The Intercollegiate Surgical Curriculum

Educating the surgeons of the future

Neurosurgery syllabus

August 2010

ISCP INTERCOLLEGIATE SURGICAL CURRICULUM PROGRAMME

The Syllabus for Neurosurgery

Overview and objectives of the Neurosurgery curriculum

Neurosurgery encompasses the diagnosis, assessment and surgical management of disorders of the nervous system. The specialty developed in the first half of the twentieth century through the treatment of cranial trauma and intracranial mass lesions. Subsequent advances in microsurgical techniques, non-invasive imaging, neuro-anaesthesia, intensive care, image-guided surgery, and the introduction of sophisticated radio-oncological and interventional treatments have changed and widened the scope of neurosurgical practice. The British Neurosurgical Training Programme reflects developments taking place in the clinical neurosciences and the requirements of service delivery.

Neurosurgical Services

Neurosurgical services in the United Kingdom are provided from regional neuroscience centres serving populations of between 1 and 3.5 million. Most regional centres offer a comprehensive range of adult services. Rare and complex disorders are managed at a supra-regional level in units with specialist expertise.

Consultant Neurosurgical Practice

Newly appointed NHS consultants must be competent to manage unselected emergency and urgent admissions to a regional neurosurgical unit. They will be capable of taking full responsibility for the continuing care of patients in a neurosurgical unit. In particular they will be proficient in all aspects of the clinical and emergency operative management of patients presenting with the essential neurosurgical conditions.

They will have acquired the skills, knowledge and professional attributes to participate in the provision of specialist elective services with appropriate support and mentoring. They will have demonstrated the potential to lead a clinical team and to undertake increasingly advanced practice with post-CCT professional development in one or more of the special interest areas of neurosurgery. The major areas of special interest practice in neurosurgery are:

- Paediatric Neurosurgery
- Neuro-oncology
- Functional Neurosurgery
- Neurovascular Surgery
- Skull Base Surgery
- Spinal Surgery
- Traumatology

British Neurosurgical Training Programme

The Neurosurgical Training Programme reflects developments taking place in the basic and applied clinical neurosciences and the requirements of service delivery. It contains eight indicative years (ST1-ST8) in three stages. The first year of the initial stage establishes a foundation of core knowledge in the clinical neurosciences - core neuroscience training. The intermediate stage provides two years in full-time general neurosurgical training (ST4 & 5). The final three-year stage (ST 6, 7 & 8) incorporates a year of special interest training.

The emphasis will change, as trainees progress through the programme, from acquiring core neuroscience knowledge and competencies in ST 1 to developing technical operative skills and surgical judgement in the final stage. Transition from the initial to intermediate neurosurgical training will depend on trainees acquiring the necessary clinical and operative competences, receiving satisfactory in-training assessments and passing an examination of essential knowledge in the basic and applied neurosciences, surgical science and clinical neurosurgery. The MRCS will be adapted to meet these requirements.

The transition from intermediate to final neurosurgical training will take place when trainees have achieved the appropriate clinical and operative competencies. They will be competent to manage a wide range of emergency neurosurgical presentations and will have demonstrated the ability to acquire microsurgical skills. Trainees whose clinical or professional skills are unsatisfactory will be referred for targeted training and will not start final training.

The acquisition of operative skills and experience will accelerate in the final phase of training. Units will concentrate advanced training in the hands of their senior trainees who will spend more of their time in the operating theatre with proportionately less commitment to ward management and general outpatient clinics.

The specialist interest year may be taken flexibly during final training. However, trainees will not start specialist interest training until their programme director is satisfied with their general neurosurgical training and their acquisition of microsurgical and advanced operative skill.

Academic Neurosurgical Training

The neurosurgical curriculum will accommodate a range of academic training pathways. The core neuroscience knowledge embodied in ST1 will provide an essential foundation for an academic career. ST 2 & 3 provide opportunities for specific training in areas relevant to a trainee's emerging academic interests e.g. patho-physiology applied to neuro-intensive care. The intermediate training stage will consolidate a trainee's clinical and operative competencies.

Full-time academic research or training fellowships to thesis level may be undertaken between the initial, intermediate and final training stages or flexibly within the final stage. The specialist interest year will usually form part of advanced training in the trainee's academic field of interest. Academic trainees will be expected to meet all of the essential competencies defined in the curriculum before award of a CCT in Neurosurgery.

Neurosurgical Services

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The Neurosurgical Workforce Plan envisages a UK-wide workforce of 325-350 WTE consultants by 2015 to meet the projected demands for service delivery and training. Neurosurgery has always been both a consultant-led and consultant-provided service. Fewer than 5% of trained neurosurgeons work in the SAS grades.

Emergency and urgent work accounts for more than 50% of neurosurgical caseload. Almost all neurosurgical consultants are involved in the delivery of emergency services and must therefore be competent to manage a wide range of adult conditions and to provide basic emergency paediatric care.

Specialist elective care is provided by neurosurgeons with special interest training, usually working in multi-disciplinary teams with colleagues in the clinical neurosciences, neuro-oncology, endocrinology and surgical disciplines including otolaryngology, maxillofacial, plastic and orthopaedic surgery.

Schedule of Essential Neurosurgical Conditions

- Cranial trauma
- Spontaneous intracranial haemorrhage
- Hydrocephalus
- Intracranial tumours
- CNS infections
- Spinal trauma
- Benign intradural tumours
- Malignant spinal cord compression
- Degenerative spinal disorders
- Emergency paediatric care

Schedule of Essential Operative Competences is displayed in Key Topics

Special Interests

Paediatric Neurosurgery

Paediatric neurosurgery accounts for 10-15% of neurosurgical activity. Paediatric neurosurgical units are located in larger centres to ensure appropriate levels of activity and expertise. The discipline involves the management of developmental disorders of the neuroaxis including craniofacial anomalies and spinal dysraphism; all forms of hydrocephalus; intrinsic tumours of the brain and spine and a wide range of rarer pathologies. Paediatric neurosurgeons often contribute to the management of related disorders such as hydrocephalus, spinal dysraphism and epilepsy presenting in young adults.

Neuro-oncology

The management of malignant intrinsic tumours of the nervous system remains a major challenge. Gradual progress has followed the refinement of surgical techniques using radiological and functional guidance; improvements in adjuvant chemotherapy and radiotherapy; greater understanding of the molecular biology of CNS tumours and better organisation of oncology services. Further advances are likely to be based on advances in basic oncological science and the sophisticated delivery of intra-lesional therapies.

Functional Neurosurgery

Functional neurosurgery involves the surgical management of a wide range of neurological problems including intractable pain, epilepsy, spasticity and movement disorders. Traditional ablative surgery is being replaced by deep brain and spinal cord stimulation. Research into neuromodulation using gene therapy, biological vectors and pharmacological agents offers the prospect of effective treatment for neurodegenerative diseases and disabling psychiatric conditions.

Neurovascular Surgery

The advent of advanced endovascular techniques in the early 1990s has fundamentally changed the practice of neurovascular surgery. Most simple intracranial aneurysms are now managed by endovascular coiling such that aneurysm surgery is no longer part of general neurosurgical practice. Neurovascular surgeons work closely with their interventional colleagues dealing with complex aneurysms, vascular malformations and occlusive cerebrovascular disease.

Skull-base Surgery

Technical advances in microsurgery, surgical approaches and reconstructions have been incorporated into the routine practice of surgeons dealing with disorders of the skull-base including common tumours such as meningiomas, acoustic neuromas and pituitary adenomas. Skull-base surgery is often undertaken jointly with neuro-otological, plastic and maxillo-facial surgeons. Adjuvant treatments with sophisticated radiosurgery and fractionated stereotactic radiotherapy have improved clinical outcomes for patients with skull-base tumours

Spinal Surgery

Spinal surgery is now the largest subspecialty in neurosurgery and accounts for more than 50% of the operative workload of some departments. Many departments offer a comprehensive service for primary and secondary spinal malignancy, spinal trauma, spinal pain and degenerative spinal disorders. A small number of neurosurgeons in the UK are exclusively spinal surgeons. The demand for spinal surgery grows steadily, particularly in the elderly population.

Traumatology

Head injury remains a major cause of death and disability in children and young adults. Recent research confirms that prompt neurosurgical intervention and neurointensive care lead to substantially better outcomes. British neurosurgeons with a special interest in head injury have made important contributions to head injury research and management.

Key Topics

To be eligible for the award of a CCT in Neurosurgery or to be considered for a Certificate of Eligibility for Specialist Registration trainees and applicants will be competent in all aspects of the clinical management of patients presenting with the essential neurosurgical conditions.

Trainees and applicants must be competent to undertake the full range of emergency and urgent operative procedures specified in the final training stage of the schedule of essential operative competencies. They must demonstrate sufficient operative experience to be able to undertake these procedures without supervision and to manage operative difficulties and complications (Competence level 4).

Essential Neurosurgical Conditions

- Cranial trauma
- Spontaneous intracranial haemorrhage
- Hydrocephalus
- Intracranial tumours
- CNS infections
- Spinal trauma
- Benign intradural tumours
- Malignant spinal cord compression
- Degenerative spinal disorders
- Emergency paediatric care

Schedule of Essential Operative Competences

Initial Stage Overview

The purpose of the initial stage (early years) 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, skills and competences in:

- Basic and applied clinical neurosciences
- Basic neurosurgical care
- Neuro-intensive care
- Emergency (A&E) medicine

Initial Neurosurgical Training ST2 & 3

During ST2 & 3 trainees will concentrate on acquiring core surgical skills and knowledge, together with specific competencies in the non-operative and operative management of the core neurosurgical conditions.

The outcome of early years training is to achieve the initial stage competences including:

- Competence in the management of patients presenting with a range of symptoms and elective and emergency conditions as specified in the core syllabus for surgery.
- Competence in the management of patients presenting with an additional range of elective and emergency conditions, as specified by the Neurourgery specialty component of the early years syllabus.
- Professional competences as specified in the syllabus and derived from Good Medical Practice documents of the General Medical Council of the UK

On completion of initial neurosurgical training, trainees will be competent in all aspects of the assessment and initial clinical management of the major disorders of the nervous system specified in the core neuroscience syllabus.

They will be competent in the resuscitation, assessment, operative preparation and post-operative care of patients presenting with core neurosurgical conditions. They will be competent to undertake a range of basic procedures without direct supervision.

Core Neuroscience Training: ST1

The first year of the training programme will concentrate on core neuroscience training. During this year trainees will consolidate their knowledge and understanding of the applied neurosciences underpinning clinical practice.

See Core Neuroscience Knowledge

Management of Common Neurological Disorders

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. (See panel)

Clinical Placements and Teaching in ST1

Clinical placements for ST1 neurosurgical trainees will include:

- One six-month full-time attachment in neurosurgery and one six-month attachment in an acute neurology service incorporating experience in clinical neurophysiology and neuro-rehabilitation or
- Four month attachments in neurosurgery, neurology and neuro-intensive care providing the same clinical experience as above.

Teaching for ST1 neurosurgical training will include:

- Regular exposure to neuroradiology and neuropathology through multi-disciplinary team meetings and case discussions.
- A core neuroscience teaching programme incorporating the core neuroscience subjects with an emphasis on the assessment and management of the common neurological presentations.

Clinical Placements in ST2 & 3

The timing of clinical placements in ST2 & 3 is flexible and at the discretion of the programme director. The following principles apply:

- All trainees will undertake at least one full-time, six month placement in neurosurgery in ST2 & 3
- By the end of ST3 all trainees will have undertaken a minimum of twelve months' full-time training in basic neurosurgery
- Trainees will undertake one or more placements in complementary surgical disciplines up to a maximum of twelve months
- By the end of ST3 trainees will have obtained four months experience in an emergency department (A & E) receiving multiply-injured patients, head-injury patients of all severities and patients presenting with acute neurological disorders
- By the end of ST3 all trainees will have had direct involvement in the care of patients receiving neuro-intensive care. This may be obtained as part of an ST1 programme or through placements in ST 2 & 3

Click on Workplace Based Assessments to view the assessment forms including DOPS and PBAs

By the end of early years training, trainees, including those following an academic pathway, will have acquired to the defined level:

- Generic skills to allow team working, and management of neurosurgery patients
- perform as a member of the team caring for surgical patients
- receive patients as emergencies and review patients in clinics and initiate management and diagnostic processes based on a reasonable differential diagnosis
- manage the perioperative care of their patients and recognise common complications and either be able to deal with them or know to whom to refer
- be safe and useful assistant in the operating room
- perform some simple procedures under minimal supervision and perform more complex procedures under direct supervision

In addition they will have attained the knowledge, skills and behaviour as defined in the following (common) modules of the syllabus:

Module 1: Basic Science Knowledge relevant to surgical practice (These can all be contextualised within the list of presenting symptoms and conditions outlined in module 2)

- Anatomy
- Physiology
- Pharmacology - in particular safe prescribing
- Pathological principles underlying system specific pathology
- Microbiology
- Diagnostic and interventional radiology

Module 2: Common surgical conditions

- To assess and initiate investigation and management of common surgical conditions which may confront any patient whilst under the care of surgeons, irrespective of their speciality.
- To have sufficient understanding of these conditions so as to know what and to whom to refer in a way that an insightful discussion may take place with colleagues whom will be involved in the definitive management of these conditions.
- This defines the scope and depth of the topics in the generality of clinical surgery required of any surgeon irrespective of their ST3 defined speciality

Module 3 Basic surgical skills

- To prepare oneself for surgery
- To safely administer appropriate local anaesthetic agents
- To handle surgical instruments safely
- To handle tissues safely
- To incise and close superficial tissues accurately
- To tie secure knots
- To safely use surgical diathermy
- To achieve haemostasis of superficial vessels.
- To use a suitable surgical drain appropriately.
- To assist helpfully, even when the operation is not familiar.
- To understand the principles of anastomosis
- To understand the principles of endoscopy

Module 4: The principles of assessment and management of the surgical patient

- To assess the surgical patient
- To elicit a history that is relevant, concise, accurate and appropriate to the patient's problem
- To produce timely, complete and legible clinical records.
- To assess the patient adequately prior to operation and manage any pre-operative problems appropriately.
- To propose and initiate surgical or non-surgical management as appropriate.
- To take informed consent for straightforward cases.

Module 5: Peri-operative care of the surgical patient

- To manage patient care in the peri-operative period.
- To assess and manage preoperative risk.
- To take part in the conduct of safe surgery in the operating theatre environment.
- To assess and manage bleeding including the use of blood products.
- To care for the patient in the post-operative period including the assessment of common complications.
- To assess, plan and manage post-operative fluid balance
- To assess and plan perioperative nutritional management.

Module 6: Assessment and early treatment of the patient with trauma

- To safely assess the multiply injured patient.
- To safely assess and initiate management of patients with

- traumatic skin and soft tissue injury
- chest trauma
- a head injury
- a spinal cord injury
- abdominal and urogenital trauma
- vascular trauma
- a single or multiple fractures or dislocations
- burns

Module 7: Surgical care of the paediatric patient

- To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients.
- To understand common issues of child protection and to take action as appropriate.

Module 8: Management of the dying patient

- To manage the dying patient appropriately.
- To understand consent and ethical issues in patients certified DNAR (do not attempt resuscitation)
- To manage the dying patient in consultation with the palliative care team.

Module 9: Organ and tissue transplantation

- To understand the principles of organ and tissue transplantation.
- To assess brain stem death and understand its relevance to continued life support and organ donation.

