European Paediatric Neurology Training Programme

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1. Introduction

Paediatric Neurology has been practised in Europe for more than 60 years. Although the majority of paediatric neurologists have come from general paediatrics, in certain member states adult neurology is the usual route of entry to the specialty and in other countries there is a direct entry to Paediatric Neurology training as a separate speciality after medical school.

This syllabus describes the European training programme in paediatric neurology. It is regularly reviewed and updated. The first version of this document was approved in November 2002 by The European Paediatric Neurology Society and by the European Committee of National Advisers (comprised of representatives of National Paediatric Neurology Societies in Europe) and by the Sections of Paediatrics and of Neurology of the Union of European Medical Specialists in December 2002 and March 2003 respectively. The first revision dates from January 5th 2009 and was approved by Sections of Paediatrics and of Neurology of the Union of Medical Specialists in November 2010.

1.1. Definition of paediatric neurology

Paediatric Neurology is the medical discipline devoted to normal and abnormal development of the central nervous and peripheral neuromuscular systems from foetal life up to and including adolescence. Primarily, it involves the diagnosis, prevention, and treatment of diseases of these systems and the comprehensive management of the consequent disabilities. Furthermore, paediatric neurologists are dedicated to research in this field, as well as the transfer of knowledge by means of education and training programs. Finally, ethical and societal issues related to neurologic disorders in the paediatric population, have their attention.

1.2. Aims of this training programme:

- To improve the care of children with neurological disorders and the support that medical services are able to give to parents / carers, associated medical professionals and other disciplines involved in child health and welfare.
- To set defined standards of knowledge and skills required to practice paediatric neurology.
- To ensure that research is developed and encouraged within paediatric neurology.
- To harmonise and help develop training programmes in different European countries.
- To support a high standard of practice of paediatric neurology in Europe.

2. Training content

Specialist training of doctors in paediatric neurology involves several elements of which a factual syllabus can cover only parts:

i) A basis of knowledge about normal and abnormal neurological function in childhood.
ii) Direct personal experience of the clinical assessment and management of a wide range of paediatric neurological diseases and developmental problems.
iii) The training should take place in fully equipped departments, which are subject to regular inspection by the national training authority.
iv) Arrangements for obtaining widened experience in paediatric neurology at other hospitals must be made within the individual training programmes where specific equipment / experience is not available at the main site of training.
v) There are strong psychosocial and multi-disciplinary elements to the practice of paediatric neurology. It is important that these dimensions are included in the training of paediatric neurologists.
vi) A period of research is not obligatory in the training programme, but is strongly encouraged. It is essential that trainees have a good understanding of research methodology and are able to critically assess the evidence base of pharmacological treatment / interventions. It is important that there are systems in place whereby selected trainees can engage in research.
vii) Trainees should get experience in how multidisciplinary teams function optimally and understand how to lead them. In addition, trainees should be able to partner with parents in the care and treatment of their children together with other professionals and members of the community of the children, especially when communication is complex.

2.1 Knowledge of paediatric neurology

A Basic fields of paediatric neurology

The knowledge base should be at least at the level of major current textbooks of paediatric neurology

i) Detailed information on the normal and common patterns of abnormal development / growth
ii) Principles and interventions in foetal neurology
iii) Neonatal neurology: acute and chronic neurological illness presenting in the neonatal period.
iv) Epidemiology, aetiology, pathogenesis, pathology, clinical features, treatment and outcome measures for disorders including:
    a) Epilepsies
    b) Movement Disorders
    c) Cerebral Palsy
    d) Central Nervous System infections
    e) Neuro-immunology
    f) Neuro-oncology
    g) Acquired brain injury including trauma, intoxication, hypoxia/ischemia
    h) Cerebrovascular diseases
    i) Neuro-muscular diseases

j) Neuro-metabolic disorders.
k) Headache
l) Neuro-degenerative disorders
m) Neuro-cognitive and behavioural problems
n) Neuro-genetics, including neurocutaneous disorders
o) Neuro-ophthalmology and hearing impairment
p) Psychosomatic (functional) disorders
q) Neurological complications of systemic diseases
r) Co-morbidities including developmental delay, learning/intellectual disabilities, language and communication disorders, manifestations of the common behavioural/psychiatric disorders of childhood (including autistic spectrum disorders, attention deficit/hyperactivity, obsessive compulsive disorder, oppositional behaviour, depression, anxiety, adolescent psychosis and anorexia nervosa).
s) Neurological emergencies
t) Neurosurgical diseases of childhood including disturbed cerebrospinal fluid circulation, brain tumours and spinal abnormalities
u) Inter-relationship of neurological diseases with other body systems including growth / nutrition, feeding difficulties, gastro-oesophageal reflux and aspiration.
v) Paediatric orthopaedics, orthotics and bioengineering used in the management of children with neurological disorders.
w) Prevention in paediatric neurology (accident reduction, abuse of psychoactive drugs and immunisation programmes). The relevant national legislation on child protection.
x) Transition of children with chronic neurological problems to adult care.
y) Diagnosis of brain death and ethical considerations concerning end of life decisions.

