

Version 2021

# EUROPEAN TRAINING REQUIREMENTS FOR NEUROLOGY



Update in cooperation of



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# 1. Introduction

Neurology is a medical specialty dealing with the inborn, developmental and acquired, acute and chronic diseases of the central and peripheral nervous system and skeletal muscle at all ages. Neurology covers their prevention, diagnosis, the understanding of underlying mechanisms and management. Neurology is a constantly evolving field parallel to the development of the neurosciences and overlaps with numerous other medical specialties, including neurosurgery, neuroradiology, psychiatry, clinical genetics, neuropaediatrics, clinical neurophysiology, neuro-rehabilitation / physical and rehabilitation medicine, intensive care medicine, sleep medicine, palliative medicine, internal medicine and public health.

The European Union of Medical Specialists (Union Européenne des Médecins Spécialistes) (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. The European professional advisory organization for neurology is the Section of Neurology of the UEMS (UEMS-SN). It communicates with the executive bureau of the UEMS and serves in the interest of the various national professional and scientific neurological societies of the European Union and associated countries.

The present update<sup>1</sup> was realized with the input of the European Academy of Neurology (EAN), including its Scientific Panels, and the support of education experts.

The aims of the UEMS-SN and EAN regarding education and training are to ensure that minimal standards for the qualification of European neurologists are achieved.

In this document, the European Training Requirements for Neurology (ETRN) are also referred as “curriculum” and were formerly known as “Core Curriculum”.

<sup>1</sup> Current version approved by UEMS-EBN on 6 November 2021

As a general recommendation to all in charge of neurological training at any level, the UEMS-SN and EAN encourage the application of modern principles of educational sciences. Additionally, together they:

## Provide recommendations

Provide recommendations for the selection of the candidates to enter post-graduate neurology training and for the requirements for training institutions and those who are in charge of training in neurology.

## Recommend a system of external peer review

Recommend that training institutions should have a system of external peer review. The UEMS-SN and EAN recommend and update standards for, and offer external peer review of training institutions at a European level. Having successfully completed an external peer review, the institution should become an UEMS-SN / EAN accredited department for specialist training in neurology.

## Hold a Board Examination

Hold a European Board Examination annually ([www.uems-neuroboard.org](http://www.uems-neuroboard.org)). The examination is open to candidates world-wide. The examination is considered as an additional sign of excellence but is without legal value, unless national authorities adopt it as an equivalent to or instead of their national exam, or accept it as an exit exam if no national equivalent exists.

## Recommend standards on communication

Recommend standards on communication with patients, their associations and the general public and also on ethical issues to ensure a high level of professionalism in all aspects of a neurologist's activity.

## Provide guidance

Provide guidance on professional development through mentor-, leadership and other career development programmes.

This document also contains a core curriculum for European residents in adult neurology. The content aims to define skills needed to diagnose and treat patients with neurological diseases as outlined by the guidelines of the EAN. The structure of this description follows the format as proposed by the UEMS-SN and the EAN.

The endeavor of this document is to promote high standards of care for patients with neurological conditions throughout the European member states and sets the basic requirements in the domains listed 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.

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## 2. Stages of neurology training

Neurology is an important part of pregraduate (undergraduate, university) training. The postgraduate training in neurology consists of residency training and Continuous Medical Education (lifelong learning).

### **Pregraduate training**

Training in neurology must be an essential part of university curricula devoted to medical training. At pregraduate level the major neurological diseases should be covered and teaching on basic history taking and clinical neurological examination should be included. A minimum number of hours / credits and case evaluations should be part of the general medical training programme. Every university should have a clearly defined curriculum for neurology including teaching of the neurological examination.

For recognition as training center see point 7.

### **Postgraduate residency training**

Postgraduate neurological training comprises a recommended minimum period of 4 years of clinical neurology. One additional year devoted to related disciplines and particular subfields of neurology and / or neurological research is recommended.

*A neurology specialist is an individual who has successfully undertaken a recognized programme 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.*

### **Continuous Medical Education and Continuous Professional Development**

Continuous Medical Education (CME) and Continuous Professional Development (CPD) is an obligation of the accredited neurologist to keep updated with developments in diagnosis and management of neurological conditions as well as of professional skills. Type, duration, content and monitoring of CME / CPD activity fall under the authority of national bodies, which should consider the recommendations of the UEMS and EAN.

Overall, CME / CPD should consist in an updating of competencies as required by the updated residency programme / European Training Requirements for Neurology (ETRN), as formulated by UEMS-SN / EBN and EAN.

The UEMS provides European Accreditation of CME (EACCME) for educational events according to defined quality standards.

It is recommended that trainees in neurology are introduced to CME / CPD during their postgraduate training period (see appendix 1).

### 3. Competencies to be acquired in a postgraduate residency training in neurology

It is widely accepted that adequate patient management requires knowledge, skills, and attitude / professional behaviour. These three abilities come together in the concept of ‘competency’. In some countries acquisition of competencies is translated in ‘entrustable professional activities’ (EPA) allowing trainees to diagnose and treat patients with neurological diseases either under supervision or independently.

The UEMS-SN 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’*.



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## 4. Organization of training

In order to train the most suitable individuals for the medical specialty of neurology, selection principles should be set up on a national basis. The selection procedure must be transparent and application must be open to all persons who have completed basic medical training.

The prime aim of the residency training in neurology is the acquisition of broad neurological knowledge and skills for competent diagnosis and management of common neurological disorders as well as rare neurological diseases. Such training may be followed by the development of particular competence in a particular area of neurology and neurological research.

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### 4.1. Duration

The residency programme should consist of a minimum of 4 years, subdivided into a phase of basic clinical training (years 1 and 2) and a phase of advanced clinical training (years 3 and 4).

At least one additional year of training is recommended to expand the advanced clinical training.

The combination / integration of the neurology training with the curricula of related disciplines like neuroradiology, neurosurgery, psychiatry, neuropaediatrics, and others, is recommended.

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### 4.2. Site

The quality of the training may benefit if it takes place in different institutions with rotations within one country, provided that all training institutions are nationally certified. The responsible authorities or training institutions should facilitate the rotations and ensure that the rotation system is useful for the trainee's curriculum and avoid duplication. Training experiences in foreign institutions are recommended.

The UEMS-SN / EAN Joint Educational Board is working on a procedure for the accreditation of training centers.

### 4.3. Contents

The first phase (year 1 and 2) should include neurological calls / emergencies and intensive care, and caring for both inpatients and outpatients with a balanced proportion of a wide spectrum of neurological diseases, and the opportunity to follow up patients.

The second phase (year 3 and 4) should include rotation in neurophysiology<sup>2</sup> (EEG, EMG, evoked potentials, cerebrovascular neurosonography, sleep-wake tests), neuroradiology (standard and advanced neuroimaging techniques), neurorehabilitation / physical and rehabilitation medicine and units specializing in complex care of major neurological patient populations (epilepsy, movement disorders, stroke, neuroimmunology and multiple sclerosis, neurological complications of immunotherapies for cancer, HIV, systemic autoimmune disease, sleep disorders, neuro-oncology, neuromuscular diseases, pediatric neurology, etc.).

A minimum of two subspecialized fields should be covered.

In parallel, facilities to gain experience in neurological research (translational research, neuroepidemiology, clinical trial design and conduction, biostatistics, etc.) should be made available.

Optional rotation in neurosurgery, psychiatry, neuropaediatric and neuropathology should be offered, preferably in the recommended additional year of training.

For the integration with a clinical neuroscientist curriculum see page 38 (interdisciplinary aspects).

The different phases are summarized in Figure 1.