Module 10: Professional behaviour and leadership skills

- To provide good clinical care
- To be a good communicator
- To teach and to train
- To keep up to date and know how to analyse data
- To understand and manage people and resources within the health environment
- To promote good Health
- To understand the ethical and legal obligations of a surgeon

Initial Stage Topics

Module 1	**Basic sciences**
Objective	• To acquire and demonstrate underpinning basic science knowledge appropriate for the practice of surgery, including:- • Applied anatomy: Knowledge of anatomy appropriate for surgery • Physiology: Knowledge of physiology relevant to surgical practice • Pharmacology: Knowledge of pharmacology relevant to surgical practice centred around safe prescribing of common drugs • Pathology: Knowledge of pathological principles underlying system specific pathology • Microbiology: Knowledge of microbiology relevant to surgical practice Imaging: • Knowledge of the principles, strengths and weaknesses of various diagnostic and interventional imaging methods
Knowledge	Applied anatomy: • Development and embryology • Gross and microscopic anatomy of the organs and other structures • Surface anatomy • Imaging anatomy This will include anatomy of thorax, abdomen, pelvis, perineum, limbs, spine, head and neck as appropriate for surgical operations that the trainee will be involved with during core training (see Module 2). Physiology: General physiological principles including: • Homeostasis • Thermoregulation • Metabolic pathways and abnormalities • Blood loss and hypovolaemic shock • Sepsis and septic shock • Fluid balance and fluid replacement therapy • Acid base balance • Bleeding and coagulation • Nutrition This will include the physiology of specific organ systems relevant to surgical care including the cardiovascular, respiratory, gastrointestinal, urinary, endocrine and neurological systems. Pharmacology: • The pharmacology and safe prescribing of drugs used in the treatment of surgical diseases including analgesics, antibiotics, cardiovascular drugs, antiepileptic, anticoagulants, respiratory drugs, renal drugs, drugs used for the management of endocrine disorders (including diabetes) and local anaesthetics. • The principles of general anaesthesia • The principles of drugs used in the treatment of common malignancies Pathology:

	General pathological principles including: • Inflammation • Wound healing • Cellular injury • Tissue death including necrosis and apoptosis • Vascular disorders • Disorders of growth, differentiation and morphogenesis • Surgical immunology • Surgical haematology • Surgical biochemistry • Pathology of neoplasia • Classification of tumours • Tumour development and growth including metastasis • Principles of staging and grading of cancers • Principles of cancer therapy including surgery, radiotherapy, chemotherapy, immunotherapy and hormone therapy • Principles of cancer registration • Principles of cancer screening • 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 Microbiology: • Surgically important micro organisms including blood borne viruses • Soft tissue infections including cellulitis, abscesses, necrotising fasciitis, gangrene • Sources of infection • Sepsis and septic shock • Asepsis and antisepsis • Principles of disinfection and sterilisation • Antibiotics including prophylaxis and resistance • Principles of high risk patient management • Hospital acquired infections Imaging: • Principles of diagnostic and interventional imaging including x-rays, ultrasound, CT, MRI. PET, radiounucleotide scanning

Module 2	**Common Surgical Conditions**	
Objective	This section assumes that trainees have general medical competences consistent with a doctor leaving Foundation in the UK. It also assumes an ongoing commitment to keeping these skills and knowledge up to date as laid out in GMP. It is predicated on the value that surgeons are doctors who carry our surgery and require competence. To demonstrate understanding of the relevant basic scientific principles for each of these surgical conditions and to be able to provide the relevant clinical care as defined in modules assessment and management as defined in Modules 1 and 4.	
Topics	Presenting symptoms or syndromes • Abdominal pain	To include the following conditions • Appendicitis

	• Abdominal swelling • Change in bowel habit • Gastrointestinal haemorrhage • Rectal bleeding • Dysphagia • Dyspepsia • Jaundice	• Gastrointestinal malignancy • Inflammatory bowel disease • Diverticular disease • Intestinal obstruction • Adhesions • Abdominal hernias • Peritonitis • Intestinal perforation • Benign oesophageal disease • Peptic ulcer disease • Benign and malignant hepatic, gall bladder and pancreatic disease • Haemorrhoids and perianal disease • Abdominal wall stomata
	Breast disease • Breast lumps and nipple discharge • Acute Breast pain	To include the following conditions • Benign and malignant breast lumps • Mastitis and breast abscess
	Peripheral vascular disease Presenting symptoms or syndrome • Chronic and acute limb ischaemia • Aneurysmal disease • Transient ischaemic attacks • Varicose veins • Leg ulceration	To include the following conditions • Atherosclerotic arterial disease • Embolic and thrombotic arterial disease • Venous insufficiency • Diabetic ulceration
	Cardiovascular and pulmonary disease	To include the following conditions • Coronary heart disease • Bronchial carcinoma • Obstructive airways disease • Space occupying lesions of the chest • Pulmonary embolus
	Genitourinary disease Presenting symptoms or syndrome • Loin pain • Haematuria • Lower urinary tract symptoms • Urinary retention • Renal failure • Scrotal swellings • Testicular pain	To include the following conditions • Genitourinary malignancy • Urinary calculus disease • Urinary tract infection • Benign prostatic hyperplasia • Obstructive uropathy
	Trauma and orthopaedics Presenting symptoms or syndrome • Traumatic limb and joint pain and deformity • Chronic limb and joint pain and deformity • Back pain	To include the following conditions • Simple fractures and joint dislocations • Fractures around the hip and ankle • Basic principles of Degenerative joint disease • Basic principles of inflammatory joint disease including bone and joint infection

		• Compartment syndrome • Spinal nerve root entrapment and spinal cord compression • Metastatic bone cancer • Common peripheral neuropathies and nerve injuries
	Disease of the Skin, Head and Neck Presenting symptoms or syndrome • Lumps in the neck • Epistaxis • Upper airway obstructions	To include the following conditions • Benign and malignant skin lesions • Benign and malignant lesions of the mouth and tongue
	Neurology and Neurosurgery Presenting symptoms or syndrome • Headache • Facial pain • Coma	To include the following conditions • Space occupying lesions from bleeding and tumour
	Endocrine Presenting symptoms or syndrome • Lumps in the neck • Acute endocrine crises	To include the following conditions • Thyroid and parathyroid disease • Adrenal gland disease • Diabetes

Module 3	**Basic surgical skills**
Objective	• Preparation of the surgeon for surgery • Safe administration of appropriate local anaesthetic agents • Acquisition of basic surgical skills in instrument and tissue handling. • Understanding of the formation and healing of surgical wounds • Incise superficial tissues accurately with suitable instruments. • Close superficial tissues accurately. • Tie secure knots. • Safely use surgical diathermy • Achieve haemostasis of superficial vessels. • Use suitable methods of retraction. • Knowledge of when to use a drain and which to choose. • Handle tissues gently with appropriate instruments. • Assist helpfully, even when the operation is not familiar. • Understand the principles of anastomosis • Understand the principles of endoscopy including laparoscopy

Knowledge	Principles of safe surgery • Preparation of the surgeon for surgery • Principles of hand washing, scrubbing and gowning • Immunisation protocols for surgeons and patients Administration of local anaesthesia • Choice of anaesthetic agent • Safe practise Surgical wounds • Classification of surgical wounds • Principles of wound management • Pathophysiology of wound healing • Scars and contractures • Incision of skin and subcutaneous tissue: o Langer's lines o Choice of instrument o Safe practice • Closure of skin and subcutaneous tissue: o Options for closure o Suture and needle choice • Safe practice • Knot tying o Range and choice of material for suture and ligation o Safe application of knots for surgical sutures and ligatures • Haemostasis: o Surgical techniques o Principles of diathermy • Tissue handling and retraction: o Choice of instruments • Biopsy techniques including fine needle aspiration cytology • Use of drains: o Indications o Types o Management/removal • Principles of anastomosis • Principles of surgical endoscopy including laparoscopy
Clinical Skills	4 Preparation of the surgeon for surgery • Effective and safe hand washing, gloving and gowning 4 Preparation of a patient for surgery • Creation of a sterile field • Antisepsis • Draping 4 Administration of local anaesthesia • Accurate and safe administration of local anaesthetic agent
Technical Skills and Procedures	4 Preparation of the surgeon for surgery • Effective and safe hand washing, gloving and gowning

	4 Administration of local anaesthesia • Accurate and safe administration of local anaesthetic agent 4 Incision of skin and subcutaneous tissue: • Ability to use scalpel, diathermy and scissors 4 Closure of skin and subcutaneous tissue: • Accurate and tension free apposition of wound edges 4 Knot tying: • Single handed • Double handed • Instrument • Superficial • Deep 3 Haemostasis: • Control of bleeding vessel (superficial) • Diathermy • Suture ligation • Tie ligation • Clip application • Transfixion suture 4 Tissue retraction: • Tissue forceps • Placement of wound retractors 3 Use of drains: • Insertion • Fixation • Removal 3 Tissue handling: • Appropriate application of instruments and respect for tissues • Biopsy techniques 4 Skill as assistant: • Anticipation of needs of surgeon when assisting

Module 4	**The assessment and management of the surgical patient**
Objective	To demonstrate the relevant knowledge, skills and attitudes in assessing the patient and manage the patient, and propose surgical or non-surgical management.
Knowledge	The knowledge relevant to this section will be variable from patient to patient and is covered within the rest of the syllabus – see common surgical conditions in particular (Module 2). As a trainee develops an interest in a particular speciality then the principles of history taking and examination may be increasingly applied in that context.
Clinical Skills	4 Surgical history and examination (elective and emergency) 3 Construct a differential diagnosis 3 Plan investigations

	3 Clinical decision making 3 Team working and planning 3 Case work up and evaluation; risk management 3 Active participation in clinical audit events 3 Appropriate prescribing 3 Taking consent for intermediate level intervention; emergency and elective 3 Written clinical communication skills 3 Interactive clinical communication skills: patients 3 Interactive clinical communication skills: colleagues

Module 5	**Peri-operative care**
Objective	To assess and manage preoperative risk To manage patient care in the peri-operative period To conduct safe surgery in the operating theatre environment To assess and manage bleeding including the use of blood products To care for the patient in the post-operative period including the assessment of common complications To assess, plan and manage post-operative fluid balance To assess and plan perioperative nutritional management
Knowledge	Pre-operative assessment and management: • Cardiorespiratory physiology • Diabetes mellitus and other relevant endocrine disorders • Fluid balance and homeostasis • Renal failure • Pathophysiology of sepsis – prevention and prophylaxis • Thromboprophylaxis • Laboratory testing and imaging • Risk factors for surgery and scoring systems • Pre-medication and other preoperative prescribing • Principles of day surgery Intraoperative care: • Safety in theatre including patient positioning and avoidance of nerve injuries • Sharps safety • Diathermy, laser use • Infection risks • Radiation use and risks • Tourniquet use including indications, effects and complications • Principles of local, regional and general anaesthesia • Principles of invasive and non-invasive monitoring • Prevention of venous thrombosis • Surgery in hepatitis and HIV carriers • Fluid balance and homeostasis Post-operative care: • Post-operative monitoring • Cardiorespiratory physiology • Fluid balance and homeostasis • Diabetes mellitus and other relevant endocrine disorders • Renal failure

	• Pathophysiology of blood loss • Pathophysiology of sepsis including SIRS and shock • Multi-organ dysfunction syndrome • Post-operative complications in general • Methods of postoperative analgesia To assess and plan nutritional management • Post-operative nutrition • Effects of malnutrition, both excess and depletion • Metabolic response to injury • Methods of screening and assessment of nutritional status • Methods of enteral and parenteral nutrition Haemostasis and Blood Products: • Mechanism of haemostasis including the clotting cascade • Pathology of impaired haemostasis e.g. haemophilia, liver disease, massive haemorrhage • Components of blood • Alternatives to use of blood products • Principles of administration of blood products • Patient safety with respect to blood products Coagulation, deep vein thrombosis and embolism: • Clotting mechanism (Virchow Triad) • Effect of surgery and trauma on coagulation • Tests for thrombophilia and other disorders of coagulation • Methods of investigation for suspected thromboembolic disease • Principles of treatment of venous thrombosis and pulmonary embolism including anticoagulation • Role of V/Q scanning, CTpulmonary angiography, D-dimer and thrombolysis • Place of pulmonary embolectomy • Prophylaxis of thromboembolism: • Risk classification and management of DVT • Knowledge of methods of prevention of DVT, mechanical and pharmacological Antibiotics: • Common pathogens in surgical patients • Antibiotic sensitivities • Antibiotic side-effects • Principles of prophylaxis and treatment Metabolic and endocrine disorders in relation to perioperative management • Pathophysiology of thyroid hormone excess and deficiency and associated risks from surgery • Causes and effects of hypercalcaemia and hypocalcaemia • Complications of corticosteroid therapy • Causes and consequences of Steroid insufficiency • Complications of diabetes mellitus • Causes and effects of hyponatraemia • Causes and effects of hyperkalaemia and hypokalaemia
Clinical Skills	3 Pre-operative assessment and management: • History and examination of a patient from a medical and surgical

	standpoint • Interpretation of pre-operative investigations • Management of co morbidity • Resuscitation • Appropriate preoperative prescribing including premedication 3 Intra-operative care: • Safe conduct of intraoperative care • Correct patient positioning • Avoidance of nerve injuries • Management of sharps injuries • Prevention of diathermy injury • Prevention of venous thrombosis 3 Post-operative care: • Writing of operation records • Assessment and monitoring of patient's condition • Post-operative analgesia • Fluid and electrolyte management • Detection of impending organ failure • Initial management of organ failure • Principles and indications for Dialysis • Recognition, prevention and treatment of post-operative complications 3 Haemostasis and Blood Products: • Recognition of conditions likely to lead to the diathesis • Recognition of abnormal bleeding during surgery • Appropriate use of blood products • Management of the complications of blood product transfusion 3 Coagulation, deep vein thrombosis and embolism • Recognition of patients at risk • Awareness and diagnosis of pulmonary embolism and DVT • Role of duplex scanning, venography and d-dimer measurement • Initiate and monitor treatment of venous thrombosis and pulmonary embolism • Initiation of prophylaxis 3 Antibiotics: • Appropriate prescription of antibiotics 3 Assess and plan preoperative nutritional management • Arrange access to suitable artificial nutritional support, preferably via a nutrition team including Dietary supplements, Enteral nutrition and Parenteral nutrition 3 Metabolic and endocrine disorders • History and examination in patients with endocrine and electrolyte disorders • Investigation and management of thyrotoxicosis and hypothyroidism • Investigation and management of hypercalcaemia and hypocalcaemia • Peri-operative management of patients on steroid therapy

	• Peri-operative management of diabetic patients • Investigation and management of hyponatraemia • Investigation and management of hyperkalaemia and hypokalaemia
Technical Skills and Procedures	2 Central venous line insertion 4 Urethral catheterisation

Module 6	**Assessment and management of patients with trauma (including the multiply injured patient)**
Objective	Assess and initiate management of patients • Who have sustained chest trauma • who have sustained a head injury • who have sustained a spinal cord injury • who have sustained abdominal and urogenital trauma • who have sustained vascular trauma • who have sustained a single or multiple fractures or dislocations • who have sustained traumatic skin and soft tissue injury • who have sustained burns • Safely assess the multiply injured patient. • Contextualise any combination of the above • Be able to prioritise management in such situation as defined by ATLS, APLS etc
Knowledge	General • Scoring systems for assessment of the injured patient • Major incident triage • Differences In children Shock • Pathogenesis of shock • Shock and cardiovascular physiology • Metabolic response to injury • Adult respiratory distress syndrome • Indications for using uncross matched blood Wounds and soft tissue injuries • Gunshot and blast injuries • Stab wounds • Human and animal bites • Nature and mechanism of soft tissue injury • Principles of management of soft tissue injuries • Principles of management of traumatic wounds • Compartment syndrome Burns • Classification of burns • Principle of management of burns Fractures • Classification of fractures • Pathophysiology of fractures • Principles of management of fractures • Complications of fractures

	• Joint injuries Organ specific trauma • Pathophysiology of thoracic trauma • Pneumothorax • Head injuries including traumatic intracranial haemorrhage and brain injury • Spinal cord injury • Peripheral nerve injuries • Blunt and penetrating abdominal trauma • Including spleen • Vascular injury including iatrogenic injuries and intravascular drug abuse • Crush injury • Principles of management of skin loss including use of skin grafts and skin flaps
Clinical Skills	**General** 4 History and examination 3 Investigation 3 Referral to appropriate surgical subspecialties 4 Resuscitation and early management of patient who has sustained thoracic, head, spinal, abdominal or limb injury according to ATLS and APLS guidelines 4 Resuscitation and early management of the multiply injured patient 3 Specific problems • Management of the unconscious patient • Initial management of skin loss • Initial management of burns • Prevention and early management of the compartment syndrome
Technical Skills and Procedures	2 Central venous line insertion 3 Chest drain insertion 2 Diagnostic peritoneal lavage 4 Urethral catheterisation 2 Suprapubic catheterisation

Module 7	**Surgical care of the Paediatric patient**
Objective	To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients To understand the issues of child protection and to take action as appropriate
Knowledge	• Physiological and metabolic response to injury and surgery • Fluid and electrolyte balance • Thermoregulation Safe prescribing in children • Principles of vascular access in children • Working knowledge of trust and Local Safeguarding Children Boards (LSCBs) and Child Protection Procedures • Basic understanding of child protection law • Understanding of Children's rights • Working knowledge of types and categories of child maltreatment, presentations, signs and other features (primarily physical, emotional,

	sexual, neglect, professional) • Understanding of one's personal role, responsibilities and appropriate referral patterns in child protection • Understanding of the challenges of working in partnership with children and families • Recognise the possibility of abuse or maltreatment • Recognise limitations of own knowledge and experience and seek appropriate expert advice • Urgently consult immediate senior in surgery to enable referral to paediatricians • Keep appropriate written documentation relating to child protection matters • Communicate effectively with those involved with child protection, including children and their families
Clinical Skills	3 History and examination of paediatric surgical patient 3 Assessment of respiratory and cardiovascular status 3 Undertake consent for surgical procedures (appropriate to the level of training) in paediatric patients

Module 8	**Management of the dying patient**
Objective	Ability to manage the dying patient appropriately. To understand consent and ethical issues in patients certified DNAR (do not attempt resuscitation) Palliative Care: Good management of the dying patient in consultation with the palliative care team.
Knowledge	Palliative Care: • Care of the terminally ill • Appropriate use of analgesia, anti-emetics and laxatives Principles of organ donation: • Circumstances in which consideration of organ donation is appropriate • Principles of brain death Understanding the role of the coroner and the certification of death
Clinical Skills	3 Palliative Care: • Symptom control in the terminally ill patient 3 Principles of organ donation: • Assessment of brain stem death • Certification of death

Module 9	**Organ and Tissue transplantation**
Objective	To understand the principles of organ and tissue transplantation
Knowledge	• Principles of transplant immunology including tissue typing, acute, hyperactute and chronic rejection • Principles of immunosuppression • Tissue donation and procurement • Indications for whole organ transplantation

Requirement to meet the ST3 in Neurosurgery

At present (6/09), neurosurgery continues with run through training that is specialty specific. Most trainees will be entering ST3 from neurosurgery programs, although it is hoped that in time, some Core trainees will be attracted into the specialty from attachments in CT2. However, those that do so will need to address the issue of competencies outside of surgery (qv).

