



# UNION EUROPÉENNE DES MÉDECINS SPÉCIALISTES EUROPEAN UNION OF MEDICAL SPECIALISTS

*Association internationale sans but lucratif – International non-profit organisation*

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President: Dr Romuald Krajewski Secretary-General: Prof Vassilios Papalois Treasurer: Dr Bernard Maillet Liaison Officer: Dr Zlatko Fras

## Training Requirements for the Specialty of Neurological Surgery

### *European Standards of Postgraduate Medical Specialist Training*

#### **Preamble**

The UEMS is a non-governmental organisation representing national associations of medical specialists at the European Level. With a current membership of 39 national associations and operating through 43 Specialist Sections and European Boards, the UEMS is committed to promote the free movement of medical specialists across Europe while ensuring the highest level of training which will pave the way to the improvement of quality of care for the benefit of all European citizens. The UEMS areas of expertise notably encompass Continuing Medical Education, Post Graduate Training and Quality Assurance.

It is the UEMS' conviction that the quality of medical care and expertise is directly linked to the quality of training provided to the medical professionals. Therefore, the UEMS committed itself to contribute to the improvement of medical training at the European level through the development of European Standards in the different medical disciplines. No matter where doctors are trained, they should have at least the same core competencies.

In 1994, the UEMS adopted its Charter on Post Graduate Training aiming at providing the recommendations at the European level for good medical training. Made up of six chapters, this Charter set the basis for the European approach in the field of Post Graduate Training. With five chapters being common to all specialties, this Charter provided a sixth chapter, known as "Chapter 6", that each Specialist Section was to complete according to the specific needs of their discipline.

More than a decade after the introduction of this Charter, the UEMS Specialist Sections and European Boards have continued working on developing these European Standards in Medical training that reflects modern medical practice and current scientific findings. In doing so, the UEMS Specialist Sections and European Boards did not aim to supersede the National Authorities' competence in defining the content of postgraduate training in their own State but rather to complement these and ensure that high quality training is provided across Europe.

At the European level, the legal mechanism ensuring the free movement of doctors through the recognition of their qualifications was established back in the 1970s by the European Union. Sectorial Directives were adopted, and one Directive addressed specifically the issue of medical Training at the European level. However, in 2005, the European Commission proposed to the European Parliament and Council to have a unique legal framework for the recognition of the Professional Qualifications to facilitate and improve the mobility of all workers throughout Europe. This Directive 2005/36/EC established the mechanism of automatic mutual recognition of qualifications for medical doctors according to training requirements within all Member States; this is based on the length of training in the Specialty and the title of qualification.

Given the long-standing experience of UEMS Specialist Sections and European Boards on the one hand



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and the European legal framework enabling Medical Specialists and Trainees to move from one country to another on the other hand, the UEMS is uniquely in position to provide specialty-based recommendations. The UEMS values professional competence as *“the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served”*<sup>1</sup>. While professional activity is regulated by national law in EU Member States, it is the UEMS understanding that it has to comply with International treaties and UN declarations on Human Rights as well as the WMA International Code of Medical Ethics.

This document derives from the previous Chapter 6 of the Training Charter and provides definitions of specialist competencies and procedures as well as how to document and assess them. For the sake of transparency and coherence, it has been renamed as “Training Requirements for the Specialty of X”. This document aims to provide the basic Training Requirements for each specialty and should be regularly updated by UEMS Specialist Sections and European Boards to reflect scientific and medical progress. The three-part structure of this documents reflects the UEMS approach to have a coherent pragmatic document not only for medical specialists but also for decision-makers at the National and European level interested in knowing more about medical specialist training.

<sup>1</sup> Defining and Assessing Professional Competence, Dr Ronald M. Epstein and Dr Edward M. Houndert, Journal of American Medical Association, January 9, 2002, Vol 287 No 2

## **Background**

Europe is a diverse continent with a population of nearly 750 million living in over 40 countries. Healthcare in Europe is provided by a wide range of systems run at national levels with a state-run system being the prevailing model. Specialist training in neurosurgery varies across the continent. In



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many countries, entry into a specialist training programme is a competitive process that follows award of a medical degree. In other countries, foundation (internship) and basic surgical experience is first required, providing a platform for further learning. The duration of training varies and there is no unifying curriculum. The requirements for certification, or licensing, differ from one country to another and there are variations in the levels of operative experience between trainees<sup>1</sup>. Different methods of assessment, including in-training assessment of knowledge, skills and behaviours, examination assessment of applied knowledge, assessment of clinical skills and logbook experience, are utilized. In this curriculum we describe an outcome-based, rather than time-based, curriculum. We outline a 3-stage training model. We define wider, necessary generic professionalism skills, key conditions, index cases and emergency competencies. We describe advisory requirements for “certification”. This includes the full attainment of **Entrustable Professional Activities** related to inpatient care, outpatient care, emergency on-call neurosurgery, elective operative neurosurgery and multidisciplinary team working. We discuss the need for continuing professional development, continuing medical education and the acquisition of special interest skills.

## **Scope – to serve the population**

Neurosurgical conditions afflict any member of the population at any age. Emergency or urgent presentation is common. Both elective and emergency neurosurgical conditions can cause mortality and severe morbidity. The disease burden upon society caused by urgent neurosurgical pathology is therefore substantial. Suboptimal treatment increases the risk of poor outcome and should be averted by effective training, continuing professional development and collaborative team working. Training must enable newly appointed specialists to be competent at treating the majority of patients (adult and children) presenting with emergency or urgent conditions during an unselected on-call duty, in a timely fashion. It is important the newly certified specialist recognises when to seek assistance and support from colleagues for both emergency and planned operative cases. We recognise that trainees in some countries will not have opportunities to undertake some aspects of this curriculum due to well established pathways of care and in some cases legal requirements. The curriculum aims to harmonise training standards, but accepts compromises will be required for some trainees and training programmes.

Most branches of neurosurgery also comprise the management of patients with conditions that require planned surgical treatment. It is common practice for a specialist to develop particular expertise in the



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management of patients with elective neurosurgical conditions in an area of subspecialty interest: this experience should commence during training and continue during specialist practice. Acknowledging that trainees acquire and apply knowledge at different rates, certification or licensing should target demonstration of competence rather than simply be a measure of time in training. A neurosurgeon has responsibility not only for the diagnosis and treatment of patients with neurosurgical conditions, but also for the communications with patients, families, carers and colleagues. Professional attributes, including ethical practice, are a prerequisite for the provision of safe care and are as necessary to practice as advanced operative skills. Since optimal treatments change in the face of rigorous scientific evaluation, a specialist must participate in continuing medical education and professional development to deliver evidence-based practice. Key elements of neurosurgical practice involve multi-disciplinary working with other medical and surgical specialties. . Examples include collaborative working with maxillofacial surgeons, otolaryngology surgeons, ophthalmologists, interventional radiologists, endocrinologists, plastic surgeons, paediatricians, oncologists, anaesthetists and intensivists. Collaborative working may be required with both acute presentations (eg trauma, brain abscess, intracranial haemorrhage) and elective presentations (tumours, deformity).