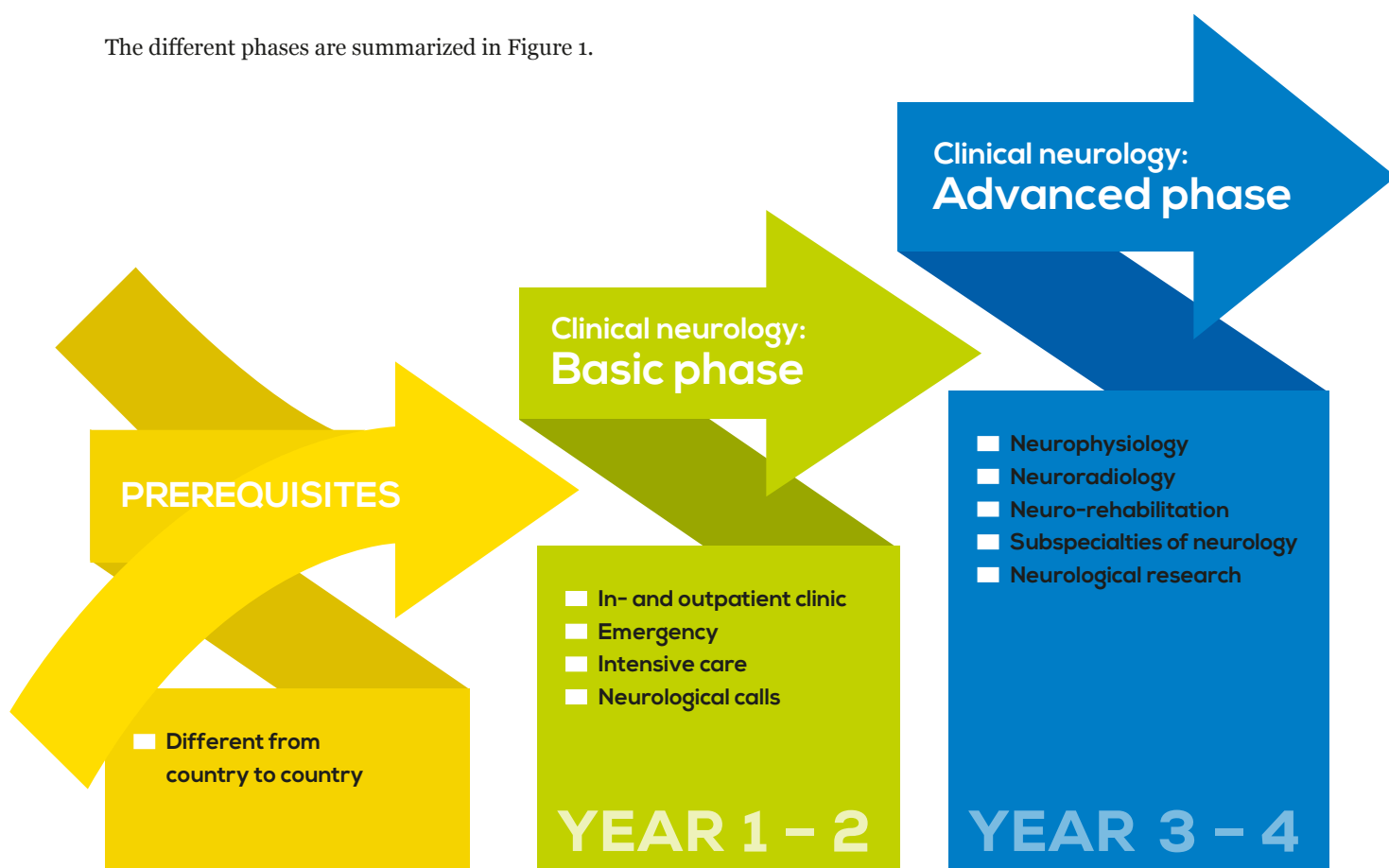


FIGURE 1.

*Different phases of the residency training in neurology (to be adapted to the organization of local institutions).*

<sup>2</sup> Not covered are Pediatric Neurophysiology, ICU Neurophysiology, Newborn neurophysiology, Advanced Neuromuscular Neurophysiological Techniques (SFEMG, MUNE, others), repetitive TMS, Sleep Medicine, Intraoperative Neurophysiological Monitoring for which advanced training in clinical neurophysiology is required



If the director of the training institute agrees that neurology training can be followed part-time, the total training time will increase proportionally.

The training and teaching instruments for the training programmes should be in line with the recommendations of modern educational science and existing guidelines.

The exact training curriculum is the prime responsibility of the national boards, however, it is recommended that the minimal requirements of the UEMS-SN and EAN European Training Requirements for Neurology are upheld, including the regular updates.

As neurologists are often involved in the long-term management of complex chronic disorders, trainees should get acquainted with the concepts of WHO's International Classification of Functioning, Disability and Health<sup>3</sup> (ICF). This is important to be able to take the medical lead in the multidisciplinary team approach while respecting the specific role, knowledge, and skills of the other professionals.

During the training period a continuous evaluation of acquired knowledge, abilities and skills should be performed and documented in a portfolio.

<sup>3</sup> <https://www.who.int/standards/classifications/international-classification-of-functioning-disability-and-health-2021>

# 5. Requirements for trainees

## 5.1. General aspects

Entry into the training programme for neurology depends on national regulations and should be transparent.

The number of trainees in national programmes should reflect the projected manpower needs in neurology. These depend on the organization of the national health care system and the demographics of the existing neurological manpower, which should be sufficient so that patients with neurological diseases have timely access to specialist care.

Trainees must have sufficient language competence to be able to communicate with patients and colleagues. They should be able to work in the social and cultural context of the country in which they are based.

Adequate language, computer and internet skills are basic requirements for accessing and studying the international medical literature and communicating with colleagues from abroad.

Basic knowledge of scientific methodology, skills in critical interpretation of study results and experience with current methods such as evidence-based medicine are required.

They must be able to communicate and work in an interdisciplinary setting.

Basic communication skills with patients and carers should have been acquired before entering residency training and will be subject of Continuous Professional Development. Experience with patient organizations is encouraged.

Acquisition of organizational skills and knowledge of local medico-legal issues, as well as ethical and palliative issues is encouraged.

The training period in neurology should be in keeping with UEMS-SN / EAN recommendations and is 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 in this document is a guide to the basic knowledge required of a specialist neurologist. The clinical experience should encompass all common neurological conditions.

When applying for a position in an EU country, or any other European country, trainees should be able to show the curriculum they actually followed with details about the required nature and extent of clinical experiences, the methods by which they are supported in their development and how judgments are made about the progress as regards the development of knowledge and understanding, the progression of their clinical work and their development as a professional.

## 5.2. Competency of trainees

The curriculum is based on the principles listed below.

**A European neurologist at the start of unsupervised practice should:**

- Be competent in history taking, physical examination, management, and continuing care of patients with common neurological conditions and in basic management of rare neurological conditions.
- Communicate effectively with patients, their families and with professional collaborators, including capacity to communicate breaking bad news and discussing end-of-life decisions.
- Be able to practice evidence-based care.
- Be able to practice cost-effective care.
- Understand the nature and degree of risks taken in their clinical practice.
- Maintain the quality of their practice by being aware of personal developments.
- Demonstrate a lifelong commitment to reflective learning.
- Be able to work as a member of a multi-disciplinary team.
- Provide clinical leadership.
- Promote the health and well-being of individual patients, communities, and populations.
- Have an understanding of specialty-based public health.
- Be committed to the health and well-being of individuals and society through profession-led regulation and high standards of personal behavior and clinical practice.
- Be able to teach and support trainees.
- Have a portfolio of evidence that the above goals have been achieved.

There will be different approaches across European countries to achieve these outcomes but the evidence that they have been achieved should be harmonized facilitating the learning and experiences of trainees, the engagement of clinical supervisors and ease the recognition of progress and achievements across European countries. In addition, such an approach will help provide confidence to the public and to individual countries that the training and the performance of doctors is of an appropriate standard.

### 5.3. Support of trainees

A trainer will supervise a trainee's clinical work during a particular period of training. The trainer will be responsible for providing trainees with regular feedback in regards to their performance and guidance in matters related to the clinical care that they are delivering.

Additionally, it is recommended to link every trainee to a mentor, who will follow the trainee during the whole period of training for monitoring progress with help of a continuing portfolio and adjusting it if necessary.

All training programmes in neurology will take place in an institution (or in a group or network of allied institutions) and led by a programme director.

**A programme of formal bleep-free regular teaching sessions to cohorts of trainees should include:**

- Bedside teaching
- Case presentations
- Lectures and small group teaching
- Grand Rounds
- Clinical skills demonstrations and teaching
- Critical appraisal and evidence-based medicine and journal clubs
- Presentation / discussion of research projects
- Audits
- Joint specialty meetings
- Leadership and project management skills programmes
- Morbidity and mortality meetings

Trainees will meet with their mentor and programme director on a regular basis. The programme director and a team of at least three trainers should meet and review the resident's progress at least every six months. Such discussions will take the format of an appraisal with trainees providing information about how they are progressing, accompanied by documented evidence (portfolio) of clinical engagement and achievement of 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.

## 5.4. Assessment and evaluation of trainees

Training institutions should provide a system of appraisal – at entry into every part of the programme, at midpoint and at the end. A structured goal setting for each training period according to the curriculum at its evaluation is recommended.

As part of their portfolio, all trainees should keep a logbook to record their clinical activity – emergency admissions, ward work, inpatients and outpatients seen. This ensures that the trainees and their supervisors can identify areas of the curriculum that have not been covered.

**In addition, it is recommended that the trainee documents the following structured assessments:**

- Mini CEX (Mini Clinical Evaluation Exercise – observed clinical skills)
- DOPS (Direct Observation of Procedural Skills – e.g. lumbar puncture)
- Case based discussions
- Multisource feedback (from colleagues, nurses, and other professionals)
- Patient feedback from in- and outpatients
- Discussion of diagnostic / treatment errors
- Teaching observation
- The logbook assessment

The minimal numbers per year of each of these items should be determined nationally.

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 logbook or equivalent.

Professional behavior should be part of the assessment strategy, typically a 360-degree multi-source feedback (MSF) would take place at intervals to be defined locally.

The programme 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. The trainee could do additional MSFs if the initial MSF demonstrated a less than adequate performance. Local standards as regards an individual's suitability for clinical practice would determine whether or not a trainee was employable as a consultant / specialist.

Research trainees will be expected to develop an understanding of research methodology and to be able to evaluate publications. They should keep a record of the articles they have reviewed and of their oral and poster presentations at scientific meetings and articles they have published.

