous syndromes	2	3
5.4	Knowledge of hereditary metabolic disorders	2	2
5.5	Knowledge of developmental disorders: Autism, ADHD, dyslexia, obsessive compulsive, developmental coordination and conduct disorders	2	3
5.6	Knowledge of common types of cerebral palsy, antecedents, presentation and management.	2	4
5.7	Knowledge of genetics and ability of genetic counseling	2	3

Childhood epilepsy, *see* A7.2

6. Neurological aspects in the very old

6.1	Understand special challenges of clinical assessment of the elderly.	2	4
6.2	Differential diagnosis of common geriatric problems such as visual and auditory disturbances, delirium, depression, dementia, weakness, falls, and transient losses of consciousness.	2	4
6.3	Maintaining functional abilities, and illness prevention in the face of instances of limited resources	2	4
6.4	Palliative Medicine	2	4

D Problems to be recognized and addressed

Following problems should be recognized and appropriately addressed.

There is no definition of levels of knowledge or skills but the neurologist should be able to work-up each problem with an appropriate differential diagnosis for a treatment plan, or a referral to another specialist.

1. (Sub)Cortical problems

Aphasia (expressive, receptive, conduction, transcortical, aprosodia, etc)
Apraxia (ideomotor, ideatory, dressing, constructive, miction, ocular, gait-, limb kinetic -)
Agnosia (visual, auditory, prosopagnosia, tactile, pure word deafness, etc)
Acalculia
Alexia, Agraphia
Amnesia
Anosognosia
Problems with judgment
Problems with decision making
Dementia
Memory disturbances
Migrainous Aura
Epileptic Aura
Déjà vu, déjà vécu
Extinction phenomena
Mutism
Specific syndromes (e.g. Dejerine, Gerstmann, Balint, Anton, Bonnet, etc)

2. Cranial nerves and Brainstem syndromes

Dysosmia
Dysgeusia
Diplopia
Disturbance of gaze and external ophthalmoplegia
Nystagmus, ocular oscillations a.o. conjugated eye movement disorders
Internuclear Ophthalmoplegia
Vision loss, incl. amaurosis fugax
Visual field defects
Metamorphopsia
Abnormalities of the optic nerve
Eyelid abnormalities, Ptosis
Pupillary abnormalities
Facial weakness
Chewing problems
Tongue weakness/atrophy/fibrillations/apraxia
Dysphagia and swallowing problems (*see also E6*)
Dysarthria (*see also E6*)
Hiccup
Hearing loss, tinnitus
Sensory disturbances in the face
Vertigo, dizziness

Horner's syndrome
Parinaud's syndrome
One-and-a-half syndrome
Brainstem stroke syndromes

3. Pain and discomfort

Headache
Meningism
Facial pain
Neuropathic pain
Central pain
Neuralgia
Cramps
Itch
Complex regional pain syndrome
Arm Pain, Neck Pain
Lower Back Pain, Lower Limb Pain.
Claudicatio

4. Muscle problems

Weakness (proximal, distal, generalised, bulbar, respiratory)
Atrophy
Hypertrophy
Myotonia
Hypotonia (*see also E6*)
Muscle pain/myalgia
Cramps
Fasciculations/myokymia
Fatigue/exercise intolerance/decreased stamina
Polymyalgia rheumatica

5. Sensory problems

Numbness, paresthesia, hyperpathia, hypesthesia
Proprioception, vibration sense, stereognosis
Disturbances of feeling with dissociation of deep and vital sensory functions
Spinal cord syndromes (Brown-Séquard, central cord, conus/cauda-syndrome, etc)
See also: E3. Pain

6. Movement problems

Gait disturbances
Falls and Drop-attacks
Spasticity
Rigidity
Hemiplegia, Monoplegia, Diplegia, Paraplegia
Hypotonia
Hypo-, hyperkinesia (incl. Chorea)
Dyskinesia (including ballism, tardive -, tics, etc.)
Dystonia (including blepharospasm, torticollis, writer's cramp, oculogyric crisis)

