ZAMBIA COLLEGE OF MEDICINE & SURGERY

Advancing Specialist Care & Professional Growth

Specialty Training Programme

Curriculum & learning guide

for

NEUROSURGERY

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GENERAL INTRODUCTION

This Curriculum and Learning Guide describes the work-based competence-based professional training programme for the Specialty Training Programme (STP) in Neurosurgery (NRS) in Zambia. The intended readership for the curriculum and guideline include the following:

- Trainees, host departments and managers of NRS healthcare services;
- STP NRS trainers, which includes all those involved in supervising, coordinating, assessing and delivering specialist education and training in Neurosurgery;
- Academic, administrative and professional staff within Higher Education Institutions (HEIs), the Higher Education Authority (HEA), and the Zambia Qualifications Authority (ZAQA);
- Strategic partners involved in supporting eye care and the training of healthcare practitioners in these related fields.

Zambia College of Medicine and Surgery (ZACOMS) advances professional training of medical specialists using the professional competence-based certification model beyond traditional university-based specialist training. It promotes specialist training as a vital pursuit for a successful professional medical career. The ZACOMS also promotes the increase of universal health coverage (UHC) by promoting equitable access to cost-effective quality specialist care as close to the family as possible for people in Zambia at all levels of socioeconomic status and geographical location. The ZACOMS certifies and admits members and/or fellows as specialists in a medical and/or surgical specialty in any of the various specializations of medicine and surgery.

The Zambia College of Medicine and Surgery (ZACOMS) oversees the training of Neurosurgery specialists working through the Society of Neurosurgeons of Zambia (SNZ). The programme is managed in with Division of Neurosurgery, Department of Clinical Neurosciences, University of Cambridge, Cambridge, in the United Kingdom and NIHR Global Health Research Group on Neurotrauma, University of Cambridge.

Neurosurgery encompasses the diagnosis, assessment and surgical management of disorders of the nervous system. The STP NRS training provides specialist training in neurosurgery.

Vision

Our vision is to be innovative in providing a teaching and support structure that will empower every trainee to excel in Neurosurgery knowledge, skills and research through internal and external collaboration.

Mission Statement

The mission of the STP NRS training in Zambia is to train specialists who shall endeavour to improve the neurosurgery health care services to all by providing safe, evidence-based, humanistic specialist care in the field of neurosurgery in an

efficient and proficient manner to meet the needs of the Zambian community, and contribute to the field of neurosurgery in the region and globally.

Values:

- Professional excellence
- Integrity
- Sensitivity to reproductive health needs
- Interdisciplinary, inter institutional collaboration
- Continuous professional development
- Innovation
- Academic Excellence
- Self and peer review

RATIONALE FOR THE SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY

The STP NRS aims to train specialists in Neurosurgery in order to prepare them for specialist service in the healthcare service. The curriculum is informed by the training requirements of the Health Professions Council of Zambia (HPCZ) and the professional creed of the Society of Neurosurgery of Zambia (SNZ). The training programme encourages self-directed learning, lifelong learning, and student-centred approaches while providing robust and structured guidance. The key outcomes are twofold as stipulated in Outcomes 1 and 2.

Outcome 1. Apply, at mastery level, Biomedical Sciences, Behavioural & Sociology, and Scientific Principles to the Practice of Neurosurgery

1. The graduate should be able to apply to Neurosurgery practice biomedical scientific principles, method and knowledge relating to anatomy, biochemistry, cell biology, genetics, immunology, microbiology, nutrition, pathology, pharmacology and physiology. The graduate should be able to:
   a) Explain normal human structure and function relevant to Neurosurgery.
   b) Explain the scientific bases for common diseases and conditions' signs, symptoms and treatment relevant to Neurosurgery.
   c) Justify and explain the scientific bases of common investigations for diseases and conditions relevant to Neurosurgery.
   d) Demonstrate knowledge of drugs, drug actions, side effects, and interactions relevant to Neurosurgery.

2. Apply Behavioural and Sociology Principles to the Practice of Neurosurgery
   a) Explain normal human behaviour relevant to Neurosurgery.
   b) Discuss psychological and social concepts of health, illness and disease relevant to Neurosurgery.
   c) Apply theoretical frameworks of psychology and sociology to explain the varied responses of individuals, groups and societies to Neurosurgery.

d) Explain psychological and social factors that contribute to illness, the course of the disease and the success of Neurosurgery interventions.

3. Apply Population Health to the Practice of Neurosurgery
   a) Discuss population health principles related to determinants of health, health inequalities, health risks and surveillance relevant to Neurosurgery.
   b) Discuss the principles underlying the development of health and health service policy, including issues related to health financing, and clinical guidelines relevant to Neurosurgery.
   c) Evaluate and apply basic principles of infectious and non-communicable disease control at community and hospital level relevant to Neurosurgery.
   d) Discuss and apply the principles of primary, secondary, and tertiary prevention of disease relevant to Neurosurgery.

4. Apply Scientific Method and Approaches to Neurosurgery Research.
   a) Evaluate research outcomes of qualitative and quantitative studies in the medical and scientific literature relevant to Neurosurgery.
   b) Formulate research questions, study designs or experiments to address the research questions relevant to Neurosurgery.
   c) Discuss and apply appropriate research ethics to a research study relevant to Neurosurgery.

Outcome 2. <u>Competence, at mastery level, in Neurosurgery Clinical Practice.</u>

On successful completion of the work-based neurosurgery STP:

1. The trainees should have clinical and specialist expertise in Neurosurgery, underpinned by broader knowledge, skills, experience and professional attributes necessary for independent practice;
2. The trainees should be able to undertake complex clinical roles, defining and choosing investigative and clinical options, and making key judgements about complex facts and clinical situations.
3. The trainees should contribute to the improvement of neurosurgery services in the context of the national health priorities, by means of outstanding scientific research and application of safe, high quality, cost effective, evidence-based practice within the Zambian health system.
4. The trainees should possess the essential knowledge, skills, experience and attributes required for their role and should demonstrate:
   - A systematic understanding of clinical and scientific knowledge, and a critical awareness of current problems, future developments, research and innovation in Neurosurgery practice, much of which is at, or informed by, the forefront of their professional practice in a healthcare environment;
   - Clinical and scientific practice that applies knowledge, skills and experience in a healthcare setting, places the patient and the public at the centre of

care prioritizing patient safety and dignity and reflecting outstanding professional values and standards;

