



ZAMBIA COLLEGE OF MEDICINE & SURGERY

Advancing Specialist Care & Professional Growth

Specialty Training Programme

Curriculum & learning guide

for

NEUROLOGY

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1. INTRODUCTION

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

- ✦ Trainees, host departments and managers of NR healthcare services;
- ✦ STP NR trainers, which includes all those involved in supervising, coordinating, assessing and delivering specialist education and training in Neurology;
- ✦ 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 NR care and the training of healthcare practitioners in its various 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 Neurology specialists working through the Zambia College of Physicians (ZACOPH).

A neurologist is a doctor who has specialized training in the localization, diagnosis, and treatment of the broad spectrum of diseases which affect the central and peripheral nervous system across the lifespan. This training enables him/her to

provide consultations for patients with neurologic complications of systemic diseases (e.g. reversible cerebral vasoconstriction syndrome in the peripartum period, neonatal encephalopathy associated with birth complications, neurocognitive impairment associated with HIV infection, etc.) and to provide direct primary care for patients with primary neurologic diseases (e.g. epilepsy, Parkinson's disease, meningitis, encephalitis, etc.). Neurologists are also trained in the performance and interpretation of neurological diagnostic tools including lumbar puncture and associated tests of cerebrospinal fluid, electroencephalogram (EEG), and electromyography (EMG)/nerve conduction studies. In most countries, training in neurology is undertaken after one to two years of training in either internal medicine or pediatrics. A neurologist sees patients in both inpatient and outpatient settings. Neurologists are also involved in research, public health, teaching, etc.

The STP NR training provides specialist training in Neurology. This is a relevant programme because of the critical shortage of Neurologists. The STP NR will equip trainees with core competencies reflecting the wide array of medical subspecialties. This will mean for every trainee who completes this programme, the population they serve will have gained access to a physician with competencies in Neurology. Furthermore, the graduate of this programme will offer support to the various medical and surgical specialties, improving outcomes in the management of a broad spectrum of pathology.

There is growing recognition that neurologic disease contributes significantly to morbidity and mortality in low- and middle-income countries (LMIC) and also disproportionately affects these countries. The Global Burden of Disease study estimates that neurological, psychiatric and substance abuse disorders account for nearly one-third of the burden of all diseases globally.[1] In actuality, the number is likely even higher as neurological complications of a primary disease (e.g., neuropathy due to HIV or diabetes, neonatal encephalopathy from a birth injury, etc.) are attributed to the burden of the primary disease and not included in estimates of neurological disease burden.[2] In hospital-based studies, admissions for neurological disorders alone accounted for as many as 25% of inpatient hospital admissions in several Sub-

Saharan African populations.[3, 4] With a national HIV prevalence of 12.5%, Zambia has the 6th highest HIV prevalence in the world, and HIV/AIDS, which is often associated with neurological effects, continues to be the number one cause of death in Zambia.[5, 6] Malaria (#2), stroke (#5), meningitis (#7), syphilis (#9) and road traffic accidents (#10) are other top 10 causes of death in Zambia which are either primary neurological conditions or conditions that commonly have neurological complications.[6] Furthermore, neurologic disease burden is expected to continue to increase sharply in LMIC as life expectancies increase and a larger proportion of the population reaches the age at which many of these disorders have their onset.[1]

Despite the increasing burden of neurological disease worldwide, most LMIC, including Zambia, lack trained neurologists to care for patients with neurological disorders.[7] This is especially true in Sub-Saharan Africa where there are 0.01 neurologists per 100,000 people as compared to more than 5 neurologists per 100,000 people in the United States. As a result of this critical shortage, Zambians with neurological disorders have higher rates of morbidity and mortality due to lack of access to trained neurologists.[8]

The STP NR programme will be based at the University Teaching Hospital (UTH) with the support of Beth Israel Deaconess Medical Center, Harvard Medical School, and the Johns Hopkins University School of Medicine. The team of practicing neurologists based at UTH will anchor the programme as the primary trainers on the STP NR. In addition, a computer-based lecture series utilizing the expertise of US-based neurologists will be used in order to provide a broad and comprehensive educational foundation for the trainees. Under this programme, faculty visits from US-based academic neurology staff will be available to provide supplemental didactic education and augment clinical bedside teaching.

UTH presently has a CT scanner, MRI scanner, EEG machine, and EMG/nerve conduction studies machine available, and these will be utilized to teach the trainees.

2. VISION

The vision of the STP Neurology is to be a leading medical training center for neurology. The program will maintain the highest levels of academic excellence and scholarship while ensuring the highest quality of patient care.

3. MISSION

The overall mission of the STP Neurology is to train doctors who will competently assess, investigate, diagnose and manage a broad range of neurologic disease, including stroke, epilepsy, meningitis/encephalitis, neurologic complications of other infections (e.g., tuberculosis, malaria, and HIV), movement disorders, headache, and neuropathy, across the lifespan and to play a significant role in developing public health policy as it relates to neurologic disorders and in educating primary care providers in the evaluation and treatment of the most common neurologic diseases.

4. AIM OF THE PROGRAMME

To produce graduates who are competent in teaching and applying practical, diagnostic and therapeutic skills in the field of Neurology at specialist level.

5. RATIONALE FOR THE SPECIALTY TRAINING PROGRAMME IN NEUROLOGY

The STP NR aims to train specialists in Neurology in order to prepare them for specialist service in the healthcare system. The STP NR aims to bridge the critical shortage of Neurologists by advancing professional training of Neurologists using the competence-based certification model beyond traditional university-based specialist training. Simply put, this model works on the principle that every health facility equipped well enough to support a Neurology practice has the basic requirements to train a Neurologist. The STP NR curriculum is therefore informed by the training requirements of the Health Professions Council of Zambia (HPCZ), the professional creed of the Zambia College of Physicians (ZACOPH) and is alive to the unique opportunities obtaining across the various training sites. The training programme encourages self-directed, life-long

learning, and student-centred training approaches while providing robust and structured guidance.

This curriculum provides a framework for the four year postgraduate specialty training and educational curriculum in Neurology. Trainees who successfully complete the requirements and meet the minimum standards set out in this curriculum should be expected to demonstrate competence in Neurology at specialist level.

6. OBJECTIVES OF THE PROGRAMME

Objectives of the programmed will be to produce graduates:

1. Who obtain and demonstrate the clinical knowledge and expertise to practice independently as a neurologist.
2. Who demonstrate mastery of clinical neurology in order to teach neurology to medical students, internal medicine trainees, other trainees, and other non-neurologist clinical providers.
3. Who understand the pharmacology of medications used to treat neurological disorders and identify appropriate indications for and common risks associated with their use.
4. Who identify the appropriate use and limitations of common neurologic diagnostic procedures, including electroencephalogram (EEG), nerve conduction studies and electromyograph (NCS/EMG), computed tomography (CT), magnetic resonance imaging (MRI), and lumbar puncture (LP), and be able to appropriately interpret the data they provide in the context of clinical information.
5. Who demonstrate mastery of the neurological examination and application of the information gleaned from the clinical examination in order to localize a pathologic process within the nervous system.
6. Who show familiarity with the basics of the epidemiology of neurologic disease and describe the most common risk factors for these diseases and the populations at highest risk for developing them.

The key outcomes are twofold as stipulated in Outcomes 1 and 2 below:

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

1. The graduate should be able to apply to neurology 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 Neurology.
 - b) Explain the scientific basis for common diseases and conditions' signs, symptoms and treatment relevant to Neurology.
 - c) Justify and explain the scientific basis of common investigations for diseases and conditions relevant to Neurology.
 - d) Demonstrate knowledge of drugs, drug actions, side effects, and interactions relevant to Neurology.

2. Apply Behavioural and Sociology Principles to the Practice of Neurology
 - a) Explain normal human behaviour relevant to Neurology.
 - b) Discuss psychological and social concepts of health, illness and disease relevant to Neurology.
 - c) Apply theoretical frameworks of psychology and sociology to explain the varied responses of individuals, groups and societies to Neurology.
 - d) Explain psychological and social factors that contribute to illness, the course of the disease and the success of Neurology interventions.

