ISCP INTERCOLLEGIATE SURGICAL CURRICULUM PROGRAMME

# Neurosurgery Curriculum

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THE INTERCOLLEGIATE
SURGICAL CURRICULUM PROGRAMME

*Educating the surgeons of the future*

**Acknowledgements**

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You can also find the curriculum on the ISCP website at **www.iscp.ac.uk**

**Table of Contents**

# 1 Introduction

The Neurosurgery curriculum provides the approved United Kingdom (UK) framework for the training of doctors to the level of independent consultant practice in Neurosurgery, addressing the requirements of patients, the population and the strategic health services. The curriculum will also be followed for training in the Republic of Ireland. GMC approval of the curriculum pertains to UK training programmes while those in the Republic of Ireland are governed by the Royal College of Surgeons in Ireland (RCSI) and the Medical Council of Ireland.

# 2 Purpose

## 2.1 Purpose of the curriculum

The purpose of the curriculum for Neurosurgery is to produce, at certification, competent doctors, able to deliver excellent outcomes for patients as consultant surgeons in the UK. The curriculum will provide consultant surgeons with the generic professional and specialty-specific capabilities needed to manage patients presenting with the full range of acute neurosurgical conditions up to and including the operation and early aftercare. Consultant surgeons will also be able to manage the full range of acute and elective conditions in the generality of their chosen special interests, including the operations. Phase 2 and 3 trainees will be entrusted to undertake the role of the general Neurosurgery Registrar (StR) during training and will be qualified at certification to apply for consultant posts in Neurosurgery in the UK or Republic of Ireland.

Patient safety and competent practice are both essential and the curriculum has been designed so that the learning experience itself should not affect patient safety. Patient safety is the first priority of training demonstrated through safety-critical content, expected levels of performance, critical progression points, required breadth of experience and levels of trainer supervision needed for safe and professional practice. Upon satisfactory completion of a training programme, we expect trainees to be able to work safely and competently in the defined area of practice and to be able to manage or mitigate relevant risks effectively. A feature of the curriculum is that it promotes and encourages excellence through the setting of high-level outcomes, appropriate supervision levels, tailored assessment and feedback, allowing trainees to progress at their own rate.

This purpose statement has been endorsed by the GMC's Curriculum Oversight Group and confirmed as meeting the needs of the health services of the countries of the UK.

## 2.2 Rationale and development of the new curriculum

The *Shape of Training* (SoT) review[1] and *Excellence by design: Standards for postgraduate curricula*[2] provided an opportunity to reform postgraduate training to produce a workforce fit for the needs of patients, producing doctors who are more patient-focused, more general and who have more flexibility in their career structure. The GMC's introduction of updated standards for curricula and assessment processes laid out in *Excellence by Design* requires all medical curricula to be based on high-level outcomes. The high-level outcomes in this curriculum are called Capabilities in Practice (CiPs) and integrate parts of the syllabus to describe the professional tasks within the scope of specialty practice. At the centre of each of these groups of tasks are Generic

[1] Shape of training: Securing the future of excellent patient care

[2] Excellence by design: standards for postgraduate curricula

Professional Capabilities[3] (GPCs), interdependent essential capabilities that underpin professional medical practice and are common to all who practise medicine. The GPCs are in keeping with Good Medical Practice (GMP)[4]. Equipping all trainees with these transferable capabilities should result in a more flexible, adaptable workforce.

The curriculum takes account of and better supports the needs of patients and service providers. It has been developed in consultation with stakeholders, including trainees, trainers, employers, lay representatives, the specialty association, the Specialty Advisory Committee (SAC) for Neurosurgery and other groups, ensuring the development of a curriculum that is fair, flexible, non-discriminatory, fit for purpose today with the capacity to evolve in future iterations in response to the changing needs of patients.

The curriculum will produce neurosurgeons with:

a) Generic competence to participate in an unselected take
   Patients presenting to an on-call neurosurgical service often require immediate management including surgery. Employers require all neurosurgeons to be able to contribute to the on-call take.
b) Broad abilities to deal with the majority of common elective cases
   The majority of elective Neurosurgery is unspecialised. For example, as much as 70% of the Neurosurgery elective workload is spinal, comprising for the most part, patients with spinal degenerative disease. Employers and the public require as many neurosurgeons as possible to undertake surgery for spinal degenerative disease and for the other common and non-complex neurosurgical conditions. Post-surgical continuity of care is an essential part of Neurosurgery and is standard practice.
c) Flexibility to adapt to changing service requirements
   Neurosurgical practice covers a broad spectrum of disease, much of which is quite rare and it is also a rapidly evolving specialty. A consequence of these facts is that the techniques used and referral patterns change rapidly so surgeons have to remain flexible with transferable skills and a willingness to change how they practise. For example, aneurysm clipping that was a very significant part of neurosurgical practice has diminished with the advent of radiological coiling while oncology surgery, spinal surgery and functional surgery have all expanded. Further growth in spinal surgery and stroke clot retrieval are areas neurosurgeons will be expected to develop.
d) Special interest skills in one or more of the key special interest areas
   Some elective areas of Neurosurgery are highly complex and rare. There is an increasing body of literature showing that these cases should be concentrated in the hands of only a few practitioners. There has been supra-regional consolidation in some areas of practice including for example paediatric epilepsy, craniofacial and some aspects of the management of neurofibromatosis. However, even at the regional level surgeons have special interests in the key areas of vascular, skull base, oncology, hydrocephalus, spinal, paediatric and functional neurosurgery. The curriculum, therefore allows flexibility for a neurosurgeon to develop special interest skills that can be applied to an elective area of practice but to continue to have the broad generic skills required for the neurosurgical on-call and general elective neurosurgical work. Microsurgical skills learned in one special interest area are readily transferable to other special interest areas.

[3] Generic professional capabilities framework
[4] Good Medical Practice

The curriculum is designed to promote a flexible approach to training. Flexibility is maintained by enabling trainees from other specialties, who have achieved appropriate capabilites to enter phase 1 training at ST2 level directly. The neuroscience specialties that are relevant for phase 1 trainees include Neurosurgery, Neuroradiology, Neurology and Neuro-intensive Care. These specialties do not normally form part of core surgical training programmes and consequently Neurosurgery phase 1 training needs to be provided through a separate training pathway. Nevertheless, it is recognised that Neurosurgery is primarily a surgical specialty so the Intercollegiate Membership examination of the Royal Colleges of Surgeons (MRCS) is required and the common core surgical training has been adopted as part of the phase 1 Neurosurgery curriculum. Experience in Emergency Medicine or a related surgical specialty is also recognised. We encourage bespoke training for trainees entering the specialty in ST1/ST2 to avoid repetition of previously learned skills and enablement of new learning in clinical areas not studied in other training programmes. We anticipate that phase 1 trainees will attain experience in four to six relevant areas of practice (Neurosurgery, Neurology, Neuro-intensive Care, Neuroradiology, Neuropathology, Emergency Medicine, another surgical specialty) which will ensure that trainees are broadly educated in surgical and neuroscience principles consequently promoting the creation of generalists who are patient-focused and have flexible career options.

Trainees who have undertaken Neurosurgery phase 1 training will acquire generic competencies and skills that are highly relevant to other surgical specialties but also to Radiology, Anaesthetics, Neurology and General Practice; consequently trainees who later choose a different career route may be able to have a shorter than usual training pathway in their new training programme, in recognition of learning already gained.

This flexible approach with acquisition of transferable capabilities will allow training in Neurosurgery to adapt to current and future patient and workforce needs as well as to changes in surgery with the advent of new treatments and technologies. For example, at a senior level, recent developments in Interventional Neuroradiology (stroke clot retrieval) and Spinal Surgery (complex instrumented fixations) have provided new opportunities for career flexibility. These two examples are given here to demonstrate how career flexibility is maximised by keeping the Neurosurgery curriculum as broad as possible.

### 2.3 The training pathway and duration of training

Trainees will enter Neurosurgery training via a national selection process at either the ST1 or ST2 level. Trainees will learn in a variety of settings using a range of methods, including workplace-based experiential learning in a variety of environments, formal postgraduate teaching, simulation-based education and through self-directed learning. Neurosurgery training is outcome-based rather than time-based. However, it will normally be completed in an indicative time of eight years for those entering run through training at ST1 (two years in phase 1, five years in phase 2 and one year in phase 3) or 7 years for trainees entering at ST2 (one year in phase 1, five years in phase 2 and one year in phase 3).

There will be options for those trainees who demonstrate exceptionally rapid development and acquisition of capabilities to complete training more rapidly than the current indicative time of eight years. There may also be a small number of trainees who develop more slowly and will require an extension of training in line with *A Reference Guide for Postgraduate Foundation and Specialty Training in the UK* (the Gold Guide[5]). Trainees who choose less than full time training

[5] Gold Guide 8th edition

(LTFT) will have their indicative training time extended pro-rata in accordance with the Gold Guide. LTFT trainees will perform both elective and out of hours duties pro-rata throughout the time of LTFT.

The programme will be divided into 3 phases (Figure 1):

Phase 1

Phase 1 will take an indicative time of two years to complete for run-through trainees, during which time trainees will gain many of the GPCs and the knowledge, clinical and technical skills in Neurosurgery, as defined in the CiPs and syllabus. The neuroscience specialties that are relevant for phase 1 trainees include Neurosurgery, Neuroradiology, Neuropathology, Neurology and Neuro-intensive Care. The common core surgical training has also been adopted as part of the phase 1 Neurosurgery curriculum. Experience in Emergency Medicine or a related surgical specialty is also recognised.

At the end of phase 1 there is a critical progression point for phase 2 entry, assessed at the Annual Review of Competence Progression (ARCP), where trainees will demonstrate competencies in knowledge, clinical skills and professional behaviours commensurate with the CiPs and defined syllabus. The MRCS examination will be achieved by this point in the training programme.

Phase 2

Phase 2 will take an indicative time of five years to complete during which time trainees will train in the full breadth of neurosurgical practice. Towards the end of this period they will sit the Intercollegiate Specialty Board (ISB) examination in Neurosurgery. To apply for a first sitting of the examination in Neurosurgery, a trainee will have demonstrated the knowledge, clinical and professional skills of a day-one consultant and the ability to acquire microsurgical skills in Neurosurgery as defined by the syllabus. It is anticipated that most trainees will reach this level by four to five years after entering phase 2 of the curriculum.

Phase 3

Phase 3 will take an indicative one year to complete and allow a trainee to develop technically, especially with regards to the essential transferable microsurgical skills required of a day-one consultant in Neurosurgery and to focus on one (or two complementary) special interest areas of practice. Phase 3 training in approved fellowship schemes in external centres is encouraged subject to deanery approval. Completion of phase 3 occurs at the final ARCP with the award of an outcome 6.

In this outcomes-based curriculum, some trainees may reach the end of phase 3 in less than the indicative time. On completion of phase 3, trainees will be eligible for certification and for recommendation to enter the specialist register. Trainees who do not meet the requirements of phase 2 within seven years may require an extension of training time in accordance with the Gold Guide.


Figure 1: Training pathway in Neurosurgery

### 2.4 ST2 entry to Neurosurgery training

Neurosurgery training is run-through training that is specialty-specific. Some but not all of the competencies required for phase 2 training can be obtained in other recognised specialty training pathways. To promote career flexibility these competencies are transferable, thus some trainees will be eligible to enter Neurosurgery training at the ST2 level, shortening the phase 1 training period.

## 3 Programme of Learning

This section covers the expected learning outcomes, learning methods, breadth of experience and levels of performance at critical progression points in the training programme and the levels of performance expected of those completing training.

### 3.1 What has to be learnt to complete the Neurosurgery curriculum

The practice of Neurosurgery requires generic and Neurosurgery knowledge, clinical and technical skills and behaviours to manage patients presenting with a wide range of central and peripheral nervous system disorders. It involves development of competence in diagnostic reasoning,

managing uncertainty, dealing with co-morbidities, and recognising when another opinion or care is required (as well as developing technical skills in the areas and to the level described in the syllabus as shown in appendix 2). The main areas for learning are described by the CiPs, which are the high-level learning outcomes for training in Neurosurgery described below and shown in full in appendix 1.

### 3.2 Capabilities in Practice (the high-level outcomes of training)

Training is designed to produce a person capable of safely and effectively performing the role of a first day consultant surgeon. The role of a consultant curgeon can be thought of as a sum of all the various tasks that need to be performed through a working week. These tasks are the high-level outcomes of the curriculum and grouping these together describes the role of a consultant surgeon. To perform a high-level clinical task as a consultant surgeon requires trainees to be able to integrate areas of learning from all parts of the syllabus, including knowledge, clinical skills, professional skills and technical skills. In addition, a consultant surgeon will need to have acquired the generic skills, behaviours and values shared by all doctors in order to perform this task safely and well. A capability is a set of skills that can be developed through training from novice to expert and, therefore, these high-level clinical outcomes are known as Capabilities in Practice. They are common across all surgical specialties and are delivered within the context of the GPCs and the Neurosurgery syllabus.

The are five CiPs which are shared between all surgical specialties:

1. Manages an out-patient clinic
2. Manages the unselected emergency take
3. Manages ward rounds and the on-going care of in-patients
4. Manages an operating list
5. Manages multi-disciplinary working

The generic knowledge, skills, behaviours and values shared by all doctors are described in the GPC framework. The GPCs are essential components and have equal weight to the CiPs in the training and assessment of clinical capabilities and responsibilities in the training programme.

The GPC framework has nine domains:

Domain 1: Professional values and behaviours

Domain 2: Professional skills

*Practical skills*
*Communication and interpersonal skills*
*Dealing with complexity and uncertainty*
*Clinical skills*

Domain 3: Professional knowledge

*Professional requirements*
*National legislative requirements*
*The health service and healthcare system in the four countries*

Domain 4: Capabilities in health promotion and illness prevention

Domain 5: Capabilities in leadership and team working

Domain 6: Capabilities in patient safety and quality improvement

*Patient safety*

*Quality improvement*

Domain 7: Capabilities in safeguarding vulnerable groups

Domain 8: Capabilities in education and training

Domain 9: Capabilities in research and scholarship

Simply put, the CiPs and GPCs are the constituent parts of the role of a consultant neurosurgeon. Each part is as important as the next and doctors are required to be capable in all parts of the role in order to be able to practice independently. In order to complete training and be recommended to the GMC for certification and entry to the specialist register, the doctor must demonstrate that they are capable of unsupervised practice in all CiPs and GPCs. For example, managing an unselected emergency take (CiP 2) requires the integration of knowledge, clinical and diagnostic skills, and technical skills described in the syllabus as well as communication and interpersonal skills, time management skills and many other generic skills described in the GPCs in order to be delivered safely, professionally and effectively. This will be assessed using the Multiple Consultant Report (MCR) as described below. The full content of the five CiPs can be found in appendix 1.

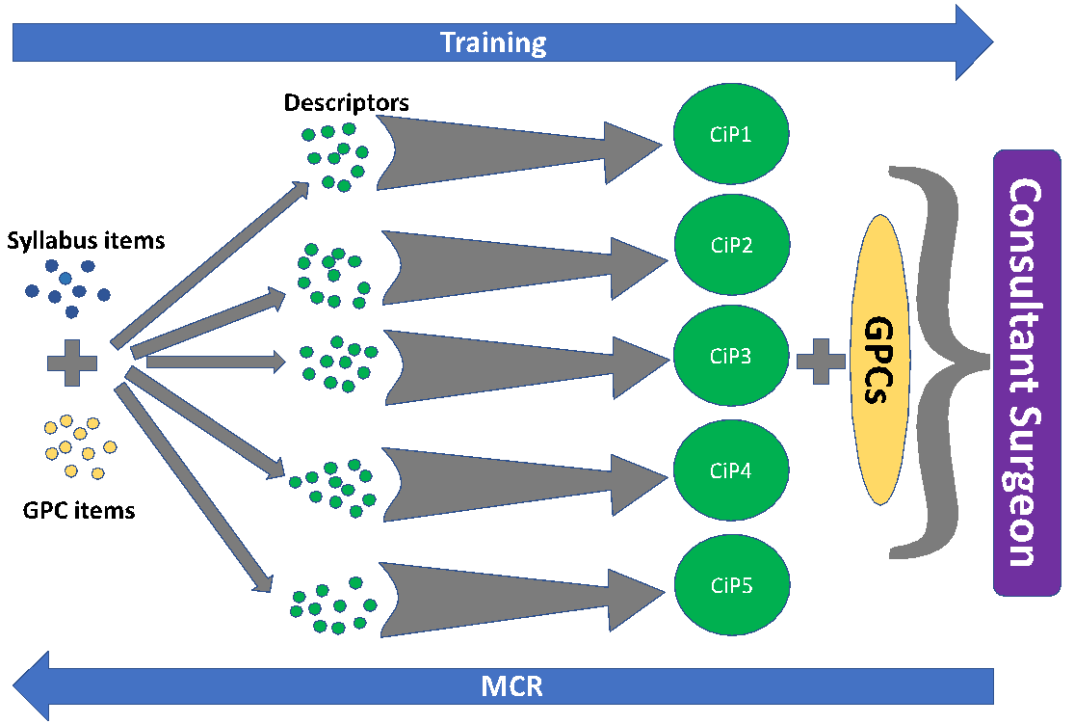



Figure 2 - The interrelationship of the GPCs, the syllabus, the CiPs and their descriptors to the role of a consultant surgeon. Items from the syllabus are combined with items taken from the GPC Framework to form the small tasks that are the CiP descriptors. When the small tasks of the descriptors are integrated they comprise the constituent parts of the role of a consultant surgeon (the CiPs). When the CiPs are taken together, along with the GPCs, the role of a consultant surgeon (the overall outcome of the curriculum), is described. Each of these CiPs will be developed through training until the level required of a day-one consultant is reached. Assessment in an outcomes-based curriculum through the MCR examines the trainee from the perspective of the outcome (a consultant surgeon), and compares performance in each CiP and in the GPCs to that level. If the outcome level is not reached, then targeted feedback and development plans can be made with reference to the CiP descriptors and beyond to the syllabus items and GPC items that combine to form the descriptors.

### 3.3 Descriptors for CiPs

The five CiPs taken together describe the role of a consultant neurosurgeon but more detail is needed to help trainees develop that capability through training via detailed feedback and focused development goals.

We can break the CiPs down into smaller tasks. Each of these smaller tasks is a CiP descriptor. For example, managing the unselected emergency take (CiP 2), includes the need to promptly assess acutely unwell and deteriorating patients and deliver resuscitative treatment and initial management and ensure sepsis is recognised and treated in compliance with protocol (see appendix 1). If a trainee has not yet reached the level required of a new consultant in a CiP then the descriptors can be used to describe in standard language what needs to be improved through learning and training to allow the trainee to get closer towards the outcome of training. By describing the component parts of a CiP, descriptors also aid decisions on assessment of the level of supervision required by a trainee at the time of that assessment, providing prompts for feedback of performance by allowing identification of areas of excellence or specific detail on areas for development, including in behavioural and professional domains. Descriptors can, therefore, help trainees identify where to focus their efforts to become competent and safe independent practitioners. More detail about assessment and feedback is given in section 5, Programme of Assessment.

Each CiP is judged against a scale that describes the level of supervision required to perform the CiP to the standard of certification. The level of supervision changes in line with the trainee's progression, consistent with safe and effective care for the patient. Typically, there should be a gradual reduction in the level of supervision required and an increase in the complexity of cases managed until the level of competence for independent practice is acquired. In the early years, therefore, it would be normal for trainees to achieve a lower supervision level and progress as experience is gained.

The supervision levels are:

Level I: Able to observe only
Level II: Able and trusted to act with direct supervision:
  a) Supervisor present throughout
  b) Supervisor present for part
Level III: Able and trusted to act with indirect supervision
Level IV: Able and trusted to act at the level expected of a day-one consultant
Level V: Able and trusted to act at a level beyond that expected of a day-one consultant

### 3.4 Critical progression points

At the end of phase 1 there is a critical progression point for phase 2 entry, assessed at the ARCP, where trainees will demonstrate competencies in knowledge, clinical skills and professional behaviours commensurate with the CiPs and defined syllabus. The MRCS examination will be achieved by this point in the training programme.

An indicative point is placed at the end of phase 2 which describes the level of competence that the majority of trainees will have developed within this indicative five years. This point allows penultimate year identification of trainees developing more slowly than the indicative trajectory and for appropriate support to be given through targeted or extended training. The ISB examination in Neurosurgery will normally be achieved by this point in the training programme.

At the end of phase 3 there is a critical progression point for entry into the specialty register. Trainees are required to reach level IV in all the CiPs and in addition to acquiring all the skills described in the GPC framework (and the other certification requirements shown in section 5.4), and will be able to demonstrate the surgical skills of a day-one consultant. Supervision levels are shown for the end of phases 1, 2 and 3 in table 1.

Excellence will be recognised by:

a) Exceeding the supervision level expected for the end of phase 1, 2 or 3
b) Achievement of a supervision level at an earlier phase than would normally be expected
c) Achievement of level V in any of the CiPs
d) Recognition of particularly good performance in any of the descriptors within a CiP.

| **Capability in practice** | **Supervision Level (end of phase 1)** | **Indicative Supervision Level (end of phase 2)** | **Supervision Level (end of phase 3 and certification)** |
|---|---|---|---|
| 1. Manages an out-patient clinic | Level IIa | Level III | Level IV |
| 2. Manages the unselected emergency take | Level IIa | Level III | Level IV |
| 3. Manages ward rounds and the on-going care of in-patients | Level IIb | Level III | Level IV |
| 4. Manages an operating list | Level I | Level III | Level IV |
| 5. Manages multi-disciplinary working | Level I | Level III | Level IV |

Table 1: Supervision levels to be achieved by the end of each phase of training

### 3.5 Breadth of experience required during training in Neurosurgery

The curriculum requires trainees to accrue a rich experience that promotes deep learning of knowledge, clinical skills, technical skills, professional behaviour, leadership and all other generic professional skills that are considered necessary to ensure patient safety throughout the training process and specifically at the end of training. The scope of practice of a day-one consultant in Neurosurgery is described in the syllabus. In addition, there are certain skills and conditions within the syllabus that are of such central and fundamental importance to the safe practice of Neurosurgery that they are highlighted as critical conditions and index procedures.

### 3.5.1 The syllabus

The syllabus, shown in appendix 2, provides a detailed description of the Neurosurgery-specific knowledge, clinical and technical skills required for each phase of training and for certification in Neurosurgery. The syllabus is organised by topics which are the presenting conditions of patients in relation to Neurosurgery. Trainees are expected to have exposure to all topics in phase 2 of training.

### 3.5.2 Critical conditions

From the syllabus, a list of critical conditions has been identified which are of significant importance for patient safety and demonstration of a safe breadth of practice. Across surgery, these are defined as any condition where a misdiagnosis could be associated with devastating consequences for life or limb. These critical conditions are assessed individually by means of the Case Based Discussion (CBD) and Clinical Evaluation Exercise (CEX), which both include an assessment of clinical judgment and decision-making. An indicative three or more CBDs or CEXs must be achieved at the specified level to progress between phases of training. Phase 1 CBD or CEX assessments may be performed by phase 2 or 3 trainees or by a consultant. Phase 2 and 3 CBD or CEX assessments must be performed by a consultant. They provide formative feedback to the trainee and feed into the summative assessment of the Assigned Educational Supervisor (AES) via the AES report for the ARCP. A list of critical conditions for Neurosurgery is given in appendix 3 and is included in the certification requirements in this curriculum. These critical conditions were decided following wide consultation with clinicians and trainers in Neurosurgery.

### 3.5.3 Index procedures

In addition to the critical conditions, a list of index procedures has been identified. Index procedures are common but important operations central to the practice of Neurosurgery, competence in which is essential to the delivery of safe patient care. Taken together they form a representative sample of the breadth of operative procedures in the specialty. Learning in the index procedures is indicative of learning in the broad range of technical procedures in the syllabus and surgical logbook and are, therefore of significant importance for patient safety and demonstration of a safe breadth of practice. Each of these index procedures are assessed individually by means of the Procedure Based Assessment (PBA) which provides formative feedback to the trainee and feeds into the summative AES report for the ARCP. An indicative three or more PBAs must be achieved at the specified level to progress between phases of training. The paediatric surgery index cases require only one PBA at the specified level. Phase 1 PBAs may be performed by phase 2 or 3 trainees or by a consultant. Phase 2 and 3 PBAs must be performed by a consultant. A list of index procedures and the indicative numbers expected for neurosurgical practice is included in the certification requirements (section 5.4) and appendix 4. The indicative numbers of cases before certification are necessary as trainees would not normally be expected to have achieved sufficient experience to be able to manage the range of pathology they encounter unless these numbers were met. It is recognised that competence could be achieved with fewer cases, if supported by evidence from other assessments. Meeting the numbers does not, in itself, imply competence. These index procedures and indicative numbers were decided following wide consultation with clinicians and trainers in the specialty.

### 3.5.4 Special Interest training

Special Interest training is required by employers and high fidelity transferable operative skills can be obtained in a variety of special interest areas pre-certification. In the table below, for each special interest we have described the area of practice that would be expected to be learned by all trainees and the areas that would be expected to be mastered by only those developing this area as a special interest. All aspects of training in trauma, infection, acute hydrocephalus, intracranial haemorrhage and acute tumour cases are required by all trainees at completion of phase 3.

| Neurosurgery | All trainees by certification | Transferable microsurgical skills acquired during phase 3 | Post certification |
|---|---|---|---|
| **Hydrocephalus** | All aspects including Endoscopic third ventriculostomy | Advanced endoscopic techniques | |
| **Neuro-Oncology** | Biopsy and resection of intracranial tumours and extramedullary spinal tumours | Resection of pineal, thalamic, insular and brainstem lesions. Resection of intramedullary spinal cord tumours. | Stereotactic Radiosurgery |
| **Skull Base and Pituitary Surgery** | Management of majority of cases, including acquisition of transferrable microsurgical skills Resection of pituitary tumours. | Resection of difficult skull base tumours (e.g. vestibular schwannoma). | |
| **Neurovascular** | Management of all patients with acute presentations of neurovascular conditions including subarachnoid haemorrhage, intraparenchymal haemorrhage, intraventricular haemorrhage, massive cerebral or cerebellar infarction | Clipping of intracranial aneurysms, resection of AVMs | Interventional radiology skills. Bypass surgery |
| **Pain, Epilepsy and Functional** | Management of complications of procedures including infected or malfunctioning implants | Stereotactic electrode placement or lesioning. Insertion of neuromodulation devices and pharmacological pump delivery systems. Surgical procedures used in the treatment of epilepsy. | |

| Neurosurgery | All trainees by certification | Transferable microsurgical skills acquired during phase 3 | Post certification |
|---|---|---|---|
| **Spine** | Management of patients with acute and elective presentations of cervical and lumbar spinal degenerative disease requiring operative intervention (e.g. disc prolapse causing radiculopathy, cauda equina syndrome or myelopathy). Emergency and surgical management of infection, oncological disease and trauma including anterior and posterior subaxial cervical spine fusion. | Thoracolumbar spine stabilisation techniques that may be used in the management of degenerative deformity, metastatic disease and trauma.<br><br>Surgical fusion techniques at the Atlantoaxial junction.<br><br>Advanced spinal microsurgical procedures such as resection of intramedullary spinal cord tumours and vascular malformations. | Advanced skills including deformity correction |
| **Paediatrics** | Emergency management of children with raised intracranial pressure, including operative management where delay due to transfer time will cause harm to the patient. Possible causes include traumatic brain swelling, intracranial haemorrhage (trauma or spontaneous), brain tumours, hydrocephalus.<br><br>Elective management of hydrocephalus. | Management of planned surgery in all other subspeciality areas. | Advanced Paediatric Neurosurgery skills including syndromic craniofacial surgery |
| **Peripheral Nerve Surgery** | Ability to diagnose and refer or manage all surgical and medical peripheral nerve pathologies | | Surgery for peripheral nerve tumours, brachial plexus injuries and cervical ribs |

Table 2: Skills that need to be learned during training. Also defined are skills that are not required by a day-one consultant in Neurosurgery with that special interest, which may be developed by professional development in post or placement in a fellowship following certification.

The certification requirements, shown in section 5.4, summarise the experience trainees need to achieve by the end of the training programme.

# 4 Teaching and Learning

## 4.1 How the Neurosurgery curriculum is delivered

The curriculum is used to help design training programmes locally that ensure all trainees can develop the necessary skills and knowledge in a variety of settings and situations. The curriculum is designed to ensure it can be applied in a flexible manner, meeting service needs as well as supporting each trainee's own tailored learning and development plan. The requirements for curriculum delivery have not changed as a result of this new curriculum. All training must comply with the GMC requirements presented in *Promoting excellence: standards for medical education and training*[6] (2017). This stipulates that all training must comply with the following ten standards:

Theme 1: learning environment and culture

*S1.1 The learning environment is safe for patients and supportive for learners and educators. The culture is caring, compassionate and provides a good standard of care and experience for patients, carers and families.*

*S1.2 The learning environment and organisational culture value and support education and training, so that learners are able to demonstrate what is expected in Good Medical Practice and to achieve the learning outcomes required by their curriculum.*

Theme 2: educational governance and leadership

*S2.1 The educational governance system continuously improves the quality and outcomes of education and training by measuring performance against the standards, demonstrating accountability and responding when standards are not being met.*

*S2.2 The educational and clinical governance systems are integrated, allowing organisations to address concerns about patient safety, the standard of care, and the standard of education and training.*

*S2.3 The educational governance system makes sure that education and training is fair and is based on the principles of equality and diversity.*

Theme 3: supporting learners

*S3.1 Learners receive educational and pastoral support to be able to demonstrate what is expected in Good Medical Practice, and to achieve the learning outcomes required by their curriculum.*

Theme 4: supporting educators

*S4.1 Educators are selected, inducted, trained, and appraised to reflect their education and training responsibilities.*

*S4.2 Educators receive the support, resources and time to meet their education and training responsibilities.*

*6 Promoting excellence: standards for medical education and training*

Theme 5: developing and implementing curricula and assessments

*S5.1 Medical school curricula and assessments are developed and implemented so that medical students are able to achieve the learning outcomes required for graduates.*

*S5.2 Postgraduate curricula and assessments are implemented so that doctors in training are able to demonstrate what is expected in Good Medical Practice, and to achieve the learning outcomes required by their curriculum.*

It is the responsibility of Health Education England (HEE) and its Local Offices, NHS Education for Scotland (NES), Health Education and Improvement Wales (HEIW), the Northern Ireland Medical and Dental Training Agency (NIMDTA) and the Health Service Executive (HSE) in the Republic of Ireland to ensure compliance with these standards. Training delivery must also comply with the latest edition of the Gold Guide. Appendix 7 outlines the quality management arrangements for the curriculum.

## 4.2 Learning opportunities

A variety of educational approaches will be used by education providers to help trainees develop the knowledge, clinical and technical skills, professional judgement, values and behaviours required by the curriculum. Taken together, these educational approaches ensure that the CiPs and GPCs are taught appropriately in order that the purpose of the curriculum is met. These educational approaches divide into three areas:

- Self-directed learning
- Learning from practice
- Learning from formal situations

### 4.2.1 Self-directed learning

The curriculum is trainee-led and self-directed learning is encouraged. Trainees are expected to take a proactive approach to learning and development and towards working as members of a multi-professional team. Trainees are encouraged to establish study groups, journal clubs and conduct peer reviews. They should take the opportunity of learning with peers at a local level through postgraduate teaching and discussion sessions, and nationally through courses and electronic resources. Trainees are expected to undertake personal study in addition to attending formal and informal teaching. This includes using study materials and publications and reflective practice. Trainees are expected to use the developmental feedback they get from their trainers in learning agreement meetings and from assessments to focus further research and practice.

Reflective practice is an important part of self-directed learning and of continuing professional development. It is an educational exercise that enables trainees to explore, with rigour, the complexities and underpinning elements of their actions in order to refine and improve them. Reflection in the oral form is very much an activity that surgeons engage in and find useful and developmental. Writing reflectively adds more to the oral process by deepening the understanding of practice. Written reflection offers different benefits to oral reflection which include: a record for later review, a reference point to demonstrate development and a starting point for shared discussion. Whatever the modality of reflection, it is important that it takes place and that there is a record of it having taken place, whether or not the specific subject or content

of the reflection is recorded[7]. Self-directed learning permits development in all five CiPs and the GPCs, especially when there is effective reflection on all aspects of learning at the centre of self-directed learning.

### 4.2.2 Learning from clinical practice

Surgical learning is largely experiential in nature with any interaction in the workplace having the potential to become a learning episode. The workplace provides learning opportunities on a daily basis for surgical trainees, based on what they see and what they do. Trainees are placed in clinical placements. determined locally by Training Programme Directors (TPDs) that provide teaching and learning opportunities. The placements must be in units that are able to provide sufficient clinical resource and have sufficient trainer capacity.

While in the workplace, trainees are involved in supervised clinical practice, primarily in a hospital environment in wards, clinics or theatre. There are strong links to practitioners working in primary care and training environments may include private settings and, where available for training, a variety of community settings where the necessary facilities and governance arrangements are in place. The trainee role in these contexts determines the nature of the learning experience.

Learning begins with observation of a trainer (not necessarily a doctor) and progresses to assisting a trainer; the trainer assisting/supervising the trainee and then the trainee managing a case independently but with access to their supervisor. The level of supervision changes in line with the trainee's progression through the phases of the curriculum. As training progresses, trainees should have the opportunity for increased autonomy, consistent with safe and effective care for the patient. Typically, there should be a gradual reduction in the level of supervision required and an increase in the complexity of cases managed until the level of competence for independent practice is acquired.

The CiPs are best taught, particularly in the early phases of training, by a specifically selected trainer directly watching and supervising while the trainee carries out the activity. This type of training is known as Professionalised Training and requires more time (and so, consequently, a reduced clinical workload) than conventional methods. It permits more thorough teaching, more rapid achievement of skill and earlier recognition of difficulties. Continuous systematic feedback and reflection are integral to learning from clinical practice. The CiP and GPC descriptors through the MCR assessment provide detailed feedback and identify specific, timely and relevant goals for development through training. Education providers should make every attempt to ensure that each trainee has exposure to Professionalised Training appropriate to their phase of progression through the curriculum. It is recommended that this be one session per week per trainee in the early years. Trainees are required to keep a surgical logbook to support their reflection and the assessment of their operative skills.

### 4.2.3 Learning from formal situations

Learning from clinical practice is supplemented by an educational programme of courses and teaching sessions arranged at local, regional and national levels. These should be mapped to the CiPs, GPCs and the Neurosurgery syllabus and may include a mixture of formal talks including

7 Improving feedback and reflection to improve learning. A practical guide for trainees and trainers
http://www.aomrc.org.uk/reports-guidance/improving-feedback-reflection-improve-learning-practical-guide-trainees-trainers/

attendance at national conferences relevant to the specialty, small group discussion, case review and morbidity and mortality meetings, literature review and skills teaching. A list of recommended courses for trainees is given in appendix 5.

### 4.2.4 Simulation

Teaching in formal situations often involves the use of simulation. In this context simulation can be any reproduction or approximation of a real event, process, or set of conditions or problems e.g. taking a history in clinic, performing a procedure or managing post-operative care. Trainees have the opportunity of learning in the same way as they would in the real situation but in a patient-free environment. Simulation can be used for the development of both individuals and teams. The realism of the simulation may reflect the environment in which simulation takes place, the instruments used or the emotional and behavioural features of the real situation. Simulation training does not necessarily depend on the use of expensive equipment or complex environments e.g. it may only require a suturing aid or a role play with scenarios.

Simulation training has several purposes:

- supporting learning and keeping up to date
- addressing specific learning needs
- situational awareness of human factors which can influence people and their behaviour
- enabling the refining or exploration of practice in a patient-safe environment
- promoting the development of excellence
- improving patient care.