- Clinical, scientific and professional practice that meets the professional standards defined by the Health Professions Council of Zambia (HPCZ);
- Personal qualities that encompass self-management, self-awareness, acting with integrity and the ability to take responsibility for self-directed learning, reflection and action planning;
- The ability to analyse and solve problems, define and choose investigative and scientific and/or clinical options, and make key judgments about complex facts in a range of situations;
- The ability to deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and to communicate their conclusions clearly to specialist and non-specialist audiences including patients and the public;
- The ability to be independent self-directed learners demonstrating originality in tackling and solving problems and acting autonomously in planning and implementing tasks at a professional level;
- A comprehensive understanding of the strengths, weaknesses and opportunities for further development of neurosurgery as applicable to their own clinical practice, research, innovation and service development which either directly or indirectly leads to improvements in clinical outcomes and scientific practice;
- Conceptual understanding and advanced scholarship in their specialism that enables the graduate to critically evaluate current research and innovation methodologies and develop critiques of them and, where appropriate, propose new research questions and hypotheses;
- Scientific and clinical leadership based on the continual advancement of their knowledge, skills and understanding through the independent learning required for continuing professional development.

5. Once registered as a specialist in Neurosurgery, a range of career development options will be available including sub-specialist training. Alternatively, others may opt to undertake further career development in post, as specialist, through structured Continuing Professional Development (CPD), provided by Accredited CPD providers. Specialist neurosurgeons who have successfully completed the STP NRS will be eligible to compete for available Consultant positions in Neurosurgery.

The outcomes of the STP NRS training are affiliated to the following curriculum outcome categories:

Category I: Scientific foundations

Goal 1: Understand the normal structure and function of the human body, at levels from molecules to cells to organs, to the whole organism.

Goal 2: Understand the major pathological processes and their biological alterations.
Goal 4: Understand how the major pathologic processes affect the organ systems.
Goal 5: Integrate basic science and epidemiological knowledge with clinical reasoning.
Goal 6: Understand the principles of scientific method and evidence-based medicine including critical thinking.

Category II: Clinical Skills

Goal 7: Obtain a sensitive, thorough medical history.
Goal 8: Perform a sensitive and accurate physical exam including mental state examination.
Goal 9: Establish and maintain appropriate therapeutic relationships with patients.

Category III: Communication and Interpersonal Skills

Goal 11: Develop the knowledge, skills, and attitudes needed for culturally-competent care.
Goal 12: Participate in discussion and decision-making with patients and families.
Goal 13: Work effectively with other providers in the health system.
Goal 14: Clearly communicate medical information in spoken and written form.

Category IV: Prevention

Goal 15: Develop knowledge, skills, and attitudes to practice the basic principles of prevention.
Goal 16: Practice personalized health planning for long-range goals.
Goal 17: Understand the planning for communities and populations.

Category V: Diagnosis

Goal 18: Elicit and correctly interpret symptoms and signs of neurosurgery conditions.
Goal 19: Diagnose and demonstrate basic understanding of common disease and conditions.
Goal 20: Appropriately use testing to help guide diagnostic and therapeutic decisions.
Goal 21: Demonstrate sound clinical reasoning.

Category VI: Treatment, Acute and Chronic.

Goal 22: Understand therapeutic options and participate in the multidisciplinary care of patients with complex problems.
Goal 23: Recognize acute life-threatening medical problems and initiate appropriate care
Goal 24: Acquire the knowledge and skills necessary to assist in the management and rehabilitation of chronic diseases.

Goal 25: Participate in care in a variety of settings; including knowledge about palliative care.

Category VII: Patient Safety

Goal 26: Identify and remove common sources of medical errors.
Goal 27: Understand and apply models of Quality Improvement.
Goal 28: Appreciate the challenges associated with reporting and disclosure.

Category VIII: Information Management

Goal 29: Use information and educational technology to facilitate research, education, and patient care.

Category IX: Ethics, Humanities, and the Law

Goal 30: Develop a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to diversity.
Goal 31: Develop a critical understanding of the multiple factors that affect the practice of medicine, public health and research.
Goal 32: Incorporate ethical principles in clinical practice and research.

Category X: Professionalism

Goal 33: Develop healthy self-care behaviours and coping skills.
Goal 34: Model service to patients and community.

Category XI: Leadership & Management

Goal 35: Develop interpersonal and communication skills that result in leadership in patient health service delivery and health human resource management.

ADMISSION CRITERIA TO THE SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY

Applicants to the STP NRS must possess a primary qualification in medicine, that is, Bachelor of Medicine and Bachelor of Surgery (MB ChB) or equivalent, from a recognized university. Additionally, they must have completed internship and retain full registration and a practising licence issued by the Health Professions Council of Zambia. Other Ministry of Health policies and directives, for example, completion of rural posting, may apply.

CURRICULUM DESIGN/MODEL OF THE SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY

The STP NRS Curriculum is a work-based professional competence-based training situated in an accredited training facility managed by specialists in Neurosurgery with oversight by the Zambia College of Medicine and Surgery (ZACOMS) working through SNZ. This curriculum is based on a process model of curriculum and is designed to be

flexible and open ended rather than predetermined; maximizing the potential for growth and development.

During the STP NRS programme the specialty registrar is an integral member of the clinical work of the department in which they are training to gain the required clinical experience and competence. The STP NRS programme is a work based professional competence-based training leading to the award of the Certificate of Completion of Specialty Training (CCST) by the Zambia College of Medicine and Surgery (ZACOMS). Graduates are then eligible to apply to the Health Professions Council of Zambia to enter the Specialist Registers in Neurosurgery.

TEACHING METHODS IN THE SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY

The STP NRS training is a work-based professional competence-based programme and should encompass diverse teaching and learning approaches that are appropriate for the target educational domain, i.e., cognitive (knowledge), psychomotor (practical), or affective (attitude) domain. The teaching methods may include, but not limited to, the following: expository lectures, tutorials, seminars, practical classes, skills laboratories, clinical demonstrations, clinical clerkships (bedside teaching, ward rounds, ambulatory care teaching, operating theatre experience, post-mortem, and on-call duties), field and community based learning, and ICT supported learning experiences.