B Diagnostic measures

The trainee should have good current knowledge of

i) Neurogenetics, including modern genomics.
ii) Neurophysiology including EEG, peripheral and central investigations.
iii) Neuroimaging- good knowledge of the neuroradiological appearances of common and rarer neurological disorders on ultrasound / CT / MRI, and some understanding of other techniques used to investigate children with neurological disorders e.g. positron emission tomography and other functional imaging.
iv) Prenatal diagnosis related to neurological disorders.
v) Biochemical and neurometabolic investigations relevant for neurological disorders in children- including neonatal screening.
vi) Immunological investigations relevant for neurological disorders.
vii) Tissue biopsy: interpretation of histological abnormalities / neuropathology.
viii) Different techniques to assess and monitor intracranial pressure.
ix) Relevant psychological tests and ability to interpret a test report.

C Therapy

i) Current treatment plans and newly developing therapies for all forms of neurological disorder.
ii) Neuropharmacology.
iii) Problems with polypharmacy.
iv) Principles underlying habilitation and rehabilitation of children with neurological impairments.
v) Principles of management of behaviour disorders including pharmacotherapy, counselling and psychotherapy.
vi) Aids used in treatment and habilitation; hearing and vision aids, seating, mobility aids, orthoses, communication aids, computers, ventilatory assistance etc.
vii) Nutritional and gastrointestinal aspects.
viii) The range and potential consequences of unconventional and alternative therapies.

D Multi- and interdisciplinary care

i) Responsibility of the paediatric neurologist in a team approach to the management of neurological disorders and disabilities, including occupational-, speech and language- and physiotherapists, nurses, dieticians, psychologists, teachers and social workers.
ii) Methods used by other medical and paramedical specialists.
iii) Community based care of children with neurological impairments
iv) Educational provision for children with neurological impairments.
v) Care and counselling in the case of a suspected abnormality of the nervous system of the fetus.
vi) Palliative medicine and symptom control when the underlying disorder will not respond to other interventions.

E Social care in the country of training.

i) Social services / benefits
ii) Understanding when and how to intervene when carers have / are not acting in the child's best interest / are abusive

F National Health Care in the country of training

i) Insurances system
ii) National health care system

G Ethical issues

i) Ethical aspects of clinical paediatric neurology in dealing with life-long disabling, sometimes progressive conditions, including aspects of prenatal diagnosis, care and life support decisions as well as palliative care.
ii) Ethics of research in children. Process of informed consent.

iii) Issues governing ethics and consent for clinical trials.
iv) United Nations Convention on the rights of the child and other relevant proclamations and judgements set down in Law.

2.2 Skills in paediatric neurology

A Clinical skills

i) Adequate and supportive history taking.
ii) Neurological examination of children of all ages from (preterm) neonate till adolescent and young adults, including developmental assessment and clinical assessment of hearing and vision.
iii) Clinical observation and analysis concerning normal development, play, motor performance and abnormal movements including clinical gait analysis.
iv) Being able to put together an effective, adequate and to the resources adjusted plan for investigations and treatment.
v) The use of relevant diagnostic measures to interpret the child's clinical condition, draw relevant conclusions and engage in relevant therapy.
vi) Tests to determine death using neurological criteria.
vii) Co-ordination of care for the critically ill child: the management of neurological emergencies and neurological aspects of multi-system illness.
viii) Effective and appropriate approach to parents and children including understanding the emotions generated within children and their families by possible neurological illness. To share difficult information in an appropriate fashion and to provide structured counselling at an appropriate level; to know when more skilled or different psychological help is required.
ix) To provide consultation to other paediatric specialties.