The use of simulation in surgical training is part of a blended approach to managing teaching and learning concurrent with supervised clinical practice. The use of simulation on its own cannot replace supervised clinical practice and experience or authorise a doctor to practice unsupervised. Provision of feedback and performance debriefing are integral and essential parts of simulation-based training. Simulation training broadly follows the same pattern of learning opportunities offering insight into the development of technical skills, team-working, leadership, judgement and professionalism. Education providers should use all teaching methods available, including simulation teaching, to ensure that the full breadth of the syllabus is covered. Where there is a need for specific intensive courses to meet specific learning outcomes, there may be a number of equivalent providers.

## 4.3 Supervision

Supervision is fundamental in the delivery of safe and effective training. It takes advantage of the experience, knowledge and skills of expert clinicians and ensures interaction between an experienced clinician and a trainee. The ultimate responsibility for the quality of patient care and the quality of training lies with the supervisor. Supervision is designed to ensure the safety of the patient by encouraging safe and effective practice and professional conduct. A number of people from a range of professional groups are involved in teaching and training with subject areas of the curriculum being taught by staff with relevant specialist expertise and knowledge. Those involved in the supervision of trainees must have the relevant qualifications, experience and training to undertake the role. Specialist skills and knowledge are usually taught by consultants and senior trainees whereas the more generic aspects of practice can also be taught by the wider multidisciplinary team (MDT).

The key roles involved in teaching and learning are the Training Programme Director, Assigned Educational Supervisor, Clinical Supervisor, Assessor and Trainee. Their responsibilities are described in appendix 6 and further information is given in the Gold Guide.

In the UK, the GMC's process for the recognition and approval of trainers[8] enables Deaneries/HEE Local Offices to formally recognise AESs and Clinical Supervisors (CSs) and ensure they meet the specified criteria. Trainees must be placed in approved placements that meet the required training and educational standards of the curriculum. In each placement, trainees have a named AES and one or more CS, responsible for overseeing their education. Depending on local arrangements these roles may be combined into a single role of AES.

All elements of work in training posts must be supervised. The level of supervision varies according to the experience of the trainee, the clinical exposure and the case mix undertaken. As training progresses trainees should have the opportunity for increased autonomy, consistent with safe and effective care for the patient. Achievement of supervision level IV in any of the five CiPs indicates that a trainee is able to work at an independent level, with advice from their trainer at this level being equivalent to a consultant receiving advice from senior colleagues within an MDT. However, within the context of a training system trainees are always under the educational and clinical governance structures of the Health Service.

### 4.4 Supporting feedback and reflection

Effective feedback is known to enhance learning, and combining self-reflection[7] with feedback promotes deeper learning. Trainees are encouraged to seek feedback on all they do, either informally, through verbal feedback at the end of a learning event, or formally through workplace-based assessments (WBAs). The MCR and use of the CiP and GPC descriptors provide regular opportunities for detailed and specific feedback. Trainee self-assessment provides a regular opportunity for focused and structured reflection and development of self-directed goals for learning as well as developing these goals through dialogue with trainers. All the assessments in the curriculum are designed to include a feedback element as well as to identify concerns in multiple ways:

- *Learning agreement:* appraisal meetings with the AES at the beginning, middle and end of each placement
- *WBA:* immediate verbal dialogue after a learning episode
- *CBD:* meeting with a consultant trainer to discuss the management of a patient case
- *MSF:* meeting with the AES to discuss the trainee's self-assessment and team views
- *MCR (mid-point formative):* meeting with the AES or CS to discuss the trainee's self-assessment and CSs' views on CiPs
- *MCR (final formative, contributing to the AES's summative Report):* meeting with the AES or CS to discuss the trainee's self-assessment and CSs' views on CiPs
- *Formal examinations:* summative feedback on key areas of knowledge and skills
- *ARCP:* a feedback meeting with the TPD or their representative following an ARCP.

Constructive feedback is expected to include three elements i) a reflection on performance ii) identification of the trainee's achievements, challenges and aspirations and iii) an action plan.

[8] GMC recognition and approval of trainers

### 4.5 Academic training

All trainees are required to satisfy the learning outcomes in domain 9 of the GPC framework: *Capabilities in research and scholarship*. Trainees are encouraged to participate in clinical research and collaborative trials to achieve these outcomes, as well as in journal clubs, literature review and systematic review and to make a major contribution to the publication of novel findings in peer reviewed journals. An understanding of the principles of research, its interpretation and safe implementation of evidenced-based new methods, processes and techniques is essential for the modern, progressive practice of Neurosurgery and in the interests of patients and the service. Some trainees choose to take time out of training for a formal period of research, as specified in the Gold Guide. For the majority, this leads to the award of a higher degree in an area related to their chosen specialty. Some also choose to focus a significant part of their training time on academic medicine, but need to complete all the essential elements of the Neurosurgery curriculum satisfactorily in order to achieve certification. The rate of progression through the clinical component of their training is determined by the ARCP process to ensure that all clinical requirements are met in keeping with the curriculum. Arrangements for academic training differ in detail across the nations of the UK and Republic of Ireland. Details of arrangements can be found on the webpages of the relevant National Health Education body.

# 5 Programme of Assessment

### 5.1 Purpose of assessment

Assessment of learning is an essential component of any curriculum. This section describes the assessment system and the purpose of its individual components which are blueprinted to the curriculum as shown in appendix 9. The focus is on good practice, based on fair and robust assessment principles and processes in order to ensure a positive educational impact on learners and to support assessors in making valid and reliable judgements. The programme of assessment comprises an integrated framework of examinations, assessments in the workplace and judgements made about a learner during their approved programme of training. Its purpose is to provide robust evidence, ensure and communicate clearly the expected levels of performance at critical progression points in, and to demonstrate satisfactory completion of, training as required by the curriculum. The programme of assessment is shown in figure 3 below.

Assessments can be described as *helping* learning or *testing* learning - referred to as formative and summative respectively. There is a link between the two; some assessments are purely formative (shown in green in figure 3), others are explicitly summative with a feedback element (shown in blue) while others provide formative feedback while contributing to summative assessment (shown in orange).

The purposes of formative assessment are to:

- assess trainees' actual performance in the workplace.
- enhance learning by enabling trainees to receive immediate feedback, understand their own performance and identify areas for development.
- drive learning and enhance the training process by making it clear what is required of trainees and motivating them to ensure they receive suitable training and experience.
- enable supervisors to reflect on trainee needs in order to tailor their approach accordingly.

The purposes of summative assessment are to:

- provide robust, summative evidence that trainees are meeting the curriculum requirements during the training programme.
- ensure that trainees possess the essential underlying knowledge required for their specialty, including the GPCs to meet the requirements of GMP.
- inform the ARCP, identifying any requirements for targeted or additional training where necessary and facilitating decisions regarding progression through the training programme.
- identify trainees who should be advised to consider changes of career direction.
- provide information for the quality assurance of the curriculum.

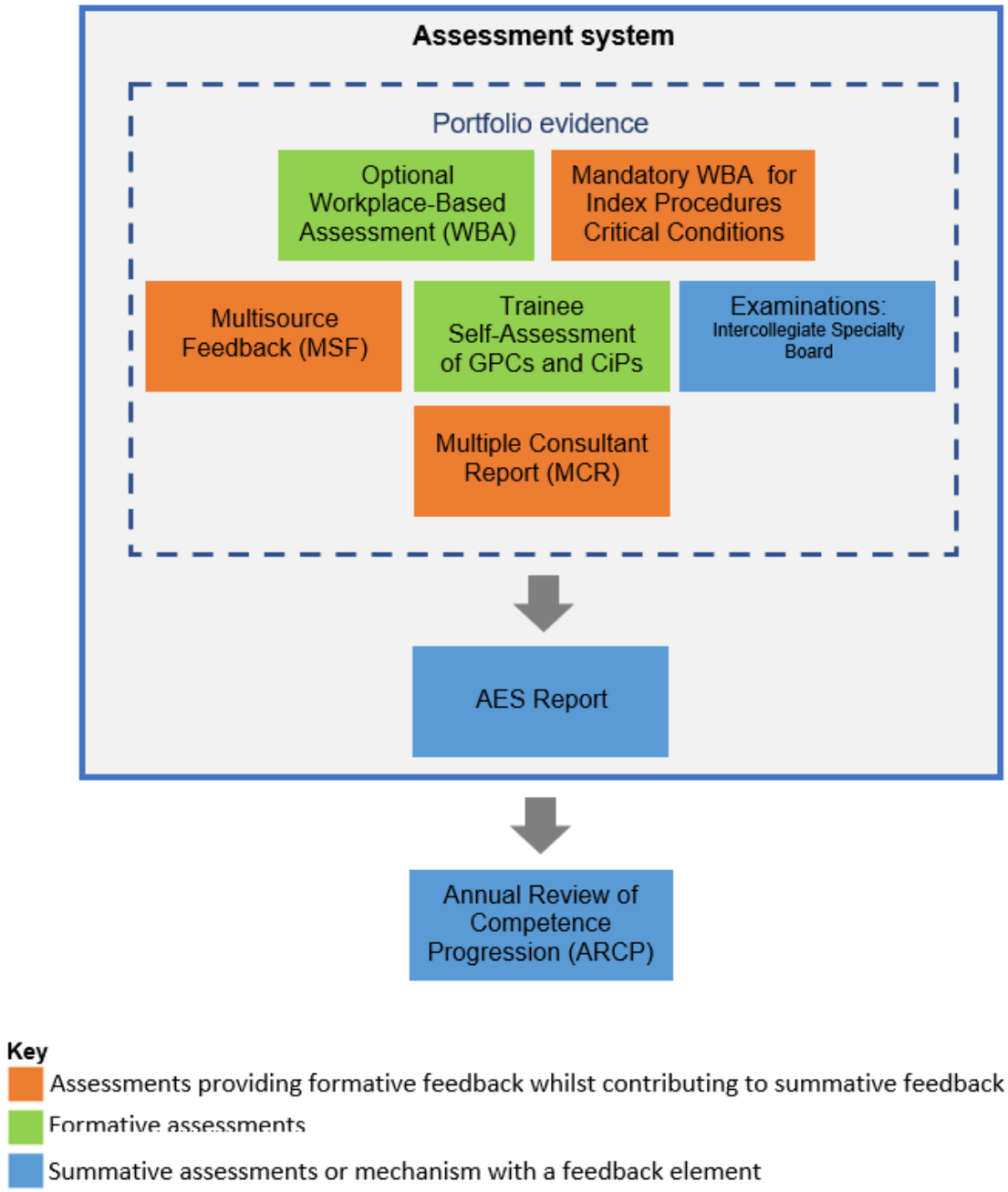



Figure 3: Assessment framework

## 5.2 Delivery of the programme of assessment

The programme of assessment is comprised of several different types of assessment needed to meet the requirements of the curriculum. These together generate the evidence required for global judgements to be made about satisfactory trainee performance, progression in, and completion of, training. These include the ISB examination in Neurosurgery and WBAs. The primary assessment in the workplace is the MCR, together with other portfolio evidence, contributes to the AES report for the ARCP. Central to the assessment framework is professional judgement. Assessors are responsible and accountable for these judgements and these judgements are supported by structured feedback to trainees. Assessment takes place throughout the training programme to allow trainees to continually gather evidence of learning and to provide formative feedback to the trainee to aid progression.

Reflection and feedback are also integral components of all WBAs. In order for trainees to maximise the benefit of WBA, reflection and feedback should take place as soon as possible after the event. Feedback should be of high quality that should include a verbal dialogue between trainee and assessor in reflection on the learning episode, attention to the trainee's specific questions, learning needs and achievements as well as an action plan for the trainee's future development. Both trainees and trainers should recognise and respect cultural differences when giving and receiving feedback[9]. The assessment framework is also designed to identify where trainees may be running into difficulties. Where possible, these are resolved through targeted training, practise and assessment with specific trainers and, if necessary, with the involvement of the AES and TPD to provide specific remedial placements, additional time and additional resources.

## 5.3 Assessment framework components

Each of the components of the assessment framework are described below.

### 5.3.1 The sequence of assessment

Training and assessment take places within placements of three to twelve months' duration throughout each phase (figure 4). Assessments are carried out by relevant qualified members of the trainee's multi-professional team whose roles and responsibilities are described in appendix 6. Trainee progress is monitored primarily by the trainee's AES through learning agreement meetings with the trainee. Throughout the placement trainees must undertake WBAs while Neurosurgery examinations are undertaken towards the higher end of the programme after satisfactory completion of the ARCP in year six. The trainee's CSs must assess the trainee on the five CiPs and nine GPC domains using a MCR. This must be undertaken towards the mid-point of each placement in a formative way and at the end of the placement when the formative assessment will contribute to the AES's summative assessment at the final review meeting of the learning agreement. The placement culminates with the AES report of the trainee's progress for the ARCP. The ARCP makes the final decision about whether a trainee can progress to the next level or phase of training. It bases its decision on the evidence that has been gathered in the trainee's learning portfolio during the period between ARCP reviews, particularly the AES report in each training placement.

[9] https://www.iscp.ac.uk/courses/culturalawarenesscourse.aspx

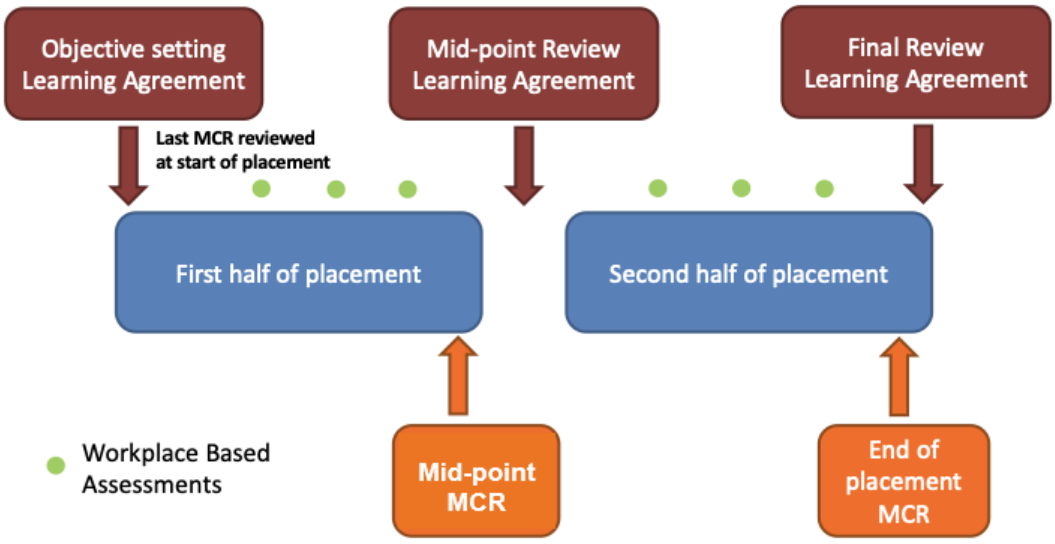



Figure 4: The sequence of assessment through a placement.

### 5.3.2 The learning agreement

The learning agreement is a formal process of goal setting and review meetings that underpin training and is formulated through discussion. The process ensures adequate supervision during training, provides continuity between different placements and supervisors and is one of the main ways of providing feedback to trainees. There are three learning agreement meetings in each placement and these are recorded in the trainee's learning portfolio. Any significant concerns arising from the meetings should be fed back to the TPD at each point in the Learning agreement.

*Objective-setting meeting*

At the start of each placement the AES and trainee must meet to review the trainee's progress so far, agree learning objectives for the placement ahead and identify the learning opportunities presented by the placement. The learning agreement is constructively aligned towards achievement of the high-level outcomes (the CiPs and GPCs) and, therefore, the CiPs and GPCs are the primary reference point for planning how trainees will be assessed and whether they have attained the learning required. The learning agreement is also tailored to the trainee's progress, phase of training and learning needs. The final MCR from the previous placement will be reviewed alongside the most recent trainee self-assessment and the action plan for training. Any specific targeted training objectives from the previous ARCP should also be considered and addressed through this meeting and form part of the learning agreement.

*Mid-point review meeting*

A meeting between the AES and the trainee must take place at the mid-point of a placement (or each three months within a placement that is longer than six months). The learning agreement must be reviewed, along with other portfolio evidence of training such as WBAs, the logbook and the formative mid-point MCR, including the trainee's self-assessment. This meeting ensures training opportunities appropriate to the trainee's own needs are being presented in the placement, and are adjusted if necessary, in response to the areas for development identified through the MCR. Particular attention must be paid to progress against targeted training objectives and a specific plan for the remaining part of the placement made if these are not yet achieved. There should be a dialogue between the AES and CSs if adequate opportunities have not been presented to the trainee, and the TPD informed if there has been no resolution. Discussion

should also take place if the scope and nature of opportunities should change in the remaining portion of the placement in response to areas for development identified through the MCR.

*Final review meeting*

Shortly before the end of each placement trainees should meet with their AES to review portfolio evidence including the final MCR. The dialogue between the trainee and AES should cover the overall progress made in the placement and the AES's view of the placement outcome.

*AES report*

The AES must write an end of placement report which informs the ARCP. The report includes details of any significant concerns and provides the AES's view about whether the trainee is on track in the phase of training for completion within the indicative time. If necessary, the AES must also explain any gaps and resolve any differences in supervision levels which came to light through the MCR.

### 5.3.3 The Multiple Consultant Report

The assessment of the CiPs and GPCs (high-level outcomes of the curriculum) involves a global professional judgtement of a range of different skills and behaviours to make decisions about a learner's suitability to take on particular responsibilities or tasks that are essential to consultant practice at the standard of certification. The MCR assessment be carried out by the consultant CSs involved with a trainee, with the AES contributing as necessary to some domains (e.g. *Quality Improvement*, *Research and Scholarship*). The number of CSs taking part reflects the size of the unit and is expected to be no fewer than two. The exercise reflects what many consultant trainers do regularly as part of a faculty group.

The MCR includes a global rating in order to indicate how the trainee is progressing in each of the five CiPs. This global rating is expressed as a supervision level recommendation described in table 3 below. Supervision levels are behaviourally anchored ordinal scales based on progression to competence and reflect a judgment that has clinical meaning for assessors. Using the scale, CSs must make an overall, holistic judgement of a trainee's performance on each CiP. Levels IV and V, shaded in grey, equate to the level required for certification and the level of practice expected of a day-one consultant in the Health Service (level IV) or beyond (level V). Figures 5 and 6 show how the MCR examines performance from the perspective of the outcome of the curriculum, the day-one consultant surgeon, in the GPCs and CiPs. If not at the level required for certification the MCR can identify areas for improvement by using the CiP or GPC descriptors or, if further detail is required, through free text. The assessment of the GPCs can be performed by CSs, whilst GPC domains 6-9 might be more relevant to assessment by the AES in some placements.

CSs will be able to best recommend supervision levels because they observe the performance of the trainee in person on a day-to-day basis. The CS group, led by a Lead CS, meet at the mid-point and towards the end of a placement to conduct a formative MCR. Through the MCR, they agree which supervision level best describes the performance of a trainee at that time in each of the five CiP and also identify any areas of the nine GPC domains that require development. It is possible for those who cannot attend the group meeting, or who disagree with the report of the group as a whole, to add their own section (anonymously) to the MCR for consideration by the AES. The AES will provide an overview at the end of the process, adding comments and signing off the MCR.

The MCR uses the principle of highlight reporting, where CSs do not need to comment on every descriptor within each CiP but use them to highlight areas that are above or below the expected

level of performance. The MCR can describe areas where the trainee might need to focus development or areas of particular excellence. Feedback must be given for any CiP that is not rated as level IV and in any GPC domain where development is required. Feedback must be given to the trainee in person after each MCR and, therefore, includes a specific feedback meeting with the trainee using the highlighted descriptors within the MCR and/or free text comments.

The mid-point MCR feeds into the mid-point learning agreement meeting. At the mid-point it allows goals to be agreed for the second half of the placement, with an opportunity to specifically address areas where development is required. Towards the end of the placement the MCR also feeds into the final review learning agreement meeting, helping to inform the AES report (figure 4). It also feeds into the objective-setting meeting of the next placement to facilitate discussion between the trainee and the next AES.

The MCR, therefore, gives valuable insight into how well the trainee is performing, highlighting areas of excellence, areas of support required and concerns. It forms an important part of detailed, structured feedback to the trainee at the mid-point and before the end of the placement and can trigger any appropriate modifications for the focus of training as required. The final formative MCR, together with other portfolio evidence, feeds into the AES report which in turn feeds into the ARCP. The ARCP uses all presented evidence to make the definitive decision on progression.

| **MCR Rating Scale (CiPs)** | **Anchor statements** | **Trainer input at each supervision level** | | | |
|---|---|---|---|---|---|
| | | **Does the trainee perform part or all of the task?** | **Is guidance required?** | **Is it necessary for a trainer to be present for the task?** | **Is the trainee performing at a level beyond that expected of a day-one consultant?** [c] |
| **Supervision Level I:** | Able to observe only: no execution. | no | n/a | n/a | n/a |
| **Supervision Level IIa:** | Able and trusted to act with direct supervision: The supervisor needs to be physically present throughout the activity to provide direct supervision. | yes | all aspects | throughout | n/a |
| **Supervision Level IIb:** | Able and trusted to act with direct supervision: The supervisor needs to guide all aspects of the activity. The supervisor will need to be physically present for part of the activity. | yes | all aspects | will be necessary for part | n/a |

| | | | | | |
|---|---|---|---|---|---|
| | This guidance may partly be given from another setting. | | | | |
| **Supervision Level III**: | Able and trusted to act with indirect supervision: The supervisor does not need to guide all aspects of the activity. The supervisor may be required to be physically present on occasion.<br><br>For those aspects which do need guidance, this may be given from another setting. | yes | some aspects | may be necessary for part | n/a |
| **Supervision Level IV:** | Able and trusted to act at the level of a day-one consultant. | yes | None [a,b] | None [a, b] | n/a |
| **Supervision Level V**: | Able and trusted to act at a level beyond that expected of a day-one consultant. | yes | None[a] | None [a] | yes |

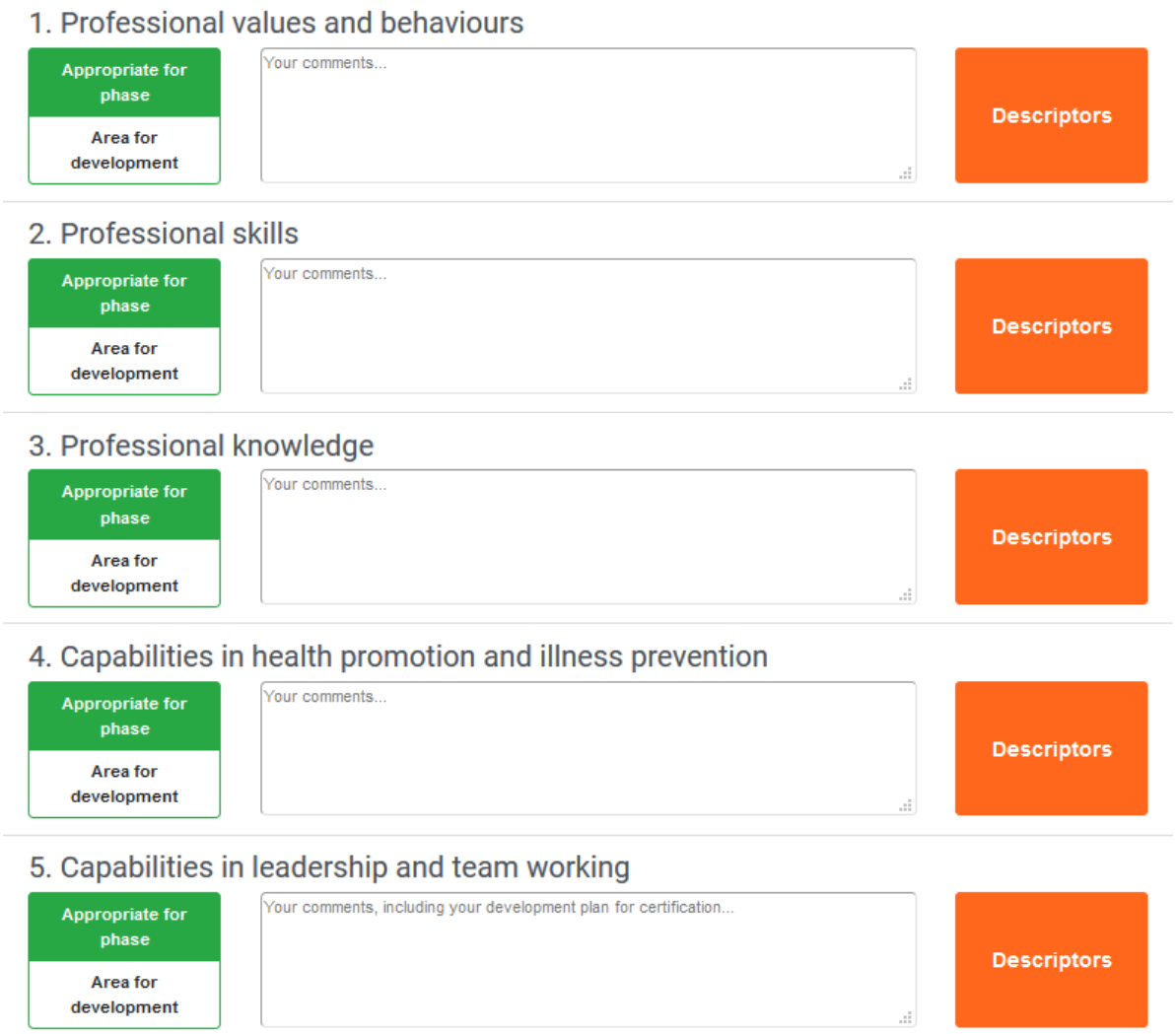
Table 3: MCR anchor statements and guide to recommendation of appropriate supervision level in each CiP.

A. This equates to the level of practice expected of a day-one consultant in the Health Service. It is recognised that advice from senior colleagues within an MDT is an important part of consultant practice. Achievement of supervision level IV indicates that a trainee is able to work at this level, with advice from their trainer at this level being equivalent to a consultant receiving advice from senior colleagues within an MDT. It is recognised that within the context of a training system that trainees are always under the educational and clinical governance structures of the Health Service.
B. Where the PBA level required by the syllabus is less than level 4 for an operative procedure, it would be expected that mentorship is sought for such procedures and this would fall within the scope of being able to carry out this activity without supervision (level IV), i.e. be a level commensurate with that of a day-one consultant.
C. Achievement of this level across the entirety of an activity would be rare, although free text could describe aspects of an activity where this level has been reached.

In making a supervision level recommendation, CSs should take into account their experience of working with the trainee and the degree of autonomy they were prepared to give the trainee during the placement. They should also take into account all the descriptors of the activities,

knowledge and skills listed in the detailed descriptions of the CiPs. If, after taking all this into account, the CSs feel the trainee is able to carry out the activity without supervision (level IV) then no further detail of this assessment is required, unless any points of excellence are noted. If the trainee requires a degree of supervision to carry out the activity then the CSs should indicate which of the descriptors of the activities, knowledge and skills require further development (to a limit of five items per CiP, so as to allow targets set at feedback to be timely, relevant and achievable). Similarly, if a trainee excels in one or more areas, the relevant descriptors should be indicated. Examples of how the online MCR will look are shown in Figures 5 and 6. Figure 7 describes the MCR as an iterative process involving the trainee, CSs, the AES and the development of specific, relevant, timely and achievable action plans.

*Multiple Consultant Report – assessment of the GPCs*



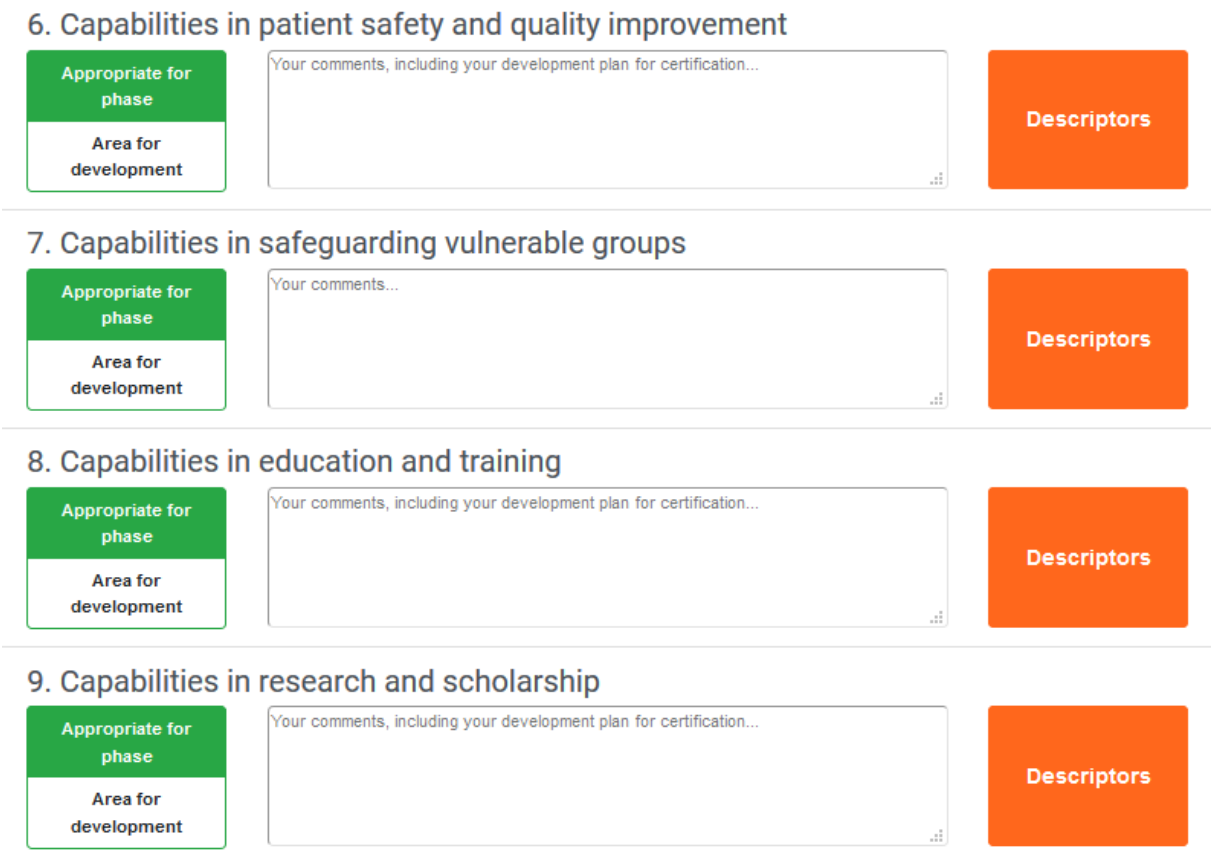



Figure 5: An example of how the GPCs are assessed through the MCR. CSs would consider whether there are areas for development in any of the nine GPC domains. If not, then nothing further needs to be recorded. If there are areas for development identified, then CSs are obliged to provide feedback through the MCR. This feedback can be recorded as free text in the comments box indicated. The Descriptors box expands to reveal descriptors taken from the GPC framework. These can be used as prompts for free text feedback or verbatim as standardised language used to describe professional capabilities.

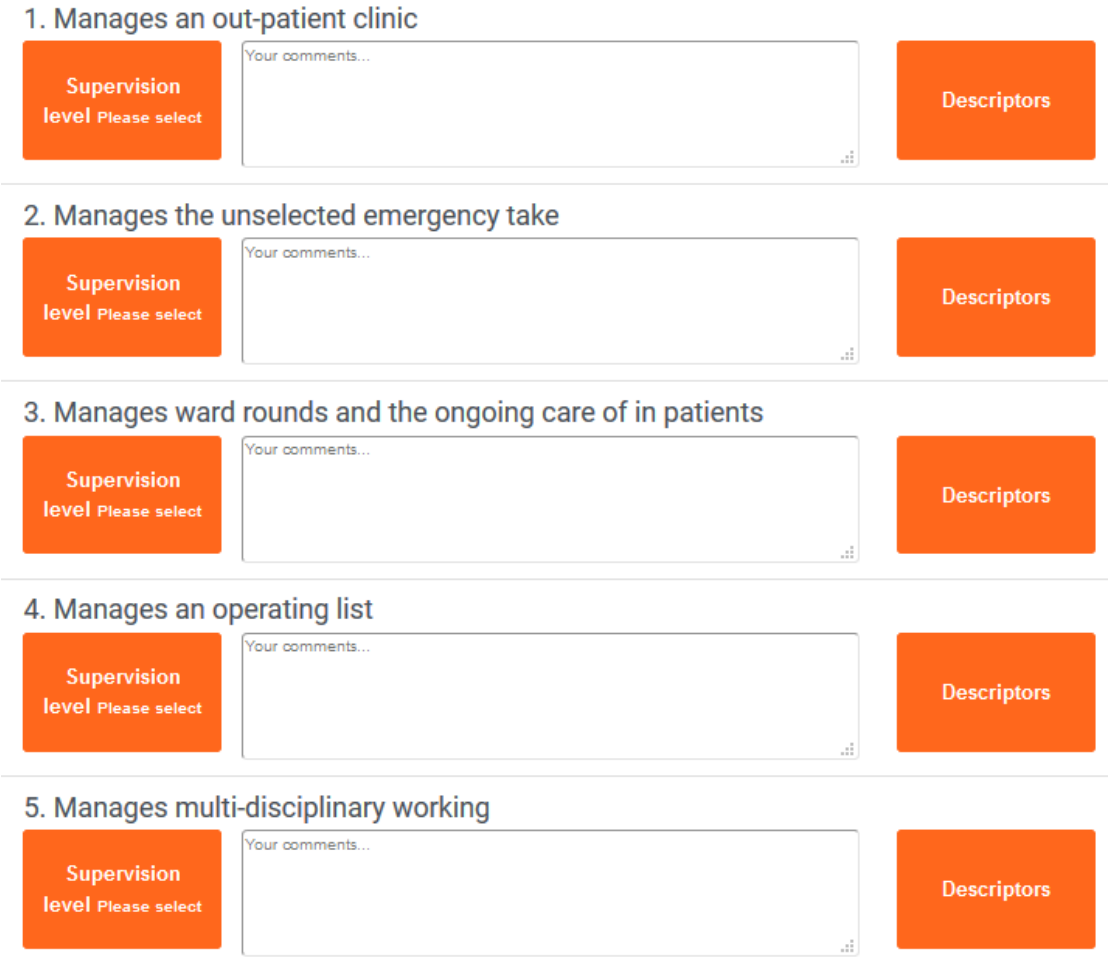



Figure 6: An example of how the CiPs are assessed through the MCR. Trainers would decide what supervision level to recommend for each of the CiPs and record this for each through the Supervision Level box. If the level recommended is IV or V then no further comment need be recorded, unless the CSs wished to capture areas of particular excellence for feedback. If levels I to III are recommended, then the CSs are obliged to provide feedback through the MCR. This feedback can be recorded as free text in the comments box indicated. The Descriptors box expands to reveal CiP descriptors. These can be used as prompts for free text feedback or verbatim as standardised language to describe the clinical capabilities.

### 5.3.4 Trainee self-assessment

Trainees should complete the self-assessment in the same way as CSs complete the MCR, using the same form and describing self-identified areas for development with free text or using CiP or GPC descriptors. Reflection for insight on performance is an important development tool and self-recognition of the level of supervision needed at any point in training enhances patient safety. Self-assessments are part of the evidence reviewed when meeting the AES at the mid-point and end of a placement. Wide discrepancy between the self-assessment and the recommendation by CSs in the MCR allows identification of over or under confidence and for support to given accordingly.