The Health Professions Specialty Training Guidelines for Zambia and Zambia College of Medicine and Surgery Society Objectives and By-Laws provide detailed guidance to the trainee about the STP and ZACOMS, respectively.

SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY CURRICULUM STRUCTURE AND MAP

Curriculum Map for the STP NRS Programme

STP YEAR 1 NSG 1040	ZACOMS PT 1 ARCP	**STP YEAR 2** NSG 2040	ARCP	**STP YEAR 3** NSG 3040	ARCP	**STP YEAR 4** NSG 4040	ARCP	**STP YEAR 5** NSG 5040	ZACOMS CCST Exams
Basic Sciences to Underpin Surgery Practice (4 months)		Basic & Applied Clinical Neurosciences (3 months)		Intensive Care Unit Rotation (3 months)		Paediatric Neurosurgery Rotation (3 months)		Global Elective Rotation (6 months)	
		Basic Neurosurgical Care (3 months)		Radiology Rotation (3 months)		Research Methods (3 months)			
The Foundations of Surgery Practice (4 months)		Neuro-Intensive Care Medicine (3 months)		Neurology Rotation (3 months)		Health systems Management (3 months)			
Fundamental Neurosurgery (4 months)		Emergency (A&E) Medicine (3 months)		Rehabilitation Rotation (3 months)		Leadership & Management (3 months)		National Elective Rotation (6 months)	
Part 1: Generic Education & Training (1 year)		Part 2: Themed & Specialist Education & Training (4 years)							

N.B. The total number of years, in particular, the themed specialist education and training may vary between different specialties.

1. ARCP = Annual Review of Competence Progression
2. CCST = Certificate of Completion of Specialty Training Examination;
3. STP = Specialty Training Programme;
4. ZACOMS PT 1 = Zambia College of Medicine and Surgery Part 1 Examinations in Basic Sciences, Behavioural Sciences, Health Population Studies, and

Professionalism & Ethics; ZACOMS CCST Examinations = Certificate of Completion of Specialist Training in Neurosurgery Examinations

ASSESSMENT IN THE SPECIALTY TRAINING PROGRAMME IN NEUROSURGERY

Progression to the next level of training is NOT automatic and is dependent on the trainee satisfying all the competency requirements of each defined level as per this curriculum and learning guide. Progression is based on passing both clinical and written examinations. The assessment framework is designed to provide a coherent system of assessing both formative and summative assessment which are workplace based and in examination settings.

Each training site must ensure that they use valid, reliable and appropriate methods for assessing the knowledge, clinical skills and attitude domains. The continuous assessments and final annual assessments are weighted at 40% and 60% of the final mark of Annual Review of Competence Progression, respectively. Assessment methods may include, but are not limited to, the following: Log of experiences and procedures completed, case reports, portfolios, project reports, multiple choice questions, essay questions, short answer questions, modified essay questions, short and long cases, objective structured clinical examinations (OSCE), practical examinations, objective structured practical examinations (OSPE), Mini-clinical Examination (MiniCEX), and Viva Voce, etc.

It is emphasized that marks from theory examinations **may not** compensate for poor scores in the clinical examinations; Students **MUST** pass the clinical examinations in order to progress to the next stage of training or completion.

Assessment	Knowledge, Skill and Attitude Domain	Examining Body
Formative Workplace Based Assessments	Outcome 1 & 2	Training Site
Annual Review of Competence Progression	Outcome 1 & 2	Training Site in conjunction with ZACOMS
ZACOMS Part 1 Examination	Outcome 1	ZACOMS working through SNZ
ZACOMS Certificate of Completion of Specialist Registration Examinations	Outcome 2	ZACOMS working through SNZ

A candidate shall be allowed a maximum of three attempts for ZACOMS Part 1 and/or Part 2 Examinations. Candidates must have submitted a completed log book to eligible to attempt the ZACOMS Part 2 Examination.

For ease of tracking progress and planning for Neurosurgery care, all STP NRS trainees will be registered with ZACOMS and SNZ for the duration of their training and will be allocated a Health Professions Council of Zambia Specialty Registrar Index Number.

Grading Scheme

The STP NRS Curriculum and Guide are the basis for all specialty training which contextualize the standards of proficiency set down by the Zambia College of Medicine and Surgery (ZACOMS) in consultation with the Society of Neurosurgery of Zambia (SNZ) in a way that is accessible to the profession and the public. The Certificate of Completion of Specialist Training (CCST) is not graded. Separate assessments and examinations may be graded to show the level of achievement of the trainee in a particular course or assignment.

Assessment of Attainment of Competence in an Academic Subject

Status & Level	Description of Competence Features	% Range
Outright Fail [D]	• Has poor and inaccurate command of the subject vocabulary • Has poor and inaccurate command of the concepts (knowledge, skills and attitudes) of the subject across a broad range of topics.	44.9% & Below
Bare Fail [D+]	• Has the basics of subject vocabulary • Has the basics of concepts (knowledge, skills and attitudes) of the subject across a broad range of topics • Unable to transfer and apply knowledge, skills and attitudes of the subject in a range of situations. • Unable to exercise independent judgement in a range of situations	45 – 49.9
Clear Pass [C]	• Has sound command of subject vocabulary • Has sound command of concepts (knowledge, skills and attitudes) of the subject across a broad range of topics • Able to formulate responses and demonstrate skill and exhibit appropriate attitude in well-defined and abstract problems/professional settings across a broad range of topics of the subject	50 – 64.9

Meritorious Pass [B]	All of above in level 3 and: • Able to transfer and apply knowledge, skills and attitudes and exercise significant independent judgement in a broad range of topics of the subject	65 – 74.9
Distinction Pass [A]	All of the above in level 4 and: • Displays masterly of complex and specialised areas of knowledge, skills and attitudes in a broad range of topics of the subject.	75% & Above

NEUROSURGERY HANDBOOK & CURRICULUM

The detailed STP Neurosurgery Handbook and Curriculum is presented in full in the next section.

SPECIALTY TRAINING PROGRAMMEME (STP) IN NEUROSURGERY THE MINISTRY OF HEALTH (ZAMBIA)

Developed in partnership with:
Division of Neurosurgery, Department of Clinical Neurosciences, University of Cambridge, Cambridge, UK.
NIHR Global Health Research Group on Neurotrauma, University of Cambridge

UNIVERSITY OF CAMBRIDGE
Department of Clinical Neurosciences
Division of Neurosurgery

GENERAL SYLLABUS

The aim of the Specialist Training Programme is to produce graduates who are competent, both clinically and technically, and who will have a sound understanding of the scientific basis of Neurosurgery. It strives to create an atmosphere where the spirit of research, independent thinking, awareness of ethical issues and empathy with patients and their families will be encouraged.