In order to meet the job specifications of an ST3 trainee, an early years trainee must take a clear role in the Neurosurgery team, managing clinic and ward based patients under supervision, including the management of acute Neurosurgical admissions. They will need to be able to take part in an outpatient clinic and in some centres see patients themselves with the consultant available for advice.

Therefore in early years training, IN ADDITION to the generic competencies for all surgeons, it is necessary to address the specifics of a developing interest in Neurosurgery during these years. This means spending 6-12 months in neurosurgery in a service which gives trainees access to the appropriate learning opportunities. They will also have to have completed either a 6 months module in clinical neurology, or four months of neurology and four in an allied clinical neuroscience such as neuro-intensive care. Also by the time a trainee enters ST3 they need to be familiar with the operating room environment both with respect to elective and emergency cases.

Trainees must attend MDT and other Departmental meetings and ward rounds, prepare elective operating lists (both inpatient, day-case), and will be expected to have performed some surgery under appropriate supervision. They must manage all patients in a neurosurgery ward environment, preoperatively and post operatively. This includes recognising and initiating the management of common complications and emergencies, over and above those already laid out in the generic component of the curriculum, particularly module 2.

The range of conditions a trainee needs to manage are laid out below and in the depth demonstrated in a text book such as Clinical Neurosurgery (Lindsay), Schmidek and Sweet or Youmans

Cranial trauma: including the resuscitation, assessment, investigation and continuing care of head-injured patients; the prevention and detection of secondary intracranial and systemic insults; insertion of an intracranial pressure monitor; burr-hole drainage of a chronic subdural haematoma;

Spinal Trauma: the resuscitation and assessment, investigation and care of patients suffering spine injuries. The initial external stabilisation of the spine including placement of skull traction. Spontaneous intracranial haemorrhage: including the resuscitation, assessment and investigation of patients suffering a subarachnoid haemorrhage; the management of post-haemorrhagic hydrocephalus; the detection and management of delayed cerebral ischaemia; the management of systemic complications; diagnostic lumbar puncture

Hydrocephalus: in particular the management of hydrocephalus complicating intracranial haemorrhage, head injury and intracranial space-occupying lesions; insertion and tapping of CSF reservoirs; insertion and maintenance of lumbar and external ventricular drains

Intracranial tumours: including the assessment and peri-operative management of patients with intracranial tumours; the detection and management of post-operative cerebral swelling, intracranial haematomas and intracranial sepsis; the management of post-operative seizures; the management of post-operative metabolic and endocrine disorders

Acute spinal disorders: including the assessment and peri-operative management of patients presenting with spinal cord, cauda equina and spinal root compression: the management of spinal shock; the ward management of patients with spinal instability; the detection and initial management of postoperative complications including compressing haematomas, CSF fistula and spinal sepsis

Topic	Early Years Neurosurgery
Objective	*Provide experience in the early care of patients with common neurosurgical problems:* • *The common emergency problems are brain and spine trauma, spontaneous intracranial haemorrhage inc. Sub arachnoid haemorrhage and hypertensive intracerebral haematomas, Acute hydrocephalus Management of acute raised intracranial pressure from brain tumours. Epilepsy. Acute spinal cord and nerve root compression and cauda equina syndrome.* • *The common elective problems include assessment and management of various brain tumours, the investigation and management thereof. The management and investigation of patients with epilepsy, stroke and movement disorders. The management investigation and assessment of patients with spinal degenerative disease including spinal stenosis and disc protrusions. Spinal tumours of all types.* *Provide some operative experience of aspects of all of these.*
Knowledge	Basic science relevant to the management of patients with the common elective and emergency brain and spine problems, (including anatomy, physiology, pharmacology, pathology and radiology) Principles of management of patients including children presenting with the common elective and emergency brain and spine problems Detailed initial management of patients presenting the common neurosurgical problems including onward referral
Clinical Skills	Assessment, investigation and initial management of patients presenting with common elective and emergency neurosurgical conditions
Technical Skills and Procedures	Insertion of ICP bolt Burr hole drainage of CSDH Basic craniotomy flap position and procedures Tapping of CSF reservoirs and shunts Lumbar puncture Part of placement of ventriculo peritoneal shunts Placement of EVD's Positioning and safety of patients for spine procedures (lumbar) Some part of simple spinal decompressive procedures

Assessment

The speciality elements of the early years will all be assessed primarily in the workplace and then scrutinised in the Annual Review of Competency Progression. All these documents would be included in a portfolio which would contribute as evidence in subsequent applications to enter ST3. The specific job specifications for entry into ST3 are shown in appendix XX. Completion of the MRCS is mandatory during the same period

Specific evidence includes

Assessment type	Subject
DOPS a selection of types and numbers of each type according to learning agreements	Burr hole for CSDH Therapeutic/diagnostic LP Insert Lumbar drain External vent drain Insert CVP line Placement of skull traction - 2 Placement of image guidance fiducials and set up -2/3 Placement of craniotomy -2/3
Case Based Discussion	One per attachment
CEX	Clinical assessment of patients with common neurosurgical conditions
PBAs	Craniotomy for trauma
Training Supervisors report	Evidenced by the above WPBAs
ARCP for each specified training interval	As per local Deanery specifications
MRCS	Generic syllabus

Initial Stage Topics – Neurosurgery specific modules of the syllabus

Topic	**Embryology and maldevelopment**
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	*To understand basic neuroembryology and its relevance to clinical practice*
Knowledge	4 Embryogenesis of the brain and spinal cord 4 Embryogenesis of supporting structures - skull and vertebral column 4 Common anatomical variations and developmental abnormalities
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Anatomy of the skull**
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	*To understand the anatomy of the skull*
Knowledge	4 Structure, blood supply, innervation, surface and three-dimensional relationships of the: - scalp - skull - meninges - orbit - cranial fossae - cranial foraminae - cranial nerves
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Anatomy of the brain**
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	*To understand the structural anatomy of the brain*
Knowledge	4 Cortical topography 4 Projection and association tracts 4 Organisation of the basal ganglia 4 Structure, organisation and connections of the cerebellum, pons and brainstem 4 Cranial nerves and their relationships 4 Visual and auditory pathways 4 Ventricular system and choroid plexus 4 Subarachnoid space and cisterns

	4 Circle of Willis and principle regional and segmental blood supply 4 Venous drainage and dural sinuses
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Anatomy of the spine**
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	*To understand the anatomy of the spine*
Knowledge	4 Structure, blood supply, innervation, surface and three-dimensional relationships of the: - vertebral column - spinal cord: ascending and descending tracts - spinal nerve roots - cauda equina
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Anatomy of the autonomic and peripheral nervous system**
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	*To understand the anatomy of the autonomic and peripheral nervous system*
Knowledge	4 Sympathetic and parasympathetic pathways 4 Visceral and pelvic innervation: control of sphincter function 4 Brachial plexus 4 Lumbosacral plexus 4 Course, distribution and innervation of the major peripheral nerves
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Functional neurophysiology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neurophysiology
Objective	*To understand the functional organisation and integration of the central nervous system*
Knowledge	4 Structure and function of neurones and glial cells 4 Synaptic function, action potentials and axonal conduction 4 Higher cerebral functions

	4 Sleep and coma 4 Memory and disorders of the limbic system 4 Control of motor function: ascending and descending pathways, basal ganglia and cerebellar function 4 The special senses 4 Functions of the autonomic nervous system 4 Hypothalamic-pituitary function
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Principles of clinical neurophysiology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neurophysiology
Objective	*To understand the basic principles of clinical neurophysiology*
Knowledge	4 Principles of electroencephalography 4 Principles of somatosensory, motor and brainstem evoked potential monitoring 4 Peripheral neuropathies and entrapment neuropathies including: - structure and function of peripheral nerves - use of nerve conduction studies 4 Disorders of the neuromuscular junction including: - structure and function of smooth and striated muscle - use of electromyographic studies
Clinical Skills	3 Interpretation of the results of EEG, EMG and NC studies
Technical Skills and Procedures	None specified

Topic	**Pathophysiology of intracranial disorders**
Category	Core Neuroscience knowledge ST1
Sub-category:	Pathophysiology of intracranial disorders
Objective	*To understand the pathophysiology of intracranial disorders*
Knowledge	4 Cerebral blood flow and metabolism 4 Cerebral autoregulation and vasospasm 4 Blood brain barrier and cerebral odema 4 Intracranial pressure dynamics 4 Cerebral ischaemia and neuroprotection 4 CSF hydrodynamics - production and absorption
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Principles of neuropharmacology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neuropharmacology
Objective	*To understand the principles of neuropharmacology*
Knowledge	4 Receptor and ion channel function 4 Neuropeptides and neurotransmitters 4 Principles of pharmacological neuroprotection 4 The pharmacology of anaesthetic agents, muscle relaxants, barbiturates, anticonvulsants and corticosteroids including: - mechanisms of action - pharmacodynamics - interactions
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Principles of neuropathology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neuropathology and Neuro-oncology
Objective	*To understand the neuropathology of infection, inflammation, ischaemia, neoplasia and trauma affecting the nervous system*
Knowledge	4 Acute and chronic inflammatory processes in the CNS including demyelination 4 Bacterial, fungal and parasitic meningitis, encephalitis and abscess formation 4 Viral encephalitis 4 Slow viruses, CJD and vCJD 4 HIV associated infections, tumours and leucoencehalopathies 4 Cytopathology of neurones and glial in response to ischaemia, hypoxia and trauma 4 Diffuse axonal injury 4 Macroscopic brain and spinal cord injury including effects of brain shift, herniation and raised ICP 4 Classification, epidemiology and pathology of CNS tumours 4 Tumour biology, cell kinetics, tumour markers, immunocytochemistry
Clinical Skills	N/A
Technical Skills and Procedures	None specified

Topic	**Principles of neuroradiology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neuroradiology
Objective	*To understand the principles of neuroradiological imaging of the structure and function of the nervous system*
Knowledge	4 Interpretation of plain radiographs of the skull and spine

	4 Principles of computerised tomography of the brain, skull and spine 4 Interpretation of CT scans with particular reference to acute spinal disorders, cranial trauma, hydrocephalus, intracranial tumours and spontaneous intracranial haemorrhage 4 Principles of basic magnetic resonance imaging 4 Interpretation of MRI scans with particular reference to acute spinal disorders, cranial trauma, hydrocephalus and intracranial tumours 3 Principles of advance magnetic resonance imaging including fMRI, DWI and spectroscopy 3 Interpretation of angiographic images: CTA, MRA and DSA
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Principles of neuropsychology**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neuropsychology
Objective	*To understand the principles of neuropsychological assessment, application of the Mental Health Act*
Knowledge	3 The principles of neuropsychological assessment 3 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	3 Ability to undertake bed-side assessment of cognition and memory
Technical Skills and Procedures	None

Topic	**Principles of neurological rehabilitation**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neurological Rehabilitation
Objective	*To understand the principles of neurological rehabilitation*
Knowledge	3 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
Technical Skills and Procedures	N/A

Topic	**Medical ethics**
Category	Core Neuroscience knowledge ST1
Sub-category:	Medical ethics

Objective	*To understand the ethical issues that commonly arise in the management of patients with neurological disorders*
Knowledge	4 Criteria for the diagnosis of brainstem death 3 Diagnosis and management of persistent vegetative states 3 Prognosis in chronic progressive neurological disorders 3 Professional and statutory framework governing living directives and end-of-life decisions
Clinical Skills	3 Ability to empathise with and support patients and carers
Technical Skills and Procedures	None specified

Topic	**Principles of neurogenetics**
Category	Core Neuroscience knowledge ST1
Sub-category:	Neurogenetics
Objective	*To understand the principles of neurogenetic studies and their relevance to clinical practice*
Knowledge	3 Inherited neurological disorders 3 Genetic control of neural connectivity 3 Inborn errors of metabolism 3 Molecular genetics of CNS tumours
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Impaired consciousness and non-traumatic coma**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with impaired consciousness and non-traumatic coma*
Knowledge	4 The aetiology, pathophysiology and differential diagnosis of altered consciousness and coma due to: - meningitis - encephalitis - intracranial haemorrhage - acutely raised ICP - hydrocephalus - hypoxaemia and ischaemia - cardiogenic shock - hypoglycaemia - epilepsy - metabolic encephalopathies - drugs and toxins
Clinical Skills	4 Neurological assessment and initial resuscitation of patients in coma or with impaired consciousness

	4 Indications for intubation and ventilation 4 Treatment of seizures 4 Establishing a neurological differential diagnosis 4 Planning and interpreting scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	4 Maintenance of airway 3 Endotracheal intubation 3 Central venous cannulation 4 Lumbar puncture

Topic	**Headache - acute and chronic**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with acute and chronic headache*
Knowledge	4 The aetiology and differential diagnosis of acute and chronic headache including headache associated with: - benign headache syndromes - migraine, cluster headache and related syndromes - space occupying lesions - meningitic disorders - intracranial haemorrhage - trigemminal neuralgia - atypical craniofacial pain syndrome Indications for investigation including scanning, lumbar puncture and angiography
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	4 Lumbar puncture

Topic	**Weakness and paralysis**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with weakness and paralysis*
Knowledge	4 Common causes of ocular, cranial nerve, limb, trunk and respiratory muscle weakness
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis

	4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Dizziness, unsteadiness and falls**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with dizziness, unsteadiness and falls*
Knowledge	4 Common causes of cerebellar, vestibular, extrapyrammidal and autonomic dysfunction
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Pain and sensory loss**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with pain and sensory loss*
Knowledge	4 Common causes of musculoskeletal, neurogenic and neuropathic pain and sensory loss
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Hearing disorder**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial*

	management of patients presenting with hearing loss
Knowledge	4 Common causes of conductive and sensorineural hearing loss 3 Principles of audiological assessment
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans 3 Interpretation of pure tone audiograms and auditory evoked potentials 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Visual disorder**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with visual disorders*
Knowledge	4 Patterns of visual loss in relation to common bulbar, retrobulbar, sellar, parasellar and optic pathway disorders 4 Analysis of diplopia and nystagmus in relation to common cranial nerve and brainstem disorders
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Use of computerised visual field assessment 4 Detailed fundoscopy 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Language and speech disturbance**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with disturbances of language and speech*
Knowledge	4 Classification, causes and presentations of dysphasias, speech dyspraxia and dyslexia 4 Classification, causes and presentations of dysarthria 2 Role of speech and language therapists in assessment and treatment
Clinical Skills	4 Neurological history taking 4 Neurological examination with assessment of dysphasia and dysarthria

	4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	N/A

Topic	**Swallowing disorders**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with swallowing disorders*
Knowledge	4 Neurological causes of dysphagia 2 Indications for laryngoscopy, videofluoroscopy, nasogastric and percutaneous gastric feeding
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Disorders of the Sphincteric and sexual function**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with sphincteric disorders*
Knowledge	4 Common causes of sphincteric and sexual dysfunction 2 Interpretation of urodynamic studies
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Movement disorder**
Category	Management of Common Neurological Conditions ST1

Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with movement disorders*
Knowledge	4 Parkinson's disease 4 Iatrogenic movement disorders 2 Dystonic syndromes 2 Choreiform syndromes
Clinical Skills	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Memory and cognitive disorders**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with disorders of memory and cognition*
Knowledge	4 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	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation 4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**Behavioural disorders**
Category	Management of Common Neurological Conditions ST1
Sub-category:	None
Objective	*To understand the aetiology, differential diagnosis, investigation and initial management of patients presenting with behavioural disorders*
Knowledge	4 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	4 Neurological history taking 4 Neurological examination 4 Establishing a neurological differential diagnosis 4 Planning investigation

	4 Interpretation of scans and other investigations 4 Presentation and summary of cases
Technical Skills and Procedures	None specified

Topic	**General management of the head injured patient**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Cranial Trauma
Objective	*To achieve competence in the general management of head-injured patients*
Knowledge	4 Pathophysiology of head injury and of multiple trauma including an understanding of: - Cerebral perfusion and oxygenation - Raised intracranial pressure - Impaired intracranial compliance - Intracranial herniation 4 Medical management of acutely raised intracranial pressure 4 Indications for operation intervention including the use of pressure monitoring 4 Principles, diagnosis and confirmation of brain death 4 Principles of intensive care of head injured patients 4 Principles of spinal stabilisation and radiological assessment in head injured patients 3 Natural history of recovery from head injury including neurological, cognitive and behavioural disability and post- traumatic epilepsy 2 Role of neurological rehabilitation
Clinical Skills	4 Clinical assessment of the multiply-injured patient. 4 Neurological assessment of the head-injured patient including: - Assessment and categorisation of impaired consciousness - Recognition and interpretation of focal neurological deficits 4 Prioritisation of clinical risk 3 Interpretation of CT scans and plain radiology
Technical Skills and Procedures	No procedures specified

Topic	**Insertion of ICP monitor**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Cranial Trauma
Objective	*To achieve competence in the insertion of subdural and intraparenchymal ICP monitors*
Knowledge	4 Indications for ICP monitoring 4 Applied anatomy of the skull vault 4 Calibration, zeroing and interpretation of ICP traces 4 Potential complications of the procedure
Clinical Skills	Non specified
Technical Skills and Procedures	4 Insertion of frontal subdural and intraparenchymal ICP monitors using a standard frontal burr hole and/or twist drill craniostomy.