## **I. TRAINING REQUIREMENTS FOR TRAINEES**

### **Selection into Neurosurgery**

Selection into neurosurgery varies across the continent. Appointment to a training programme may be made at a local level, or via a nationally led selection process. The selection process should be open to all eligible persons, be fair and multifaceted, and include objective assessment of:

1. A structured curriculum vitae application form
2. Motivation and understanding of the specialty
3. Applied clinical knowledge and technical skills
4. Communication skills
5. Situational judgement skills evaluating judgement under pressure, problem solving and professional integrity

### **3-Stage Training Programme**

Once appointed to a training programme, training should be conducted in 3 stages. Given that outcomes are based upon competency, the duration of training is not specified. An indicative



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period of training is 5 to 8 years: we recognise that in some countries there is pressure to shorten specialist medical training. Learning should include:

- Self-directed learning that is shaped by reflection upon feedback from trainers
- Learning from clinical practice under the supervision of trainers
- Learning from formal educational programmes (e.g. EANS Training Course; National Training Courses or similar)
- Simulation training – useful for technical and non-technical skill acquisition

Trainees should be trained within a structured, accredited Training Programme (see Appendix 1, Table 7). Each trainee must achieve competence in adult and paediatric neurosurgery including competence in cranial and spinal surgery. Where possible, trainees should attain competence and skills in peripheral nerve surgery, pain management surgery and non-operative spinal interventions.<sup>a</sup> Trainees should rotate to posts covering all the major specialty interest areas of neurosurgery. Training programmes ideally should encompass training in at least two different neurosurgical centres, although large centres may have sufficient breadth and depth of opportunities to support single centre training. Each trainee must have an Educational Supervisor. This does not need to be the clinical supervisor (clinical supervisors will change every time the trainee rotates to a different placement). The trainee must meet with the Educational Supervisor on a regular basis (at least every 3 months). Meeting content should evaluate clinical and non-clinical (e.g., professionalism) aspects of training in the context of achieving curriculum requirements, provide a forum for reflective learning and set SMART objectives (Specific, Measurable, Achievable, Realistic, Time scale) that are forward thinking. Regular formative feedback should be provided by clinical and educational supervisors. Many tools may be used to evaluate competence, and these should be discussed with the Educational Supervisor.

<sup>a</sup> In many European Countries, neurosurgeons are the main providers of peripheral nerve surgery. However, in some countries, orthopaedic and plastic surgeons provide this care for limb nerve injuries and oral & maxillofacial surgery for facial and trigeminal nerve injuries. All neurosurgeons must have a thorough understanding of the principles of peripheral nerve dysfunction, clinical assessment and investigation: where available we encourage neurosurgical trainees to acquire surgical skills in peripheral nerve surgery. Similarly, the delivery of interventional care for the management of pain and non-operative spinal conditions, is conducted by non-neurosurgical specialties in some European countries. Neurosurgical trainees should have a thorough understanding of the management of pain and where possible, should equip themselves with the skills to safely undertake such procedures independently.



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Tools to evaluate capabilities include:

- Logbook evaluation – assessing the volume, complexity, and extent of involvement with cases
- Work based assessments (e.g., clinical evaluation exercise; case-based discussion; direct observation of procedural skills; procedural based assessment) – aimed at assessing understanding and application of knowledge and clinical competence
- Multisource feedback (from members of the multidisciplinary team) and/ or multiple specialist reports (from those involved in providing clinical supervision) – providing anonymised feedback on clinical, operative and professional development
- Performance in formal examinations
- Feedback from patients
- Reflections – particularly in relation to complaints or untoward events.

## **Annual Performance Review**

Trainees must compile a Training Portfolio (electronic preferred) detailing posts held, examinations achieved, publications, presentations delivered, courses attended, outcomes from educational tools listed above and evidence of satisfactory progress. The Training Portfolio enables evidence to be assessed at the Annual Performance Review by the Training Programme Director; this assessment may be conducted by a panel chaired by the programme director. The annual assessment will result in one of the following options:

- Achieving progress and competencies at the expected rate
- Development of specific competencies required – additional training time not required
- Development of specific competencies required – additional training time required
- Inadequate progress – additional training time required
- Release from training programme
- Gained all required competencies for completion of the programme



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## **Stages of Training (see Overview Figure on next page)**

Stage 1: Development of diagnostic and ward-based clinical skills; learning of basic operative skills and principles. (Indicative duration 1-2 years)

Stage 2: Acquisition of emergency operative skills. Consolidation of clinical skills. Acquisition of technical skills including frequently used cranial and spinal approaches and non-complex elective operations. Acquisition of peripheral nerve surgical skills where available. (Indicative duration 3-5 Years)

Stage 3: Development of transferable microsurgical and special interest skills. (Indicative duration 1-2 years)

## **Multidisciplinary Work**

The neurosurgical trainee must work collaboratively with specialists from many different areas of medicine. Patients benefit from close working with radiologists, interventional radiologists, intensivists, anaesthetists, pain management specialists, those from other surgical specialities (most commonly maxillofacial surgeons, otolaryngologists and ophthalmologists), oncologists, paediatricians, medical specialists (e.g. neurology, neurophysiologists, haematologists, endocrinology) terminal care doctors and neuropathologists. The neurosurgical trainee must learn their own limitations and work constructively, in a timely manner to optimise medical care. Work with other specialties may concern elective and emergency cases and should frequently occur in multidisciplinary meetings, the outpatient clinic, ward rounds and the operating theatre .