The Neurosurgical training of registrars includes the following four objectives:

1. Five years as a Specialist Registrar in the Neurosurgical Division and successful achievement of desired competencies.
2. Successful completion of STP examinations overseen by the Zambia College of Medicine and Surgery (ZACOMS) through the Society of Neurosurgery of Zambia (SNZ). 3. Completion of a research project and publication of an article in a peer-reviewed outlet.
4. Completing the required number of neurosurgical procedures as set out by the detailed programme.

EDUCATIONAL PRINCIPLES OF THE CURRICULUM

- A common format and similar framework for neurosurgery trainees.
- Systematic progression from the entry into the STP through to completion of neurosurgical specialty training.
- Curriculum standards that are underpinned by robust assessment processes, both of which conform to the standards specified by Health Professions Council of Zambia
- Regulation of progression through training by the achievement of outcomes that are specified within the specialty curricula. These outcomes are competence-based rather than time-based.
- Delivery of the curriculum by surgeons and neurosurgeons who are appropriately qualified to deliver surgical training.
- Formulation and delivery of surgical care by surgeons working in a multidisciplinary environment.
- Collaboration with those charged with delivering health services and training at all levels.

LENGTH OF TRAINING

In general terms, by the end of training, surgeons have to demonstrate:

- Theoretical and practical knowledge related to surgery in general and to neurosurgery practice;
- Technical and operative skills;
- Clinical skills and judgement;
- Generic professional and leadership skills;
- An understanding of the values that underpin the profession of surgery and the responsibilities that come with being a member of the profession;
- The special attributes needed to be a surgeon;
- A commitment to their on-going personal and professional development and practice using reflective practice and other educational processes;
- An understanding and respect for the multi-professional nature of healthcare and their role in it; and an understanding of the responsibilities of being an employee in Zambia Health Care system and/or private practice.

In the final stage of training, when the trainee has attained the knowledge and skills required for the essential aspects of the curriculum in neurosurgery, there will be the opportunity to extend his/her skills and competences in one or two specific fields by way of the global elective rotation. The final stage of the syllabus covers the major areas of specialized practice. Further post certification training in order to achieve the competences necessary for some of the rarer complex procedures may be required.

NATIONAL ELECTIVE ROTATION

The National Elective Rotation provides final year trainees with experience to help them make the transition from trainee to specialist. A period of acting as a specialist offers trainees an opportunity to get a feel for the specialist role while still being under a level of supervision.

The trainee, during the national elective rotation, will be carrying out a specialist's tasks but with the understanding that they will have a designated supervisor who will always be available for support.

EDUCATIONAL FRAMEWORK

The educational framework is built on three key foundations that are interlinked:

- Stages in the development of competent practice

The modular neurosurgical curriculum framework has been designed to define stages in the development of competent neurosurgical practice, with each stage underpinned by explicit outcome standards. This provides a means of charting progress through the various stages of neurosurgical training in the domains of specialty-based knowledge, clinical and technical skills and professional behaviour and leadership (including judgement).

- Standards in the areas of specialty-based knowledge, clinical judgment, technical and operative skills, and professional behaviour and leadership

The STP Neurosurgery Handbook lays down the standards of specialty-based knowledge, clinical judgment, technical and operative skills and professional skills and behaviour that must be acquired at each stage in order to progress. The syllabus comprises the following components:

A neurosurgery overview which describes the following: Details of neurosurgery as it expected to be practiced in Zambia; The scope of practice within neurosurgery; The key topics that a trainee will cover by the end of training; and an overview of how, in general terms, training is shaped:

- Key topics that all trainees will cover by certification and will be able to manage independently, including complications. These are also referred to as essential topics.
- Index procedures that refer to some of the more commonly performed clinical interventions and operations in neurosurgery. They represent evidence of technical competence across the whole range of neurosurgery procedures in supervised settings, ensuring that the required elements of neurosurgery are acquired and adequately assessed. Direct Observations of Procedural Skills (DOPS) and Procedure-based Assessments (PBAs) assess trainees carrying out index procedures (whole procedures or specific sections) to evidence learning.
- The stages of training, which comprise a number of topics to be completed during a notional period of training. Within each stage there is the syllabus content which contains the specialty topics that must be covered. Each of these topics includes one or more learning objectives and the level of performance / competence to be achieved at completion in the domains of: Specialty-based knowledge
- Clinical skills and judgement
- Technical and operative skills
- Framework for Appraisal, Feedback and Assessment

The curriculum is consistent with the four domains of Good Medical Practice:

- Knowledge, skills and performance
- Safety and quality
- Communication, partnership and team-working
- Maintaining trust

The knowledge, skills and performance aspects are primarily found within the specialty-specific syllabus. All domains are reflected within the professional behaviour and leadership syllabus.

PURPOSE AND STRUCTURE OF TRAINING

The curriculum is competence-based. It focuses on the trainee's ability to demonstrate the knowledge, skills and professional behaviours that they have acquired in their training (specified in the syllabus) through observable behaviours. Since it is

competence-based, it is not time- defined and accordingly it allows these competences to be acquired in different time frames according to variables such as the structure of the programme and the ability of the trainee.
Any time points used are therefore merely indicative.
There are certain milestones or competence points, which allow trainees to benchmark their progress:

- Entry to the neurosurgical STP
- Passing the STP ZACOMS Part 1Examination
- Passing the Annual Review of Competence Progression
- Exit endorsement by ZACOMS by way of Certificate of Completion of Specialist Training (CCST)certification

Early Years Neurosurgical Training

The purposes of early years (i.e. the initial stage) training are:

1. To provide a broad-based initial training in surgical clinical care with attainment of knowledge, skills and professional behaviours relevant to the practice of any surgical specialty.
2. In addition, it will provide early neurosurgery training such that trainees can demonstrate that they have the knowledge, skills and professional behaviours to enter higher specialty training in neurosurgery.