Topic	**Burr hole evacuation of chronic subdural haematoma**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Cranial Trauma
Objective	*To achieve competence in burr hole evacuation of chronic subdural haematomas*
Knowledge	4 Pathophysiology of chronic subdural haematomas 4 Applied anatomy of the skull vault and subdural space 4 Indications for surgery 4 Surgical options 4 Complications of surgery 4 Management of anti-platelet and anti-coagulant medication
Clinical Skills	4 Neurological assessment of patients with a CSDH 3 Interpretation of CT scans 4 Obtaining informed consent 4 Post-operative assessment and management
Technical Skills and Procedures	3 Performance of single and multiple frontal and parietal burrhole evacuation of CSDHs

Topic	**Management of soft tissue trauma**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Cranial Trauma
Objective	*To achieve competence in the management of cranial soft tissue trauma*
Knowledge	4 Anatomy and blood supply of the scalp 4 Indications for primary and secondary closure of wounds 4 Indications for antibiotic prophylaxis
Clinical Skills	4 Assessment of tissue perfusion and viability
Technical Skills and Procedures	4 Wound exploration under local and general anaesthesia 3 Wound debridement 4 Arrest of scalp haemorrhage 4 Layered closure of the scalp without tension 3 Suturing technique 4 Wound drainage and head bandaging

Topic	**General management of subarachnoid haemorrhage**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Spontaneous Intracranial haemorrage
Objective	*To achieve competence in the general management of subarachnoid haemorrhage (SAH)*
Knowledge	4 Aetiology of SAH 4 Pathophysiology of SAH 4 WFNS grading of SAH 4 Principles of resuscitation and timing of interventions.

	4 Indications for CT scanning, diagnostic lumbar puncture, CT angiography and digital subtraction angiography. 4 Principles of management of post-haemorrhagic hydrocephalus 4 Indications for endovascular and surgical intervention
Clinical Skills	3 Interpretation of CT scans including assessment of intracranial blood load, haematomas and hydrocephalus 3 Basic interpretation of cerebral angiography
Technical Skills and Procedures	4 Lumbar puncture

Topic	**Diagnostic lumbar puncture**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Spontaneous Intracranial haemorrage
Objective	*To understand the indications for diagnostic lumbar puncture* *To undertake an atraumatic lumbar puncture*
Knowledge	4 Indications for diagnostic lumbar puncture 4 Interpretation of basic microscopy and biochemistry 3 Principles of spectrophotometry
Clinical Skills	None specified
Technical Skills and Procedures	4 Lumbar puncture

Topic	**Management of delayed secondary ischaemia**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Spontaneous Intracranial haemorrage
Objective	*To recognise and manage delayed cerebral ischaemia following subarachnoid haemorrhage*
Knowledge	4 Pathophysiology of delayed cerebral ischaemia including the impact of secondary insults 4 Principles governing the augmentation of cerebral blood flow
Clinical Skills	4 Assessment of a deteriorating patient 4 Recognition and management of secondary insults 4 Interpretation of CT scans 3 Management of hypervolaemic hypertension
Technical Skills and Procedures	3 Insertion of central venous catheter 3 Insertion of lumbar drain 3 Insertion of external ventricular drain

Topic	**Management of post-haemorrhagic hydrocephalus**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Spontaneous Intracranial haemorrage

Objective	*To achieve competence in the management of post-haemorrhagic hydrocephalus*
Knowledge	4 Pathophysiology of hydrocephalus 4 Indications for external ventricular drainage and lumbar subarachnoid drainage 4 Applied anatomy of the skull vault, subdural space and ventricular system 4 Complications of surgery
Clinical Skills	4 Assessment of the unconscious and deteriorating SAH patient 3 Interpretation of CT scans
Technical Skills and Procedures	4 Insertion of lumbar drain 3 Insertion of external ventricular drain

Topic	**Adult hydrocephalus**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Hydrocephalus
Objective	*The management of hydrocephalus complicating intracranial haemorrhage, head injury and intracranial space occupying lesions; insertion and taping of CSF reservoirs; insertion and maintenance of lumbar and ventricular drains*
Knowledge	3 The pathophysiology of CSF circulation 3 Applied surgical anatomy of the ventricular system 3 Indications for external ventricular drainage, ventriculoperitoneal shunting, lumbar CSF drainage and shunting, ventriculo-cisternostomy 3 Complications of surgery
Clinical Skills	None
Technical Skills and Procedures	3 Insertion of ventricular drain/access device 2 Insertion of VP shunt 1 Revision of VP shunt

Topic	**Assessment and peri-operative management of patients with space-occupying intracranial tumours**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Intracranial tumours
Objective	*To achieve competence in the assessment and peri-operative management of patients with intracranial tumours*
Knowledge	3 The neuropathology of primary and secondary intracranial tumours including: - classification - epidemiology - natural history 4 Clinical presentations of intracranial tumours 4 Indications for neuroimaging 4 Management of raised intracranial pressure 3 Principles of operative management 4 Detection and management of post-operative complications
Clinical Skills	4 Neurological history taking and examination

	4 Basic interpretation of CT and MRI scans
Technical Skills and Procedures	None specified

Topic	**Image-guided biopsy of intracranial tumour**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Intracranial tumours
Objective	*To undertake image-guided biopsy of an intracranial tumour under supervision*
Knowledge	4 Indications for biopsy of intracranial tumours 4 Risks of biopsy 4 Principles of image-guided surgery
Clinical Skills	3 Interpretation of CT and MRI scans and selection of biopsy targets
Technical Skills and Procedures	3 Image-guided frameless and/or frame-based stereotactic biopsy including: - Setting up a computer workstation and importing and interrogating image data - Positioning the patient and applying a cranial fixator - Obtaining and confirming accurate patient registration - Positioning and performing a suitable burr hole - Passage of biopsy probe and biopsy - Preparation of smear histology (when available)

Topic	**Acute Spinal Disorders**
Category	Basic Clinical Neurosurgery ST2 & ST3
Sub-category:	Acute Spinal Disorders
Objective	*To achieve competence in the peri-operative management of patients presenting with acute spinal disorders*
Knowledge	4 The assessment and peri-operative management of patients presenting with spinal cord, cauda equina and spinal root compression 4 The management of spinal shock 4 The ward management of patients with spinal instability 4 The detection and initial management of post-operative complications including compressing haematomas, CSF fistula and spinal sepsis
Clinical Skills	None
Technical Skills and Procedures	None

Intermediate Stage Overview

Intermediate Training Stage ST4 – ST5

During the intermediate stage trainees will consolidate the theoretical knowledge and clinical skills gained during the initial training stage. They will develop their surgical judgement, decision making and operative competencies in the following conditions:

- Cranial trauma: including the general management of the head injured patient; surgical management of cranial trauma; neuro-intensive care of the head-injured patient; the role of post-traumatic neurological rehabilitation
- Intracranial haemorrhage: including the operative management of space-occupying spontaneous intracerebral haematomas; surgical aspects of the multi-disciplinary management of aneurysmal subarachnoid haemorrhage SAH
- 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
- 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; the operative management of convexity meningiomas
- CNS sepsis: including 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
- Spinal trauma: all aspects of the non-operative management of spinal injury patients
- Spinal oncology: including the general management of patients with malignant spinal cord compression and basic surgical management of patients with malignant spinal cord compression
- Degenerative spinal disorders: including the surgical management of lumbar compressive radiculopathies by lumbar microdiscectomy and associated microsurgical decompressions; the surgical management of compressive cervical myeloradiculopathies

By the end of the intermediate stage trainees will have acquired the necessary clinical and operative skills with sufficient experience to manage without direct supervision a range of adult emergency conditions together with selected, life saving emergency intervention in children. They will be competent to undertake all the common surgical approaches and to perform selected microsurgical procedures included in the Operative Competency Schedule.

Click on Workplace Based Assessments to view the assessment forms including DOPS and PBAs

Entry into ST3

Entry into ST3 will usually involve a competitive selection process. The current person specifications for entry into ST3 in Neurosurgery are shown on the Modernising Medical Careers website. The essential components are completion of the common component of the core surgical training programme (as evidenced by successful ARCP, WPBA and completion of the MRCS examination) and completion of the Neurosurgery specific components of the early years training as evidenced by a successful ARCP and completion of the appropriate WPBA.

2009 Person Specification

Application to enter Specialty Training at ST3: Neurosurgery

Essential		**When Evaluated**[1]
Qualifications	• MBBS or equivalent medical qualification • Successful completion of MRCS or equivalent at time of application	Application form
Eligibility	• Eligible for full registration with the GMC at time of appointment	Application form
	• Evidence of achievement of Foundation competences by time of appointment in line with GMC standards/ Good Medical Practice including: o *Good clinical care* o *Maintaining good medical practice* o *Good relationships and communication with patients* o *Good working relationships with colleagues* o *Good teaching and training* o *Professional behaviour and probity* o *Delivery of good acute clinical care*	Application form Interview / Selection centre[2]
	• Evidence of achievement of **CT/ST1 competences** in neurosurgery at time of appointment & projected completion of **CT/ST2 competences** in neurosurgery by August 2009	Application form Interview / Selection centre
	• Eligibility to work in the UK	Application form
Fitness To Practise	Is up to date and fit to practise safely	Application form References
Language Skills	All applicants to have demonstrable skills in written and spoken English adequate to enable effective communication about medical topics with patients and colleagues demonstrated by one of the following: o *a) that applicants have undertaken undergraduate medical training in English; or* o *b) have the following scores in the academic International English Language Testing System (IELTS) – Overall 7, Speaking 7, Listening 6, Reading 6, Writing 6* • If applicants believe they have adequate communication skills but do not fit into one of these examples they must provide supporting evidence	Application form Interview / Selection centre

[1] when evaluated' is indicative, but may be carried out at any time throughout the selection process

[2] A selection centre is a process not a place. It involves a number of selection activities that may be delivered within the Unit of Application.

Health	Meets professional health requirements (in line with GMC standards/Good Medical Practice)	Application form Pre-employment health screening
Career Progression	*• Ability to provide a complete employment history* • Evidence that career progression is consistent with personal circumstances • Evidence that present achievement and performance is commensurate with totality of period of training *• At least **24 months' experience**[3] in neurosurgical-related training at ST/SHO level (not including Foundation modules) by August 2009*	Application form Interview / Selection centre
Application Completion	***ALL** sections of application form completed **FULLY** according to written guidelines*	Application form

SELECTION CRITERIA			
Essential	**Desirable**	**When Evaluated**	
Career Progression	**As Above**	• Foundation competences to have been achieved in posts completed not more than five years before August 2009	
Clinical Skills	**Technical Knowledge & Clinical Expertise:** • Capacity to apply sound clinical knowledge & judgement & prioritise clinical need • Demonstrates appropriate technical and clinical competence and evidence of the development of diagnostic skills and clinical judgement • Validated logbook documentation of surgical exposure to date	**Personal Attributes:** • Shows aptitude for practical skills, e.g. hand-eye co-ordination, dexterity, visuo-spatial awareness • Attendance at relevant courses, e.g. ATLS, Basic Surgical Skills or equivalent, CCrISP	Application form Interview / Selection centre References

[3] Any time periods specified in this person specification refer to full time equivalent

Academic / Research Skills	**Research Skills:** • Demonstrates understanding of the basic principles of audit, clinical risk management & evidence-based practice • Understanding of basic research principles, methodology & ethics, with a potential to contribute to research **Audit:** Evidence of active participation in audit **Teaching:** • Evidence of contributing to teaching & learning of others	• Evidence of relevant academic & research achievements, e.g. degrees, prizes, awards, distinctions, publications, presentations, other achievements • Evidence of participation in risk management and/or clinical/laboratory research	Application form Interview / Selection centre Application form Interview / Selection centre

Personal Skills	**Judgement Under Pressure:** • Capacity to operate effectively under pressure & remain objective In highly emotive/pressurised situations • Awareness of own limitations & when to ask for help **Communication Skills:** • Capacity to communicate effectively & sensitively with others • Able to discuss treatment options with patients in a way they can understand **Problem Solving:** • Capacity to think beyond the obvious, with analytical and flexible mind • Capacity to bring a range of approaches to problem solving **Situation Awareness:** • Capacity to monitor and anticipate situations that may change rapidly **Decision Making:** • Demonstrates effective judgement and decision-making skills **Leadership & Team Involvement:** • Capacity to work effectively in a Multi-Disciplinary Team • Demonstrate leadership when appropriate. • Capacity to establish good working relations with others **Organisation & Planning:** • Capacity to manage time and prioritise workload, balance urgent & important demands, follow instructions • Understands importance & impact of information systems	Application form Interview / Selection centre References
Probity	**Professional Integrity:** • Takes responsibility for own actions • Demonstrates respect for the rights of all • Demonstrates awareness of ethical principles, safety, confidentiality & consent • Awareness of importance of being the patients' Advocate, clinical governance & responsibilities of an NHS Employee	Application form Interview / Selection centre References

Commitment To Specialty	**Learning & Development:** • Shows realistic insight into neurosurgery and the personal demands of a commitment to surgery • Demonstrates knowledge of the neurosurgical training programme & commitment to own development • Shows critical & enquiring approach to knowledge acquisition, commitment to self-directed learning and a reflective/analytical approach to practice	**Extracurricular activities:** • Achievements relevant to neurosurgery, including elective or other experience • Attendance at, or participation in, national and international meetings relevant to neurosurgery	Application form Interview / Selection centre References

Intermediate Stage Topics

Topic	General management of the head injured patient
Category	Cranial Surgery
Sub-category:	Cranial Trauma
Objective	*To achieve competence in all aspects of the general management of head-injured patients*
Knowledge	4 Pathophysiology of head injury and of multiple trauma 4 Prevention of secondary insults 4 Indications for operative intervention 4 Medical management of acutely raised intracranial pressure
Clinical Skills	4 Clinical assessment of the head-injured and multiply-injured patient 4 Prioritisation of clinical risk 4 Interpretation of CT scans and plain radiology 4 Interpretation of multi-modality cerebral monitoring 4 Ability to assess and advise on the transfer of head-injured patient using image-transfer and telemedicine
Technical Skills and Procedures	None specified

Topic	Surgical management of cranial trauma
Category	Cranial Surgery
Sub-category:	Cranial Trauma
Objective	*To achieve competence in the operative management of head-injured patients*
Knowledge	4 Pathophysiology of raised intracranial pressure and space occupying haematomas 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Indications for surgery and appropriate surgical approaches
Clinical Skills	4 Assessment of the head-injured patient 4 Interpretation of trauma CT scans
Technical Skills and Procedures	3 Craniotomy for supratentorial traumatic haematoma, in particular: 3 Planning and siting of craniotomies for evacuation of extradural and subdural haematomas 3 Handling the "tight" brain 3 Achieving haemostasis in the coagulopathic patient 3 Achieving haemostasis from the skull base and venous sinuses 3 Elevation of compound depressed skull fracture with dural repair 3 Delayed cranioplasty of skull vault

Topic	Neuro-intensive care of the head-injured patient
Category	Cranial Surgery
Sub-category:	Cranial Trauma
Objective	*To achieve competence in the neurointensive care of head-injured patients*
Knowledge	4 Pathophysiology of head injury 4 The management of raised intracranial pressure, impaired intracranial compliance, and cerebral ischaemia 4 Prevention and management of secondary insults
Clinical Skills	4 Assessment of the unconscious patient 4 Use and interpretation of multimodality monitoring 4 Interpretation of CT scans 4 Ability to advise on management of secondary complications and further surgical

	intervention
Technical Skills and Procedures	None specified

Topic	**Neurological rehabilitation**
Category	Cranial Surgery
Sub-category:	Cranial Trauma
Objective	*To understand the role of post-traumatic neurological rehabilitation*
Knowledge	4 The natural history of recovery from head injury 4 Understanding of neurological, cognitive and behavioural disabilities following mild and severe head injury 4 Risks of post-traumatic epilepsy and its management
Clinical Skills	4 Ability to contribute to the multi-disciplinary assessment of head injured patients 4 Ability to advise family and carers regarding prognosis, professional and lay support
Technical Skills and Procedures	None specified

Topic	**Primary intracerebral haematomas**
Category	Cranial Surgery
Sub-category:	Intracranial Haemorrhage
Objective	*To achieve competence in the operative management of space-occupying spontaneous intracerebral haematomas*
Knowledge	4 Aetiology of supra and infratentorial intracerebral haemorrhage 4 Pathophysiology of spontaneous intracerebral haemorrhage 4 Indications for surgical evacuation 4 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	4 Assessment of patients with intracerebral haematomas and raised intracranial pressure 4 Interpretation of CT and MRI scans and identification of probable aetiology 4 Indications for pre-operative CT angiography, MRA and digital subtraction angiography
Technical Skills and Procedures	3 Craniotomy for supratentorial haematoma including: 3 Planning and siting of craniotomies 3 Use of ventricular drainage 3 Intracerebral haemostasis in the coagulopathic patient

Topic	**Aneurysmal subarachnoid haemorrhage**
Category	Cranial Surgery
Sub-category:	Intracranial Haemorrhage
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of aneurysmal subarachnoid haemorrhage SAH*
Knowledge	4 Pathophysiology of SAH 4 Prevention and management of delayed cerebral ischaemia, cerebral vasospasm and hydrocephalus 4 Relative indications for endovascular and surgical interventions

Clinical Skills	4 Clinical assessment of patients with aneurysmal SAH 4 Non operative management of patients undergoing endovascular coiling 4 Management of delayed cerebral ischaemia
Technical Skills and Procedures	4 External ventricular drainage 4 Lumbar subarachnoid drainage 3 Ventriculoperitoneal shunting