3. Apply Population Health to the Practice of Neurology
 - a) Discuss population health principles related to determinants of health, health inequalities, health risks and surveillance relevant to Neurology.
 - b) Discuss the principles underlying the development of health and health service policy, including issues related to health financing, and clinical guidelines relevant to Neurology.

- c) Evaluate and apply basic principles of infectious and non-communicable disease control at community and hospital level relevant to Neurology.
 - d) Discuss and apply the principles of primary, secondary, and tertiary prevention of disease relevant to Neurology.
4. Apply Scientific Method and Approaches to Neurology Research.
- a) Evaluate research outcomes of qualitative and quantitative studies in the medical and scientific literature relevant to Neurology.
 - b) Formulate research questions, study designs or experiments to address the research questions relevant to Neurology.
 - c) Discuss and apply appropriate research ethics to a research study relevant to Neurology.

Outcome 2. Competence, at mastery level, in Neurology Clinical Practice

On successful completion of the work-based Neurology STP:

1. The trainees should have clinical and specialist expertise in Neurology, 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 Neurology 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 Neurology 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 analyze 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 General Surgery 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 Neurology, 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 Neurologists who have successfully completed the STP NR will be eligible to compete for available Consultant positions in Neurology.

The outcomes of the STP NR 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 3:** Understand how the major pathologic processes affect the organ systems.
- Goal 4:** Integrate basic science and epidemiological knowledge with clinical reasoning.
- Goal 5:** Understand the principles of scientific method and evidence-based medicine including critical thinking.

Category II: Clinical Skills

- Goal 6:** Obtain a sensitive, thorough medical history.
- Goal 7:** Perform a sensitive and accurate physical exam including mental state examination.

Goal 8: Establish and maintain appropriate therapeutic relationships with patients.

Category III: Communication and Interpersonal Skills

Goal 9: Develop the knowledge, skills, and attitudes needed for culturally-competent care.

Goal 10: Participate in discussion and decision-making with patients and families.

Goal 11: Work effectively with other providers in the health system.

Goal 12: Clearly communicate medical information in spoken and written form.

Category IV: Prevention

Goal 13: Develop knowledge, skills, and attitudes to practice the basic principles of prevention.

Goal 14: Practice personalized health planning for long-range goals.

Goal 15: Understand the planning for communities and populations.

Category V: Diagnosis

Goal 16: Elicit and correctly interpret symptoms and signs of General Surgery conditions.

Goal 17: Diagnose and demonstrate basic understanding of common disease and conditions.

Goal 18: Appropriately use testing to help guide diagnostic and therapeutic decisions.

Goal 19: Demonstrate sound clinical reasoning.

Category VI: Treatment, Acute and Chronic.

Goal 20: Understand therapeutic options and participate in the multidisciplinary care of patients with complex problems.

Goal 21: Recognize acute life-threatening medical problems and initiate appropriate care

Goal 22: Acquire the knowledge and skills necessary to assist in the management and rehabilitation of chronic diseases.

Goal 23: Participate in care in a variety of settings; including knowledge about palliative care.

Category VII: Patient Safety

Goal 24: Identify and remove common sources of medical errors.

Goal 25: Understand and apply models of Quality Improvement.

Goal 26: Appreciate the challenges associated with reporting and disclosure.

Category VIII: Information Management

Goal 27: Use information and educational technology to facilitate research, education, and patient care.

Category IX: Ethics, Humanities, and the Law

Goal 28: Develop a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to diversity.

Goal 29: Develop a critical understanding of the multiple factors that affect the practice of medicine, public health and research.

Goal 30: Incorporate ethical principles in clinical practice and research.

Category X: Professionalism

Goal 31: Develop healthy self-care behaviours and coping skills.

Goal 32: Model service to patients and community.

Category XI: Leadership & Management

Goal 33: Develop interpersonal and communication skills that result in leadership in patient health service delivery and health human resource management.

7. COMPETENCIES

At the end of the STP Neurology, the neurology trainee will demonstrate competency as a specialist in the following areas:

7.1 Patient Care

1. Provide the highest quality clinical care to their patients. The neurology trainee will provide wholesome, compassionate, appropriate and effective care for the promotion of health, prevention of illness, treatment of disease, and end-of-life care.
2. Demonstrate appropriate management of ambulatory patients and inpatients with neurological disorders across the lifespan including those who require emergency and intensive care.
3. Master the principles of primary and secondary prevention of neurological diseases.
4. Practice evidence-based medicine supported by sound clinical judgement.

7.2 Procedural Skills

1. Demonstrate the ability to independently perform lumbar punctures.
2. Independently perform basic neurophysiologic tests, including electroencephalograms (EEGs) and electromyography/nerve conduction studies (EMG/NCS).

7.3 Medical Knowledge

1. Demonstrate mastery of clinical neurology that enables sound and high-quality care of patients with neurologic disease across the lifespan.
2. Obtain broad-based knowledge that will management of patients with neurologic problems in all medical and surgical disciplines and in all clinical settings (e.g., ambulatory, inpatient, emergency and intensive care).
3. Exhibit a thorough knowledge of neuroanatomy, neurophysiology, and neuropathology.
4. Obtain familiarity with the key principles of clinical epidemiology and biostatistics.
5. Obtain familiarity with the key principles of psychiatric diagnosis and pharmacology of psychiatric medications.

6. Demonstrate a commitment to lifelong learning and to continuously updating their knowledge in order to continue to provide the highest-quality, most up-to-date, and evidence-based patient care.

7.4 Communication Skills

1. Demonstrate mastery of creating and cultivating the patient-physician relationship through developing interpersonal and communication skills that result in the effective exchange of information and collaboration with patients and their families. Neurology trainees will demonstrate compassion, patience and clarity while explaining to patients and their families the diagnosis, nature of disease, and expected disease course.
2. Exhibit effective and professional interpersonal and communication skills that result in the effective exchange of information and collaboration with other healthcare professionals. The neurology trainees should demonstrate effective communication with diverse health care team members in varying clinical settings.
3. Communicate effectively with patients, families, health care professionals, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds.
4. Work effectively as a member or leader of a health care team or other professional group.
5. Act in a consultative role to primary caregivers and other health professionals and communicate patient care recommendations clearly and respectfully in order to facilitate optimal patient care.
6. Demonstrate effective written communication of medical information, including writing clear, legible and coherent notes in the medical record that provide recommendations which accurately reflect the patient's current status and planned management strategies.

7.5 Academic Activities

1. Identify strengths, deficiencies and limits in personal knowledge and expertise, perform appropriate learning activities, and implement changes in order to improve the quality of patient care one delivers.

2. Actively seek feedback and advice on one's practice from peers, mentors, staff and patients alike and engage in introspective reflection to gain greater insight into one's own strengths and weaknesses.
3. Locate, appraise and assimilate evidence from relevant scientific studies into clinical practice with the goal of improving quality of patient care.
4. Critically evaluate research publications to assess their importance and potential impact on one's clinical practice and present and discuss these results in context in both small and large audiences.
5. Demonstrate a continuous commitment to maintaining expert knowledge in the diagnosis and treatment of a broad range of neurologic diseases through systematic continuing professional development.

7.6 Professionalism, Ethical and Legal Issues

1. Demonstrate familiarity and compliance with the principles of professional behavior as outlined by the Health Professions Council of Zambia and other similar bodies.
2. Exhibit behaviors which are consistent with the guiding ethical principles of medical care, including altruism, respect for and dignity of patients, respect for privacy and confidentiality, autonomy, informed consent, and a patient's right to decline treatment or participation in research or teaching activities.
3. Demonstrate compassion, integrity and respect for others and accountability to patients, society, and the profession.
4. Exhibit sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, socioeconomic status, and disability.
5. Act with honesty, empathy and sensitivity by promptly informing patients or their families in the case of a medical error.
6. Recognize one's own limitations and be open to constructive feedback and be willing to seek advice from colleagues and consultants when needed in order to provide the highest level of patient care and practice medicine according to best practice guidelines.