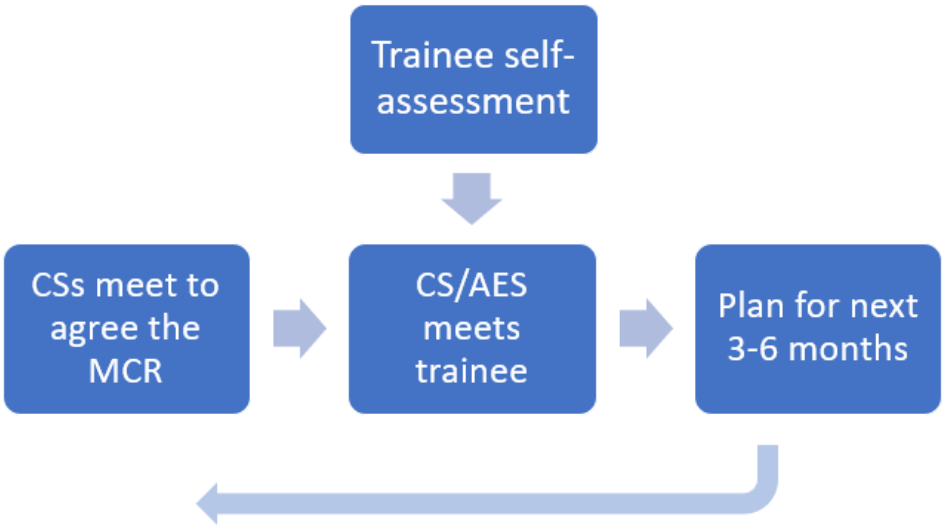



Figure 7: The iterative process of the MCR, showing the involvement of CSs, self-assessment by trainees, face to face meetings between trainees and supervisors and the development of an action plan focused on identified learning needs over the next three to six months of training. Progress against these action plans is reviewed by the AES and at subsequent MCRs.

### 5.3.5 Workplace-based assessment (WBA)

Each individual WBA is designed to assess a range of important aspects of performance in different training situations. Taken together the WBAs can assess the breadth of knowledge, skills and performance described in the curriculum. They also constructively align with the clinical CiPs and GPCs as shown in appendix 9 and will be used to underpin assessment in those areas of the syllabus central to the specialty i.e. the critical conditions and index procedures, as well as being available for other conditions and operations as determined by the trainee and supervisors and especially where needed in the assessment of a remediation package to evidence progress in areas of training targeted by a non-standard ARCP outcome. The WBAs described in this curriculum have been in use for over ten years and are now an established component of training.

The WBA methodology is designed to meet the following criteria:

- *Validity* – the assessment actually does test what is intended; that methods are relevant to actual clinical practice; that performance in increasingly complex tasks is reflected in the assessment outcome
- *Reliability* - multiple measures of performance using different assessors in different training situations produce a consistent picture of performance over time
- *Feasibility* – methods are designed to be practical by fitting into the training and working environment
- *Cost-effectiveness* – the only significant additional costs should be in the training of trainers and the time investment needed for feedback and regular appraisal, this should be factored into trainer job plans
- *Opportunities for feedback* – structured feedback is a fundamental component
- Impact on learning – the educational feedback from trainers should lead to trainees' reflections on practice in order to address learning needs.

WBAs use different trainers' direct observations of trainees to assess the actual performance of trainees as they manage different clinical situations in different clinical settings and provide more granular formative assessment in the crucial areas of the curriculum than does the more global assessment of CiPs in the MCR. WBAs are primarily aimed at providing constructive feedback to

trainees in important areas of the syllabus throughout each placement in all phases of training. Trainees undertake each task according to their training phase and ability level and the assessor must intervene if patient safety is at risk. It would be normal for trainees to have some assessments that identify areas for development because their performance is not yet at the standard for the completion of that training.

Each WBA is recorded on a structured form to help assessors distinguish between levels of performance and prompt areas for their verbal developmental feedback to trainees immediately after the observation. Each WBA includes the trainee's and assessor's individual comments, ratings of individual competencies (e.g. *Satisfactory*, *Needs Development* or *Outstanding*) and global rating (using anchor statements mapped to phases of training). Rating scales support the drive towards excellence in practice, enabling learners to be recognised for achievements above the level expected for a level or phase of training. They may also be used to target areas of underperformance. As they accumulate, the WBAs for the critical conditions and index procedures also contribute to the AES report for the ARCP.

WBAs are formative and may be used to assess and provide feedback on all clinical activity. Trainees can use any of the assessments described below to gather feedback or provide evidence of their progression in a particular area. WBAs are only mandatory for the assessment of the critical conditions and index procedures (see appendices 3 and 4). They may also be useful to evidence progress in targeted training where this is required e.g. for any areas of concern.

WBAs for index procedures and critical conditions will inform the AES report along with a range of other evidence to aid the decision about the trainee's progress. All trainees are required to use WBAs to evidence that they have achieved the learning in the index procedures or critical conditions by certification. However, it is recognised that trainees will develop at different rates, and failure to attain a specific level at a given point will not necessarily prevent progression if other evidence shows satisfactory progress.

The assessment blueprint (appendix 9) indicates how the assessment programme provides coverage of the CiPs, the GPC framework and the syllabus. It is not expected that the assessment methods will be used to evidence each competency and additional evidence may be used to help make a supervision level recommendation. The principle of assessment is holistic; individual GPC and CiP descriptors and syllabus items should not be assessed, other than in the critical conditions and index procedures or if an area of concern is identified. The programme of assessment provides a variety of tools to feedback to and assess the trainee.

*Case Based Discussion (CBD)*

The CBD assesses the performance of a trainee in their management of a patient case to provide an indication of competence in areas such as clinical judgement, decision-making and application of medical knowledge in relation to patient care. The CBD process is a structured, in-depth discussion between the trainee and a consultant supervisor. The method is particularly designed to test higher order thinking and synthesis as it allows the assessor to explore deeper understanding of how trainees compile, prioritise and apply knowledge. By using clinical cases that offer a challenge to trainees, rather than routine cases, trainees are able to explain the complexities involved and the reasoning behind choices they made. It also enables the discussion of the ethical and legal framework of practice. It uses patient records as the basis for dialogue, for systematic assessment and structured feedback. As the actual record is the focus for the discussion, the assessor can also evaluate the quality of record keeping and the presentation of

cases. The CBD is important for assessing the critical conditions (appendix 3). Trainees are assessed against the standard for the completion of their phase of training.

*Clinical Evaluation Exercise (CEX) / CEX for Consent (CEX(C))*

The CEX or CEX(C) assesses a clinical encounter with a patient to provide an indication of competence in skills essential for good clinical care such as communication, history taking, examination and clinical reasoning. These can be used at any time and in any setting when there is a trainee and patient interaction and an assessor is available. The CEX or CEX(C) is important for assessing the critical conditions (appendix 3). Trainees are assessed against the standard for the completion of their phase of training.

*Direct Observation of Procedural Skills (DOPS)*

The DOPS assesses the trainee's technical, operative and professional skills in a range of basic diagnostic and interventional procedures during routine surgical practice in wards, out-patient clinics and operating theatres. The procedures reflect the common and important procedures. Trainees are assessed against the standard for the completion of core surgical training.

**Multi-source Feedback (MSF)**

The MSF assesses professional competence within a team working environment. It comprises a self-assessment and the assessments of the trainee's performance from a range colleagues covering different grades and environments (e.g. ward, theatre, out-patients) including the AES. The competencies map to the standards of GMP and enable serious concerns, such as those about a trainee's probity and health, to be highlighted in confidence to the AES, enabling appropriate action to be taken. Feedback is in the form of a peer assessment chart, enabling comparison of the self-assessment with the collated views received from the team and includes their anonymised but verbatim written comments. The AES should meet with the trainee to discuss the feedback on performance in the MSF. Trainees are assessed against the standard for the completion of their training level.

*Procedure Based Assessment (PBA)*

The PBA assesses advanced technical, operative and professional skills in a range of specialty procedures or parts of procedures during routine surgical practice in which trainees are usually scrubbed in theatre. The assessment covers pre-operative planning and preparation; exposure and closure; intra-operative elements specific to each procedure and post-operative management. The procedures reflect the routine or index procedures relevant to the specialty. The PBA is used particularly to assess the index procedures (appendix 4). Trainees are assessed against the standard for certification.

*Surgical logbook*

The logbook is tailored to each specialty and allows the trainee's competence as assessed by DOPS and PBA to be placed in context. It is not a formal assessment in its own right, but trainees are required to keep a log of all operative procedures they have undertaken including the level of supervision required on each occasion using the key below. The logbook demonstrates breadth of experience and can be compared with procedural competence using a DOPS and / or PBA and may also be compared to the indicative numbers on index procedures defined in the curriculum (section 5.4 and appendix 4).

Observed (O)
Assisted (A)
Supervised - trainer scrubbed (S-TS)
Supervised - trainer unscrubbed (S-TU)
Performed (P)
Training more junior trainee (T)

The following WBAs may also be used to further collect evidence of achievement, particularly in the GPC domains of *Quality improvement, Education and training and Leadership and team working*:

*Assessment of Audit (AoA)*

The AoA reviews a trainee's competence in completing an audit or quality improvement project. It can be based on documentation or a presentation of a project. Trainees are assessed against the standard for the completion of their phase of training.

*Observation of Teaching (OoT)*

The OoT assesses the trainee's ability to provide formal teaching. It can be based on any instance of formalised teaching by the trainee that has been observed by the assessor. Trainees are assessed against the standard for the completion of their phase of training.

The forms and guidance for each WBA method can be found on the ISCP website (see section 7).

### 5.3.6 Intercollegiate Specialty Board Examination

The ISB examination is governed by the Joint Committee on Intercollegiate Examinations (JCIE, www.jcie.org.uk) on behalf of the four surgical Royal Colleges. The JCIE is served by the Intercollegiate Specialty Board in Neurosurgery. The examination is a powerful driver for knowledge and clinical skill acquisition. It has been in existence for over twenty years and is accepted as an important, necessary and proportionate test of knowledge, clinical skill and the ability to demonstrate the behaviours required by the curriculum. The examination is taken after successful completion of the ST6 year and the standard is set at having the knowledge, clinical and professional skills at the level of a day-one consultant in the generality of the specialty, and must be passed in order to complete the curriculum. The examination components have been chosen to test the application of knowledge, clinical skills, interpretation of findings, clinical judgement, decision-making, professionalism, and communication skills described within the curriculum. The examination also assesses components of the CiPs and GPCs (as shown in appendix 9) and feeds into the same process as WBA for review by the AES and ARCP.

There are two sections to the exam:

- Section 1 is a computer-based assessment comprising two papers taken on the same day. These are both Single Best Answer (SBA) papers designed to test the application of knowledge and clinical reasoning.
- Section 2 comprises the clinical component of the examination. It consists of a series of carefully designed and structured interviews on clinical topics – some scenario-based and others patient-based. The construct of section 2 allows assessment of the application of knowledge, clinical interpretation, decision-making, clinical judgement and professionalism.

Standard setting:

- Section 1 is standard set by the modified Angoff method with one set being added to the Angoff cut score to generate the eligibility to proceed mark. Section 1 is computer marked. Any questions identified as anomalous (possible wrong answers, negative discriminators etc.) are discussed at the standard setting meeting prior to the Angoff and, if necessary, removed.
- The Section 2 clinical and oral components are calibrated prior to the start of each diet. It is independently marked by examiners working in pairs but with reference to the marking descriptors and the standard agreed at the calibration meeting.

Feedback:

Following section 1, candidates will receive a formal letter from the Board Chair confirming the result and a Final Performance Report which shows:

Paper 1 (Single Best Answer) Score %
Paper 2 (Single Best Answer) Score %
Combined Score %

Following section 2, candidates will receive a formal letter from the Board Chair confirming the result. Unsuccessful candidates will also receive a Final Performance Report showing the name of each station and its pass mark, and the mark achieved by a candidate in each of the stations.

Attempts:

Trainees have a maximum of four attempts at each section of the examination with no re-entry. A pass in section 1 is required to proceed to section 2 and must be achieved within two years of the first attempt. The time limit for completion of the entire examination process is seven years. Pro-rata adjustments are permissible to these timescales for LTFT trainees. Trainees in Neurosurgery become eligible to sit section 1 following an ARCP outcome 1 at the end of the ST6 year of Neurosurgery training and must remain in satisfactory standing to retain eligibility. Further details can be found at https://www.jcie.org.uk/content/content.aspx?ID=12

### 5.3.7 Annual Review of Competence Progression (ARCP)

The ARCP is a formal Deanery/HEE Local Office process overseen and led by the TPD. It scrutinises the trainee's suitability to progress through the training programme. It bases its decisions on the evidence that has been gathered in the trainee's learning portfolio during the period between ARCP reviews, particularly the AES report in each training placement. The ARCP would normally be undertaken on an annual basis for all trainees in surgical training. A panel may be convened more frequently for an interim review or to deal with progression issues (either accelerated or delayed) outside the normal schedule. The ARCP panel makes the final summative decision that determines whether trainees are making appropriate progress to be able to move to the next level or phase of training or to achieve certification.

## 5.4 Completion of training in Neurosurgery

The following requirements are applied to all trainees completing the curriculum and applying for certification and entry to the specialist register.

All seeking certification in Neurosurgery must:

a) be fully registered with the GMC and have a licence to practise (UK trainees) or be registered with the Medical Council in Ireland (Republic of Ireland trainees)
b) have successfully passed the ISB examination in Neurosurgery
c) have achieved level IV or V in all the CiPs
d) have achieved the competencies described in the nine domains of the GPC framework
A. have been awarded an outcome 6 at a final ARCP (if applying for specialist registration through certification).

In order to be awarded an outcome 6 at the final ARCP, trainees must be able to satisfy the following Neurosurgery requirements:

A. Generic requirements shared between surgical specialities

| | |
|---|---|
| **Research** - Trainees must provide evidence of having met the relevant requirements for research and scholarship. For UK trainees, this can be found in the GMC's GPC framework. Broadly, this includes capabilities in 4 areas:<br><br>1. The demonstration of evidence-based practice.<br>2. Understanding how to critically appraise literature and conduct literature searches and reviews.<br>3. Understanding and applying basic research principles.<br>4. Understanding the basic principles of research governance and how to apply relevant ethical guidelines to research activities. | |
| **Quality Improvement** - evidence of an understanding of, and participation in, audit or service improvement as defined in the curriculum | Trainees must complete or supervise an indicative number of three audit or quality improvement projects during specialty training. In one or more of these, the cycle should be completed. |
| **Medical Education and Training** - evidence of an understanding of, and participation in, medical education and training as defined in the curriculum | Trainees must provide evidence of being trained in the training of others and present written structured feedback on their teaching uploaded to the ISCP portfolio. |
| **Management and Leadership** - evidence of an understanding of management structures and challenges of the health service in the training jurisdiction | Trainees must provide evidence of training in health service management and leadership and having taken part in a management related activity e.g. rota administration, trainee representative, membership of working party etc. or of having shadowed a management role within the hospital. |

B. Requirements specific to Neurosurgery

| | |
|---|---|
| **Additional courses / qualifications** – evidence of an understanding of, and participation in, medical education and training as defined in the curriculum | The Advanced Trauma Life Support® (ATLS®), European Trauma Course, Definitive Surgical Trauma Skills course or equivalent locally provided course(s) meeting the outcomes described. |
| **Clinical experience -** evidence of the breadth of clinical experience defined in the specialty syllabus. | Trainees should have completed a training programme in the neurosciences, incorporating neurosurgery, together with exposure to a selection of Neurology, Intensive Care, Neuroradiology, Accident and Emergency medicine, Neuropathology and an allied surgical specialty.<br><br>Trainees should have had a broad exposure to emergency and scheduled components of the special interest areas (current and potentially emerging) recognised in Neurosurgery, including, but not necessarily limited to:<br>• Trauma (both brain and spine, including evidence of trauma competency during training e.g. ATLS®/PALS course)<br>• Hydrocephalus<br>• Neuro-oncology<br>• Skull base / pituitary<br>• Neurovascular<br>• Pain / Epilepsy / Functional<br>• Spinal Surgery (including intradural tumours)<br>• Paediatric Neurosurgery |
| **Critical conditions -** To ensure that trainees have the necessary skills to manage the defined critical conditions. | Trainees must be able to demonstrate knowledge and understanding of the management of the following critical conditions:<br>• Impaired consciousness and seizures<br>• Cranial Trauma<br>• Acute Hydrocephalus<br>• Acute tumour presentations<br>• Spontaneous intracranial haemorrhage<br>• CNS infections<br>• Spinal trauma<br>• Spinal oncology<br>• Degenerative spinal disorders and cauda equina syndrome<br>• Emergency paediatric neurosurgery<br><br>By certification, there should be documented evidence of performance at the level of a day-one consultant (via CEX / CBD as appropriate at level 4) for the clinical critical conditions listed here<br>(see appendix 4) |

<table>
<tr>
<td>Operative experience and competence - consolidated logbook evidence of the breadth of operative experience defined in the specialty syllabus<br><br>Index Procedures – Index procedures are of significant importance for patient safety and to demonstrate a safe breadth of practice.</td>
<td>Trainees will need to complete an indicative number of 1200 (including 70 paediatric and 250 spinal) approved cases in the surgical skills section of the consolidated SAC indicative logbook report that have been performed in approved training placements with appropriate assessment, with a satisfactory spread of cases between assisting and operating as the primary surgeon.<br><br>The full range of Neurosurgery should be represented including microsurgical operating procedures, spinal internal fixation, use of endoscopes and image guidance.<br><br>Index procedures performed as primary surgeon (‘P, ST-S, ST-U, T’) with PBA evidence of achieving the indicative level in the majority of index cases.<br><br>See appendix 4.
<table>
<tr><th>Index procedure</th><th>Indicative number by certification</th><th>PBA Level</th></tr>
<tr><td>Advanced Adult Supratentorial</td><td>10</td><td>4</td></tr>
<tr><td>Endoscopic and Transphenoidal</td><td>10</td><td>3 (4 if special interest)</td></tr>
<tr><td>Convexity and falcine meningiomas</td><td>10</td><td>4</td></tr>
<tr><td>Advanced adult infratentorial</td><td>10</td><td>4</td></tr>
<tr><td>Intradural Spine</td><td>5</td><td>4</td></tr>
<tr><td>Complex Spinal fusion</td><td>10</td><td>3 (4 if special interest)</td></tr>
<tr><td>Advanced paediatric supratentorial</td><td>1</td><td>2 (3 if special interest)</td></tr>
<tr><td>Advanced paediatric infratentorial</td><td>1</td><td>2 (3 if special interest)</td></tr>
</table>
</td>
</tr>
</table>

Table 4: Requirements for completion of training in Neurosurgery. a) generic requirements shared between all surgical specialties and b) requirements specific to Neurosurgery.
Attainment of these requirements contribute to evidence that outcomes of training have been met. Once these requirements have been met, the ARCP panel may consider the award of outcome 6 having reviewed the portfolio and AES report. Award of outcome 6 allows the trainee to seek recommendation for certification and entry onto the specialist register.

# 6 Recording progress in the ISCP Learning Portfolio

This curriculum is available through the JCST's Intercollegiate Surgical Curriculum Programme (ISCP) training management system at www.iscp.ac.uk. Trainees and all involved with training must register with the ISCP and use the curriculum as the basis of their discussion and to record assessments and appraisals. Both trainers and trainees are expected to have a good knowledge of the curriculum and should use it as a guide for their training programme. Each trainee must maintain their learning portfolio by developing learning objectives, undergoing assessments, recording training experiences and reflecting on their learning and feedback.

The ISCP learning portfolio can be used to build a training record of trainee conduct and practice as follows:

- Trainees can initiate the learning agreement and WBAs directly with supervisors. They can record logbook procedures and other evidence using a variety of forms. They can also link WBAs with critical conditions and index procedures.
- TPDs can validate trainees in their placements, monitor training and manage the ARCP.
- Deanery/HEE Local Office administrators can support the TPD, JCST trainee enrolment and ARCP process.
- AESs can complete trainee appraisal through the learning agreement, monitor trainee portfolios and provide end of placement AES reports.
- CSs can complete the MCR at the mid-point and end of each placement.
- Assessors can record feedback and validate WBAs.
- Other people involved in training can access trainee portfolios according to their role and function.

In each of the CiPs the word 'manage' is defined as clinical assessment, diagnosis, investigation and treatment (both operative and non-operative) and recognising when referral to more specialised or experienced surgeons is required for definitive treatment. Trainees are expected to apply syllabus defined knowledge and skills in straightforward and unusual cases across the breadth of the specialty across all CiPs.

**Shared Capability in Practice 1:**

**Manages an out-patient clinic**

**Good Medical Practice Domains 1,2,3,4**

**Description**

Manages all the administrative and clinical tasks required of a consultant surgeon in order that all patients presenting as out-patients in the specialty are cared for safely and appropriately.

**Example descriptors:**

- Assesses and prioritises GP and inter-departmental referrals and deals correctly with inappropriate referrals
- Assesses new and review patients using a structured history and a focused clinical examination to perform a full clinical assessment, and determines the appropriate plan of action, explains it to the patient and carries out the plan
- Carries out syllabus defined practical investigations or procedures within the out-patient setting
- Adapts approach to accommodate all channels of communication (e.g. interpreter, sign language), communicates using language understandable to the patient, and demonstrates communication skills with particular regard to breaking bad news. Appropriately involves relatives and friends
- Takes co-morbidities into account
- Requests appropriate investigations, does not investigate when not necessary, and interprets results of investigations in context
- Selects patients with urgent conditions who should be admitted from clinic
- Manages potentially difficult or challenging interpersonal situations, including breaking bad news and complaints
- Completes all required documentation
- Makes good use of time
- Uses consultation to emphasise health promotion

**Specialty specific requirements:**

See critical conditions (appendix 3 of the curriculum)

**Supervision levels:**

Level I: Able to observe only

Level II: Able and trusted to act with direct supervision:

a) Supervisor present throughout
b) Supervisor present for part

| | |
|---|---|
| Level III: | Able and trusted to act with indirect supervision |
| Level IV: | Able and trusted to act at the level expected of a day-one consultant |
| Level V: | Able and trusted to act at a level beyond that expected of a day-one consultant |

**Shared Capability in Practice 2:**

**Manages the unselected emergency take**

**Good Medical Practice Domains 1,2,3,4**

**Description**

Manages all patients with an emergency condition requiring management within the specialty. Able to perform all the administrative and clinical tasks required of a consultant surgeon in order that all patients presenting as emergencies in the specialty are cared for safely and appropriately.

**Example descriptors:**

- Promptly assesses acutely unwell and deteriorating patients, delivers resuscitative treatment and initial management, and ensures sepsis is recognised and treated in compliance with protocol
- Makes a full assessment of patients by taking a structured history and by performing a focused clinical examination, and requests, interprets and discusses appropriate investigations to synthesise findings into an appropriate overall impression, management plan and diagnosis
- Identifies, accounts for and manages co-morbidity in the context of the surgical presentation, referring for specialist advice when necessary
- Selects patients for conservative and operative treatment plans as appropriate, explaining these to the patient, and carrying them out
- Demonstrates effective communication with colleagues, patients and relatives
- Makes appropriate peri- and post-operative management plans in conjunction with anaesthetic colleagues
- Delivers ongoing post-operative surgical care in ward and critical care settings, recognising and appropriately managing medical and surgical complications, and referring for specialist care when necessary
- Makes appropriate discharge and follow up arrangements
- Carries out all operative procedures as described in the syllabus
- Manages potentially difficult or challenging interpersonal situations
- Gives and receives appropriate handover

**Specialty specific requirements:**

- See critical conditions (appendix 3 of the curriculum)
- Trauma course (ATLS or equivalent)

**Supervision levels:**

| | |
|---|---|
| Level I: | Able to observe only |
| Level II: | Able and trusted to act with direct supervision: |
| | a) Supervisor present throughout |

| | |
|---|---|
| | b) Supervisor present for part |
| Level III: | Able and trusted to act with indirect supervision |
| Level IV: | Able and trusted to act at the level expected of a day-one consultant |
| Level V: | Able and trusted to act at a level beyond that expected of a day-one consultant |

**Shared Capability in Practice 3:**

**Manages ward rounds and the on-going care of in-patients**

**Good Medical Practice Domains 1,2,3,4**

**Description**

Manages all hospital in-patients with conditions requiring management within the specialty. Able to perform all the administrative and clinical tasks required of a consultant surgeon in order that all in-patients requiring care within the specialty are cared for safely and appropriately.

**Example descriptors:**

- Identifies at the start of a ward round if there are acutely unwell patients who require immediate attention
- Ensures that all necessary members of the multi-disciplinary team are present, knows what is expected of them and what each other's roles and contributions will be, and contributes effectively to cross specialty working
- Ensures that all documentation (including results of investigations) will be available when required and interprets them appropriately
- Makes a full assessment of patients by taking a structured history and by performing a focused clinical examination, and requests, interprets and discusses appropriate investigations to synthesise findings into an appropriate overall impression, management plan and diagnosis
- Identifies when the clinical course is progressing as expected and when medical or surgical complications are developing, and recognises when operative intervention or re-intervention is required and ensures this is carried out
- Identifies and initially manages co-morbidity and medical complications, referring on to other specialties as appropriate
- Contributes effectively to level 2 and level 3 care
- Makes good use of time, ensuring all necessary assessments are made and discussions held, while continuing to make progress with the overall workload of the ward round
- Identifies when further therapeutic manoeuvres are not in the patient's best interests, initiates palliative care, refers for specialist advice as required, and discusses plans with the patient and their family
- Summarises important points at the end of the ward rounds and ensures all members of the multi-disciplinary team understand the management plans and their roles within them
- Gives appropriate advice for discharge documentation and follow-up

**Specialty specific requirements:**

See critical conditions (appendix 3 of the curriculum)

**Supervision levels:**

Level I: Able to observe only

Level II: Able and trusted to act with direct supervision:

a) Supervisor present throughout
b) Supervisor present for part

Level III: Able and trusted to act with indirect supervision

Level IV: Able and trusted to act at the level expected of a day-one consultant

Level V: Able and trusted to act at a level beyond that expected of a day-one consultant

**Shared Capability in Practice 4:**

**Manages an operating list**

**Good Medical Practice Domains 1,2,3,4**

**Description**

Manages all patients with conditions requiring operative treatment within the specialty. Able to perform all the administrative and clinical tasks required of a consultant surgeon in order that all patients requiring operative treatment receive it safely and appropriately.

**Example descriptors:**

- Selects patients appropriately for surgery, taking the surgical condition, co-morbidities, medication and investigations into account, and adds the patient to the waiting list with appropriate priority
- Negotiates reasonable treatment options and shares decision-making with patients
- Takes informed consent in line with national legislation or applies national legislation for patients who are not competent to give consent
- Arranges anaesthetic assessment as required
- Undertakes the appropriate process to list the patient for surgery
- Prepares the operating list, accounting for case mix, skill mix, operating time, clinical priorities, and patient co-morbidity
- Leads the brief and debrief and ensures all relevant points are covered for all patients on the operating list
- Ensures the WHO checklist (or equivalent) is completed for each patient at both the beginning and end of each procedure
- Understands when prophylactic antibiotics should be prescribed and follows local protocol
- Synthesises the patient's surgical condition, the technical details of the operation, co-morbidities and medication into an appropriate operative plan for the patient
- Carries out the operative procedures to the required level for the phase of training as described in the specialty syllabus
- Uses good judgement to adapt operative strategy to take account of pathological findings and any changes in clinical condition
- Undertakes the operation in a technically safe manner, using time efficiently
- Demonstrates good application of knowledge and non-technical skills in the operating theatre, including situation awareness, decision-making, communication, leadership,

and teamwork
- Writes a full operation note for each patient, ensuring inclusion of all post-operative instructions
- Reviews all patients post-operatively
- Manages complications safely, requesting help from colleagues where required

**Specialty specific requirements:**

- Trainees will need to complete an indicative number of 1200 (including 70 paediatric and 250 spinal) approved cases in the surgical skills section of the consolidated SAC indicative logbook report that have been performed in approved training placements with appropriate assessment, with a satisfactory spread of cases between assisting and operating as the primary surgeon. The full range of Neurosurgery should be represented including microsurgical operating procedures, spinal internal fixation, use of endoscopes and image guidance.
- Index procedures performed as primary surgeon ('P, ST-S, ST-U, T') with PBA evidence of achieving the indicative level in the majority of index cases as described in appendix 4 of the curriculum.

**Supervision levels:**

Level I: Able to observe only

Level II: Able and trusted to act with direct supervision:

a) Supervisor present throughout
b) Supervisor present for part

Level III: Able and trusted to act with indirect supervision

Level IV: Able and trusted to act at the level expected of a day-one consultant

Level V: Able and trusted to act at a level beyond that expected of a day-one consultant

**Shared Capability in Practice 5:**

**Manages multi-disciplinary working**

**Good Medical Practice Domains 1,2,3,4**

**Description**

Manages all patients with conditions requiring inter-disciplinary management (or multi-consultant input as in trauma or fracture meetings in Trauma and Orthopaedic Surgery) including care within the specialty. Able to perform all the administrative and clinical tasks required of a consultant surgeon in order that safe and appropriate multi-disciplinary decisions are made on all patients with such conditions requiring care within the specialty.

**Example Descriptors:**

Appropriately selects patients who require discussion at the multi-disciplinary team

Follows the appropriate administrative process

Deals correctly with inappropriate referrals for discussion (e.g. postpones discussion if information is incomplete or out-of-date)

Presents relevant case history, recognising important clinical features, co-morbidities and

investigations

Identifies patients with unusual, serious or urgent conditions

Engages constructively with all members of the multi-disciplinary team in reaching an agreed management decision, taking co-morbidities into account, recognising when uncertainty exists, and being able to manage this

Effectively manages potentially challenging situations such as conflicting opinions

Develops a clear management plan and communicates discussion outcomes and subsequent plans by appropriate means to the patient, GP and administrative staff as appropriate

Manages time to ensure the case list is discussed in the time available

Arranges follow up investigations when appropriate and knows indications for follow up

**Specialty specific requirements:** None

**Supervision levels:**

Level I: Able to observe only

Level II: Able and trusted to act with direct supervision:

a) Supervisor present throughout
b) Supervisor present for part

Level III: Able and trusted to act with indirect supervision

Level IV: Able and trusted to act at the level expected of a day-one consultant

Level V: Able and trusted to act at a level beyond that expected of a day-one consultant

Expected competency levels in knowledge and clinical skills are defined for critical conditions, index procedures and the technical skills in the special interest areas of Neurosurgery.

WBA
Formative WBAs may be used to assess and provide feedback on any areas of clinical activity. However, other than for the critical conditions, index procedures or where they have been identified to address a concern, WBAs are optional and trainees, therefore, do not need to use WBAs to evidence their learning against each syllabus topic.

**Standards for depth of knowledge during surgical training**
In the three phases of Neurosurgery training the following methodology is used to define the relevant depth of knowledge required of the surgical trainee. Each topic within a phase has a competence level ascribed to it for knowledge ranging from 1 to 4 that indicates the depth of knowledge required:

1. knows of
2. knows basic concepts
3. knows generally
4. knows specifically and broadly

**Standards for clinical and technical skills**
The practical application of knowledge is evidenced through clinical and technical skills. Each topic within a phase has a competence level ascribed to it in the areas of clinical and technical skills ranging from 1 to 4:

1. Has observed

Exit descriptor; at this level the trainee:

- Has adequate knowledge of the steps through direct observation.
- Demonstrates that he/she can handle instruments relevant to the procedure appropriately and safely.
- Can perform some parts of the procedure with reasonable fluency.

2. Can do with assistance

Exit descriptor; at this level the trainee:

- Knows all the steps - and the reasons that lie behind the methodology.
- Can carry out a straightforward procedure fluently from start to finish.
- Knows and demonstrates when to call for assistance/advice from the supervisor (knows personal limitations).

3. Can do whole but may need assistance

Exit descriptor; at this level the trainee:

- Can adapt to well-known variations in the procedure encountered, without direct input from the trainer.
- Recognises and makes a correct assessment of common problems that are encountered.
- Is able to deal with most of the common problems.
- Knows and demonstrates when he/she needs help.
- Requires advice rather than help that requires the trainer to scrub.

4. Competent to do without assistance, including complications

Exit descriptor; at this level the trainee:

- With regard to the common clinical situations in Neurosurgery, can deal with straightforward and difficult cases to a satisfactory level and without the requirement for external input.
- Is at the level at which one would expect a UK consultant surgeon to function.
- Is capable of supervising trainees.

**Phase 1 Neurosurgery Training**

**Overview**

The purpose of phase 1 is to allow the trainee to develop the basic and fundamental surgical skills common to all surgical specialties, together with a broad foundation of theoretical knowledge, clinical experience, non-operative and operative skills as they relate to the core neurosurgical conditions.

At the end of Phase 1 there is a critical progression point for Phase 2 entry, assessed at the Annual Review of Competence Progression (ARCP), where trainees will demonstrate competencies in knowledge, clinical skills and professional behaviours commensurate with the CiPs and defined syllabus. MRCS must be achieved by this point in the training programme.

Trainees will be able to resuscitate when necessary, assess through a full neurological history and examination, establish a differential diagnosis, initiate and interpret investigations for patients presenting with a wide range of common neurological disorders.

The common emergencies that phase 1 trainees must learn to recognise and understand the management of brain and spinal trauma, spontaneous intracranial haemorrhage including subarachnoid haemorrhage and hypertensive intraparenchymal haematomas, acute hydrocephalus, acute raised intracranial pressure from brain tumours, epilepsy, acute spinal cord and nerve root compression including cauda equina syndrome. Trainees are encouraged to spend time on the ward and develop their diagnostic and management skills at every opportunity.

The common elective problems that phase 1 trainees must have some understanding of the management of include brain and spinal tumours, epilepsy, stroke and spinal degenerative disease. Trainees are encouraged to attend clinics and develop their diagnostic and management skills at every opportunity.

The key technical skills for phase 1 training are suturing, insertion of an ICP monitor, burr hole drainage of a CSDH, lumbar puncture and lumbar drain insertion, tapping of CSF reservoirs and shunts, placement of EVD’s and basic craniotomies. Trainees are encouraged to attend theatre and develop their surgical skills at every opportunity.