Topic	**Adult hydrocephalus**
Category	Cranial Surgery
Sub-category:	Hydrocephalus
Objective	*To achieve competence the assessment and operative management of adult patients with communicating and non communicating hydrocephalus.*
Knowledge	4 The pathophysiology of CSF circulation 4 Applied surgical anatomy of the ventricular system 4 Indications for external ventricular drainage, ventriculoperitoneal shunting, lumbar CSF drainage and shunting, ventriculo-cisternostomy 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with hydrocephalus, including interpretation of CT and MRI scans and identification of shunt malfunction
Technical Skills and Procedures	4 Lumbar subarachnoid drainage 4 External ventricular drainage 3 Primary ventriculoperitoneal shunt 2 Revision of ventriculoperitoneal shunt 2 Lumbo-peritoneal shunt

Topic	**Paediatric hydrocephalus**
Category	Cranial Surgery
Sub-category:	Hydrocephalus
Objective	*To achieve competence in the assessment of children with hydrocephalus. To undertake emergency external ventricular drainage in children with acute hydrocephalus*
Knowledge	4 The pathophysiology of CSF circulation 4 Applied surgical anatomy of the ventricular system 4 Indications for external ventricular drainage
Clinical Skills	4 Assessment of the ill child with hydrocephalus, impaired consciousness and sepsis 4 Differential diagnosis of shunt malfunction 4 Interpretation of CT scans in shunted children
Technical Skills and Procedures	4 Taping and draining from an Ommaya reservoir 4 Taping a shunt 2 External ventricular drainage

Topic	**General principles of neuro-oncology**
Category	Cranial Surgery
Sub-category:	Neuro-oncology
Objective	*To achieve competence in the multi-disciplinary management of patients with intracranial neoplasia*
Knowledge	4 Classification, natural history and pathology of benign and malignant intracranial neoplasia

	4 Pathophysiology of raised intracranial pressure associated with space occupying tumours 4 Diagnostic imaging of intracranial tumours including the interpretation of CT and MRI scans and the role of MRS 4 Principles of fractionated radiotherapy, stereotactic radiotherapy and radiosurgery 4 Role of adjuvant chemotherapy 4 Principles of clinical trials and their application to neuro-oncology 4 Principles of palliative care
Clinical Skills	4 Clinical assessment of patients with raised intracranial pressure and space occupying lesions 4 Ability to contribute to the multi-disciplinary management of patients with intracranial neoplasia 4 Empathetic communication with patients and families
Technical Skills and Procedures	None specified

Topic	**Principles of image-guided surgery**
Category	Cranial Surgery
Sub-category:	Neuro-oncology
Objective	*To achieve competence in image-guided surgery applied to the management of patients with intracranial tumours*
Knowledge	4 An understanding of the principles and practice of frameless image-guided surgery and the principles of frame-based stereotactic surgery
Clinical Skills	4 Interpretation of CT and MRI scans
Technical Skills and Procedures	3 Image-guided biopsy of supratentorial intrinsic tumour 4 Ability to import, check and interrogate image data sets on a standard work station 4 Setting up an image-guidance system and obtaining satisfactory intra-operative registration 4 Planning and siting burr holes and craniotomy flaps using image-guidance 4 Identification of an intra-cranial tumour and its margins using image-guidance

Topic	**Supra-tentorial intrinsic tumours**
Category	Cranial Surgery
Sub-category:	Neuro-oncology
Objective	*To achieve competence in the operative management of supra-tentorial intrinsic tumours*
Knowledge	4 Indications for surgery 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with supratentorial intrinsic tumours
Technical Skills and Procedures	3 Craniotomy for superficial, lobar supratentorial intrinsic tumour In particular: 3 safe patient positioning 3 planning and siting of craniotomy with and without image-guidance 3 intra-operative management of raised ICP 3 appropriate exposure of the tumour, using operating microscope as necessary 3 safe use of fixed retractors 3 precise use of suction, electo-coagulation and ultrasonic aspiration 3 intracranial haemostasis

Topic	**Convexity meningioma**
Category	Cranial Surgery
Sub-category:	Neuro-oncology
Objective	*To achieve competence in the operative management of a convexity menginiomas*
Knowledge	4 Indications for surgery 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with convexity meningiomas
Technical Skills and Procedures	Resection of a convexity meningioma, in particular: 3 safe patient positioning 3 planning and siting of craniotomy with and without image-guidance 3 intra-operative management of raised ICP 3 appropriate exposure of the tumour 3 precise use of suction, electo-coagulation and ultrasonic aspiration 3 use of internal tumour decompression 3 dissection in the subarachnoid plane using the operating microscope as necessary 3 intracranial haemostasis 3 use of duraplasty and cranioplasty

Topic	**General microbiological principles**
Category	Cranial Surgery
Sub-category:	CNS Sepsis
Objective	*To achieve competence in the general management of CNS infections including ventriculitis, cerebral abscess, subdural empyema and spinal epidural abscess*
Knowledge	4 The pathophysiology of intracranial and spinal sepsis 4 Principles of anti-microbial chemotherapy 4 Indications for operative intervention
Clinical Skills	4 Clinical assessment of patients with CNS infections 4 Interpretation of CT and MRI scans
Technical Skills and Procedures	None specified

Topic	**Management of intracerebral abscess**
Category	Cranial Surgery
Sub-category:	CNS Sepsis
Objective	*To achieve competence in the operative management of cerebral abscess using burr hole aspiration*
Knowledge	4 Indications for surgery 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment and pre-operative preparation of patients with a cerebral abscess
Technical Skills and Procedures	4 Burr hole aspiration of a cerebral abscess with and without image-guidance

Topic	**Management of the spinal injury patient**
Category	Spinal Surgery
Sub-category:	Spinal Trauma
Objective	*To achieve competence in all aspects of the non-operative management of spinal injury patients.*
Knowledge	4 Pathophysiology of spinal cord injury 4 Classification of spinal fracture dislocations 4 Biomechanics of spinal instability 4 Indications for halo traction and external stabilisation 4 Indications for and principles of open reduction and stabilisation
Clinical Skills	4 Clinical assessment of the spinal injury patient 4 Management of spinal shock 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with spinal injury units
Technical Skills and Procedures	4 Use of external mobilisation including cervical collars and spinal boards 3 Application of halo traction 2 Application of a halo-body jacket

Topic	**Malignant spinal cord compression**
Category	Spinal Surgery
Sub-category:	Spinal Oncology
Objective	*To achieve competence in the general management of patients with malignant spinal cord compression.*
Knowledge	4 The pathophysiology of spinal cord compression 4 The classification, aetiology and natural history of vertebral metastases 4 Spinal instability associated with vertebral malignancy 4 Indications for surgical intervention 4 Role of primary radiotherapy and adjuvant radiotherapy or chemotherapy
Clinical Skills	4 Clinical assessment of patients with malignant spinal cord compression 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with medical oncologists and radiotherapist
Technical Skills and Procedures	N/A

Topic	**Surgical management of thoraco-lumbar metastases**
Category	Spinal Surgery
Sub-category:	Spinal Oncology
Objective	*To achieve competence in the basic surgical management of patients with malignant spinal cord compression*
Knowledge	4 Indications for surgery 4 The principles of operative spinal decompression and stabilisation of patients with spinal cord metastases. 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with malignant spinal cord compression
Technical Skills and Procedures	3 Extradural spinal biopsy and decompression by laminectomy in selected patients without segmental instability 2 Instrumented posterior spinal stabilisation

Topic	**Lumbar radiculopathies**
Category	Spinal Surgery
Sub-category:	Degenerative Spinal Disorders
Objective	*To achieve competence in the surgical management of lumbar compressive radiculopathies by lumbar microdiscectomies and associated microsurgical decompressions.*
Knowledge	4 Indications for operative management of lumbar radiculopathies 4 Applied surgical anatomy of the lumbar spine with particular reference to degenerative neural compression and morphological variations in vertebral anatomy 4 Selection of minimally-invasive approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with lumbar radiculopathies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms
Technical Skills and Procedures	3 Primary lumbar microdiscectomy 3 Primary posterior decompression (laminotomy, hemilaminectomy etc): including - Identification of spinal level by pre and intra-operative fluoroscopy - Achieving safe access to the spinal canal by micro-surgical fenestration - Achieving full decompression of the spinal canal, lateral recess and foramen by appropriate bone and soft tissue resection - Protection and safe retraction of neural tissues

Topic	**Compressive cervical myeloradiculopathies**
Category	Spinal Surgery
Sub-category:	Degenerative Spinal Disorders
Objective	*To achieve competence in the surgical management of compressive cervical myeloradiculopathies*
Knowledge	4 Indications for operative management of cervical myeloradiculopathies 4 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 4 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with cervical myeloradiculopathies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms
Technical Skills and Procedures	3 Single level anterior cervical discectomy with and without fusion In particular: 3 Standard anterolateral approach to the cervical spine 3 Use of fluoroscopy or plain radiographs to confirm spinal level 3 Radical and subtotal excision of the cervical disc, PLL, central and unco-vertebral osteophytes 3 Protection and full decompression of the spinal cord and spinal nerve roots 3 Interbody fusion using autologous bone with or without interbody cages

Final Stage Overview

Final Stage ST6 – ST7

The final stage syllabus is not intended to be a comprehensive training guide. Due to the nature of neurosurgical practice there will be conditions and procedures that are not individually specified in the syllabus and that will form part of a trainee's experience. This clinical and operative experience will be taken into account when assessing the overall quality of advanced training.

However, by the time that trainees apply for special interest training or to take the FRCS (Neurosurgery) they must be competent in all aspects of the clinical management of patients presenting with the following essential conditions:

- Cranial trauma
- Spontaneous intracranial haemorrhage
- Hydrocephalus
- Intracranial tumours
- CNS infections
- Spinal trauma
- Benign intradural tumours
- Malignant spinal cord compression
- Degenerative spinal disorders
- Emergency paediatric care

They must be competent to undertake the full range of operative procedures specified in the final training stage of the essential operative competency schedule (Table 1) without supervision and have sufficient operative experience to be able to manage operative difficulties and complications (Competence level 4).

Paediatric training

Before completing their training all trainees will undertake a 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 a minimum annual operative workload of 250 cases. On completion of general paediatric training trainees will be competent to assess and undertake the emergency neurosurgical management of the critically-ill child with raised intracranial pressure.

Special Interest Training ST8

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

Trainees in special interest training will develop a comprehensive and in-depth knowledge of their field. The special interest training year is allocated to ST8 in the stage overview for convenience. However this year may be undertaken at any time in the final stage at the doscretion of the programme director. 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 specialist interest summaries indicate the breath and depth of training required in a specialist interest fellowship

Table1. Schedule of Essential Operative Competencies

This table summarises the level of operative competence which should be attained at each stage of training using the four point scale: 1 – has observed; 2 – can do with assistance; 3 – can do whole but may need assistance; 4 – competent to do whole without assistance and manage complications.

	Initial	Intermediate	Final
• **Surgical Approaches**			
• Burr hole	3	4	4
• Craniotomy – convexity	2	3	4
• Craniotomy – pterional	1	3	4
• Craniotomy – midline supratentorial	1	3	4
• Craniotomy – midline posterior fossa	2	3	4
• Transsphenoidal approach	1	2	4
• Lateral posterior fossa	1	2	4
• Lumbar fenestration	2	4	4
• Laminectomy	2	3	4
• **General Procedures**			
• Insertion of lumbar drain	3	4	4
• Tapping/draining of CSF reservoir	3	4	4
• Application of skull traction	2	4	4
• Image Guidance/Stereotaxy set up	2	4	4
• **Management of cranial trauma**			
• Insertion of Intracranial (ICP) monitor	3	4	4
• Burr hole evacuation of CSDH	3	4	4
• Elevation of depressed skull fracture	2	4	4
• Craniotomy for traumatic haematoma (ICH)	2	3	4
• **Management of spontaneous intracranial haemorrhage**			
• Craniotomy for spontaneous intracerebral haematoma (ICH supratentorial)	1	3	4
• Craniotomy for spontaneous intracerebellar haematoma (ICH infratentorial)	1	3	4
• **Management of hydrocephalus**			
• Insertion of ventricular drain/access device	3	4	4
• Insertion of VP shunt	2	3	4
• Revision of VP shunt	1	2	4
• **Management of intracranial tumours**			
• Supratentorial tumour biopsy	2	3	4
• Craniotomy for supratentorial intrinsic tumour/metastasis	1	3	4
• Craniotomy for posterior fossa intrinsic tumour/metastasis	1	2	4
• Craniotomy for convexity meningioma	1	3	4
• **Management of intradural spinal tumours**			
• Excision of intradural extramedullary tumour	1	2	4
• **Management of degenerative spinal disorders**			
• Lumbar microdiscectomy	1	3	4
• Anterior cervical discectomy	1	3	4
• **Emergency paediatric care**			
• Insertion of EVD	1	2	4
• Evacuation of intracranial haematoma (ICH)	1	2	4

Final Stage Topics

Topic	**Management of head injured patients**
Category	Cranial Surgery
Sub-category:	Cranial Trauma
Objective	*To achieve competence in all aspects of the advanced operative management of head-injured patients*
Knowledge	4 Pathophysiology of raised intracranial pressure and space occupying haematomas 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Indications for surgery and appropriate surgical approaches 4 Indications for open and endoscopic closure of traumatic CSF fistulae 4 Complications of surgery and their management
Clinical Skills	4 Competence in all aspects of peri-operative management of head-injured patients 4 Ability to diagnose and confirm brain death
Technical Skills and Procedures	4 Craniotomy for supra and infratentorial extradural, subdural and intracerebral haematomas 4 Lobectomy for haemorrhagic contusion 4 Vault cranioplasty using in-situ or preformed prostheses 3 Decompressive bifrontal craniotomy with extensive durotomy 3 Subfrontal extradural or subdural repair of anterior fossa fractures 3 Combined craniofacial repair of fronto-orbito-maxillary injuries (fellowship)

Topic	**Aneurysmal Subarachnoid haemmorrhage**
Category	Cranial Surgery
Sub-category:	Spontaneous Intracranial haemorrage
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of aneurysmal subarachnoid haemorrhage SAH*
Knowledge	4 Pathophysiology of SAH 4 Prevention and management of delayed cerebral ischaemia, cerebral vasospasm and hydrocephalus 4 Relative indications for endovascular and surgical interventions
Clinical Skills	4 Clinical assessment of patients with aneurysmal SAH 4 Non operative management of patients undergoing endovascular coiling 4 Management of delayed cerebral ischaemia
Technical Skills and Procedures	4 External ventricular drainage 4 Lumbar subarachnoid drainage 4 Ventriculoperitoneal shunting 4 Revision of ventriculoperitoneal shunt 4 Craniotomy for intracerebral haematoma

Topic	**Adult hydrocephalus**
Category	Cranial Surgery
Sub-category:	Hydrocephalus
Objective	*To achieve competence in all aspects of the management of adult patients with hydrocephalus*
Knowledge	4 The pathophysiology of CSF circulation 4 Applied surgical anatomy of the ventricular system 4 Indications for external ventricular drainage, shunting, lumbar CSF drainage and shunting, ventriculo-cisternostomy 4 Surgical complications and their management

Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with hydrocephalus 4 Interpretation of pressure studies and CSF infusion studies 4 Interpretation of CT and MRI scans and identification of shunt malfunction
Technical Skills and Procedures	Competence in all aspects of primary and revisional shunt surgery including: 4 Use of 3-D image-guidance or ultrasound for difficult ventricular cannulation 4 Intra-operative testing of shunt function 4 Selection of appropriate shunts 4 Management of peri-operative ventricular haemorrhage 4 Lumbo-peritoneal shunt 2 Third ventriculo-cisternostomy

Topic	**Anterior and middle fossa skull base tumours**
Category	Cranial Surgery
Sub-category:	Intracranial tumours
Objective	*To achieve competence in the surgical management of patients with anterior and middle fossa tumours*
Knowledge	4 Indications for selected approaches in relation to pathology and surgical goals 4 Applied microsurgical anatomy of the anterior and middle cranial fossae 4 Principles of intra-operative management of patients undergoing resection of anterior and middle fossa tumours including olfactory groove, planum sphenoidale, parasellar and sphenoid wing and falcine meningiomas 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with anterior and middle fossa tumours 4 Interpretation of CT and MRI scans
Technical Skills and Procedures	4 Standard pterional and subfrontal approaches including: - Pterional resection and basal drilling - Subfrontal approach to the optic nerve, chiasm and internal carotid arteries - Sylvian fissure splitting and exposure of the MCA bifurcation - CSF drainage by chiasmatic cisternal suction, intra-operative ventricular puncture and lamina terminalis fenestration 4 Bi-Frontal/Frontal and panietal parafalcine approaches 4 Microsurgical resection of superfical skull base meningioma 2 Anterior interhemispheric, fronto-orbital, zygomatic and temporo-zygomatic approaches

Topic	**Transphenoidal surgery**
Category	Cranial Surgery
Sub-category:	Intracranial tumours
Objective	*To achieve competence in transphenoidal approaches to the pituitary fossa and resection of pituitary adenomas*
Knowledge	4 Pathophysiology of the hypothalamic-pituitary axis 3 Indications for surgery 3 Selection of surgical approaches: sublabial, transnasal and endoscopic 3 Applied surgical anatomy of the skull base 4 Principles of peri-operative care 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with pituitary, sellar and parasellar tumours 4 Interpretation of CT and MRI scans

Technical Skills and Procedures	3 Microsurgical transphenoidal approach 2 Transphenoidal resection of non-functioning macroadenoma

