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European Paediatric Neurology Training Programme

Definition

1. Introduction

2. Aims of training

Knowledge of paediatric neurology
Diagnostic measures
Therapy
Clinical skills
Multidisciplinary care
Technical skills
Academic skills
Teaching skills
Integrated care – work with other agencies
Ethical issues
Management/administration

3. Training programme

Structure of the programme
General paediatric training
Obligatory modules
In depth studies (desirable modules)
Strict time requirements versus goal completion
Relationship to training in paediatrics and adult neurology
Research training
Monitoring of training
Flexibility of training

4. Training centres

5. Examinations/certifications

6. National training programmes

Countries with existing programmes
Countries without existing programmes
Training abroad

Definition

Paediatric neurology (PN) is the medical discipline devoted to normal and abnormal development of the central nervous and peripheral neuromuscular systems from fetal life up to and including adolescence. It involves the diagnosis, treatment and research into diseases of these systems and the comprehensive management of the consequent disabilities.

• **Introduction**

Paediatric Neurology has been practised in Europe for more than 50 years. In several countries paediatric neurology has been recognised as a separate speciality. PN is a large subject requiring a long training, part of which is in effect separate from paediatrics. This document describes the European Training Programme in PN. There is a strong concordance of training programmes within individual countries and the preliminary Recommendations for core training in Paediatric Neurology in Europe were approved by the Board of EPNS and the European Committee of National Representatives in Paediatric Neurology in 2000.

Although the majority of paediatric neurologists have come from general paediatrics, in certain member states adult neurology is still the usual route of entry to the specialty. Thus, this European training programme is constructed to reflect these dual sources of people and expertise. PN training according to this programme is thus:

First, be a sub-specialist training programme in Tertiary Care Paediatrics, defined by the Confederation of European Specialists in Paediatrics (CESP)/ the Paediatric Section of the European Union of Medical Specialists (UEMS) and

Second, a training programme, which in countries where this is applicable may follow a period of adult neurological training as agreed by the Neurological Section of the UEMS. This syllabus has been approved by the CESP/EBP and by the Neurological Section of the UEMS

In general terms, this training programme aims:

- 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 establish clearly defined standards of knowledge and skill required to practice PN at tertiary level.
- To ensure that research is developed and encouraged within PN.
- To harmonise training programmes in PN between different European countries and to support a high standard of practice of PN in Europe.
- To encourage the development of a European Network of competent tertiary centres for PN, which will allow collaborative training and research throughout Europe.

This syllabus will need to be regularly reviewed and updated. Specialist training of doctors in paediatric neurology involves several elements of which a factual syllabus can cover only parts:

- i) A base 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.
- iii) The training should take place in fully equipped departments, which are subject to regular inspection by the national training authority.
- iv) Training posts should be normal paid employment with a major content of supervised patient care.

- v) Arrangements for obtaining widened experience in Paediatric Neurology at other hospitals must be made within the individual training programmes where specific equipment and experience is not available at the main site of training.
- vi) 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.
- vii) A period of research is not obligatory in the training programme but is strongly encouraged. It is important that there are systems in place whereby selected trainees can engage in research.

Although the European paediatric neurologist is expected to be experienced across the wide spectrum of neurological diseases in childhood, specialty skills in specific areas of PN are developing rapidly. Those practising such super-specialties should be comprehensively trained in PN. Super-specialties should be based in a comprehensive PN department, and would be expected to be part of an active research programme.

- **Aims of training**

2.1 Knowledge of paediatric neurology

The level of the knowledge base of a paediatric neurologist is extensive and difficult to specify in detail but should be as least at the level of the major current textbooks of paediatric neurology

