The Residents handbook is updated as necessary to meet the program requirement and a copy is posted via internet. Residents are required to sign a form stating that they have received an updated copy at the beginning of the academic year in July before starting rotations, particularly the interns. They are responsible for reviewing all general and specific goals and objectives prior to beginning each rotation as well.
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I. Program Overview Description

A. Description of the Program

The Medical University of South Carolina (MUSC), College of Medicine, Department of Neuroscience, Division of Neurological Surgery has a long and rich history of providing outstanding clinical training for residents. The department’s seven-year Neurosurgical Residency Program has been accredited since 1956 and accepts one to two residents per year (alternating years). Previous department chairs included the distinguished neurosurgical scholars and educators, the late Dr. Phanor Perot, Dr. Christian Vera, and Dr. Steven Haines. In October 2004, Dr. Sunil Patel assumed the position of department chairman. In August 2012, Dr. Raymond Turner, IV, became the residency program director. In August 2014, Dr. Alejandro Spiotta because the associate residency program director. Under their leadership the department aims to build on existing strengths and propel the program to further excellence. The goal of the MUSC Neurosurgical Residency Program is to prepare residents to become highly skilled, compassionate, and ethical neurosurgeons, who will continue to learn new aspects of neurosurgery throughout their professional lifetimes, and who contribute to the development of neurosurgery in academic and clinical positions.

Residents in the Neurosurgical Residency Program receive extensive training in all aspects of neurosurgery, including: pediatric neurosurgery, surgical neuro-oncology, stereotactic surgery, radiosurgery, spinal surgery and instrumentation, vascular neurosurgery, and epilepsy surgery. The MUSC Neurosurgical Residency Program also draws upon faculty in other departments in the College of Medicine to provide residents excellent training in related fields, including: neurology, neuroradiology, and neuropathology. In addition, the program also requires a year-long research rotation. The academic program provides regularly scheduled conferences, lectures, seminars, and courses in the basic sciences as they apply to neurosurgery, as well as thoughtful and realistic curriculum of reading and web-based lectures designed to provide residents with a solid knowledge base essential for training in neurosurgery. Clinical and surgical experience is gained at the Medical University Hospital and through the department’s affiliated hospital, the Ralph H. Johnson Veterans Affairs Medical Center. The Ralph H. Johnson VA Medical Center is in close proximity and offers unique elements to the neurosurgical training at MUSC. Together these different experiences make neurosurgical training at MUSC uniquely excellent.

The overall goal of the Neurosurgical Residency Program at MUSC is to train highly skilled neurosurgeons that are competent to deal with a wide range of neurosurgical problems. In order to meet this goal, each resident rotates through different services within the Medical University Hospital. These services are busy and demanding, but provide the resident with ample exposure to both common and unusual neurological cases. Opportunities for participation in ongoing neurosurgical clinical or laboratory-based research projects are also provided; in-depth involvement in the particular project is encouraged.

By accomplishing our goals of comprehensive clinical neurosurgical training, basic science, clinical research training, and excellent cutting-edge neurosurgical care to patients, we hope to produce trainees who can successfully pursue careers in neurological surgery with the skills necessary to provide leadership and creativity in scientific, educational, regulatory, and leadership settings. Overall, the program is designed with graduated responsibility and supervision at each level of training. Goals and objectives for each year of residency, clinical and non-clinical will be described in detail throughout this handbook. In addition, goals and objectives specific for individual rotations, developed in consultation with the neurosurgical chiefs and educational directors for each of the affiliated hospitals.
B. Curriculum Block Schedule

### 2015-2016 MUSC Neurosurgery Block Schedule

<table>
<thead>
<tr>
<th>Resident's Name</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
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<td>NES</td>
<td>Pod 3</td>
<td>ICU</td>
<td>Trauma</td>
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<td>ICU</td>
<td>NF</td>
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<td>NES</td>
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<td>Pod 1</td>
<td>Trauma</td>
<td>Pod 3</td>
<td>Pod 2</td>
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<td>Pod 2</td>
<td>Pod 1</td>
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<td>Pod 2-Chief</td>
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C. Overall Educational Goals

The Accreditation Council for Graduate Medical Education (ACGME) via its Outcome Project has increased its emphasis on educational outcome assessment in the accreditation process. This increased emphasis is reflected in changes to Program and Institutional Requirements that require programs to:

- Identify learning objectives related to the ACGME’s general competencies
- Use increasingly more dependable methods of assessing residents’ attainment of these competency-based objectives
- Use outcome data to facilitate continuous improvement of both resident and residency program performance.

The core competencies were developed via research and a collaborative review process with broad representation. They reflect among other things, an increasing recognition of our responsibility as educators of physicians to ensure the public that we are training residents in a consistent and logical manner, to be adequately prepared to practice in a rapidly changing healthcare environment. The core competencies are meant to represent what residents should know and be able to do. Programs are expected to determine the objectives that should guide progress toward achievement of the competencies. Subsequently, outcomes assessment will be expected to follow and to assess effectiveness in meeting the objective.
The final evaluation of graduating residents is to reflect that the resident has “demonstrated sufficient professional ability to practice competently and independently”. Given the emphasis on educational outcomes assessment, it is our viewpoint that the structure of the core competencies is the best framework for achieving this landmark. Goals, objectives, assessment, and improvement can all readily be framed within the competencies.

Therefore, the overall goal of the residency program is to develop in our graduating residents a proficiency level appropriate for a new and independent practitioner in the core competencies as outlined by the ACGME.

1. **Patient Care** that is compassionate, appropriate and effective for the treatment of health problems and the promotion of health.

2. **Medical Knowledge** about the established and evolving biomedical, clinical and cognate sciences and the application of this knowledge to patient care.

3. **Practice Based Learning and Improvement** which involves investigation and evaluation of patient care, the appraisal and assimilation of scientific evidence, followed by improvement in patient care.

4. **Interpersonal and Communication Skills** resulting in effective information exchange with patients, their families and other health professionals.

5. **Professionalism** manifested through a commitment to carry out professional responsibilities, adherence to ethical principles and sensitivity to a diverse patient population.

6. **Systems Based Practice** as manifested by actions that demonstrate an awareness of and responsiveness to the larger context in system of healthcare and the ability to effectively call on system resources to provide care that is of optimum value.

Each rotation is designed to contribute to the achievement of the overall goal and therefore share the common goal. In order to direct progress toward goal achievement, general and specific objectives are identified. General Objectives are purposefully common to all rotations and listed separately. Unique aspects of each rotation are outlined and specific objectives are listed under each rotation. In order to achieve our stated goal, we have purposefully mirrored the goals and objectives of the ACGME Outcome Project. Our assessment tools are designed to demonstrate progress towards these objectives by direct linking via a common format.