**Phase 1 Capability in Practice**

| Capability in practice | Supervision level |
|---|---|
| 1. Manages an outpatient clinic | Level IIa |
| 2. Manages the unselected emergency take | Level IIa |
| 3. Manages ward rounds and the on-going care of inpatients | Level IIb |
| 4. Manages an operating list | Level I |
| 5. Manages multi-disciplinary working | Level I |

**Phase 1 Critical conditions**

| Critical condition | Assessed by | Knowledge level Expected (see syllabus levels above) |
|---|---|---|
| Impaired consciousness and seizures | CBD or CEX | 4 |
| Cranial trauma | CBD or CEX | 3 |
| Acute hydrocephalus | CBD or CEX | 3 |
| Acute tumour presentations | CBD or CEX | 2 |
| Spontaneous intracranial haemorrhage | CBD or CEX | 2 |
| CNS infections | CBD or CEX | 2 |
| Spinal trauma | CBD or CEX | 2 |
| Spinal oncology | CBD or CEX | 2 |
| Degenerative spinal disorders and cauda equina syndrome | CBD or CEX | 3 |
| Emergency paediatric neurosurgery | CBD or CEX | 1 |

**Phase 1 Index procedures**

| Index procedure | Assessed by | Skill level expected (see syllabus levels above) |
|---|---|---|
| Lumbar puncture and lumbar drain insertion | PBA | 4 |
| Insertion of ICP monitor | PBA | 3 |
| Burr hole evacuation of chronic subdural haematoma | PBA | 2 |
| Insertion of external ventricular drain | PBA | 2 |
| Craniotomy | PBA | 2 |
| Lumbar decompression (approach) | PBA | 2 |

**Clinical Placements in Phase 1**

Clinical placements in Phase 1 will include:

- At least 6 months in Neurosurgery attachments

Further attachments from related disciplines (minimum 3, maximum 5) including:

- Neurocritical care
- Neurology (including neurophysiology and neurorehabilitation)
- Neuroradiology
- Neuropathology
- A related surgical specialty
- Accident and Emergency Medicine

The further attachment placements during phase 1 are flexible and at the discretion of the programme director. The following principles apply:

- To promote flexibility the Shape of Training review requires that equivalent training already undertaken in other training programmes should be recognised where the appropriate CiPs have been achieved
- Trainees should not be required to work in specialty areas they have already undertaken earlier in their career for example during foundation training
- Flexible, bespoke training requirements should be supported wherever possible
- Training programme directors will be familiar with which specialties offer good training opportunities locally and placements in these specialties should be arranged
- Trainees on placements should receive training and are not primarily in these placements to support service requirements

**Phase 1 Topics**

**CORE COMMON CONTENT MODULE**

**Basic Sciences**

| | |
|---|---|
| **Objective** | To acquire and demonstrate a knowledge of the basic science which underpins the practice of surgery |
| **Knowledge** | *Applied anatomy*:<br>• Gross and microscopic anatomy of the organs and other structures<br>• Surface anatomy<br>• Imaging anatomy<br>• Development and embryology<br>This will include anatomy of thorax, abdomen, pelvis, perineum, limbs, spine, head and neck.<br><br>*Physiology*:<br>General physiological principles including:<br>• Thermoregulation<br>• Metabolic, ionic and acid/base homeostasis<br>• Cardiorespiratory homeostasis<br>• Haemostasis<br>• Acid base balance<br>This will include the physiology of specific organ systems relevant to surgical care including the cardiovascular, respiratory, gastrointestinal, urinary, endocrine, musculoskeletal and neurological systems.<br><br>*Pharmacology*:<br>• The pharmacology of drugs used in surgical practice, both for treatment and prophylaxis, including analgesics, antibiotics, anticoagulants and local anaesthetics<br>• The pharmacology and recommended modification in the perioperative period of the common agents used for the treatment of chronic intercurrent disease<br>• The pharmacological principles of general anaesthesia and intensive care medicine<br>• The pharmacological principles relevant to the treatment of malignancy<br>• The pharmacological principles of immunosuppression<br><br>*Pathology*:<br>General pathological principles including:<br>• Necrosis and apoptosis<br>• Inflammation and immunity including transplant rejection<br>• Repair, regeneration and healing<br>• Thrombosis and embolism<br>• Shock, systemic inflammatory response syndrome and multiple organ failure<br>• Neoplasia including carcinogenesis, the biology of tumour growth, metastasis and the principles of grading and staging<br>• Genetics including genomics<br>The pathology of specific organ systems relevant to surgical care including cardiovascular pathology, respiratory pathology, gastrointestinal pathology, |

| | |
|---|---|
| | genitourinary disease, breast, exocrine and endocrine pathology, central and peripheral, neurological systems, skin, lymphoreticular and musculoskeletal systems.<br><br>*Microbiology*:<br>• Infection control including sources of infection, asepsis, disinfection and sterilisation<br>• General pathology of bacterial and viral disease including mechanisms of injury and systemic sepsis<br>• Soft tissue infections including cellulitis, abscesses, necrotising fasciitis and gangrene<br>• Hospital acquired infection, antibiotic governance and bacterial resistance<br>• Prevention of the transmission of blood born viral infection during surgery<br><br>*Medical physics*:<br>• Principles of diagnostic and interventional imaging including plain and contrast radiography, ultrasound, CT, MRI, PET and radionuclide imaging<br>• Principles of diathermy, LASER, ultrasonic aspiration<br>• Principles of radiotherapy<br>• Application of robotics and artificial intelligence to surgery<br><br>*Medical statistics*:<br>• Principles of screening<br>• The null hypothesis and common tests used with parametric and non-parametric data |

**The clinical method in surgical practice**

| | |
|---|---|
| **Objective** | To demonstrate the knowledge and clinical skill necessary to assess and investigate a patient presenting to a surgical team |
| **Knowledge** | For each of the index conditions below:<br>• epidemiology<br>• common presentations<br>• expected findings on history and examination<br>• natural history<br>• important investigations and likely findings<br>• management options and published guidelines<br>• prognosis |
| **Clinical Skills** | Take a tailored history and perform a relevant examination in an outpatient clinic<br>Detect the need for and initiate resuscitation in an unwell patient<br>Take a tailored history and perform a relevant examination for an acutely unwell patient<br>Construct and investigate a differential diagnosis<br>Facilitate a patient centred discussion of treatment options and agree on a management plan |
| **Reference to other relevant syllabus items** | Critical care<br>Professional/leadership skills: good clinical care<br>Surgical care of the paediatric patient |

| **Index conditions** | This section sets out those common and important conditions about which a working knowledge of the relevant clinical science and principles of management are essential for all core surgical trainees. | |
|---|---|---|
| ***Organ system*** | *Presentations* | *Conditions* |
| **Abdomen** | • Abdominal pain<br>• Abdominal swelling<br>• Change in bowel habit<br>• Gastrointestinal haemorrhage<br>• Dysphagia<br>• Dyspepsia<br>• Jaundice | • Appendicitis<br>• Gastrointestinal malignancy<br>• Inflammatory bowel disease<br>• Diverticular disease<br>• Intestinal obstruction<br>• Adhesions<br>• Abdominal hernias<br>• Peritonitis<br>• Intestinal perforation<br>• Benign oesophageal disease<br>• Peptic ulcer disease<br>• Benign and malignant hepatic, gall bladder and pancreatic disease<br>• Haemorrhoids and perianal disease<br>• Abdominal wall stomata<br>• Abdominal trauma including splenic injury |
| **Breast** | • Breast lumps and nipple discharge<br>• Acute Breast pain | • Benign and malignant breast lumps<br>• Mastitis and breast abscess |
| **Vascular** | • Chronic and acute limb ischaemia<br>• Aneurysmal disease<br>• Transient ischaemic attacks<br>• Varicose veins<br>• Leg ulceration | • Atherosclerotic arterial disease<br>• Embolic and thrombotic arterial disease<br>• Venous insufficiency<br>• Diabetic ulceration<br>• Vascular injury |
| **Cardiac & respiratory** | | • Coronary heart disease<br>• Valvular heart disease<br>• Bronchial carcinoma<br>• Obstructive airways disease<br>• Tumours of the chest including carcinoma of the bronchus<br>• Thoracic trauma |
| **Genitourinary** | • Loin pain<br>• Haematuria<br>• Lower urinary tract symptoms<br>• Urinary retention<br>• Renal failure<br>• Scrotal swellings<br>• Testicular pain | • Genitourinary malignancy<br>• Urinary calculus disease<br>• Urinary tract infection<br>• Benign prostatic hyperplasia<br>• Obstructive uropathy |
| **Musculo-skeletal** | • Acute limb pain and deformity<br>• Chronic joint pain and deformity | • Simple fractures and joint dislocations<br>• Fractures around the hip and ankle<br>• Degenerative joint disease<br>• Inflammatory joint disease including bone |

| | | |
|---|---|---|
| | • Back pain | and joint infection<br>• Compartment syndrome<br>• Bony metastatic malignancy |
| **Skin, head and neck** | • Lumps in the neck<br>• Skin lumps<br>• Epistaxis<br>• Upper airway obstruction | • Benign and malignant skin and subcutaneous lesions<br>• Benign and malignant lesions of the mouth and tongue<br>• Burns<br>• Soft tissue trauma and skin loss<br>• Infections related to the nose, ears, throat and face |
| **Neurological** | • Headache<br>• Coma | • Intracranial tumour<br>• Traumatic brain injury<br>• Common entrapment neuropathies<br>• Peripheral nerve injury<br>• Spinal nerve root entrapment, spinal cord compression & cauda equina compression |
| **Endocrine** | • Acute endocrine crises | • Thyroid and parathyroid disease<br>• Adrenal gland disease<br>• Diabetes |
| **Paediatric** | • Abdominal pain<br>• Vomiting<br>• Constipation | • Pyloric disease<br>• Intussusception<br>• Undescended testis, PPV and inguinal hernia<br>• Phimosis |

**Peri-operative care**

| | |
|---|---|
| **Objective** | To assess and manage preoperative risk and prepare a patient for theatre, to conduct safe surgery in the operating theatre environment and to provide medical care for the patient in the post- operative period. |
| <u>Pre-operative care</u> | |
| **Knowledge** | • Risk factors for surgery and scoring systems including ASA and VTE risk<br>• Antibiotic and VTE prophylaxis guidelines<br>• Principles of ambulatory day surgery including selection and discharge criteria<br>• Ethical principles of, and legislative framework for, capacity and consent<br>• Nutritional assessment methods and feeding options |
| **Clinical skills** | • The safe prescribing of pharmacological agents used for the treatment of chronic intercurrent disease, modified appropriately to the peri-operative period<br>• The safe prescribing of measures for antibiotic and VTE prophylaxis<br>• Assessing patient capacity<br>• Obtaining consent for surgery<br>• Communication with anaesthetic and scrub teams in advance<br>• Planning perioperative nutrition in advance in partnership with the nutrition team<br>• Engaging with multidisciplinary team discussions including those with oncology and interventional radiology |

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| Intra-operative care | | |
| **Knowledge** | • The patient safety movement and the evidence behind the WHO check list<br>• The principles of positioning and pressure area care<br>• Radiation protection legislation<br>• Guidelines for tourniquet use<br>• Safety requirements for use of sharps, LASER and diathermy<br>• What to do when something goes wrong<br>• Anaesthetic monitoring techniques | |
| **Clinical skills** | • Maintenance of communication with theatre team throughout procedure<br>• Crisis management | |
| **Technical skills and procedures** | • Safe positioning of the patient on the operating table<br>• Safe intraoperative use of sharps and diathermy<br>• Completion of team briefing<br>• Completion of WHO check list (time out and sign out) | 2<br>3<br>1<br>3 |
| Post-operative care | | |
| **Knowledge** | • Delirium<br>  ○ Epidemiology and prognosis of delirium<br>  ○ Causes and clinical features of delirium<br>  ○ The impact of delirium on patient, family and carers<br>• Spectrum of post-operative complications<br>• Guidelines for indications, prescription and management of complications of the transfusion of blood products | |
| **Clinical skills** | • Assessment of the unwell postoperative patient<br>• Writing an operation note with clear post-operative instructions<br>• Delivery of effective analgesia<br>• Diagnosis and treatment of VTE<br>• Post-operative monitoring and optimisation of fluid & electrolyte balance<br>• Diagnosis and treatment of post-operative infection and sepsis<br>• Diagnosis and treatment of transfusion reactions<br>• Delirium<br>  ○ Assessment of cognitive impairment seeking to differentiate dementia from delirium, with the knowledge that delirium is common in people with dementia<br>  ○ Management of patients with delirium including addressing triggers and using non-pharmacological and pharmacological methods where appropriate<br>  ○ Explanation of delirium to patients and advocates | |

**Basic surgical skills**

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|---|---|
| **Objective** | To acquire and develop throughout the programme those generic technical skills common to all or many areas of surgical practice. |
| **Knowledge** | Surgical wounds:<br>• Classification of surgical wounds<br>• Principles of wound management<br>• Principles underlying incision placement including cosmesis and Langer's lines, vascularity and function<br>• Principles underlying wound closure including suture method, needle types and the physical and biological characteristics of suture material<br>The range, nomenclature and functional design of surgical instruments |

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|---|---|---|
| **Technical skills and procedures** | Effective hand washing, gloving and gowning | 4 |
| | Accurate, effective and safe administration of local anaesthetic | 3 |
| | Preparation and maintenance of an aseptic field | 3 |
| | Incision of skin and subcutaneous tissue:<br>• Ability to use scalpel, cutting diathermy and scissors<br>• Control of superficial bleeding using diathermy and ligation | 3 |
| | Closure of skin and subcutaneous tissue:<br>• Accurate and tension free apposition of wound edges<br>• Knot tying by hand and instrument | 3 |
| | Selection and placement of tissue retractors | 2 |
| | Insertion, fixation and removal of drains | 2 |
| | Appropriate selection and use of instruments to handle tissue with minimal trauma | 2 |
| | Taking biopsies, safe labelling and completion of request forms | 2 |
| | Anticipation of needs of surgeon when assisting | 2 |
| | Co-ordination of camera and instrument from a 2-dimensional display during surgical endoscopy | |

**Critical care**

| | | |
|---|---|---|
| **Objective** | To demonstrate the knowledge and clinical and technical skills necessary to contribute to the management of critically unwell patients suffering from traumatic injuries or sepsis. | |
| <u>Trauma management</u> | | |
| **Knowledge** | A systematic, prioritised method of trauma management such as that set out by the American College of Surgeons, Committee on Trauma<br>Scoring systems for assessment of global injury severity including ISS | |
| **Clinical skills** | Resuscitation and early management of the patient who has sustained thoracic, head, spinal, abdominal and/or limb injury according to ATLS®, APLS or European Trauma Course guidelines | |
| **Technical skills and procedures** | Chest drain insertion | 2 |
| <u>Sepsis management</u> | | |
| **Knowledge** | A systematic, prioritised method of managing the septic patient<br>Recommendations of the surviving sepsis campaign including the “Sepsis 6” | |
| **Clinical skills** | Resuscitation and early management of the septic patient | |
| **Technical skills and procedures** | Surgical drainage of pus | 2 |
| <u>Intensive care medicine</u> | | |
| **Knowledge** | Classification of levels of critical care<br>Principles of organ support including:<br>• Invasive monitoring of circulation and ionotropic support<br>• Mechanical ventilation and tracheostomy<br>Haemofiltration and haemodialysis | |
| **Clinical skills** | Assessment of a patient receiving critical care<br>Surgical contribution, in discussion with the critical care team, to the management plan of a patient receiving critical care | |

**Surgical care of the paediatric patient**

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|---|---|
| **Objective** | To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients, within the appropriate legal and safeguarding frameworks. |
| **Knowledge** | An awareness of the normal physiological parameters at different ages<br>Principles of vascular access in children<br>Working knowledge of trust and Local Safeguarding Children Boards (LSCBs) and Child Protection Procedures<br>Child protection law and the issues of consent in childhood<br>Working knowledge of types and categories of child maltreatment |
| **Clinical Skills** | Recognise limitations of own knowledge and experience and seek early advice from dedicated paediatric teams<br>History and examination of paediatric surgical patient<br>Recognition of the unwell child<br>Assessment of respiratory and cardiovascular status in a child<br>Obtaining consent for operative treatment in a paediatric patient |

**Management of the dying patient**

| | |
|---|---|
| **Objective** | To demonstrate the knowledge and clinical skills necessary to manage the transition from life to death including palliation of symptoms, certification of death and the discussion of resuscitation status and organ donation. |
| **Knowledge** | Awareness of the public debate around resuscitation and palliative care, and organ donation<br>Classification of organ donors<br>The role of the coroner and the certification of death |
| **Clinical Skills** | Assessment and control of distress in the dying patient in collaboration with a palliative care team<br>The diagnosis of death following irreversible cessation of brain-stem function<br>Discussion of best interest including resuscitation status and limits of care with patient advocate<br>Discussion of organ donation with family in collaboration with transplant coordinators |

**Health promotion**

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|---|---|
| **Objective** | This syllabus module aims to enable all surgical trainees to develop the competencies necessary to support patients in caring for themselves; to empower them to improve and maintain their own health. |
| <u>General aspects</u> | |
| **Knowledge** | Damaging health and social issues such as excessive alcohol consumption, obesity, smoking and illicit drugs and the harmful effects they have on health<br>The connection between mental health and physical health<br>The importance of health education for promoting self-care for patients<br>The GMC's requirement that doctors protect patients and colleagues from any risk posed by their own health |
| **Clinical Skills** | Modification of explanations to match the intellectual, social and cultural background of individual patients<br>Patient centred care<br>Identification and utilisation of opportunities to promote health including positive role modelling |
| **Reference to other relevant** | • Nutrition (Module 5, Perioperative Care)<br>• Drugs and alcohol (Module 1, Pharmacology) |

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|---|---|
| **syllabus items** | • Screening (Module 1, Pathology)<br>• Child protection (Module 7, Surgical Care of the Paediatric Patient) |
| <u>Obesity</u> | |
| **Knowledge** | Classification of excess body mass<br>The health risks posed by obesity including an increased incidence of coronary heart disease, type 2 diabetes, hypertension, stroke, and some major cancers<br>Social, psychological and environmental factors that underpin obesity<br>Physiological and metabolic effects of obesity on the surgical patient<br>Available treatments for obesity including diet, exercise, medication and surgery |
| **Clinical Skills** | The ability to treat patients who are obese in a supportive and sensitive manner<br>Assess and explain the higher risks for obese individuals undergoing surgery<br>Management of cardiovascular, respiratory and metabolic complications in patients with obesity undergoing surgery<br>Provide advice and guidance about weight loss to overweight and obese patients within the context of a multidisciplinary team |
| <u>Dementia</u> | |
| **Knowledge** | Clinical features of dementia and the distinction between it and delirium<br>The impact of dementia on patient, family and carers<br>Principles and key provisions of the relevant legislation regarding the safeguarding of vulnerable adults across the UK, such as the Mental Capacity Act 2005 and the Adult Support and Protection (Scotland) Act 2007 |
| **Clinical Skills** | Recognises cognitive impairment and appropriately refers<br>Management of surgical patients in the context of their dementia<br>A range of techniques and strategies to communicate effectively with people with dementia and their carers/families<br>Assessment of capacity, involvement of advocates and documentation of consent and best interests |
| <u>Exercise and physical fitness</u> | |
| **Knowledge** | Physical inactivity as an independent risk factor for ill health and obesity<br>Relationship between physical exercise programmes and healthy eating and smoking cessation programmes<br>Government behaviour change programmes such as 'Let's Get Moving' and 'Shift into Sports' |
| **Clinical Skills** | Utilisation of all patient interactions as opportunities for health and fitness promotion with particular reference to the prevention and management of long-term chronic conditions such as coronary heart disease, diabetes, hypertension, obesity, cancer, osteoporosis, peripheral vascular disease and depression and the promotion of health and well being<br>Modification of advice on physical exercise to the specific requirements of individual patients |

**CORE NEUROSCIENCES**

| | |
|---|---|
| **TOPIC** | **Neuroanatomy** |
| **Category** | Core neurosciences |
| **Objective** | *To understand neuroanatomy and embryology* |
| **Knowledge** | Embryogenesis of the brain, spinal cord, skull and vertebral column including common anatomical variations and developmental abnormalities<br>Structure, blood supply, innervation and three-dimensional relationships of the scalp, skull, meninges, orbit, cranial fossae, cranial foraminae and cranial nerves<br>Structure, blood supply, innervation and three-dimensional relationships of the brain including cortical topography, projection and association tracts and organisation of the basal ganglia<br>Structure, organisation and connections of the cerebellum, pons and brainstem. The cranial nerves and their relationships, visual and auditory pathways.<br>Structure and three dimensional relationships of the ventricular system, choroid plexus, subarachnoid space and cisterns<br>The cerebral circulation system including the Circle of Willis and principle regional and segmental blood supply, venous drainage and dural sinuses<br>Structure, blood supply, innervation, surface and three-dimensional relationships of the vertebral column, spinal cord: ascending and descending tracts, spinal nerve roots and cauda equina<br>Sympathetic and parasympathetic pathways, visceral and pelvic innervation and the control of sphincter function<br>Brachial plexus, Lumbosacral plexus and the course, distribution and innervation of the major peripheral nerves |
| **Clinical Skills** | N/A |

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|---|---|
| **TOPIC** | **Neurophysiology** |
| **Category** | Core neurosciences |
| **Objective** | *To understand the functional organisation and integration of the central nervous system* |
| **Knowledge** | Structure and function of neurones and glial cells including synaptic function, action potentials and axonal conduction<br>Higher cerebral functions including sleep, coma, memory and disorders of the limbic system, control of motor function: ascending and descending pathways, basal ganglia and cerebellar function. the special senses<br>Functions of the autonomic nervous system and hypothalamic-pituitary function<br>Cerebral blood flow and metabolism including cerebral autoregulation and vasospasm, the blood brain barrier, cerebral oedema, cerebral ischaemia and neuroprotection<br>Intracranial pressure dynamics and CSF hydrodynamics - production and absorption |
| **Clinical Skills** | N/A |

| TOPIC | Neuropharmacology |
|---|---|
| **Category** | Core neurosciences |
| **Objective** | *To understand the principles of neuropharmacology* |
| **Knowledge** | Receptor and ion channel function<br>Neuropeptides and neurotransmitters<br>Principles of pharmacological neuroprotection<br>The pharmacology of anaesthetic agents, muscle relaxants, barbiturates, anticonvulsants and corticosteroids including:<br>• mechanisms of action<br>• pharmacodynamics<br>• interactions |
| **Clinical Skills** | N/A |

| TOPIC | Neuropathology |
|---|---|
| **Category** | Core neurosciences |
| **Objective** | *To understand the neuropathology of infection, inflammation, ischaemia, neoplasia and trauma affecting the nervous system* |
| **Knowledge** | Acute and chronic inflammatory processes in the CNS including demyelination<br>Bacterial, fungal and parasitic meningitis, encephalitis and abscess formation<br>Viral encephalitis<br>Slow viruses, CJD and vCJD<br>HIV associated infections, tumours and leucoencephalopathies<br>Cytopathology of neurones and glial in response to ischaemia, hypoxia and trauma<br>Diffuse axonal injury<br>Macroscopic brain and spinal cord injury including effects of brain shift, herniation and raised ICP<br>Classification, epidemiology and pathology of CNS tumours<br>Tumour biology, cell kinetics, tumour markers, immunocytochemistry |
| **Clinical Skills** | N/A |

| TOPIC | Neuroradiology |
|---|---|
| **Category** | Core neurosciences |
| **Objective** | *To understand the principles of neuroradiological imaging of the structure and function of the nervous system* |

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|---|---|
| **Knowledge** | Interpretation of plain radiographs of the skull and spine<br>Principles of computerised tomography of the brain, skull and spine<br>Interpretation of CT scans with particular reference to acute spinal disorders, cranial trauma, hydrocephalus, intracranial tumours and spontaneous intracranial haemorrhage<br>Principles of basic magnetic resonance imaging<br>Interpretation of MRI scans with particular reference to acute spinal disorders, cranial trauma, hydrocephalus and intracranial tumours<br>Principles of advanced magnetic resonance imaging including fMRI, DWI and spectroscopy<br>Interpretation of angiographic images: CTA, MRA and DSA<br>Principles of ultrasound including intraoperative and diagnostic use, doppler and the assessment of cerebral blood flow velocity<br>Principles and uses of PET and SPECT scanning |
| **Clinical Skills** | N/A |

| **TOPIC** | **Clinical neurophysiology** |
|---|---|
| **Category** | Core neurosciences |
| **Objective** | *To understand the basic principles of clinical neurophysiology* |
| **Knowledge** | Principles of electroencephalography<br>Principles of somatosensory, motor and brainstem evoked potential monitoring<br>Peripheral neuropathies and entrapment neuropathies including:<br>• structure and function of peripheral nerves<br>• use of nerve conduction studies<br>Disorders of the neuromuscular junction including:<br>• structure and function of smooth and striated muscle<br>• use of electromyographic studies |
| **Clinical Skills** | Interpretation of the results of EEG, EMG and NC studies |

| **TOPIC** | **Neuropsychology** |
|---|---|
| **Category** | Core neurosciences |
| **Objective** | *To understand the principles of neuropsychological assessment, application of the Mental Health Act* |
| **Knowledge** | The principles of neuropsychological assessment<br>Common neuropsychological problems associated with head injury, subarachnoid haemorrhage, hydrocephalus, structural lesions of the frontal and temporal lobes and disorders of the limbic system |
| **Clinical Skills** | Ability to undertake bed-side assessment of cognition and memory |

| **TOPIC** | **Neurological rehabilitation** |
|---|---|
| **Category** | Core neurosciences |

| | |
|---|---|
| **Objective** | *To understand the principles of neurological rehabilitation* |
| **Knowledge** | The principles of neurological rehabilitation including strategies to optimise the recovery of cognition, communication, continence, selective movement, gait, self-care, psychological stability, social adjustment and employment |
| **Clinical Skills** | N/A |

| | |
|---|---|
| **TOPIC** | **Medical ethics** |
| **Category** | Core neurosciences |
| **Objective** | *To understand the ethical issues that commonly arise in the management of patients with neurological disorders* |
| **Knowledge** | Criteria for the diagnosis of brainstem death<br>Diagnosis and management of persistent vegetative states<br>Prognosis in chronic progressive neurological disorders<br>Professional and statutory framework governing living directives and end-of-life decisions |
| **Clinical Skills** | Ability to empathise with and support patients and carers |

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|---|---|
| **TOPIC** | **Neurogenetics** |
| **Category** | Core neurosciences |
| **Objective** | *To understand the principles of neurogenetic studies and their relevance to clinical practice* |
| **Knowledge** | Inherited neurological disorders<br>Genetic control of neural connectivity<br>Inborn errors of metabolism<br>Molecular genetics of CNS tumours |
| **Clinical Skills** | N/A |

**COMMON NEUROLOGICAL PRESENTATIONS**

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|---|---|
| **TOPIC** | **Headache - acute and chronic** |
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with acute and chronic headache* |

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|---|---|
| **Knowledge** | The aetiology and differential diagnosis of acute and chronic headache including headache associated with:<br>• benign headache syndromes<br>• migraine, cluster headache and related syndromes<br>• space occupying lesions<br>• meningitic disorders<br>• intracranial haemorrhage<br>• trigemminal neuralgia<br>• atypical craniofacial pain syndrome<br>• Intracranial hypotension<br>Indications for investigation including scanning, lumbar puncture and angiography |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Weakness and paralysis** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with weakness and paralysis* |
| **Knowledge** | Common causes of ocular, cranial nerve, limb, trunk and respiratory muscle weakness |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Dizziness, unsteadiness and falls** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with dizziness, unsteadiness and falls* |
| **Knowledge** | Common causes of cerebellar, vestibular, extrapyrammidal and autonomic dysfunction |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| TOPIC | Pain and sensory loss |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with pain and sensory loss* |
| **Knowledge** | Common causes of musculoskeletal, neurogenic and neuropathic pain and sensory loss |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| TOPIC | Hearing disorder |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with hearing loss* |
| **Knowledge** | Common causes of conductive and sensorineural hearing loss<br>Principles of audiological assessment |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans<br>Interpretation of pure tone audiograms and auditory evoked potentials<br>Presentation and summary of cases |

| TOPIC | Visual disorder |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with visual disorders* |
| **Knowledge** | Patterns of visual loss in relation to common bulbar, retrobulbar, sellar, parasellar and optic pathway disorders<br>Analysis of diplopia and nystagmus in relation to common cranial nerve and brainstem disorders |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Use of computerised visual field assessment<br>Detailed fundoscopy<br>Establishing a neurological differential diagnosis<br>Planning investigation |

| | |
|---|---|
| | Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Language and speech disturbance** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with disturbances of language and speech* |
| **Knowledge** | Classification, causes and presentations of dysphasias, speech dyspraxia and dyslexia<br>Classification, causes and presentations of dysarthria<br>Role of speech and language therapists in assessment and treatment |
| **Clinical Skills** | Neurological history taking<br>Neurological examination with assessment of dysphasia and dysarthria<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Swallowing disorders** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with swallowing disorders* |
| **Knowledge** | Neurological causes of dysphagia<br>Indications for laryngoscopy, videofluoroscopy, nasogastric and percutaneous gastric feeding |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Disorders of the Sphincteric and sexual function** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with sphincteric disorders* |
| **Knowledge** | Common causes of sphincteric and sexual dysfunction<br>Interpretation of urodynamic studies |

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|---|---|
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Movement disorder** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with movement disorders* |
| **Knowledge** | Parkinson's disease<br>Iatrogenic movement disorders<br>Dystonic syndromes<br>Choreiform syndromes |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Memory and cognitive disorders** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with disorders of memory and cognition* |
| **Knowledge** | Disorders of memory and cognition associated with head injury, subarachnoid haemorrhage, hydrocephalus, structural lesions of the frontal and temporal lobes and disorders of the limbic system |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

| **TOPIC** | **Behavioural disorders** |
|---|---|
| **Category** | Common neurological presentations |
| **Objective** | *To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with behavioural disorders* |
| **Knowledge** | The common acute and chronic presentations of organic and psychiatric behavioural disorders relating to alcohol and drug abuse, encephalitis, organic |

| | |
|---|---|
| | dementia, and psychosis |
| **Clinical Skills** | Neurological history taking<br>Neurological examination<br>Establishing a neurological differential diagnosis<br>Planning investigation<br>Interpretation of scans and other investigations<br>Presentation and summary of cases |

**CRITICAL CONDITIONS**

| **TOPIC** | **Impaired consciousness and seizures** | **Phase 1 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency management of patients presenting with impaired consciousness and non-traumatic coma* | |
| **Knowledge** | Aetiology, pathophysiology and differential diagnosis of altered consciousness and coma<br>Assessment of the patient with impaired consciousness<br>The emergency management and investigation of patients with deteriorating levels of consciousness or seizures | |
| **Clinical Skills** | Clinical assessment of patients with impaired consciousness or seizures<br>Emergency management of patients with impaired consciousness or seizures<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Maintenance of airway<br>Endotracheal intubation<br>Lumbar puncture | |

| **TOPIC** | **Cranial trauma** | **Phase 1 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 3 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of head-injured patients* | |
| **Knowledge** | Anatomy and blood supply of the scalp, cranium, meninges and brain<br>Pathophysiology of head injury and of multiple trauma<br>Emergency, intensive care and ward-based management of patients with a head injury<br>Principles of operative interventions | |

| | | |
|---|---|---|
| | The detection and management of complications<br>Rehabilitation and prognosis of patients following a head injury<br>Principles, diagnosis and confirmation of brain stem death | |
| **Clinical Skills** | Clinical assessment of patients with a head injury<br>Emergency management of patients with a head injury<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Wound exploration, debridement and closure<br>Burr hole drainage of chronic subdural haematoma<br>Insertion of intracranial pressure monitor<br>Principles of trauma craniotomy for acute subdural and extradural haematomas | |

| **TOPIC** | **Acute hydrocephalus** | **Phase 1 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 3 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with acute hydrocephalus* | |
| **Knowledge** | The pathophysiology of CSF circulation<br>Applied surgical anatomy of the ventricular system<br>Emergency, intensive care and ward-based management of patients with acute hydrocephalus and shunt failure<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with hydrocephalus | |
| **Clinical Skills** | Clinical assessment of patients with acute hydrocephalus<br>Emergency management of patients with acute hydrocephalus<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture<br>Insertion and taping of CSF reservoirs<br>Insertion and maintenance of lumbar and ventricular drains<br>Insertion of external ventricular drain | |

| **TOPIC** | **Acute tumour presentations** | **Phase 1 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 2 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with intracranial tumours* | |

| | | |
|---|---|---|
| **Knowledge** | The neuropathology of primary and secondary intracranial tumours<br>Functional cerebral anatomy<br>Emergency, intensive care and ward-based management of patients with an intracranial tumour<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with a brain tumour | |
| **Clinical Skills** | Clinical assessment of patients with an acute tumour presentation<br>Emergency management of patients with an intracranial tumour<br>Interpretation of imaging studies including MRI and CT<br>Breaking bad news to patients and families | |
| **Technical Skills and Procedures** | None specified | |

| **TOPIC** | **Spontaneous intracranial haemorrhage** | **Phase 1 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 2 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with subarachnoid haemorrhages (SAH) and Spontaneous Intracerebral Haemorrhages (ICH)* | |
| **Knowledge** | Anatomy and Physiology of the cerebral arterial and venous circulations<br>Aetiology and pathophysiology of SAH and ICH<br>Emergency, intensive care and ward-based management of patients with spontaneous intracranial haemorrhage<br>Principles of operative and neuroradiological interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients following a spontaneous intracranial haemorrhage | |
| **Clinical Skills** | Clinical assessment of patients with a spontaneous intracranial haemorrhage<br>Emergency management of patients with an intracranial haemorrhage<br>Interpretation of imaging studies including MRI, CT and angiograms | |
| **Technical Skills and Procedures** | Lumbar puncture | |

| TOPIC | CNS infections | Phase 1 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 2 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of CNS infections* | |
| **Knowledge** | Aetiology and pathophysiology of CNS infections including surgery related infections, meningitis, cerebral abscess and subdural empyema<br>Microbiological pathogens and antibiotic selection<br>Emergency, intensive care and ward-based management of patients with CNS infections<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with CNS infections | |
| **Clinical Skills** | Clinical assessment of patients with CNS infections<br>Emergency management of patients with CNS infections<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture | |

| TOPIC | Spinal trauma | Phase 1 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 2 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of spinal trauma* | |
| **Knowledge** | Epidemiology of spinal trauma<br>Spinal biomechanics and the classification of injuries<br>Pathophysiology of spinal cord injury<br>Emergency, intensive care and ward-based management of patients with spinal injuries<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with a spinal injury | |
| **Clinical Skills** | Clinical assessment of patients with a spinal injury<br>Emergency management of patients with spinal trauma<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Use of external immobilisation including cervical collars<br>Application of cranial-cervical traction<br>Application of a halo-body jacket | |

| TOPIC | Spinal oncology | Phase 1 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 2 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of spinal oncology* | |
| **Knowledge** | The neuropathology of primary and secondary spinal tumours<br>Clinical presentations of intramedullary, intradural extramedullary, extradural and bony spinal tumours including malignant spinal cord compression<br>Emergency, intensive care and ward-based management of patients with spinal tumours<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with spinal tumours | |
| **Clinical Skills** | Clinical assessment of patients with a spinal tumour<br>Emergency management of patients with a spinal tumour<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | None specified | |

| TOPIC | Acute spinal disorders and cauda equina syndrome | Phase 1 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 3 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of acute spinal disorders especially cauda equina syndrome* | |
| **Knowledge** | Anatomy of the spine, spinal cord, autonomic and somatic nervous systems<br>Physiology of spinal cord function and control of the bladder<br>Pathophysiology of cauda equina syndrome, nerve root compression and spinal cord compression<br>Emergency, intensive care and ward-based management of patients with acute spinal disorders<br>Principles of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with acute spinal disorders | |
| **Clinical Skills** | Clinical assessment of patients with an acute spinal disorder<br>Emergency management of patients with an acute spinal disorder<br>Interpretation of imaging studies including MRI and CT | |

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|---|---|---|
| **Technical Skills and Procedures** | None | |

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|---|---|---|
| **TOPIC** | **Emergency paediatric neurosurgery** | **Phase 1 knowledge level** |
| **Category** | Critical conditions | 1 |
| **Objective** | *To achieve competence in the emergency management of paediatric neurosurgical patients* | |
| **Knowledge** | Paediatric physiology<br>Pathophysiology of hydrocephalus, head injury and acute presentations of tumours and intracranial haemorrhage in children of all ages<br>Child Safeguarding principles<br>Understanding of Children's rights and surgical consent | |
| **Clinical Skills** | Clinical assessment of children with acute neurosurgical disorders<br>Emergency management of children with acute neurosurgical disorders | |
| **Technical Skills and Procedures** | Lumbar puncture in children<br>Taping of CSF reservoirs in children | |

**INDEX PROCEDURES**

| | | |
|---|---|---|
| **TOPIC** | **Lumbar puncture and lumbar drain insertion** | **Phase 1 Technical Level** |
| **Category** | Index procedures | 4 |
| **Objective** | *To achieve competence in performing lumbar punctures and inserting lumbar drains* | |
| **Knowledge** | Indications and contraindications for diagnostic lumbar puncture<br>Anatomy of the spine and spinal cisterns<br>Interpretation of CSF microscopy and biochemistry | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic<br>Patient positioning<br>Skin preparation<br>Needle insertion and pressure measurement<br>Inserting, connecting and securing a lumbar drain<br>Post procedure care | |

| TOPIC | Insertion of ICP monitor | Phase 1 Technical Level |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve competence in the insertion of intraparenchymal ICP monitors* | |
| **Knowledge** | Indications for ICP monitoring<br>Applied anatomy of the skull vault<br>Calibration, zeroing and interpretation of ICP traces<br>Potential complications of the procedure | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic<br>Patient positioning<br>Skin preparation<br>Burr hole / twist drill fenestration and insertion of probe<br>Inserting, connecting and securing an ICP monitor<br>Post procedure care | |

| TOPIC | Burr hole evacuation of chronic subdural haematoma | Phase 1 Technical Level |
|---|---|---|
| **Category** | Index procedures | 2 |
| **Objective** | *To achieve competence in burr hole evacuation of chronic subdural haematomas* | |
| **Knowledge** | Pathophysiology of chronic subdural haematomas<br>Applied anatomy of the skull vault and subdural space<br>Indications for surgery<br>Surgical options<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic, and antibiotics<br>Patient positioning<br>Skin preparation<br>Burr hole fenestration and drainage of subdural haematoma<br>Closure<br>Post procedure care | |

| TOPIC | Insertion of EVD | Phase 1 Technical Level |
|---|---|---|
| **Category** | Index procedures | 2 |

| | | |
|---|---|---|
| **Objective** | *To achieve competence in inserting an EVD* | |
| **Knowledge** | Applied anatomy of the ventricles<br>Indications for surgery<br>Surgical options<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic, manitol and antibiotics<br>Patient positioning<br>Skin preparation<br>Burr hole fenestration and insertion of EVD<br>Inserting, connecting and securing an EVD<br>Post procedure care | |

| **TOPIC** | **Craniotomy** | **Phase 1 Technical Level** |
|---|---|---|
| **Category** | Index procedures | 2 |
| **Objective** | *To achieve competence in performing a craniotomy* | |
| **Knowledge** | Applied anatomy of the meninges, skull and scalp<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic, manitol and antibiotics<br>Patient positioning<br>Skin preparation<br>Skin incision and scalp management<br>Skull fenestration and use of a craniotome<br>Opening the dura<br>Closing a craniotomy<br>Post procedure care | |

| **TOPIC** | **Lumbar decompression (approach)** | **Phase 1 Technical Level** |
|---|---|---|
| **Category** | Index procedures | 2 |
| **Objective** | *To achieve competence in approach to decompressing the lumbar canal* | |
| **Knowledge** | Applied anatomy of the lumbar spine, discs, muscles and ligaments<br>Indications for surgery | |

| | | |
|---|---|---|
| | Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | Patient consent and preparation<br>Selection of appropriate equipment<br>Use of local anaesthetic and antibiotics<br>Patient positioning<br>Skin preparation<br>Skin incision and approach to the posterior elements<br>Closure<br>Post procedure care | |

**Phase 2 Neurosurgery Training**

**Overview**

During phase 2 trainees will consolidate the theoretical knowledge and clinical skills already gained during phase 1. They will develop their surgical judgement, decision making and operative competencies in:

- Emergency Neurosurgery including trauma (the general management of the head injured patients; surgical management of cranial trauma; neuro-intensive care of the head-injured patient and the role of post-traumatic neurological rehabilitation), infections (the general management of CNS infections e.g. ventriculitis, cerebral abscess, subdural empyema and spinal epidural abscess; the operative management of cerebral abscess by burr hole aspiration), acute hydrocephalus, intracranial haemorrhage and acute tumour presentations.
- Hydrocephalus including the assessment and operative management of adult patients with communicating and non-communicating hydrocephalus; the assessment of children with hydrocephalus; emergency external ventricular drainage in children with acute hydrocephalus and endoscopic third ventriculostomy.
- Neuro-Oncology including the multi-disciplinary management of patients with intracranial neoplasia; image-guided surgery applied to the management of patients with intracranial tumours; the operative management of supra-tentorial intrinsic tumours and the operative management of convexity meningiomas.
- Skull Base and Pituitary Surgery including management of the majority of cases, including acquisition of transferrable microsurgical skills and the surgical treatment of pituitary tumours.
- Neurovascular Surgery including management of all patients with acute presentations of neurovascular conditions including subarachnoid haemorrhage, intraparenchymal haemorrhage, intraventricular haemorrhage and massive cerebral or cerebellar infarctions
- Pain, Epilepsy and Functional including management of trigeminal neuralgia, seizures and movement disorders. Complications of procedures including infected or malfunctioning implants
- Spinal Surgery including management of patients with acute and elective presentations of cervical and lumbar spinal degenerative disease requiring operative intervention (eg disc prolapse causing radiculopathy, cauda equina syndrome or myelopathy). Emergency and surgical management of spinal infection, oncological disease and trauma. Extramedullary spinal cord tumours including the general and surgical management of patients with malignant spinal cord compression.
- Paediatric Neurosurgery including the emergency management of children with raised intracranial pressure, including operative management where delay due to transfer time will cause harm to the patient. Possible causes include traumatic brain swelling, intracranial haemorrhage (trauma or spontaneous), brain tumours and hydrocephalus. Elective management of paediatric hydrocephalus.
- Peripheral Nerve Surgery including the diagnosis of compressive lesions

By the end of phase 2, the standard expected is that a trainee can demonstrate the knowledge, clinical and professional skills of a day-one consultant and the ability to acquire microsurgical skills in Neurosurgery as defined by the syllabus. This is assessed at the ARCP. The ISB examination in Neurosurgery will normally be achieved by completion of phase 2.