Myoclonus
Tremor
Ataxia
Akathisia
Cataplexy
Conversive movement disorders
Motor Impersistence and Perseveration
Apraxia, *See EI*

7. Disturbance of consciousness

Seizures
Psychogenic non-epileptic seizures
Syncope
Fainting
Delirium
Perceptual disturbances (including hallucinations, delusions, derealisation)
Coma
Confusion
Disturbed Sleep-Wake Cycle
Parasomnia
Attentional deficits
Vegetative state

8. Autonomic problems

Positional tension problems (orthostasis etc)
Sexual disturbances
Sweating disturbances
Neurological bladder dysfunction
Neurological bowel dysfunction
Trophic disturbances
Complex regional pain syndrome
Palpitations

9. General symptoms

Fatigue
Nausea
Fever
Depression
Addiction

10. Other Problems

Developmental Delay
Behavioral disturbances
Personality disturbances
Depression
Non-organic (or functional) diseases

E Skills in Neurology

Levels of skills

1. Has observed or knows of
2. Can manage with assistance
3. Can manage whole but may need assistance
4. Competent to manage without assistance including complications, knowledge on own capacities and limitations, ready for referral to other specialists.

Initial Advanced

1. Diagnostic Skills

1.1	Adequate history taking	3	4
1.2	Adequate communication e.g. breaking bad news	3	4
1.3	Reliable neurological examination and cognitive screening	4	4
1.4	Lumbar puncture	3	4

2. Interventional Skills

2.1	Parenteral application of Botulin Toxin and Spasmolytics.	1	2
2.2	Control of neurostimulators	1	2
2.3	Acute intervention in stroke	3	4
2.4	Handling PEG-catheters	2	2
2.5	Control of shunt function	2	3
2.6	Local anesthesia	1	2
2.7	Application of drugs into the ventricular system	1	3

3. Skills in center intensive care and emergency neurology

3.1	Management of raised intracranial pressure and CSF pressure	2	3
3.2	Management of coma and post coma states	2	4
3.3	Management of cerebrovascular disease and complications	3	4
3.4	Management of status epilepticus	3	4
3.5	Management of severe brain injury / use of coma scales for monitoring.	3	4
3.6	Management of life threatening neuromuscular diseases	2	3
3.7	Management of intracranial infections (meningitis, encephalitis)	3	4
3.8	Management of malignant hyperthermia	2	3
3.9	Management of hypoxic brain damage	2	3
3.10	Respiratory support and Artificial ventilation.	2	3
3.11	Monitoring of homeostasis and management of metabolic problems	2	3
3.12	Cardiovascular support.	2	3
3.13	Psychological care for ICU patients and relatives.	3	4
3.14	Diagnosis of brain death, dealing with organ donation	3	4

Appendix Data to be provided to a receiving country about a doctor.

Record of clinical work and clinical skills

Many trainees already keep a record or have a record kept automatically of patients for whom they have provided care. It is not proposed as a requirement of becoming a European Neurologist that any additional record should be kept but when a doctor seeks to gain employment in an EU country other than their own (or the one in which they have been trained if different) they will be required to provide access to appropriate records (logbook) demonstrating the extent and nature of their clinical experience and skills to a future potential employer and any other relevant body (for example a statutory medical body that grants employment rights within a country).

Independent confirmation of progress of a trainee (or of work as a specialist)

Doctors seeking to gain employment in a country other than their own or the country in which they have been trained will be required to provide references that provide details about:

1. The curriculum that the trainee has followed
2. The nature of assessments completed by the trainee and the outcomes of any assessments undertaken by him/her
3. The outcomes of assessments of a trainee's professional behaviors
4. The good-standing of the trainee
5. The nature of the quality assurance processes by which it is known locally that the quality of the curriculum and its delivery are satisfactory
6. As regards a specialist seeking to work in another country, references will be required to contain confirmation regarding an individual's clinical experience and good-standing, including outcomes of any assessments of professional behaviors.