**D. General Learning Objectives (All Rotations)**

*At the completion of this training program all residents will be able to demonstrate:*

1. **Patient Care**

   *Operating Room performance* as evidenced by exhibiting knowledge of anatomy, physiology and pathology of case. This is also evidenced by an understanding of mechanics and demonstration of dexterity, efficiency, thoroughness and concern for professional Operating Room atmosphere.
Caring as evidenced by compassionate, appropriate and effective care of patients for the treatment of health problems and the promotion of health

Judgment as evidence by common sense, decisiveness, ability to draw sound conclusions, willingness to admit mistakes, regard for patient’s needs & life conditions.

2. Medical Knowledge

Intellectual ability as evidenced by retention, comprehension, abstraction, discrimination and logical thinking.

Knowledge of Neurological Surgery by showing evidence of the literature, methods of management, advantages and disadvantages of alternative treatments of their own patient care appraisal and assimilation of scientific evidence and improvements in patient care.

3. Practice Based Learning and Improvement

Use of information technology to manage information as evidenced by the ability to access on-line medical info to support their own education

Resourcefulness as evidenced by management of available resources. Also by demonstrating an understanding of roles of support personnel and making maximum use of their assistance and also through demonstrating resourcefulness in obtaining information about patients.

Research aptitude demonstrated through curiosity, creativity, and the ability to evaluate and analyze data. Also demonstrated by appropriate utilization of resources and working independently.

Motivation as evidenced by exhibits active, aggressive attitude toward learning.

4. Interpersonal and Communication Skills

Communication skills as evidenced by gathering essential & accurate information about patients and working with health care professionals to provide patient focused care.

Oral communication skills as evidenced by clarity of expression, articulateness, and proper grammar. It is also evidenced by demonstrating skills that allow for effective information exchange with patients, their families and other health professionals.

Written communication skills are evidenced by observing and documenting observations accurately and in good time. Also writes progress, operative and discharge notes completely and promptly.

Relating to patients is evidenced by being interested, honest and understanding as well as by explaining clearly to the patient’s satisfaction details related to diagnosis, proposed treatment and the implications.
5. **Professionalism**

*Conference performance* as evidenced by punctuality, organization and preparation. It is also evidenced by showing knowledge of current literature & treatment.

*Work habits* as demonstrated by initiative or the amount of prodding or supervision needed. Also as demonstrated by the degree to which they accept responsibility, the quality work, and the amount of work produced.

*Relating to students* as demonstrated by accepting the role of teacher, explaining and elaborating and recognizing student’s interests and needs

*Reliability* as evidenced by acceptance of responsibility, punctuality and availability.

*Integrity* as evidenced by showing honesty and discretion and by showing accountability to patients, society and the profession, as well as a commitment to excellence and on-going professional development.

*Appearance* as evidenced by showing poise, alertness, cleanliness, and appropriateness of dress.

*Ethical principles* as evidenced by showing a commitment to provide or withhold clinical care as appropriate and being confidential with patient information, informed consent, and business practices.

*Professional promise* as evidenced by whether one would let this person treat you or your family.

*Emotional stability and stress management* as evidenced by performing in emergency situations, responding to opposition or frustration, and maintaining mood stability or control.

*Stamina* as evidenced by physical endurance, perseverance, and health.

*Duty hours* as evidenced by the E*Value duty hour log weekly or bi-weekly reports.

6. **Systems Based Practice**

*Decision making* as evidenced by making informed decisions about diagnostic-therapeutic treatment based on patient information, preferences, up-to-date scientific evidence & clinical judgment. Also evidenced by developing and carry out patient management plans and demonstrating investigatory & analytic thinking approaches to clinical situations.

*Leadership* as evidenced by the ability to elicit cooperation from nursing staff, technicians, and other healthcare workers or personnel in the discharge of their functions in patient care.

*System of health care* as evidenced by the ability to demonstrate an awareness and responsiveness to the large context and system of health care as well as by the ability to effectively call on system resources to provide care for optimal value and by advocacy for quality patient care and help patients deal with system complexities.
Concern for others is evidenced by showing sensitivity to and consideration of others, tactfulness, as well as being committed to ethical principles and sensitivity to a diverse patient population (culture, age, gender, disabilities).

II. Competency-Based Specific Goals and Objectives (Rotations and Levels)

A. Neuro-Oncology

The primary goal of the tumor rotation is preparation of the neurosurgical resident to treat adult tumors of the central nervous system. At the completion of this rotation:

Neurosurgery Intern (PGY1)

Perform a history and physical examination and report the pertinent findings in oral and written format for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, P, ICS)

Develop a preliminary plan for management, including the indications for the use of specific laboratory examinations for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, SBP)

Identify appropriate neuron-radiographic studies to initiate a complete diagnostic workup of a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, SBP)

Perform basic wound closure after surgical treatment of a patient with a known or suspected brain tumor as measured by the rotation evaluation & the surgical case evaluation. (MK, PC)

Junior Neurosurgery Resident (PGY2 and PGY3)

Perform a history and physical examination and report the pertinent findings in oral and written format for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, P, ICS)

Formulate a complete management plan for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, SBP)

Interpret and integrate neuron-radiological findings into the treatment plan for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC)

Integrate the anatomical characteristics of the tumor(s) in a patient with a known or suspected brain tumor into a surgical plan as measured by the rotation evaluation and the surgical case evaluation. (MK, PC)

List the histological and genetic characteristics of the more common tumors of the central nervous system as measured by the rotation evaluation. (MK, PC)
Communicate effectively and compassionately with the family or caregivers about the treatment plan and options for treatment as measured by the rotation evaluation. (MK, PC, P, ICS)

Discuss the anesthetic requirements for craniotomies for tumors of the adult central nervous system, such as blood loss, awake sedation, and pharmacological characteristics of various anesthetic agents measured by the rotation evaluation surgical case evaluation. (MK, PC)
Perfor craniotomies for more common tumors, such as metastasis or malignant tumors of the cortex as measured by the rotation evaluation & the surgical case evaluation. (MK, PC)

Manage postoperative complications, such as hemorrhage, infection, or hydrocephalus in a patient with a known or suspected brain tumor as measured by the rotation evaluation surgical case evaluation. (MK, PC)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Supervise management of the hospital care of the patient by lower level residents as measured by the rotation evaluation. (MK, PC, P, ICS)

Identify alternative or supplementary therapeutic options for treatment of CNS tumors, radio-therapy, radiosurgery, and chemotherapy as measured by the rotation evaluation. (MK, PC, SBP)