Intermediate and Final Years Specialty Training

The purposes of the intermediate and final years training are:

1. To provide higher specialty training in neurosurgery with attainment of knowledge, skills and professional behaviours relevant to the practice in neurosurgery.
2. To develop competence to manage patients presenting either acutely or electively with a range of symptoms and conditions as specified in the syllabus.
3. To develop competence to manage an additional range of elective and emergency conditions by virtue of appropriate training and assessment opportunities obtained during training as specified by special interest or sub-specialty components of the final stage syllabus.
4. To acquire professional competences as specified in this Handbook.

Completion of training

Successful completion of the programme will result in a Certificate of Completion of Specialist Training (CCST) and eligibility for placement on the Specialist Register of the Health Professions Council of Zambia. This will indicate that the surgeon has reached the curriculum standards of competence to practice as a consultant surgeon in Zambia. These requirements translate into the ability to manage a significant proportion of the elective work within the specialty and to undertake the primary management of emergencies. It is anticipated that where additional, well-recognized specialist skills are required by the service, these will be gained by the completion of additional modules before the completion of training and the award of the specialty certificate.

TRAINING STRUCTURE

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 Zambia Neurosurgical Training Programme reflects developments taking place in the clinical neurosciences and the requirements of service delivery.

AREAS OF TRAINING

1. **Operative training:**

This training will occur in the theatre under the tutelage of the consultant or senior registrar. Once the trainees are considered competent in a particular procedure, they will be allowed to perform it unaided. There will always be a consultant available to advise and teach.

2. **Clinical teaching:**

General Neurosurgical care of patient as well as specialized ICU and paediatric neurosurgery training will be undertaken. Consultant ward rounds will be held twice per week in the general ward as well as a professional round once a week. Problem solving meetings will be held daily.

Administrative skills will also be developed.

3. **Radiology:**

Radiology training will be undertaken once per week in the Department of Radiology with the Consultant Radiologist. Furthermore, daily radiological sessions will be held with the neurosurgery consultants on a daily basis during ward rounds and patient reviews.t is planned that a 1-month neuro-radiological training with the Department of Radiology particularly in MRI and Angiography will be incorporated into the programme.

4. **Tutorials**

Neurosurgical topics will be covered during the consultant teaching ward rounds. The weekly departmental Academic meeting will include presentations by the registrars and outside experts, a journal club, a monthly morbidity and mortality meeting and combined daily lunch time meetings with the rest of the Department of Surgery

5. **Cadaveric dissections**

This will be conducted in the department of pathology either among registrars or with consultants. This will assist the registrars to learn their surgical anatomy and to be well prepared for certain approaches into the CNS.

6. **Examinations**

All registrars are required to complete the ZACOMS examinations.

7. Research

The candidate is expected to write a research project report will be expected to have published a paper in a peer-reviewed journal and demonstrate an understanding or research methodology and critical analysis.

TRAININGPROGRAMME STRUCTURE

The 5-year training programme will involve a minimum of 3 years in general neurosurgery, 18 months in more specialized areas of neurosurgery and related fields and 6 months of clinical attachment at an international neurosurgical programme.

Specialized areas are:

- Intensive care Unit (ICU): 6 months
- Radiology: 1 month
- Neurology: 1 months
- Rehabilitation: 1 month
- Pediatric neurosurgery: 9 months

The Zambia Neurosurgical Training Programme reflects developments taking place in the basic and applied clinical neurosciences and the requirements of service delivery. It contains 5 indicative years in three stages. The first year of the initial stage (Junior Registrar) establishes a foundation of core knowledge in the clinical neurosciences - core neuroscience training. The intermediate stage provides 1.5 years in full-time general neurosurgical training. The final year incorporates a year of special interest training and acting up as a specialist. Variations in this programme can be made from time to time dependent on the needs of the department.

The emphasis will change, as trainees progress through the programme, from acquiring core neuroscience knowledge and competencies in the first year to developing technical operative skills and surgical judgement in the final stage. Transition from the Junior Specialty Registrar to Senior Specialty Registrar will depend on trainees acquiring the necessary clinical and operative competences, receiving satisfactory in-training assessments and passing the ZACOMS examinations.

The transition from Senior Specialty Registrar to Chief Specialty Registrar 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 the final year of training.

The acquisition of operative skills and experience will accelerate in the final phase of training - last 6 months of Senior Specialty Registrar and Chief Specialty Registrar. Units will concentrate advanced training in the hands of their Senior and Chief Registrars 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.

INITIAL TRAINING - JUNIOR SPECIALTY REGISTRAR:

Period: 0-2 years

Criteria: 1. Passed STP (Neurosurgery) ZACOMS part 1 exam.

Functions: 1. Rotations through the specialized areas:

- ICU: 6 months
- Radiology: 1 month
- Neurology: 1 months
- Intensive Care Unit Rotation 9 months

2. General Neurosurgical ward management
3. Brain and Spine dissection
4. Commence research for STP Neurosurgery Research Project Report.

INTERMEDIATE TRAINING - SENIOR SPECIALTY REGISTRAR:

Period: 2 -4 years

Criteria: 1. 2 years training in a neurosurgical registrar post
2. Passed ARCP STP Neurosurgery exam (or equivalent international exam)
3. Completed brain dissection

Functions: 1. Manage one of the ward firms
2. Cover the junior registrar on call (where necessary)
3. Physiotherapy lectures
4. Present the department journal
5. Research- 1 published in a recognized journal
6. Complete STP Neurosurgery thesis

FINAL TRAINING -CHIEF SPECIALTY REGISTRAR:

Period: 5th year

Criteria: 1. Passed the year 4 ARCP (Final) of STP Neurosurgery exam
2. Completed 4 years training in a neurosurgical training post
3. Published 1 article in a peer reviewed journal

Functions: 1. Shares consultant calls
2. Whole class student lectures (with consultants)

3. Complete procedure logbook
4. Specialist interest training if available, either at mother Unit or abroad
5. Run departmental mortality and morbidity meetings

THE SYLLABUS

ASSESSMENT OF PROGRESS

Competences in the key topics are assessed using grading systems on a regular basis.