**Phase 2 Capability in Practice**

| Capability in practice | Indicative supervision level |
|---|---|
| 1. Manages an outpatient clinic | Level III |
| 2. Manages the unselected emergency take | Level III |
| 3. Manages ward rounds and the on-going care of inpatients | Level III |
| 4. Manages an operating list | Level III |
| 5. Manages multi-disciplinary working | Level III |

**Phase 2 Critical conditions**

| Critical condition | Assessed by | Indicative knowledge level |
|---|---|---|
| Impaired consciousness and seizures | CBD or CEX | 4 |
| Cranial trauma | CBD or CEX | 4 |
| Spontaneous intracranial haemorrhage | CBD or CEX | 4 |
| Acute hydrocephalus | CBD or CEX | 4 |
| Intracranial tumours | CBD or CEX | 4 |
| CNS infections | CBD or CEX | 4 |
| Spinal trauma | CBD or CEX | 4 |
| Spinal oncology | CBD or CEX | 4 |
| Degenerative spinal disorders | CBD or CEX | 4 |
| Emergency paediatric neurosurgery | CBD or CEX | 4 |

**Phase 2 Index procedures**

| Index procedure | Assessed by | Indicative number (excluding assisted) by certification | Indicative skill level expected by the end of phase 2 |
|---|---|---|---|
| Advanced adult supratentorial | PBA | 10 | 3 |
| Endoscopic and transphenoidal | PBA | 10 | 3 |
| Convexity and falcine meningiomas | PBA | 10 | 3 |
| Advanced adult infratentorial | PBA | 10 | 3 |
| Intradural spine | PBA | 5 | 3 |
| Complex spinal fusion | PBA | 10 | 3 |
| Advanced paediatric supratentorial | PBA | 1 | 2 |
| Advanced paediatric infratentorial | PBA | 1 | 2 |

**Clinical Placements in Phase 2**

Clinical placements in Phase 2 will ensure that trainees are exposed to all areas of Neurosurgical practice. Trainees must participate in a neurosurgical on-call rota.

All trainees will undertake a minimum six-month placement in a paediatric neurosurgery service under the direct supervision of paediatric neurosurgeons with a full-time or major commitment to paediatric surgery. The service must provide a comprehensive range of paediatric neurosurgical care (with the exception of supra-regional services) and have an annual operative workload of at least 150 cases.

Trainees at ST3 level will need high levels of support especially when on call. Local arrangements should be made to provide this support and should include a named more senior trainee providing cover on call, mentoring from a more senior registrar colleague and rota flexibility to ensure ST3 trainees are not exposed to high risk shifts too early.

The organisation of clinical placements is at the discretion of the programme director. The following principles apply:

- The Shape of Training review identified that training is optimal in longer (6 month) rather than shorter (4 month) attachments
- Training programme directors will be familiar with parts of their training programme that provide training in key areas. Training surveys and logbook data can also be used to provide this information.
- Trainees should be placed flexibly in posts that support their training needs
- Trainees on placements should receive training and are not primarily in these placements to support service requirements

**Phase 2 Topics**

**Cranial Trauma**

| **TOPIC** | **Early and surgical management of the head injured patient** |
|---|---|
| **Category** | Cranial Trauma |
| **Objective** | *To achieve competence in all aspects of the general and surgical management of head-injured patients* |
| **Knowledge** | Epidemiology and Outcomes of head injury<br>Pathophysiology of head injury and of multiple trauma<br>Emergency management of head injury<br>Assessment and investigation of the patient with a head injury<br>Medical management of acutely raised intracranial pressure<br>Surgical management of head injury<br>Indications for operative intervention<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Surgical approaches<br>Complications of surgery and their management<br>Indications for endoscopic and open closure of traumatic CSF fistulae |

| | |
|---|---|
| **Clinical Skills** | Clinical assessment of the head-injured and multiply-injured patient<br>Prioritisation of clinical risk<br>Interpretation of CT scans and plain radiology<br>Ability to assess and advise on the transfer of head-injured patient using image-transfer and telemedicine |
| **Technical Skills and Procedures** | Craniotomy for supra and infratentorial extradural, subdural and intracerebral haematomas<br>Lobectomy for haemorrhagic contusion<br>Decompressive bifrontal craniotomy with extensive durotomy<br>Subfrontal extradural or subdural repair of anterior fossa fractures<br>Elevation of compound depressed skull fracture with dural repair<br>Delayed cranioplasty of the skull vault<br>Craniofacial repair of a CSF leak |

| **TOPIC** | **Neuro-intensive care and ward-based care of the head-injured patient** |
|---|---|
| **Category** | Cranial Trauma |
| **Objective** | *To achieve competence in the neurointensive care of head-injured patients* |
| **Knowledge** | Pathophysiology of head injury<br>The management of raised intracranial pressure, impaired intracranial compliance, and cerebral ischaemia<br>Prevention and management of secondary insults |
| **Clinical Skills** | Assessment of the unconscious patient<br>Use and interpretation of multimodality cerebral monitoring<br>Interpretation of CT scans<br>Ability to advise on management of secondary complications and further surgical intervention |
| **Technical Skills and Procedures** | Insertion of ICP monitor |

| **TOPIC** | **Neurological rehabilitation following head injury** |
|---|---|
| **Category** | Cranial Trauma |
| **Objective** | *To understand the role of post-traumatic neurological rehabilitation* |
| **Knowledge** | The natural history of recovery from head injury<br>Understanding of neurological, cognitive and behavioural disabilities following mild and severe head injury<br>Risks of post-traumatic epilepsy and its management<br>Concussion and sports related head injury |
| **Clinical Skills** | Ability to contribute to the multi-disciplinary assessment of head injured patients<br>Ability to advise family and carers regarding prognosis, professional and lay support |

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| **Technical Skills and Procedures** | None specified |

**CSF Pathologies**

| **TOPIC** | **Hydrocephalus** |
|---|---|
| **Category** | CSF pathologies |
| **Objective** | *To achieve competence the assessment and operative management of patients with communicating and non-communicating hydrocephalus.* |
| **Knowledge** | The pathophysiology of CSF production, circulation and absorbtion<br>Applied surgical anatomy of the ventricular system<br>Shunt technology including valve design and antibiotic impregnation of catheters<br>Indications for external ventricular drainage, ventriculoperitoneal shunting, lumbar CSF drainage and shunting, endoscopic third ventriculostomy<br>Complications of surgery<br>Normal pressure hydrocephalus |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with hydrocephalus, including interpretation of CT and MRI scans and identification of shunt malfunction<br>Identification of papillodoema<br>Interpretation of pressure studies and CSF infusion studies |
| **Technical Skills and Procedures** | Insertion of ICP monitor<br>Lumbar subarachnoid drainage and lumbar puncture<br>External ventricular drainage<br>Primary and revision procedures on ventriculoperitoneal shunts in all age groups<br>Use of 3-D image-guidance or ultrasound for difficult ventricular cannulation<br>Lumbo-peritoneal shunt<br>Endoscopic third ventriculostomy |

| **TOPIC** | **Idiopathic and Venous Intracranial Hypertension** |
|---|---|
| **Category** | CSF pathologies |
| **Objective** | *To achieve competence the assessment and operative management of adult patients with raised intracranial pressure from venous or idiopathic causes.* |
| **Knowledge** | The pathophysiology and differential diagnosis of idiopathic and venous intracranial hypertension<br>Applied surgical anatomy of the venous system<br>Assessment and investigation of patients with idiopathic intracranial hypertension<br>Medical management of idiopathic intracranial hypertension<br>Indications for ICP pressure monitoring, lumbar puncture, lumbo-peritoneal shunt, ventriculoperitoneal shunt, subtemporal decompression, optic nerve fenestration and vascular stenting<br>Complications of surgery and their management |

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|---|---|
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with idiopathic intracranial hypertension, including interpretation of imaging and pressure studies and identification of shunt malfunction<br>Identification of papillodoema |
| **Technical Skills and Procedures** | Insertion of ICP monitor<br>Lumbar puncture<br>Primary and revision procedures on ventriculoperitoneal and lumbo-peritoneal shunts<br>Use of 3-D image-guidance or ultrasound for difficult ventricular cannulation |

| **TOPIC** | **Arachnoid cysts** |
|---|---|
| **Category** | CSF pathologies |
| **Objective** | *To achieve competence in the management of cranial and spinal arachnoid cysts* |
| **Knowledge** | The pathogenesis, grading and natural history of arachnoid cysts<br>Indications for surgical intervention<br>Selection of surgical approach including endoscopic, open fenestration and shunting<br>Complications of surgery |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with an arachnoid cyst<br>Interpretation of imaging studies |
| **Technical Skills and Procedures** | Endoscopic fenestration of arachnoid cyst<br>Open fenestration of arachnoid cyst<br>Shunting of arachnoid cyst |

| **TOPIC** | **Hindbrain Herniation and Syringomyelia** |
|---|---|
| **Category** | CSF pathologies |
| **Objective** | *To achieve competence in the management of craniocervical stenosis, hindbrain herniation and syringomyelia* |
| **Knowledge** | The pathogenesis and natural history of hindbrain herniation, cranicervical stenosis, syringomyelia and syringobulbia<br>Familiarity with craniocervical congenital and acquired bony or ligamentous anomalies<br>Indications for foramen magnum decompression or direct approaches to a syrinx<br>Applied surgical anatomy of the craniocervical junction and spinal cord<br>Selection of surgical approaches<br>Principles of peri-operative care<br>Complications of surgery |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with hind brain anomalies<br>Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms and 3D spinal reconstructions |

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|---|---|
| **Technical Skills and Procedures** | Foramen magnum decompression<br>Syringostomy and syringo-pleural shunting |

**Neuro-oncology**

| **TOPIC** | **General principles of neuro-oncology** |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the multi-disciplinary management of patients with intracranial neoplasia* |
| **Knowledge** | Classification, natural history and pathology including molecular classification, of benign and malignant intracranial neoplasia and cysts<br>Genetic tumour syndromes including neurofibromatosis, tuberous sclerosis, von HippelLindau, multiple endocrine neoplasia, Turcot's and Li Fraumeni<br>Pathophysiology of raised intracranial pressure associated with space occupying tumours<br>Diagnostic imaging of intracranial tumours including the interpretation of CT and MRI scans and the role of advanced imaging including spectroscopy, PET and SPECT<br>Principles of fractionated radiotherapy, stereotactic radiotherapy and radiosurgery including proton beam therapy<br>Role of chemotherapy and immunotherapy<br>Principles of clinical trials and their application to neuro-oncology<br>Principles of palliative care |
| **Clinical Skills** | Clinical assessment of patients with raised intracranial pressure and space occupying lesions<br>Ability to contribute to the multi-disciplinary management of patients with intracranial neoplasia<br>Empathetic communication with patients and families |
| **Technical Skills and Procedures** | None specified |

| **TOPIC** | **Intrinsic tumours** |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the operative management of Intrinsic tumours* |
| **Knowledge** | Pathology of glial tumours, lymphomas, metastases and benign intrinsic tumours including haemangioblastoma.<br>Indications for surgery<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Complications of surgery<br>An understanding of the principles and practice of frameless image-guided surgery, the principles of frame-based stereotactic surgery and the place of |

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| | robotic surgery<br>Principles and practice of awake craniotomy<br>Techniques to maximise resection margins whilst avoiding eloquent cerebral cortex |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with intrinsic tumours<br>Interpretation of CT and MRI scans<br>Ability to work with the multidisciplinary team |
| **Technical Skills and Procedures** | Familiarity with image guidance set up and use<br>Craniotomy for intrinsic tumours of the cerebral cortex and posterior fossa including convexity, midline, suboccipital and retrosigmoid approaches<br>Image-guided biopsy of intrinsic tumours<br>Use of pre-operative and intra-operative techniques to identify eloquent brain<br>Use of pre-operative and intra-operative techniques to maximise tumour resection |

| **TOPIC** | **Meningiomas** |
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| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the operative management of mengingiomas* |
| **Knowledge** | Pathology and grading of meningiomas and solitary fibrous tumours<br>Treatments for meningiomas including watch and wait, radiotherapy, stereotactic radiosurgery and the indications for surgery<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Complications of surgery |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with convexity, midline, lateral skull base, olfactory groove and intraventricular meningiomas |
| **Technical Skills and Procedures** | Resection of convexity meningioma<br>Resection of parasagittal and falcine meningiomas<br>Resection of olfactory grove meningioma<br>Resection of lateral skull base meningioma |

| **TOPIC** | **Cerebellopontine angle tumours** |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the management of patients with cerebellopontine angle tumours* |
| **Knowledge** | Pathology of Vestibular schwannomas, meningiomas, glomus tumours, dermoid and epidermoid cysts including knowledge of Neurofibromatosis type II.<br>Relative indications for surgery, radiosurgery and conservative management<br>Principles of intra-operative management of patients undergoing resection of CP angle tumours including Principles and application of cranial nerve and brainstem monitoring<br>Applied microsurgical anatomy of the CP angle, brainstem and lower cranial |

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| | nerves<br>Relative indications for retrosigmoid, middle fossa, and translabyrinthine approaches with respect to hearing preservation, tumour size and position |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with CP angle tumours<br>Interpretation of CT and MR scans |
| **Technical Skills and Procedures** | Retrosigmoid approach<br>Subarachnoid dissection and exposure of the tumour and lower cranial nerves<br>Subtotal microsurgical resection of acoustic neuroma |

| **TOPIC** | **Sellar and suprasellar mass lesions** |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in transphenoidal and cranial approaches to sellar and suprasellar mass lesions* |
| **Knowledge** | Pathology of pituitary adenoma, craniopharyngioma and Rathke's cleft cyst<br>Pathophysiology of the hypothalamic-pituitary axis<br>Investigation of patients with hypothalamic-pituitary axis lesions<br>Medical treatments for pituitary adenomas and for pituitary failure<br>Indications for surgery<br>Selection of surgical approaches: pterional, interhemispheric, endoscopic or microsurgical transphenoidal<br>Applied surgical anatomy of the skull base<br>Principles of peri-operative care<br>Complications of surgery and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with pituitary, sellar and parasellar tumours<br>Interpretation of CT and MRI scans |
| **Technical Skills and Procedures** | Endoscopic and microsurgical transphenoidal approach<br>Pterional craniotomy for pituitary adenoma or craniopharyngioma |

| TOPIC | Intraventricular and pineal region tumours |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the management of patients with pineal region and third ventricular tumours including colloid cysts* |
| **Knowledge** | Pathology of pineal region and intraventricular mass lesions including pineocytoma, pineoblastoma, germ cell tumours, meningiomas, choroid plexus tumours, glioneuronal tumours and colloid cysts<br>Assessment of patients with pineal region tumours including the role of tumour markers<br>Emergency management of patients presenting with hydrocephalus from a pineal or intraventricular mass<br>Relative indications for surgery, radiosurgery and conservative management<br>Applied surgical anatomy of midline structures<br>Selection of surgical approaches including principles of endoscopic biopsy and/or resection<br>Principles of intra-operative management of patients undergoing resection of pineal and ventricular tumours including colloid cysts<br>Complications of surgery and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with intraventricular and pineal region tumours<br>Interpretation of CT and MRI scans |
| **Technical Skills and Procedures** | Insertion of EVD and VP shunt<br>Interhemispheric and transcortical approach to the lateral and third ventricle<br>Endoscopic biopsy of tumours, endoscopic third venriculostomy and endoscopic excision of colloid cyst |

| TOPIC | Skull and skull base tumours |
|---|---|
| **Category** | Neuro-oncology |
| **Objective** | *To achieve competence in the assessment of patients with skull and skull base lesions* |
| **Knowledge** | Pathology of skull and skull base abnormalities including fibrous dysplasia, lytic skull lesions, chordoma, chondrosarcoma and esthesioneuroblastoma, cranial nerve schwannomas, paragangliomas, adenoid cystic carcinomas, angiofibromas and nasopharyngeal carcinomas<br>Assessment of patients with skull base mass lesions especially with regards to cranial nerve and vascular involvement<br>Relative indications for surgery, radiotherapy, radiosurgery, proton beam therapy and conservative management<br>Applied surgical anatomy of midline structures<br>Complications of surgery and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with mass lesions in the skull base or skull.<br>Interpretation of CT and MRI scans |

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| **Technical Skills and Procedures** | Resection of convexity skull lesion |

**Neurovascular**

| **TOPIC** | **Primary intracerebral haemorrhage** |
|---|---|
| **Category** | Neurovascular |
| **Objective** | *To achieve competence in the operative management of space-occupying spontaneous intracerebral haematomas* |
| **Knowledge** | Aetiology of supra and infratentorial intracerebral haemorrhage<br>Pathophysiology of spontaneous intracerebral haemorrhage<br>Indications for surgical evacuation<br>Management strategies to reduce the risk of intra-operative re-bleeding in presence of suspected aneurysm or AVM including partial haematoma evacuation, pre or post-operative embolisation and definitive surgical treatment |
| **Clinical Skills** | Assessment of patients with intracerebral haematomas and raised intracranial pressure<br>Interpretation of CT and MRI scans and identification of probable aetiology<br>Indications for and interpretation of CT, MR and digital subtraction angiography |
| **Technical Skills and Procedures** | Insertion of external ventricular drain<br>Craniotomy for supratentorial haematoma<br>Decompressive craniectomy |

| **TOPIC** | **Aneurysmal subarachnoid haemorrhage** |
|---|---|
| **Category** | Neurovascular |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of aneurysmal subarachnoid haemorrhage* |
| **Knowledge** | Pathophysiology and general management of subarachnoid haemorrhage<br>Investigation of patients with subarachnoid haemorrhage<br>Management of non-aneurysmal subarachnoid haemorrhage<br>Relative indications for endovascular and surgical interventions<br>Prevention and management of delayed cerebral ischaemia, cerebral vasospasm and hydrocephalus |
| **Clinical Skills** | Clinical assessment and investigation of patients with aneurysmal SAH<br>Non operative management of patients with aneurysmal SAH<br>Management of delayed cerebral ischaemia |
| **Technical Skills and Procedures** | External ventricular drainage<br>Lumbar subarachnoid drainage<br>Ventriculoperitoneal shunting |

| TOPIC | Intracranial aneurysms |
|---|---|
| **Category** | Neurovascular |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of ruptured and unruptured intracranial aneurysms* |
| **Knowledge** | Aetiology, epidemiology and natural history of unruptured and ruptured intracranial aneurysms<br>Angiographic and microsurgical anatomy of the cerebral circulation<br>Indications for surgical management of intracranial aneurysms by clipping, trapping, microsurgical reconstruction and microvascular bypass<br>Complications of surgery and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with ruptured and unruptured aneurysms<br>Interpretation of CT, MR and catheter angiography |
| **Technical Skills and Procedures** | Standard pterional and subfrontal approaches |

| TOPIC | Vascular malformations |
|---|---|
| **Category** | Neurovascular |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of vascular malformations* |
| **Knowledge** | Pathogenesis, aetiology, epidemiology and natural history of intracranial vascular malformations including AVMs, A-V fistulas, cavernomas and venous malformations<br>Pathogenesis, aetiology, epidemiology and natural history of spinal vascular malformations including AVMs, A-V fistulas and cavernomas.<br>Angiographic and microsurgical anatomy of the cerebral and spinal circulation<br>Indications for embolisation and radiosurgery<br>Indications for surgical management of malformations<br>Complications of surgery, embolisation, Stereotactic radiosurgery and their management, including hyperperfusion syndromes |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with vascular malformations<br>Interpretation of CT, MR and catheter angiography |
| **Technical Skills and Procedures** | Image-guided craniotomy and exposure of supratentorial AVM<br>Image guided craniotomy and resection of cavernoma<br>Ligation of spinal A-V fistula |

| TOPIC | Occlusive cerebrovascular disease |
|---|---|
| **Category** | Neurovascular |
| **Objective** | *To achieve competence in the clinical management of occlusive cerebrovascular disease* |

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| **Knowledge** | The epidemiology, natural history and pathophysiology of extra- and intracranial atherosclerotic occlusive disease<br>The epidemiology, natural history and pathophysiology of non-atherosclerotic occlusive diseases<br>Principles of regional cerebral blood flow and metabolism measurement and imaging using CT and MRI perfusion techniques; SPECT and PET scanning<br>Role of decompressive craniectomy in treating stroke<br>Indications for stroke thrombolysis<br>Principles of cerebral revascularisation by indirect synangiosis, low-flow EC-IC anastomosis and high flow EC-IC bypass grafting<br>Indications for surgical treatment of carotid artery atherosclerosis |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients undergoing surgery for occlusive cerebrovascular disease<br>Interpretation of CT, MR and digital subtraction angiography |
| **Technical Skills and Procedures** | Decompressive craniectomy |

**CNS Infection**

| **TOPIC** | **Intracerebral abscess and subdural empyema** |
|---|---|
| **Category** | CNS infection |
| **Objective** | *To achieve competence in the management of patients with CNS infections including ventriculitis, cerebral abscess and subdural empyema* |
| **Knowledge** | The aetiology and pathophysiology of intracranial sepsis including atypical infections such as TB, parasites and fungi<br>Indications for burr hole drainage, ventricular drainage and craniotomy in the management of intracranial sepsis<br>Indications for combined otorhinological procedures<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Surgical complications |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with intracranial sepsis<br>Interpretation of CT and MRI scans<br>Management of anti-microbial therapy |
| **Technical Skills and Procedures** | Image guided burr hole drainage of intracerebral abscess<br>Insertion of external ventricular drain<br>Craniotomy for subdural empyema, including parafalcine and retrosigmoid approaches<br>Craniotomy and resection of frontal, temporal and cerebellar abscess |

**Spinal Trauma**

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|---|---|
| **TOPIC** | **General management of the spinal injury patient** |
| **Category** | Spinal trauma |
| **Objective** | *To achieve competence in all aspects of the non-operative management of spinal injury patients.* |
| **Knowledge** | Pathophysiology of spinal cord injury<br>Classification of spinal fractures<br>Biomechanics of spinal stability<br>Indications for traction and external stabilization<br>Indications for and principles of open reduction and stabilization<br>Principles of spinal injury rehabilitation |
| **Clinical Skills** | Clinical assessment of the spinal injury patient<br>Management of spinal shock<br>Interpretation of plain radiology, CT and MRI scans<br>Liaison with spinal injury units |
| **Technical Skills and Procedures** | Use of external immobilisation including cervical collars<br>Application of cranial-cervical traction<br>Application of a halo-body jacket |

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| **TOPIC** | **Cervical spine fractures** |
| **Category** | Spinal trauma |
| **Objective** | *To achieve competence in the general management of fractures of the cervical spine* |
| **Knowledge** | Pathophysiology of spinal cord injury and the classification of fractures in the axial and sub-axial cervical spine<br>Biomechanics of spinal instability<br>Cervical spine fractures associated with Ankylosing spondylitis<br>Indications for traction and external stabilization<br>Indications for and principles of open reduction, decompression and internal fixation |
| **Clinical Skills** | Clinical assessment of the spinal injury patient<br>Management of spinal shock<br>Interpretation of plain radiology, CT and MRI scans<br>Liaison with spinal injury units<br>Counselling and pre-operative preparation of spinal injury patients |
| **Technical Skills and Procedures** | Application of cranial-cervical traction<br>Anterior cervical discectomy or corpectomy, insertion of cage and plating<br>Posterior cervical decompression and fusion using lateral mass screws |

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| **TOPIC** | **Thoraco-lumbar fractures** |
| **Category** | Spinal trauma |
| **Objective** | *To achieve competence in the general management of thoracolumbar fractures* |
| **Knowledge** | Pathophysiology of spinal cord injury and the classification of thoracolumbar fractures<br>Biomechanics of spinal instability<br>Indications for open reduction, decompression and stabilisation |
| **Clinical Skills** | Clinical assessment of the spinal injury patient<br>Management of spinal shock<br>Interpretation of plain radiology, CT and MRI scans<br>Liaison with spinal injury units<br>Counselling and pre-operative preparation of spinal injury patients |
| **Technical Skills and Procedures** | N/A |

**Spinal Oncology**

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|---|---|
| **TOPIC** | **Malignant extradural spinal tumours** |
| **Category** | Spinal oncology |
| **Objective** | *To achieve competence in the general management of patients with malignant spinal cord compression and their surgical management.* |
| **Knowledge** | The pathophysiology of spinal cord compression<br>The classification, aetiology and natural history of vertebral metastases and primary bony tumours of the vertebral column including lymphoma<br>Spinal instability associated with vertebral malignancy<br>Role of primary radiotherapy and adjuvant radiotherapy or chemotherapy<br>Indications for surgical intervention and the principles of operative spinal decompression and stabilisation of patients with spinal cord metastases.<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Complications of surgery |
| **Clinical Skills** | Clinical assessment of patients with malignant spinal cord compression<br>Interpretation of plain radiology, CT and MRI scans<br>Liaison with medical and radiation oncologists<br>The assessment, counselling and pre-operative preparation of patients with malignant spinal cord compression |
| **Technical Skills and Procedures** | Emergency posterior spinal decompression |

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| **TOPIC** | **Intradural extramedullary and intramedullary tumours** |
| **Category** | Spinal oncology |
| **Objective** | *To achieve competence in the management of patients with intradural tumours* |
| **Knowledge** | Classification, natural history and molecular biology of intradural extramedullary spinal tumours including neurofibroma, schwannoma, meningioma, ependymoma and intramedullary tumours including ependymoma, astrocytoma, cavernoma and haemangioblastoma.<br>Pathophysiology of spinal cord compression<br>Indications for surgery and selection of surgical approach<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Complications of surgery and their management<br>Awareness of the principles of spinal cord monitoring |
| **Clinical Skills** | Assessment, counselling and pre-operative preparation of patients with intradural spinal tumours<br>Interpretation of spinal MRI scans |
| **Technical Skills and Procedures** | Microsurgical excision of intradural extramedullary tumours |

**Spinal Degenerative Disease**

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| **TOPIC** | **Lumbar radiculopathies** |
| **Category** | Spinal degenerative disease |
| **Objective** | *To achieve competence in the surgical management of lumbar compressive radiculopathy* |
| **Knowledge** | Differential diagnosis especially peripheral neuropathies and spinal cord pathologies<br>Indications for operative management of lumbar radiculopathies<br>Classification of spondylolisthesis and indications for surgical fixation<br>Applied surgical anatomy of the lumbar spine with particular reference to degenerative neural compression and morphological variations in vertebral anatomy<br>Selection of minimally-invasive approaches<br>Principles of peri-operative care<br>Complications of surgery |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with lumbar radiculopathies<br>Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms |
| **Technical Skills and Procedures** | Lumbar microdiscectomy<br>Microsurgical lateral recess decompression<br>Posterior decompression (laminotomy, hemilaminectomy etc)<br>Revisional lumbar microsurgical discectomy with and without decompression |

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| | Microsurgical lumbar discectomy for central disc protrusion with cauda equina compression |

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| **TOPIC** | **Compressive cervical myeloradiculopathies** |
| **Category** | Spinal degenerative disease |
| **Objective** | *To achieve competence in the surgical management of compressive cervical myeloradiculopathies* |
| **Knowledge** | Differential diagnosis especially motor neurone disease, transverse myelitis and peripheral neuropathies.<br>Indications for operative management of cervical myeloradiculopathies<br>Applied surgical anatomy of the cervical spinal column with particular reference to the relationships between the bony elements, spinal cord, nerve roots and vertebral arteries<br>Recognition and appropriate management of ossification of the posterior longtitudinal ligament, ankylosing spondylitis and cervical deformity<br>Selection of surgical approaches<br>Principles of peri-operative care<br>Complications of surgery |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with cervical myeloradiculopathies<br>Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms |
| **Technical Skills and Procedures** | Anterior cervical discectomy with and without fusion<br>Anterior cervical corpectomy and fusion<br>Posterior cervical foraminotomy<br>Posterior cervical laminectomy, skip laminectomy, split laminectomy of trap door laminoplasty |

**Spinal Infection**

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| **TOPIC** | **Spinal epidural abscess** |
| **Category** | Spinal infection |
| **Objective** | *To achieve competence in the operative management of spinal epidural abscess* |
| **Knowledge** | The aetiology and pathophysiology of spinal epidural abscess<br>Indications for drainage of spinal epidural abscess by laminectomy or multiple laminotomies<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Surgical complications and their management<br>Principles of peri-operative care |

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| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with spinal sepsis<br>Interpretation of spinal CT and MRI scans<br>Management of anti-microbial therapy |
| **Technical Skills and Procedures** | Drainage of spinal epidural abscess by laminectomy or multiple laminotomies |

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| **TOPIC** | **Vertebral osteomyelitis and discitis** |
| **Category** | Spinal infection |
| **Objective** | *To achieve competence in the operative management of vertebral osteomyelitis and discitis* |
| **Knowledge** | The aetiology and pathophysiology of vertebral osteomyelitis and discitis, including pyogenic, tuberculous and atypical infections<br>Indications for percutaneous and open biopsy<br>Indications for spinal stabilization<br>Principles of peri-operative care<br>Surgical complications and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with spinal sepsis<br>Interpretation of spinal CT and MRI scans<br>Management of anti-microbial therapy |
| **Technical Skills and Procedures** | Transpedicular and open vertebral and disc biopsy |

**Pain, Epilepsy and Functional**

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| **TOPIC** | **Movement disorders** |
| **Category** | Pain, epilepsy and functional |
| **Objective** | *To understand the management of patients with movement disorders* |
| **Knowledge** | The aetiology and pathophysiology of movement disorders<br>Indications for medical, minimally-invasive and surgical management<br>Principles of deep brain stimulation for movement disorders<br>Complications of surgery and their management |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of patients with movement disorders |
| **Technical Skills and Procedures** | Management of complications of devices used to treat movement disorders |

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| **TOPIC** | **Chronic pain** |
| **Category** | Pain, epilepsy and functional |

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| **Objective** | *To understand the management of patients with chronic pain syndromes* |
| **Knowledge** | The aetiology and pathophysiology of chronic pain syndromes<br>Indications for medical, minimally-invasive and surgical management<br>Principles of deep brain stimulation, rhizotomy and lesioning for pain<br>Complications of surgery and their management |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of chronic pain patients<br>Pre-operative counselling and preparation |
| **Technical Skills and Procedures** | Management of complications of devices used to treat pain |

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| **TOPIC** | **Trigeminal neuralgia and hemifacial spasm** |
| **Category** | Pain, epilepsy and functional |
| **Objective** | To achieve competence in the surgical aspects of the multi-disciplinary management of patients with trigeminal neuralgia |
| **Knowledge** | Aetiology, epidemiology and natural history of trigeminal neuralgia and hemifacial spasm<br>Differential diagnosis and management of related cranio-facial pain syndromes<br>Medical management of cranio-facial pain<br>Surface anatomy of the trigeminal and facial nerves and microsurgical anatomy of the CP angle<br>Indications for surgical management of trigeminal neuralgia by peripheral neurectomy, percutaneous rhizotomy, radiofrequency rhizotomy, microvascular decompression or stereotactic radiosurgery<br>Complications of surgery and their management |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with trigeminal neuralgia or hemifacial spasm<br>Interpretation of posterior fossa CT and MRI scans |
| **Technical Skills and Procedures** | Microvascular decompression of the trigeminal or facial nerve<br>Percutaneous trigeminal rhizotomy |

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| **TOPIC** | **Epilepsy** |
| **Category** | Pain, epilepsy and functional |
| **Objective** | *To understand the management of patients with idiopathic and lesional epilepsy* |
| **Knowledge** | The aetiology and pathophysiology of idiopathic and lesional epilepsy<br>Indications for medical and surgical management<br>The assessment and surgical work-up for patients with seizures |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of epilepsy patients<br>Interpretation of CT, MRI and SPECT scans<br>Pre-operative counselling and preparation |
| **Technical** | Management of complications of devices used to treat epilepsy |