Plan and perform surgery for complex tumors of the central nervous system using the operative microscope and neuron-navigation as indicated as measured by the rotation evaluation and the surgical case evaluation. (MK, PC)

Recognize how the proximity of eloquent brain tissue alters the management of a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC)

Participate in the oncology conference and discuss the different instruments of radiation therapy and radio-surgery as measured by the rotation evaluation. (MK, PC, SBP)

Plan and manage tumor cases using gamma knife radio-surgery as measured by the rotation evaluation. (MK, PC)

**Chief Resident (PGY6 and PGY7)**

Communicate effectively with consulting services, including surgical planning that involves monthly specialty input regarding a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, SBP, ICS, P)

Plan long-term care and rehabilitation with relatives, caregivers, and appropriate outside agencies for a patient with a known or suspected brain tumor as measured by the rotation evaluation. (MK, PC, SBP)

Demonstrate cost effective hospital management and care as measured by the rotation evaluation. (SBP, PC)
Perform craniotomies for complex tumors of the brain and skull base, with emphasis on microsurgical techniques and preoperative endovascular embolization when indicated as measured by the rotation evaluation and the surgical case evaluation. (MK, PC)

Perform biopsies using MRI and neuro-navigation or endoscopic equipment on patients with a known or suspected brain tumor as measured by the rotation evaluation and the surgical case evaluation (MK, PC)

**B. Night Emergency Trauma**

The primary goal of the night emergency trauma rotation is preparation of the neurosurgical resident to treat emergency trauma. At the completion of this rotation:

*Neurosurgery Intern (PGY1)*

**Care for traumatic brain injured (TBI) patients**

Report the history and physical examination and imaging of a polytrauma patient with a traumatic brain injury both verbally and in written format. (MK, PC, ICS)

Differentiate central from peripheral nervous system injuries. (MK)

Define brain death and discuss methods of making such a diagnosis. (MK)

**Surgical management of blunt and penetrating trauma to the brain**

Identify the signs, symptoms, and pathophysiology of cerebral herniation syndromes. (MK)

Report the physical examination and monitoring parameters of a patient following surgery for a TBI verbally and in written format. (MK, PC, P, ICS)

**Management of the long-term surgical consequences of traumatic brain injury**

Identify the signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC)

Report the history and physical examination of a patient with a complication following traumatic brain injury. (MK, PC, ICS)

*Junior Neurosurgery Resident (PGY2 and PGY3)*

**Care for traumatic brain injured (TBI) patients**

Identify the signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC)

Report the history and physical examination of a patient with a complication following traumatic brain injury. (MK, PC)
Place and manages intracranial monitors for patients with severe traumatic brain injury. (MK, PC)

**Surgical management of blunt and penetrating trauma to the brain**

Identify signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC)

Report the history and physical examination of a patient with a complication following traumatic brain injury. (MK, PC, ICS)

**Management of the long-term surgical consequences of traumatic brain injury**

Identify the signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC)

Report the history and physical examination of a patient with a complication following traumatic brain injury. (MK, PC, ICS)

Communicate compassionately with families and patients the nature of and plan of care of a common complication following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC, P, ICS)

Surgically perform ventriculoperitoneal shunt placement for hydrocephalus. (MK, PC)

Surgically assists for reconstructive procedures following traumatic brain injury such as cranioplasty. (MK, PC)

Review their surgical outcomes through self-assessment and identifies ways to improve performance in surgery for degenerative disorders of the lumbar spine. (PBLI)

**Manages intracranial emergencies such as intracranial hemorrhage or acute stroke.**

Report the history, physical examination and findings on diagnostic imaging of a patient with common intracranial emergencies in verbal and in written format. (MK, PC)

Communicate compassionately with families and patients the nature of and plan of care for common intracranial emergencies. (MK, PC, P, ICS)

Surgically perform ventriculoperitoneal shunt revision. (MK, PC)

Surgically assist for emergency craniotomies. (MK, PC)

Review their surgical outcomes through self-assessment and identify ways to improve performance in surgery for degenerative disorders of the lumbar spine. (PBLI)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Care for traumatic brain injured (TBI) patients.
Evaluate diagnostic images in a polytrauma patient with a TBI. (MK, PC)

Formulate a medical plan for management of severe traumatic brain injury based on the history, physical examination and diagnostic images. (MK, PC)

Manage the complications of a TBI such as seizure, diabetes incipitus and CSF fistula. (MK, PC)
Communicate the prognosis of the TBI compassionately to families and patients and performs informed choice. (MK, PC, P, ICS)

Communicate with allied health professionals and consultants regarding long-term care needs and rehabilitation for patients with traumatic brain injury. (MK, PC, P, ICS)

**Surgical management of blunt and penetrating trauma to the brain**

Formulate a surgical plan for management of a traumatic brain injury based on the history, physical examination and diagnostic images. (MK, PC, SBP)

Provide informed consent to the patient and/or family regarding surgery for traumatic brain injury. (MK, PC, P, ICS)

Perform basic surgical procedures for patients with typical traumatic brain injuries (PC, MK)

Communicate compassionately with families and patients the findings at surgery following a surgical procedure for a traumatic brain injury. (MK, PC, P, ICS)

Review their surgical outcomes through self assessment and identify ways to improve performance anterior cervical surgery for degenerative disorders. (PBLI)

**Management of the long-term surgical consequences of traumatic brain injury**

Identify the signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC)

Report the history, physical examination and findings on diagnostic imaging of a patient with common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula verbally and in written format. (MK, PC, ICS)

Communicate compassionately with families and patients the nature of and plan for care of a common complication following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. (MK, PC, P, ICS)

Surgically perform basic reconstructive procedures following traumatic brain injury such as cranioplasty. (MK, PC)

Review their surgical outcomes through self-assessment and identifies ways to improve performance in surgery for degenerative disorders of the lumbar spine. (PBLI)

**Manages intracranial emergencies such as intracranial hemorrhage or acute stroke**
Report the history, physical examination and findings on diagnostic imaging of a patient with common intracranial emergencies in verbal and in written format. \textit{(MK, PC)}

Communicate compassionately with families and patients the nature of and plan of care for common intracranial emergencies. \textit{(MK, PC, P, ICS)}

Surgically perform ventriculoperitoneal shunt revision. \textit{(MK, PC)}

Surgically assist for emergency craniotomies. \textit{(MK, PC)}

Review their surgical outcomes through self-assessment and identify ways to improve performance in surgery for degenerative disorders of the lumbar spine. \textit{(PBLI)}

\textbf{Chief Resident (PGY6 and PGY7)}

\textbf{Care for traumatic brain injured (TBI) patients}

Manage polytrauma patients with severe neurological and systemic trauma. \textit{(MK, PC, SBP)}