Where knowledge is assessed the following competence levels are used:

Level 0 - Below that expected for Initial Stage Training
Level 1 - Appropriate for Initial Stage Training
Level 2 - Appropriate for completion of Initial Stage Training or entry into Intermediate Stage Training
Level 3 - Appropriate for central period of training
Level 4 - Appropriate for Certification

Where operative skills are assessed the following competence levels are used:

Level 0 - Insufficient evidence
Level 1 - Able to assist with or without guidance
Level 2 - Guidance required
Level 3 - Procedure performed with minimal guidance or no guidance but lacking fluency
Level 4a - Procedure performed fluently
Level 4b - 4a and able to anticipate and avoid common complications/problems

KEY TOPICS

To be eligible for the award of a CCST 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 intraduraltumours
- Malignant spinal cord compression
- Degenerative spinal disorders
- Emergency paediatric care

INITIAL TRAINING STP1 & 2

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

NEUROSURGICAL COMPONENT STP1 & 2

During STP1 & 2 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 Neurosurgery specialty component of the early years syllabus.
- Professional competences as specified in the syllabus and derived from Good Medical Practice documents of the Health Professions Council of Zambia

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: STP1

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.

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.

Clinical Placements and Teaching in STP1 & 2

Clinical placements for STP1 neurosurgical trainees will include:

Eleven-month attachment in general neurosurgery

One-month attachment in an acute neurology service

- Six-month attachment in intensive care including neuro-intensive care
- Four-month attachment in paediatric neurosurgery Two-month attachment in another surgical specialty **Teaching for STP1& 2 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.

Competencies achieved by the end of STP2

By the end of early years training, trainees 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
- Perform 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 modules:

CORE NEUROSCIENCES AND SURGERY MODULES

Module 1: Basic Science Knowledge relevant to surgical practice

- Anatomy
- Physiology
- Pharmacology - in particular safe prescribing
- Pathological principles underlying system specific pathology and 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 specialty.
- 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 o 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. o 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, head injury, spinal cord injury, abdominal and urogenital trauma, vascular trauma
- a single or multiple fractures or dislocations and 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: Health promotion

- To promote good health.

SPECIFIC MODULES FOR INITIAL STAGE STP1 & STP2

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/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/procedures	N/A

Topic	Anatomy of the brain
Category	Core Neuroscience knowledge ST1
Sub-category:	Applied neuroanatomy
Objective	To understand the 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/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/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/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/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/procedures	N/A

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/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/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/procedures	N/A

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/procedures	N/A

Topic	Principles of neuropsychology
Category	Core Neuroscience knowledge ST1
Sub-category:	Neuropsychology
Objective	To understand the principles of neuropsychological assessment and application of principals of capacity
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/procedures	N/A

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/procedures	N/A

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

Objective	o 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/procedures	N/A

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/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/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/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/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/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 f 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/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 and other investigations 4 Presentation and summary of cases
Technical skills/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 f patients presenting with visual disorder
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/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 f patients presenting with Language and speech disturbance
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/procedures	None specified

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/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 Disorders of the Sphincteric and sexual function
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	None specified
skills/procedures	

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 f patients presenting with movement disorder

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/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 memory and cognitive disorders
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/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/procedures	None specified

Topic	General management of the head injured patient
Category	Basic Clinical Neurosurgery ST1 & ST2
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/procedures	None specified

Topic	Insertion of ICP monitor
Category	Basic Clinical Neurosurgery ST1 & ST2
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	None specified
Technical skills/procedures	Insertion of ICP monitor

Topic	Burr hole evacuation of chronic subdural haematoma
Category	Basic Clinical Neurosurgery ST1 & ST2
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/procedures	3 Performance of single and multiple frontal and parietal burrhole evacuation of CSDHs

Topic	Management of soft tissue trauma
Category	Basic Clinical Neurosurgery ST1 & ST2
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/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 ST1 & ST2
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/procedures	4 Lumbar puncture

Topic	Diagnostic lumbar puncture
Category	Basic Clinical Neurosurgery ST1 & ST2
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/procedures	4 Lumbar puncture

Topic	Management of delayed secondary ischaemia
Category	Basic Clinical Neurosurgery ST1 & ST2
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/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 ST1 & ST2
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/procedures	4 Insertion of lumbar drain 3 Insertion of external ventricular drain

Topic	Adult hydrocephalus

Category	Basic Clinical Neurosurgery ST1 & ST2
Sub-category:	Hydrocephalus
Objective	he 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 specified
Technical skills/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 ST1 & ST2
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/procedures	None specified

Topic	Image-guided biopsy of intracranial tumour
Category	Basic Clinical Neurosurgery ST1 & ST2
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/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 ST1 & ST2
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/procedures	None

INTERMEDIATE TRAINING STP3 & 4

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
- Hydrocephalus: including the assessment and operative management of adult patients with communicating and non-communicating hydrocephalus; the assessment and operative management of children with hydrocephalus; emergency management of acute hydrocephalus with external ventricular drainage
- 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 supratentorial 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 spinalcord 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.

Clinical Placements in STP3& 4

Prior to commencing STP3 all trainees will be expected to have done:

- At least eleven months of full time work in general neurosurgery, two months in a complementary surgical specialty, one-month placement in radiology and one-month placement in rehabilitation prior to commencing ST3
- Passed the STP ZACOMS Neurosurgery part 1 exam before commencing STP3 placement

The timing of clinical placements in STP3 & 4 is flexible and at the discretion of the Programme Director. The following principles apply:

- Clinical placements will be entirely within neurosurgery
- Trainees will be expected to participate in general neurosurgery as well as subspecialty teams including paediatric neurosurgery, spine and skull base/vascular neurosurgery
- Trainees will be encouraged to apply for fellowship placements for six to twelve months in a neurosurgical center abroad to gain broader exposure to neurosurgical practice and develop microsurgical skills. The fellowship should take place during the STP4 year (however exact timing is at the discretion of the Programme Director)

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/procedures	not specified

Topic	Surgical management of cranial trauma
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 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/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 all aspects of the general management 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/procedures	not specified

Topic	Neurological rehabilitation
Category	Cranial surgery
Sub-category:	Cranial trauma
Objective	To understand the role of post-traumatic neurological rehabilitation
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 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/procedures	not 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/procedures	3 Craniotomy for supratentorialhaematoma 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/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/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/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/procedures	not 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/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/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 meningioma
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/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/procedures	not 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/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 stabilization
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/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/procedures	Not specified

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/procedures	3 Extradural spinal biopsy and decompression by laminectomy in selected and patients without segmental instability 2 Instrumented posterior spinal stabilization