7.7 Organizational Planning and Service Management

1. Demonstrate an understanding of the contexts and systems in which health care is provided and apply this knowledge to improve and optimize health care delivery.
2. Effectively access available system resources and search for ways to deal with bureaucracy and resource limitations in order to provide the highest level of and most cost-effective patient care.
3. Work effectively within a multi-disciplinary team to develop an optimal care plan for patients and enhance patient safety.
4. Exhibit familiarity with the roles of other healthcare providers (e.g. social workers, mental health providers, clinical officers, nurses, environmental health technicians, pharmacists, laboratory personnel, etc.) and learn how to interact and advocate effectively with members of these groups in order to optimize patient care.
5. Engage in the development and implementation of quality improvement programs in the clinical practice setting.

8. ADMISSION CRITERIA TO THE SPECIALTY TRAINING PROGRAMME IN NEUROLOGY

Applicants to the STP NR 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 license issued by the Health Professions Council of Zambia. Other Ministry of Health policies and directives, for example, completion of rural posting, may apply. In addition candidates who have completed a minimum of 2 years of training in either MMed Pediatrics or MMed Internal Medicine will be considered for continuing the remaining part of their training as neurologists.

9. CURRICULUM DESIGN/MODEL OF THE SPECIALTY TRAINING PROGRAMME IN NEUROLOGY

The STP NR Curriculum is a work and competence-based professional training situated in an accredited training facility managed by specialists in Neurology with oversight by the Zambia College of Medicine and Surgery (ZACOMS) working through ZACOPH. 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 NR 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 NR 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 Register in Neurology.

10. PROGRAMME STRUCTURE

10.1 Duration of Programme

The STP NR is a four year programme for direct entrants who will complete the first two years of their training under either the STP IMED or STP PED. The last two years will then be spent specializing in Neurology. Focused Neurology training therefore shall cover a period of 2 years which will be entirely devoted to Neurology training.

Trainees who enter the STP NR training after having successfully completed either Internal medicine or Paediatrics and Child Health training will need to complete the last two years of training under STP NR to qualify as Neurologists. The trainees who enter the programme already with qualifications in either Internal medicine or Paediatrics and Child Health will complete 18 months of their STP NR training in the area of their specialization and will do the last 6 months in the other area. Therefore a trainee who on entry for example already possess an Internal Medicine qualification will need to do Adult Neurology training for 18 months and spend 6 months of their training in Paediatric Neurology to qualify as an Adult Neurologist. Whereas those trainees who possess qualifications in Paediatrics and Child Health will need to complete 18 months of Paediatric Neurology training and 6 months of Adult Neurology training to qualify as Paediatric Neurologists.

The didactic curriculum will be identical for both adult and pediatric trainees and will cover the essential topics in both Adult and Paediatric Neurology. However, clinical training will be weighted to either Adult or Paediatric Neurology depending on the specialization bias of a trainee.

10.2 Delivery/ Teaching Methods in the Specialty Training Programme In Neurology

The STP NR 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, post-mortem, and on-call duties), field and community based learning, and ICT supported learning experiences. Students will be required to participate in these and a variety of educational activities that include as outlined above lectures, journal clubs, seminars, and conferences.

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.

10.3 Clinical Rotations

Rotations for both adult and pediatric trainees will include psychiatry, neuroradiology, and neuropathology and rotations at the neurology ambulatory clinic and a rural hospital. Trainees will be encouraged to participate in education of non-neurologist healthcare providers during their rural rotations in order to provide basic training in the evaluation and treatment of the most common neurological disorders. Trainees will work very closely with other medical and surgical departments throughout their neurology training in order to optimize treatment of patients with neurological concerns across all departments.

For the bulk of their two years of STP training, trainees will be attached to an adult or pediatric neurology consult service in the Department of Internal Medicine and/or the Department of Pediatrics. The case mix will include adult and pediatric patients, medical patients, surgical patients, ICU patients, and gynecologic and obstetric patients. Trainees will have a weekly continuity ambulatory clinic where they will see patients with neurological diseases.

10.4 Student Assessment

The student's performance will be assessed through tests, presentations, vivas, and observed clinical examinations as part of continuous assessment. 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 of Attainment of Competence in an Academic Subject

Status & Level	Description of Competence Features	% Range
Outright Fail [D]	<ul style="list-style-type: none"> • 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+]	<ul style="list-style-type: none"> • 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]	<ul style="list-style-type: none"> • 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]	<p>All of above in level 3 and:</p> <ul style="list-style-type: none"> • 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]	<p>All of the above in level 4 and:</p> <ul style="list-style-type: none"> • Displays masterly of complex and specialised areas of knowledge, skills and attitudes in a broad range of topics of the subject. 	75% & Above

11. COURSE OUTLINE

Neurology Training Year 1:

- NEU 8010 Introduction to Neurosciences and Neuroanatomy
- NEU 8020 Introduction to Clinical Neurology
- NEU 8030 Principles and Practice of Neurology

Neurology Training Year 2:

- NEU 8040 Principles and Practice of Neurology

12. CURRICULUM MAP

YEAR	COURSE
Neurology Training Year 1	1.) Introduction to Neurosciences and Neuroanatomy (NEU 8010) (<i>1st 6 months</i>) 2.) Introduction to Clinical Neurology (NEU 8020) (<i>1st 6 months</i>) 3.) Principles and Practice of Neurology (NEU 8030) (<i>2nd 6 months</i>)
Neurology Training Year 2	1.) Principles and Practice of Neurology (NEU 8040)

Overview of STP in Adult Neurology

	YEAR 1 NRO 1018	YEAR 2 NRO 2018	ARCP
Continuity Clinic	Adult Neurology Ambulatory Clinic		
Clinical Rotations	Adult Neuro Consult Pediatric Neuro Consult Neuropath Neuroradiology	Adult Neuro Consult Pediatric Neuro Consult Psychiatry Rural Rotation	
Didactics/Weekly Meetings	Neurology Case Conference Neurology Journal Club Neurology Core Curriculum Lectures		

Overview of STP in Pediatric Neurology

	YEAR 1 NRO 1018	YEAR 2 NRO 2018	ARCP
Continuity Clinic	Pediatric Neurology Ambulatory Clinic		
Clinical Rotations	Pediatric Neuro Consult Adult Neuro Consult Neuropath Neuroradiology	Pediatric Neuro Consult Adult Neuro Consult Psychiatry Rural Rotation	
Didactics/Weekly Meetings	Neurology Case Conference Neurology Journal Club Neurology Core Curriculum Lectures		

13. PROGRAMME EVALUATION

The programme shall be evaluated every two (2) years.

14. COURSE DESCRIPTION AND CONTENT

COURSE CODE: NEU 8010

COURSE TITLE: INTRODUCTION TO NEUROSCIENCE AND NEUROANATOMY

RATIONALE

The first-year course NEU 8010 will take place during the first six months of the academic year and will review the basics of neuroscience, including neurophysiology and neuronal cell and molecular biology, and provide an overview of neuroanatomy from a systems approach.

COURSE AIM

To review basic neuroscience and neuroanatomy relevant to the practice of internal medicine.

COURSE OBJECTIVES

At the end of this course, the trainee shall be able to:

1. Demonstrate broad-based knowledge and understanding of basic neuroscience and its relevance to the field of neurology.
2. Demonstrate broad-based knowledge and understanding of systems-based neuroanatomy and its relevance to the clinical practice of neurology.
3. Describe the dysfunction expected at a cellular level for a given pathologic process involving the nervous system.
4. Localize a pathologic lesion to a particular portion of the nervous system based on a description of the abnormalities it causes.