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| **Skills and Procedures** | |

**Paediatrics**

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| **TOPIC** | **Paediatric head and spinal injury** |
| **Category** | Paediatrics |
| **Objective** | *To achieve competence the management of accidental and non-accidental paediatric head and spinal injuries.* |
| **Knowledge** | Pathophysiology of raised intracranial pressure in children following head injury<br>Prevention and treatment of secondary insults relating to transfer and emergency surgery in head-injured children<br>Medical management and intensive care in paediatric head injury<br>Pathophysiology, legal and social aspects of non-accidental injury in children<br>Management of perinatal trauma, growing fractures and penetrating injuries in children<br>Indications for decompressive craniectomy in management of intractable increases in ICP<br>Rehabilitation after mild, moderate and severe head injuries<br>Diagnosis and certification of brain death in children<br>Classification, assessment, investigation and management of paediatric spinal injuries (including SCIWORA) |
| **Clinical Skills** | Assessment and clinical management of children with head and spinal injuries |
| **Technical Skills and Procedures** | Subdural tap<br>Insertion of ICP monitor<br>Insertion of external ventricular drain<br>Craniotomy for traumatic intracranial haematoma<br>Elevation of depressed skull fracture |

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| **TOPIC** | **Paediatric hydrocephalus** |
| **Category** | Paediatrics |
| **Objective** | *To achieve competence in the assessment of children with hydrocephalus. To undertake emergency external ventricular drainage in children with acute hydrocephalus* |
| **Knowledge** | The pathophysiology of CSF circulation<br>Applied surgical anatomy of the ventricular system<br>Indications for insertion of an access device, external ventricular drain, lumbar CSF drainage, shunting and third ventriculostomy<br>Assessment of the neonate with hydrocephalus<br>Principles of shunt function and selection<br>Surgical complications and their management |
| **Clinical Skills** | Assessment of the ill child with hydrocephalus and impaired consciousness<br>Differential diagnosis of shunt malfunction<br>Interpretation of CT, MRI and ultrasound scans |

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| **Technical Skills and Procedures** | Insertion, tapping and draining from a CSF reservoir<br>External ventricular drainage including externalisation of VP shunts<br>Ventriculo-peritoneal shunting in all age groups<br>Third ventriculostomy |

| **TOPIC** | **Paediatric tumours** |
|---|---|
| **Category** | Paediatrics |
| **Objective** | *To achieve competence in the emergency neurosurgical management of children presenting with intracranial tumours* |
| **Knowledge** | Epidemiology, natural history, pathophysiology and clinical features of paediatric tumours especially medulloblastoma, ependymoma, pineal region tumours and low grade tumours.<br>Emergency management of children presenting acutely with intracranial mass lesions |
| **Clinical Skills** | The assessment and clinical management of children presenting acutely with cranial tumours |
| **Technical Skills and Procedures** | Insertion of external ventricular drain |

| **TOPIC** | **Paediatric intracranial vascular disorders** |
|---|---|
| **Category** | Paediatrics |
| **Objective** | *To achieve competence in the emergency neurosurgical management of children presenting with intracranial vascular disorders* |
| **Knowledge** | Epidemiology, natural history, pathophysiology and clinical features of intraventricula haemorrhage, subarachnoid haemorrhage, haemorrhagic stroke and ischaemic stroke in children secondary to prematurity, intracranial aneurysms, arteriovenous malformations and fistulae, cavernomas, arterial dissection, moya-moya disease and venous sinus thrombosis<br>Surgical and endovascular strategies for the management of acute intracranial vascular disorders in children |
| **Clinical Skills** | The assessment and clinical management of children presenting with spontaneous intracranial haemorrhage and acute cerebral ischaemia |
| **Technical Skills and Procedures** | Emergency operative management of spontaneous intracerebral haemorrhage |

**Peripheral Nerve Neurosurgery**

| **TOPIC** | **Peripheral nerve compression** |
|---|---|
| **Category** | Peripheral Nerve Surgery |
| **Objective** | *To achieve competence in carpal tunnel decompression. To achieve competence in the management of ulnar neuropathy* |

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| **Knowledge** | Presentation, differential diagnosis and management of peripheral nerve compression syndromes especially those related to brachial plexus pathologies, ulnar nerve compression or carpal tunnel syndrome<br>Interpretation of nerve conduction studies<br>Indications for surgery |
| **Clinical Skills** | Diagnosis and investigation of patients with peripheral nerve compression syndromes |
| **Technical Skills and Procedures** | None specified |

**CRITICAL CONDITIONS**

| **TOPIC** | **Impaired consciousness and seizures** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency management of patients presenting with impaired consciousness and non-traumatic coma* | |
| **Knowledge** | Aetiology, pathophysiology and differential diagnosis of altered consciousness and coma<br>Assessment of the patient with impaired consciousness<br>The emergency management and investigation of patients with deteriorating levels of consciousness or seizures | |
| **Clinical Skills** | Clinical assessment of patients with impaired consciousness or seizures<br>Emergency management of patients with impaired consciousness or seizures<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Maintenance of airway<br>Endotracheal intubation<br>Lumbar puncture | |

| **TOPIC** | **Cranial trauma** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of head-injured patients* | |

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|---|---|---|
| **Knowledge** | Anatomy and blood supply of the scalp, cranium, meninges and brain<br>Pathophysiology of head injury and of multiple trauma<br>Emergency, intensive care and ward-based management of patients with a head injury<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients following a head injury<br>Principles, diagnosis and confirmation of brain stem death | |
| **Clinical Skills** | Clinical assessment of patients with a head injury<br>Emergency management of patients with a head injury<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Wound exploration, debridement and closure<br>Burr hole drainage of chronic subdural haematoma<br>Insertion of intracranial pressure monitor<br>Craniotomy for acute subdural, extradural and interparenchymal haematomas, removal of penetrating objects and elevation of depressed skull fractures.<br>Decompressive craniectomy for trauma | |

| **TOPIC** | **Acute hydrocephalus** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with acute hydrocephalus* | |
| **Knowledge** | The pathophysiology of CSF circulation<br>Applied surgical anatomy of the ventricular system<br>Emergency, intensive care and ward-based management of patients with acute hydrocephalus and shunt failure<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with hydrocephalus | |
| **Clinical Skills** | Clinical assessment of patients with acute hydrocephalus<br>Emergency management of patients with acute hydrocephalus<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture<br>Insertion and taping of CSF reservoirs<br>Insertion and maintenance of lumbar and ventricular drains<br>Insertion of external ventricular drain<br>Shunt insertion and revision | |

| TOPIC | Acute tumour presentations | Phase 2 indicative knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with intracranial tumours* | |
| **Knowledge** | The neuropathology of primary and secondary intracranial tumours<br>Functional cerebral anatomy<br>Emergency, intensive care and ward-based management of patients with an intracranial tumour<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with a brain tumour | |
| **Clinical Skills** | Clinical assessment of patients with an acute tumour presentation<br>Emergency management of patients with an intracranial tumour<br>Interpretation of imaging studies including MRI and CT<br>Breaking bad news to patients and families | |
| **Technical Skills and Procedures** | Craniotomy for supratentorial intrinsic tumour<br>Craniotomy for infratentorial intrinsic tumour | |

| TOPIC | Spontaneous intracranial haemorrhage | Phase 2 indicative knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of patients with subarachnoid haemorrhages (SAH) and Spontaneous Intracerebral Haemorrhages (ICH)* | |
| **Knowledge** | Anatomy and Physiology of the cerebral arterial and venous circulations<br>Aetiology and pathophysiology of SAH and ICH<br>Emergency, intensive care and ward-based management of patients with spontaneous intracranial haemorrhage<br>Principles and practice of operative interventions and principles of neuroradiological interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients following a spontaneous intracranial haemorrhage | |

| | | |
|---|---|---|
| **Clinical Skills** | Clinical assessment of patients with a spontaneous intracranial haemorrhage<br>Emergency management of patients with an intracranial haemorrhage<br>Interpretation of imaging studies including MRI, CT and angiograms | |
| **Technical Skills and Procedures** | Craniotomy for interparenchymal haemorrhage including sylvian haematoma and AVM related haemorrhage | |

| **TOPIC** | **CNS infections** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of CNS infections* | |
| **Knowledge** | Aetiology and pathophysiology of CNS infections including surgery related infections, meningitis, cerebral abscess and subdural empyema<br>Microbiological pathogens and antibiotic selection<br>Emergency, intensive care and ward-based management of patients with CNS infections<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with CNS infections | |
| **Clinical Skills** | Clinical assessment of patients with CNS infections<br>Emergency management of patients with CNS infections<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture<br>Burr hole aspiration of cerebral abscess<br>Craniotomy for subdural empyema or cerebral abscess | |

| **TOPIC** | **Spinal trauma** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of spinal trauma* | |

| | | |
|---|---|---|
| **Knowledge** | Epidemiology of spinal trauma<br>Spinal biomechanics and the classification of injuries<br>Pathophysiology of spinal cord injury<br>Emergency, intensive care and ward-based management of patients with spinal injuries<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with a spinal injury | |
| **Clinical Skills** | Clinical assessment of patients with a spinal injury<br>Emergency management of patients with spinal trauma<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Use of external immobilisation including cervical collars<br>Application of cranial-cervical traction<br>Application of a halo-body jacket<br>Anterior cervical spine fusion, posterior cervical spine fusion | |

| **TOPIC** | **Spinal oncology** | **Phase 2 indicative knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of spinal oncology* | |
| **Knowledge** | The neuropathology of primary and secondary spinal tumours<br>Clinical presentations of intramedullary, intradural extramedullary, extradural and bony spinal tumours including malignant spinal cord compression<br>Emergency, intensive care and ward-based management of patients with spinal tumours<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with spinal tumours | |
| **Clinical Skills** | Clinical assessment of patients with a spinal tumour<br>Emergency management of patients with a spinal tumour<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Decompression of malignant spinal cord compression in the cervical, thoracic and lumbar spine | |

| TOPIC | Acute spinal disorders and cauda equina syndrome | Phase 2 indicative knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward-based management of acute spinal disorders especially cauda equina syndrome* | |
| **Knowledge** | Anatomy of the spine, spinal cord, autonomic and somatic nervous systems<br>Physiology of spinal cord function and control of the bladder<br>Pathophysiology of cauda equina syndrome, nerve root compression and spinal cord compression<br>Emergency, intensive care and ward-based management of patients with acute spinal disorders<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with acute spinal disorders | |
| **Clinical Skills** | Clinical assessment of patients with an acute spinal disorder<br>Emergency management of patients with an acute spinal disorder<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar laminectomy<br>Lumbar discectomy<br>Anterior cervical discectomy<br>Posterior cervical decompression<br>Laminectomy for epidural or subdural haematomas and empyemas | |

| TOPIC | Emergency paediatric neurosurgery | Phase 2 indicative knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency management of paediatric neurosurgical patients* | |
| **Knowledge** | Paediatric physiology<br>Pathophysiology of hydrocephalus, head injury and acute presentations of tumours and intracranial haemorrhage in children of all ages<br>Child Safeguarding principles<br>Understanding of Children's rights and surgical consent | |

| | | |
|---|---|---|
| **Clinical Skills** | Clinical assessment of children with acute neurosurgical disorders<br>Emergency management of children with acute neurosurgical disorders | |
| **Technical Skills and Procedures** | Lumbar puncture in children<br>Taping of CSF reservoirs in children<br>Shunt insertion and revision in all age groups<br>EVD insertion in all age groups | |

**INDEX PROCEDURES**

| **TOPIC** | **Advanced adult supratentorial** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in advanced adult supratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures in those 16 years and over:<br><br>Clipping of anterior circulation aneurysm<br>Clipping of posterior circulation aneurysm<br>Craniotomy and excision of AVM<br>Craniotomy and excision of Cavernoma<br>Hemispherectomy (functional or anatomic) for epilepsy<br>Infratentorial, supracerebellar approach to pineal region tumour<br>Interhemispheric approach to midline ventricular lesion (eg colloid cyst)<br>Interhemispheric approach to pineal region tumour<br>Lesionectomy for epilepsy<br>Supratentorial, suboccipital approach to pineal region tumour<br>Temporal lobectomy for epilepsy<br>Transcranial approach to sellar or suprasellar lesion | |

| **TOPIC** | **Endoscopic and transphenoidal** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in endoscopic and transphenoidal surgery* | |

| | | |
|---|---|---|
| **Knowledge** | Applied anatomy of the sphenoid sinus, sella, pituitary and optic nerves<br>Indications for surgery<br>Use of an endoscope to perform complex surgery<br>Complications of surgery and management of endocrine function<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br><br>Endoscopic biopsy of intrinsic cerebral tumour<br>Endoscopic excision / drainage of ventricular lesion (eg colloid cyst)<br>Endoscopic third ventriculostomy<br>Other Endoscopic Procedure (except biopsy)<br>Transphenoidal biopsy of sellar lesion (not adenoma)<br>Transphenoidal hypophysectomy | |

| **TOPIC** | **Convexity and falcine meningiomas** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in convexity and falcine meningioma surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature and brain<br>Indications for surgery<br>Microsurgical dissection techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br><br>Excision of meningioma - convexity<br>Excision of meningioma - falx<br>Excision of meningioma - Other<br>Excision of meningioma - parasagital<br>Excision of meningioma - sphenoid ridge<br>Excision of meningioma - subfrontal | |

| TOPIC | Advanced adult infratentorial | Phase 2 indicative technical level |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in advanced adult infratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures in those 16 years and over:<br><br>Craniotomy for spontaneous ICH (infratentorial)<br>Infratentorial skull base approach to skull base tumour<br>Microvascular decompression of facial nerve<br>Microvascular decompression of trigeminal nerve<br>Middle fossa approach to vestibular schwannoma<br>Midline approach to intrinsic brain stem or 4th ventricle tumour<br>Midline approach to intrinsic cerebellar tumour<br>Midline posterior fossa craniotomy and excision of meningioma<br>Midline posterior fossa craniotomy for benign lesions (excl. meningioma)<br>Retrosigmoid approach to intrinsic brain stem tumour<br>Retrosigmoid approach to intrinsic cerebellar tumour<br>Retrosigmoid approach to vestibular schwannoma<br>Retrosigmoid craniotomy and excision of meningioma<br>Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)<br>Translabrynthine approach to vestibular schwannoma<br>Transoral / transfacial approach to skull base tumour | |

| TOPIC | Intradural spine | Phase 2 indicative technical level |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in intradural spinal surgery* | |
| **Knowledge** | Applied anatomy of the spine, meninges, vasculature, spinal cord and nerves<br>Indications for surgery<br>Microsurgical dissection techniques<br>Spinal cord monitoring | |

| | | |
|---|---|---|
| | Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Biopsy of intramedullary spinal cord lesion<br>Closure of encephalocoele<br>Closure of myelomeningocoele<br>Evacuation of primary spinal subdural haematoma<br>Excision / debulking of intramedullary spinal cord lesion<br>Excision of other intradural, extramedullary lesion<br>Excision of spinal meningioma<br>Excision of spinal neurofibroma<br>Foramen magnum decompression including durotomy<br>Other surgery for spinal dysraphism<br>Surgery for spinal AVM<br>Surgery for spinal cavernoma<br>Untethering of spinal cord | |

| **TOPIC** | **Complex spinal fusion** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 3 |
| **Objective** | *To achieve technical competence in spinal fusion surgery* | |
| **Knowledge** | Applied anatomy of the vertebrae, ligaments, discs, musculature and nerves<br>Indications for surgery<br>Spinal decompression and fusion techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |

| | | |
|---|---|---|
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Spinal fixation<br>**AND**<br>Anterior cervical fusion<br>Anterior Lumbar Interbody Fusion<br>Anterior PEG spinal fixation<br>Anterior thoracic fusion<br>Occipito-Cervical fusion (with instrumentation)<br>Other anterior cervical decompression<br>Other anterior thoracic decompression<br>Other decompressive posterior lumbar surgery<br>Other posterior cervical decompression<br>Other posterior thoracic decompression<br>Posterior C1/2 spinal fixation<br>Posterior cervical fusion<br>Posterior Lumbar Fusion<br>Posterior Lumbar Interbody Fusion<br>Posterior thoracic fusion<br>Open biopsy of spine (eg tumour, infection)<br>Primary Posterior Cervical Laminectomy or laminoplasty<br>Revision anterior cervical decompression<br>Revision posterior cervical decompression<br>Transoral excision of odontoid<br>Primary anterior lumbar surgery for disc/degen disease<br>Primary lumbar laminectomy for disc/degen disease<br>Primary posterior lumbar discectomy<br>Revision anterior lumbar surgery for disc/degen disease<br>Revision posterior lumbar surgery for disc/degen disease | |

| **TOPIC** | **Advanced paediatric supratentorial** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 2 |
| **Objective** | *To gain experience in advanced paediatric supratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques in children<br>Complications of surgery | |

| | | |
|---|---|---|
| **Technical Skills and Procedures** | A wide range of the following procedures in children under 16:<br>Clipping of anterior circulation aneurysm<br>Clipping of posterior circulation aneurysm<br>Craniotomy and excision of AVM<br>Craniotomy and excision of Cavernoma<br>Craniotomy for dural AVM<br>Craniotomy for frontal intrinsic cerebral tumour<br>Craniotomy for occipital intrinsic cerebral tumour<br>Craniotomy for other intrinsic cerebral tumour<br>Craniotomy for parietal intrinsic cerebral tumour<br>Craniotomy for temporal intrinsic cerebral tumour<br>Excision of meningioma - convexity<br>Excision of meningioma - falx<br>Excision of meningioma - Other<br>Excision of meningioma - parasagital<br>Excision of meningioma - sphenoid ridge<br>Excision of meningioma - subfrontal<br>Hemispherectomy (functional or anatomic) for epilepsy<br>Interhemispheric approach to midline ventricular lesion (eg colloid cyst)<br>Interhemispheric approach to pineal region tumour<br>Lesionectomy for epilepsy<br>Supratentorial craniotomy for benign lesions (excl. meningioma)<br>Supratentorial, suboccipital approach to pineal region tumour<br>Temporal lobectomy for epilepsy<br>Transcranial approach to sellar or suprasellar lesion | |

| **TOPIC** | **Advanced paediatric infratentorial** | **Phase 2 indicative technical level** |
|---|---|---|
| **Category** | Index procedures | 2 |
| **Objective** | *To gain experience in advanced paediatric infratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques in children<br>Complications of surgery | |

| | | |
|---|---|---|
| **Technical Skills and Procedures** | A wide range of the following procedures in children under 16:<br>Infratentorial, supracerebellar approach to pineal region tumour<br>Midline approach to intrinsic brain stem or 4th ventricle tumour<br>Midline approach to intrinsic cerebellar tumour<br>Midline posterior fossa craniotomy and excision of meningioma<br>Midline posterior fossa craniotomy for benign lesions (excl. meningioma)<br>Retrosigmoid approach to intrinsic brain stem tumour<br>Retrosigmoid approach to intrinsic cerebellar tumour<br>Retrosigmoid craniotomy and excision of meningioma<br>Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)<br>Transoral / transfacial approach to skull base tumour | |

**Phase 3 Neurosurgery Training**

**Overview**

Phase 3 will allow a trainee to develop technically, especially with regards to the essential transferable microsurgical skills required of a day-one consultant in Neurosurgery and to focus on one (or two complementary) special interest areas of practice.

Phase 3 training in approved OOP schemes in external centres is encouraged subject to deanery approval. Completion of phase 3 occurs at the final ARCP with the award of an outcome 6.

**Special Interest Training**

To ensure the quality of emergency and continuing care of neurosurgical patients with appropriate liaison and cross referral all trainees are expected to have an understanding of the specialist areas of neurosurgical practice. During final phase training all trainees will undertake selected specialist operative procedures under direct supervision to consolidate their advanced (especially microsurgical) operative skills.

Trainees in special interest training will develop a comprehensive and in-depth knowledge of their field. By the end of special interest training they will be competent to undertake selected operative procedures relating to the common presentations in their specialist field without direct supervision. They will be competent to undertake other procedures in their field under the mentorship of a senior colleague. The special interest summaries indicate the breadth and depth of training required in phase 3 training.

**Neuro-oncology**

All trainees will be competent to manage patients with high grade intrinsic tumours, metastases and convexity meningiomas. Trainees with a special interest in neuro-oncology will participate fully in the multidisciplinary management of neuro-oncology patients and will be familiar with current developments in molecular neuro-oncology, emerging surgical techniques and the ethical, regulatory and practical considerations governing clinical trials in neuro-oncology. They will develop additional expertise as follows:

- Advanced surgical techniques: including awake craniotomy; stereotactic craniotomy, intraoperative neurophysiological monitoring; advanced image guidance with integration of functional data; intraoperative imaging techniques; the use of surgically delivered chemotherapy agents; third ventriculostomy
- Low-grade intrinsic tumours: the management of low grade intrinsic tumours using advanced techniques; optimal resection of lobar low grade intrinsic tumours
- Tumours of the ventricular system and pineal region: including surgical approaches to the third ventricle and pineal; transfrontal transventricular excision of intraventricular tumours and cysts; transcallosal transventricular excision of lesions of the third ventricle and foramen of Munro
- Brainstem tumours: including the management options for intrinsic brainstem tumours; stereotactic biopsy of accessible lesions
- Radiosurgery and stereotactic radiotherapy: including the principles of radiosurgery and stereotactic radiotherapy and the indications for their use as adjunctive and/or primary treatment modalities.

**Skull-base and pituitary**

Special interest training in skull base surgery will take place in units with extensive multi-disciplinary experience in the management of all common skull-base disorders. Trainees with a special interest in skull-base surgery will develop additional expertise as follows:

- Skull-base and craniofacial surgical access: including standard variations of fronto-basal, fronto-orbital, trans-zygomatic, infratemporal, transtemporal, far-lateral, transphenoidal and transmaxillary approaches
- Cranial base meningiomas: including resection of anterior fossa (olfactory groove and suprasellar) meningiomas; tentorial and petrous temporal meningiomas; petroclival meningiomas
- Pituitary and sellar tumours: including endoscopic (+/- microscopic) transphenoidal resection of pituitary tumours; pterional, subfrontal, interhemispheric and transventricular approaches to suprasellar tumours
- Vestibular schwannoma: including retrosigmoid and translabyrinthine approaches and knowledge of the application of middle fossa resection
- Other skull-base tumours: including the management of other cranial nerve schwannomas, glomus tumours and malignant primary and secondary tumours of the skull-base
- Management of cranio-facial trauma: including multi-disciplinary management of fronto-orbital disruption
- Repair of CSF fistulae: including the management of post-operative CSF fistulae; indications for endoscopic repair of a basal CSF fistula; techniques for open repair and skull-base reconstruction

**Neurovascular**

Special interest training will take place in units with extensive experience in the multi-disciplinary management of all common intracranial vascular disorders. These units should manage a minimum of 100 aneurysmal subarachnoid haemorrhages a year. Trainees with a special interest in neurovascular surgery will develop additional expertise in:

- Intracranial aneurysms: including surgical and endovascular strategies for the management of ruptured and unruptured intracranial aneurysms; surgical treatment of ruptured aneurysms of the anterior circulation; principles of microvascular reconstruction and bypass for complex aneurysms
- Intracranial vascular malformations: including surgical, endovascular and radiosurgical strategies for the management of arteriovenous malformations; surgical treatment of superficial cortical arteriovenous malformations, surgical and endovascular treatment of dural arteriovenous fistulae, image-guided resection of cavernomas
- Other vascular disorders: including the management of primary intracerebral haematomas; the management of venous occlusive disorders
- Management of stroke including indications for thrombolysis and endovascular clot retrieval; role and indications of decompressive craniectomy. Some trainees may consider developing some endovascular skills to remove clots from the intracranial vasculature
- Acute and chronic cerebral ischaemia: including the medical, surgical and endovascular management of intracranial arterial occlusive disease.

**Pain, epilepsy and functional**

Trainees with a special interest in functional neurosurgery will develop additional expertise as follows:

- Surgical management of pain: including the implantation of spinal cord stimulators; the insertion of intrathecal drug delivery systems; knowledge of ablative surgical treatment for pain including DREZ lesioning, cordotomy and myelotomy and of neuromodulatory techniques including peripheral nerve, motor cortex and deep brain stimulation.

- Neurovascular compression syndromes: including microvascular decompression of the trigeminal nerve; microvascular decompression of the facial nerve; percutaneous trigeminal rhizotomy
- Spasticity: including an in-depth understanding of medical and surgical treatments for spasticity; implantation of intrathecal drug delivery systems; knowledge of other surgical treatments for spasticity including phenol blocks, neurectomies and rhizotomy.
- Epilepsy: including the multidisciplinary assessment and preparation of patients for epilepsy surgery; stereotactic placement of depth electrodes and placement of subdural electrode grids; temporal lobectomy; selective amygdalohippocampectomy; callosotomy; insertion of vagal nerve stimulators; hemispherectomy; multiple subpial transections
- Movement disorders: including the multidisciplinary assessment and selection of patients with movement disorders e.g. Parkinsons's disease and dystonia; selection, targeting and placement of deep brain stimulation electrodes; management of neuro-stimulators; radiofrequency lesioning

**Spine**

On completion of a special interest year in spinal surgery trainees will be competent in all aspects of the emergency and urgent operative care of patients with spinal disorders. They will develop additional expertise as follows:

- Spinal trauma: including reduction and internal stabilisation of atlanto-axial, sub-axial and thoraco-lumbar fractures and dislocations
- Metastatic disease of the spine: including posterior decompression and stabilisation using pedicle screw, hook and sub-laminar wire constructs; corpectomy and instrumented reconstruction of the anterior column
- Primary tumours of the spine: including techniques for local ablation of benign lesions and en bloc resections of malignant tumours
- Intradural tumours: including the radical resection of intradural, extra-medullary tumours; biopsy and optimal resection of intramedullary tumours
- Syringomyelia and hind brain anomalies: including foramen magnum decompression, syringostomy, syringopleural shunting, untethering and duroplasty
- Advanced surgery of the ageing and degenerative spine: including the management of osteoporotic collapse, vertebroplasty, kyphoplasty; stabilisation of the osteoporotic spine; operative management degenerative spondylolisthesis and scoliosis
- The rheumatoid and ankylosed spine: including the management of atlanto-axial subluxation; cranial settling and odontoid migration; sub-axial degeneration; cervico-dorsal kyphosis
- Spinal deformity: including the multidisciplinary management of patients with spinal dysraphism, diastematomyelia etc

**Paediatrics**

On completion of a special interest year in paediatric neurosurgery trainees will be competent in all aspects of the non-operative neurosurgical management of children presenting with disorders of the nervous system. They will have detailed knowledge of the statutory framework governing the care of children, paediatric neurointensive care, the principles of paediatric neurorehabilitation and of the management of non-accidental injury. They will be competent to undertake all aspects of the emergency neurosurgical operative care of children and to undertake a range of elective procedures in the following fields with appropriate supervision:

- Hydrocephalus: including the insertion and revision of ventriculo-peritoneal, ventriculo-atrial and lumbo-peritoneal shunts; endoscopic third ventriculostomy; image-guided placement of ventricular catheters; management of neonatal post-haemorrhagic hydrocephalus

- Paediatric neuro-oncology: including stereotactic and image-guided biopsy of paediatric tumours; endoscopic biopsy of third ventricular tumours; resection of supratentorial and infratentorial intrinsic tumours; resection of suprasellar, third ventricular and pineal tumours; management of spinal cord tumours
- Paediatric head injury: including decompressive craniectomy; cranioplasty; management of growing fractures; craniofacial reconstruction; management of CSF fistulae
- Spinal dysraphism: including the management of neonatal spina bifida, meningoceles and encephaloceles; spinal cord tethering syndromes
- Congenital and acquired spinal deformity: including the management of syndromic spinal deformity and post-operative spinal deformity
- Craniofacial disorders: including the management of simple craniosynostosis, syndromic craniosynostosis, post-traumatic deformity

**Phase 3 Capability in Practice**

| Capability in practice | Supervision level |
|---|---|
| 1. Manages an outpatient clinic | Level IV |
| 2. Manages the unselected emergency take | Level IV |
| 3. Manages ward rounds and the on-going care of inpatients | Level IV |
| 4. Manages an operating list | Level IV |
| 5. Manages multi-disciplinary working | Level IV |

**Phase 3 Critical conditions**

| Critical condition | Assessed by | Phase 3 Knowledge level |
|---|---|---|
| Impaired consciousness and seizures | CBD or CEX | 4 |
| Cranial trauma | CBD or CEX | 4 |
| Acute hydrocephalus | CBD or CEX | 4 |
| Acute tumour presentations | CBD or CEX | 4 |
| Spontaneous intracranial haemorrhage | CBD or CEX | 4 |
| CNS infections | CBD or CEX | 4 |
| Spinal trauma | CBD or CEX | 4 |
| Spinal oncology | CBD or CEX | 4 |
| Degenerative spinal disorders and cauda equina syndrome | CBD or CEX | 4 |
| Emergency paediatric neurosurgery | CBD or CEX | 4 |

**Phase 3 Index procedures**

| Index procedure | Assessed by | Indicative number (excluding assisted) by certification | Technical skill level expected by certification |
|---|---|---|---|
| Advanced adult supratentorial | PBA | 10 | 4 |
| Endoscopic and transphenoidal | PBA | 10 | 3 (4 if special interest) |
| Convexity and falcine meningiomas | PBA | 10 | 4 |
| Advanced adult infratentorial | PBA | 10 | 4 |
| Intradural spine | PBA | 5 | 4 |
| Complex spinal fusion | PBA | 10 | 3 (4 if special interest) |
| Advanced paediatric supratentorial | PBA | 1 | 2 (3 if special interest) |
| Advanced paediatric infratentorial | PBA | 1 | 2 (3 if special interest) |

**Clinical Placements in Phase 3**

Clinical placements in Phase 3 will ensure that trainees are exposed to microsurgical training in a specialist area of Neurosurgical practice. Trainees must participate in a neurosurgical on call rota. The organisation of clinical placements is at the discretion of the programme director. The following principles apply:

- The Shape of Training review identified that training is optimal in longer (6 month) rather than shorter (3-4 month) attachments
- Training programme directors will be familiar with parts of their training programme that provide training in key areas. Training surveys and logbook data can also be used to provide this information.
- Trainees should be placed flexibly in posts that support their training needs
- Trainees on placements should receive training and are not primarily in these placements to support service requirements

**Phase 3 Topics**

**Advanced microsurgical skills**

| **TOPIC** | **Advanced Microsurgical skills** |
|---|---|
| **Category** | Advanced microsurgical skills |
| **Objective** | *To achieve competence in the essential transferable microsurgical skills* |
| **Knowledge** | Operating microscope technology and physics<br>Endoscope technology and physics |
| **Clinical Skills** | Tissue handling and microsurgical dissection technique |
| **Technical Skills and Procedures** | Use of the endoscope and operating microscope to develop microsurgical skills can be undertaken in a wide variety of different advanced procedures including surgery for aneurysms, AVMs, tumours, epilepsy, skull base, pituitary, spine and spinal cord pathologies. |

**Neuro-oncology**

| **TOPIC** | **Advanced surgical techniques for intrinsic tumours** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neuro-oncology | 4 |
| **Objective** | *To achieve competence in the application of advanced surgical techniques to the management of patients with brain tumours* | |
| **Knowledge** | Indications for; applications of; advantages and disadvantages of various advanced surgical approaches and adjuncts | |
| **Clinical Skills** | Assessment, counselling and pre-operative preparation of patients undergoing neuro-oncological surgery<br>Selection of appropriate advanced techniques based on clinical and imaging information | |
| **Technical Skills and Procedures** | Frameless, frame based and robotic stereotactic techniques<br>Use of intra-operative drug delivery systems<br>Awake craniotomy<br>Intraoperative neurophysiological monitoring | |

| **TOPIC** | **Tumours of the ventricular system and pineal region** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neuro-oncology | 4 |
| **Objective** | *To achieve competence in the management of patients with intraventricular and pineal region tumours.* | |

| | | |
|---|---|---|
| **Knowledge** | Epidemiology, natural history, genetic characteristics, pathology and clinical features of intraventricular and pineal region tumours<br>Radiological and biochemical staging<br>Surgical and non-surgical management options for low grade intrinsic tumours<br>Surgical anatomy relevant to approaches to the lateral and third ventricles and the pineal region | |
| **Clinical Skills** | Counselling of patients regarding surgical treatment options for pineal and intraventricular tumours<br>Choice of operative approaches based on tumour location and imaging | |
| **Technical Skills and Procedures** | Transcallosal and transcortical approaches to ventricular tumours<br>Microsurgical resection of lateral intraventricular tumour<br>Microsurgical resection of third ventricular tumour/colloid cyst<br>Transfrontal endoscopic biopsy and third ventriculostomy<br>Supracerebellar infratentorial approaches to the pineal<br>Occipital transtentorial approaches to the pineal | |

| **TOPIC** | **Brainstem tumours** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neuro-oncology | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multidisciplinary management of patients with intrinsic brainstem tumours* | |
| **Knowledge** | Epidemiology, natural history, genetic characteristics, pathology and clinical features of brain stem tumours<br>Management options for patient with brainstem tumours including open surgery, biopsy and radiotherapy | |
| **Clinical Skills** | Selection of open surgery or image guided biopsy for patients with brainstem lesions | |
| **Technical Skills and Procedures** | Stereotactic biopsy of brainstem lesions | |

**Skull Base and Pituitary**

| **TOPIC** | **Skull base meningiomas** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Skull-base and pituitary | 4 |
| **Objective** | *To achieve competence in the neurosurgical aspects of the multidisciplinary management of cranial base meningiomas* | |
| **Knowledge** | Epidemiology, natural history, pathology and clinical presentation of meningiomas of the medial anterior, middle and posterior fossae<br>Indications for radical or subtotal resection of skull-base meningiomas<br>Indications for radiosurgical treatment<br>Applied surgical anatomy of the skull base and craniofacial skeleton<br>Selection of optimal approaches in relation to the presenting pathology and imaging | |
| **Clinical Skills** | Assessment and clinical management of patients with skull base meningiomas | |
| **Technical Skills and Procedures** | Anterior interhemispheric, fronto-orbital, zygomatic and temporo-zygomatic approaches<br>Resection of anterior fossa meningioma: olfactory, planum sphenoidale and medial sphenoid wing<br>Resection of clinoidal and suprasellar meningioma<br>Resection of occipital, lateral petrosal and tentorial meningioma<br>Resection of cavernous sinus and petroclival meningioma | |

| **TOPIC** | **Anterior and middle fossa skull base tumours** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Skull-base and pituitary | 4 |
| **Objective** | *To achieve competence in the surgical management of patients with anterior and middle fossa tumours* | |
| **Knowledge** | Epidemiology, natural history, pathology and clinical presentation of benign and malignant tumours of the skull base including cranial nerve schwannomas, chordomas, paragangliomas, adenoid cystic carcinomas, angiofibromas and nasopharyngeal carcinomas<br>Indications for radical or subtotal resection of skull-base tumours<br>Indications for radiosurgical treatment<br>Applied surgical anatomy of the skull base and craniofacial skeleton<br>Selection of optimal approaches in relation presenting pathology and imaging | |