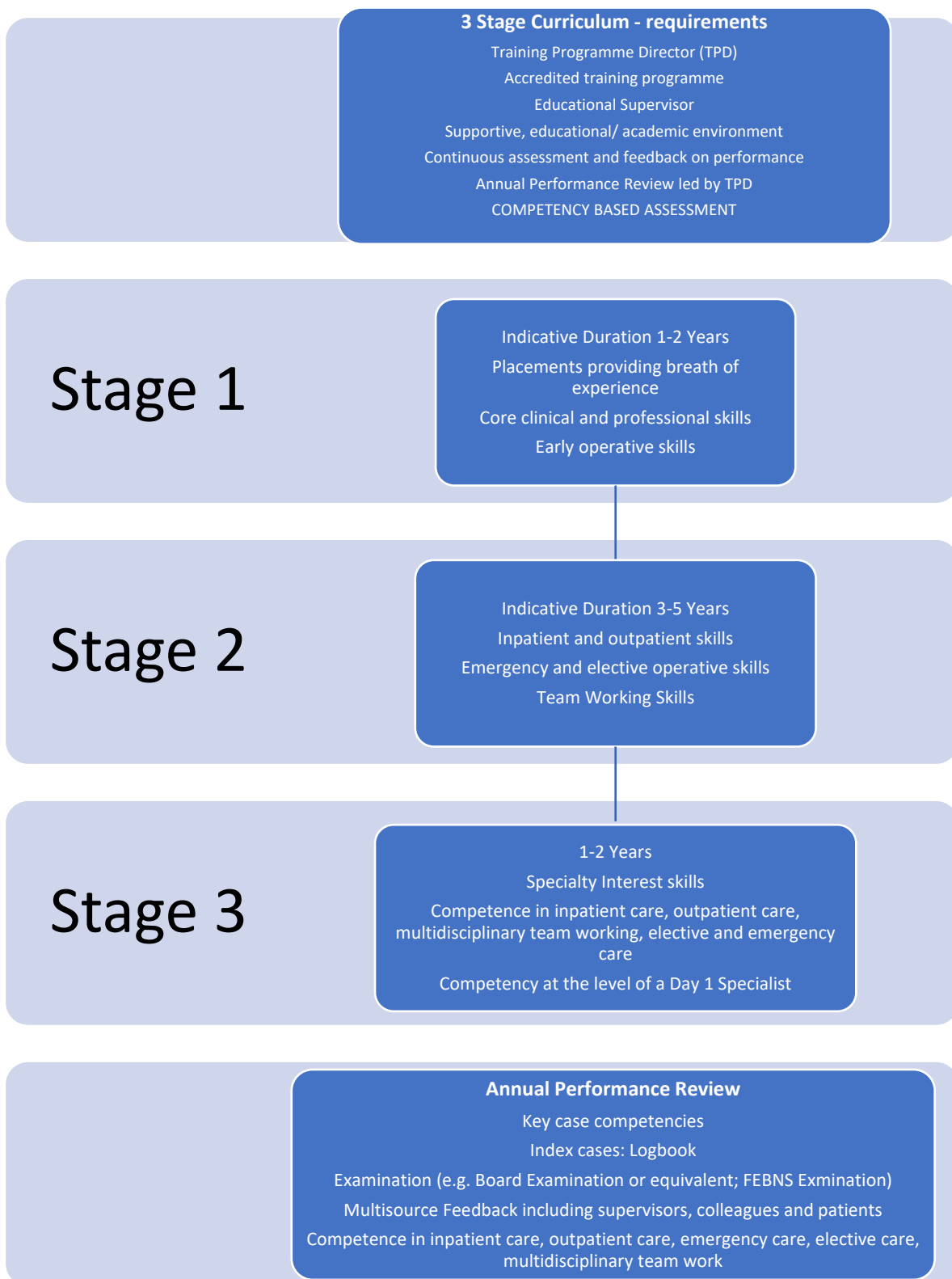


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## Levels of Knowledge and Operative Competency

The level of knowledge attained by a trainee is defined as:

- **Level 1 = Knows of**
- **Level 2 = Knows basic concepts**
- **Level 3 = Knows in detail**
- **Level 4 = Knows in detail and can apply knowledge**

The level of operative competency is defined as:

- **Level 1 = Assisted**
- **Level 2 = Perform with direct supervision**
- **Level 3= Perform with indirect supervision**
- **Level 4 = Competent to perform without supervision, including management of the majority of operative problems and complications that can occur during the procedure: may need occasional assistance**
- **Level 5 = Can be entrusted to carry out the procedure independently.**

## Stage 1 Training (indicative duration 1-2 years)

Trainees should attain experience relevant to a career in neurological surgery. The curriculum is not prescriptive concerning specific placements. However, a minimum of 6 months should be spent in neurological surgery. Other placements may include the clinical neurosciences (e.g., neurology, neuroradiology, neuro-intensive care), other surgical specialties (including peripheral nerve) and Emergency Medicine. Relevant experience gained in common trunk training can appropriately be counted towards Stage 1 at the discretion of the Training Programme Director.

During Stage 1 trainees will undertake directly or indirectly supervised work in the following five key areas of practice: these form the basis of developing Entrustable Professional Activities (see Page 17).

1. Inpatient care on a ward – learning the principles of patient care and clinical management
2. Emergency care – who to transfer to a neurosurgical centre, principles of safe transfer, rapid assessment of a patient and formulation of a safe management



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plan

3. Outpatient clinic – learning diagnostic and clinical skills
4. Multidisciplinary team care – often coordinating care
5. Operating theatre – acquiring generic principles of surgery, basic operative skills and an understanding of surgical anatomy

During Stage 1 trainees will attain experience in the management of key conditions. These are shown in Table 1. Trainees at the end of Stage 1 training must demonstrate attainment of experience in surgical procedures. The index procedures with levels of competency are shown in Table 2.

Trainees at the end of Stage 1 should be competent at taking a detailed clinical history, performing a competent examination of a patient, formulating an appropriate differential diagnosis and initial management plan. The trainee should be competent at resuscitation of a patient, including after trauma.



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**Table 1: Knowledge of key conditions at the end of Stage 1 of training**

Key conditions (end of Stage 1) - including knowledge of when to collaborate with other specialties	Knowledge level required
Impaired consciousness and seizures	4
Cranial trauma	3
Acute hydrocephalus	3
Acute tumour presentations	2
Spontaneous intracranial haemorrhage	2
CNS infections	2
Spinal trauma	2
Spinal oncology	2
Degenerative spinal disorders and cauda equina syndrome	3
Peripheral nerve	2
Emergency paediatric neurosurgery	1

**Table 2: Surgical competency levels at end of Stage 1 of training**

Index procedure (end of Stage 1)	Skill level required
Lumbar puncture and lumbar drain insertion	4
Insertion of ICP monitor	4
Burr hole evacuation of chronic subdural haematoma	2
Insertion of external ventricular drain	2
Craniotomy (opening and closing)	2
Lumbar decompression (approach)	2
Median nerve decompression/ ulnar nerve decompression or transposition/ sural nerve biopsy/ harvesting (where available)	2