Topic	**Movement disorders**
Category	Cranial Surgery
Sub-category:	Functional neurosurgery
Objective	*To understand the management of patients with movement disorders*
Knowledge	3 The aetiology and pathophysiology of movement disorders 2 Indications for medical, minimally-invasive and surgical management 4 Complications of surgery and their management
Clinical Skills	3 Surgical aspects of the multi-disciplinary assessment of patients with movement disorders
Technical Skills and Procedures	N/A

Topic	**Midline tumours**
Category	Cranial Surgery
Sub-category:	Intracranial tumours
Objective	*To achieve competence in the management of patients with midline sellar, parasellar, pineal and third ventricular tumours*
Knowledge	4 Indications for surgery 4 Applied surgical anatomy of midline structures 4 Selection of surgical approaches including principles of endoscopic biopsy and/or resection 4 Principles of intra-operative management of patients undergoing resection of midline sellar, para-sellar, pineal and third ventricular tumours including colloid cysts 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with midline tumours tumours 4 Interpretation of CT and MRI scans
Technical Skills and Procedures	3 Transfrontal, transcortical approach to the lateral and third ventricle 2 Microsurgical resection of lateral intraventricular tumour 2 Transfrontal endoscopic biopsy

Topic	**Malignant posterior fossa tumours**
Category	Cranial Surgery
Sub-category:	Intracranial tumours
Objective	*To achieve competence in the surgical management of superficial, hemispheric and midline intrinsic posterior fossa tumours and metastases*
Knowledge	4 Indications for surgery 4 Selection of surgical approaches 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with posterior fossa malignant tumours 4 Interpretation of CT and MRI scans
Technical Skills	4 Competence in midline, paramedian and retrosigmoid posterior fossa craniotomies

and Procedures	including: - safe patient positioning in the prone and semi-prone positions - exposure of the lateral and sigmoid sinuses - exposure and decompression of the foramen magnum - use of cisternal CSF drainage - safe use of fixed retractors - exposure and resection of superficial, lateral and mid-line intrinsic cerebellar tumours and metastases

Topic	**Cerebellopontine angle tumours**
Category	Cranial Surgery
Sub-category:	Intracranial tumours
Objective	*To achieve competence in the management of patients with cerebellopontine angle tumours*
Knowledge	4 Relative indications for surgery, radiosurgery and conservative management 4 Principles of intra-operative management of patients undergoing resection of CP angle tumours including vestibular schwannomas and menignomas 3 Principles and application of cranial nerve and brainstem monitoring 4 Applied microsurgical anatomy of the CP angle, brainstem and lower cranial nerves 3 Relative indications for retrosigmoid, middle fossa, and translabyrinthine approaches with respect to hearing preservation, tumour size and position
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with CP angle tumours 4 Interpretation of CT and MR scans
Technical Skills and Procedures	4 Retrosigmoid approach 3 Subarachnoid dissection and exposure of the tumour and lower cranial nerves 2 Subtotal microsurgical resection of acoustic neuroma

Topic	**Intracerebral abscess and subdural empyema**
Category	Cranial Surgery
Sub-category:	CNS Infection
Objective	*To achieve competence in the management of patients with CNS infections including ventriculitis, cerebral abscess and subdural empyema*
Knowledge	4 The aetiology and pathophysiology of intracranial sepsis 4 Indications for burr hole drainage, ventricular drainage and craniotomy in the management of intracranial sepsis 4 Indications for combined otorhinological procedures 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Surgical complications
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with intracranial sepsis 4 Interpretation of CT and MRI scans 3 Management of anti-microbial therapy
Technical Skills and Procedures	4 Burr hole drainage of intracerebral abscess 4 Ventricular drainage 4 Craniotomy for subdural empyema, including frontal and parietal parafalcine approaches 4 Craniotomy and resection of frontal, temporal and cerebellar abscess 3 Anterior and middle fossa extradural and subdural duroplasty

Topic	**Intracranial aneurysms**
Category	Cranial Surgery
Sub-category:	Neurovascular surgery
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of ruptured and unruptured intracranial aneurysms*
Knowledge	4 Aetiology, epidemiology and natural history of unruptured and ruptured intracranial aneurysms 4 Pathophysiology and general management of subarachnoid haemorrhage 3 Angiographic and microsurgical anatomy of the cerebral circulation 3 Indications for surgical management of intracranial aneurysms by clipping, trapping, microsurgical reconstruction and microvascular bypass 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with ruptured and unruptured aneurysms 4 Interpretation of CT, MR and catheter angiography
Technical Skills and Procedures	4 Standard pterional and subfrontal approaches 2 Clipping of anterior circulation aneurysm

Topic	**Intracranial vascular malformations**
Category	Cranial Surgery
Sub-category:	Neurovascular surgery
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of intracranial vascular malformations*
Knowledge	4 Pathogenesis, aetiology, epidemiology and natural history of intracranial vascular malformations including AVMs, A-V fistula, cavernomas and venous malformations 4 Pathophysiology and general management of intracranial haemorrhage 3 Angiographic and microsurgical anatomy of the cerebral circulation 3 Indications for embolisation and radiosurgery 3 Indications for surgical management of malformations 4 Complications of surgery and their management, including hyperperfusion syndromes
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with vascular malformations 4 Interpretation of CT, MR and catheter angiography
Technical Skills and Procedures	3 Image-guided craniotomy and exposure of supratentorial AVM 2 Microsurgical resection of superficial gyral or sulcal AVM

Topic	**Occlusive cerebrovascular disease**
Category	Cranial Surgery
Sub-category:	Neurovascular surgery
Objective	*To achieve competence in the clinical management of occlusive cerebrovascular disease*
Knowledge	3 The epidemiology, natural history and pathophysiology of extra- and intracranial atherosclerotic occlusive disease 3 The epidemiology, natural history and pathophysiology of non-atherosclerotic occlusive diseases 3 Optimal medical management of occlusive and thrombo-embolic cerebrovascular disease 3 Imaging of the acutely ischaemic brain using CT and MRI 3 Principles of non-invasive and invasive imaging of the extra and intracranial vasculature using CT, MRI and catheter angiography 2 Principles of regional cerebral blood flow and metabolism measurement and imaging

	using CT and MRI perfusion techniques; SPECT and PET scanning 2 Indications for carotid endarterectomy 2 Indications for endovascular intervention including intra-arterial thrombolysis; carotid angioplasty and stenting; intracranial angioplasty 2 Principles of cerebral revascularisation by indirect synangiosis, low-flow EC-IC anastomosis and high flow EC-IC bypass grafting
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients undergoing surgery for occlusive cerebrovascular disease with ruptured and unruptured aneurysms 3 Interpretation of CT, MR and catheter angiography
Technical Skills and Procedures	None

Topic	**Chronic pain**
Category	Cranial Surgery
Sub-category:	Functional neurosurgery
Objective	*To understand the management of patients with chronic pain syndromes*
Knowledge	3 The aetiology and pathophysiology of chronic pain syndromes 3 Indications for medical, minimally-invasive and surgical management 3 Complications of surgery and their management
Clinical Skills	3 Surgical aspects of the multi-disciplinary assessment of chronic pain patients 4 Pre-operative counselling and preparation
Technical Skills and Procedures	None

Topic	**Trigeminal neuralgia**
Category	Cranial Surgery
Sub-category:	Functional neurosurgery
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of patients with trigeminal neuralgia*
Knowledge	4 Aetiology, epidemiology and natural history of trigeminal neuralgia 4 Differential diagnosis and management of related cranio-facial pain syndromes 4 Medical management of cranio-facial pain 4 Surface anatomy of the trigemminal nerve and microsurgical anatomy of the CP angle 4 Indications for surgical management of trigeminal neuralgia by peripheral neurectomy, percutaneous rhizotomy, radiofrequency rhizotomy, microvascular decompression 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with trigeminal neuralgia 4 Interpretation of posterior fossa CT and MRI scans
Technical Skills and Procedures	3 Retrosigmoid microsurgical approach to the CP angle and trigeminal nerve 2 Trigeminal microvascular decompression 2 Percutaneous trigeminal rhizotomy

Topic	**Epilepsy**
Category	Cranial Surgery
Sub-category:	Functional neurosurgery

Objective	*To understand the management of patients with idiopathic and lesional epilepsy)*
Knowledge	4 The aetiology and pathophysiology of idiopathic and lesional epilepsy 3 Indications for medical and surgical management
Clinical Skills	4 Surgical aspects of the multi-disciplinary assessment of epilepsy patients 4 Interpretation of CT, MRI and SPECT scans 4 Pre-operative counselling and preparation
Technical Skills and Procedures	3 Image-guided resection of cortical lesions 3 Vagal nerve stimulation

Topic	**Cervical spine fracture-subluxation**
Category	Spinal Surgery
Sub-category:	Spinal Trauma
Objective	*To achieve competence in the general management of fracture-subluxations of the cervical spine*
Knowledge	4 Pathophysiology of spinal cord injury 4 Classification of cervical spinal fracture dislocations 4 Biomechanics of spinal instability 4 Indications for halo traction and external stabilisation 4 Indications for and principles of open reduction and stabilisation
Clinical Skills	4 Clinical assessment of the spinal injury patient 4 Management of spinal shock 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with spinal injury units 4 Counselling and pre-operative preparation of spinal injury patients
Technical Skills and Procedures	4 Application of cranial-cervical traction

Topic	**Thoraco-lumbar fractures**
Category	Spinal Surgery
Sub-category:	Spinal Trauma
Objective	*To achieve competence in the general management of thoracolumbar fractures*
Knowledge	4 Pathophysiology of spinal cord injury 4 Classification of thoracolumbar fracture dislocations 4 Biomechanics of spinal instability 4 Indications for open reduction and stabilisation
Clinical Skills	4 Clinical assessment of the spinal injury patient 4 Management of spinal shock 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with spinal injury units 4 Counselling and pre-operative preparation of spinal injury patients
Technical Skills and Procedures	2 Posterior reduction of thoracolumbar fractures by pedicle screw instrumentation and ligamentotaxis

Topic	**Intradural extramedullary tumours**
Category	Spinal Surgery
Sub-category:	Benign Intradural Tumours
Objective	*To achieve competence in the management of patients with intradural extramedullary tumours including scwannomas, neurofibromas and meningiomas*

Knowledge	4 Classification, natural history and basic molecular biology of intradural spinal tumours 4 Pathophysiology of spinal cord compression 4 Indications for surgery 4 Selection of surgical approaches 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Complications of surgery and their management
Clinical Skills	4 Assessment, counselling and pre-operative preparation of patients with intradural spinal tumours 4 Interpretation of spinal MRI scans
Technical Skills and Procedures	4 Microsurgical excision of posterior and postero-lateral intradural extramedullary tumours 2 Microsurgical excision of anterior intradural extramedullary tumours

Topic	**Intramedullary spinal cord tumours**
Category	Spinal Surgery
Sub-category:	Benign Intradural Tumours
Objective	*To achieve competence in the management of patients with intramedullary spinal cord tumours*
Knowledge	4 Classification, natural history and pathology of intramedullary spinal cord tumours 4 Indications for biopsy, subtotal and radical excision 4 Role of adjuvant treatment 4 Applied surgical anatomy of spine and spinal cord 4 Selection of surgical approaches 4 Principles of intra-operative management of patients undergoing resection of intramedullary tumours 4 Complications of surgery and their management
Clinical Skills	4 Assessment, counselling and pre-operative preparation of patients with intramedullary spinal cord tumours 4 Interpretation of spinal MRI scans
Technical Skills and Procedures	3 Microsurgical biopsy of intramedullary spinal cord tumour 2 Subtotal microsurgical resection of intramedullary tumour 4 Duroplasty

Topic	**Malignant spinal cord compression**
Category	Spinal Surgery
Sub-category:	Malignant Spinal Cord Compression
Objective	*To achieve competence in the management of patients with malignant secondary spinal cord compression*
Knowledge	4 The pathophysiology of spinal cord compression 4 The classification, aetiology and natural history of vertebral metastases 4 Spinal instability associated with vertebral malignancy 4 Indications for percutanous and open spinal biopsy 4 Role of primary radiotherapy and adjuvant radiotherapy or chemotherapy 4 Indications for spinal decompression with and without instrumented spinal stabilisation
Clinical Skills	4 Clinical assessment of patients with malignant spinal cord compression 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with medical oncologists and radiotherapist 4 Counselling and pre-operative preparation of patients with malignant spinal cord compression
Technical Skills	4 Decompressive thoracic and lumbar laminectomy with extradural tumour resection

and Procedures	Posterior pedicle screw stabilisation 3 Anterior cervical corporectomy with anterior column re-construction and anterior cervical plating

Topic	**Lumbar radiculopathies**
Category	Spinal Surgery
Sub-category:	Degenerative Spinal Disorders
Objective	*To achieve competence in the surgical management of lumbar compressive radiculopathies by lumbar microdiscectomies and associated microsurgical decompressions*
Knowledge	4 Indications for operative management of lumbar radiculopathies 4 Applied surgical anatomy of the lumbar spine with particular reference to degenerative neural compression and morphological variations in vertebral anatomy 4 Selection of minimally-invasive approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with lumbar radiculopathies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms
Technical Skills and Procedures	4 Lumbar microdiscectomy 4 Microsurgical lateral recess decompression 4 Posterior decompression (laminotomy, hemilaminectomy etc) 4 Revisional lumbar microsurgical discectomy with and without decompression 4 Microsurgical lumbar discectomy for central disc protrusion with cauda equina compression

Topic	**Cervical myeloradiculopathy**
Category	Spinal Surgery
Sub-category:	Degenerative Spinal Disorders
Objective	*To achieve competence in the management of cervical radiculopathy*
Knowledge	4 Indications for operative management of cervical radiculopathies 4 Applied surgical anatomy of the cervical spinal column, spinal cord, nerve roots and vertebral arteries 4 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with cervical myeloradiculopathies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms
Technical Skills and Procedures	4 Single and multi-level anterior cervical discectomy with and without fusion 4 Anterior cervical plating 3 Posterior cervical microforaminotomy and microdiscectomy 4 Posterior cervical decompression (laminotomy, hemilaminectomy etc

Topic	**Rheumatoid disease**
Category	Spinal Surgery
Sub-category:	Craniocervical junction disorders
Objective	*To understand the management of rheumatoid patients with atlanto-axial subluxation, cranial settling and related disorders*

Knowledge	3 The pathology and natural history of rheumatoid spondylopathy 3 Indications for operative management of atlanto-axial subluxation, cranial settling and related disorders 3 Applied surgical anatomy of the craniocervical junction 3 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with cervical myeloradiculopathies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms and 3D spinal reconstructions
Technical Skills and Procedures	2 Atlanto-axial wiring for reducible atlanto-axial subluxation

Topic	**Hindbrain herniation**
Category	Spinal Surgery
Sub-category:	Craniocervical junction disorders
Objective	*To achieve competence in the management of craniocervical stenosis and hindbrain herniation*
Knowledge	4 The pathogenesis and natural history of hindbrain herniation, cranicervical stenosis, syringomyelia and syringobulbia 4 Indications for foramen magnum decompression 4 Applied surgical anatomy of the craniocervical junction 4 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with hind brain anomalies 4 Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms and 3D spinal reconstructions
Technical Skills and Procedures	3 Foramen magnum decompression

Topic	**Spinal epidural abscess**
Category	Spinal Surgery
Sub-category:	Spinal Infection
Objective	*To achieve competence in the operative management of spinal epidural abscess*
Knowledge	4 The aetiology and pathophysiology of spinal sepsis 4 Indications for drainage of spinal epidural abscess by laminectomy and multiple laminotomies 4 Applied surgical anatomy 4 Principles of peri-operative care 4 Surgical complications and their management 4 Principles of peri-operative care
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with spinal sepsis 4 Interpretation of spinal CT and MRI scans 3 Management of anti-microbial therapy
Technical Skills and Procedures	4 Drainage of spinal epidural abscess by laminectomy and/or multiple laminotomies

Topic	**Vertebral osteomyelitis and discitis**
Category	Spinal Surgery
Sub-category:	Spinal Infection
Objective	*To achieve competence in the operative management of vertebral osteomyelitis and discitis*
Knowledge	4 The aetiology and pathophysiology of vertebral osteomyelitis and discitis, including pyogenic, tuberculous and atypical infections 4 Indications for percutaneous and open biopsy 4 Indications for spinal stabilisation 4 Principles of peri-operative care 4 Surgical complications and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with spinal sepsis 4 Interpretation of spinal CT and MRI scans 3 Management of anti-microbial therapy
Technical Skills and Procedures	2 Transpedicular and open vertebral and disc biopsy

Topic	**Carpal tunnel compression**
Category	Peripheral Nerve Surgery
Sub-category:	None
Objective	*To achieve competence in carpal tunnel decompression*
Knowledge	4 Presentation, differential diagnosis and management of carpal tunnel syndrome 4 Interpretation of nerve conduction studes 4 Indications for surgery 4 Applied surgical anatomy
Clinical Skills	4 Assessment and counselling of patients with carpal tunnel syndrome
Technical Skills and Procedures	4 Carpal tunnel decompression

Topic	**Ulnar neuropathy**
Category	Peripheral Nerve Surgery
Sub-category:	None
Objective	*To achieve competence in the management of ulnar neuropathy*
Knowledge	4 Presentation, differential diagnosis and management of ulnar neuropathies 4 Interpretation of nerve conduction studes 4 Indications for surgery 4 Applied surgical anatomy
Clinical Skills	4 Assessment and counselling of patients with an ulnar neuropathy
Technical Skills and Procedures	4 Cubital ulnar nerve decompression with and without transposition

