European Manual of Medicine

Neurosurgery

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Editors
Foreword of the Series Editors

The European Manual of Medicine series was founded on the premise of offering residents as well as specialised clinicians the latest and most up-to-date information on diagnosis and treatment in Europe. In contrast to existing textbooks, the European Manual of Medicine series aims to find a consensus on the demands of modern European medicine based on the “logbooks” recommended by the Union of European Medical Societies (UEMS). Therefore, identical for each discipline, diagnostic and therapeutic principles are recommended as “recommended European standards”.

To fulfil these demands, we – together with Springer – recruit editors who are well established and recognised in their specialities. For each volume, at least three editors from different European countries are invited to bring the high clinical and scientific standards of their respective disciplines to the book.

Wherever possible, the book editors were asked to follow a standardised structure for each chapter so as to guarantee the reader easy and quick access to the material. High-quality illustrations and figures should provide additional useful information. For the interested reader, detailed references allow him or her to further investigate areas of individual interest.

The series editors are deeply grateful to Springer, especially to Mrs. Gabriele Schroeder, Mrs. Waltraud Leuchtenberger and Mrs. Stephanie Benko for their support and assistance in the realisation of this project from the early stages.

The third volume of the European Manual of Medicine series is Neurosurgery. The aim is to provide neurosurgery trainees with a comprehensive, yet condensed, guide to the core knowledge required in this speciality, and to give them the ability to work in their speciality in the entire European Union.

The volume editors Prof. Christiano B. Lumenta, Munich/Germany; Prof. Concezio Di Rocco, Rome/Italy; Prof. Jens Haase, Aalborg/Denmark; and Prof. Jan Jakob A. Mooij, Groningen/The Netherlands, leading European experts in Neurosurgery, recruited contributors from different European countries to compile a textbook that fulfils our original concept of the European Manual of Medicine series.

Wolfgang Arnold
Uwe Ganzer
Munich/Düsseldorf
Fall 2009
Preface

In a highly specialized field of medicine such as neurosurgery, specific knowledge is needed, and residents in training for neurosurgery also need to have such knowledge.

As we know, there are differences in the training programmes in the various EU countries, making it difficult to standardize medical training in the specialized field of neurosurgery. The basis for an international European consensus in neurosurgery is set out in this manual.

The book is written for residents as well as for students and other physicians with special interest in neurosurgery. Attempts were made to incorporate details of diagnostic and therapeutic procedures in different neurosurgical cases depending on the localization (cranial, spinal, peripheral nerves), with consideration of congenital defects and paediatric neurosurgical disorders, of functional and stereotactic neurosurgery as well as of critical neurosurgical care. The chapters on each organ contain the basics in anatomy and physiology. The book is structured with a clear description of the entities and their neurosurgical treatment options.

With better understanding of specific neurosurgical problems, the reader will be able to provide patients with better medical care. In preparing for the board examination, the resident will have a European standard for stepwise management of neurosurgical problems.

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Summer 2009
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### The Spine and Spinal Cord

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Introduction

Edited by Christianto B. Lumenta
Neurosurgery is defined as a special field of operative treatment of space-occupying lesions, such as tumors, infection, or hematomas, malformations, degenerative changes, injuries, and other surgically reachable entities of the central, peripheral, and vegetative nervous system and the associated necessary diagnostic procedures.

Modern neurosurgery is count as one of the newer fields of medicine, comparable to the fields of urology, orthopedic surgery, or vascular surgery which are now separated from the field of “general surgery” [1]. Nevertheless, the beginnings of neurosurgery go back to Stone Age times. Old Egyptian medicine had experience of and treatment guidelines for skull diseases 3,000 years bc. Since the middle of the nineteenth century archeologists have found, in different parts of the world, the remains of human skulls that have undergone trepanation and show evidence that the individuals have survived the procedure. Probably the procedures were for ritual purposes or for the treatment of some head injuries. Surgery on the nervous system, however, was reserved for more recent times. In the second half of the nineteenth century topographic anatomy was introduced after the development of asepsis and anesthesia. The first successful brain surgery was performed by R. Godlee in 1884, while, one year before, McEwen had removed a spinal tumor.