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|---|---|---|
| **Clinical Skills** | Neurosurgical aspects of the multidisciplinary assessment and clinical management of patients with rarer skull base tumours<br>Multidisciplinary working with neurotologists, maxillofacial surgeons and oncologists | |
| **Technical Skills and Procedures** | Standard pterional and subfrontal approaches including:<br>Pterional resection and basal drilling<br>Subfrontal approach to the optic nerve, chiasm and internal carotid arteries<br>Sylvian fissure splitting and exposure of the MCA bifurcation<br>CSF drainage by chiasmatic cisternal suction, intra-operative ventricular puncture and lamina terminalis fenestration<br>Anterior interhemispheric, fronto-orbital, zygomatic and temporo-zygomatic approaches<br>Frontobasal approaches to the anterior fossa and orbito-ethmoidal complex<br>Transfacial and mid-face approaches to the skull base<br>Lateral approaches to the infratemporal fossa and pterygo-palatine fossa<br>Transtemporal approaches to the jugular bulb and petrous apex | |

| **TOPIC** | **Sellar and suprasellar mass lesions** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neuro-oncology | 4 |
| **Objective** | *To achieve competence in transphenoidal and cranial approaches to sellar and suprasellar mass lesions* | |
| **Knowledge** | Pathology of pituitary adenoma, craniopharyngioma and Rathke's cleft cyst<br>Pathophysiology of the hypothalamic-pituitary axis<br>Investigation of patients with hypothalamic-pituitary axis lesions<br>Medical treatments for pituitary adenomas and for pituitary failure<br>Indications for surgery<br>Selection of surgical approaches: pterional, interhemispheric, endoscopic or microsurgical transphenoidal<br>Applied surgical anatomy of the skull base<br>Principles of peri-operative care<br>Complications of surgery and their management | |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with pituitary, sellar and parasellar tumours<br>Interpretation of CT and MRI scans | |
| **Technical Skills and Procedures** | Endoscopic and microsurgical transphenoidal approach<br>Pterional craniotomy for pituitary adenoma or craniopharyngioma | |

| TOPIC | Vestibular Schwannoma | Phase 3 knowledge level |
|---|---|---|
| **Category** | Skull-base and pituitary | 4 |
| **Objective** | *To achieve competence in the neurosurgical aspects of the multidisciplinary management of patients with vestibular schwanommas* | |
| **Knowledge** | Epidemiology, natural history, pathology and clinical presentation of sporadic and NFII-related vestibular schwanommas. Relative indications for surgery, radiosurgery and conservative management<br>Principles of intra-operative facial nerve and BAEP monitoring<br>Applied microsurgical anatomy of the CP angle, brainstem and lower cranial nerves<br>Relative indications for retrosigmoid, middle fossa, and translabyrinthine approaches with respect to hearing preservation, tumour size and position | |
| **Clinical Skills** | Neurosurgical aspects of the assessment and clinical management of patients undergoing v surgery<br>Multidisciplinary working with neuro-otologists and oncologists<br>Role of hearing therapy | |
| **Technical Skills and Procedures** | Retrosigmoid subtotal and radical resection of vestibular schwannoma<br>Translabyrinthine resection of vestibular schwannoma | |

**Pain, Epilepsy and Functional**

| TOPIC | Surgical management of pain | Phase 3 knowledge level |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of patients with chronic pain syndromes* | |
| **Knowledge** | The aetiology and pathophysiology of chronic pain syndromes<br>Indications for medical, minimally-invasive and surgical management<br>Applied surgical anatomy<br>Complications of surgery and their management | |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of chronic pain patients<br>Pre-operative counselling and preparation | |
| **Technical Skills and** | Spinal cord stimulation<br>DREZ lesion | |

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|---|---|---|
| **Procedures** | Open cordotomy<br>Deep brain stimulation for pain | |

| **TOPIC** | **Neurovascular compression syndromes** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To achieve advanced competence in the surgical aspects of the multi-disciplinary management of patients with neurovascular compression syndromes* | |
| **Knowledge** | Aetiology, epidemiology and natural history of trigeminal neuralgia, and glossopharyngeal neuralgia<br>Differential diagnosis and management of related cranio-facial pain syndromes<br>Medical management of cranio-facial pain<br>Surface anatomy of the trigeminal nerve and microsurgical anatomy of the CP angle<br>Indications for surgical management of trigeminal and glossopharyngeal neuralgia by peripheral neurectomy, percutaneous rhizotomy, radiofrequency rhizotomy, microvascular decompression<br>Indications for stereotactic radiosurgery treatment of trigeminal neuralgia<br>Complications of surgery and their management | |
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with trigeminal neuralgia<br>Interpretation of posterior fossa CT an MR and scans including MR sequences demonstrating neurovascular compression<br>Application and interpretation of intraoperative monitoring techniques | |
| **Technical Skills and Procedures** | Percutaneous trigeminal rhizotomy<br>Trigeminal microvascular decompression | |

| **TOPIC** | **Spasticity** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of patients with spasticity* | |
| **Knowledge** | The aetiology and pathophysiology of spasticity<br>Indications for medical, minimally-invasive and surgical management<br>Applied surgical anatomy | |

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|---|---|---|
| | Complications of surgery and their management | |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of patients with spasticity<br>Pre-operative counselling and preparation | |
| **Technical Skills and Procedures** | Intrathecal drug delivery<br>Deep brain stimulation | |

| **TOPIC** | **Epilepsy** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of patients with epilepsy* | |
| **Knowledge** | The pathophysiology of idiopathic and lesional epilepsy<br>Indications for medical and surgical management<br>Principles of ictal, interictal, sphenoidal and intraoperative EEG<br>Principles of video-EEG monitoring<br>Applied surgical anatomy<br>Complications of surgery and their management | |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of epilepsy patients<br>Interpretation of CT, MRI and SPECT scans<br>Pre-operative counselling and preparation | |
| **Technical Skills and Procedures** | Stereotactic placement of depth electrodes<br>Placement of subdural electrode-grids<br>Image-guided resection of cortical lesions<br>Mesial temporal resection<br>Vagal nerve stimulation<br>Functional hemispherectomy<br>Corpus callosotomy | |

| **TOPIC** | **Movement disorders** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of patients with movement disorders* | |

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|---|---|---|
| **Knowledge** | The aetiology and pathophysiology of movement disorders<br>Indications for medical, minimally-invasive and surgical management<br>Applied surgical anatomy<br>Complications of surgery and their management | |
| **Clinical Skills** | Surgical aspects of the multi-disciplinary assessment of patients with movement disorders<br>Interpretation of CT and MRI scans<br>Pre-operative counselling and preparation | |
| **Technical Skills and Procedures** | Deep brain stimulation<br>Microvascular decompression for hemi-facial spasm | |

| **TOPIC** | **Surgery for mental illness** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Pain, Epilepsy and Functional | 4 |
| **Objective** | *To be familiar with current surgical treatment options for treatment resistant mental illness and in particular depression and obsessive compulsive disorder* | |
| **Knowledge** | Indications for surgical treatment of mental illness<br>Ethical and regulatory aspects of surgical treatment of mental illness<br>Surgical targets | |
| **Clinical Skills** | None | |
| **Technical Skills and Procedures** | None | |

**Neurovascular**

| **TOPIC** | **Intracranial aneurysms** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neurovascular | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of patients with intracranial aneurysms* | |
| **Knowledge** | The epidemiology, natural history, aetiology and pathophysiology of unruptured and ruptured intracranial aneurysms<br>Vascular anatomy of the central nervous system<br>Indications for surgical and endovascular treatment of intracranial aneurysms<br>The principles of endovascular treatment | |

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|---|---|---|
| | Indications for intra and extracranial bypass in the management of complex aneurysms | |
| **Clinical Skills** | Clinical assessment and management of patients with ruptured and unruptured intracranial aneurysms | |
| **Technical Skills and Procedures** | Pterional approach<br>Interhemispheric approaches<br>Temporo-zygomatic and related approaches<br>Clipping of saccular anterior circulation aneurysm<br>Clipping of complex anterior circulation aneurysm<br>Harvest of saphenous vein and radial artery grafts | |

| **TOPIC** | **Intracranial arteriovenous malformations** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neurovascular | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of intracranial arteriovenous malformations (AVMs)* | |
| **Knowledge** | The epidemiology, classification, natural history, embryogenesis and pathophysiology of AVMs of the brain<br>The indications for surgical, radiosurgical and endovascular treatment of asymptomatic, symptomatic and ruptured brain AVMs | |
| **Clinical Skills** | The assessment and clinical management of patients undergoing treatment of AVMs of the brain | |
| **Technical Skills and Procedures** | Evacuation of intracerebral haematoma associated with an AVM<br>Microsurgical resection of cortical AVM | |

| **TOPIC** | **Intracranial dural arteriovenous fistulae** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neurovascular | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of intracranial dural arteriovenous fistulae (dAVFs)* | |
| **Knowledge** | Applied anatomy of the cerebral venous circulation<br>The epidemiology, classification, natural history, pathogenesis and pathophysiology of intracranial dAVFs | |

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|---|---|---|
| | The indications for surgical and endovascular treatment of asymptomatic, symptomatic and ruptured intracranial dAVFs | |
| **Clinical Skills** | The assessment and clinical management of patients undergoing treatment of intracranial dAVFs | |
| **Technical Skills and Procedures** | Exploration and closure of supratentorial dAVF | |

| **TOPIC** | **Cerebral ischaemia** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Neurovascular | 4 |
| **Objective** | *To achieve competence in the surgical aspects of the management of patients with acute and chronic cerebral ischaemia* | |
| **Knowledge** | The epidemiology, natural history and pathophysiology of extra- and intracranial atherosclerotic occlusive disease<br>The epidemiology, natural history and pathophysiology of non-atherosclerotic occlusive diseases<br>Optimal medical management of occlusive and thrombo-embolic cerebrovascular disease<br>Imaging of the chronically ischaemic brain to assess cerebral vascular reserve using CT or MRI<br>Principles of non-invasive and invasive imaging of the extra and intracranial vasculature using ultrasound, transcranial Doppler, CT, MRI, catheter angiography and intraoperative ICG<br>Principles of regional cerebral blood flow and metabolism measurement and imaging using CT and MRI perfusion techniques; SPECT and PET scanning<br>Indications for endovascular intervention including intra-arterial thrombolysis; carotid angioplasty and stenting; intracranial angioplasty<br>Principles of cerebral revascularisation by indirect synangiosis, low-flow EC-IC anastomosis and high flow EC-IC bypass grafting | |
| **Clinical Skills** | The assessment and clinical management of patients with acute and chronic cerebral ischaemia | |
| **Technical Skills and Procedures** | N/A | |

**Spine**

| **TOPIC** | **Spinal trauma** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Spine | 4 |
| **Objective** | *To achieve competence in the operative management of fractures of the cervical and thoracolumbar spine* | |
| **Knowledge** | Pathophysiology of spinal cord injury<br>Classification of cervical and thoracolumbar fractures<br>Biomechanics of spinal instability<br>Indications for halo traction and external stabilization<br>Indications for and principles of open reduction and stabilization<br>Applied surgical anatomy of cervical and thoracolumbar fracture-subluxations<br>Relative indications for operative reduction and stabilisation by anterior and posterior approaches<br>Management of post-traumatic spinal deformity and delayed sequelae | |
| **Clinical Skills** | Assessment and clinical management of patients with spinal injuries | |
| **Technical Skills and Procedures** | Application of cranial-cervical traction<br>Instrumented stabilisation of subaxial fractures by anterior cervical plate and/or lateral mass screws<br>Instrumented stabilisation of atlanto-axial fracture dislocation by anterior odonto-axial screws and/or posterior atlantoaxial screws<br>Posterior craniocervical and cervicothoracic fusion<br>Application of halo-body jacket<br>Posterior reduction of thoracolumbar fractures using pedicle screws<br>Combined anterior and posterior reduction and instrumented stabilisation of thoracolumbar fractures | |

| **TOPIC** | **Metastatic spinal disease** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Spine | 4 |
| **Objective** | *To achieve competence in the management of patients with malignant secondary spinal cord compression* | |

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|---|---|---|
| **Knowledge** | The pathophysiology of spinal cord compression<br>The classification, aetiology and natural history of vertebral metastases<br>Spinal instability associated with vertebral malignancy<br>Indications for percutanous and open spinal biopsy<br>Role of primary radiotherapy and adjuvant radiotherapy or chemotherapy<br>Indications for spinal decompression with and without instrumented spinal stabilisation | |
| **Clinical Skills** | Clinical assessment of patients with malignant spinal cord compression<br>Interpretation of plain radiology, CT and MRI scans<br>Liaison with medical oncologists and radiotherapist<br>Counselling and pre-operative preparation of patients with malignant spinal cord compression | |
| **Technical Skills and Procedures** | Decompressive thoracic and lumbar laminectomy with extradural tumour resection and pedicle screw stabilisation<br>Anterior cervical corpectomy with anterior column reconstruction and anterior cervical plating<br>Cervical lateral mass stabilization<br>Vertebroplasty and Kyphoplasty | |

| **TOPIC** | **Intramedullary tumours** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Spine | 4 |
| **Objective** | *To achieve competence in the management of patients with intramedullary spinal tumours* | |
| **Knowledge** | Classification, epidemiology, natural history and pathology of intramedullary spinal tumours<br>Pathophysiology of spinal cord compression<br>Indications for biopsy, subtotal and radical surgery<br>Selection of surgical approaches<br>Applied surgical anatomy<br>Principles of peri-operative care<br>Complications of surgery and their management<br>Role of adjuvant treatment<br>Indications for and interpretation of spinal cord monitoring | |
| **Clinical Skills** | None | |
| **Technical Skills and Procedures** | Microsurgical biopsy of intramedullary spinal cord tumour<br>Subtotal microsurgical resection of intramedullary tumour<br>Duroplasty | |

| TOPIC | Advanced surgery of the ageing and degenerative spine | Phase 3 knowledge level |
|---|---|---|
| **Category** | Spine | 4 |
| **Objective** | *To achieve competence in the advanced surgery of the ageing and degenerative spine* | |
| **Knowledge** | Techniques for operative stabilisation of the osteoporotic spine<br>Principles of surgery for degenerative scoliosis<br>Biomechanical principles of and indications for cervical and lumbar disc replacement<br>Biomechanical principles of and indications for non-fusion spinal stabilization<br>Indications for, techniques and complications of vertebroplasty and Kyphoplasty<br>Principles of thoracoscopic and laparoscopic surgical techniques<br>Presentation and natural history of thoracic disc prolapse | |
| **Clinical Skills** | Assessment and clinical management of patients with degenerative spinal disorders | |
| **Technical Skills and Procedures** | Pedicle screw instrumentation of the thoracic and lumbar spine<br>Lumbar interbody fusion by posterior (PLIF) postero-lateral (TLIF) and extreme lateral (XLIF) fusion<br>Lumbar anterior interbody fusion<br>Single and multi-level cervical corpectomy with anterior cervical plating<br>Anterior cervical discectomy and cervical arthroplasty<br>Cervical laminectomy with lateral mass and/or pedicle screw stabilization<br>Cervical laminoplasty<br>Postero-lateral thoracic discectomy<br>Anterior (transthoracic) discectomy<br>Thoracoscopic techniques | |

| TOPIC | Rheumatoid disease | Phase 3 knowledge level |
|---|---|---|
| **Category** | Spine | 4 |
| **Objective** | *To understand the management of rheumatoid patients with atlanto-axial subluxation, cranial settling and related disorders* | |
| **Knowledge** | The pathology and natural history of rheumatoid spondylopathy<br>Indications for operative management of atlanto-axial subluxation, cranial settling and related disorders<br>Applied surgical anatomy of the craniocervical junction<br>Selection of surgical approaches<br>Principles of peri-operative care<br>Complications of surgery | |

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|---|---|---|
| **Clinical Skills** | The assessment, counselling and pre-operative preparation of patients with cervical myeloradiculopathies<br>Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms and 3D spinal reconstructions | |
| **Technical Skills and Procedures** | Fusion surgery for atlanto-axial subluxation incuding craniocervical fusion and C1/C2 fusion. Awareness of the priniciples of transoral PEG resection. | |

**Paediatrics**

| **TOPIC** | **Paediatric neuro-oncology** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Paediatrics | 3 |
| **Objective** | *To achieve competence in the surgical aspects of the multi-disciplinary management of children with tumours of the brain and spinal cord* | |
| **Knowledge** | Epidemiology, natural history and pathology of tumours of the central nervous system in children including medulloblastoma, pilocytic astrocytoma, high grade gliomas, supratentorial PNET, pineal region tumours, brain stem tumours and intramedullary spinal cord tumours<br>Imaging of paediatric CNS tumours<br>Radiological and biochemical staging of tumours<br>Indications for surgery, radiotherapy, primary and adjuvant chemotherapy<br>Goals of surgery<br>Long-term effects of treatment on cognition, hypothalamic-pituitary function and quality of life<br>Availability of clinical (CCLG) trials<br>Management of delayed spinal deformity associated with treatment of spinal cord tumours<br>Consent issues in children<br>Recognition of importance of mentorship in dealing with unfamiliar or complicated exposures and procedures | |
| **Clinical Skills** | Assessment and clinical management of children with tumours of the central nervous system<br>Multidisciplinary approach to treating patients with paediatric brain tumours | |

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| **Technical Skills and Procedures** | Emergency operative management of a deteriorating child with an intracranial haemorrhage and/or hydrocephalus secondary to tumour<br>Use of CT, MRI, electromagnetic and ultrasound guided localisation of tumours of the brain and spine<br>Stereotactic, image-guided and endoscopic biopsy of intracranial tumours<br>Supratentorial craniotomy for hemispheric tumour<br>Approaches to the suprasellar region: pterional, orbitozygomatic and subfrontal<br>Approaches to the third ventricle: transcortical-transventricular, transcallosal<br>Approaches to the pineal region: endoscopic, supracerebellar, suboccipital transtentorial<br>Midline posterior fossa craniotomy for tumour<br>Retrosigmoid approach to tumour presenting in the CP angle<br>Laminoplasty approach to spinal cord tumours. | |

| **TOPIC** | **Paediatric head and spinal injury** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Paediatrics | 4 |
| **Objective** | *To achieve competence in all aspects of the management of accidental and non-accidental paediatric head and spinal injuries.* | |
| **Knowledge** | Pathophysiology of raised intracranial pressure in children following head injury<br>Prevention and treatment of secondary insults relating to transfer and emergency surgery in head-injured children<br>Medical management and intensive care in paediatric head injury<br>Pathophysiology, legal and social aspects of non-accidental injury in children<br>Management of perinatal trauma, growing fractures and penetrating injuries in children<br>Indications for decompressive craniectomy in management of intractable increases in ICP<br>Rehabilitation after mild, moderate and severe head injuries<br>Diagnosis and certification of brain death in children<br>Classification, assessment, investigation and management of paediatric spinal injuries (including SCIWORA) | |
| **Clinical Skills** | Assessment and clinical management of children with head and spinal injury<br>Understanding of the legal issues surrounding non-accidental injury<br>Understanding of multi-disciplinary approach to non- accidental injury | |

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| **Technical Skills and Procedures** | Insertion of ICP monitor<br>Insertion of external ventricular drain<br>Craniotomy for traumatic intracranial haematoma<br>Repair of depressed skull fracture<br>Anterior skull base repair | |

| **TOPIC** | **Paediatric Hydrocephalus** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Paediatrics | 4 |
| **Objective** | *To achieve competence in all aspects of the management (operative and non-operative) of paediatric patients with hydrocephalus.* | |
| **Knowledge** | Pathophysiology and investigation of abnormal CSF dynamics in hydrocephalus and IIH<br>Indications for third ventriculostomy and for shunt insertion<br>Principles of shunt design and function<br>Antenatal diagnosis of hydrocephalus and its prognosis<br>Medical and ophthalmological treatment options for IIH. | |
| **Clinical Skills** | Assessment and clinical management of neonates and children presenting with hydrocephalus<br>Assessment and clinical management of neonates and children presenting with shunt malfunction including obstruction, over-drainage and slit ventricle syndrome<br>Interpretation of CT, MRI scans and ultrasound scans<br>Antenatal counselling<br>Consent in neonates and children | |
| **Technical Skills and Procedures** | Insertion of intracranial pressure monitor<br>Insertion of ventricular access device in neonates<br>Insertion and revision of ventriculoperitoneal shunt / subduroperitoneal shunt<br>Insertion and revision of ventriculoatrial / ventriculopleural shunt<br>Insertion and revision of lumboperitoneal shunt<br>Endoscopic third ventriculostomy<br>Endoscopic fenestration of loculated ventricles or intraventricular cysts<br>CT, MRI and ultrasound guided ventricular access<br>Management of arachnoid cysts by shunting, open or endoscopic fenestration | |

| TOPIC | Congenital spinal disorders | Phase 3 knowledge level |
|---|---|---|
| **Category** | Paediatrics | 4 |
| **Objective** | *To achieve competence in all aspects of the management (operative and non-operative) of children with congenital spinal disorders* | |
| **Knowledge** | Embryogenesis of craniospinal dysraphism<br>Pathophysiology of CSF circulation associated with hindbrain hernia, syringobulbia and syringomyelia<br>Epidemiogy, natural history and clinical features of congenital spinal disorders including dysraphism, tethered cord syndrome, diastematomyelia, Chiari malformations, Klippel-Feil syndrome, achondroplasia, Downs syndrome and other similarly presenting conditions<br>Imaging of the neonatal and growing paediatric spine of children with congenital disorders commonly<br>Antenatal diagnosis of dysraphism and its implications. | |
| **Clinical Skills** | Assessment and clinical management of children presenting with open or closed dysraphic spines and other congenital spinal abnormalities.<br>Collaborative multidisciplinary approach, particularly with orthopaedic and plastic surgery | |
| **Technical Skills and Procedures** | Closure of myelomeningocoele<br>Foramen magnum decompression for hind brain herniation<br>Syringostomy and shunting of syringomyelia<br>Untethering of thickened filum<br>Excision of simple dermal sinus tract<br>Untethering and resection of bony spur in diastematomyelia<br>Untethering of lipomyelomeningocoele<br>Instrumented stabilisation and fusion in the treatment of congenital spinal disorders | |

| TOPIC | Craniofacial disorders | Phase 3 knowledge level |
|---|---|---|
| **Category** | Paediatrics | 3 |
| **Objective** | *To achieve competence in all aspects of the management (operative and non-operative) of children with simple craniosynostosis and cranial deformity after trauma or tumour*<br>*To understand the management of children with syndromic craniosynostosis and encephalocoeles* | |

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| **Knowledge** | Advances in the genetic understanding of craniofacial conditions<br>Epidemiology, natural history and clinical features of simple and syndromic craniosynostosis including cosmetic, cognitive and ophthalmological complications<br>Imaging of simple and syndromic craniosynostosis<br>Indication for and timing of surgical interventions<br>Understanding of causes and management of positional plagiocephaly<br>Epidemiology, natural history, and clinical features of common skull vault conditions including eosinophilic granuloma, fibrous dysplasia etc | |
| **Clinical Skills** | Management of ophthalmic and airway emergencies in syndromic craniosynostosis<br>Neurosurgical contribution to the multi-disciplinary management of children with craniofacial abnormalities<br>Consent issues children<br>Liaison with supraregional centres for designated cases. | |
| **Technical Skills and Procedures** | Cranioplasty using autologous, titanium or acrylic implants<br>Surgical management of non-syndromic single suture synostosis (in the context of a multidisciplinary team) | |

| **TOPIC** | **Paediatric epilepsy** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Paediatrics | 3 |
| **Objective** | *To understand the management of paediatric epilepsy and the assessment of children for epilepsy surgery* | |
| **Knowledge** | Classification, epidemiology, natural history and clinical features of epilepsy in childhood<br>Clinical, encephalographic, videotelemetric and radiological assessment of children entering a surgical program<br>Indications for, prognosis and complications of VNS, disconnection procedures and temporal lobe surgery | |
| **Clinical Skills** | Treatment of status epilepticus<br>Neurosurgical contribution to the multidisciplinary assessment and clinical management of children in preparation for and undergoing epilepsy surgery | |
| **Technical Skills and Procedures** | Cortical lesionectomy<br>VNS insertion/revision<br>Invasive EEG recording by grid and depth electrode placement<br>Surgery for temporal lobe epilepsy<br>Non-temporal lobe resections<br>Disconnection procedures | |

| TOPIC | Paediatric intracranial vascular disorders | Phase 3 knowledge level |
|---|---|---|
| **Category** | Paediatrics | 3 |
| **Objective** | *To achieve competence in the neurosurgical aspects of the multi-disciplinary management of children presenting with intracranial vascular disorders* | |
| **Knowledge** | Epidemiology, natural history, pathophysiology and clinical features of subarachnoid haemorrhage, haemorrhagic stroke and ischaemia stroke in children secondary to intracranial aneurysms, arteriovenous malformations and fistulae, cavernomas, arterial dissection, moya-moya disease and venous sinus thrombosis<br>Surgical, endovascular and radiosurgical strategies for the management of intracranial vascular disorders in children | |
| **Clinical Skills** | The assessment and clinical management of children presenting with spontaneous intracranial haemorrhage, acute cerebral ischaemia and chronic cerebral ischaemia | |
| **Technical Skills and Procedures** | Emergency operative management of spontaneous intracerebral haemorrhage<br>Resection of superficial vascular malformations and cavernomas<br>Surgical management of cerebral ischaemia | |

| TOPIC | Paediatric spasticity and movement disorders | Phase 3 knowledge level |
|---|---|---|
| **Category** | Paediatrics | 3 |
| **Objective** | *To understand the principles of surgical management of spasticity and movement disorders in children* | |
| **Knowledge** | Clinical presentations of spasticity and other movement disorders in childhood<br>Multi-disciplinary assessment of children entering a surgical program<br>The indications for, prognosis and complications of intrathecal baclofen therapy, dorsal rhizotomy and deep brain stimulation in the management of spasticity and dystonia<br>Awareness of indications for CNS modulating procedures in the management of pain and convulsive disorders | |
| **Clinical Skills** | Neurosurgical aspects of the multi-disciplinary assessment and management of children with spasticity and movement disorders<br>Consent in children | |

| | | |
|---|---|---|
| **Technical Skills and Procedures** | Baclofen pump insertion, assessment of function and revision<br>Laminotomy for selective dorsal rhizotomy<br>Removal/revision of pulse generator units | |

**CRITICAL CONDITIONS**

| **TOPIC** | **Impaired consciousness and seizures** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency management of patients presenting with impaired consciousness and non-traumatic coma* | |
| **Knowledge** | Aetiology, pathophysiology and differential diagnosis of altered consciousness and coma<br>Assessment of the patient with impaired consciousness<br>The emergency management and investigation of patients with deteriorating levels of consciousness or seizures | |
| **Clinical Skills** | Clinical assessment of patients with impaired consciousness or seizures<br>Emergency management of patients impaired consciousness or seizures<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Maintenance of airway<br>Endotracheal intubation<br>Lumbar puncture | |

| **TOPIC** | **Cranial Trauma** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of head-injured patients* | |
| **Knowledge** | Anatomy and blood supply of the scalp, cranium, meninges and brain<br>Pathophysiology of head injury and of multiple trauma<br>Emergency, intensive care and ward based management of patients with a head injury<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients following a head injury<br>Principles, diagnosis and confirmation of brain stem death | |
| **Clinical Skills** | Clinical assessment of patients with a head injury<br>Emergency management of patients with a head injury | |

| | | |
|---|---|---|
| | Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Wound exploration, debridement and closure<br>Burr hole drainage of chronic subdural haematoma<br>Insertion of intracranial pressure monitor<br>Craniotomy for acute subdural, extradural and interparenchymal haematomas, removal of penetrating objects and elevation of depressed skull fractures.<br>Decompressive craniectomy for trauma | |

| **TOPIC** | **Acute Hydrocephalus** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of patients with acute hydrocephalus* | |
| **Knowledge** | The pathophysiology of CSF circulation<br>Applied surgical anatomy of the ventricular system<br>Emergency, intensive care and ward based management of patients with acute hydrocephalus and shunt failure<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with hydrocephalus | |
| **Clinical Skills** | Clinical assessment of patients with acute hydrocephalus<br>Emergency management of patients with acute hydrocephalus<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture<br>Insertion and taping of CSF reservoirs<br>Insertion and maintenance of lumbar and ventricular drains<br>Insertion of external ventricular drain<br>Shunt insertion and revision | |

| **TOPIC** | **Acute Tumour Presentations** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of patients with intracranial tumours* | |

| | | |
|---|---|---|
| **Knowledge** | The neuropathology of primary and secondary intracranial tumours<br>Functional cerebral anatomy<br>Emergency, intensive care and ward based management of patients with an intracranial tumour<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with a brain tumour | |
| **Clinical Skills** | Clinical assessment of patients with an acute tumour presentation<br>Emergency management of patients with an intracranial tumour<br>Interpretation of imaging studies including MRI and CT<br>Breaking bad news to patients and families | |
| **Technical Skills and Procedures** | Craniotomy for supratentorial intrinsic tumour<br>Craniotomy for infratentorial intrinsic tumour | |

| **TOPIC** | **Spontaneous Intracranial Haemorrhage** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of patients with subarachnoid haemorrhages (SAH) and Spontaneous Intracerebral Haemorrhages (ICH)* | |
| **Knowledge** | Anatomy and Physiology of the cerebral arterial and venous circulations<br>Aetiology and pathophysiology of SAH and ICH<br>Emergency, intensive care and ward based management of patients with spontaneous intracranial haemorrhage<br>Principles and practice of operative interventions and principles of neuroradiological interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients following a spontaneous intracranial haemorrhage | |
| **Clinical Skills** | Clinical assessment of patients with a spontaneous intracranial haemorrhage<br>Emergency management of patients with an intracranial haemorrhage<br>Interpretation of imaging studies including MRI, CT and angiograms | |
| **Technical Skills and Procedures** | Craniotomy for interparenvhymal haemorrhage including sylvian haematoma and AVM related haemorrhage | |

| TOPIC | CNS infections | Phase 3 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of CNS infections* | |
| **Knowledge** | Aetiology and pathophysiology of CNS infections including surgery related infections, meningitis, cerebral abscess and subdural empyema<br>Microbiological pathogens and antibiotic selection<br>Emergency, intensive care and ward based management of patients with CNS infections<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with CNS infections | |
| **Clinical Skills** | Clinical assessment of patients with CNS infections<br>Emergency management of patients with CNS infections<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar puncture<br>Burr hole aspiration of cerebral abscess<br>Craniotomy for subdural empyema or cerebral abscess | |

| TOPIC | Spinal Trauma | Phase 3 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of spinal trauma* | |
| **Knowledge** | Epidemiology of spinal trauma<br>Spinal biomechanics and the classification of injuries<br>Pathophysiology of spinal cord injury<br>Emergency, intensive care and ward based management of patients with spinal injuries<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with a spinal injury | |
| **Clinical Skills** | Clinical assessment of patients with a spinal injury<br>Emergency management of patients with spinal trauma<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Use of external immobilisation including cervical collars<br>Application of cranial-cervical traction<br>Application of a halo-body jacket<br>Anterior cervical spine fusion, posterior cervical spine fusion | |

| TOPIC | Spinal Oncology | Phase 3 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of spinal oncology* | |
| **Knowledge** | The neuropathology of primary and secondary spinal tumours<br>Clinical presentations of intramedullary, intradural extramedullary, extradural and bony spinal tumours including malignant spinal cord compression<br>Emergency, intensive care and ward based management of patients with spinal tumours<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation, further treatment and prognosis of patients with spinal tumours | |
| **Clinical Skills** | Clinical assessment of patients with a spinal tumour<br>Emergency management of patients with a spinal tumour<br>Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Decompression of malignant spinal cord compression in the cervical, thoracic and lumbar spine | |

| TOPIC | Acute Spinal Disorders and cauda equina syndrome | Phase 3 knowledge level |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency, intensive care and ward based management of acute spinal disorders especially cauda equina syndrome* | |
| **Knowledge** | Anatomy of the spine, spinal cord, autonomic and somatic nervous systems<br>Physiology of spinal cord function and control of the bladder<br>Pathophysiology of cauda equina syndrome, nerve root compression and spinal cord compression<br>Emergency, intensive care and ward based management of patients with acute spinal disorders<br>Principles and practice of operative interventions<br>The detection and management of complications<br>Rehabilitation and prognosis of patients with acute spinal disorders | |
| **Clinical Skills** | Clinical assessment of patients with an acute spinal disorder<br>Emergency management of patients with an acute spinal disorder | |

| | | |
|---|---|---|
| | Interpretation of imaging studies including MRI and CT | |
| **Technical Skills and Procedures** | Lumbar laminectomy<br>Lumbar discectomy<br>Anterior cervical discectomy<br>Posterior cervical decompression<br>Laminectomy for epidural or subdural haematomas and empyemas | |

| **TOPIC** | **Emergency paediatric neurosurgery** | **Phase 3 knowledge level** |
|---|---|---|
| **Category** | Critical conditions | 4 |
| **Objective** | *To achieve competence in the emergency management of paediatric neurosurgical patients* | |
| **Knowledge** | Paediatric physiology<br>Pathophysiology of hydrocephalus, head injury and acute presentations of tumours and intracranial haemorrhage in children of all ages<br>Child Safeguarding principles<br>Understanding of Children's rights and surgical consent | |
| **Clinical Skills** | Clinical assessment of children with acute neurosurgical disorders<br>Emergency management of children with acute neurosurgical disorders | |
| **Technical Skills and Procedures** | Lumbar puncture in children<br>Taping of CSF reservoirs in children<br>Shunt insertion and revision in all age groups<br>EVD insertion in all age groups | |