Topic	**Peripheral nerve sheath tumours**
Category	Peripheral Nerve Surgery
Sub-category:	None
Objective	*To achieve competence in the resection of major and minor peripheral nerve tumours*
Knowledge	4 Pathology of peripheral nerve sheath tumours

	4 Indications for complete and subtotal resection of tumours 4 Applied surgical anatomy of the major peripheral nerves
Clinical Skills	4 Assessment and counselling of patients with peripheral nerve sheath tumours
Technical Skills and Procedures	3 Microsurgical excision of peripheral nerve sheath tumour

Topic	**Paediatic head and spinal injury**
Category	Paediatric Neurosurgery
Sub-category:	None
Objective	*To achieve competence the management of accidental and non-accidental paediatric head and spinal injuries.*
Knowledge	4 Pathophysiology of raised intracranial pressure in children following head injury 4 Prevention and treatment of secondary insults relating to transfer and emergency surgery in head-injured children 4 Medical management and intensive care in paediatric head injury 4 Pathophysiology, legal and social aspects of non-accidental injury in children 4 Management of perinatal trauma, growing fractures and penetrating injuries in children 4 Indications for decompressive craniectomy in management of intractable increases in ICP 3 Rehabilitation after mild, moderate and severe head injuries 4 Diagnosis and certification of brain death in children 4 Classification, assessment, investigation and management of paediatric spinal injuries (including SCIWORA)
Clinical Skills	4 Assessment and clinical management of children with head and spinal injuries
Technical Skills and Procedures	4 Insertion of ICP monitor 4 Insertion of ventriculostomy 4 Craniotomy for traumatic intracranial haematoma 3 Repair of depressed skull fracture

Topic	**Paediatric hydrocephalus**
Category	Paediatric Neurosurgery
Sub-category:	None
Objective	*To achieve competence in the management of paediatric hydrocephalus*
Knowledge	4 The pathophysiology of CSF circulation 4 Applied surgical anatomy of the ventricular system 4 Indications for external ventricular drainage, lumbar CSF drainage and shunting, ventriculo-cisternostomy 4 Indications for VP and VA shunting and 4 Principles of shunt function and selection 4 Surgical complications and their management
Clinical Skills	4 Assessment of the ill child with hydrocephalus, impaired consciousness and sepsis 4 Differential diagnosis of shunt malfunction 4 Interpretation of CT scans in shunted children
Technical Skills and Procedures	4 Insertion, tapping and draining from a CSF reservoir 4 External ventricular drainage including externalisation of VP shunts 3 Ventriculo-peritoneal shunting

Topic	**Intracranial vascular disorders**
Category	Paediatric Neurosurgery
Sub-category:	None
Objective	*To achieve competence in the emergency neurosurgical management of children presenting with intracranial vascular disorders*
Knowledge	4 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 4 Surgical and endovascular strategies for the management of acute intracranial vascular disorders in children
Clinical Skills	4 The assessment and clinical management of children presenting with spontaneous intracranial haemorrhage and acute cerebral ischaemia
Technical Skills and Procedures	4 Emergency operative management of spontaneous intracerebral hemorrhage

Special Interest Training Stage

Trainees in special interest training will develop a comprehensive and in-depth knowledge of their field. By the end of specialist 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 specialist interest summaries indicate the breath and depth of training required in a specialist interest fellowship.

Paediatric neurosurgery

On completion of a special interest fellowship 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; approaches to 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

Neuro-oncology

All trainees will be competent to manage patients with high grade intrinsic tumours, metastases and convexity meningiomas. Trainees will 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 intraoperative chemotherapy wafers; 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: 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.

Functional neurosurgery

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

Neurovascular surgery

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 120 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

 Acute and chronic cerebral ischaemia: including the medical, surgical and endovascular management of extracranial arterial occlusive disease

Skull-base surgery

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 (olefactory groove and suprasellar) meningiomas; tentorial and petrous temporal meningiomas; petroclival meningiomas
- Pituitary and sellar tumours: including microsurgical and endoscopic transphenoidal resection of pituitary tumours; pterional, subfrontal, interhemispheric and transventricular approaches to suprasellar tumours
- Acoustic neuromas: including retrosigmoid, translabyrinthine and middle fossa resection of acoustic neuromas
- 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 basal CSF fistula; techniques for open repair and skull-base reconstruction

Spinal surgery

On completion of a special interest fellowship 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; corporectomy 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, detethering 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

Click on Workplace Based Assessments to view the assessment forms including DOPS and PBAs

Special Interest Topics

Topic	**Paediatric neurooncology**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of children with tumours of the brain and spinal cord*
Knowledge	4 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 4 Imaging of paediatric CNS tumours 4 Radiological and biochemical staging of tumours 4 Indications for surgery, radiotherapy, primary and adjuvant chemotherapy 4 Goals of surgery 4 Long-term effects of treatment on cognition, hypothalamic-pituitary function and quality of life 3 Availability of clinical (CCLG) trials 3 Management of delayed spinal deformity associated with treatment of spinal cord tumours
Clinical Skills	4 Assessment and clinical management of children with tumours of the central nervous system 4 Multidisciplinary approach to treating patients with paediatric brain tumours
Technical Skills and Procedures	4 Emergency operative management of a deteriorating child with an intracranial haemorrhage and/or hydrocephalus secondary to tumour 4 Use of CT, MRI, electromagnetic and ultrasound guided localisation of tumours of the brain and spine 4 Stereotactic, image-guided and endoscopic biopsy of intracranial tumours 4 Supratentorial craniotomy for hemispheric tumour 4 Approaches to the suprasellar region: pterional, orbitozygomatic and subfrontal 4 Approaches to the third ventricle: transcortical-transventricular, transcallosal 4 Approaches to the pineal region: endoscopic, supracerebellar, suboccipital transtentorial

	4 Midline posterior fossa craniotomy for tumour 3 Retrosigmoid approach to tumour presenting in the CP angle 3 Laminoplasty approach to spine cord tumours.

Topic	**Paediatric head and spinal injury**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To achieve competence in all aspects of the management of accidental and non-accidental paediatric head and spinal injuries.*
Knowledge	4 Pathophysiology of raised intracranial pressure in children following head injury 4 Prevention and treatment of secondary insults relating to transfer and emergency surgery in head-injured children 4 Medical management and intensive care in paediatric head injury 4 Pathophysiology, legal and social aspects of non-accidental injury in children 4 Management of perinatal trauma, growing fractures and penetrating injuries in children 4 Indications for decompressive craniectomy in management of intractable increases in ICP 3 Rehabilitation after mild, moderate and severe head injuries 4 Diagnosis and certification of brain death in children 4 Classification, assessment, investigation and management of paediatric spinal injuries (including SCIWORA)
Clinical Skills	4 Assessment and clinical management of children with head and spinal injury
Technical Skills and Procedures	4 Insertion of ICP monitor 4 Insertion of ventriculostomy 4 Craniotomy for traumatic intracranial haematoma 4 Repair of depressed skull fracture 3 Anterior skull base repair

Topic	**Hydrocephalus**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To achieve competence in all aspects of the management (operative and non-operative) of paediatric patients with hydrocephalus.*
Knowledge	4 Pathophysiology and investigation of abnormal CSF dynamics in hydrocephalus and BIH 4 Indications for third ventriculostomy and for shunt insertion Principles of shunt design and function 4 Antenatal diagnosis of hydrocephalus and its prognosis 4 Medical and ophthalmological treatment options for BIH.
Clinical Skills	4 Assessment and clinical management of neonates and children presenting with hydrocephalus 4 Assessment and clinical management of neonates and children presenting with shunt malfunction including obstruction, over-drainage and slit ventricle syndrome 4 Interpretation of CT, MRI scans and ultrasound scans
Technical Skills and Procedures	4 Insertion of intracranial pressure monitor 4 Insertion of ventricular access device in neonates

	4Insertion and revision of ventriculoperitoneal shunt/subduroperitoneal shunt 4 Insertion and revision of ventriculoatrial /ventriculopleural shunt 4 Insertion and revision of lumboperitoneal shunt 4 Endoscopic third ventriculostomy 4 Endoscopic fenestration of loculated ventricles 4 CT, MRI and ultrasound guided ventricular access 4 Management of arachnoid cysts by shunting, open or endoscopic fenestration

Topic	**Congenital spinal disorders**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To achieve competence in all aspects of the management (operative and non-operative) of children with congenital spinal disorders*
Knowledge	4 Embryogenesis of craniospinal dysraphism 4 Pathophysiology of CSF circulation associated with hindbrain hernia, syringobulbia and syringomyelia 4 Epidemiogy, natural history and clinical features of congenital spinal disorders including dysraphism, tethered cord syndrome, diastematomyelia, Chiari malformations, Klippel-Feil syndrome, achondroplasia, Downs syndrome etc 4 Imaging of the neonatal and growing paediatric spine of children with congenital disorders commonly 4 Antenatal diagnosis of dysraphism and its implications.
Clinical Skills	4 Assessment and clinical management of children presenting with open or closed dysraphic spines and other congenital spinal abnormalities.
Technical Skills and Procedures	4 Closure of myelomeningocoele 4 Foramen magnum decompression for hind brain herniation 3 Syringostomy and shunting of syringomyelia Untethering of thickened filum 4 Excision of simple dermal sinus tract 3 Untethering and resection of bony spur in diastematomyelia 3 Untethering of lipomyelomeningocoele 2 Instrumented stabilization and fusion in the treatment of congenital spinal disorders

Topic	**Craniofacial disorders**
Category	Paediatric neurosurgery
Sub-category:	None
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* *To understand the management of children with syndromic craniosynostosis and encephalocoeles*
Knowledge	4 Advances in the genetic understanding of craniofacial conditions 4 Epidemiology, natural history and clinical features of simple and syndromic craniosynostosis including cosmetic, cognitive and ophthalmological complications 4 Imaging of simple and syndromic craniosynostosis 4 Indication for and timing of surgical interventions 4 Understanding of causes and management of positional plagiocephaly 4 Epidemiology, natural history, and clinical features of common skull vault conditions including eosinophilic granuloma, fibrous dysplasia etc
Clinical Skills	4 Management of ophthalmic and airway emergencies in syndromic craniosynostosis 4 Neurosurgical contribution to the multi-disciplinary management of children with craniofacial abnormalities
Technical Skills	4 Cranioplasty using autologous, titanium or acrylic implants

and Procedures	4 Surgical management of non-syndromic single suture synostosis (in the context of a multidisciplinary team)

Topic	**Paediatric epilepsy**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To understand the management of paediatric epilepsy and the assessment of children for epilepsy surgery*
Knowledge	4 Classification, epidemiology, natural history and clinical features of epilepsy in childhood 4 Clinical, encephalographic, videotelemetric and radiological assessment of children entering a surgical program 4 Indications for, prognosis and complications of VNS, disconnection procedures and temporal lobe surgery
Clinical Skills	4 Treatment of status epilepticus 4 Neurosurgical contribution to the multidisciplinary assessment and clinical management of children in preparation for and undergoing epilepsy surgery
Technical Skills and Procedures	4 Cortical lesionectomy 3 VNS insertion/revision 2 Invasive EEG recording by grid and depth electrode placement 2 Surgery for temoral lobe epilepsy 2 Non-temporal lobe resections 2 Disconnection procedures

Topic	**Intracranial vascular disorders**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To achieve competence in the neurosurgical aspects of the multi-disciplinary management of children presenting with intracranial vascular disorders*
Knowledge	4 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 4 Surgical, endovascular and radiosurgical strategies for the management of intracranial vascular disorders in children
Clinical Skills	4 The assessment and clinical management of children presenting with spontaneous intracranial haemorrhage, acute cerebral ischaemia and chronic cerebral ischaemia
Technical Skills and Procedures	4 Emergency operative management of spontaneous intracerebral hemorrhage 3 Resection of superficial vascular malformations and cavernomas

Topic	**Spasticity and movement disorders**
Category	Paediatric neurosurgery
Sub-category:	None
Objective	*To understand the principles of surgical management of spasticity and movement disorders in children*
Knowledge	3 Clinical presentations of spasticity and other movement disorders in childhood

	3 Multi-disciplinary assessment of children entering a surgical program 3 The indications for, prognosis and complications of intrathecal baclofen therapy, dorsal rhizotomy and deep brain stimulation in the management of spasticity and dystonia 2 Awareness of indications for CNS modulating procedures in the management of pain and convulsive disorders
Clinical Skills	4 Neurosurgical aspects of the multi-disciplinary assessment and management of children with spasticity and movement disorders
Technical Skills and Procedures	3 Baclofen pump insertion, assessment of function and revision 3 Laminotomy for selective dorsal rhizotomy 3 Removal/revision of pulse generator units

Topic	**Advanced surgical techniques**
Category	Neuro-oncology
Sub-category:	None
Objective	*To achieve competence in the application of advanced surgical techniques to the management of patients with brain tumours*
Knowledge	4 Indications for; applications of; advantages and disadvantages of various advanced surgical approaches and adjuncts
Clinical Skills	4 Assessment, counselling and pre-operative preparation of patients undergoing neuro-oncological surgery 4 Selection of appropriate advanced techniques based on clinical and imaging information
Technical Skills and Procedures	4 Stereotactic craniotomy 4 Advanced image guidance techniques 4 Use of intraoperative chemotherapy wafers 3 Third ventriculostomy 2 Awake craniotomy 2 Intraoperative neurophysiological monitoring

Topic	**Low-grade intrinsic tumours**
Category	Neuro-oncology
Sub-category:	None
Objective	*Achieve competence in the surgical and clinical management of low grade intrinsic tumours*
Knowledge	4 Epidemiology, natural history, genetic characteristics, pathology and clinical features of low grade intrinsic cerebral tumours 4 Surgical and non-surgical management options for low grade intrinsic tumours
Clinical Skills	4 Interpretation of CT, MRI and functional imaging in patients with low grade intrinsic tumours 4 Assessment, counselling and pre-operative preparation of patients with low grade intrinsic tumours 4 Continuing management of patients with low grade intrinsic tumours within a multidisciplinary team setting
Technical Skills and Procedures	4 Craniotomy for lobar low grade intrinsic tumours using appropriately selected advanced surgical techniques

Topic	**Tumours of the ventricular system and pineal**
Category	Neuro-oncology

Sub-category:	None
Objective	*To achieve competence in the management of patients with intraventricular and pineal region tumours.*
Knowledge	4 Epidemiology, natural history, genetic characteristics, pathology and clinical features of intraventricular and pineal region tumours Radiological and biochemical staging 4 Surgical and non-surgical management options for low grade intrinsic tumours 4 Surgical anatomy relevant to approaches to the lateral and third ventricles and the pineal region
Clinical Skills	4 Counselling of patients regarding surgical treatment options for pineal and intraventricular tumours 4 Choice of operative approaches based on tumour location and imaging
Technical Skills and Procedures	3 Transcallosal and transcortical approaches to ventricular tumours 3 Microsurgical resection of lateral intraventricular tumour 2 Microsurgical resection of third ventricular tumour/colloid cyst 3 Transfrontal endoscopic biopsy and third ventriculostomy 2 Supracerebellar infratentorial approaches to the pineal 2 Occipital transtentorial approaches to the pineal

Topic	**Brainstem tumours**
Category	Neuro-oncology
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multidisciplinary management of patients with intrinsic brainstem tumours*
Knowledge	4 Epidemiology, natural history, genetic characteristics, pathology and clinical features of brain stem tumours 4 Management options for patient with brainstem tumours including open surgery, biopsy and radiotherapy
Clinical Skills	4 Selection of open surgery and stereotactic biopsy for patients with brainstem lesions
Technical Skills and Procedures	4 Stereotactic biopsy of brainstem lesions 1 Open resection of exophytic brainstem tumours

Topic	**Radiosurgery and stereotactic radiotherapy**
Category	Neuro-oncology
Sub-category:	None
Objective	*To achieve competence in the neurosurgical aspects of the multidisciplinary management of patients undergoing radiosurgery and stereotactic radiotherapy*
Knowledge	4 The principles of radiosurgery and stereotactic radiotherapy 4 The indications for their use as adjunctive and/or primary treatment modalities
Clinical Skills	4 Assessment of the suitability of these techniques for the treatment of metastatic and intrinsic tumours based on clinical presentation and imaging appearances 4 Counselling potential patients on the role of these techniques in tumour treatment
Technical Skills and Procedures	3 Application of stereotactic frames for radiosurgical treatment

Topic	**Surgical management of pain**
Category	Functional Neurosurgery

Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of patients with chronic pain syndromes*
Knowledge	4 The aetiology and pathophysiology of chronic pain syndromes 4 Indications for medical, minimally-invasive and surgical management 4 Applied surgical anatomy 4 Complications of surgery and their management
Clinical Skills	4 Surgical aspects of the multi-disciplinary assessment of chronic pain patients Pre-operative counselling and preparation
Technical Skills and Procedures	4 Spinal cord stimulation 2 DREZ lesion 2 Open cordotomy 2 Deep brain stimulation for pain