Modern neurosurgery could be realized after the development of examination methods such as myelography by W. Dandy in 1919, cerebral angiography by E. Moniz in 1927, electroencephalography by Berger in 1927, and echoencephalography by Leksell in 1953. With the beginning of the computer era in the 1970s, computed tomography was developed by Ambrose and Hounsfield, followed by magnetic resonance imaging (MRI) with the possibility for functional MRI, MRI spectroscopy, depiction of the pyramidal tract, and so on.

The results of brain surgery were improved after the introduction of clips and diathermy by Cushing at the beginning of the twentieth century. Modern neurosurgery, however, began with the introduction of the microscope, modern anesthesiology, and neurointensive management. Progress continued with the development of the ultrasonic aspirator, laser technology, neuroendoscopy, neuronavigation, and image-guided surgery. Functional neurosurgery for the treatment of pain and movement disorders changed from ablative procedures to electrode stimulation techniques.

Despite these rapid advances, in the last two decades the special field of neurosurgery has had to compete with other disciplines in the treatment of some conditions, such as stereotactic radiosurgery for the treatment of arteriovenous malformations (AVM) or small and well-defined brain tumors (metastasis, vestibular schwannoma, etc.), and endovascular neuroradiology for the treatment of intracranial aneurysms and AVM. Nanotechnology and molecular biology will bring in alternative treatments for many neurooncologic diseases. The most difficult cases, however, will be reserved for the neurosurgeon.

As a consequence of all these developments, it is very important to have standards in the training of neurosurgical residents and in basic training for the technical skills.

References
Training and Education

Edited by Christiano B. Lumenta
2.1 Training in Neurosurgery

HANS-JÜRGEN REULEN

2.1.1 Introduction

National authorities and professional bodies have the responsibility for monitoring and recognising training institutions and to provide certification or recognition of medical specialists. The European Union of Medical Specialists (UEMS) is the responsible authority in the EU for harmonisation and improvement of the quality of training of medical specialists. Harmonisation is a necessary prerequisite to enable free movement of medical specialists in the countries of the EU.

The European Neurosurgical Training Charter of the UEMS [1] summarises the requirements and standards for training in neurosurgery. National organisations are strongly recommended to adopt these requirements in their national guidelines. In the following, all referrals are made to the European Neurosurgical Training Charter.

Departments in the process of developing or improving their training programme may find comprehensive information in Training in neurosurgery in the countries of the EU, a guide to organize a training program [2].

2.1.2 Goals of a Neurosurgical Training Programme

The main goal is to provide a trainee with a broad knowledge base, the necessary operative and procedural skills and experiences, as well as professional judgement as preparation for independent neurosurgical practice. Further goals are to teach self-criticism, critical assessment of his/her results, and the ability to undertake self-directed learning, which will eventually lead to continued expert practice and professionalism.

2.1.3 Length of Training

Neurosurgical training requires a minimum duration of six years which includes a minimum of four years training in clinical neurosurgery in an accredited programme. Of these four years at least three years should be spent in a UEMS member state and not less than three years in the same recognised programme. Training must include adequate exposure to intensive care and to paediatric neurosurgery. Because of the future reduction in the hours of work there may be a need to extend the training time in clinical neurosurgery from four to five years.

Up to a total of two years may be spent in related disciplines (in a surgical discipline, neurology, neuropaediatrics, neuroradiology, neuropathology, neurophysiology) and/or activities including research in neurosciences.