COURSE CONTENT

1. Cellular Neuroanatomy - neurons, glia, membrane structure and function
2. Neurophysiology - resting potential, action potential, synapatic transmission, neurotransmission, neurotransmitter receptors, neuronal signals, and inhibition.
3. Neurogenetics - mechanisms of genetic neurologic disease, common neurogenetic diseases, neurodegeneration.
4. Neuropharmacology - Molecular, cellular, behavioral effects, monitoring, drug reactions, drug interactions and criteria for selecting neuropsychiatric medications.
5. Neuroanatomy - development of the nervous system, organization of the vertebrate brain, vision and the retina, hearing, olfaction, cortex, thalamus, limbic system, basal ganglia, motor system, somatosensory system, cranial nerves, brainstem, cerebellum, spinal cord, peripheral nervous system.
6. Functional Neuroanatomy - learning and memory, attention, motivation, emotion, social behavior, sleep.

TEACHING METHODS

- Lectures
- Journal clubs

ASSESSMENT METHODS

- Continuous assessment tests 40%
- Written Examination 60%

PRESCRIBED READINGS

1. Bear MF, Connors B, Pardiso M. Neuroscience: Exploring the Brain. 3rd edition. Lippincott-Raven Publishers, 2007. ISBN-13: 978-0781760034.
2. Hendelman, Walter. Atlas of Functional Neuroanatomy. 3rd edition. CRC Press, 2016, ISBN-13: 978-1466585348.

RECOMMENDED READINGS

1. Blumenfeld H. Neuroanatomy Through Clinical Cases. 2nd edition. Sinauer Associates, Inc., 2011. ISBN-13: 978-0878936137.
2. Siegel A, Sapru HN. Essential Neuroscience. Lippincott Williams & Wilkins. 2006. ISBN-13: 978-0781783835.
3. Watson C, Kirkcaldie M, Paxinos G. The Brain: An Introduction to Functional Neuroanatomy. Elsevier, 2010. ISBN 13: 978-0123738899.

COURSE CODE: NEU 8020

COURSE TITLE: INTRODUCTION TO CLINICAL NEUROLOGY

RATIONALE

This first-year course is largely a clinical course which will consist of neurology consults with some didactic lectures. The course will introduce trainees to the neurological examination and localization and basic management of common adult and pediatric neurological conditions. The course will take place during the first six months of the academic year.

COURSE AIM

The course aims to introduce principles and practice of neurologic diseases and develop a clinical approach to evaluating patients with neurological symptoms.

COURSE OBJECTIVES

Knowledge:

At the end of the course, the trainee shall be able to:

1. Synthesize information from a clinical history and a neurological examination in order to determine neurological localization of a pathologic process.
2. Understand the assessment and management of common neurological emergencies as they present in adults.
3. Understand the assessment and management of common neurological emergencies as they present in pediatric patients.
4. Describe the indications for routine neuroimaging and neurophysiologic testing as well as their limitations.
5. Understand how to interpret the results of routine neuroimaging and neurophysiologic testing.
6. Understand the most common neurological processes that affect different portions of the nervous system, including the cortex, brainstem, cranial nerves, spinal cord, spinal roots, peripheral nerves, neuromuscular junction and muscles.
7. Describe mechanisms of action and adverse events as well as appropriate use and management of commonly used medications to treat neurological disease in a variety of clinical settings.

Skills:

At the end of the course, trainee shall be able to:

1. Perform a complete history including chief complaint, history of present illness, review of systems, past medical history, social history, family history, list of current medications, and allergy history with particular attention to aspects related to neurologic diseases.
2. Perform a thorough medical and neurological examination including pertinent parts of the ophthalmologic and musculoskeletal examinations.
3. Generate a differential diagnosis and unique management and treatment plan for each encounter.

4. Perform literature searches in order to gather information on the most up-to-date treatment and management of neurologic diseases.
5. Perform lumbar punctures independently and know how to manage common complications from this procedure.
6. Practice judicious use of ordering appropriate diagnostic laboratory tests to narrow the differential diagnosis and to evaluate a specific syndrome.
7. Write consultation notes which are clear, concise, summarize pertinent aspects of the patient's clinical presentation and neurological examination findings, and clearly articulate recommendations for further work-up and management of the patient's neurological problems as well as the rationale behind these recommendations.

Behaviors:

At the end of this course, the trainee shall be able to:

1. Demonstrate respect, compassion and integrity in their professional behavior.
2. Place patient safety and care above all competing considerations at all times.
3. Approach patients and their families with a friendly, interested and respectful demeanor.
4. Demonstrate sensitivity and responsiveness to patients' culture, age, gender, disabilities, religion and other parameters of human diversity.
5. Operate with respect for patient confidentiality at all times.
6. Work closely and respectfully with the primary physicians caring for the patient in order to provide diagnostic and management input for a patient's neurological condition.
7. Work effectively and respectfully within a multi-disciplinary team to provide the highest level of patient care.

COURSE CONTENT

1. Neurological Examination and Localization - mental status and cognitive examination, language examination.

2. Cranial nerve examination - motor examination, reflex examination, sensory examination, coordination examination, gait examination.
3. Approach to Neurological Emergencies - ischemic stroke, hemorrhagic stroke, subarachnoid hemorrhage, subdural and epidural hemorrhage, meningitis, encephalitis, increased intracranial pressure, herniation syndromes, acute inflammatory demyelinating polyneuropathy, spinal cord trauma, cauda equina syndrome, acute paralysis, myasthenic crisis, status epilepticus, coma, special considerations in the pediatric population.
4. Approach to Common Neurologic Presentations - altered mental status, seizures, gait disturbance and falls, vision loss, dizziness/vertigo, headache, back pain, numbness and paresthesia's, movement disorders, weakness.

TEACHING METHODS

- One-on-one precepting
- Didactic lectures given by faculty
- Case presentations in clinical teaching rounds
- Journal club

ASSESSMENT METHODS

- Continuous assessment tests 40%
- Final Examination 60%

PRESCRIBED READINGS

1. Biller J. Practical Neurology. 4th edition. Lippincott Williams & Wilkins, 2012. ISBN-13: 978-1451142631.
2. Pina-Garzam JE. Fenichel's Clinical Pediatric Neurology: A Signs and Symptoms Approach. Expert Consult, 2013. ISBN-13: 978-1455723768.

RECOMMENDED READINGS

1. Brust, JCM. Current Diagnosis and Treatment Neurology. 2nd edition. McGraw-Hill Education, 2011. ISBN-13: 978-0071701181.

2. Gelb, DJ. Introduction to Clinical Neurology. 5th edition. Oxford University Press, 2016. ISBN-13: 978-0190467197.
3. Daroff RB, Jankovic J, Mazziotta JC, Pomeroy SL. Bradley's Neurology in Clinical Practice. 7th edition. Elsevier, 2015. ISBN-13: 978-0323287838.

COURSE CODE: NEU 8030

COURSE TITLE: INTRODUCTION TO PRINCIPLES AND PRACTICE OF NEUROLOGY

RATIONALE

NEU 8030 is largely a clinical course which will consist of neurology consults with some didactic lectures. The course will introduce trainees to the practice of neurology. It will take place during the second six months of the academic year in the first year of neurology training.

COURSE AIM

To introduce principles and practice of neurology and the concept of neurological consultations.

COURSE OBJECTIVES

Knowledge:

At the end of the course, the trainee shall be able to:

1. Synthesize information from a clinical history and neurological examination in order to develop a prioritized differential diagnosis with both common and uncommon neurologic disorders.
2. Understand the assessment and management of acute and chronic neurological conditions as they present in adults.
3. Understand the assessment and management of acute and chronic neurological emergencies as they present in pediatric patients.
4. Understand the appropriate use and limitations of routine neuroimaging and neurophysiologic testing, including CTs, MRIs, EEG and EMG/NCS in order to give

advice on the repertoire of diagnostic tests available at routine and/or reference facilities and be able to interpret this data in the context of clinical information.