**Stage 2 Training (indicative duration 3-5 years)**



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Trainees will consolidate Stage 1 achievements and further develop their clinical, professional, and technical skills. The main focus of Stage 2 training is to develop competence in the management of most acute neurosurgical presentations, in adult and paediatric neurosurgical practice. Training must include management of traumatic brain injury, acute hydrocephalus, neurovascular emergencies, CNS infection, spinal trauma and all other spinal emergencies. Where available, trainees should be exposed to peripheral nerve surgery. Trainees must therefore rotate through the majority of special interest areas. All trainees should undertake a minimum period of 6 months paediatric neurosurgery. Most trainees will need a longer period of paediatric training, including exposure to paediatric emergencies, to develop competence in the management of emergency presentations. In some training programmes, exposure to paediatric neurosurgery and adult neurosurgery can be synchronous. We recognise that in some jurisdictions, access to paediatric neurosurgical and neurovascular training may be limited. Due to the high proportion of emergency work in neurosurgical practice, all trainees must undertake experiential emergency on-call work including “out of hours” work for a substantial proportion of Stage 2 training. Trainees must be supported with appropriate levels of direct and indirect supervision throughout Stage 2 training commensurate with their level of competence. Levels of competence in key conditions (Table 3) and surgical procedures (Table 4) are shown. Trainees should also develop considerable experience in the management of most elective neurosurgical conditions including hydrocephalus, neuro-oncology, skull base and pituitary surgery, pain, epilepsy and functional surgery, peripheral nerve surgery, spinal surgery and paediatric neurosurgery. At the end of Stage 2 training, the trainee should be able to undertake a majority of emergency neurosurgical work with remote supervision. Areas of special interest should develop, and the trainee should be ready to undertake supervised microsurgery on a regular basis.

During Stage 2 trainees must continue to develop skills enabling them to develop capabilities as listed below. These should be assessed at the Annual Performance Review of trainee progress.

- In-patient care (including ward and intensive care unit management)
- Outpatient care (assessment, diagnosis, investigation and management)
- Emergency on-call neurosurgery (assessment, investigation, operative and non-



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operative management of cranial, spinal, adult and paediatric cases)

- Elective operating (cranial, spine, peripheral nerve [where available], adult and paediatric cases in a breadth of specialty interest areas)
- Multidisciplinary team working

**Table 3: Knowledge of key conditions at the end of Stage 2 of training**

Key condition (end of Stage 2)	Knowledge level required
Impaired consciousness and seizures	4
Cranial trauma	4
Spontaneous intracranial haemorrhage	4
Acute hydrocephalus	4
Intracranial tumours	4
CNS infections	4
Spinal trauma	4
Spinal oncology	4
Degenerative spinal disorders	4
Peripheral nerve	4
Emergency paediatric neurosurgery	4

**Table 4: Surgical competency levels at the end of Stage 2 of training**



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Index procedure (end of Stage 2)	Indicative skill level required
Advanced adult supratentorial	3
Endoscopic and transsphenoidal	2
Convexity and falcine meningiomas	3
Advanced adult infratentorial	3
Intradural spine	3
Complex spinal fusion	3
Advanced paediatric supratentorial	2
Advanced paediatric infratentorial	2
Non-complex peripheral nerve surgery* (where available)	3

\* At stage 2 non-complex peripheral nerve surgery includes simple peripheral nerve decompression in the extremities and nerve transposition.

## Stage 3 Training (indicative duration 1-2 years)

Stage 3 of training is designed to enable trainees to develop specialist technical skills of generic and specialty interest area relevance. Trainees will be provided with experience to acquire transferable microsurgical skills. During Stage 3, Special Interest Training should be provided for the trainee in one or two areas of specialist practice. The trainee should be provided with in-depth experience in the placements that are provided. Ideally a period of 12 months should be provided as a minimum in each of the specialty interest areas undertaken. Key condition requirements (Table 5) and indicative index procedure requirements (Table 6) are shown. Key condition requirements are similar to those required at the end of Stage 2. Trainees should develop their confidence and competence in all areas during Stage 3 and should continue to provide emergency on-call care.

### Special Interest Training during Stage 3

We recognise the following areas of special interest, though accept that there must be



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flexibility about the specifics of training content at this stage in accordance with trainer skills and the evolution of clinical practice. During this training some trainees may learn skills that provide competence in areas not specified in this curriculum. Once practicing as a specialist, the trainee should apply the principles of professionalism when undertaking such surgery. For example, the specialist should work with appropriate audit and clinical governance structures to ensure patient safety is of paramount importance. For some cases this will require team working, including in the operating room, with other specialties.

- **Neuro-oncological surgery** – e.g., functional imaging, awake craniotomy, intra operative monitoring, use of fluorescent markers, intraventricular tumour surgery, pineal surgery, brainstem tumours, stereotactic radiosurgery.
- **Skull-base and pituitary surgery – advanced surgical approaches, endoscopic and microscopic experience**, cranial nerve monitoring, repair of CSF fistulae
- **Neurovascular surgery** – Emergency and elective aneurysm management (surgical and/or learning of interventional radiology skills – recognizing and respecting the ETR in Interventional Neuroradiology<sup>5</sup>); AVM management, mechanical thrombectomy, cerebral ischaemia management.
- **Pain, epilepsy and functional surgery** – microvascular decompression, spinal cord neuromodulation (or stimulation), intrathecal drug delivery systems, rhizotomy, assessment of epilepsy, surgery for epilepsy, management of movement disorders including deep brain stimulation (DBS) and lesioning.
- **Peripheral nerve surgery** – including management of complex conditions including trauma and tumours.
- **Advanced spinal surgery** – non-operative interventions (eg injections/radiofrequency), minimally invasive procedures, spinal navigation, advanced management of spinal trauma, stabilisation of metastatic spine, resection of spinal tumours (bony, extradural, intradural extramedullary and intramedullary), use of spinal monitoring, surgical management of osteoporosis, spinal deformity, ankylosing spondylitis, rheumatoid spine, syringomyelia and hindbrain malformations.
- **Paediatric neurosurgery** – hydrocephalus, paediatric neuro-oncology, paediatric trauma, spinal dysraphism, spinal deformity, craniofacial disorders.

During Stage 3 trainees must continue to develop skills enabling them to be competent to the level of a Day 1 specialist at the end of training. These Entrustable Professional Activities should



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be assessed at the Annual Performance Review of trainee progress (see below).