2.1.4 Contents of Training

The contents of training are described in the classical textbooks, encompassing knowledge in:

- General basics of surgery
- Complete neurological investigation tests and procedures
- Neurosurgical diseases, their diagnosis, prognosis, treatment indications, and their operative and non-operative treatment (including intensive care and possible complications)
- Conservative and operative treatment of head injuries and the spine/spinal cord
- Microsurgical operative techniques and neuronavigation
- Indications for and the interpretation of modern neuroradiological examination techniques (CT, MRI, myelography, angiography), as well as Doppler sonography and ultrasound
- Quality control (morbidity and mortality conference, infection control, risk management)

2.1.5 The Training Programme

- There should be a written Training Curriculum describing the contents and aims in each year of training. A structured Surgical Training Plan can be helpful to provide a systematic escalation of surgical competence
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and responsibilities. Emphasis should be placed on adequate time allocated for study and tuition independent of clinical duties.

- There should be established Rotation Periods covering all main areas of neurosurgery. Each rotation should have clearly defined goals with regard to responsibilities in patient care, knowledge and operative experience.
- During each rotation a trainee should be assigned to a specific trainer.
- There should be a documented Education Programme with lectures, clinical presentations, neuropathological and neuroradiological conferences, a journal club, a morbidity and mortality conference, teaching meetings including subspecialties, and teaching in ethics, administration, management and economics.
- It is recommended that trainees participate at least once a year in a national/European training course, in a hands-on course or a national neurosurgical meeting, respectively.
- Each trainee must keep an authorised logbook (meeting the standards of the UEMS/European Association of Neurosurgical Societies [EANS] logbook) for documentation of his/her operative experience. The trainee will have to demonstrate that he/she has assisted in a wide range of cases, which should include a balance of trainer-assisted and personal cases under supervision. The logbook must be supervised and signed regularly by the respective trainer, and it must be available at Board examination.
- Trainees should be encouraged to participate in research and to develop an understanding of research methodology. In academic programmes, clinical and/or basic research opportunities must be available to trainees with appropriate faculty supervision.

2.1.6 The Training Institution

A training institution must have national recognition in accordance with the standards of the UEMS Training Charter. Participation of training institutions in the European accreditation process at present is voluntary and, if compliant, indicates that the department and the training programme fulfil the European Standards of Excellence for Education in Neurosurgery.

Units that cannot comply with the minimum standards of the UEMS Training Charter (case volume and mixture, number of trainers and beds, etc. as listed below) and cannot offer the full spectrum of neurosurgery cannot be training centres on their own. It is recommended that they develop a common training programme in co-operation with a larger department. Highly specialised centres can be included in the rotation of a recognised training centre.

2.1.6.1 Requirements for Training Institutions with Regard to Equipment and Educational Facilities

- There must be a referral base sufficient to provide an adequate case volume and mixture to support the training programme.
- There must be a minimum of four trainers (including the chairman/programme director).
- There must be at least 30 neurosurgical beds and in addition critical care beds (7–10/million population).
- There must be at least two designated, fully staffed operating theatres (neurosurgically trained staff), appropriately equipped and with 24-h availability.
- There must be an operating microscope with CCTV for each theatre. The following are deemed essential equipment: ultrasonic aspirator, image guidance and/or ultrasound, a stereotactic system, radiological imaging, and endoscopy equipment.
- Neurosurgical theatres should be covered by anaesthetists with a special interest in neuroanaesthesia. Anaesthesia coverage should be available at all times for neurosurgery.
- There must be designated and fully staffed neurosurgical intensive care beds. Neurosurgical intensive care may be managed by neurosurgery or there may be joint responsibility between neurosurgery and anaesthesia.
- There must be an emergency unit with 24-h admission.
- There must be outpatient clinics where non-emergency patients are seen before and after surgery.
- There must be exposure to paediatric neurosurgery as a mandatory component of a training programme. Where this does not form part of the routine work of a neurosurgical department, a 6-month secondment to an appropriate programme should be arranged (it must be recognised that in some European countries paediatrics requires special training and a protected environment).
- There should be opportunity to obtain experience in functional neurosurgery either within the department or in another neurosurgical department specialising in this field.
- All main specialities (neurology, surgery/traumatology, anaesthesiology, radiology, neuroradiology, neuropathology, radiotherapy, internal medicine, paediatrics) must be present to provide the trainee with the opportunity of developing his/her skills in a team approach to patient care.
- There should be an easily accessible library, with an adequate selection of books and journals on neurosurgery, as well as facilities for computer literature searches.
2.1.6.2 Institutional Quality Management Provisions