In order to be eligible for a residency programme in a country other than the country of training or to be recognized as a European neurologist all aspects of the above assessment approaches will need to be completed satisfactorily.

## 5.5. European Board Examination

This is delivered in Europe on an annual basis, is available to test knowledge in the areas of relevant science (basic medical and clinical sciences, public health sciences and behavioral sciences) and clinical practice (diagnosis, investigation, and treatment) as described in this document. Testing in order to judge other competencies than theoretical neurology is being implemented.

The UEMS-SN and EAN recommend that the European Board of Neurology Exam is taken after completion of the training period as a sign of excellence.

## 5.6. Governance

The governance of an individual's training programme will be the responsibility of the programme director and the institution(s) in which the training programme is being delivered. A trainer will be responsible to the programme director for delivering the required training in his/her area of practice.

## 6. Requirements for the training staff

### 6.1. Process of recognition as trainer

#### *a. Required qualification and experience*

A *trainer* has to be a registered medical practitioner and a neurology specialist / consultant within their own country. The trainer will have completed any relevant national requirements as regards accreditation / appraisal / training to be a trainer.

A *mentor* has been or still is a trainer and has considerable knowledge and experience in training doctors. The mentor should be a practicing neurologist for at least 5 years after the specialist accreditation, have a sound practical knowledge of the whole field of neurology and must be recognized by the national monitoring authority.

The *programme director* has been or still is a mentor, has considerable knowledge and experience in training doctors and must be recognized by the national monitoring authority.

The recognition across the EU as regards competence to be a trainer 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 neurology curriculum as it relates to practice within his / her country.
2. Experienced in teaching and in supporting learners.
3. Skilled in identifying the learning needs of the 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 and follow regular updating in educational and team leader skills.
6. Have leadership skills to guide the trainee.



## 6.2. Quality management for trainers

Trainers and programme directors should have their job description agreed with their employer which will allow them sufficient time to support trainees and in the case of programme directors, sufficient time for their work with mentors and trainers. One trainer should not have more than four trainees. The number of trainees would determine the amount of time that would be allocated to their support.

Trainers will collaborate with trainees, the mentor, the programme director, and their institution to ensure that the delivery of training is optimal. A master in education or equivalent certifications is recommended for the programme director.

Programme director, trainers and mentors should meet at least twice a year with all trainees to openly discuss all aspects of training including the evaluation and approval of their logbooks / portfolios.

The educational work of trainers, mentors and programme directors should be appraised annually within their department / institution.

Educational support of trainers, mentors and programme directors will be provided by their department and institution, through the national bodies and the Section and Board of Neurology of UEMS, and EAN.

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## 7. Requirements for training centers

### *a. Requirements on staff and clinical activities*

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 at national level as a provider of a defined section of the curriculum.

Within a training center there would be a number of specialist / consultant neurologists (trainers) able to supervise and personally train a trainee. Whilst trainers will not manage patients with all the diagnoses listed in this document, they will be able to ensure, by working with the programme director and other local trainers that the clinical experience of the trainee will prepare them for clinical work as a specialist.

The staff of a training center will engage collaboratively in regular reviews of the center'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 psychiatry, neuroradiology, neurosurgery, neuropsychiatry, neurorehabilitation / physical and rehabilitation medicine, palliative medicine, medicine, orthopedics, immunology, cardiology, pneumology, oncology, infectious diseases, geriatrics, rheumatology, etc.

Within a training center for neurology, 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. Specialist staff members appointed to a training center will have completed all training requirements themselves and will have been trained also in teaching and mentoring a trainee. 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 6.2).

It is recommended that a trainee should have one mentor but should not have only one trainer during their entire training period. Trainees should 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 previous page for comments about the mentor and programme director and their role). In addition to medical staff supporting a trainee's development it is likely that non-medical members of staff will also be engaged. The specialists in a training center as a rule represent a wide range of neurological expertise and have to 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 if there were less than four specialists in a training center or clinical network. One trainer should not have more than four trainees attached to him / her at any one time. If a trainee moves between several centers for his / her training it is recommended that, whenever possible, although the trainers may change, the programme director should remain the same.

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 academic links and contribute to research.

#### *b. Requirements on equipment, accommodation*

A training center would need to 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.

Computing and information technology and library resources must be available.

All trainees must engage in a clinical audit and have the opportunity to engage in research.

#### *c. Accreditation*

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

The UEMS-SN/EBN and EAN may recognize a neurology department / center as a European training center after successful completion of their procedure of the peer review.

#### *d. Clinical Governance*

Training centers should undertake internal audits of their performance as part of the requirements for continuing national recognition / accreditation.

Any national evaluation of a training center's performance is expected to include the demonstration that it is:

1. Providing care for a significant number of 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.
4. Guarantee an adequate number of mentors supervising the trainees.

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 programme director has specific responsibilities in this regard.

Training centers should promote, supervise, and support the "first steps" in clinical and /or basic research.

#### *e. Transparency of training programmes*

It is expected that a training center publishes 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 programme, the nature of the clinical experiences with which a trainee would be engaged and the support and interaction with the trainer and programme director. There should be a named individual whom a prospective trainee might contact and discuss the programme.

To assist a neurology specialist move from one European country to another it would be expected that they have satisfactorily completed a training programme 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 2).

# 8. Contents of the curriculum

## 8.1. General Competencies

To be appointed as a specialist an individual should show a level of competence sufficient to allow independent clinical practice and to 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 of 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 range of neurological problems.

A European specialist in neurology should be well informed in research principles: Principles and methods of basic and translational, clinical, and epidemiological research, evidence-based medicine, data analysis and medical informatics, laboratory techniques, ethical aspects of research, and be able of critical appraisal of data generally.

European neurologists would be expected to demonstrate professional and ethical behavior, in keeping with the requirements of their country's medical registry / statutory body.

European neurologists would be in good standing with their relevant national registration body.

## 8.2. Specific competencies

### *a. Theoretical and clinical knowledge*

**Theoretical knowledge should include:**

- Neuroanatomy, neurophysiology, neurochemistry of the central and peripheral nervous system and the neuromuscular system
- Neuropathology
- Neurogenetics
- Neuropharmacology
- Neuroepidemiology
- Neuroimaging
- Neuroimmunology
- Neuroinformatics
- Digital care / telemedicine
- Omics, precision neurology
- Principles of public health
- Palliative medicine
- Research methodology and biostatistics
- Ethics and law
- Communication with patients and carers
- Advocacy for neurology

**Theoretical knowledge of neurology includes the following aspects:**

- Knowledge of specific clinical neurological topics as given in section A.
- Knowledge and interpretation of laboratory tests as summarized in section B.
- Knowledge to be shared with other specialties as described in section C.
- Ability to face problems as described in section D.

**These conditions define the basis of the curriculum. By the time an individual is appointed as a specialist, the following armamentarium would be expected:**

- Knowledge and understanding of the relevant medical sciences, public 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 tests, 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 findings in neurology so that their clinical practice is, as far as possible, based upon evidence.
- Ability to provide evidence that general medical as well as neurological knowledge is maintained at a sufficient level to ensure a high standard of clinical practice.
- An understanding of the healthcare system(s) within the country of training.
- Ability to be an effective member and a leader of a multidisciplinary team.

**The following levels are used in the following text to describe the training goal to be achieved for a particular clinical knowledge:**

#### **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);  
Knows own capacities and limitations, ready for referral to other specialists

These definitions of levels should be considered when defining the minimal requirements for residents in neurology after two years and at the end of their training. Local conditions may dictate modifications in this level-setting.

#### ***b. Clinical skills***

Trainees should demonstrate competence of the required skills prior to being appointed as a specialist. In some countries specialists may be required to demonstrate the retention of such skills for the purpose of re-accreditation.

**The following levels are used in the following text to describe the training goal to be achieved for a particular applied clinical skill:**

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

These definitions of levels should be considered when defining the minimal requirements for residents in neurology after two years and at the end of their training. Local situations may dictate modifications in this level-settings.