Surgical management of blunt and penetrating trauma to the brain: \textit{(MK, PC)}

Formulate a surgical plan for management of a traumatic brain injury based on the history, physical examination and diagnostic images. \textit{(MK, PC, SPB)}

Provide informed consent to the patient and/or family regarding surgery for traumatic brain injury. \textit{(MK, PC, P, ICS)}

Perform complex surgical procedures for patients with atypical traumatic brain injuries. \textit{(MK, PC)}

Perform decompressive craniectomy for the treatment of intracranial hypertension following severe traumatic brain injury. \textit{(MK, PC)}

Communicate compassionately with families and patients the findings at surgery following a surgical procedure for a traumatic brain injury. \textit{(MK, PC, P, ICS)}

Review their surgical outcomes through self assessment and identify ways to improve performance anterior cervical surgery for degenerative disorders. \textit{(PBLI)}

\textbf{Management of the long-term surgical consequences of traumatic brain injury}

Identify the signs, symptoms, and pathophysiology of common complications following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. \textit{(MK, PC)}

Report the history, physical examination and findings on diagnostic imaging of a patient with common complications following traumatic brain injury such as seizures, hydrocephalus and CSF fistula verbally and in written format. \textit{(MK, PC, ICS)}
Communicate compassionately with families and patients the nature of and plan for care of a common complication following traumatic brain injury such as seizure, hydrocephalus and CSF fistula. *(MK, PC, P, ICS)*

Surgically perform complex reconstructive procedures following traumatic brain injury such as repair of cranial sinus disruption. *(MK, PC)*

Review their surgical outcomes through self assessment and identify ways to improve performance in surgery for degenerative disorders of the lumbar spine. *(PBLI)*

-Manages intracranial emergencies such as intracranial hemorrhage or acute stroke-

Report the history, physical examination and findings on diagnostic imaging of a patient with complex intracranial emergencies in verbal and in written format. *(MK, PC)*

Communicate compassionately with families and patients the nature of and plan of care for complex intracranial emergencies. *(MK, PC, P, ICS)*

Surgically perform emergency craniotomies for evacuation of hematomas. *(MK, PC)*

Surgically perform decompressive craniotomies for the treatment of intracranial hypertension following stroke. *(MK, PC)*

Review their surgical outcomes through self assessment and identify ways to improve performance in surgery for degenerative disorders of the lumbar spine. *(PBLI)*

C. Neurosurgery

The main goal of this rotation is to provide the resident an organized experience to enable him/her to acquire the basic knowledge and skills in the evaluation and management of patients presenting with neurosurgical complaints. The resident should gain an appreciation for the collaborative efforts between other specialties. At the completion of this rotation the resident should be knowledgeable in the following areas and be able to do:

*Neurosurgery Intern (PGY1)*

Perform neurosurgical patient evaluation, assessment and management. *(MK, PC, ICS)*

Review basic cranial anatomy including cranial nerve origin and function. *(MK, PC, SBP)*

Learn evaluation and treatment of neurological trauma, critical care and emergencies. *(MK, PC)*

The indications for and basic interpretation of diagnostic tests and X-rays including basic head CT and MRI imaging studies. *(MK, PC)*

Basic neurosurgical skills, technique, and wound management including simple craniotomy, dural suturing and craniotomy closure. *(MK, PC)*
Recognition, diagnosis, and basic management of CSF leaks. (MK, PC)

Insertion and management of a lumbar drain. (MK, PC)

Management of common neurosurgical complications. (MK, PC)

Differentiate between stroke, TIA, and non-cerebrovascular events causing neurological symptoms and know the diagnostic techniques. (MK, PC)

Participate in at least 5 major procedures (cranial decompression, craniotomy, removal of pituitary adenoma). (MK, PC)

Recognize the signs and symptoms of patients with hypersecretory disorders, as measured by the rotation evaluation. (MK, PC)

Report the history and physical examination of patients with hypersecretory disorders, both verbally and in written format as measured by the rotation evaluation. (MK, PC, ICS)

Corroborate with appropriate consultants to further evaluate patients with hypersecretory disorders as measured by the rotation evaluation. (MK, PC, P, ICS)

Junior Neurosurgery Resident (PGY2 and PGY3)

Recognize by history, physical examination, and imaging studies the problems associated with hydrocephalus, as measured by the rotation evaluation (MK, PC)

Communicate compassionately with patients and/or families regarding the nature of problems with hydrocephalus and its complications and instruct them regarding potential options regarding the management of this disorder, as measured by the rotation evaluation. (MK, PC, P, ICS)

Plan and perform shunt procedures or cerebrospinal fluid diversion procedures, as measured by both the rotation evaluation and surgical case evaluation. (MK, PC, SBP)

Identify complications resulting from the performance of surgical management of hydrocephalus, including both infections and malfunction, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Identify the signs, symptoms, and pathophysiology syndromes of hypersecretory disorders of the pituitary as measured by the rotation evaluation. (MK, PC)

Report the history, physical examination, and laboratory findings, as well as imaging findings on patients with hypersecretory disorders. (MK, PC, ICS)

Communicate compassionately with families and patients regarding the nature of hypersecretory disorders and the care plan as measured by the rotation evaluation. (MK, PC, P, ICS)

Senior Neurosurgery Resident (PGY4 and PGY5)
Recognize patients with hydrocephalus, both pediatrics and normal pressure hydrocephalus and interpret imaging studies appropriate to the problem, as measured by the rotation evaluation. (MK, PC)

Communicates compassionately with patients and/or families, as well as consultants regarding the nature of the hydrocephalic problem and the care and management, as measured by the rotation evaluation. (MK, PC, P, ICS)

Plan and perform both simple and complex shunts, including ventriculopleural, ventriculoatrial, and multiple compartment shunts, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Manage complications resulting from the performance of simple and complex shunts, including infections, malfunctions, and seizures, as measured by the rotation evaluation. (MK, PC)

Formulate a medical and/or surgical plan for the management of typical hypersecretory disorder patients with pituitary tumors based upon the history, physical examination, imaging studies, and laboratory studies. (MK, PC)

Provide informed options to the family and patient regarding management therapies as determined by the rotation evaluation. (MK, PC, P, ICS)

Plan surgical approaches based upon the endocrine evaluation and imaging evaluation as measured by both the rotation evaluation and surgical case evaluation. (MK, PC)

Assess the patients postoperatively by both laboratory studies and clinical findings regarding possibilities of endocrine deficiencies or surgical complications as measured by both the rotation evaluation and surgical evaluation. (MK, PC, SBP)