**Table 5: Knowledge of key conditions at the end of Stage 3**

Key condition (end of Stage 3)	Knowledge level required
Impaired consciousness and seizures	4
Cranial trauma	4
Spontaneous intracranial haemorrhage	4
Acute hydrocephalus	4
Intracranial tumours	4
CNS infections	4
Spinal trauma	4
Spinal oncology	4
Degenerative spinal disorders	4
Peripheral nerve	4
Emergency paediatric neurosurgery	4

**Table 6: Surgical competency levels at the end of Stage 3 of training**

Index procedure (end of Stage 3)	Indicative skill level required *
Advanced adult supratentorial	4/5
Endoscopic and transsphenoidal	2 (4 if pituitary specialty interest)
Convexity and falx meningiomas	4/5
Advanced adult infratentorial	4/5
Intradural spine (extramedullary)	4/5
Complex spinal fusion	3 (4/5 if spine special interest)
Advanced paediatric supratentorial	2 (3 if paediatric special interest)
Advanced paediatric infratentorial	2 (3 if paediatric special interest)
Non-complex peripheral nerve surgery (where available)	3 (4/5 if special interest**)

\* Special interest experience can be attained in high-volume training centres supported by national and international specialty courses and meetings.





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\*\* Non-complex peripheral nerve surgery at Stage 3 includes neurolysis, schwannoma enucleation, nerve sutures.

Trainee should achieve Level 5 surgical competency in many areas including all common “time-constrained” emergency neurosurgical conditions.

## Entrustable Professional Activities (EPAs)

EPAs describe the daily responsibilities and tasks that a doctor undertakes. An EPA is a ‘critical part of professional work that can be identified as a **unit** to be **entrusted** to a trainee once sufficient competence has been reached’. An EPA goes a level higher than the traditional 4th level of competence *which is the ‘independence competency’*. The key factor is **Entrustment**. The trainee is not only capable of tackling the particular procedures or units independently, but he can be **trusted** to do this by his tutors.

Satisfactory completion of the training programme indicates that the trainee is entrusted to undertake all of the EPA tasks listed below. The decision to entrust the trainee with the capability and responsibility to undertake EPAs is based on the portfolio review, including logbook review, the use of multiple assessment tools including knowledge tests, observations of clinical and procedural skills, and multiple specialist reports. The EPAs must be delivered with professionalism, encompassing the principles of ethical practice. The five EPAs embedded in the neurosurgical curriculum are:

- ***In-patient care*** (including responsibility for ward and intensive care unit management)
- ***Outpatient care*** (including responsibility for the assessment, diagnosis, investigation and management of patients)
- ***Emergency on-call neurosurgery*** (including the performance of cranial, spinal, peripheral nerve (where available), adult and paediatric neurological surgery). Trainee should achieve Level 5 surgical competency in many areas including all common “time-constrained” emergency neurosurgical conditions.
- ***Elective operative neurosurgery*** (including advanced technical skills in one or two special interest areas). Trainee should achieve Level 5 surgical



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competency in many areas.

- **Multidisciplinary team working** (including significant contributions to team decision making and knowing when to seek assistance and advice)

## Logbooks

Trainees must keep a logbook of operative procedures conducted during training. The logbook should be up-dated contemporaneously, validated by the clinical supervisors and reviewed at meetings with the Educational Supervisor and at the Annual Performance Review led by the Training Programme Director. The logbook can be used to monitor accumulation of technical skills according to the Stage of training and to set goals for future development. The logbook should not record personal patient data and should comply with Data Protection Law. The operative procedure and the level of involvement should be recorded. The classification of the operation should include:

- Assisted
- Performed (supervisor scrubbed)
- Performed independently
- Trained (e.g., trained a more junior colleague)

The [www.elogbook.org](http://www.elogbook.org) is a well-established, widely used electronic logbook. Tables 8 and 9 (in Appendix 2) provide further information for trainees and trainers on logbooks and indicative numbers of cases as published by UEMS and the Intercollegiate Surgical Curriculum Project. These numbers are not obligatory: the key principle to consider is the trainer assessment of competence.

## Professionalism and Behaviours

Professionalism is a key attribute required by the specialist. There are many definitions of professionalism, which are effectively encapsulated as “a set of values, behaviours and relationships that underpins the trust the public has in doctors”<sup>2</sup>. Professionalism encompasses adherence to ethical practice (see below), effective communication skills with patients, family, carers and other health care team members, reliability, accountability and a



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commitment to continuing professional developments.<sup>3</sup> We consider that continuing professional development is an important component of training that must continue post certification. We consider that this can be evidenced as undertaking and completing training courses, attending and participating in medical conferences, contributions to audits to medical research. In providing evidence of professionalism, trainees should demonstrate judgement under pressure, problem solving, situational awareness, effective communication, teamwork, leadership and an ability to appraise research evidence as part of continuing medical education, commensurate with their stage of training.

We consider that formal assessment of professionalism is required for all trainees. Methods of assessment should be multiple and triangulate. Feedback should include “in the moment” feedback from trainers and colleagues, regular anonymized 360° feedback from multiple members of the healthcare team (e.g. once per annum, selected by the trainee in discussion with the educational supervisor) and feedback from patients. Feedback to the trainee about lapses in professionalism is required to develop professional behaviours. By the end of training, a trainee must display consistent professional behaviours that put the patient first. The trainee should maintain a written reflective portfolio in the event of any complaints, concerns or untoward clinical incidents: this demonstrates the important attribute of personal insight. A reflection should be anonymised as far as possible. Reflections do not need to capture full details of an experience; they should capture learning outcomes and future plans. Discussion with other team members and an educational supervisor can help learning. Reflections following positive experiences can also enhance team performance.

A trainee who does not meet the required professional standards should not be recommended for certification.

## **Ethical Practice**

Trainees should have an applied knowledge of ethical practice. This sphere of practice should develop experientially throughout training. Knowledge should include respecting the key pillars of the principlism model of ethical practice:

- Autonomy: the patient’s wishes are paramount
- Non-maleficence: treat with the objective of avoiding harm.
- Beneficence: promote overall benefit to the patient



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- Justice: equality of availability of treatments to all patients

Trainees must also respect veracity (telling the patient the truth), the Duty of Candour and maintain patient confidentiality.

Within neurosurgical practice many ethical dilemmas may arise. The application of the above principals will help resolve most dilemmas. However, to manage the full breadth of ethical issues in clinical practice, trainees must have a thorough understanding of the ethical principles governing:

- Capacity
- Consent (of adults and children – including those lacking capacity)
- End of life care (including advanced directives, withholding and withdrawing care)
- Use of human tissue
- Research, experimentation and innovation (including data storage)

## **Fellowship of the European Board of Neurological Surgeons (FEBNS) Examination**

The Fellowship of the European Board of Neurological Surgeons (FEBNS) Part 1 examination assesses knowledge and is appropriately undertaken once a trainee has had exposure to a wide range of neurosurgical conditions (usually toward the latter part of Stage 2 training). The clinical component (Part 2) of the FEBNS Examination is designed to assess applied knowledge in those who have completed a training programme. We advise that all neurosurgery trainees undertake FEBNS or an equivalent national examination. Progression through the phases of training differ across Europe. Progression may be dependent upon examination outcome and/or portfolio assessment by the Training Programme Director, evaluating many of the tools used to assess competence. The FEBNS Examination does not constitute a license to practice; it is an evaluation of applied neurosurgical knowledge. Many European Nations conduct examinations as a test of applied specialist knowledge. Post-graduate examinations should publish eligibility criteria, blueprint content to the curriculum and use psychometric methods to set examination standards. Quality assurance processes should exist.