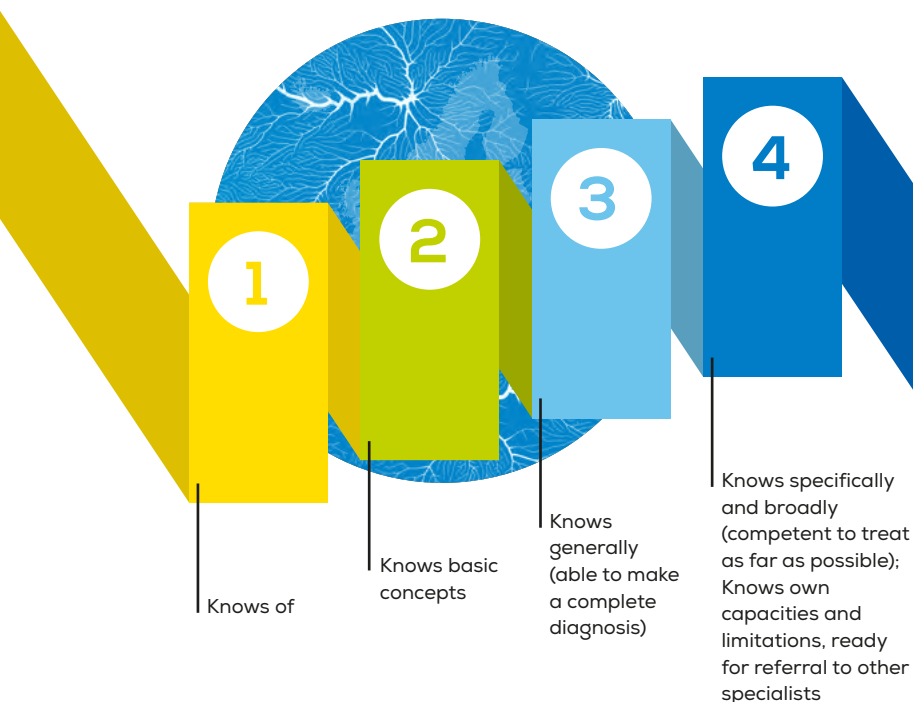
## 8. Section A

# Specific learning objectives in neurology

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

- Anatomy, pathology and pathophysiology
- Epidemiology
- Clinical semiology
- Clinical course
- Neuroradiological and neurophysiological aspects
- Pharmacological therapy
- Non-pharmacological interventions
- Neurorehabilitation / physical and rehabilitation medicine
- Psychological and behavioral aspects and care
- Comorbidity
- Palliative care
- Diagnosis and management of treatment complications
- Primary prevention
- Secondary prevention
- Working capacity and ability to drive
- Working within a multidisciplinary care team

### Applied clinical knowledge



## 1. Cerebrovascular disorders

		Basic	Advanced
1.1	Ischemic stroke due to:		
	Cardiac embolism, thromboembolism, atherosclerosis, small vessel disease	3	4
	Arterial dissection, vasculitis, CADASIL, Fabry, MELAS ...	2	3
	Diagnostic work up of stroke patients (CT, MRI, ultrasound, cardiology)	4	4
	Acute stroke therapy: Indications for thrombolysis and thrombectomy	4	4
	Acute stroke therapy: Primary and secondary stroke prevention	3	4
1.2	Intracranial hemorrhage due to:		
	Hypertension, anticoagulation, tumors, aneurysms, cerebral venous thrombosis, cerebral amyloidosis	3	4
	Options for surgical clot removal, clipping and coiling, antagonization of anticoagulation, resumption of anticoagulation, treatment of brain edema	3	4
1.3	Encephalopathies: Hypertensive, posterior reversible encephalopathy syndrome, post anoxic	2	4

## 2. Cognitive disorders/dementias

		Basic	Advanced
2.1	Definition of dementia and mild cognitive impairment	2	4
2.2	Common neurodegenerative diseases causing cognitive impairment such as Alzheimer's disease, frontotemporal lobar degeneration, Lewy body	2	4
2.3	Rare causes of cognitive impairment or presentations of common neurodegenerative diseases such as Creutzfeldt-Jakob disease, posterior cortical atrophy	2	3
2.4	Vascular neurocognitive impairment	2	4
2.5	Non-neurodegenerative causes of cognitive impairment such as metabolic deficiencies, endocrine disorders, biochemical disturbances and with radiotherapy and chemotherapy, tumors, psychiatric disorders, substance abuse, infectious disorders	3	4
2.6	Differential diagnosis and scales in neuroimaging	2	3
2.7	Behavioral and psychological disturbances in patients with dementia	2	3
2.8	Specific biomarkers for neurodegenerative diseases (e.g. cerebrospinal fluid biomarkers)	1	3



### 3. Epilepsies and other paroxysmal disorders

		Basic	Advanced
3.1	Differentiation of first unprovoked seizure from provoked seizures, syncope and other paroxysmal events	2	4
3.2	Impact of diagnosis and misdiagnosis of epilepsy and other paroxysmal events	2	4
3.3	Appropriate use of investigations (ECG, CT, MRI EEG) following first unprovoked seizure	2	4
3.4	ILAE classifications of seizures and epilepsy syndromes	2	4
3.5	Seizure semiology and symptoms of other paroxysmal events	2	4
3.6	Investigation and treatment of new unprovoked seizure and idiopathic generalized epilepsies	2	4
3.7	Investigation and treatment of newly diagnosed focal epilepsies	2	4
3.8	Investigation and treatment of epilepsy difficult to classify	2	4
3.9	Diagnosis and management of psychogenic non-epileptic attacks	2	4
3.10	Diagnosis and management of syncope	2	4
3.11	Management of women of childbearing age with epilepsy (contraception, pregnancy, use of anti-epileptics, breast feeding)	2	4
3.12	Management of idiopathic generalized epilepsy that is not responding to treatment	2	4
3.13	Management of focal epilepsy that is not responding to treatment	2	4
3.14	Surgical options to treat epilepsy and how patients are selected and worked up	2	4
3.15	Status epilepticus, convulsive and nonconvulsive	2	4
3.16	Common comorbidities and how they are managed (including depression, poor memory, intellectual disability)	2	4
3.17	Approach to genetic testing in the epilepsies	2	4
3.18	Epileptology in intensive care patients	2	4

## 4. Headache and facial pain

		Basic	Advanced
	History taking, clinical evaluation, classification according to the International Classification of Headache Disorders, acute and prophylactic treatment of:		
4.1	Migraine	3	4
4.2	Tension-type headache	3	4
4.3	Trigeminal autonomic cephalalgias, including cluster headache	3	4
4.4	Other primary headache disorders	2	3
4.5	Secondary headache disorders:		
	Headache attributed to trauma or injury to the head and / or neck	3	4
	Headache attributed to cranial or cervical vascular disorder	3	4
	Headache attributed to non-vascular intracranial disorder	2	3
	Headache attributed to infection	3	4
	Medication overuse headache	3	4
	Other secondary headache	2	3
4.6	Headache in the emergency department	3	4
4.7	Cranial neuralgias and facial pain	3	4

## 5. Immune-mediated diseases

		Basic	Advanced
5.1	Differential diagnosis on neuroimaging	3	4
5.2	Differential diagnosis on CSF and other related laboratory investigations	3	4
5.3	Immunomodulatory / -suppressive and symptomatic therapies	2	4
5.4	Multiple Sclerosis	3	4
5.5	Acute demyelinating encephalomyelitis	2	4
5.6	Neuromyelitis optica spectrum disorders	2	4
5.7	Vasculitis	2	4

## 5. Immune-mediated diseases

		Basic	Advanced
5.8	(Neuro-) Sarcoidosis	2	4
5.9	Autoimmune encephalitis and other syndromes	2	4
5.10	Neurological manifestations / adverse events derived from immunotherapies in the context of cancer, HIV, systemic immune-mediated disease	2	3

## 6. Infections of the nervous system

		Basic	Advanced
6.1	Infections of the nervous system		
	Acute and chronic bacterial meningitis	4	4
	Acute, chronic and relapsing viral meningitis	3	4
	Acute and chronic CNS infection	4	3
	Acute and chronic parasitic CNS infection	2	3
	Eosinophilic meningitis, meningoencephalitis, radiculomyelitis	2	2
6.2	Cerebral abscess and epi / sub-dural empyema	3	3
6.3	Acute and chronic encephalitis, particularly herpes encephalitis, VZV, arboviral meningoencephalitis	4	4
6.4	Myelitis and spinal epidural and subdural empyema	3	4
6.5	Radiculoneuritis, in particular neuroborreliosis	4	4
6.6	Neurotuberculosis	3	3
6.7	Sexually transmitted infections including HIV / AIDS	3	3
6.8	Imported infections, including tropical infectionsa	3	3
6.9	Prion diseases	3	4
6.10	Post-infectious neurological syndromes	3	4
6.11	Diseases caused by bacterial toxins (tetanus, botulism, diphtheria)	3	4
6.12	Neurological complications of COVID-19 infection	2	4

## 7. Movement disorders

		Basic	Advanced
<b>7.1</b>	Hypokinetic movement disorders due to:		
	Parkinson's disease	3	4
	Parkinsonian syndromes (Lewy Body disease, progressive supranuclear palsy, multisystem atrophy, corticobasal degeneration syndrome, vascular parkinsonism, iatrogenic parkinsonism, normal pressure hydrocephalus, Wilson's disease, other acquired parkinsonian syndromes)	3	4
<b>7.2</b>	Hyperkinetic movement disorders:		
	Tremor (essential tremor, tremor plus, orthostatic tremor)	3	4
	Dystonia (isolated dystonia, combined dystonia, dystonia associated with other neurological signs)	3	4
	Chorea (Huntington's disease and Huntington-like diseases, other idiopathic and symptomatic choreic syndromes)	3	4
	Myoclonus	2	3
	Tics (tics, Gilles de la Tourette syndrome, symptomatic tic syndromes)	3	4
<b>7.3</b>	Ataxia (hereditary ataxia, acquired ataxia)	2	3
<b>7.4</b>	Paroxysmal movement disorders	1	2
<b>7.5</b>	Stiff man syndrome	2	3