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/procedures	3 Primary lumbar microdiscectomy 3 Primary posterior decompression (laminotomy, hemilaminectomyetc): 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/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 uncovertebral 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 TRAINING STP5

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 STP Neurosurgery exit exam 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 intraduraltumours
- 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 without supervision and have sufficient operative experience to be able to manage operative difficulties and complications (Competence level 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 headinjured patients 4 Ability to diagnose and confirm brain death
Technical skills/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 haemorrhage
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/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/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 Lumboperitoneal 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 falcinemeningiomas
	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/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 chiasmaticcisternal suction, intra-operative ventricular puncture and lamina terminalis fenestration 4 Bi-Frontal/Frontal and panietalparafalcine approaches 4 Microsurgical resection of superficial 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 parasellartumours 4 Interpretation of CT and MRI scans
Technical skills/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/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 tumourstumours 4 Interpretation of CT and MRI scans
Technical skills/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/procedures	4 Competence in midline, paramedian and retrosigmoid posterior fossa craniotomies 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 meningiomas 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 rectosigmoid, middle fossa, and trans labyrinthine 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/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	4 Burr hole drainage of intracerebral abscess
skills/procedures	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/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/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/procedures	2 Carotid endarterectomy 2 EC-IC anastomosis

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/procedures	None

Topic	Trigeminal and other neuralgias
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/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/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/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/procedures	2 Posterior reduction of thoracolumbar fractures by pedicle screw instrumentation and ligamentotaxis

Topic	Intradural extramedullary tumours
Category	Spinal Surgery

Sub-category:	Benign IntraduralTumours
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/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/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/procedures	4 Decompressive thoracic and lumbar laminectomy with extradural tumour resection 3 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/procedures	4 Lumbar microdiscectomy 4 Microsurgical lateral recess decompression 4 Posterior decompression (laminotomy, hemilaminectomyetc) 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/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, hemilaminectomyetc

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/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/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/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/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 studies 4 Indications for surgery
Clinical skills	4 Assessment and counselling of patients with carpal tunnel syndrome
Technical skills/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 studies 4 Indications for surgery 4 Applied surgical anatomy

Clinical skills	4 Assessment and counselling of patients with an ulnar neuropathy
Technical skills/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/procedures	3 Microsurgical excision of peripheral nerve sheath tumour

Topic	Paediatric 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/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/procedures	4 Insertion, tapping and draining from a CSF reservoir 4 External ventricular drainage including externalisation of VP shunts 3 Ventriculo-peritoneal shunting

Topic	Paediatric neuro-oncology
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/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, suboccipitaltranstentorial 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	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 craniospinaldysraphism 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/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	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/procedures	4 Emergency operative management of spontaneous intracerebral haemorrhage

SURGICAL LOGBOOK

SCHEDULE OF ESSENTIAL OPERATIVE COMPETENCIES

The table below 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
• Laminectom	2	3	4
General Procedures			
• Insertion of lumbar drain	3	4	4
• T apping/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 intracerebellarhaematoma (ICH infratentorial)	1	3	4
Management of hydrocephalus			
□ Insertion of ventricular drain/access device	3	4	4

• Insertion of VP shunt • Revision of VP shunt	2 1	3 2	4 4
Management of intracranial tumours • Supratentorialtumour biopsy • Craniotomy for supratentorial intrinsic tumour/metastasis • Craniotomy for posterior fossa intrinsic tumour/metastasis • Craniotomy for convexity meningioma	 2 1 1 1	 3 3 2 3	 4 4 4 4
Management of intradural spinal tumours Excision of intradural extramedullary tumour	1	2	4
Management of degenerative spinal disorders • Lumbar microdiscectomy • Anterior cervical discectomy	 1 1	 3 3	 4 4
Emergency paediatric care • Insertion of EVD • Evacuation of intracranial haematoma (ICH)	 1 1	 2 2	 4 4

SURGICAL LOGBOOK

The syllabus content details the level of knowledge, clinical, technical/operative and professional skills expected of a trainee at any given stage of training. The surgical logbook provides a record of the trainee's operative experience and supervision levels corresponding to the operative levels of:
Observed (O);
Assisting (A);
Supervised - trainer scrubbed (S-TS);
Supervised - trainer unscrubbed (S-TU);
Performed (P);
Training a more junior trainee (T)

The numbers of the procedures required for the completion of the logbook are as follows:

OPERATIVE SKILLS TOTAL (A < 1/3 OF ALL CASES)	**1200**
Paediatric 0 - 15yo	70
Adult > 15yo	1130
INDEX CASES(STS, STU, P; T)	**55**
Advanced adult supratentorial	**10**

- Clipping of anterior circulation aneurysm
- Clipping of posterior circulation aneurysm
- Craniotomy and excision of AVM
- Craniotomy and excision of Cavernoma
- Hemispherectomy (functional or anatomic) for epilepsy
- Infratentorial, supracerebellar approach to pineal region tumour
- Craniotomy for midline ventricular lesion (eg colloid cyst)
- Interhemispheric approach to pineal region tumour
- Lesionectomy for epilepsy
- Supratentorial, suboccipital approach to pineal region tumour
- Temporal lobectomy for epilepsy
- Transcranial approach to sellar or suprasellar lesion
- Excision of meningioma - sphenoid ridge
- Excision of meningioma - subfrontal

Endoscopic and transsphenoidal **10**

- Endoscopic biopsy of intrinsic cerebral tumour
- Endoscopic excision / drainage of ventricular lesion (eg colloid cyst)
- Endoscopic third ventriculostomy
- Other Endoscopic Procedure (except biopsy)
- Trans-sphenoidal biopsy of sellar lesion (not adenoma)
- Trans-sphenoidal excision of pituitary adenoma

Convexity and falcine meningioma **10**

- Excision of meningioma - convexity
- Excision of meningioma - falx
- Excision of meningioma - Other
- Excision of meningioma - parasagital