- i) Detailed information on normal and the common patterns of abnormal development.
- ii) Principles of antenatal brain development, both normal and abnormal.
- 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:
 - a) Neurological diseases in childhood.
 - b) Developmental delay (mental retardation), learning disability and specific learning difficulties language and complex communication disorders.
 - c) Congenital and acquired disabling neurological conditions of childhood.
- v) Natural history and manifestations of the common behavioural abnormalities of childhood (autistic spectrum disorders, attention deficit/hyperactivity, obsessive compulsive disorder, oppositional behaviour, depression, anxiety, adolescent psychosis and anorexia nervosa)
- vi) Neurological emergencies in childhood, eg. presenting with a coma, status epilepticus, raised intracranial pressure and paediatric emergencies presenting with neurological features, eg. metabolic disorders, non-accidental injury.
- vii) Neurosurgical diseases of childhood: theoretic and practical knowledge of the common neurosurgical disorders, their identification, investigation and management.
- viii) Inter-relationship of neurological diseases with other body systems including growth and nutrition, feeding difficulties, gastro-oesophageal reflux and aspiration.
- ix) Orthopaedics, orthotics and bioengineering in the clinical setting.
- x) Genetic issues including taking a pedigree, recurrence risk, prenatal diagnosis, gene localisation, imprinting and the principles of molecular genetics.

2.2 Diagnostic measures

- i) The ability to take good histories in a supportive fashion.
- i) Clinical examination of children of all ages including developmental assessment.
- ii) Skills in clinical observation and analysis concerning normal development, play, motor performance and abnormal movements.
- iii) Prenatal diagnosis as it relates to neurological disorder.

- iv) Biochemical and neurometabolic investigations relevant for neurological disorder in children.
- v) Methodology of genetic and immunological investigations relevant for neurological disorders.
- vi) Use of tissue biopsy: interpretation of histological abnormalities.
- vii) Appropriate use of neuroradiology, neuropathology and clinical neurophysiology including EEG, evoked potentials, EMG and neurography.
- viii) Assessment of hearing and vision including behavioural, brainstem, auditory evoked potentials and visual evoked potentials.
- ix) Principles of gait analysis
- x) Perform tests to determine brain death ..

2.3 Therapy

- i) Familiarity with current standard treatment plans for all forms of neurological disorder.
- i) Thorough knowledge of drugs used in treatment, especially anti-epileptic drugs, steroids and other immunosuppressants, muscle relaxants, analgesics, gastro-protective drugs, anti-bacterial and anti-viral agents and behaviour modifying drugs.
- ii) Principles underlying habilitation of children with congenital impairments.
- iii) Principles of management of behaviour disorders including pharmacotherapy, counselling and psychotherapy.
- iv) Knowledge of aids to treatment and habilitation, hearing and vision aids, seating, mobility aids, orthoses, communication aids, computers ventilatory assistance etc.
- v) Awareness of the range and potential consequences of unconventional and alternative therapies.
- vi) Experience of rehabilitation following acquired neurological impairments.
- vii) Knowledge of nutritional and gastrointestinal aspects of management.

2.4 Clinical skills

- i) To use relevant diagnostic measures (2.2) to interpret the patient's clinical condition, draw relevant conclusions and engage in relevant therapy.
- i) Co-ordination of care for the critically ill child: the management of neurological emergencies and neurological aspects of multi-system neurological illness.
- ii) Effective and appropriate approach to parents and children; to understand the emotions generated within children and their families by possible neurological illness and to be able to share difficult information in an appropriate fashion; to provide structured counselling at an appropriate level; to know when more skilled or different psychological help is required.
- iii) Draw up a management plan taking into account continuing medical problems and attendant school, educational and psychological factors.

2.5 Multidisciplinary care

- i) Use a team approach to the management of neurological disorders and to understand its advantages and limitations.
- ii) Understand methods used by occupational, speech and physiotherapists, nurses, specialist health visitors, play therapists, dieticians, clinical, neuro- and educational psychologists, teachers and social workers in assessment, treatment and rehabilitation.
- iii) Knowledge of methods used by other medical specialists
- iv) The paediatric neurologist should be able to provide consultation to other paediatric specialties.
- v) Transition of care from children's to adult services.

2.6 Technical skills

Trainees are not asked to be proficient in all these investigations but rather to be familiar with them and to understand their inherent strengths and weaknesses.

- i) EEG.
- ii) EMG.
- iii) Neurography.
- iv) Skin biopsy.
- v) Muscle biopsy.
- vi) Intracranial pressure monitoring/line care.
- vii) Neonatal cranial ultrasound.
- viii) Muscle ultrasound.
- ix) Cerebral function monitoring.
- x)

2.7 Academic skills

- i) Critical evaluation of clinical results from literature review and audit.
- ii) Manuscript preparation.
- iii) Oral presentation skills.
- iv) To develop a critical approach to problem solving in clinical practice.
- v) Support to or be active in research.
- vi) Collaborative attitude to local and national research initiatives.