## 8. Neuro-emergency and intensive care

		Basic	Advanced
<b>8.1</b>	Raised intracranial pressure cerebral perfusion pressure and CSF pressure	2	4
<b>8.2</b>	Deranged intracerebral metabolism:	2	4
	Deranged intracerebral hypoxia, hypo-, and hypercapnia	2	4
	Intracerebral hypothermia	2	3
<b>8.3</b>	Coma and disturbances of consciousness	2	4
<b>8.4</b>	Cerebrovascular disease and complications	3	4
<b>8.5</b>	Status epilepticus	3	4

## 8. Neuro-emergency and intensive care

		Basic	Advanced
8.6	Severe brain injury / use of coma scales for monitoring	3	4
8.7	Life threatening neuromuscular diseases e.g. myasthenic crisis, Guillain-Barré syndrome	2	4
8.8	Intracranial infections (meningitis, encephalitis)	3	4
8.9	Malignant hyperthermia, rhabdomyolysis	2	3
8.10	Hypoxic brain damage	2	4
8.11	Respiratory support and artificial ventilation	2	3
8.12	Monitoring of homeostasis and management of metabolic problems	2	3
8.13	Cardiovascular support	2	4
8.14	Psychological and palliative care for ICU patients and relatives	3	4
8.15	Diagnosis of brain death, dealing with organ donation	3	4

## 9. Neurological trauma

		Basic	Advanced
9.1	Head trauma without brain injury	3	4
9.2	Mild and moderate brain injury	3	4
9.3	Severe brain injury	2	4
9.4	Secondary neurological complications of brain injury	2	4
9.5	Intracranial hematoma including epidural, subdural, intracerebral	3	4
9.6	Decompression sickness (barotrauma)	2	3
9.7	Fractures of skull and skull base	2	4
9.8	Flexion-extension trauma of the neck	2	4
9.9	Peripheral nerve trauma	2	3

## 10. Neurologic manifestations and complications of non-primary neurological diseases / conditions and intoxications

		Basic	Advanced
10.1	Neurological complications of biochemical dysregulation	3	4
10.2	Neurological complications of pregnancy	3	4
10.3	Neurological complications of endocrine disease	3	4
10.4	Neurological complications of cardiovascular disease	3	4
10.5	Neurological complications of connective tissue disorders	2	4
10.6	Neurological complications of anti-cancer therapies	2	4
10.7	Metabolic deficiencies	3	4
10.8	Alcohol and other substances abuse	3	4
10.9	Intoxications a.o. carbon monoxide	3	4
10.10	Mitochondrial diseases, peroxisomal diseases	2	3

## 11. Neuromuscular disorders

		Basic	Advanced
11.1	Motor neuron disorders:		
	Amyotrophic lateral sclerosis	2	4
	Primary lateral sclerosis	2	4
	Progressive muscular atrophy	2	4
	Postpolio syndrome	2	4
	Spinal muscular atrophies	2	4
11.2	Plexopathies:		
	Compression, traumatic, infectious, hereditary, radiation, tumor, associated with diabetes, idiopathic	2	4
11.3	Polyneuropathies:		
	Inflammatory, infectious, metabolic, toxic, paraneoplastic, idiopathic, immune-mediated, hereditary	2	4

## 11. Neuromuscular disorders

		Basic	Advanced
11.4	Mononeuropathies:		
	Compression, traumatic, infectious, tumor, associated with systemic disease, e.g. diabetes, amyloidosis, hypothyroidism	2	4
11.5	Myasthenia gravis	2	4
11.6	Lambert Eaton syndrome	2	3
11.7	Congenital myasthenic syndromes	1	2
11.8	Congenital myopathies	1	2
11.9	Myotonic dystrophies, channelopathies	2	3
11.10	(Congenital) muscular dystrophies	2	3
11.11	Metabolic, endocrine, and toxic myopathies	2	3
11.12	Inflammatory, paraneoplastic, and immune-mediated myopathies	2	3

## 12. Neuro-oncology

		Basic	Advanced
12.1	The most recent WHO Classification of Tumors of the Central Nervous System	2	3
12.2	Differential diagnosis on neuroimaging	2	3
12.3	Options for surgery, radiotherapy, and medical therapy (chemotherapy, targeted therapy, supportive care)	2	3
12.4	Primary intracranial tumors including the brain stem	2	4
12.5	Intracranial metastasis including leptomeningeal metastasis	2	4
12.6	Intracranial paraneoplastic syndromes	2	4



## 13. Neuro-ophthalmology and neuro-otology

		Basic	Advanced
<b>13.1</b>	Neuro-ophthalmology <sup>4</sup>		
	Optic neuritis	2	4
	Optic nerve ischemia	2	4
	Optic nerve compression	2	4
	Other optic neuropathies including hereditary (Leber)	2	4
	Oculomotor disorders with a neuronal, muscular, or neuromuscular junction origin	2	4
	Palsy of the III, IV and VI cranial nerve	2	4
	Central ocular motor disorders - Nystagmus, deficits of gaze-holding, saccades, and smooth pursuit	2	4
<b>13.2</b>	Neuro-otology <sup>5</sup> :		
	Benign paroxysmal positional vertigo	3	4
	Bilateral vestibulopathy	2	3
	Central vestibular disorders Acute central vestibular syndrome Cerebellar dizziness	2	4
	Functional dizziness	2	3
	Menière's disease	2	3
	Vestibular migraine	2	3
	Vestibular neuritis	2	4
	Vestibular paroxysmia	2	3
	Vestibular schwannoma	2	3
<b>13.3</b>	Facial nerve disturbances	3	4
<b>13.4</b>	The trigeminal nerve and its diseases	3	4
<b>13.5</b>	Diseases of remaining cranial nerves	2	4

<sup>4</sup> Patient management in close collaboration with ophthalmologist

<sup>5</sup> Patient management in close collaboration with ENT surgeon

## 14. Neuropsychiatry and functional neurological disturbances

		Basic	Advanced
14.1	Functional cognitive disorders	2	3
14.2	Functional sensori-motor disorders (including stroke-mimics and MS-mimics)	3	4
14.3	Functional movement disorders	2	3
14.4	Functional / dissociative non-epileptic attacks	2	4

## 15. Neurorehabilitation / physical and rehabilitation medicine

		Basic	Advanced
15.1	Making functional assessment and outcome measures	2	4
15.2	Working in an interdisciplinary rehabilitation team	3	4
15.3	Use of orthotics, wheelchairs, and other forms of adaptive equipment	2	3
15.4	Restorative neuropharmacology	2	3
15.5	Chronic problems as spasticity, and other gait difficulty, chronic pain, neurogenic bowel, bladder and sexual dysfunction, cognitive and behavioral disorders, depression, eating and swallowing problems, sexual dysfunction	2	3
15.6	Prevention of complications of persistent disability, e.g. contractures, pressure ulcers, deep venous thrombosis	2	3
15.7	Role of rehabilitation for common debilitating neurological disorders	2	3
15.8	Palliative care (educational opportunities depend on country)	2	3   4
15.9	Digital knowledge and skills in telemedicine, relevant to scope of expertise and to assess needs for telerehabilitation	2	3

## 16. Pain and neurological pain syndromes

		Basic	Advanced
16.1	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	4
16.2	Usage of definitions of pain, nociception, allodynia, hyperalgesia, neuropathic pain, nociceptive pain	4	4
16.3	Pain - neurological examination, specific diagnostic tests	4	4
16.4	Assessing pain intensity and pain relief	3	4
16.5	Pharmacology of opioids and management of side-effects:		
	Principles of addiction, tolerance, and physical dependency	3	4
16.6	Neck and low back pain	3	4
16.7	Central pain	3	4
16.8	Understanding the principles of palliative care medicine	3	4
16.9	Understanding diagnostic properties and indications of interventions such as sympatholytic blocks, nerve and root blocks, provocative discograms	2	3
16.10	Pain management in geriatrics	2	3

## 17. Disturbances of circulation of Cerebrospinal Fluid (CSF)

		Basic	Advanced
17.1	Hydrocephalus (including reversible types)	2	4
17.2	(Idiopathic) Intracranial hypertension	2	4
17.3	Intracranial hypotension	2	4

## 18. Sleep-wake disorders

		Basic	Advanced
18.1	Insomnias	2	3
18.2	Sleep-related breathing disorders	2	3
18.3	Central disorders of hypersomnolence, including narcolepsy	2	4
18.4	Circadian rhythm sleep-wake disorders	2	3
18.5	Parasomnias	2	4
18.6	Sleep-related movement disorders, including restless limbs syndrome	2	4
18.7	Sleep-wake disorders in neurological disorders	2	4

## 19. Spinal cord and roots disorders

		Basic	Advanced
19.1	Spinal cord compression:		
	Due to cervical spondylotic myelopathy	3	4
	Traumatic	3	4
	In infectious diseases (tuberculosis, abscess)	2	3
19.2	Vascular problems:		
	Infarction, including anterior spinal artery syndrome	4	4
	Hemorrhage	2	4
	Vascular malformations	2	4
19.3	Spinal cord tumor (epi- and intradural, intramedullar):	3	4
	Leptomeningeal metastasis	2	4
19.4	Syringomyelia	3	4
19.5	Nutritional deficiencies (a.o. B12)	2	4
19.6	Toxic myelopathies (a.o. nitrous oxide)	2	4
19.7	Radiation damage	3	4
19.8	Paraneoplastic myelopathies	2	4