**INDEX PROCEDURES**

| **TOPIC** | **Advanced Adult Supratentorial** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 4 |
| **Objective** | *To achieve technical competence in advanced adult supratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |

| | | |
|---|---|---|
| **Technical Skills and Procedures** | A wide range of the following procedures in those 16 years and over:<br>Clipping of anterior circulation aneurysm<br>Clipping of posterior circulation aneurysm<br>Craniotomy and excision of AVM<br>Craniotomy and excision of Cavernoma<br>Hemispherectomy (functional or anatomic) for epilepsy<br>Infratentorial, supracerebellar approach to pineal region tumour<br>Interhemispheric approach to midline ventricular lesion (eg colloid cyst)<br>Interhemispheric approach to pineal region tumour<br>Lesionectomy for epilepsy<br>Supratentorial, suboccipital approach to pineal region tumour<br>Temporal lobectomy for epilepsy<br>Transcranial approach to sellar or suprasellar lesion | |

| **TOPIC** | **Endoscopic and Transphenoidal** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 3<br><br>(4 if special interest) |
| **Objective** | *To achieve technical competence in endoscopic and transphenoidal surgery* | |
| **Knowledge** | Applied anatomy of the sphenoid sinus, sella, pituitary and optic nerves<br>Indications for surgery<br>Use of an endoscope to perform complex surgery<br>Complications of surgery and management of endocrine function<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Endoscopic biopsy of intrinsic cerebral tumour<br>Endoscopic excision / drainage of ventricular lesion (eg colloid cyst)<br>Endoscopic third ventriculostomy<br>Other Endoscopic Procedure (except biopsy)<br>Transphenoidal biopsy of sellar lesion (not adenoma)<br>Transphenoidal hypophysectomy | |

| **TOPIC** | **Convexity and falcine meningiomas** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 4 |
| **Objective** | *To achieve technical competence in convexity and falcine meningioma surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature and brain<br>Indications for surgery<br>Microsurgical dissection techniques | |

| | | |
|---|---|---|
| | Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Excision of meningioma - convexity<br>Excision of meningioma - falx<br>Excision of meningioma - Other<br>Excision of meningioma - parasagital<br>Excision of meningioma - sphenoid ridge<br>Excision of meningioma - subfrontal | |

| **TOPIC** | **Advanced adult infratentorial** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 4 |
| **Objective** | *To achieve technical competence in advanced adult infratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures in those 16 years and over:<br>Craniotomy for spontaneous ICH (infratentorial)<br>Infratentorial skull base approach to skull base tumour<br>Microvascular decompression of facial nerve<br>Microvascular decompression of trigeminal nerve<br>Middle fossa approach to vestibular schwannoma<br>Midline approach to intrinsic brain stem or 4th ventricle tumour<br>Midline approach to intrinsic cerebellar tumour<br>Midline posterior fossa craniotomy and excision of meningioma<br>Midline posterior fossa craniotomy for benign lesions (excl. meningioma)<br>Retrosigmoid approach to intrinsic brain stem tumour<br>Retrosigmoid approach to intrinsic cerebellar tumour<br>Retrosigmoid approach to vestibular schwannoma<br>Retrosigmoid craniotomy and excision of meningioma<br>Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)<br>Translabrynthine approach to vestibular schwannoma<br>Transoral / transfacial approach to skull base tumour | |

| TOPIC | Intradural Spine | Phase 3 technical level |
|---|---|---|
| **Category** | Index procedures | 4 |
| **Objective** | *To achieve technical competence in intradural spinal surgery* | |
| **Knowledge** | Applied anatomy of the spine, meninges, vasculature, spinal cord and nerves<br>Indications for surgery<br>Microsurgical dissection techniques<br>Spinal cord monitoring<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Biopsy of intramedullary spinal cord lesion<br>Closure of encephalocoele<br>Closure of myelomeningocoele<br>Evacuation of primary spinal subdural haematoma<br>Excision / debulking of intramedullary spinal cord lesion<br>Excision of other intradural, extramedullary lesion<br>Excision of spinal meningioma<br>Excision of spinal neurofibroma<br>Foramen magnum decompression<br>Other surgery for spinal dysraphism<br>Surgery for spinal AVM<br>Surgery for spinal cavernoma<br>Untethering of spinal cord | |

| TOPIC | Complex Spinal Fusion | Phase 3 technical level |
|---|---|---|
| **Category** | Index procedures | 3<br><br>(4 if special interest) |
| **Objective** | *To achieve technical competence in spinal fusion surgery* | |
| **Knowledge** | Applied anatomy of the vertebrae, ligaments, discs, musculature and nerves<br>Indications for surgery<br>Spinal decompression and fusion techniques<br>Complications of surgery<br>Management of anti-platelet and anti-coagulant medication | |
| **Technical Skills and Procedures** | A wide range of the following procedures:<br>Spinal fixation<br>AND<br>Anterior cervical fusion<br>Anterior Lumbar Interbody Fusion<br>Anterior PEG spinal fixation<br>Anterior thoracic fusion<br>Occipito-Cervical fusion (with instrumentation) | |

| | | |
|---|---|---|
| | Other anterior cervical decompression<br>Other anterior thoracic decompression<br>Other decompressive posterior lumbar surgery<br>Other posterior cervical decompression<br>Other posterior thoracic decompression<br>Posterior C1/2 spinal fixation<br>Posterior cervical fusion<br>Posterior Lumbar Fusion<br>Posterior Lumbar Interbody Fusion<br>Posterior thoracic fusion<br>Open biopsy of spine (eg tumour, infection)<br>Primary Posterior Cervical Laminectomy or laminoplasty<br>Revision anterior cervical decompression<br>Revision posterior cervical decompression<br>Transoral excision of odontoid<br>Primary anterior lumbar surgery for disc/degen disease<br>Primary lumbar laminectomy for disc/degen disease<br>Primary posterior lumbar discectomy<br>Revision anterior lumbar surgery for disc/degen disease<br>Revision posterior lumbar surgery for disc/degen disease | |

| **TOPIC** | **Advanced paediatric supratentorial** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 2<br><br>(3 if special interest) |
| **Objective** | *To gain experience in advanced paediatric supratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques in children<br>Complications of surgery | |
| **Technical Skills and Procedures** | A wide range of the following procedures in children under 16:<br>Clipping of anterior circulation aneurysm<br>Clipping of posterior circulation aneurysm<br>Craniotomy and excision of AVM<br>Craniotomy and excision of Cavernoma<br>Craniotomy for dural AVM<br>Craniotomy for frontal intrinsic cerebral tumour<br>Craniotomy for occipital intrinsic cerebral tumour<br>Craniotomy for other intrinsic cerebral tumour<br>Craniotomy for parietal intrinsic cerebral tumour<br>Craniotomy for temporal intrinsic cerebral tumour<br>Excision of meningioma - convexity<br>Excision of meningioma - falx<br>Excision of meningioma - Other<br>Excision of meningioma - parasagital<br>Excision of meningioma - sphenoid ridge<br>Excision of meningioma - subfrontal | |

| | | |
|---|---|---|
| | Hemispherectomy (functional or anatomic) for epilepsy<br>Interhemispheric approach to midline ventricular lesion (eg colloid cyst)<br>Interhemispheric approach to pineal region tumour<br>Lesionectomy for epilepsy<br>Supratentorial craniotomy for benign lesions (excl. meningioma)<br>Supratentorial, suboccipital approach to pineal region tumour<br>Temporal lobectomy for epilepsy<br>Transcranial approach to sellar or suprasellar lesion | |

| **TOPIC** | **Advanced paediatric infratentorial** | **Phase 3 technical level** |
|---|---|---|
| **Category** | Index procedures | 2<br><br>(3 if special interest) |
| **Objective** | *To gain experience in advanced paediatric infratentorial surgery* | |
| **Knowledge** | Applied anatomy of the scalp, skull, meninges, vasculature, nerves and brain<br>Indications for surgery<br>Microsurgical dissection techniques in children<br>Complications of surgery | |
| **Technical Skills and Procedures** | A wide range of the following procedures in children under 16:<br>Infratentorial, supracerebellar approach to pineal region tumour<br>Midline approach to intrinsic brain stem or 4th ventricle tumour<br>Midline approach to intrinsic cerebellar tumour<br>Midline posterior fossa craniotomy and excision of meningioma<br>Midline posterior fossa craniotomy for benign lesions (excl. meningioma)<br>Retrosigmoid approach to intrinsic brain stem tumour<br>Retrosigmoid approach to intrinsic cerebellar tumour<br>Retrosigmoid craniotomy and excision of meningioma<br>Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)<br>Transoral / transfacial approach to skull base tumour | |

## Appendix 3: Critical conditions

Neurosurgery manages a large number of individual conditions as described in the syllabus. Assessment of a trainee's ability to manage these is through the supervision level decisions made when assessing the shared CiPs. Each specialty also has a list of critical conditions that are felt to be of significant importance for patient safety and to demonstrate a safe breadth of practice. These critical conditions will be assessed individually by means of the Case Based Assessment (CBD) and / or Clinical Evaluation Exercise (CEX) which will both provide formative feedback to the trainee and feed into the summative assessments of the Assigned Educational Supervisor.

To ensure that trainees have the necessary skills, there should be documented evidence (CEX / CBD) at the progression points for the critical conditions. An indicative three or more CBDs or CEXs must be achieved at the specified level to progress between phases of training.

CEX/CBD levels:
Level 1: Appropriate for early years training
Level 2: Appropriate for completion of early years training
Level 3: Appropriate for central period of specialty training
Level 4: Appropriate for certification

| **Critical Condition** | **Phase 1** | **Phase 2 indicative** | **Phase 3** |
|---|---|---|---|
| Impaired consciousness and seizures | 4 | 4 | 4 |
| Cranial Trauma | 3 | 4 | 4 |
| Acute Hydrocephalus | 3 | 4 | 4 |
| Acute tumour presentations | 2 | 4 | 4 |
| Spontaneous intracranial haemorrhage | 2 | 4 | 4 |
| CNS infections | 2 | 4 | 4 |
| Spinal trauma | 2 | 4 | 4 |
| Spinal oncology | 2 | 4 | 4 |
| Degenerative spinal disorders and cauda equina syndrome | 3 | 4 | 4 |
| Emergency paediatric neurosurgery | 1 | 4 | 4 |

## Appendix 4: Index procedures / Indicative Numbers

Each specialty requires technical skills to be achieved across a wide range of operative procedures as described in the syllabus. Assessment of a trainee's ability to carry out this full range of procedures is covered by the supervision level decisions made when assessing the shared CiPs. These assess not only the necessary technical skills but the totality of capabilities required to carry them out.

Neurosurgery also has a list of index procedures which are felt to be of significant importance for patient safety and to demonstrate a safe breadth of practice. These index procedures will be assessed individually by means of the Procedure Based Assessment (PBA) which will both provide formative feedback to the trainee and feed into the summative assessments of the AES Report and ARCP. There should be evidence that a representative proportion of the operations in each group have been assessed and recorded on the ISCP at the expected skill level shown in the table below.

PBA levels

Level 2a: Guidance required for most/all of the procedure (or part performed)
Level 2b: Guidance or intervention required for key steps only

Level 3a: Procedure performed with minimal guidance or intervention (needed occastional help)
Level 3b: Procedure performed competently without guidance or intervention but lacked fluency

Level 4a: Procedure performed fluently without guidance or intervention
Level 4b: As 4a and was able to anticipate, avoid and/or deal with common problems/complications

An indicative three or more PBAs must be achieved at the specified level to progress between phases of training. The paediatric surgery index cases require only one PBA at the specified level.

Trainees should have undertaken an indicative 1200 operations during training to include an indicative 70 paediatric cases and 250 spinal cases.

| **Index procedure** | **Indicative number (excluding assisted) by certification** | **Indicative technical skill (PBA) level expected at end of phase 2** | **Technical skill (PBA) level expected by certification** |
|---|---|---|---|
| Advanced Adult Supratentorial | 10 | 3 | 4 |
| Endoscopic and Transphenoidal | 10 | 3 | 3 (4 if special interest) |
| Convexity and falcine meningiomas | 10 | 3 | 4 |
| Advanced adult infratentorial | 10 | 3 | 4 |

| | | | |
|---|---|---|---|
| Intradural Spine | 5 | 3 | 4 |
| Complex Spinal Fusion | 10 | 3 | 3 (4 if special interest) |
| Advanced paediatric supratentorial | 1 | 2 | 2 (3 if special interest) |
| Advanced paediatric infratentorial | 1 | 2 | 2 (3 if special interest) |

## Appendix 5: Courses and other learning opportunities away from the workplace

Some knowledge and capabilities are best gained in the formal setting of a taught course. In Neurosurgery there is one mandated course.

| **Trauma learning outcomes** | **Rationale for learning by attendance at a course** | **Phase of training** | **GPC** | **CiP** | **Examples of ways to meet trauma learning outcomes** |
|---|---|---|---|---|---|
| To achieve competence in the emergency, intensive care and ward based management of head-injured patients<br><br>To achieve competence in the emergency, intensive care and ward based management of spinal trauma | Cannot be learned in the workplace to the level required for patient safety<br><br>Allows a systematic process of teaching a safe and reliable method of immediate management of severely injured patients and comprises a range of comprehensive and adaptable trauma management skills relevant to all specialties | Once throughout training | Domain 2: Professional skills<br><br>Domain 3: Professional knowledge<br><br>Domain 5: Capabilities in leadership and team working | 2) Manages the unselected emergency take | The Advanced Trauma Life Support® (ATLS®), European Trauma Course, Definitive Surgical Trauma Skills course or equivalent and APLS<br><br>locally provided course(s) meeting the outcomes described |

### The role of the Training Programme Director (TPD)

TPDs are responsible for managing the specialty training programmes, ensuring they deliver the specialty curriculum.

TPDs are responsible for:

- Organising, managing and directing the training programmes, ensuring that the programmes meet curriculum requirements
- Identifying, appointing and supporting local faculty i.e. Assigned Educational Supervisors (AESs) and Clinical Supervisors (CSs), providing training as necessary, including training in equality and diversity and providing feedback to AESs and CSs on the quality of their performance
- Ensuring a policy for career management and advice covering the needs of trainees in their placements and programmes
- Overseeing progress of individual trainees through the levels of the curriculum, ensuring learning objectives are set, appropriate assessments are being undertaken and that appropriate levels of supervision and support are in place
- Helping the Postgraduate Dean and AES manage trainees who are running into difficulties by identifying remedial placements and resources where required
- Working with delegated Specialty Advisory Committee (SAC) representatives (SAC Liaison Members) and College representatives (e.g. college tutors) to ensure that programmes deliver the specialty curriculum
- Ensuring that Deanery/HEE Local Office administrative support are knowledgeable about curriculum delivery and are able to work with NHS Employers, SACs, trainees and trainers
- Providing induction for trainees entering specialty programmes
- Administering and chairing the Annual Review of Competence Progression (ARCP) meetings
- Monitoring the quality of the training programme and producing quality reports (including the quality of trainer assessments and feedback) for the Postgraduate Dean
- Ensuring access to trainee data is kept confidential.

### The role of the Assigned Educational Supervisor (AES)

AESs are consultant surgeons responsible for the management and educational progress of one or more specified trainee(s) in a training placement or series of placements. AESs must be appropriately trained for the role, familiar with the curriculum and have demonstrated an interest and ability in teaching, training, assessing and appraising. They should have gained skills equivalent to courses such as Training the Trainer offered by an appropriate educational institution and must keep up-to-date with developments in training. They must have appropriate access to teaching resources and time for training allocated to their job plan (approx. 0.25 PA per trainee). They must have access to the support and advice of their senior colleagues regarding any issues related to teaching and training and to keep up-to-date with their own professional development.

AESs are responsible for:

- Providing induction to the unit (where appropriate)
- Ensuring that trainees are familiar with the curriculum and assessment system relevant to the level/phase of training and undertake it according to requirements
- Ensuring that trainees have appropriate day-to-day supervision appropriate to their phase of training
- Helping trainees with both professional and personal development

- Completing a learning agreement with trainees and undertaking appraisal meetings (typically one at the beginning, middle and end of a placement)
- Ensuring the MCR is completed by CSs, ensuring all the CiPs are addressed, any differences in supervision level are explained and final sign off of the MCR
- Ensuring a record is kept in the portfolio of any serious incidents or concerns and how they have been resolved
- Regularly inspecting trainee learning portfolios and ensuring trainees are making the necessary clinical and educational progress
- Informing trainees of their progress and encouraging trainees to discuss any deficiencies in the training programme, ensuring that records of such discussions are kept
- Ensuring access to trainee data is kept confidential
- Ensuring patient safety in relation to trainee performance by the early recognition and management of those doctors in distress or difficulty
- Keeping the TPD informed of any significant problems that may affect training
- Discussing trainees' progress with each trainer with whom trainees spend a period of training and involving them in the formal reporting process
- Providing an end of placement AES report for the ARCP.

**The role of the Clinical Supervisor (CS)**

CSs are consultant surgeons responsible for delivering teaching and training under the delegated authority of the AES. The training of CSs should be similar to that of the AES.

CSs are responsible for:

- Ensuring patient safety in relation to trainee performance
- Carrying out WBAs on trainees and providing verbal and written feedback
- Liaising closely with other colleagues, with whom the trainee is working, regarding the progress and performance of trainees
- Keeping the AES informed of any significant problems that may affect training
- Ensuring access to trainee data is kept confidential
- Contributing to the MCR as part of the faculty of CSs and providing constructive feedback to the trainee.

The roles of AES and CS come under the umbrella of the Professionalised Trainer outlined in section 3.2.2. The JSCT is supportive of the GMC's moves towards greater recognition and accreditation for clinicians undertaking the roles of AES and CS, and other responsibilities supporting education and training.

**The role of the Assessor**

Assessors carry out a range of WBAs and provide verbal and written feedback trainees. Assessments during training are usually be carried out by CSs, who will be responsible for the MCR, recommending the supervision level and providing detailed formative feedback to trainees with reference to the CiPs. Other members of the surgical team including senior trainees, senior nurses and doctors from other medical disciplines may assess trainees in areas where they have particular expertise (e.g. with the use of the DOPS). Those who are not medically qualified may also act as assessors for the trainee's Multi-source Feedback (MSF). Assessors must be appropriately qualified in the relevant professional discipline and trained in the methodology of WBA. This does not apply to MSF raters.

Assessors are responsible for:

- Carrying out WBA, including the MCR, according to their area of expertise and training
- Providing constructive verbal feedback to trainees, including an action plan, immediately after the event
- Ensuring access to trainee data is kept confidential
- Providing written feedback and/or validating WBAs in a timely manner.

**The role of the Trainee**

Trainees are the learners who have been selected into a specialty training programme. Other surgeons who have registered to use the curriculum and learning portfolio as learners have the same responsibilities. All trainees/learners have a responsibility to recognise and work within the limits of their professional competence and to consult with colleagues as appropriate. Throughout the curriculum, great emphasis is laid on the development of good judgement and this includes the ability to judge when to seek assistance and advice. Trainees/learners must place the well-being and safety of patients above all other considerations. They are required to take responsibility for their own learning and to be proactive in initiating appointments to plan, undertake and receive feedback on learning opportunities.

Trainees/learners are responsible for:

- Engaging with opportunities for learning
- Creating a learning agreement and initiating meetings with the AES
- Raising concerns with the AES and/or TPD about any problems that might affect training
- Initiating regular WBAs with assessors in advance of observations
- Undertaking self and peer assessment
- Undertaking regular reflective practice
- Maintaining an up to date learning portfolio
- Working as part of the surgical and wider multi-professional team.

## Appendix 7: Quality Management of the Curriculum

The Joint Committee on Surgical Training (JCST) works as an advisory body to the four surgical Royal Colleges of the UK and Ireland for all matters related to surgical training. It is the parent body of the Specialty Advisory Committees (SACs) and the Training Interface Groups (TIGs) and works closely with the Surgical Specialty Associations in Great Britain and Ireland. The JCST sets out a curriculum quality framework directed at evaluating and monitoring curriculum delivery against curriculum standards whereby a range of qualitative and quantitative measures inform continuous improvement. The JCST is also the umbrella organisation for the Intercollegiate Surgical Curriculum Programme (ISCP), the curriculum training management system. Through the variety of mechanisms outlined below, the JCST complies, and ensures compliance, with the requirements of equality and diversity legislation set out in the Equality Act 2010.

The quality system includes the following components:

- Quality assurance (QA): the development and maintenance of the curriculum links with the GMC's role in providing standards for training and for curricula.
- Quality management (QM): the implementation of training and curriculum standards by Deaneries/HEE Local Offices through training programmes and post locations approved by the GMC. The system includes processes for recruitment and selection and mechanisms to address concerns. SAC Liaison Members provide externality and support for local quality management.
- Quality control (QC): the implementation of training standards by local education providers (LEPs). The local delivery of curriculum is through the trainers recognised by the GMC.

### Internal Quality Review

The following mechanisms provide sources of information that, together, provide complementary information which informs quality management and quality improvement.

*Specialty Advisory Committees (SACs)*

There is one SAC for each GMC recognised surgical specialty and a Core Surgical Training Advisory Committee (CSTAC) which oversees core surgical training. Each SAC will comprise appointed Liaison Members to cover all training regions in the UK, the Lead Dean for the specialty, a trainee representative, the Chair of the Intercollegiate Specialty Board (ex officio), the President of the Specialty Association or deputy, a representative of Royal College of Surgeons in Ireland and additional members may be co-opted for a time-limited period to provide specific expertise as necessary. The skill set and experience of SAC members will reflect the breadth of the specialty. The Liaison Members act on behalf of the SAC by overseeing training in a particular region(s) other than their own. Duties include contributing to the local quality management systems, the ARCP and to the regular reporting through first-hand independent knowledge of training programmes.

*Curriculum development*

The SACs, working with their Specialty Associations, are responsible for curriculum development and maintenance. They monitor innovations in clinical practice and, when these become established components of service delivery, they can be incorporated into an approximately three yearly review of the specialty curriculum. Similarly, the JCST, ISCP Management Committee, JCST Quality Assurance Group and the SACs monitor developments in training delivery and incorporate these into formal curriculum reviews. Curriculum updates are made in consultation with all stakeholders, including trainees, trainers, speciality organisations, deans, employers, patient and lay representatives and the GMC including specific trials and pilots when required.

Equality and diversity implications are considered throughout the development of curricula in association with trainees and trainers through specific development events, which feed into impact assessments, noting any potential adverse effects on learners with protected characteristics as defined by the Equality Act 2010. Curricula are also developed through regular meetings with the GMC, helping to refine the curriculum approach and ensuring that the standards for curricula are met and identify future developments.

*GMC Survey*

The GMC undertakes a national training survey of trainee views on their training. The findings of the survey are available by country, postgraduate body, LEP, training level and graduating medical school. The GMC also conducts a survey of educational and clinical supervisors in the UK, which aims to collect evidence on whether trainers are able to undertake their duties as trainers effectively; have support for training including trainer development and the formal recognition of their duties in job plans; are implementing curricula and assessments appropriately.

The JCST analyses the GMC's published reports on these surveys, drawing out the key messages for surgery to feed into each SAC and QA Group meeting. SAC Liaison Members are responsible for consulting on the outcomes of these discussions with those responsible for curriculum delivery in their regions including TPDs and Specialty Training Committees (STCs). They also report key learning points through their Liaison Member Reports. The JCST uses the initial analysis and feedback from these processes to help address ad hoc queries and inform projects, pilots, monitoring and evaluation work. The outcomes of these processes are to report the specialty and national view of postgraduate surgical training through a continuous model of reporting to the GMC at regional and national level.

The GMC also provides a progression data portal, which colleges and faculties can use to consider data on the progression of trainees by specialties and regions. The JCST uses these data to help identify system or policy changes that might need review in order to ensure equality, diversity and fairness. See also below – External Quality Review (the GMC and postgraduate bodies use the GMC survey findings in external quality review).

Quality Indicators

The JCST Quality Indicators are the JCST and SACs' guidance on the attributes of good quality training posts. They are not an assessment for measuring the achievements of individual trainee. They are a tool to monitor the quality of training posts and drive quality improvement.

JCST Survey

The JCST trainee survey measures training post compliance with the JCST Quality Indicators across all UK training programmes. The anonymised survey responses are pivotal to the JCST's quality processes. Trainees complete one survey for each training placement prior to their ARCP. As part of its five-year strategy, the JCST shares this information in the form of annual reports. The JCST also conducts a biennial survey of surgical Assigned Educational Supervisors to gather information on issues particularly relevant to surgical trainers, such as use of the web-based ISCP, time and support available to undertake training and other related activities. Analysis of the findings from these surveys are key to the work of the SACs and QA Group. This informs their meetings and the consultations SAC Liaison Members have with those responsible for curriculum delivery within their regions including TPDs and STCs. The learning points drawn from the analysis and feedback inform all JCST work including projects, pilots and evaluation and help report the specialty and national view of postgraduate surgical training.

*JCST and ISCP data*

Training data collected through the JCST and ISCP are used to review quality. These include curriculum delivery, adherence to quality indicators and equality and diversity issues. The ISCP is used to monitor curriculum delivery, trainee progression and WBA performance. The ISCP Management Committee undertakes and supports qualitative and quantitative research and recruits external Research Fellows to conduct specific studies to support curriculum and assessment change.

*Trainee views*

Representatives of trainee associations are members of the JCST committees and have specific sections of meetings to report on training issues and raise concerns. Trainee representatives are involved in working groups, curriculum review and the development of the ISCP training management system, including, where necessary, cascading training, testing and piloting.

**External Quality Review**

*Postgraduate Deans*

The responsibility for the quality management of specialty training programmes rests with the Deans. They ensure posts and programmes are approved by the GMC, oversee the appointment of trainees and of TPDs. They ensure that training in the regions is implemented in accordance with GMC-approved curricula. Deans work through STCs and Boards, seeking advice from the JCST, the surgical Royal Colleges and SACs on curriculum delivery, the local content of programmes, assessment of trainees, remedial training and the recognition and training of trainers. The Deans contract LEPs through Service Level Agreements to deliver training to agreed standards. Working alongside Postgraduate Deans, education providers must take responsibility for ensuring that clinical governance and health and safety standards are met. This includes the provision of a system of training including in equality and diversity, a process of revalidation and annual appraisals of trainers by employers set against the professional standards for Good Medical Practice.

*Schools of Surgery*

The co-ordination of surgical training is through Schools and their devolved nation equivalents, which are accountable to the Deaneries/HEE Local Offices. They bring together networks of lead providers of postgraduate medical education in a particular specialty or group of specialties to decide how educational initiatives are best delivered and ensure consistency of approach. Each School is led by the Head of School who acts as a workforce adviser to the education commissioners, leads on quality management of surgery, supports and develops lead providers, provides regional representation in national fora and an interface with other disciplines. The Head of School or their devolved nation equivalent also oversees the quality of training posts provided locally. The national Heads of School and their devolved nation equivalents meet through their Confederation of Postgraduate Schools of Surgery (CoPSS), which is also attended by the Chair of the JCST and ISCP Surgical Director.

*Training Programme Directors*

Training programmes are led by TPDs or their designated equivalent. TPDs have responsibility for managing individual specialty training programmes. Their responsibilities include allocating trainees to training placements and rotations, providing systems for career management, flexible training, academic training and remedial training as well as organising the recognition and training of trainers and co-ordinating the ARCP. TPDs, working alongside Heads of School, are also

introducing a standardised form for the evaluation of AES reports in order to offer feedback to AESs about the quality of their feedback to trainees, along with mechanisms for development.

*Statutory Education Bodies*

Co-ordination and alignment of policy on medical education is devolved from health ministers to bodies governing the health services in the four nations of the UK (Health Education England (HEE), NHS Education for Scotland (NES), the Northern Ireland Medical and Dental Training Agency (NIMDTA) and Health Education and Improvement Wales (HEIW)) and Ireland (the Health Service Executive (HSE)). These organisations are responsible for healthcare, education, training and workforce development. They take advice from the JCST and the surgical Royal Colleges in order to ensure consistent regional delivery. These organisations can undertake visits to LEPs and visits can be triggered by specific concerns. They highlight any areas for improvement, agree the timetable for any appropriate action and identify areas of notable practice. SAC Liaison Members may be involved in the visits to provide both specialty-specific input and externality.

*UK Medical Education Reference Group (UKMERG)*

The UKMERG is a forum for discussion, co-ordination and alignment of matters relating to medical education across the UK. It includes representation from the four UK health departments and the four statutory postgraduate medical education bodies.

*General Medical Council*

The GMC is responsible for setting the standards for curricula and approving curricula as well as approval of training programmes and training post locations. The Deanery/HEE Local Office submits an application for programme and post location approval. Support for an application is available from the relevant surgical SAC. There is regular reporting to the GMC as part of their quality framework. The GMC activities may include document requests, meetings, shadowing, observations, visits and document reviews. The GMC uses the GMC survey results in quality assurance by monitoring that training meets the required standards. It will escalate issues through other QA activity such as an enhanced monitoring process. Triggered visits investigate possible serious educational failures or risks to patient safety as part of the GMC's enhanced monitoring process. The GMC’s QA process includes the ability to impose a sanction in response to a failure to meet its standards including imposing conditions which limit the time or scope of approval, refusing approval, and withdrawing recognition for training.

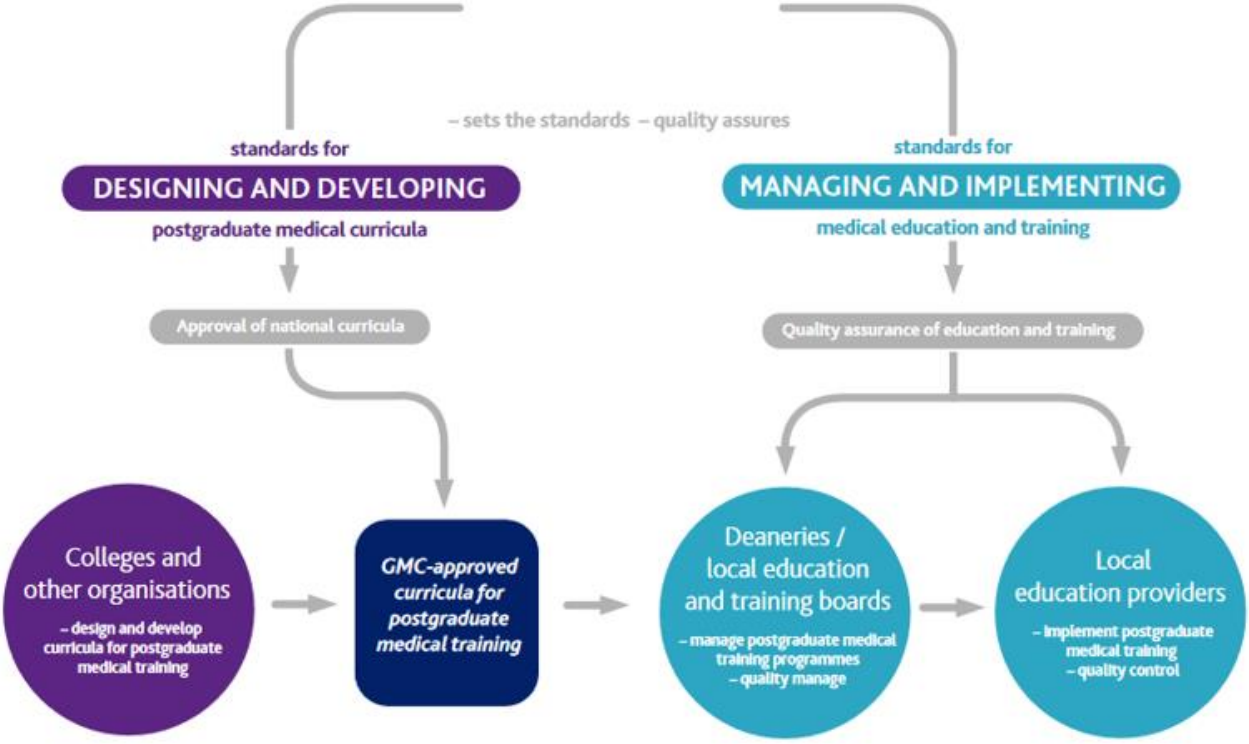


Figure 8: The quality assurance structure of the curriculum (adapted from Excellence by Design, GMC, 2017)

| Term | Definition |
|---|---|
| AES Report | An end of placement report by the trainee's Assigned Educational Supervisor, providing key evidence for the trainee's ARCP. |
| ARCP / ARCP 6 | The Annual Review of Competence Progression (ARCP) panel will recommend one of 8 outcomes to trainees. Outcome 6 sets out that a trainee has gained all required competencies and will be recommended as having completed the training programme. (For further information, please see the Gold Guide[7]). |
| Capability | The ability to be able to perform an activity in a competent way. |
| Capabilities in Practice (CiP) | The high-level learning outcomes of the curriculum.<br>Learning outcomes operationalise groups of competencies by describing them in terms of holistic professional activities. In surgery they are aligned to what a day-one consultant will need to be able to know and do. Rather than learning 'inputs' ('what is learned', they set out what the learner must be able to do as a result of the learning at the end of the training programme – a practical skill) and clarify the extent to which trainees should successfully perform to reach certification. |
| Critical Condition | Any condition where a misdiagnosis can be associated with devastating consequences for life or limb. |
| Critical Progression Points | Key points during the curriculum where trainees will transition to a higher level of responsibility or enter a new area of practice. These points are frequently associated with increased risk, and so robust assessment is required. These points are at the end of phase 2 (transition to phase 3), and the end of phase 3 to achieve certification. |
| Core Surgical Training | The early years of surgical training for all ten surgical specialties. |
| Generic | Applicable to *all* trainees regardless of specialty, discipline and level of training, e.g. Generic Professional Capabilities. |
| Generic Professional Capabilities (GPCs) | A framework of educational outcomes that underpin medical professional practice for all doctors in the United Kingdom. |
| Good Medical Practice (GMP) | The core ethical guidance that the General Medical Council (GMC) provides for doctors. |
| High-Level Outcome | See Capability in Practice. |
| Index Procedure | Operative procedures that refer to some of the more commonly performed clinical interventions and operations in the specialty. They represent evidence of technical competence across the whole range |

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| | of specialty procedures in supervised settings, ensuring that the required elements of specialty practice are acquired and adequately assessed. Direct Observations of Procedural Skills (DOPS) and Procedure-based Assessments (PBAs) assess trainees carrying out index procedures (whole procedures or specific sections) to evidence learning. |
| Manage | Throughout the curriculum the term 'manage' indicates competence in clinical assessment, diagnosis, investigation and treatment (both operative and non-operative), recognising when referral to more specialised or experienced surgeons is required for definitive treatment. |
| Multiple Consultant Report (MCR) | An assessment by Clinical Supervisors that assesses trainees on the high-level outcomes of the curriculum. The MCR provides a supervision level for each of the five Capabilities in Practice (CiPs) as well as giving outcomes for the nine domains of the Generic Professional Capabilities. The assessment will be at the mid-point and end of a placement. The MCR is a formative assessment, providing trainees with formative feedback. However, the final MCR also contributes to the summative AES report. |
| Phase | An indicative period of training encompassing a number of indicative training levels. Phases are divided by critical progression points to ensure safe transitioning where patient or training risk may increase. Phases have replaced 'stages' of training in previous versions of the curriculum. |
| Placement | A surgical unit in which trainees work in order to gain experiential training and assessment under named supervisors. |
| Run-through training | The route which allows trainees, after a single competitive selection process at ST1 and satisfactory progress, to progress through to specialty training at ST3 onwards (unlike uncoupled training). |
| Specialty Advisory Committee (SAC) | The committee which oversees training in a particular specialty, reporting to the JCST. SAC responsibilities include trainee enrolment and support, certification, out of programme and LTFT training, curriculum development, logbook development, simulation training, quality assurance (including processes for externality via the provision of regional liaison members), national recruitment also credentialing (if appropriate). |
| Shared | Applicable to all specialties i.e. the five shared CiPs are identical to all ten surgical specialties. In some specialties some additional CiPs may be specialty-specific. |
| Special Interest | Advanced areas of training in the specialty. |
| Supervision level | The level of supervision required by a trainee to undertake an activity, task or group of tasks, ranging from the ability to observe only through direct and indirect supervision to the ability to perform |

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|---|---|
| | unsupervised. |
| Trainees | Doctors in training programmes. |
| Training programme | A rotation of placements in which training is provided under a Training Programme Director and named supervisors. |
| Uncoupled programme | The route where core surgical training (CT1 and CT2) and specialty training (ST3 onwards) are separated by a national recruitment process (unlike run-through training). |

**Appendix 9: Assessment Blueprint**

All aspects of the curriculum are assessed using one or more of the described components of the assessment system. Some curriculum content can be assessed in more than one component but the emphasis will differ between assessments so that testing is not excessive in any one area. The key assessment is the MCR through which trainees are assessed on the high-level outcomes of the curriculum; the CiPs and GPCs.

| High-level outcomes | Assessment Framework | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CiP/GPC self-assessment | MCR | MSF | CEX | CBD | PBA | DOPS | AoA | OoT | ISB Exam Section 1 | ISB Exam Section 2 |
| | **Capabilities in Practice** | | | | | | | | | | | |
| | 1. Manages an out-patient clinic | * | * | * | * | * | | | | | | * |
| | 2. Manages the unselected emergency take | * | * | * | * | * | * | * | | | | * |
| | 3. Manages ward rounds and the on-going care of in-patients | * | * | * | * | * | | | | | | * |
| | 4. Managing an operating list | * | * | * | | | * | * | | | | |
| | 5. Managing multi-disciplinary working | * | * | * | | * | | | | | | |

| High-level outcomes | Generic Professional Capabilities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CiP/GPC self-assessment | MCR | MSF | CEX | CBD | PBA | DOPS | AoA | OoT | ISB Exam Section 1 | ISB Exam Section 2 |
| | Domain 1: Professional values and behaviours | * | * | * | * | * | * | * | * | * | | * |
| | Domain 2: Professional skills | * | * | * | * | * | * | * | | * | | * |
| | Domain 3: Professional knowledge | * | * | * | * | * | * | * | * | * | * | * |
| | Domain 4: Capabilities in health promotion and illness prevention | * | * | | * | * | | | | | * | |
| | Domain 5: Capabilities in leadership and team working | * | * | * | | * | * | * | * | * | * | |
| | Domain 6: Capabilities in patient safety and quality improvement | * | * | | | * | | | * | | * | |
| | Domain 7: Capabilities in safeguarding vulnerable groups | * | * | | * | * | * | * | | | * | |
| | Domain 8: Capabilities in education and training | * | * | | | | | | | * | | |
| | Domain 9: Capabilities in research and scholarship | * | * | | | | | | | | | |

| **Syllabus** | | | CiP/GPC self-assessment | MCR | MSF | CEX | CBD | PBA | DOPS | AoA | OoT | ISB Exam Section 1 | ISB Exam Section 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge | | * | * | * | * | * | * | * | * | * | * | * |
| | Clinical skills | Clinical skills (general) | * | * | * | * | * | | | | | | * |
| | | Critical conditions (mandated CEX/CBD) | * | * | * | * | * | | | | | | * |
| | Technical skills | Technical skills (general) | * | * | | | | * | * | | | | |
| | | Index procedures (mandated PBA/DOPS) | * | * | | | | * | * | | | | |