2.8 Teaching skills

- i) Formal and informal teaching skills at undergraduate and postgraduate level.
- ii) Development of core materials to enable participation in teaching programmes on a regular basis.
- iii) Commitment to continuing self-education and teaching of others.
- iv) Maintenance of a training experience portfolio.

2.9 *Integrated care – Work with other agencies

- i) Direct experience of community based care of children with neurological impairments
- ii) Knowledge of educational provision for children with neurological impairments in the country of training.
- iii) Child protection: a thorough knowledge of the national legislation and experience working within that system.
- iv) Social services/ benefits in the country of training.
- v) Self-help and parent support groups.

2.10 *Ethical issues

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

2.11 *Management/administration

Understanding of the management skills required for the development and use of resources in the neurology unit, including budget control, contracting, strategic planning and writing a business plan.

- i) Experience of the day-to-day running of a paediatric neurology service within the national medical system.
- ii) Knowledge and involvement in clinical audit.
- iii) The structure and function of local, specialist and national organisation.
- iv) Knowledge of research funding.
- v) Understanding and implementing a leadership role in a multidisciplinary team.

- vi) Constructive attitude to the processes of decision making.
- vii) Ability to understand clinical complaints procedures and to respond effectively to them.

* These items are matters for national legislation and not solely part of medical training. Thus, when planning to move to another country it is important that the doctor and those employing the doctor ensure that this information is made available and understood.

• **Training program**

The overall period of training required is 6 years. Entry to the training programme should normally be through application for a vacant post, which is nationally advertised and interviewed for in the normal 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 and (4) supervised library work. The detailed structure of such programmes is not given but the expected outcomes are.

Most of those practising PN will work at least in part within the framework of a specialised tertiary care unit, department or hospital. Where a paediatric neurologist is working for a significant amount of time within a secondary level unit it would be expected that they would have sessions within a fully equipped tertiary unit.

3.1 Structure of the program

The training programme is structured in modules. Each module contains training in a specific area, expertise or skill. There are two different types of modules, obligatory and desirable. *Obligatory modules* are those considered essential for successful training. Four main modules and ten sub-modules are defined. *Desirable modules* are selected according to personal interest and need. At least 3 such modules are selected in collaboration with the tutor.

3.2 General paediatric training

Paediatric training should normally reach the level of the common trunk of paediatrics as defined by the CESP. This means 3 years of general paediatrics including 6 months of neonatology. In this context up to 1 year of paediatric neurology, child development or habilitation can count towards the 3 of 6 years training that are to be in paediatrics. This training should contain inpatient and out patient care and it should involve active patient care at a hospital approved for training.

When national rules allow an entry from general neurology, trainees (who have completed at least two years of recognised adult neurological training) should complete one year of general paediatrics at a junior grade. Both the immediate supervisor of this post and the senior paediatric neurology tutor should confirm that the trainee is competent at that level of paediatrics. Further general paediatric training can be required if necessary.

It must be pointed out that national regulations in several European countries demand full paediatric specialty training, or at least a longer time spent in paediatrics to allow a person to hold a post in paediatric neurology. This programme is not designed to give full specialty training in general paediatrics. National regulations may demand more extensive paediatric training for a post in general paediatrics.

3.3 Obligatory modules

i. Acute paediatric neurology 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 the whole range of infants, children and adolescents with neurological disease. This includes direct involvement with the care of children in intensive care with neurological disease. This module should include the assessment and management of children undergoing neurosurgery. This training involves attendance at investigation meetings (radiology, pathology and neurophysiology), which are integral to clinical management.
Required minimum duration 1-2 years.

ii. Habilitation/ neurodisability module

The trainee works in a recognised paediatric neurology/habilitation service, which comprises a multidisciplinary team including psychology and paramedical therapies in addition to the senior medical staff. During this time the trainee acquires expertise in the diagnosis and management of the full range of paediatric neurodisability patients of all ages.
Required minimum duration 1-2 years.