B Academic skills

i) Critical evaluation of clinical and research results from literature review of international publications, to present these to peers and allied professionals.
ii) Manuscript preparation.
iii) To prepare and deliver oral / poster presentations.
iv) Support or be active in research.
v) Formal and informal teaching at undergraduate and postgraduate level.
vi) Active in all stages of the audit process

3. Training programme

The overall duration of training will differ between countries and will depend on the route of the trainee through Paediatrics, Neurology or a separate Paediatric Neurology training program. The program has to have a minimum duration to allow the acquisition of adequate competencies, but also to demonstrate the acquisition of the needed competencies and will in general have a minimum of 5 years duration. Whatever route is chosen, training should include a trunk of

Paediatric Neurology, General Paediatrics as well as Adult Neurology in order to give the opportunity to acquire the necessary competencies. Entry to the training programme should normally be through application for a vacant post, which is nationally advertised and interviewed for in a structured fashion.

It is expected that training programmes will contain a mix of (1) direct supervised clinical care of patients, (2) a taught programme, which contains formal lectures and seminars, (3) informal clinical and tutorial style work, (4) national and international training courses and (5) supervised home / electronic / library work. The detailed structure of such programmes is not given but the expected outcomes are. The ideal way of satisfying a training programme is through demonstrating effective learning and achieved competencies.

3.1 Paediatric Neurology training

3.1.A. Main modules

The paediatric neurology training programme is structured in three main obligatory modules, each containing a specific area of expertise and skill. Including extra study in one or more of the special fields the duration of the programme will take in general 5 years.

i. Paediatric Neurology trunk module
The trainee works in a recognised specialist / tertiary paediatric neurology unit(s). During this time the trainee acquires expertise in the diagnosis and management of infants, children and adolescents with neurological disease. It should include all the above mentioned basic fields in paediatric neurology (see section 2.1). This also includes direct involvement with children in intensive and neonatal care units and basic assessment and management of children with psychiatric illness. This module should include the assessment and management of children undergoing neurosurgery. This training involves attendance at investigation meetings (e.g. radiology, genetics, pathology and neurophysiology), which are integral to clinical management. Training should be extended when further sub speciality competencies are required in special fields
Normal duration over 2 years.

ii. General Paediatrics
General paediatric training should normally reach the level of the common paediatric trunk training as defined by the European Academy of Paediatrics (EAP) /Paediatric Section of the Union Européenne des Médecins Spécialistes (UEMS); http//http://eapaediatrics.The EAP/Paediatric Section of the UEMS recommends that the Common Trunk Curriculum training in general paediatrics is 3 years followed by 2-3 years of paediatric speciality training.

It is emphasised that all specialists in Paediatric Neurology should have a solid training in General Paediatrics including Neonatology. When such national rules allow an entry from Neurology, or an entry directly to Paediatric Neurology as a distinct specialty, it is recommended that trainees should

complete a minimum of two years of general paediatric training. Up to one year of training in Paediatric Neurology trunk module can also be counted as paediatric training. In combination with the additional paediatrics year from Paediatric Neurology, training would then satisfy the EAP request of a common paediatric trunk.

This syllabus acts as a European guideline. It is suggested that national regulations which deviate substantially from this concept are revised stepwise in order to achieve a common trans-European standard.

iii. Adult Neurology

As well as learning about the care of younger adults who have moved through transition into the care of adults neurologists, the trainees should learn about the investigation, identification and management of disorders which are relatively common in adult practice and less so in children. Examples of these types of disorders include stroke, immune-mediated diseases, movement disorders and motor neuron diseases. Acute focal lesions where clinical signs correlate accurately with the radiological appearance are more common in the adult population and attachment to an adult service allows the paediatric neurologist to consolidate their ability to extrapolate disease process / location with predicted and evident clinical signs

The trainee works in a recognised adult neurology unit with inpatient and outpatient responsibility for patients with neurological diseases. During this training, skills in correlative neuroanatomy and the diagnosis and management of most common and especially acute neurological disorders in adulthood are acquired. It will involve attendance at investigation meetings (e.g. radiology, pathology, and neurophysiology). This module may be integrated with paediatric neurology modules and may include transitional clinics for older teenage patients. In countries in which this module is a challenge, this module could be alternatively done as sessional attachments or half day attendance of (outpatient) clinics instead of a continuous period.

Minimal duration 6 months or equivalent.

3.1.B Special fields

Some fields of paediatric neurology need special attention during the training- see section 2.1. They are not necessarily subject to any extra time: completion is certified by the training supervisor. The trainee may wish to focus on some of these fields in agreement with the tutor.