5. Understand the common and uncommon neurological processes that affect different portions of the nervous system, including the cortex, brainstem, cranial nerves, spinal cord, spinal roots, peripheral nerves, neuromuscular junction and muscles.
6. Describe mechanisms of action and adverse events as well as appropriate use and management of commonly used medications to treat neurological disease in a variety of clinical settings.
7. Understand the evaluation and workup of common neurological conditions which present in the ambulatory setting.

Skills:

At the end of the course, trainee shall be able to:

1. Perform a complete history including chief complaint, history of present illness, review of systems, past medical history, social history, family history, list of current medications, and allergy history with particular attention to aspects related to neurologic diseases.
2. Perform a thorough medical and neurological examination advanced neurological examination maneuvers to identify subtle exam findings which can influence the differential diagnosis and help to refine neurological localization.
3. Generate a differential diagnosis and unique management and treatment plan for each encounter including both common and uncommon neurological conditions.
4. Perform literature searches in order to gather information on the most up-to-date treatment and management of neurologic diseases.
5. Perform lumbar punctures independently and know how to manage common complications from this procedure.
6. Practice judicious use of ordering appropriate diagnostic laboratory tests to narrow the differential diagnosis and to evaluate a specific syndrome.
7. Write consultation notes which are clear, concise, summarize pertinent aspects of the patient's clinical presentation and neurological examination findings, and

clearly articulate recommendations for further work-up and management of the patient's neurological problems as well as the rationale behind these recommendations.

Behaviors:

At the end of this course, the trainee shall be able to:

1. Demonstrate respect, compassion and integrity in their professional behavior.
2. Place patient safety and care above all competing considerations at all times.
3. Approach patients and their families with a friendly, interested and respectful demeanor.
4. Demonstrate sensitivity and responsiveness to patients' culture, age, gender, disabilities, religion and other parameters of human diversity.
5. Operate with respect for patient confidentiality at all times.
6. Work closely and respectfully with the primary physicians caring for the patient in order to provide diagnostic and management input for a patient's neurological condition.
7. Work effectively and respectfully within a multi-disciplinary team to provide the highest level of patient care.

COURSE CONTENT

This course will cover the epidemiology, pathophysiology, diagnosis and management of the following conditions:

1. Cerebrovascular Disease - ischemic stroke, hemorrhagic stroke, intracranial aneurysms, subarachnoid hemorrhage, central nervous system vasculitis, spinal cord vascular disease, and pediatric stroke.
2. Neuro-oncology – primary nervous system tumors of adults, primary nervous system tumors of pediatric patients, metastatic disease of the nervous system, and paraneoplastic disorders of the nervous system.
3. Neurologic Trauma – traumatic brain injury, spinal cord trauma, and peripheral nerve trauma.

4. Infectious Diseases of the Nervous System – neurological complications of HIV infection, viral infections, bacterial infections, fungal infections, and prion diseases.
5. Demyelinating Diseases – multiple sclerosis, neuromyelitis optica, optic neuritis, clinically isolated syndrome, and transverse myelitis.
6. Encephalopathies – anoxic-ischemic encephalopathy, toxic encephalopathies, and metabolic encephalopathies.
7. Pediatric Neurology – developmental disorders of the nervous system, developmental disabilities, inborn errors of metabolism, and mitochondrial disorders.
8. Epilepsy – pediatric epilepsy syndromes, primary generalized epilepsies, primary focal epilepsies, secondary epilepsies, and status epilepticus.
9. Headache – migraines, tension headaches, cluster headaches, other primary headaches and secondary headaches.
10. Motor Neuron Diseases – amyotrophic lateral sclerosis, primary lateral sclerosis, progressive bulbar palsy, progressive muscular atrophy, spinal muscular atrophy, poliomyelitis, post-polio syndrome.
11. Peripheral Nervous System Diseases – Charcot-Marie-Tooth, acquired demyelinating peripheral neuropathies, acquired axonal peripheral neuropathies, acute inflammatory demyelinating polyneuropathy, chronic inflammatory demyelinating polyneuropathy, Miller-Fisher syndrome and other AIDP variants, vasculitis neuropathies, compression neuropathies, neuronopathies, polyradiculopathies, and plexopathies.
12. Neuromuscular Junction Disorders – myasthenia gravis, neonatal myasthenia gravis, congenital myasthenia gravis, Lambert Eaton syndrome, neuromyotonia, and botulism.
13. Myopathies – polymyositis, dermatomyositis, inclusion body myositis, other inflammatory myopathies, metabolic myopathies, and toxic myopathies.

TEACHING METHODS

- One-on-one precepting
- Didactic lectures given by faculty

- Case presentations in clinical teaching rounds
- Case conferences, i.e. clinical vignette presentations at neurology conference
- Journal club

ASSESSMENT METHODS

- Continuous assessment (40%)
- Final Examination (60%)

PRESCRIBED READINGS

1. Ropper A, Samuels M, Klein J. Adams and Victor's Principles of Neurology. 10th edition. McGraw Hill Professional, 2014. ISBN-13: 978-0071794794.
2. Swaiman KF, Ashwal S, Ferriero DM, Schor NF. Swaiman's Pediatric Neurology: Principles and Practice. 7th edition. Saunders, 2012. ISBN-13: 978-1437704358.

RECOMMENDED READINGS

1. Biller J. Practical Neurology. 4th edition. Lippincott Williams & Wilkins, 2012. ISBN-13: 978-1451142631.
2. Daroff RB, Jankovic J, Mazziotta JC, Pomeroy SL. Bradley's Neurology in Clinical Practice. 7th edition. Elsevier, 2015. ISBN-13: 978-032387838.
3. Sims K, Peters J, Musolino P, Elibol MZ. Handbook of Pediatric Neurology. Lippincott Williams & Wilkins, 2013. ISBN-13: 978-1451175486.

COURSE CODE: NEU 8031

COURSE TITLE: NEURORADIOLOGY ROTATION

RATIONALE

Trainees will spend one month doing a rotation in neuroradiology. During this month, trainees will rotate through computed tomography (CT) and magnetic resonance imaging (MRI) units. The rotation will include training in interpreting CTs and MRIs of the brain and spine in order to generate a list of the most likely etiologies of visualized pathologies.

COURSE AIM

The goal of this rotation is to train neurologists who are knowledgeable in the interpretation of neuroimaging studies and develop skills that will help them function as neurology consultants and enhance the links between radiologists and clinicians.

COURSE OBJECTIVES

Knowledge:

At the end of this rotation, the trainee shall be able to:

1. Describe the appearance of normal anatomy on CT scans and on different sequences Of MRI scans.
2. Describe the appearance of blood, calcification, and edema on CT scans and on different sequences of MRI.
3. Know the indications for ordering a CT versus an MRI and when to order different vascular imaging techniques.
4. Generate a list of the most likely etiologies of pediatric and adult pathology based on its neuroimaging characteristics.
5. Understand how imaging characteristics of ischemia and blood vary with time.

Skills:

1. At the end of this rotation, the trainee shall be able to:
2. Develop good communication skills to facilitate links between radiology personnel and clinicians.
3. Integrate neuroimaging data with clinical information.
4. Make recommendations for further imaging studies based on clinical information.
5. Demonstrate how to read CT and MRI scans.
6. Present neuroimaging data using oral and written techniques.

Behavior:

At the end of this rotation, the trainee shall be able to:

1. Act with respect towards all team members irrespective of gender, race, religion or position.

2. Value the opinion of all team members.
3. Participate constructively in groups and work independently.
4. Be teachable.

TEACHING METHODS

- Direct observation of interpreting neuroimaging studies
- Didactic lectures
- Case-based discussions
- Self-study

ASSESSMENT METHODS

- Oral examination (25%)
- Written examination (50%)
- End of rotation evaluation by supervisors (25%)

PRESCRIBED READINGS

1. Yousem DM, Zimmerman RD, Grossman RI. *Neuroradiology: The Requisites*. 3rd edition. Mosby, 2010. ISBN-13: 978-0323045216.
2. Small J, Schaefer PW. *Neuroradiology: Key Differential Diagnoses and Clinical Questions: Expert Consult*. Elsevier Saunders, 2013. ISBN-13: 978-1437717211.