The acute and neurodisability modules will occupy a total of three years. The two modules may be integrated. It is envisaged that some trainees will focus on acute paediatric neurology and have two years in that area and others will focus on neurodisability and have two years in that area reflecting their specific training needs.

iii. Adult neurology module

The trainee works in a recognised adult neurology unit with inpatient and outpatient responsibility for patients with a wide range of neurological diseases. This training will involve attendance at investigation meetings (radiology, pathology, neurophysiology). This module may be integrated with paediatric neurology modules and may include transitional clinics for older teenage patients.

Required minimum duration 6 months or equivalent.

iv. Child psychiatry module

This module may be part-time and may be completed within basal paediatric or PN training. It will consist of supervised direct clinical experience of children with psychiatric illness. This may be in a general or neuropsychiatry setting. This module may be integrated within the paediatric neurology modules.

Required minimum duration 1 half-day/ week for 6 months or equivalent.

Ten *obligatory sub-modules* form part of the training programme with the purpose to achieve the aims outlined in chapter 2. These are integrated within the clinical and taught aspects of the entire programme. The tutor is to certify that the aims have been achieved.

- 1) Paediatric neuroimaging
- 2) Paediatric neurophysiology
- 3) Paediatric neuropathology
- 4) Academic **work** supervised and supported as outlined in 2.7.
- 5) Integrated **multi-disciplinary** care
- 6) Ethical issues
- 7) Neurogenetics

- 8) Neurooncology
- 9) Neonatal neurology
- 10) Management/organisational

3.4 In depth studies (desirable modules)

These periods of study allow a greater depth of understanding of the subject although aspects of the content of these modules appears in the obligatory training. Each of these modules has a reading list. They are not subject to a minimum time or necessarily any extra time: completion is certified by the tutor.

Paediatric neuroimaging

The trainee will join neuroradiologists in reporting sessions and independently report the whole range of MR, CT, angiography and skull and spinal x-rays under supervision. They will acquire skills of reporting neuroradiological investigations.

Paediatric neurophysiology

The trainee will perform EEGs, evoked responses, EMG and neurography and report these investigations independently under supervision. They will acquire skills of reporting these investigations.

Paediatric neuropathology

The trainee will join the consultant neuropathologist in reporting sessions and will independently report a series of specimens/ slides (cut brain and spinal cord, brain, neurohistopathology of spinal cord, gut, skin, bone marrow and blood film) of paediatric neuropathological interest under supervision. The trainee will acquire basic neuropathology reporting skills.

Neurogenetics

The trainee will participate in the clinical genetics service and have direct involvement with families coming for genetic counselling under supervision. The trainee will acquire genetic counselling skills in the common patterns of neurological genetic disease.

Paediatric neurometabolic disease

The trainee will participate in the clinical care of patients in a specialist service for children with neurometabolic disease and become familiar with the common laboratory diagnostic techniques. The trainee will acquire detailed knowledge of the diagnosis and management of neurometabolic disease.

Paediatric neurointensive care

Although neurointensive care is an obligatory part of the acute training module, some trainees will spend a whole time module of 2-3 months as a member of intensive care unit staff. The trainee will acquire general and neurological skills in intensive care.

Neonatal neurology

The trainee will attend a neonatal unit, which has specialist neurological expertise, and perform clinical examinations and ultra-sound investigations under supervision. The trainee will be able to provide a good opinion on the neurological status of a neonate.

Paediatric and adolescent neuropsychiatry

The trainee will spend a more intensive time with a specialist unit. The trainee will be expected to be able to provide a competent diagnosis and management advice on the common psychiatric disorders of childhood, under supervision.

Paediatric epileptology

The trainee would work in a specialist paediatric epilepsy unit. The trainee will acquire skills of neurological, neurophysiological, radiological assessment and an understanding of the use of neuropsychology and neuropsychiatry in the assessment of children with complex epilepsy, including those being assessed for surgical treatment.

3.5 Strict time requirements versus goal completion

Clearly the ideal way of satisfying a training programme is through demonstrating effective learning. However, because of the difficulties of this style of assessment alone, we give minimum duration times of obligatory modules as an additional guide to trainees and trainers. This emphasis may change over time.