**Chief Resident (PGY6 and PGY7)**

Evaluate and interpret the radiologic studies of patients with hydrocephalus, as measured by the rotation evaluation. (MK, PC)

Communicate compassionately with patients and/or families regarding the disorder of hydrocephalus, its management, and long-term care, as measured by the rotation evaluation. (MK, PC, P, ICS)

Supervise junior residents regarding the performance of shunt procedures and the management of complications, as measured both by the surgical case evaluation and rotation evaluation. (MK, PC, ICS)

Recognize simple spinal dysraphic disorders, such as myelomeningocele by both history and physical examination, as measured by the rotation evaluation. (MK, PC)

Report the history and physical examination of a patient with a simple dysraphic disorder, both verbally and in written format, as measured by the rotation evaluation. (MK, PC, ICS)

Order appropriate imaging studies to further evaluate a patient with a spinal dysraphic disorder, as measured by the rotation evaluation. (MK, PC, ICS, SBP)
Communicate compassionately with patients and/or families, with a spinal dysraphic disorder regarding the nature of the condition and its acute care plan, as measured by the rotation evaluation. (MK, PC, P, ICS)

Formulate a medical and/or surgical plan for the management of hypersecretory disorder patients with pituitary problems, based on the endocrine evaluation and radiologic evaluation. (MK, PC)

Correlate the radiologic findings and endocrine findings regarding management options and management of other complex medical problems that may bear on the planning of surgery or other management as determined by both the rotation evaluation and surgical evaluation. (MK, PC)

Plan and perform either craniotomy or transsphenoidal surgery for patients with hypersecretory pituitary disorders as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Manage the complications of surgery and endocrine changes as the result of pituitary surgery as measured by the rotation evaluation. (MK, PC)

Communicate with consultants, families, and patients regarding long-term management of patients with pituitary hypersecretory disorders as measured by the rotation evaluation. (MK, PC, P, ICS)

Instruct the patient and family regarding long-term management plan for patients with mass lesions from the pituitary and communicate with consultants regarding this plan as measured by the rotation evaluation and surgical case evaluation. (MK, PC, P, ICS)

D. Pediatric Neurosurgery

A goal of the pediatric neurosurgery rotation is to prepare the neurosurgery residents to care for patients with pediatric head injuries. At the completion of the pediatric neurosurgery rotation:

**Neurosurgery Intern (PGYI)**

Recognize pediatric head injuries by both history and physical examination, as measured by the rotation evaluation. (MK, PC)

Report the history and physical examination of a patient with a pediatric head injury, both verbally and in written format, as measured by the rotation evaluation. (MK, PC, ICS)

Communicate compassionately with patients and/or families regarding the nature of the pediatric head injured, as measured by the rotation evaluation (MK, PC, P, ICS)

Demonstrate confidence in surgically implanting and intracranial pressure monitor, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

**Junior Neurosurgery Resident (PGY2 and PGY3)**
Recognize by both history and physical evaluation, a patient with a pediatric head injury and be able to assess whether the patient could be a child abuse instance, as measured by the rotation evaluation. (MK, PC)

Interpret the radiologic studies, as well as the laboratory evaluations in patients with pediatric head injuries, as measured by the rotation evaluation. (MK, PC)

Perform simple craniotomies for epidural and subdural hematomas and depressed skull fractures, as well as inserting intracranial pressure monitors, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Communicate with patients and/or families, as well as consultants regarding the pediatric head injured patient, as measured by the rotation evaluation. (MK, PC, P, ICS)

Manage the intracranial pressure problems in patients with head injuries, as measured by the rotation evaluation. (MK, PC)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Recognize by history, physical examination, laboratory evaluation, and the pathophysiologic problems involved in a patient with a pediatric head injury, as measured by the rotation evaluation. (MK, PC)

Perform complex craniotomies for patients with pediatric head injuries, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Communicate compassionately with the patient and/or family and consultants regarding the nature of the pediatric head injury and its long-term implications, as measured by the rotation evaluation. (MK, PC, P, ICS)

Manage the complications associated with pediatric head injuries, including inappropriate AVH secretion, seizure disorder, intracranial pressure elevation, nutritional problems, and febrile events, as measured by the rotation evaluation. (MK, PC)

**Chief Resident (PGY6 and PGY7)**

Manage complex polytrauma patients with head injuries, as measured by the rotation evaluation. (MK, PC)

Assess and interpret imaging studies in pediatric patients with complex head injuries, as measured by the rotation evaluation. (MK, PC)

Communicate compassionately with families and consultants regarding the severity and long-term implications of patients with pediatric brain injuries. (MK, PC)

Manage the short-term and long-term problems of patients with pediatric head injuries, as measured by the rotation evaluation. (MK, PC)
Perform complex craniotomies and cranial repair of patients with pediatric injuries, as measured by the surgical case evaluation and rotation evaluation. (MK, PC)

Plan for the long-term rehabilitation of patients with pediatric head injuries, including necessity for tracheostomy, gastrostomy, speech evaluation, and physical therapy, as measured by the rotation evaluation. (MK, PC, SBP)

E. Neurointerventional

The goal of the neurointerventional surgery rotation is to prepare and learn the role of minimally invasive procedures guided under fluoroscopic control has radically changed the practice of vascular neurosurgery in the last two decades. Multiple clinical studies and the continuous creativity of leaders in endovascular techniques have allowed the establishment of well defined therapeutic strategies using interventional neuroradiology techniques for the management of cerebrovascular disease.

**Neurosurgery Intern (PGY1)**

To develop a knowledge base of the decision-making process for performing guided imaging interventional radiology versus open surgical procedures for specific pathologic processes. (MK, PC, ICS)

To acquire diagnostic skills in the interpretation of cerebral and spinal angiograms, and the ability to determine differential diagnosis with their clinical and surgical implications. (MK, PC)

To recognize the different endovascular treatment options for neurological conditions and identify their advantages and disadvantages in the management of cerebrovascular diseases. (MK, PC)

To develop skills in the interpretation of angiography. (MK)

To develop skills in the handling of vascular catheters, guiding wires, and microcatheters, and microwires. (MK)

To develop the ability to comprehend and critically analyze current literature in endovascular procedures. (MK)

**Junior Neurosurgery Resident (PGY2 and PGY3)**

Recognize by both history and physical evaluation, a patient with cerebrovascular disease and be able to assess whether the patient is a candidate for neurointerventional surgery, as measured by the rotation evaluation. (MK, PC)

Interpret the radiologic studies, as well as the laboratory evaluations in patients with cerebrovascular diseases, as measured by the rotation evaluation. (MK, PC)