RECOMMENDED READINGS

1. O'Brien WT. *Top 3 Differentials in Neuroradiology*. 1st edition. Thieme, 2015. ISBN-13: 978-1604067231.
2. Ho ML, Eisenberg RL. *Neuroradiology Signs*. 1st edition. McGraw-Hill Education, 2014. ISBN-13: 978-0071804325.
3. do Amaral LLF, Bag AK, Goncalves FG, Hanagandi PB, Bryan-Parker S. *Advanced Neuroradiology Cases: Challenge Your Knowledge*. 1st edition. Cambridge University Press, 2017. ISBN-13: 978-1107088712.

COURSE CODE: NEU 8032

COURSE TITLE: NEUROPATHOLOGY ROTATION

RATIONALE

Trainees will spend one month doing a rotation in neuropathology. During this month, trainees will rotate through surgical pathology and autopsy. The rotation will include training in identifying brain tumors, neurodegenerative diseases, and other primary neurologic pathologies.

COURSE AIM

The goal of this rotation is to train neurologists who are knowledgeable in the interpretation of neuropathologic studies and develop skills that will help them function as neurology consultants and enhance the links between pathologists and clinicians.

COURSE OBJECTIVES

Knowledge:

At the end of this rotation, the trainee shall be able to:

1. Describe the indications for and appearance of standard pathologic stains used to stain neuropathologic specimens.
2. Describe the appearance of normal anatomy on pathologic specimens, including the appearance of cortex, white matter, deep gray matter, and brainstem sections.
3. Describe the normal appearance of neurons, oligodendrocytes, and astrocytes.
4. Describe the normal appearance of peripheral nerve sections and muscles on biopsy.
5. Describe the gross and microscopic appearance of common adult and pediatric brain tumors, neurodegenerative diseases, ischemia, hemorrhage, demyelinating diseases, and central nervous system infections.
6. Describe the microscopic features of neuropathic and myopathic processes on nerve and muscle biopsies.
7. Generate a list of the most likely etiologies of pediatric and adult pathology based on its gross and microscopic pathologic characteristics.

Skills:

At the end of this rotation, the trainee shall be able to:

1. Develop good communication skills to facilitate links between pathology personnel and clinicians.
2. Integrate neuropathologic data with clinical information.
3. Make recommendations for further pathologic studies based on clinical information.
4. Demonstrate how to read and interpret microscopic findings on pathologic specimens.
5. Present neuropathologic data using oral and written techniques.

Behavior:

1. At the end of this rotation, the trainee shall be able to:
2. Act with respect towards all team members irrespective of gender, race, religion or position.
3. Value the opinion of all team members.
4. Participate constructively in groups and work independently.
5. Be teachable.

TEACHING METHODS

- Direct observation of interpreting gross and microscopic neuropathologic studies
- Didactic lectures
- Case-based discussions
- Self-study

ASSESSMENT METHODS

- Oral examination (25%)
- Written examination (50%)
- End of rotation evaluation by supervisors (25%)

PRESCRIBED READINGS

1. Nicoll JAR, Bone I, Graham D. Adams & Graham's Introduction to Neuropathology. 3rd edition. CRC Press, 2006. ISBN-13: 978-0340811979.
2. Troncoso JC, Rubio A, Fowler DR. Essential Forensic Neuropathology. 1st edition. Lippincott Williams & Wilkins, 2009. ISBN-13: 978-0781778695.

RECOMMENDED READINGS

1. Kleinschmidt-DeMasters BK, Tihan T, Rodriguez F. Diagnostic Pathology: Neuropathology. 2nd edition. Elsevier, 2016. ISBN-13: 978-0323445926.
2. Love S, Perry A, Ironside J, Budka H. Greenfield's Neuropathology. 9th edition. CRC Press, 2015. ISBN-13: 978-1498721288.
3. Ellison D, Love S, Chimelli LMC, Harding B, Lowe JS, Vinters HV, Brandner S, Young WH. Neuropathology: A Reference Text of CNS Pathology. 3rd edition. Mosby, 2013. ISBN-13: 978-0723435150.

COURSE CODE: NEU 8035

COURSE TITLE: NEUROLOGY AMBULATORY CLINIC ROTATION

RATIONALE:

This rotation will consist of a longitudinal continuity clinic as well as two months of daily ambulatory clinics as follows. The continuity clinic will consist of a single continuity clinic consisting of one half-day of clinic weekly for 2 years. Adult neurology trainees will complete adult neurology clinics while pediatric neurology trainees will complete pediatric neurology clinics. Each trainee will have a half day of outpatient neurology clinic each week. This clinic will serve as a continuity clinic for the 2 years of neurology training. During the continuity clinic, there will be at least 12 months of direct supervision of each trainee. The patient population will include general neurology consults that can be managed on an outpatient basis.

The two months of daily ambulatory clinics will consist of one month of daily neurology ambulatory clinics during year 1 and one additional month during year 2. Adult trainees will attend pediatric neurology ambulatory clinics, and pediatric trainees will attend adult neurology ambulatory clinics during these rotations. In addition, this rotation will consist of at least 12 months of direct supervision, 8-10% women's health, and minimal interruptions during clinic time (i.e. protected clinic time) free from other clinical duties except for emergencies.

COURSE AIM

The aim of this course is to provide an introduction to the evaluation and management of outpatient neurological conditions.

ROTATION OBJECTIVES

Knowledge:

At the end of the training, the trainee shall be able to:

1. Be familiar with common presentations of adult and pediatric neurologic disease appropriate for evaluation in an ambulatory setting
2. Understand the principles of outpatient workup and management of neurologic diseases
3. Be conversant with treatment guidelines for common neurologic disorders

Skills:

At the end of the training, the trainee shall be able to:

1. Demonstrate how to perform a lumbar puncture
2. Demonstrate how to perform an EEG
3. Demonstrate how to perform an EMG/NCS
4. Develop time-management skills and efficiency required in a busy ambulatory clinic setting

Behaviors:

At the end of the training, the trainee shall be able to:

1. Act as a team player.
2. Respect the other members of the team.
3. Demonstrate respect and compassion for clinic patients and their families.

TEACHING METHODS

- One-on-one precepting
- Case presentations in clinical teaching rounds
- Self-study

ASSESSMENT METHODS

- Oral examination (25%)
- Written examination (50%)
- End of rotation evaluation by clinical preceptors (25%)

PRESCRIBED READINGS

1. Samuels MA, Feske SK. Office Practice of Neurology. 2nd edition. Churchill Livingstone, 2003. ISBN-13: 978-0443065576.
2. Aminoff MJ, Greenberg DA, Simon RP. Clinical Neurology. 9th edition. McGraw-Hill Education, 2015. ISBN-13: 978-0071841429.

RECOMMENDED READINGS

1. Weber CG. Clinical Neurology: The Clinical Medicine Series Book 18. 17th edition. Pacific Primary Care, 2014. ASIN: B004XN4GVO.
2. Lauren R. Foundations for Clinical Neurology. Oxford University Press, 2017. ISBN-13: 978-0190607166.
3. Howard J, Singh A. Neurology Image-Based Clinical Review. 1st edition. Demos Medical, 2016. ISBN-13: 978-1620701034.

COURSE CODE: NEU 8040

COURSE TITLE: PRINCIPLES AND PRACTICE OF NEUROLOGY

RATIONALE:

NEU 8040 will build on NEU 8030 and solidify knowledge of neurologic diseases. It will take place for the duration of the academic year during the second year of neurology training.