3.6 Relationship to training in paediatrics and adult neurology

The purpose of this training programmes is to train paediatric neurologists not primarily paediatricians or adult neurologists. However, because of the acute and chronic neurology content of paediatrics, many paediatric trainees will spend the equivalent of a year in paediatric neurology/neurodisability. Thus it is appropriate to regard at least one year of the PN training as paediatric training and thus that their training contains at least three years of paediatrics.

So far as comparability with the length of adult neurology training, adult neurologists do a minimum of four years neurology. Paediatric neurologists do three and a half years plus the acute neurology experience within paediatrics and the neonatal neurology within the six months neonatology module. Thus the time spent in neurology training is very similar in both schemes.

3.7 Research training in paediatric neurology

It is important that appropriate trainees are encouraged to carry out research and that some units are equipped to provide a research training, supervision of research and a peer group of research workers. There must therefore be systems that allow extended periods of 3-4 years, largely full-time in research, whilst nevertheless becoming fully clinically trained. The clinical content of the research should be recognised as part of their clinical training as agreed upon with the senior PN tutor and national rules.

3.6 Monitoring of training

A senior paediatric neurology tutor is 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. Ideally the tutor should have research experience in PN. He/she supervises the broad programme for the trainee's progress at yearly intervals.

On a shorter-term basis, each trainee's progress is monitored by the tutor (or one of the teachers) in the training centre and by the trainee themselves. The trainee maintains a portfolio, which documents relevant training experiences.

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

National Training Co-ordinator for PN

Each country will have a national training co-ordinator who will:

- Communicate with European bodies with responsibility for PN as necessary.
- Co-ordinate the activities of PN training directors.
- Maintain a database of people in training and advise on training issues presented to them.
Maintain a database of centres, units, training directors, tutors and teachers and regularly update it.

3.9 Flexibility of Training

It will happen that not every department can provide all of the content of this syllabus and that some gaps will occur in the trainee's portfolio. The task of the final assessment is not merely to "tick all the boxes", but 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.

- **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. A *PN Training Director* should be appointed to be a tutor and head of a full training centre's teaching programme.

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.

A system of accreditation of training centres is desirable and will be developed according to the recommendations of the UEMS. Visitation of training centres should follow the rules as outlined in the relevant UEMS charter. The visitation committee is nominated by the relevant European Boards in co-operation with the EPNS.

Centres will be variously defined according to its training capacity and competence:

Full training centres

Full training centres are highly specialised tertiary care centres for PN that can offer a complete training. They are defined by the following features:

- Availability of all obligatory modules.
- Availability of at least 4 desirable modules.
- 2 or more accredited tutors.

Partial training centre

Partial training centres are partially specialised centres, which however cannot offer a complete training. They are defined by the following features:

- Availability of more than half of the content of the obligatory modules.
- One or more accredited tutors.

Training unit

Training units are specialised in one or a few specialised areas of the obligatory or desirable modules and have a teacher competent in these areas.

- **Examinations/certifications**

It is a matter for national bodies to decide if they wish to conduct exit examinations in PN. It is not the immediate intention that there should be European wide examinations in PN because:

- i) Factual knowledge is only one part of the practice of PN
- ii) There are formidable logistic and funding difficulties in putting on such examinations.

- **National training programmes**

6.1 Countries with existing programmes

National training programmes in PN that already exist or are in an advanced stage of development at the time when this European programme is implemented, should be considered as compatible when they have a content that clearly fulfils the educational aims of the European program. Each national syllabus should be scrutinised by the European Board of Paediatrics, when relevant by the European Board of Neurology, and the EPNS for compatibility.

6.2 Countries without existing programmes

National professional medical bodies should be encouraged to adopt a national training programme in PN and to structure it in close compatibility with this European programme.

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 in a relevant board evaluation on a voluntary basis. The instruments to monitor such training and to obtain approval are again with the European Board of Paediatrics in co-operation with EPNS. Although recognition as a trained European Paediatric Neurologist could be obtained without agreement of the official body of the member state, this is not the aim and joint National and European recognition is expected to be the rule.

6.3 Training abroad

European countries with existing programmes are encouraged to allow trainees to do some training in recognised European centres or centres outside Europe that clearly provide equivalent training.