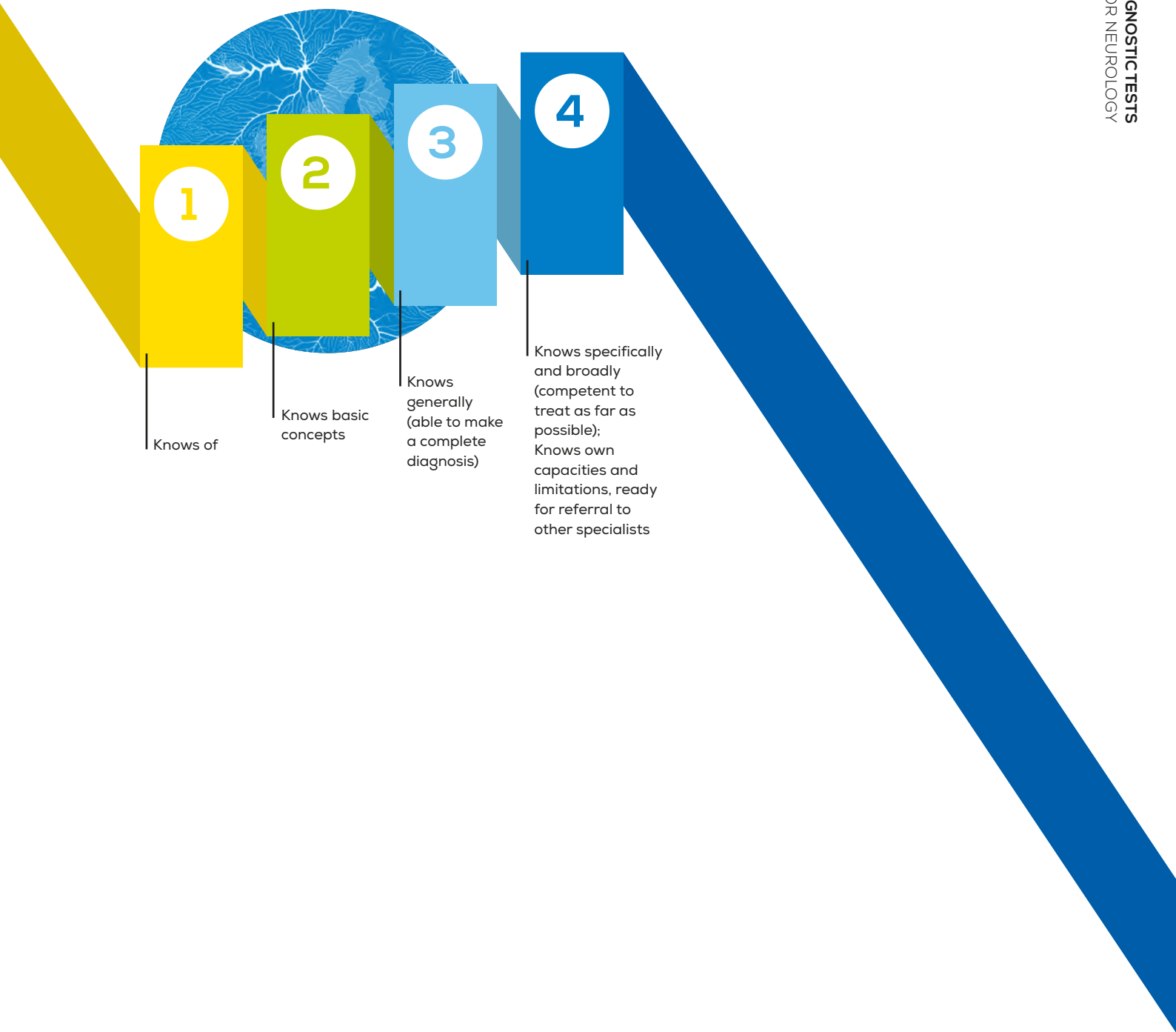
## 19. Spinal cord and roots disorders

		Basic	Advanced
<b>19.9</b>	Transverse myelitis of unknown cause:	2	4
	Demyelinating and immune-mediated diseases <i>see A5</i>	2	3
	Spinal cord infections <i>see A6</i>	2	3
<b>19.10</b>	Radiculopathies:		
	Compression	2	4
	Traumatic	3	4
	Infectious	3	4
	Tumor (e.g. neurinoma)	2	4

## 8. Section B

# Learning objectives in diagnostic tests

### Levels of knowledge



## 1. General laboratory knowledge

		Basic	Advanced
1.1	Interpretation of laboratory data of blood, CSF and other body fluids or tissue as relevant for neurology	2	4
1.2	Investigation techniques on CSF	2	4

## 2. Neurophysiology

		Basic	Advanced
2.1	Electroencephalography:		
	Basic concepts, recording, technical problems	2	4
	Interpretation, limitations, and normal findings at different ages	2	4
	Special techniques: Video EEG, telemetry, polysomnography and multiple sleep latency, depth recording and cortical mapping	1	3
2.2	Nerve conduction tests, thermal thresholds:	2	4
	Reflex techniques (H-, F-, C-responses)	2	4
2.3	Electromyography and SFEMG	1	4
2.4	Evoked potentials	1	4
2.5	Magnetic stimulation	1	4
2.6	Autonomic function tests	1	3
2.7	Sleep-wake tests (polysomnography, vigilance test, actigraphy)	1	3

### 3. Neuroimaging

		Basic	Advanced
3.1	Basic principles, techniques, limitations in neuroradiology and nuclear medicine including CT, MRI, SPECT and PET scanning.	2	3
3.2	Vascular investigations: Digital subtraction MR and CT angiography	2	3
3.3	Interventional neuroradiology	1	3
3.4	Extra and transcranial Doppler / Duplex	2	3
3.5	Neuromuscular imaging (ultrasound, MR)	2	3
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 and molecular neurobiology (central nervous system, spinal cord, nerve and muscle)

		Basic	Advanced
4.1	Macroscopic and microscopic pathology	1	2
4.2	Techniques for brain fixation and cutting, and on staining methods including immunocytochemistry, electron microscopy	1	2
4.3	Basic molecular techniques (PCR, next generation sequencing, MLPA, Sanger sequencing ...)	1	2
4.4	Indications for and limitations of different techniques and correct interpretation of information obtained from biopsy, surgical and autopsy material	1	2
4.5	Forensic neuropathology	1	1
4.6	Neurogenetics (indications and limitations, need for counseling)	1	2
4.7	Current and emerging biomarkers	1	2