Topic	**Neurovascular compression syndromes**
Category	Functional Neurosurgery
Sub-category:	None
Objective	*To achieve advanced competence in the surgical aspects of the multi-disciplinary management of patients with neurovascular compression syndromes*
Knowledge	4 Aetiology, epidemiology and natural history of trigeminal neuralgia, and glossopharyngeal neuralgia 4 Differential diagnosis and management of related cranio-facial pain syndromes 4 Medical management of cranio-facial pain 4 Surface anatomy of the trigeminal nerve and microsurgical anatomy of the CP angle 4 Indications for surgical management of trigeminal and glossopharyngeal neuralgia by peripheral neurectomy, percutaneous rhizotomy, radiofrequency rhizotomy, microvascular decompression 4 Complications of surgery and their management
Clinical Skills	4 The assessment, counselling and pre-operative preparation of patients with trigeminal neuralgia 4 Interpretation of posterior fossa CT an MR and scans including MR sequences demonstrating neurovascular compression 4 Application and interpretation of intraoperative monitoring techniques
Technical Skills and Procedures	3 Percutaneous trigeminal rhizotomy 4 Trigeminal microvascular decompression

Topic	**Spasticity**
Category	Functional Neurosurgery
Sub-category:	None
Objective	*4 To achieve competence in the surgical aspects of the multi-disciplinary management of patients with spasticity*
Knowledge	4 The aetiology and pathophysiology of spasticity 4 Indications for medical, minimally-invasive and surgical management 4 Applied surgical anatomy 4 Complications of surgery and their management
Clinical Skills	4 Surgical aspects of the multi-disciplinary assessment of patients with spasticity 4 Pre-operative counselling and preparation
Technical Skills and Procedures	4 Intrathecal drug delivery 3 Deep brain stimulation

Topic	**Epilepsy**
Category	Functional Neurosurgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of patients with epilepsy*
Knowledge	4 The pathophysiology of idiopathic and lesional epepilepsy 4 Indications for medical and surgical management 3 Principles of ictal, interictal, sphenoidal and intraoperative EEG 3 Principles of video-EEG monitoring 4 Applied surgical anatomy 4 Complications of surgery and their management
Clinical Skills	4 Surgical aspects of the multi-disciplinary assessment of epilepsy patients 4 Interpretation of CT, MRI and SPECT scans 4 Pre-operative counselling and preparation
Technical Skills and Procedures	2 Stereotactic placement of depth electrodes 3 Placement of subdural electrode-grids 3 Image-guided resection of cortical lesions 3 Mesial temporal resection 3 Vagal nerve stimulation 1 Functional hemispherectomy 2 Corpus callosotomy

Topic	**Movement disorders**
Category	Functional Neurosurgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of patients with movement disorders*
Knowledge	4 The aetiology and pathophysiology of movement disorders 4 Indications for medical, minimally-invasive and surgical management 4 Applied surgical anatomy 4 Complications of surgery and their management
Clinical Skills	4 Surgical aspects of the multi-disciplinary assessment of patients with movement disorders 4 Interpretation of CT and MRI scans 4 Pre-operative counselling and preparation
Technical Skills and Procedures	3 Deep brain stimulation 3 Microvascular decompression for hemi-facial spasm

Topic	**Surgery for mental illness**
Category	Functional Neurosurgery
Sub-category:	None
Objective	*To be familiar with current surgical treatment options for treatment resistant mental illness and in particular depression and obsessive compulsive disorder*
Knowledge	3 Indications for surgical treatment of mental illness 3 Ethical and regulatory aspects of surgical treatment of mental illness 3 Surgical targets
Clinical Skills	None
Technical Skills and Procedures	None

Topic	**Intracranial aneurysms**
Category	Neurovascular surgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of patients with intracranial aneurysms*
Knowledge	4 The epidemiology, natural history, aetiology and pathophysiology of unruptured and ruptured intracranial aneurysms 4 Vascular anatomy of the central nervous system 4 Indications for surgical and endovascular treatment of intracranial aneurysms 4 The principles of endovascular treatment 4 Indications for intra and extracranial bypass in the management of complex aneurysms
Clinical Skills	4 Clinical assessment and management of patients with ruptured and unruptured intracranial aneurysms
Technical Skills and Procedures	4 Pterional approach 3 Interhemispheric approaches 3 Temporo-zygomatic and related approaches 2 Exposure of the basilar termination 2 Exposure of the vertebral artery and PICA 3 Clipping of saccular anterior circulation aneurysm 2 Clipping of complex anterior circulation aneurysm 3 Harvest of saphenous vein and radial artery grafts

Topic	**Intracranial arteriovenous malformations**
Category	Neurovascular surgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of intracranial arteriovenous malformations (AVMs)*
Knowledge	4 The epidemiology, classification, natural history, embryogenesis and pathophysiology of AVMs of the brain 4 The indications for surgical, radiosurgical and endovascular treatment of asymptomatic, symptomatic and ruptured brain AVMs
Clinical Skills	4 The assessment and clinical management of patients undergoing treatment of AVMs of the brain
Technical Skills and Procedures	4 Evacuation of intracerebral haematoma associated with an AVM 3 Microsurgical resection of superficial cortical AVM 2 Microsurgical resection of paraventricular and posterior fossa AVM

Topic	**Intracranial dural arteriovenous fistulae**
Category	Neurovascular surgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the multi-disciplinary management of intracranial dural arteriovenous fistulae (dAVFs)*
Knowledge	4 Applied anatomy of the cerebral venous circulation 4 The epidemiology, classification, natural history, pathogenesis and pathophysiology of intracranial dAVFs 4 The indications for surgical and endovascular treatment of asymptomatic, symptomatic and ruptured intracranial dAVFs
Clinical Skills	4 The assessment and clinical management of patients undergoing treatment of intracranial dAVFs
Technical Skills	2 Exploration and closure of supratentorial dAFV

and Procedures	

Topic	**Cerebral ischaemia**
Category	Neurovascular surgery
Sub-category:	None
Objective	*To achieve competence in the surgical aspects of the management of patients with acute and chronic cerebral ischaemia*
Knowledge	4 The epidemiology, natural history and pathophysiology of extra- and intracranial atherosclerotic occlusive disease 4 The epidemiology, natural history and pathophysiology of non-atherosclerotic occlusive diseases 3 Optimal medical management of occlusive and thrombo-embolic cerebrovascular disease 4 Imaging of the acutely ischaemic brain using CT and MRI 3 Principles of non-invasive and invasive imaging of the extra and intracranial vasculature using ultrasound, transcranial Doppler, CT, MRI and catheter angiography Principles of regional cerebral blood flow and metabolism measurement and imaging using CT and MRI perfusion techniques; SPECT and PET scanning 4 Indications for carotid endarterectomy 3 Indications for endovascular intervention including intra-arterial thrombolysis; carotid angioplasty and stenting; intracranial angioplasty 4 Principles of cerebral revascularisation by indirect synangiosis, low-flow EC-IC anastomosis and high flow EC-IC bypass grafting
Clinical Skills	4 The assessment and clinical management of patients with acute and chronic cerebral ischaemia
Technical Skills and Procedures	2 Carotid endarterectomy 3 Saphenous and radial artery graft harvest 2 Extracranial vascular anastomosis 1 Intracranial microvascular anastomosis

Topic	**Cranial base meningiomas**
Category	Skull-base surgery
Sub-category:	None
Objective	*To achieve competence in the neurosurgical aspects of the multidisciplinary management of cranial base meningiomas*
Knowledge	4 Epidemiology, natural history, pathology and clinical presentation of meningiomas of the anterior, middle and posterior fossae 4 Indications for radical or subtotal resection of skull-base meningiomas 4 Indications for radiosurgical treatment 4 Applied surgical anatomy of the skull base and craniofacial skeleton 4 Selection of optimal approaches in relation presenting pathology and imaging
Clinical Skills	4 Assessment and clinical management of patients with skull base meningiomas
Technical Skills and Procedures	4 Anterior interhemispheric, fronto-orbital, zygomatic and temporo-zygomatic approaches 4 Resection of anterior fossa meningioma: olefactory, planum sphenoidale and outer sphenoid wing 3 Resection of clinoidal and suprasellar meningioma Resection of occipital, lateral petrosal and tentorial meningioma 2 Resection of cavernous sinus and petroclival meningioma

Topic	**Pituitary and sellar region tumours**
Category	Skull-base surgery
Sub-category:	None
Objective	*To achieve competence in the management of patients with pituitary and sellar region tumours*
Knowledge	4 Classification, epidemiology, natural history, pathology and clinical presentation of tumours of the pituitary and sellar region 4 Pathophysiology of the hypothalamic-pituitary axis 4 Investigation of the hypothalmic pituitary axis in patients with hypopituitarism and hypersecretion syndromes 4 Indications for surgery, radiosurgery and adjuvant radiotherapy 4 Selection of surgical approaches: sublabial, transnasal and endoscopic 4 Applied surgical anatomy of the skull base 4 Principles of peri-operative care 4 Complications of surgery and their management
Clinical Skills	4 Peri-operative management of patients with established and threatened dysfunction of the hypothalamic-pituitary axis 4 Neurosurgical aspects of the continuing care of patients with pituitary tumours
Technical Skills and Procedures	4 Transphenoidal exposure of the pituitary fossa (microsurgical transnasal or sublabial)4 Transphenoidal resection of non-functioning macroadenoma 3 Transphenoidal selective microadenectomy 2 Endoscopic transphenoidal resection of non-functioning adenoma 3 Pterional craniotomy and microsurgical decompression of optic nerves and chiasm

Topic	**Acoustic neuromas**
Category	Skull-base surgery
Sub-category:	None
Objective	*To achieve competence in the neurosurgical aspects of the multidisciplinary management of patients with acoustic neuromas*
Knowledge	4 Epidemiology, natural history, pathology and clinical presentation of sporadic and NFII-related acoustic neuromas4 Relative indications for surgery, radiosurgery and conservative management 4 Principles of intra-operative facial nerve and BAEP monitoring 4 Applied microsurgical anatomy of the CP angle, brainstem and lower cranial nerves 4 Relative indications for retrosigmoid, middle fossa, and translabyrinthine approaches with respect to hearing preservation, tumour size and position
Clinical Skills	4 Neurosurgical aspects of the assessment and clinical management of patients undergoing acoustic neuroma surgery
Technical Skills and Procedures	4 Retrosigmoid approach 3 Retrosigmoid subtotal resection of acoustic neuroma 2 Retrosigmoid radical resection 2 Translabyrinthine resection of acoutic tumour

Topic	**Other skull-base tumours**
Category	Skull-base surgery
Sub-category:	None
Objective	*To achieve competence in the neurosurgical aspects of the multidisciplinary management of patients with benign and malignant cranial base tumours*
Knowledge	4 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 4 Indications for radical or subtotal resection of skull-base tumours 4 Indications for radiosurgical treatment 4 Applied surgical anatomy of the skull base and craniofacial skeleton 4 Selection of optimal approaches in relation presenting pathology and imaging
Clinical Skills	4 Neurosurgical aspects of the mutidisciplinary assessment and clinical management of patients with rarer skull base tumours
Technical Skills and Procedures	3 Frontobasal approaches to the anterior fossa and orbito-ethmoidal complex 2 Transfacial and mid-face approaches to the skull base 2 Lateral approaches to the infratemporal fossa and pterygo-palatine fossa 2 Transtemporal approaches to the jugular bulb and petrous apex

Topic	**Craniofacial repair**
Category	Skull-base surgery
Sub-category:	None
Objective	*To achieve competence in the repair of skull base defects and the closure of CSF fistulae*
Knowledge	4 Applied surgical anatomy of the cranial base floor and paranasal sinus 4 Indications for open surgical and endoscopic repair of spontaneous, post-traumatic and post-surgical skull base defects and CSF fistulae 4 Principles of simple, pedicled and free vascularised tissue transfer
Clinical Skills	4 Neurosurgical aspects of the multi-disciplinary management of patients with skull base defects
Technical Skills and Procedures	4 Use of simple autologous grafts and substitutes (fascia, pericranium, fat etc) in closing small defects 4 Use of vascularised pericranial, temporalis muscle and galeal flaps for major defects 1 Endoscopic repair of anterior fossa defects 1 Free vascularised flap reconstruction following major cranio-facial resections

Topic	**Spinal trauma**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the operative management of fracture-subluxations of the cervical and thoracolumbar spine*
Knowledge	4 Pathophysiology of spinal cord injury 4 Classification of cervical and thoracolumbar fracture dislocations 4 Biomechanics of spinal instability 4 Indications for halo traction and external stabilisation 4 Indications for and principles of open reduction and stabilisation 4 Applied surgical anatomy of cervical and thoracolumbar fracture-subluxations 4 Relative indications for operative reduction and stabilisation by anterior and posterior approaches Management of post-traumatic spinal deformity and delayed sequelae
Clinical Skills	4 Assessment and clinical management of patients with spinal injuries
Technical Skills and Procedures	4 Application of cranial-cervical traction 3 Instrumented stabilisation of subaxial fracture-dislocation by anterior cervical plate and/or lateral mass screws 2 Instrumented stabilisation of atlanto-axial fracture dislocation by anterior odonto-axial screws and/or posterior atlantoaxial screws/wiring 4 Application of halo-body jacket

	3 Posterior reduction of thoracolumbar fractures by pedicle screw instrumentation and ligamentotaxis 2 Combined anterior and posterior reduction and instrumented stabilisation of thoracolumbar fractures

Topic	**Metastatic spinal disease**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the management of patients with malignant secondary spinal cord compression*
Knowledge	4 The pathophysiology of spinal cord compression 4 The classification, aetiology and natural history of vertebral metastases 4 Spinal instability associated with vertebral malignancy 4 Indications for percutanous and open spinal biopsy 4 Role of primary radiotherapy and adjuvant radiotherapy or chemotherapy 4 Indications for spinal decompression with and without instrumented spinal stabilisation
Clinical Skills	4 Clinical assessment of patients with malignant spinal cord compression 4 Interpretation of plain radiology, CT and MRI scans 4 Liaison with medical oncologists and radiotherapist 4 Counselling and pre-operative preparation of patients with malignant spinal cord compression
Technical Skills and Procedures	4 Decompressive thoracic and lumbar laminectomy with extradural tumour resection and pedicle screw stabilisation 4 Anterior cervical corporectomy with anterior column re-construction and anterior cervical plating 3 Cervical lateral mass stabilisation 2 Posterior corporectomy with anterior column replacement and posterior stabilisation 2 Combined anterior and posterior total vertebrectomy with stabilisation

Topic	**Primary spinal tumours**
Category	Spinal Surgery
Sub-category:	None
Objective	N/A
Knowledge	N/A
Clinical Skills	N/A
Technical Skills and Procedures	N/A

Topic	**Intradural tumours**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the management of patients with intradural spinal tumours*
Knowledge	4 Classification, epidemiology, natural history and pathology of intradural spinal tumours 4 Pathophysiology of spinal cord compression 4 Indications for biopsy, subtotal and radical surgery 4 Selection of surgical approaches 4 Applied surgical anatomy

	4 Principles of peri-operative care 4 Complications of surgery and their management 4 Role of adjuvant treatment
Clinical Skills	None
Technical Skills and Procedures	4 Microsurgical excision of intradural extramedullary tumours 3 Microsurgical biopsy of intramedullary spinal cord tumour 3 Subtotal microsurgical resection of intramedullary tumour 4 Duroplasty

Topic	**Syringomyelia and hind brain anomalies**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the management of craniocervical stenosis and hindbrain herniation*
Knowledge	4 The pathogenesis and natural history of hindbrain herniation, craniocervical stenosis, syringomyelia and syringobulbia 4 Indications for foramen magnum decompression 4 Applied surgical anatomy of the craniocervical junction 4 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 Assessment and clinical management of patients with hindbrain herniation and syringomyelia
Technical Skills and Procedures	4 Foramen magnum decompression 3 Syringostomy and syringo-pleural shunting

Topic	**Advanced surgery of the ageing and degenerative spine**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the advanced surgery of the ageing and degenerative spine*
Knowledge	4 Techniques for operative stabilization of the osteoporotic spine 4 Principles of surgery for degenerative scoliosis 4 Biomechanical principles of and indications for cervical and lumbar disc replacement 4 Biomechanical principles of and indications for non-fusion spinal stabilisation 3 Indications for, techniques and complications of vertebroplasty and Kyphoplasty 2 Principles of thoracoscopic and laparoscopic surgical techniques
Clinical Skills	4 Assessment and clinical management of patients with degenerative spinal disorders
Technical Skills and Procedures	3 Pedicle screw instrumentation of the thoracic and lumbar spine 3 Lumbar interbody fusion by posterior(PLIF) and postero-lateral (TLIF) fusion 2 Lumbar anterior interbody fusion 3 Single and multi-level cervical corporectomy with anterior cervical plating 3 Anterior cervical discectomy and cervical arthroplasty 3 Cervical laminectomy with lateral mass and/or pedicle screw stabilisation 3 Cervical laminoplasty 3 Postero-lateral thoracic discectomy 2 Anterior (transthoracic) discectomy 1 Thoracoscopic techniques

Topic	**Surgery of the rheumatoid spine**
Category	Spinal Surgery
Sub-category:	None
Objective	*To achieve competence in the management of rheumatoid atlanto-axial subluxation, cranial settling and related disorders*
Knowledge	4 The pathology and natural history of rheumatoid spondylopathy 4 Indications for operative management of atlanto-axial subluxation, cranial settling and related disorders 4 Applied surgical anatomy of the craniocervical junction 4 Selection of surgical approaches 4 Principles of peri-operative care 4 Complications of surgery
Clinical Skills	4 Assessment and clinical management of patients with spinal complications of rheumatoid arthritis
Technical Skills and Procedures	3 Atlanto-axial wiring for reducible atlanto-axial subluxation 3 Atlantoaxial stabilisation using transarticular screws or pedicle and lateral mass screws and rods 3 Instrumented atlanto-occipital fusion 2 Transoral odontoidectomy