Perform simple neurointerventional surgery for cerebrovascular disease and depressed skull fractures, as well as inserting intracranial pressure monitors, as measured by the rotation evaluation and surgical case evaluation. (MK, PC)
Communicate with patients and/or families, as well as consultants regarding the cerebrovascular diseased patient, as measured by the rotation evaluation. (MK, PC, P, ICS)

Manage the cerebrovascular problems in patients. (MK, PC)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Recognize by history, physical examination, laboratory evaluation, and the pathophysiologic problems involved in a patient with a cerebrovascular disease, as measured by the rotation evaluation. (MK, PC)

Perform complex neurointerventional surgery for patients with cerebrovascular disease as measured by the rotation evaluation and surgical case evaluation. (MK, PC)

Communicate compassionately with the patient and/or family and consultants regarding the nature of the cerebrovascular disease and it long-term implications, as measured by the rotation evaluation. (MK, PC, P, ICS)

Manage the complications associated with cerebrovascular disease, intracranial pressure elevation, nutritional problems, and febrile events, as measured by the rotation evaluation. (MK, PC)

**Chief Resident (PGY6 and PGY7)**

Manage complex polytrauma patients with cerebrovascular disease, as measured by the rotation evaluation. (MK, PC)

Assess and interpret imaging studies in cerebrovascular disease patients. (MK, PC)

Communicate compassionately with families and consultants regarding the severity and long-term implications of patients with cerebrovascular disease. (MK, PC)

Manage the short-term and long-term problems of patients with cerebrovascular disease. (MK, PC)

Perform complex craniotomies and cranial repair of patients with cerebrovascular disease, as measured by the surgical case evaluation and rotation evaluation. (MK, PC)

Plan for the long-term rehabilitation of patients with cerebrovascular disease, including necessity for tracheostomy, gastrostomy, speech evaluation, and physical therapy, as measured by the rotation evaluation. (MK, PC, SBP)

**F. Spinal Disorder**

The primary goal of the spinal disorders rotation is preparation of the neurosurgical resident to treat adult spinal cord injuries. At the completion of this rotation:
Neurosurgery Intern (PGY1)

Recognize chronic nerve entrapments by performing a history and physical examination specific for peripheral nerves as measured by the peripheral nerve rotation evaluation. (MK, PC)

Report the pertinent findings of the history and physical exam verbally and in a written format as measured by the peripheral nerve rotation evaluation. (MK, P, ICS)
Locate and interpret published books describing the peripheral nerve exam and their correlation to peripheral nerve entrapment syndromes as measured by the peripheral nerve rotation evaluation. (PBLI)

Junior Neurosurgery Resident (PGY2 and PGY3)

Identify chronic peripheral nerve entrapments by history and physical examination plus differentiate radicular versus nerve/plexus entrapments as measured by the peripheral nerve rotation evaluation. (MK, PC)

Provide post-operative patient care including physical and occupational rehabilitation of peripheral nerve entrapment syndromes including the rehabilitation process as measured by the peripheral nerve rotation evaluation. (MK, PC)
Locate and interpret evidence-based literature on carpal tunnel and ulnar nerve release procedures as measured by the peripheral nerve rotation evaluation. (PC, PBLI, SBP)

Provide informed choice to the patient and/or family regarding management options for peripheral nerve entrapment syndromes as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (P, ICS, PC, MK)

Perform open carpal tunnel and ulnar nerve releases as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Senior Neurosurgery Resident (PGY4 and PGY5)

Evaluate diagnostic tests including nerve conduction studies and electromyography to differentiate surgical versus non-surgical conditions such as diabetic neuropathies as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Formulate medical and surgical treatment plans for peripheral nerve entrapments and communicate verbally with both the faculty member and patient as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Perform endoscopic carpal tunnel releases and tarsal tunnel releases as well as posterior sub scapular approaches for thoracic outlet syndrome as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Provide informed choice to the patient and/or family regarding management options for peripheral nerve entrapment syndromes as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (P, ICS, PC, MK)
Chief Resident (PGY6 and PGY7)

Evaluate and interpret diagnostic intraoperative tests including nerve conduction studies and be able to utilize this data to formulate complex surgical treatment plans as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Perform complex interpositional nerve grafting and nerve transfers using microscopic techniques as measured by the peripheral nerve rotation evaluation and the surgical case evaluation. (MK, PC)

Assume routine administrative duties and supervise subordinate resident patient care for peripheral entrapments as measured by the peripheral nerve rotation evaluation. (P, ICS, PC, MK, SBP)

Communicate effectively with consulting services regarding peripheral nerve injuries as measured by the peripheral nerve rotation evaluation. (P, ICS, PC, MK, SBP)

G. Cerebrovascular/Endovascular

The goal of the cerebrovascular/endovascular rotation is to prepare neurosurgical residents to care for intracranial aneurysms, and subarachnoid hemorrhages. At the completion of the cerebrovascular/endovascular rotation:

Neurosurgery Intern (PGY1)

Recognize subarachnoid hemorrhage by performing a history and physical examination as measured by the rotation evaluation. (MK, PC)

Report the history and physical examination both verbally and written format as measured by the rotation evaluation. (P, ICS)

Locate and interpret evidence-based reviews relevant to the treatment of intracranial aneurysms including ISAT and ISUA and institutional guidelines as measured by the rotation evaluation. (PBLI)

Locate and review Guidelines for the basic management of ruptured aneurysm/Guidelines for radiation exposure/Guidelines for artery catheterization/Guidelines for endovascular interventions as measured by the rotation evaluation. (PBLI)

Junior Neurosurgery Resident (PGY2 and PGY3)

Identify the signs, symptoms and pathophysiology and classify subarachnoid hemorrhage according to Fisher and Hunt-Hess scales from reviewing CT scans and physical exam, respectively as measured by the rotation evaluation. (MK, PC)

Report the history, physical examination and findings on diagnostic angiograms with intracranial aneurysms as measured by the rotation evaluation. (P, ICS)
Resuscitate an acute deterioration from subarachnoid hemorrhage and initiate measures to prevent secondary complications as outlined by the *Guidelines for the Management of Acute Subarachnoid Hemorrhage* and institutional guidelines as measured by the rotation evaluation. (PC, PBLI, SBP)

Communicate compassionately with families and patients the nature of the acute subarachnoid hemorrhage/intracranial aneurysm and/or stabilization as measured by the rotation evaluation. (PC, MK)

Recite differential diagnosis of acute subarachnoid hemorrhages and treatment and surgically perform ventriculostomies as measured by the rotation evaluation. (PC, MK)

Review their surgical/procedural outcomes through self assessment and identify ways to improve performance in ventriculostomies as measured by the rotation evaluation. (PBLI)