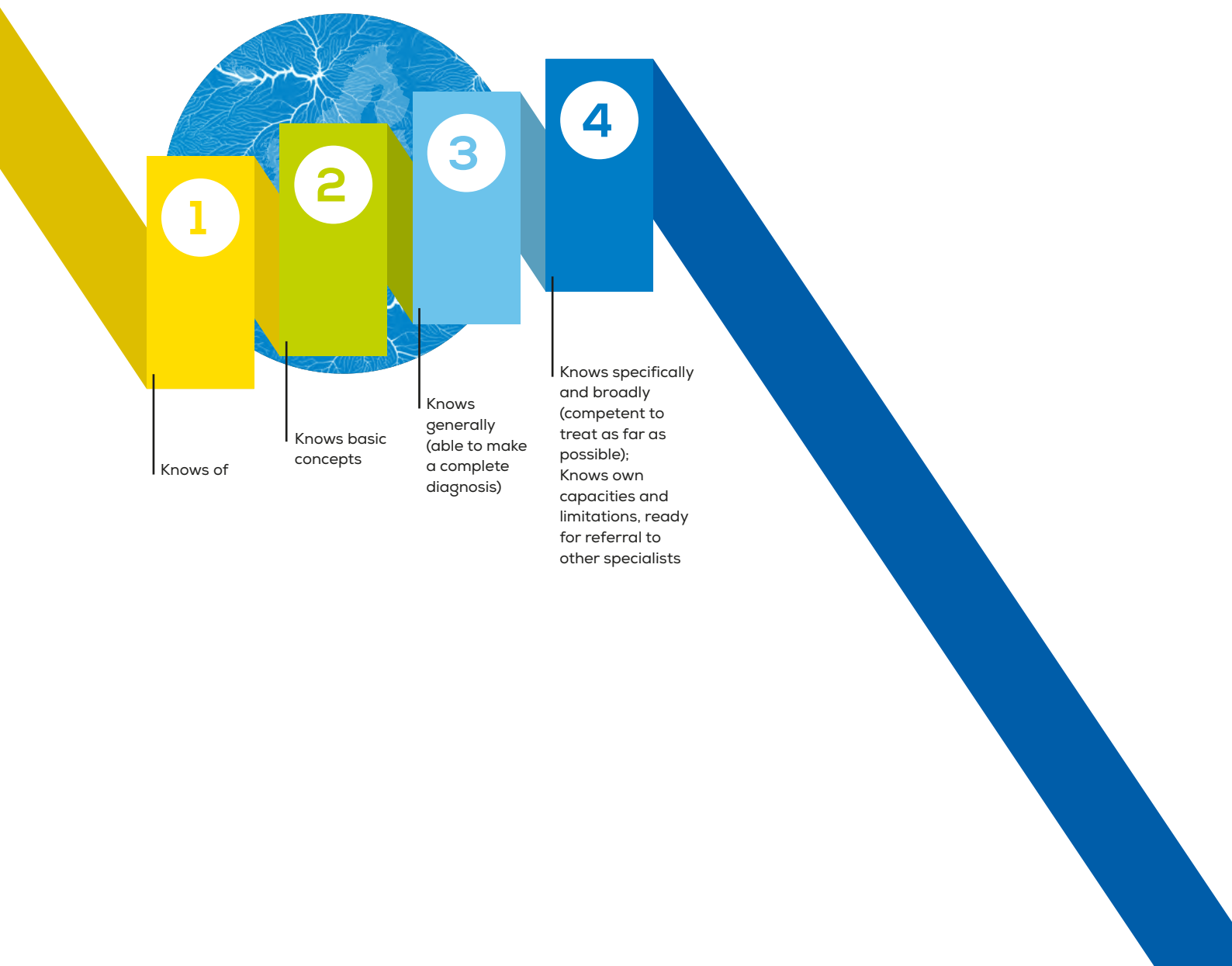


## 8. Section C

### Interdisciplinary aspects

The value of items in this section is dependent on specifics of health care in the particular country. This holds especially for the relation between neurology and neuropsychiatry, which differs in several countries. Neuropsychiatric patients passing the limit of adolescence will be confided to the care of neurologists and this transition should be as smooth as possible. Nevertheless, it will be important for each neurologist to be familiar with many topics in neighboring specialties to be able to communicate and collaborate, and to warrant a proper transition for patients moving from one specialty to another. The ability to provide a smooth transition and optimal collaboration should be a key competency in this section, both for trainees and for neurologists.

#### Levels of knowledge



## 1. Neurosurgical aspects

		Basic	Advanced
1.1	Indications and limitations of neurosurgical treatment	2	4
1.2	Ability to manage the acute neuromedical problems that can arise following neurosurgery	2	4
1.3	Indications for central and peripheral nervous system biopsies	2	4

## 2. Psychiatric aspects

		Basic	Advanced
2.1	Basic skills in taking a psychiatric history and evaluating psychiatric symptomatology (including mental status) as far as relevant for neurology	2	3
2.2	Common psychiatric symptoms as derealisation, hallucination, anxiety-symptoms	2	3
2.3	Common psychiatric disorders – acute and chronic, especially those related to alcohol and other substance abuse, other intoxications (substance overdose, medication, water), dementia, epilepsy and delirious and other confusional states	2	3
2.4	Somatization disorders, including conversion disorders and somatically unexplained problems	2	3
2.5	Perceive suicidality	2	3
2.6	Skill in the use of the common psychoactive drugs, their indications, contraindications and (especially neurological) side effect	2	4

### 3. Neuropediatric aspects

		Basic	Advanced
3.1	Normal child development – gross and fine motor, language, cognition and behavior	2	3
3.2	Understanding family psychological responses to neurological illness in childhood	2	3
3.3	Malformations and neurocutaneous syndromes	2	3
3.4	Hereditary metabolic disorders	2	3
3.5	Hereditary neuromuscular diseases	2	3
3.6	Developmental disorders: Autism, ADHD, dyslexia, obsessive compulsive, developmental coordination, and conduct disorders	2	3
3.7	Common types of cerebral palsy, antecedents, presentation, and management	2	3
3.8	Genetics and ability of genetic counseling; childhood epilepsy, see A7.2	2	3
3.9	Childhood neuro-oncology and late sequelae or complications of treatment	2	3
3.10	Safeguarding vulnerable children, child abuse and non-accidental injury	2	3
3.11	Immunomediated diseases (a.o. MS, ADEM, Guillain-Barré syndrome, myasthenia gravis, myositis)	2	3

### 4. Neurogeriatric aspects

		Basic	Advanced
4.1	Clinical assessment of the elderly	2	4
4.2	Differential diagnosis of common geriatric problems such as visual and auditory disturbances, delirium, depression, dementia, weakness, falls, and transient losses of consciousness	2	4
4.3	Maintaining functional abilities, and illness prevention in the case of limited resources	2	4

### 5. Neurological aspects in palliative care (at all ages)

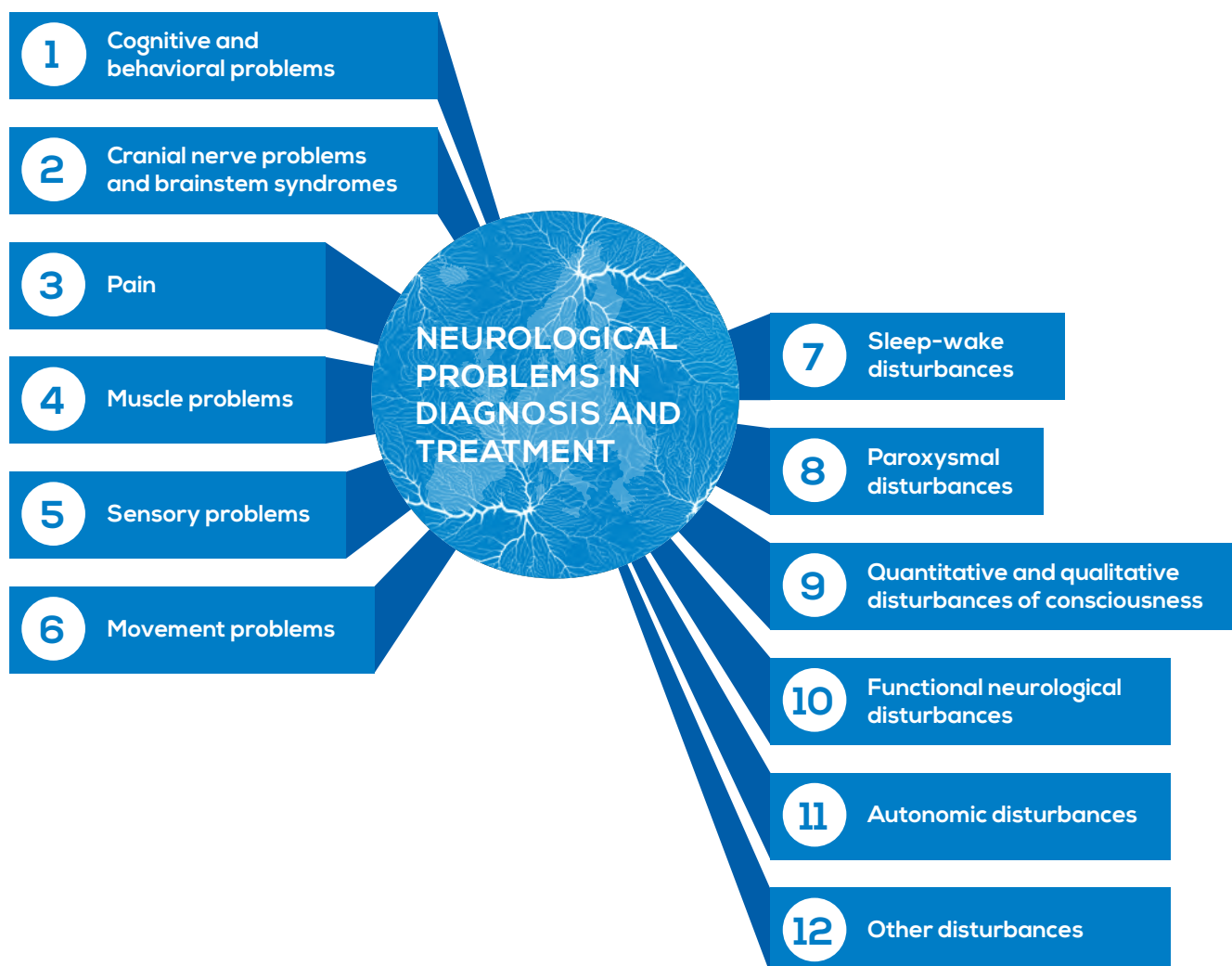
		Basic	Advanced
5.1	Advanced care planning	2	4
5.2	Specific ambulant palliative care management	2	4

## 8. Section D

### Problems to be recognized and addressed

The 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.