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## Certification/ Licensing

The EANS/UEMS Curriculum is provided as a template for the development of national training programmes. The content of the curriculum is given as a safe level for independent specialist practice within a team of neurological surgeons. The National Authority is the responsible body for recognition/ certification of medical specialists in Europe. The majority of countries now have a compulsory Board Examination (or equivalent). The FEBNS Examination does not constitute a license to practice neurosurgery in any European country but is a useful tool to evaluate applied neurosurgical knowledge both in countries with, and those without, a Board Examination.

The key considerations for a training programme director to support specialist certification are:

- Completion of a structured training programme in neurosurgery
- Competence in the management of key neurosurgical conditions
- Competence in the operative management of emergency neurosurgical conditions (brain and spine) in children and adults
- Competence in the following Entrustable Professional Activities:
  - Outpatient neurosurgical care
  - Inpatient neurosurgical care (including elective)
  - On-call neurosurgical care
  - Elective operating (including one or two specialty interest areas)
  - Multidisciplinary team working
- Demonstration of ability to consistently undertake ethical practice
- Demonstration of professional attributes that indicate the trainee is committed to continued professional development
- Demonstration of professional attributes that indicate the trainee seeks help and support from more experienced colleagues, and colleagues in other specialties when faced with challenging cases
- Evidence of material contributions to quality improvement
- Understanding and application of the principles of research
- Evidence of participation in management and/or leadership activity relevant to the



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specialty e.g., rota administration, membership of working party, trainee  
representative, project lead



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Due to variation in the content of individual training programmes, it is not possible to specify required competencies throughout each year of training. The key condition competencies and level of index procedures required at the end of each stage of training are shown in Tables 1-6 above. Appendix 1 (Table 8) provides a granular overview of the requirements for competencies at the completion of training. We recognize that all trainees will not achieve all competencies in all conditions. Training Programme Directors should be aware that Appendix 1 (Table 8) is indicative and does not comprise essential requirements for completion of training (unlike Tables 1 to 6). Grouping of operations into those with similar transferable skills is useful when assessing competence (see Appendix 2, Table 9). When considering suitability for certification a pragmatic approach should be adopted and the entirety of a trainee's clinical and operative experience should be considered, with a focus on the technical skills required to deliver safe emergency neurosurgical treatment and elective treatment in a supportive, team-based environment. We recognise that some trainees will want to further the development of their skills by undertaking Fellowship Level training in areas of special interest. We also recognise that in some European Countries, training in some specialty areas is limited or restricted.

## **TRAINING REQUIREMENTS FOR TRAINERS and TRAINING INSTITUTIONS**

The delivery of high-quality training requires competent trainers with time allocations in their work schedule to provide training opportunities for trainees at all stages of the training programme. The trainers must work with departmental colleagues to ensure that a comprehensive educational programme is provided and that opportunities exist to enable trainees to undertake quality improvement projects, audit and research. The Training Programme must have sufficient volume and breadth of cases (across a single or multiple institutions) to enable trainees to achieve the Entrustable Professional Activities defined in the curriculum. The Programme must have access to sufficient clinical and educational resources to fully support the trainees. An Accreditation Process should exist to evaluate training centres. The table below summarises the requirements for training.

### **Table 7: Requirements for trainers and training programmes**



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Requirement	Recommendations
Trainers	<ul style="list-style-type: none"><li>• The Training Programme Director and Educational Supervisors should have been trained in the delivery of teaching, learning and assessment.</li><li>• TPDs and Educational Supervisors should have protected time for educational activities and adequate administrative support.</li><li>• TPDs and Educational Supervisors should be familiar with the contents and requirements of the curriculum and the use of assessment tools.</li><li>• The TPD has overall responsibility for the placement of trainees to ensure that training opportunities are structured, and that training is delivered in the 3 stages described in the curriculum.</li><li>• The TPD should lead an Annual Review of Competency for each trainee. This is usually undertaken in the context of a Panel reviewing the performance of all trainees using assessment tools as described in the curriculum</li></ul>
Education programme	<p>Face to face and virtual learning opportunities should be available throughout training e.g.</p> <ul style="list-style-type: none"><li>• Mortality and morbidity meetings</li><li>• Journal clubs</li><li>• Educational neuroscience lectures/ seminars/ webinars covering a wide selection of the curriculum provided on a regular and sustained basis</li><li>• Multidisciplinary team meetings in key specialty areas</li><li>• Delivery of teaching by trainees</li></ul>
Research opportunities	<ul style="list-style-type: none"><li>• Trainees should be enabled to develop an understanding of research methodology including assessment of published literature.</li><li>• Trainees should achieve competence at evaluating research evidence</li><li>• Trainees should have opportunities to undertake supervised clinical and/or basic science research.</li><li>• Trainees should be encouraged to recruit patients into approved clinical trials.</li></ul>
Audit and Quality Improvement	<ul style="list-style-type: none"><li>• Trainees should work with trainers to develop audit and quality improvement programmes aiming to improve patient care.</li></ul>





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Presentations	<ul style="list-style-type: none"><li>• Trainees should be encouraged to present research, audits and quality improvement projects (poster and oral) at national and international meetings.</li></ul>
Courses	<ul style="list-style-type: none"><li>• Trainees should attend simulation training throughout the training programme.</li><li>• Trainees should be encouraged to attend relevant training courses in neurosurgery (e.g., European Training Course), the management of trauma and ‘hands-on’ cadaveric courses.</li></ul>
Training Programme Hospital Requirements	<ul style="list-style-type: none"><li>• Sufficient volume of adult and paediatric cases to support training in the breadth of the specialty – this may involve trainees rotating between centres to obtain sufficient experience in all key areas. Logbooks should be used to evaluate surgical opportunities for trainees. Indicative logbook numbers are provided in Appendix 1.</li><li>• Dedicated neurosurgical theatres (24h access) with a microscope in each theatre and availability of commonly used equipment e.g. neuronavigational system, ultrasonic aspirator, stereotactic equipment, endoscopy equipment, instrumentation for spinal fixation procedures.</li><li>• Neurosurgical intensive care beds.</li><li>• Availability of allied specialties e.g., Neuroanaesthesia, neurology, neuroradiology with on-site CT and MRI, neuropathology, clinical oncology, paediatrics. rehabilitation.</li><li>• Sufficient manpower to provide safe clinical services within the limits of any Working Time directives.</li><li>• Outpatient clinics with learning opportunities for trainees. • Library with electronic access to key journals</li><li>• Office space for trainers and trainees</li><li>• Resources to support clinical and/ or basic science research activities</li><li>• Governance systems responsible for infection control, prescribing, reporting systems (e.g., for ‘near misses’ and when things go wrong) and medical records.</li><li>• Transparency in reviews of training conducted by regulatory or advisory bodies.</li></ul>