Some examples are given below, others can be considered:

Paediatric neuroimaging	
Paediatric neurophysiology	Paediatric neurointensive care
Paediatric neurometabolic disease	Neonatal neurology
Paediatric neuropathology	Paediatric epileptology
Neurogenetics	Paediatric and adolescent
Neuro(re)habilitation	Neuropsychiatry

3.1.C Research training in paediatric neurology

It is important that trainees are encouraged to carry out clinical or basic research and that units are equipped to provide a research training, supervision of research and a peer group of research workers. The clinical content of the research should be recognised as part of their clinical training as agreed upon with the senior paediatric neurology tutor and national rules but may not be more than 6 months of the total training for Paediatric Neurologist.

4. Tutoring of training

A senior Paediatric Neurology tutor should be assigned to each trainee at the beginning of his / her training. This tutor is a senior Paediatric Neurologist who has appropriate teaching and management experience. The tutor should have research experience in paediatric neurology, but if they do not, then they should arrange for the trainee to gain research supervision from a different supervisor. He/she assesses and advises on the trainee's progress at least 6 monthly and especially pays attention to development of the necessary clinical and practical skills.

On a shorter-term basis, each trainee's progress is monitored by the tutor (or one of the teachers) in the training centre- for example by short clinical audits and by the trainee themselves. The trainee maintains a portfolio, which documents relevant training experiences in the above domains, providing evidence of the relevant competencies. Although clinical vignettes can be used, patient identifiable information must not be recorded in a training record.

Successful completion of a training module is certified by the tutor in a detailed documentation of the module- the experience, competence and knowledge acquired.

5. Training centres

Training centres and units are defined by the clinical and teaching facilities available as they apply to the detailed requirements of the modules.

Several institutions, located in close proximity, may combine in the one training centre. In such a case one qualified individual must be the designated training centre director who represents this centre to outside bodies and carries responsibility for the programme.

Most of those practicing paediatric neurology will work at least in part within the framework of a specialised tertiary care unit, department or hospital. A paediatric neurologist working for a significant amount of time within a secondary level unit would be expected to have the majority of sessions within a fully equipped tertiary unit.

6 Examinations / certifications

Considering the rarity of many neurological disorders, it is inevitable that there will be variability in the acquisition of competencies. The task of the final assessment is to review the whole training and the performance of the trainee to see if they broadly satisfy the training requirements and are effective paediatric neurologists. It takes many years to gain competence in almost all neurological disorders. The training scheme should be able to identify a development plan for the trainee after accreditation in order to ensure a system for accredited reregistration after set time intervals.

It is a matter for national bodies to decide if they wish to conduct exit examinations in paediatric neurology. However, if the national body does not have a formal exit examination, they should be able to supply written confirmation that the trainee has undertaken an accredited program that meets the above EPNS guideline and has acquired the relevant competencies successfully. It is strongly recommended that in the absence of a formal examination or board examination at the end of the training of a Paediatric Neurologists, national societies constitute some framework to assess if competencies acquired during training as a Paediatric Neurologist meet the criteria of this Syllabus.
It must be stressed that acquiring knowledge of paediatric neurology and keeping this knowledge up to date does not finish at the end of training. We strongly recommend the National societies to develop or continue a cyclic process of reregistration as Paediatric Neurologist in which elements of theoretical and practical knowledge and experience are checked.

7 National training programmes

7.1 Countries with existing programmes

National training programmes in paediatric neurology should be considered as compatible when they have a content that clearly fulfils the educational aims of the European programme. A national training programme can be evaluated on a voluntary basis by the European Training Advisory Board of Paediatric Neurology, in which the European Paediatric Neurology Society as well as the Committee of National Advisers are represented.

7.2 Countries without existing programmes

National professional medical bodies should be encouraged to adopt a national training programme in paediatric neurology and to structure it in close compatibility with this European programme. The instruments to evaluate such training programmes are with the European Training Advisory Board of Paediatric Neurology.

Until implementation of such a national training programme, motivated individuals should have the opportunity to train according to this European programme and to document their obtained qualification.

7.3 National Training Co-ordinator for paediatric neurology

Each country / national society should have a national training co-ordinator who will for example:

- Communicate with European bodies with responsibility for paediatric neurology.
- Co-ordinate paediatric neurology training activities.
- Check/ supervise presence of exit assessments.
- Advise on training issues.
- Maintain a database of people in training, training centres, tutors and teachers and regularly update it.