Provide post-operative care of ruptured intracranial aneurysms as outlined by the *Guidelines for the Management of Acute Intracranial Aneurysms* and institutional guidelines as measured by the rotation evaluation. (PBLI, SBP, PC)

Communicate compassionately with the families and patients about the nature of intracranial aneurysms and the acute care plan as measured by the rotation evaluation. (P, ICS, PC, MK)

Locate, review and implement *The Guidelines for Treatment of Aneurysms* as measured by the rotation evaluation. (PBLI)

Prepare the surgical field and position for a cerebrovascular surgical intervention plus closure of craniotomies for subarachnoid hemorrhage as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Perform procedure for femoral access for endovascular procedures as measured by the rotation evaluation. (PC, MK)

Review their surgical outcomes through self assessment and identify ways to improve performance in craniotomy closure as measured by rotation evaluation and the surgical case evaluation. (PBLI)

*Senior Neurosurgery Resident (PGY4 and PGY5)*

Formulate medical and/or surgical plan for management of subarachnoid hemorrhage based on the history, physical examination and diagnostic images as measured by the rotation evaluation and surgical case evaluation. (PC, MK, SBP)

Provide informed choice to the patient and/or family regarding management options for aneurysms and subarachnoid hemorrhage as measured by the rotation evaluation. (P, ICS, MK, PC)

Surgical exposure for aneurysm clipping as measured by the rotation evaluation and the surgical case evaluation (PC, MK).

Communicate compassionately with the families and patients about the nature of subarachnoid hemorrhage and the acute care plan as measured by the rotation evaluation. (P, ICS, MK, PC)

Perform diagnostic angiograms along with their respective interpretation once competencies assessed by flow models as measured by the rotation evaluation. (PC, MK)
Review their surgical outcomes through self assessment and identify ways to improve performance in angiograms, aneurysm clipping exposure, and subarachnoid hemorrhage intervention as measured by rotation evaluation and the surgical case evaluation. (PBL1)

Chief Resident (PGY6 and PGY7)

Formulate a medical and/or surgical plan for management of complex aneurysms based on the history, physical examination plus diagnostic tests including CT scans, diagnostic cerebral angiograms as measured by the rotation evaluation and the surgical case evaluation. (PC, MK, SBP)

Perform complex exposures plus clip ligation of intracranial aneurysms utilizing microscopic techniques as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Assume routine administrative duties and supervise patient care from more junior residents as measured by the rotation evaluation. (P, ICS, and SBP)

Communicate compassionately with the families and patients about the nature of the injury and acute care plan plus the findings at surgery following a surgical procedure as measured by the rotation evaluation. (P, ICS, PC, MK)

Surgically perform endovascular coiling of aneurysms once competencies of use of micro catheters approved by faculty observed use of flow models as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Review their surgical outcomes through self assessment and identify ways to improve performance in endovascular coiling of aneurysms as measured by rotation evaluation and the surgical case evaluation. (PBL1)

H. Vascular/Stroke/NSICU

Neurosurgery Intern (PGY1)

Recognize carotid stenosis by performing a history & physical examination as measured by the rotation evaluation. (PC, MK)

Report the history & physical exam both verbally and written format as measured by the rotation evaluation. (PC, ICS)

Locate & interpret evidence based literature relevant to carotid stenosis including the ACAS, NASCET, and SAPPHIRE as measured by the rotation evaluation. (PBL1)

Assist w/femoral access for endovascular procedures as measured by the rotation evaluation. (PC, MK)

Junior Neurosurgery Resident (PGY2 and PGY3)
Identify signs, symptoms and pathophysiology of carotid stenosis/occlusion by performing a history and physical examination plus diagnostic angiograms as measured by the rotation evaluation. (PC, MK)

Formulate a medical and surgical plan of management for post-operative complications, such as embolic strokes, myocardial infarctions, and groin hematomas as measured by the rotation evaluation. (PC, MK)

Recite differential diagnosis of carotid stenosis and procedural complications treatment as measured by the rotation evaluation. (PC, MK)

Communicate compassionately with the families and patients about the nature of the diagnosis and the treatment of carotid stenosis and occlusions as measured by the rotation evaluation. (PC, MK)

Surgically expose the carotid artery for endarterectomy as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Surgically obtain femoral access for endovascular procedures as measured by the rotation evaluation. (PC, MK)

Review their surgical outcomes through self assessment and identify ways to improve performance in carotid artery exposure as measured by the rotation evaluation and the surgical case evaluation. (PBLI)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Formulate a medical and surgical plan for management of carotid lesions based on history, physical examination plus diagnostic tests as measured by the rotation evaluation. (PC, MK, SBP)

Provide informed choice to the patient and/or family regarding management options for carotid lesions as measured by the rotation evaluation and the surgical case evaluation. (ICS, PC, MK)

Surgically perform carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Communicate compassionately with the families and patients the findings at surgery following the surgical procedure for carotid stenosis/occlusions as measured by the rotation evaluation. (ICS, PC, MK)

Review their surgical outcomes through self assessment and identify ways to improve performance in carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PBLI)

**Chief Resident (PGY6 and PGY7)**

Formulate a medical and surgical plan for management of carotid lesions based on history, physical examination plus diagnostic tests as measured by the rotation evaluation. (PC, MK, SBP)

Provide informed choice to the patient and/or family regarding management options for carotid lesions as measured by the rotation evaluation and the surgical case evaluation. (PC, ICS, MK)
Surgically perform carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Surgically perform endovascular angioplasty with stent placement once competencies assessed on use with flow models as measured by the rotation evaluation and the surgical case evaluation. (PBLI, MK, PC)

Communicate the prognosis of endovascular angioplasty with stent placement to families and patients as measured by the rotation evaluation. (P, ICS, MK, PC)

Review their surgical outcomes through self assessment and identify ways to improve performance in endovascular angioplasty with stent placement and carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PBLI)

I. **Skull Base Neurosurgery**

The goal of the neurotology lateral skull base surgery rotation is to provide advanced education in the diagnosis and management of disorders of the temporal bone, lateral skull base, and related anatomical structures, as well as advanced diagnostic expertise and advanced medical and surgical management skills in neurotology. Surgery of the lateral skull base involving the mesial aspect of the dura or intradural structure requires the joint effort of a neurotology and neurological surgery team. Residents are trained in surgery and postoperative care of patients undergoing lateral skull base surgery and work in close collaboration with the neurological surgery team. During education, residents gain exposure to new research opportunities and have time to explore new research ideas.