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## Appendix 1 (Table 8)

Controversy exists about the value of logbook numbers as a measure of competency. We recognise that competence requires the confidence and capability to undertake a procedure, assess and manage anatomical or pathological variation, and safely manage complications. In this table we provide an **indicative** table of expected levels of **competency** by special interest area. If a trainee has undertaken special interest training in Stage 3 of training, the level of expected competency is greater. Due to variation in the delivery of healthcare across Europe, no trainee is expected to achieve maximal levels of competency in all skills. Some trainees may develop experience and competence in operations not including in this list. Trainees and trainers commonly utilise logbook numbers as a surrogate measure of competence. In this competency-based curriculum, the capabilities of the trainee are more important than the absolute numbers. We have listed previously published UEMS “target” numbers for many operations in this table. These provide an **indicative** parameter for the evaluation of experience: increased operative experience often correlates with the ability of the surgeon to manage both straight-forward and complex variations of the same operation. The higher numbers of more straight forward procedures are a surrogate measure of trainee exposure to sufficient operative caseload to support training. The numbers are not obligatory.

The = symbol is used in table 8 where the operation may contribute to the target numbers of a similar type of procedure included in the table

\* In some European countries peripheral nerve procedures are no longer regularly performed by neurosurgeons.

### Levels of Operative Competency

- Level 1 = Observed
- Level 2 = Perform with direct supervision
- Level 3 = Perform with indirect supervision
- Level 4 = Competent to perform without supervision, including management of complications that occur during the procedure



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Specialty Area	Operative Skill	Level of competency expected by end of stage 3 for all trainees	Level of additional competency expected if included within special interest Stage 3 training	UEMS Section of Neurosurgery target numbers (where available)
Surgery for Cranial Trauma	Intraparenchymal ICP monitor/ EVD	4		30
	Burr hole evacuation of CSDH	4		20
	Elevation of depressed fracture	4		8
	Craniotomy for EDH, SDH, contusions	4		20
	Decompressive craniectomy	4		
	Cranioplasty	4		10
	Combined craniofacial repair of fronto-orbito-maxillary injuries	2	3	
	Craniofacial repair of CSF leak	2	3	
Surgery for CSF Disorders	Insertion of EVD/ ventricular access device	4		20
	Insertion of VP shunt	4		30
	Insertion of LP shunt	4		
	Revision of VP shunt	4		15



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	Revision of LP shunt	4		
	Third ventriculostomy	2	4	5
	Foramen magnum decompression	4		4
	Syringostomy / syringo-pleural shunt	2	3	
	Endoscopic treatment of complex hydrocephalus	2	3	

<b>Neuro oncological Surgery</b>	Image guided biopsy (framebased and / or frameless) of supratentorial tumour	4		20
	Image guided biopsy of brainstem/ cerebellar tumour	2	3	
	Supratentorial craniotomy for intra-axial tumour (e.g. glioma)	4		40
	Supratentorial craniotomy for extra-axial tumour (e.g.convexity, parasagittal, parafalcine, sphenoid wing, anterior fossa meningioma)	4		12
	Midline infratentorial craniotomy/ craniectomy for intra-axial tumour (e.g. metastasis)	4		6
	Retrosigmoid infratentorial craniotomy/ craniectomy for extra-axial tumour (i.e. VS)	2	3	10
	Craniotomy for intrinsic tumour of insula	2	3	



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	Craniotomy for intraventricular tumour excision (lateral, 3 <sup>rd</sup> and 4 <sup>th</sup> ventricle) – e.g. colloid cyst, meningioma, ependymoma. Transcortical, transcallosal and telovelar approaches	2	3	
	Craniotomy for pineal region tumour excision (e.g. supracerebellar-infratentorial and occipital trans-tentorial approaches)	1	3	
	Awake craniotomy	2	4	
	Endoscopic biopsy of intraventricular lesion	2	3	
	Endoscopic resection of intraventricular lesion	2	3	
	Stereotactic radiosurgery Stereotactic radiosurgery	1 1	4 4	



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<b>Skull Base and Pituitary Surgery</b>	Endoscopic resection of pituitary tumour	2	3	
	Microsurgical resection of pituitary tumour	2	3	10
	Retrosigmoid infratentorial craniotomy/ craniectomy for extra-axial tumour (i.e. vestibular schwannoma)	2	3	
	Translabyrinthine excision of vestibular schwannoma	1	2	=
	Extended pterional approach and resection of tumour of skull base	2	3	
	Pre-sigmoid approach to tumour of skull base	1	2	
	Far lateral approach to tumour of skull base	1	3	
	Craniotomy for suprasellar/ cliniodal/ parasellar lesion (microsurgical and endoscope assisted)	2	3	5
	Trans-facial approach to skull base tumour	1	2	
	Frontobasal approaches to the anterior fossa and orbito-ethmoidal complex	2	3	



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<b>Surgery for Infection</b>	Burr hole image guided aspiration of abscess	4		10
	Craniotomy excision/ marsupialization of abscess/	4		=
	Craniectomy for subdural empyema	4		=
<b>Peripheral Nerve Surgery*</b>	Decompression of median nerve	4		45
	Decompression of ulnar nerve	4		=
	Resection of peripheral nerve tumour	2	3	
	Brachial plexus surgery (compression/ trauma)	2	3	
	Nerve suture	3	3	



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<b>Neurovascular Surgery</b>	Craniotomy and evacuation of supratentorial ICH	4		12
	Craniotomy and evacuation of infratentorial ICH	4		=
	Craniotomy to clip anterior circulation aneurysm	1	3	5
	Craniotomy to clip posterior circulation aneurysm	1	2	
	Endovascular treatment of aneurysm (recognising and respecting the ETR in Interventional Neuroradiology)	1	3	
	Decompressive craniectomy for cerebral infarction	4		
	Craniotomy for excision of supratentorial AVM	1	3	2
	Craniotomy for excision of infratentorial AVM	1	2	=
	Craniotomy to obliterate DAVF	1	2	
	Craniotomy excision of cavernoma	2	3	5
	Revascularisation (e.g. aneurysm, ischaemia)	1	2	
	Removal of infected or malfunctioning implant	4		