#### Applied clinical knowledge



## 1 Cognitive and behavioral problems

- Aphasia (expressive, receptive, conduction, transcortical, aprosodia, etc)
- Apraxia (ideomotor, ideatory, dressing, constructive, ocular, gait-, limb kinetic)
- Agnosia (visual, auditory, prosopagnosia, tactile, pure word deafness, etc)
- Acalculia
- Alexia, agraphia
- Amnesias
- Anosognosia
- Problems with judgment and decision making
- Dementia
- Memory disturbances
- Extinction phenomena
- Mutism

## 2 Cranial nerve problems and brainstem syndromes

- Dysosmia
- Dysgeusia
- Diplopia
- Disturbance of gaze and external ophthalmoplegia
- Nystagmus, ocular oscillations
- Internuclear ophthalmoplegia
- Vision loss, including 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 syndromes

## 3 Pain

- Headache
- Meningism
- Facial pain
- Neuropathic pain
- Central pain
- Neuralgia
- Cramps
- Itch
- Complex regional pain syndrome
- Arm pain, neck pain
- Lower back pain, leg pain
- Claudicatio

## 4 Muscle problems

- Weakness (proximal, distal, generalized, bulbar, respiratory)
- Atrophy
- Hypertrophy
- Myotonia
- Hypotonia (see also D6)
- Muscle pain / myalgia
- Cramps
- Fasciculations / myokymia
- Fatigue (see also D7)

## 5 Sensory problems

- Numbness, paresthesia, hyperpathia, hypesthesia, allodinia
- 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 D3 Pain)

## 6 Movement problems

- Gait disturbances
- Falls and drop-attacks
- Spasticity
- Rigidity, akinetic-rigid syndrome
- Hemiplegia, monoplegia, diplegia, paraplegia
- Hypotonia
- Akinesia / bradykinesia
- Dystonia (including blepharospasm, torticollis, writer's cramp, oculogyric crisis)
- Chorea (including ballism)
- Tics
- Stereotypy
- Myoclonus
- Tremor
- Ataxia
- Akathisia
- Cataplexy
- Functional / psychogenic movement disorders (see also 10)
- Motor impersistence

## 7 Sleep-wake disturbances

- Fatigue, apathy, excessive daytime sleepiness, hypersomnia
- Insomnias
- Sleepwalking, REM sleep behavior disorder, other parasomnias
- Sleep-related injuries, violence
- Restless limb syndrome (RLS) and RLS-like disturbances
- Sleep-related breathing disturbances
- Sleep-related epilepsies
- Sleep violence / injuries
- Shiftwork

## 8 Paroxysmal disturbances

- Seizures
- Status epilepticus
- Functional / psychogenic non-epileptic seizures (see also 10)
- Transient loss of consciousness / Syncope

## 9 Quantitative and qualitative disturbances of consciousness

- Delirium
- Perceptual disturbances (including hallucinations, delusions, derealisation)
- Coma
- Coma-like conditions (Locked-in syndrome, unresponsive wakefulness syndrome and minimal conscious state)

## 10 Functional neurological disturbances

- Consciousness
- Cognition
- Sensory and motor dysfunctions
- Movement disorders
- Paroxysmal, non-epileptic attacks

## 11 Autonomic disturbances

- Orthostatic intolerance
- Sexual disturbances
- Sweating disturbances
- Neurological lower urinary tract dysfunction
- Neurological gastro-intestinal dysfunction
- Trophic disturbances
- Complex regional pain syndrome
- Palpitations

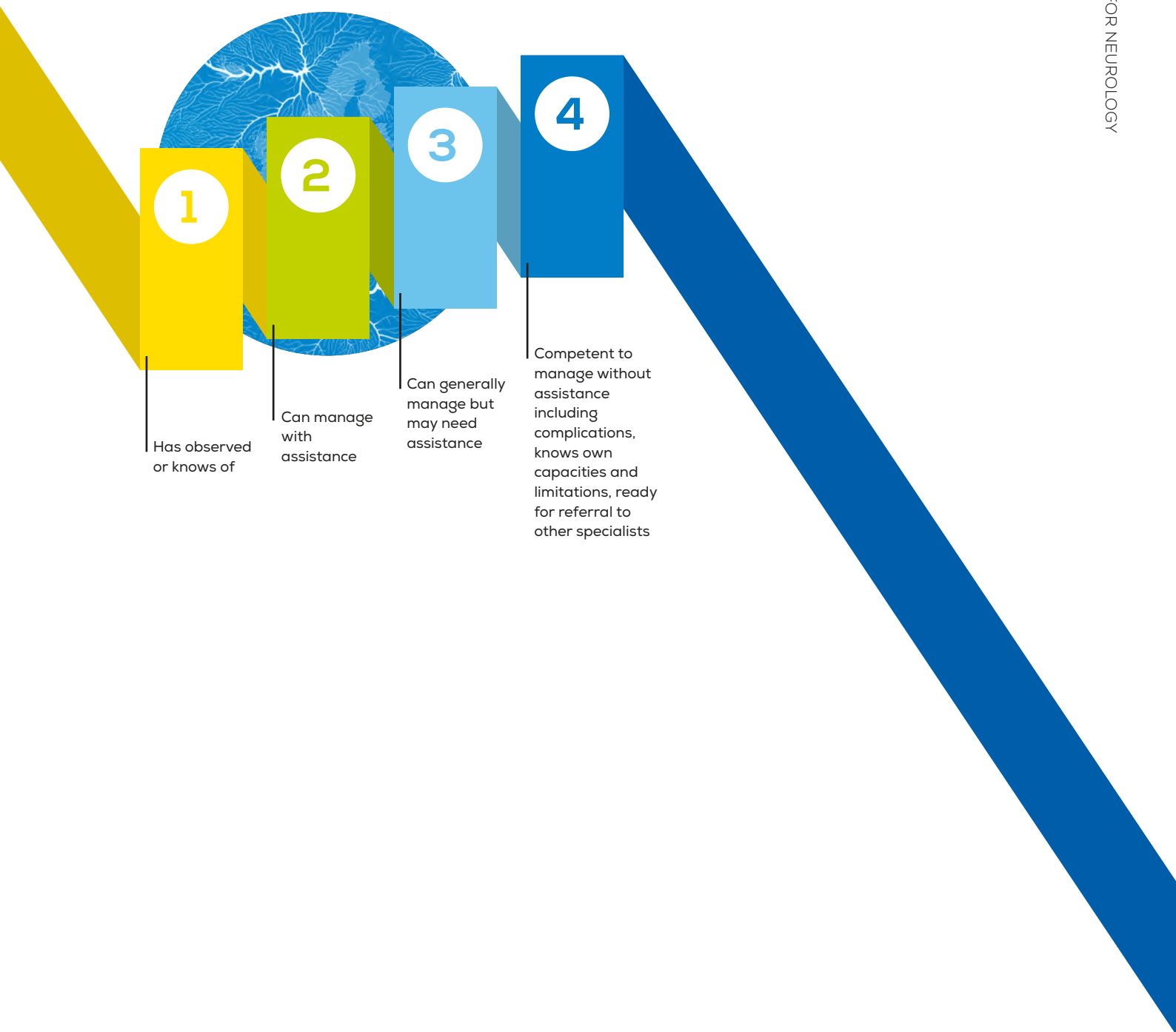
## 12 Other disturbances

- Nausea
- Fever, hypothermia
- Depression
- Addiction
- Developmental delay
- Behavioral disturbances
- Personality disturbances
- Somatically unexplained complaints

## 8. Section E

### Skills in neurology

#### Levels of skills



## 1. Diagnostic skills

		Basic	Advanced
1.1	Reliable history taking	3	4
1.2	Reliable neurological examination and cognitive screening	4	4
1.3	Assessment of possible etiological factor (genetic, lifestyle, occupational, environmental)	4	4

## 2. Interventional skills

		Basic	Advanced
2.1	Lumbar puncture	3	4
2.2	Application of botulin toxin and spasmolytics	2	4
2.3	Control of neurostimulators	1	3
2.4	Acute intervention in stroke	3	4
2.5	Handling PEG-catheters	2	2
2.6	Control of shunt function	2	3
2.7	Local anesthesia	1	2
2.8	Administration of drugs into the CSF	1	3
2.9	Neurorehabilitation	1	3
2.10	Interventional pain management	1	4



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# 9. Appendices

## Appendix 1

**EAN offers different CME / CPD including the following:**

- European Board Exam (together with UEMS / SN-EBN)
- Scientific sessions at the EAN Congress
- Educational sessions at the EAN Congress
- Educational schools
- On-demand sessions from congresses
- Mentorship programme
- Leadership programme
- Scientific school
- eLearning platform
- Webinars
- Virtual Master Classes

## Appendix 2

**Data to be provided to a receiving country about a doctor**

**Record of clinical work and clinical skills:**

A record has to be kept of patients for whom trainees have provided care. It is not proposed as a requirement of becoming a European neurologist that any additional record should be kept in addition to the regular medical records.

If a doctor seeks to gain employment in another European country other than his / her own (or the one in which he / she has been trained), he / she will be required to provide access to appropriate records (logbook) demonstrating the extent and nature of his / her 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

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# Acknowledgements

*The present version of the European Training Requirements for Neurology has been developed jointly by UEMS-SN/EBN, the Education Committee of EAN, the Scientific Panels of EAN, revised by the National Neurological Societies, approved by the EAN Board, and finally approved by UEMS-SN/EBN.*

*The administrative work has been coordinated jointly by the UEMS-SN executive bureau and the EAN Head Office.*