COURSE AIM

The aim of this course is to consolidate the principles and practice of clinical neurology and to consolidate the concept of neurology consultation

COURSE OBJECTIVES

Knowledge:

At the end of this course, trainees shall be able to:

1. Know how to assess and manage individuals with neurologic diseases.
2. Understand pharmacology of medications used to treat neurologic disease and demonstrate their appropriate use in the inpatient and ambulatory clinical setting.
3. Understand the appropriate use and limitations of common neuroimaging and neurophysiologic tests in order to give advice on the repertoire of diagnostic tests available at routine and/or reference facilities and be able to interpret this data in the context of clinical information.
4. Know the utility, sensitivities and specificities of major diagnostic tests used in diagnosing neurologic disease.
5. Understand the assessment and management of acute and chronic neurological conditions as they present in adults and pediatric patients.
6. Understand the common and uncommon neurological processes that affect different portions of the nervous system, including the cortex, brainstem, cranial nerves, spinal cord, spinal roots, peripheral nerves, neuromuscular junction and muscles.

7. Understand the epidemiology, clinical course, manifestations, diagnosis, treatment and prevention of neurologic disorders which affect all parts of the nervous system.
8. Describe mechanisms of action and adverse events as well as appropriate use and management of commonly used medications to treat neurological disease in a variety of clinical settings.
9. Exhibit mastery of knowledge of neurologic diseases and use this knowledge to demonstrate that they are becoming teachers in the discipline of neurology.

Skills:

At the end of the course, the trainee shall be able to:

1. Perform a complete history including chief complaint, history of present illness, review of systems, past medical history, social history, family history, list of current medications, and allergy history with particular attention to aspects related to neurologic diseases.
2. Perform a thorough medical and neurological examination advanced neurological examination maneuvers to identify subtle exam findings which can influence the differential diagnosis and help to refine neurological localization.
3. Generate a differential diagnosis and unique management and treatment plan for each encounter including both common and uncommon neurological conditions.
4. Perform literature searches in order to gather information on the most up-to-date treatment and management of neurologic diseases.
5. Perform lumbar punctures, electroencephalograms (EEGs), and electromyography and nerve conduction studies (EMG/NCS) independently and know how to manage common complications from these procedures.
6. Practice judicious use of ordering appropriate diagnostic laboratory tests to narrow the differential diagnosis and to evaluate a specific syndrome.
7. Write consultation notes which are clear, concise, summarize pertinent aspects of the patient's clinical presentation and neurological examination findings, and clearly articulate recommendations for further work-up and management of the patient's neurological problems as well as the rationale behind these recommendations.

8. Act as teachers and educational mentors to medical students, interns, and neurology trainees, making optimal use of “teaching pearls” and “teachable moments,” instructing neurology trainees in the proper content and format of concise and organized patient presentations and proper performance of the neurological examination; helping students and interns to develop patient care plans; and providing neurology trainees with timely and constructive evaluations and feedback.

Behaviors:

1. At the end of this course, the trainee shall be able to:
2. Demonstrate respect, compassion and integrity in their professional behavior.
3. Place patient safety and care above all competing considerations at all times.
4. Approach patients and their families with a friendly, interested and respectful demeanor.
5. Demonstrate sensitivity and responsiveness to patients’ culture, age, gender, disabilities, religion and other parameters of human diversity.
6. Operate with respect for patient confidentiality at all times.
7. Work closely and respectfully with the primary physicians caring for the patient in order to provide diagnostic and management input for a patient’s neurological condition.
8. Work effectively and respectfully within a multi-disciplinary team to provide the highest level of patient care.
9. Clearly and openly identify and repudiate statements of prejudice made by professional colleagues and will not permit their actions as physicians to be influenced by such prejudice.
10. Cultivate the ability to identify and articulate their own cultural values and preferences, comforts and discomforts; and to be self-aware in attempting to deliver fair and optimal medical care to all patients – including recognizing their obligation to transfer care to another physician should the occasion arise in which personal values or biases interfere with such care delivery to any patient or family.

COURSE CONTENT

This course will cover the epidemiology, pathophysiology, diagnosis and management of the following conditions:

1. Dementias – Alzheimer’s disease, Lewy body dementia, frontotemporal dementia, normal pressure hydrocephalus, primary progressive aphasia and other dementia disorders.
2. Movement Disorders – Parkinson’s Disease, Parkinson’s Plus syndromes, dystonias, essential tremor, and other hyperkinetic movement disorders.
3. Cerebellar Disorders – spinocerebellar ataxias and other ataxias.
4. Autonomic Nervous System Disorders – autonomic ganglionopathies, postural tachycardic syndrome, centrally-mediated orthostasis and syncope, and other dysautonomias.
5. Sleep Disorders – insomnias, narcolepsy, other hypersomnias, obstructive sleep apnea, centrally-mediated sleep apnea, sleep-related breathing disorders, circadian rhythm disorders, parasomnias, restless leg syndromes, periodic limb movements, and sleep movement disorders.
6. Neurologic Complications of Systemic Disease – adult systemic disease, pediatric systemic disease, neurocutaneous syndromes, and neurological problems of pregnancy.
7. Pediatric Neurology – hypoxic ischemic injury of the newborn, disorders of brain development, mitochondrial disorders, peroxisomal disorders, lysosomal disorders, glycosylation disorders, muscular dystrophies, and congenital myopathies.
8. Neurophysiologic testing: Trainees will spend time in the neurophysiologic laboratory learning how to set up and independently perform electroencephalograms (EEGs), electromyographs and nerve conduction studies (EMG/NCS).

TEACHING METHODS

- One-on-one precepting
- Didactic lectures given by faculty

- Case presentations in clinical teaching rounds
- Case conferences, i.e. clinical vignette presentations at neurology conference
- Journal club

ASSESSMENT METHODS

- Continuous assessment tests (40%)
- Examination (Written and OSCE) (60%)

PRESCRIBED READINGS

1. Ropper A, Samuels M, Klein J. Adams and Victor's Principles of Neurology. 10th edition. McGraw Hill Professional, 2014. ISBN-13: 978-0071794794.
2. Swaiman KF, Ashwal S, Ferriero DM, Schor NF. Swaiman's Pediatric Neurology: Principles and Practice. 7th edition. Saunders, 2012. ISBN-13: 978-1437704358.

RECOMMENDED READINGS

1. Biller J. Practical Neurology. 4th edition. Lippincott Williams & Wilkins, 2012. ISBN-13: 978-1451142631.
2. Daroff RB, Jankovic J, Mazziotta JC, Pomeroy SL. Bradley's Neurology in Clinical Practice. 7th edition. Elsevier, 2015. ISBN-13: 978-032387838.
3. Sims K, Peters J, Musolino P, Elibol MZ. Handbook of Pediatric Neurology. Lippincott Williams & Wilkins, 2013. ISBN-13: 978-1451175486.

COURSE CODE: NEU 8041

COURSE TITLE: PSYCHIATRY ROTATION

RATIONALE

Trainees will spend one month doing a rotation in psychiatry. During this month, trainees will rotate through clinical inpatient and ambulatory psychiatry under the supervision of a trained psychiatrist. The rotation will include training in identifying common psychiatric conditions and recognizing the overlap between neurologic and psychiatric disorders. Adult trainees will focus primarily on adult psychiatry and pediatric trainees will focus primarily on pediatric psychiatry when possible.

COURSE AIM

The goal of this rotation is to train neurologists who are knowledgeable common psychiatric and neuropsychiatric disorders and develop skills that will help them function as neurology consultants and enhance the links between psychiatrists and neurologists.

COURSE OBJECTIVES

Knowledge:

At the end of this rotation, the trainee shall be able to:

1. Describe common manifestations and recognize clinical presentations of common psychiatric conditions in pediatrics and adults including major depressive disorder, bipolar disorder, attention deficit hyperactivity disorder, and schizophrenia.
2. Describe common manifestations of neurologic conversion disorders and recognize their clinical presentations.
3. Describe and recognize common psychiatric manifestations of neurologic disease and of common neurologic manifestations of psychiatric disease in adult and pediatric populations.
4. Describe the approach to diagnosis and management of common adult and pediatric psychiatric conditions.
5. Describe the approach to diagnosis and management of common neurologic conversion disorders in adults and pediatrics.

6. Know the common indications for use of psychiatric medications, the most common adverse effects associated with these medications, and their common drug-drug interactions.