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<b>Pain, Epilepsy and Functional surgery</b>	Stereotactic electrode placement	2	4	
	Stereotactic lesioning	2	3	
	Insertion of neuromodulation implant	2	4	5
	Insertion of pharmacological pump delivery system	3	4	5
	Vagal nerve stimulator	2	4	5
	Lesionectomy for the treatment of epilepsy	1	4	=
	Amygdalohippocampectomy for epilepsy	1	2/3	=
	Other open epilepsy surgery (e.g. hemispherotomy, callosotomy)	1	2/3	=
	Microvascular decompression of trigeminal/ facial nerve	3	3/4	5
	Percutaneous trigeminal rhizotomy	2	3	10
	Spinal cord stimulator	2	4	20
	DREZ lesion	1	3	=
	Cordotomy	1	2	
	DBS for pain/ spasticity	1	3	=



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<b>Spinal Surgery</b>	Posterior decompression of lumbar spine	4		70
	Posterior decompression of cervical spine (e.g. foraminotomy, laminectomy, laminoplasty)	4		
	Posterior decompression of thoracic spine	4		
	Anterior cervical discectomy + fusion/ arthroplasty	4		25
	Lumbar discectomy	4		=
	Revision lumbar discectomy/ decompression	4		
	Thoracic discectomy (range of approaches)	1	3	5
	Drainage of spinal epidural abscess	4		
	Open biopsy of vertebral body/ disc	3	4	
	External immobilisation of unstable spine (e.g. application of traction or halo)	4		
	Atlanto-axial stabilisation	1	2	
	Stabilisation of cervical spine (trauma)	2	4	10
	Stabilisation of cervical spine (e.g. tumour/ infection)	2	4	=
Stabilisation of thoracic spine (trauma)	2	4		



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	Stabilisation of thoracic spine (e.g. tumour/ infection)	2	4	
	Stabilisation of lumbar spine (trauma)	2	4	20
	Stabilisation of lumbar spine (e.g. degenerative/ tumour/ infection)	2	4	=
	Thoraco-lumbar deformity correction	2	3	
	Resection of intradural extramedullary tumour (e.g. meningioma, neurofibroma, schwannoma)	3	4	5
	Resection of intradural intramedullary lesion (e.g. ependymoma, haemangioblastoma, cavernoma)	2	3	3
	Intra-operative spinal cord monitoring (e.g for intramedullary lesion resection)	1	3	
	Surgery for spinal dysraphism	2	3	
	Use of endoscope in spine surgery	1	3	
	Percutaneous injection techniques (e.g., nerve root block, RFL – where available)	3	4	
	Kyphoplasty/ vertebroplasty (where available)	2	4	



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<b>Paediatric Neurosurgery</b>	Insertion of ICP monitor	4		5
	Craniotomy for traumatic intracranial haematoma	4		
	Elevation of depressed skull fracture	4		
	Tapping of CSF reservoir	4		
	Insertion of EVD/ ventricular access device	4		10
	Insertion of VP shunt	4		10
	Revision of VP shunt	4		=
	Endoscopic third ventriculostomy	2	4	
	Endoscopic treatment of complex hydrocephalus	2	3	
	Endoscopic fenestration of arachnoid cyst	2	3	
	Open fenestration of arachnoid cyst	2	3	
	Supratentorial craniotomy for tumour	2	3	5
	Midline infratentorial craniotomy for tumour	2	3	=
	Intraventricular tumour excision	2	3	
	Craniotomy/ endoscopic approach for pineal region tumour excision	1	2	



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	Craniotomy for spontaneous intracranial haematoma	3	4	
	Craniotomy for vascular lesion (e.g. AVM, cavernoma)	1	2	
	Untethering of spinal cord	2	3	5
	Dorsal rhizotomy (e.g. for spasticity)	1	3	
	Baclofen pump insertion	2	3	
	Closure of myelomeningocele	2	4	
	Instrumented stabilisation of spine	1	3	
	Intradural spinal tumour resection	1	3	
	Surgical management of craniosynostosis	1	2	
	Vagal nerve stimulator	2	4	
	Epilepsy surgery	1	2/3	
	Revascularisation surgery for ischaemia (e.g. Moya Moya)	1	2	



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## Appendix 2 : Table 9. Grouping of operative competencies

Neurosurgical training includes the learning of operative skills acquired during a wide range of operations. To facilitate assessment of transferable operative skill acquisition, the UK Specialist Advisory Committee in Neurosurgery developed a grouping of operative experiences to facilitate evaluation of high-fidelity operative capabilities. This is adapted below to help TPDs and Trainees benchmark progress.

Procedure Group	Indicative number by certification	Operative performance Level
Advanced adult supratentorial e.g. aneurysm, AVM, cavernoma, supratentorial skull base meningioma, craniotomy for craniopharyngioma, colloid cyst, amygdalohippocampectomy, hemispherectomy	10	4
Endoscopic and transsphenoidal	10	3 (4 if special interest training)
Supratentorial meningiomas	10	4
Advanced adult infratentorial e.g. microvascular decompression, intrinsic posterior fossa tumour resection, extrinsic posterior fossa tumour	10	4



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Intradural spine (e.g. intradural extramedullary tumour resection, intradural intramedullary tumour resection, foramen magnum decompression with durotomy)	5	4
Complex Spinal Fusion (e.g. any posterior spinal fixation, corpectomy and fusion procedures, NB ACD + F not included)	10	3 (4 if special interest training)
Advanced paediatric supratentorial (e.g. tumour resection, AVM resection)	1	2 (3 if special interest training)
Advanced paediatric infratentorial (e.g. tumour resection, AVM resection)	1	2 (3 if special interest training)



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## Consultations

The curriculum has been reviewed by all Board Members and Section Chairs of the EANS and the UEMS Neurosurgery Section. Feedback from these groups has been of immense value. The Young Neurosurgeons Committee have also provided valuable input to support the development of the curriculum. I accept responsibility for any errors in the curriculum (Peter Whitfield). If errors are identified, please contact me via the EANS staff team so that corrections can be made.

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As Chair of the Specialists Advisory Committee in Neurosurgery in the UK (2017-2020) Professor Peter Whitfield was responsible for the development and writing of the UK and Ireland Curriculum for the Intercollegiate Surgical Curriculum Project (ISCP). Peter recognises the support and guidance provided by the Joint Committee on Surgical Training and the immense efforts of Mr Simon Thomson during this work. The EANS/ UEMS Curriculum in Neurosurgery is broadly aligned with the approach taken to training in the British Isles.