A training institution must have an internal system of quality assurance. There should be written guidelines concerning patient care and patient information (patient's consent), referrals, medical records, documentation, on-call and back-up schedules, days off, residents' working schedules, attendance at conferences and educational activities. An example may be found in [2]. There must be a structured procedure for the reporting of adverse events in the form of a mortality and morbidity conference; and the hospital should have an infection control committee and a drugs and therapeutics committee.

2.1.6.3 Responsibilities of a Training Programme Director

The training programme director does not need to be the head of the training institution. He/she must be a certified specialist of a minimum of five years, and demonstrate evidence of continuing professional development.

The Programme Director must establish a transparent and fair appointment process for trainees. A training agreement (contract) should be completed and signed by the director and the trainee at the beginning of training. The programme director should provide the trainee with a written Training Curriculum of his/her training (see Sect. 2.1.5). The promotion of an ethos of a high level of professional conduct and ethics within the training programme is essential.

The programme director has to:
- Organise and coordinate a balanced training programme with established rotations ensuring that the trainee will have exposure to all aspects of neurosurgery. The programme must be written and available to trainees and trainers.
- Ensure that there is dedicated time allocated to the trainers for training and that the trainers fulfil their training responsibilities.
- Ensure that there is dedicated time for trainees to attend educational meetings and approved courses, and that trainees can fulfil all training obligations.
- Ensure that the individual trainee’s documentation (training portfolio) is up to date.
- Organise a transparent and fair semi-annual progress evaluation of trainees.
- Provide valid documentation as to satisfactory completion of training.

2.1.6.4 Responsibilities of Trainers

Trainers should be certified specialists and possess the necessary administrative, teaching and clinical skills, and commitment to instruct and support their trainees. They have to:
- Set realistic aims and objectives for a rotation period
- Supervise the day-to-day work of the trainee on the ward, in the outpatient clinic and in the operating theatre
- Support the trainee’s operative and clinical progress and provide feedback
- Assess and report on the trainee’s progress at the end of each rotation (progress evaluation)
- Inform the programme director of problems at an early stage

2.1.6.5 Requirements for Trainees

Trainees during their training must be exposed to at least four different trainers and the full spectrum of neurosurgical procedures.

The attached Operative List (Appendix 1) summarises the minimal and optimal numbers of so-called key procedures that trainees should have performed on completion of training. In addition to this mandatory list of operative procedures, the trainee should have assisted in or partly performed operations for pituitary adenomas, complex basal meningiomas, aneurysms, arteriovenous malformations, acoustic neurinomas, paediatric procedures, intramedullary tumours, etc. (see assistant figures in Appendix 1) [3].

Trainees should be directly involved in the pre- and postoperative management of these patients and should have a detailed understanding of the preoperative investigations.

Many of the above procedures demand the use of the operating microscope that the trainee must be fully familiar with.

The trainee must learn to record and document patient history, examinations and investigative findings, obtain patients’ consent for operative procedures, clearly detailing the reasons for performing the procedure and the risks involved, as well as learn to communicate with patients and relatives and pass on distressing information (e.g. malignancies or bereavement) in a sensitive and caring manner.

He/she must maintain an operative logbook detailing his/her involvement in all cases. He/she should ensure that the goals and objectives of each rotation are met, that all problems are discussed with the assigned trainer and that copies of the progress evaluation forms are stored. Also it is recommended to keep a record of courses attended, publications and/or presentations (training portfolio).