Advanced adult infratentorial **10**

- Craniotomy for spontaneous ICH (infratentorial)
- Infratentorial skull base approach to skull base tumour
- Microvascular decompression of facial nerve
- Microvascular decompression of trigeminal nerve
- Middle fossa approach to vestibular schwannoma
- Midline approach to intrinsic brain stem or 4th ventricle tumour
- Midline approach to intrinsic cerebellar tumour
- Midline posterior fossa craniotomy and excision of meningioma
- Midline posterior fossa craniotomy for benign lesions (excl. meningioma)
- Retrosigmoid approach to intrinsic brain stem tumour
- Retrosigmoid approach to intrinsic cerebellar tumour
- Retrosigmoid approach to vestibular schwannoma
- Retrosigmoid craniotomy and excision of meningioma
- Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)
- Translabrynthine approach to vestibular schwannoma
- Transoral / transfacial approach to skull base tumour

Intradural spine **5**

- Biopsy of intramedullary spinal cord lesion
- Closure of encephalocoele
- Closure of myelomeningocoele
- Evacuation of primary spinal subdural haematoma
- Excision / debulking of intramedullary spinal cord lesion
- Excision of other intradural, extramedullary lesion
- Excision of spinal meningioma

- Excision of spinal neurofibroma
- Foramen magnum decompression
- Other surgery for spinal dysraphism
- Surgery for spinal AVM
- Surgery for spinal cavernoma
- Untethering of spinal cord

Advanced paediatricsupratentorial 5

- Clipping of anterior circulation aneurysm
- Clipping of posterior circulation aneurysm
- Craniotomy and excision of AVM
- Craniotomy and excision of Cavernoma
- Craniotomy for dural AVM
- Craniotomy for frontal intrinsic cerebral tumour
- Craniotomy for occipital intrinsic cerebral tumour
- Craniotomy for other intrinsic cerebral tumour
- Craniotomy for parietal intrinsic cerebral tumour
- Craniotomy for temporal intrinsic cerebral tumour
- Excision of meningioma - convexity
- Excision of meningioma - falx
- Excision of meningioma - Other
- Excision of meningioma - parasagital
- Excision of meningioma - sphenoid ridge
- Excision of meningioma - subfrontal
- Hemispherectomy (functional or anatomic) for epilepsy
- Interhemispheric approach to midline ventricular lesion (eg colloid cyst)
- Interhemispheric approach to pineal region tumour
- Lesionectomy for epilepsy
- Supratentorial craniotomy for benign lesions (excl. meningioma)
- Supratentorial, suboccipital approach to pineal region tumour
- Temporal lobectomy for epilepsy
- Transcranial approach to sellar or suprasellar lesion

Advanced paediatricinfratentorial 5

- Infratentorial, supracerebellar approach to pineal region tumour
- Midline approach to intrinsic brain stem or 4th ventricle tumour
- Midline approach to intrinsic cerebellar tumour
- Midline posterior fossa craniotomy and excision of meningioma
- Midline posterior fossa craniotomy for benign lesions (excl. meningioma)
- Retrosigmoid approach to intrinsic brain stem tumour

- Retrosigmoid approach to intrinsic cerebellar tumour
- Retrosigmoid craniotomy and excision of meningioma
- Retrosigmoid craniotomy for benign lesions (excl. schwanoma and meningioma)
- Transoral / transfacial approach to skull base tumour

TRAUMA:

Craniotomy for EDH, SDH, ICH		30
Craniectomy for depressed skull fracture	40	
Intracranial pressure monitor placement	5	
Anterior/middle base of skull fracture repair	10	
Burr-hole for chronic subdural hematoma		10

HYDROCEPHALUS

Ventriculo-peritoneal shunt(VPS)	100	
ETV/CPC	100	
EVD placement		50

TUMOURS

Craniotomy for extrinsic tumor		20
Cranitomy for intrincic tumor	20	
Posterior fossa tumor	15	
Trans-sphenoidal for pituitary tumor	10	
Base of skull tumor surgery	10	
Laminectomy for biopsy/removal of tumor	10	

SPINAL

ACDF	15	
Lumbar laminectomy for disc disease		20
Posterior cervical laminectomy		15
Far lateral disc removal		5
Cervical foraminotomy		10
Vertebrectomy	5	
Anterolateral approaches to spine	5	

Transpedicular screw fixation	5

SEPSIS

Brain abscess	10
Subdural empyema	10
Spinal abscess	5

PEDIATRIC

Posterior fossa tumor	15
Craniopharyngioma	5
Craniofacial/craniosynostosis surgery	5
Myelomeningocele repair	30
Tethered cord release	5

FUNCTIONAL

Temporal lobectomy	5
Trigeminal lesion	5

OTHER PROCEDURES

Carpal tunnel release	10
Syrinx surgery(shunt or other)	5
Posterior fossa decompression for Chiari	5
Cranioplasty	10

VASCULAR

Endovascular procedure	5
Craniotomy for cerebral aneurysm	10
Craniotomy for AVM	5
Craniotomy for spontaneous ICH	10
Posterior fossa craniectomy for hematoma	10
Microvascular decompression	10

ASSESSMENT AND FEEDBACK

ANNUAL REVIEW OF COMPETENCE PROGRESSION (ARCP)

The ARCP is a formal STP process which scrutinises each neurosurgical trainee's suitability to progress to the next stage of, or complete, the training programme. It follows on from the appraisal process and bases its recommendations on the evidence that has been gathered in the trainee's learning portfolio during the period between ARCP reviews. The ARCP records that the required curriculum competences and experience are being acquired, and that this is at an appropriate rate. It also provides a coherent record of a trainee's progress. The ARCP is not in itself an assessment exercise of clinical or professional competence.

The ARCP should normally be undertaken on at least an annual basis for all trainees in neurosurgical training. An ARCP panel may be convened more frequently if there is a need to deal with progression issues outside the normal schedule.

The trainee's learning portfolio provides the evidence of progress. It is the trainee's responsibility to ensure that the documentary evidence is complete in good time for the ARCP. The learning portfolio will consist of a minimum of a CV, evidence of courses and training, evidence of the sufficient amount of work based assessments and evidence of achieving a sufficient amount of surgical cases and surgical competencies.

The ARCP panel will make one of the following recommendations about each trainee based on the evidence put before them:

Satisfactory progress

1. Achieving progress and competences at the expected rate

Unsatisfactory progress

2. Development of specific competences required – additional training time not required
3. Inadequate progress by the trainee – additional training time required
4. Released from training programmeme with or without specified competences

Insufficient evidence

5. Incomplete evidence presented – additional training time may be required

Recommendation for completion of the training programmeme

6. Gained all required competences for the programmeme

INDICATIVE RESOURCES