Skills:

At the end of this rotation, the trainee shall be able to:

1. Develop good communication skills to facilitate links between psychiatry and neurologists.
2. Take a complete psychiatric history including family history of psychiatric disorders, personal history of prior psychiatric disorders, and a detailed social history including social support, prior behavioral problems and educational attainment.
3. Perform a complete psychiatric mental status examination.
4. Develop a differential diagnosis for patients presenting with psychiatric and neuropsychiatric symptoms.
5. Make recommendations for further diagnostic studies based on clinical information.

Behavior:

1. At the end of this rotation, the trainee shall be able to:
2. Act with respect towards all team members irrespective of gender, race, religion or position.
3. Value the opinion of all team members.
4. Participate constructively in groups and work independently.
5. Be teachable.

TEACHING METHODS

- One-on-one precepting
- Didactic lectures given by faculty
- Case presentations in clinical teaching rounds
- Case conferences, i.e. clinical vignette presentations at neurology conference

- Journal club
- Self-study

ASSESSMENT METHODS

- Oral examination (25%)
- Written examination (50%)
- End of rotation evaluation by clinical preceptors (25%)

PRESCRIBED READINGS

1. Sadock BJ, Sadock VA. Kaplan and Sadock's Concise Textbook of Clinical Psychiatry. 3rd edition. Lippincott Williams & Wilkins, 2008. ISBN-13: 978-0781787468.
2. Arciniegas DB, Anderson CA, Filey CM. Behavioral Neurology and Neuropsychiatry. 1st edition. Cambridge, 2013. ISBN-13: 978-0521875011.

RECOMMENDED READINGS

1. Higgins ES, George MS. Neuroscience of Clinical Psychiatry: The Pathophysiology of Behavior and Mental Illness. 2nd edition. Lippincott Williams & Wilkins, 2013. ISBN-13: 978-1451101546.
2. Levy M. The Neurology and Psychiatry Work-Up: Patient Encounters. 1st edition. Lippincott Williams & Wilkins, 2012. ISBN-13: 978-0781793971.
3. Budur K. Neurology and Psychiatry: 1000 Questions to Help You Pass the Boards. 1st edition. Lippincott Williams & Wilkins, 2012. ISBN-13: 978-0781792639.

COURSE CODE: NEU 8042

COURSE TITLE: RURAL ROTATION IN NEUROLOGY

RATIONALE

This rotation will consist of a one-month rotation at a rural hospital during the trainee's fourth year. During this month, trainees will rotate at a rural hospital without other consultants and with limited access to neuroimaging and neurophysiologic testing. The rotation will include training in diagnosing and managing neurologic diseases in resource-limited facilities and educating non-specialist health care professionals in recognizing and managing common neurologic presentations. Trainees will care for both pediatric and adult patients with neurologic conditions during this rotation.

COURSE AIM

The goal of this rotation is to train neurologists who are capable of managing adult and pediatric neurologic diseases with limited diagnostic resources and develop skills that will help them function as neurology consultants and educators in any setting.

COURSE OBJECTIVES

Knowledge:

1. At the end of this rotation, the trainee shall be able to:
2. Recognize and manage adult and pediatric neurologic diseases in settings with limited diagnostic testing availability.
3. Generate an individualized treatment plan for patient care when significant uncertainty exists regarding a patient's exact diagnosis.
4. Modify recommended treatment guidelines when medication and therapeutic options are limited.
5. Demonstrate mastery of clinical neurology by teaching nurses, clinical officers, interns and medical officers how to recognize, triage, manage and treat common neurologic presentations in resource-limited facilities.

Skills:

At the end of this rotation, the trainee shall be able to:

1. Develop good communication skills with non-specialist health care providers.
2. Develop plans of care for patients presenting with neurologic conditions that are applicable to the resources and treatment options available at a given facility.
3. Effectively lead a team of non-specialist health care providers to care for patients with neurologic problems.

Behavior:

1. At the end of this rotation, the trainee shall be able to:
2. Act with respect towards all team members irrespective of gender, race, religion or position.
3. Value the opinion of all team members.
4. Participate constructively in groups and work independently.
5. Be teachable.
6. Demonstrate adaptability to the resources available at a given facility.
7. Exhibit a willingness and commitment to teaching non-specialist healthcare providers.

TEACHING METHODS

- Self-study
- Phone communication with remote clinical supervisors

ASSESSMENT METHODS

- Written case log of cases seen (25%)
- Written log of didactic lectures given (25%)
- End of rotation written summary of the experience (50%)

PRESCRIBED READINGS

1. Howland W. *Neurology in Africa*. BRIC Bergen, 2012. Free PDF available at: <http://www.uib.no/en/cih/72120/book-neurology-africa>.

2. Birbeck GL. *Where There is No Neurologist*. World Federation of Neurology, 2002. Free PDF available at: <https://www.wfneurology.org/neurology-for-non-neurologists>.

RECOMMENDED READINGS

1. Salardini A, Biller J. *The Hospital Neurology Book*. 1st edition. McGraw-Hill Education, 2016. ISBN-13: 978-0071845830.
2. Misulis KE, Murray EL. *Essentials of Hospital Neurology*. 1st edition. Oxford University Press, 2017. ISBN-13: 978-0190259419.
3. Flaherty AW, Rost NS. *The Massachusetts General Hospital Handbook of Neurology*. 2nd edition. Lippincott Williams & Wilkins, 2007. ISBN-13: 978-0781751377.

14. CASE MIX

The patients that neurology trainees will see will include the following types of consults: general neurology consults, oncology consults, infectious diseases consults, ICU consults, general internal medicine consults, orthopedic consults, neurosurgery consults, general surgery consults, obstetrical consults, pediatric consults and HIV patients on nonmedical wards. General neurology consults will include headaches, seizures, strokes, acute paralysis, altered mental status, and focal neurologic deficits in adult and/or pediatric populations. Oncology consults will include syndromes consistent with CNS infections and CNS toxicities associated with chemotherapeutic agents as well as primary tumors of the CNS. Infectious diseases consults will include meningitis, encephalitis, fungal infections, cerebral abscesses, spinal abscesses, and opportunistic infections. ICU consults will include altered mental status, unexplained weakness, coma, and non-convulsive status epilepticus. Neurosurgical consults will include seizure management and focal neurologic deficits. Obstetrical consults will include seizures, vision loss, headache, and focal neurologic deficits.

15. REFERENCES

1. Murray, C.J., et al., *Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010*. Lancet, 2012. **380**(9859): p. 2197-223.
2. Silberberg, D., et al., *Brain and other nervous system disorders across the lifespan - global challenges and opportunities*. Nature, 2015. **527**(7578): p. S151-4.
3. Wilson, L.A., *Uganda*. Pract Neurol, 2007. **7**(6): p. 416-9.
4. Bower, J.H., et al., *The burden of inpatient neurologic disease in two Ethiopian hospitals*. Neurology, 2007. **68**(5): p. 338-42.
5. UNAIDS. *Zambia*. 2014 2015 [cited 2016 January 25]; Available from: <http://www.unaids.org/en/regionscountries/countries/zambia>.
6. Centers for Disease Control. *CDC in Zambia*. 2013 October 2013 [cited 2015 January 25]; Available from: <http://www.cdc.gov/globalhealth/countries/zambia/>.
7. World Health Organization and World Federation of Neurology, *Atlas: Country Resources for Neurologic Disorders*. 2004: Geneva. p. 1-62.
8. Siddiqi, O., *Developing Neurological Care in Zambia*, B.I.D.M. Center, Editor. 2015.

16. APPENDIX: BASIC PROCEDURAL SKILLS

Some procedures may not be mandated for all trainees but opportunities to become competent in these techniques should be available during one's training.

They include:

- Lumbar puncture
- Electroencephalogram
- Electromyography/Nerve Conduction Studies
- Venepuncture and cannula insertion, including large bore and central venous cannulation
- Perform and interpret ECG
- Basic and advanced cardiorespiratory resuscitation
- Arterial blood gas sampling
- Urethral catheterization