**Neurosurgery Intern (PGY1)**

Identify signs, symptoms and pathophysiology of carotid stenosis/occlusion by performing a history and physical examination plus diagnostic angiograms. (PC, MK)

Formulate a medical and surgical plan of management for post-operative complications, such as embolic strokes, myocardial infarctions, and groin hematomas. (PC, MK)

Recite differential diagnosis of carotid stenosis and procedural complications treatment. (PC, MK)

Communicate compassionately with the families and patients about the nature of the diagnosis and the treatment of carotid stenosis and occlusions. (PC, ICS, MK)

**Junior Neurosurgery Resident (PGY2 and PGY3)**

Identify signs, symptoms and pathophysiology of carotid stenosis/occlusion by performing a history and physical examination plus diagnostic angiograms. (PC, MK)

Formulate a medical and surgical plan of management for post-operative complications, such as embolic strokes, myocardial infarctions, and groin hematomas. (PC, MK)
Recite differential diagnosis of carotid stenosis and procedural complications treatment. (PC, MK)
Communicate compassionately with the families and patients about the nature of the diagnosis and the treatment of carotid stenosis and occlusions. (PC, ICS, MK)

Surgically expose the carotid artery for endarterectomy and the surgical cases. (PC, MK)

Surgically obtain femoral access for endovascular procedures as measured by the rotation evaluation. (PC, MK)

Review their surgical outcomes through self assessment and identify ways to improve performance in skull base surgery exposure and the surgical case evaluation. (PBLI)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Formulate a medical and surgical plan for management of skull base surgery based on history, physical examination plus diagnostic tests. (PC, MK, SBP)

Provide informed choice to the patient and/or family regarding management options for skull base surgery and the surgical case evaluation. (ICS, PC, MK)

Surgically perform carotid endarterectomies as measured by the skull base surgery and the surgical case evaluation. (PC, MK)

Communicate compassionately with the families and patients the findings at surgery following the surgical procedure for skull base surgery. (ICS, PC, MK).

Review their surgical outcomes through self assessment and identify ways to improve performance in carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PBLI)

**Chief Resident (PGY6 and PGY7)**

Formulate a medical and surgical plan for management of carotid lesions based on history, physical examination plus diagnostic tests as measured by the rotation evaluation. (PC, MK, SBP)

Provide informed choice to the patient and/or family regarding management options for carotid lesions as measured by the rotation evaluation and the surgical case evaluation. (PC, ICS, MK)

Surgically perform carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PC, MK)

Surgically perform endovascular angioplasty with stent placement once competencies assessed on use with flow models as measured by the rotation evaluation and the surgical case evaluation. (PBLI, MK, PC)

Communicate the prognosis of endovascular angioplasty with stent placement to families and patients as measured by the rotation evaluation. (P, ICS, MK, PC)
Review their surgical outcomes through self assessment and identify ways to improve performance in endovascular angioplasty with stent placement and carotid endarterectomies as measured by the rotation evaluation and the surgical case evaluation. (PBLI)

J. Stereotactic/Image-Guided/Functional

The goal of this rotation is to obtain a history and physical examination on a patient with Parkinson's disease, essential tremor, or epilepsy.

*Neurosurgery Intern (PGY1)*

Obtain appropriate ancillary tests: MRI, EEG, functional imaging. (SBP, ICS, PC, MK)

Formulate a differential diagnosis for movement disorders and causes of epilepsy. (PC, MK)

Perform stereotactic frame application. (MK, PC, P)

Perform burr hole craniostomy and twist drill craniostomy. (MK, PC, P)

Perform stereotactic target determination for frame-based coordinates (for stereotactic brain biopsy). (MK, PC, P)

Perform a stereotactic brain lesion biopsy. (MK, PC, P, ICS)

*Junior Neurosurgery Resident (PGY2 and PGY3)*

Identify signs, symptoms and the type of patients that would benefit from stereotactic/image-guided/functional neurosurgery by performing a history and physical examination plus diagnostic angiograms, perform simple radiosurgery dose-planning. (MK, PC)

Discuss the considerations of stereotactic frame placement in regard to target localization and purpose of procedure (biopsy, craniotomy, functional, radiosurgery). (MK, PC, P, ICS)

Describe the direct and indirect basal ganglion-thalamocortical motor pathways. (MK, PC)

Define and distinguish each of the following entities: tremor, rigidity, dystonia, chorea, and athetosis (MK, PC)

Describe the pathophysiology of Parkinson’s disease and cerebellar tremor. (MK)

Explain the primary symptoms treated by ventro-lateral (VL) thalamotomy pallidotomy. (MK)

Discuss the advantages and disadvantages of stereotactic biopsy compared to open biopsy procedures. (MK, PC)

Discuss the differential diagnosis of a newly discovered ring-enhancing intracranial mass. (MK, PC)
Discuss the differential diagnosis of a newly discovered non-enhancing intracranial mass. (MK, PC)

Define different seizure types (partial, partial-complex, generalized, etc). (MK, PC)

Define medically intractable epilepsy. (MK, PC)
Describe the anatomy of the mesial temporal lobe. (MK, PC)

Define brachytherapy. (MK, PC)

Define conventional care for patients with high-grade gliomas. (MK, PC)

Review the limitations of conventional care for patients with high-grade gliomas. (MK, PC)
Describe the anatomy of the trigeminal nuclei, root, ganglion and divisions. (MK, PC)

Define typical trigeminal neuralgia, atypical trigeminal neuralgia, and trigeminal neuropathy. (MK, PC)

Explain the potential causes for trigeminal neuralgia. (MK, PC)

Define stereotactic radiosurgery. (MK, PC)

Explain the differences between radiosurgery and radiation therapy. (MK, PC)

List the potential indications for radiosurgery. (MK, PC)

List the reported complications of radiosurgery. (MK, PC)

Compare advantages and disadvantages of frame-based or frameless stereotactic craniotomies to non-stereotactic craniotomies. (MK, PC, P, SBP)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Identify signs, symptoms and the type of patients that would benefit from stereotactic/image-guided/functional neurosurgery by performing a history and physical examination plus diagnostic angiograms, perform simple radiosurgery dose-planning. (MK, PC)

Describe factors guiding the choice of neuroimaging (CT, MRI, angiography) for stereotactic procedures. (MK, PC)

Explain the rationale for various MRI sequences used for tumor localization and functional procedures. (MK, PC)

Discuss the benefits and limitations of frame-based stereotactic procedures. (MK, PC)

Discuss patient selection for VL thalamotomy, pallidotomy, and deep brain stimulation. (MK, PC)

Discuss the advantages and disadvantages of ablative procedures. (MK, PC)
List the potential complications of VL thalamotomy, pallidotomy, and bilateral thalamotomies or pallidotomies. (MK, PC)

Discuss technical considerations to minimize the potential for an intracranial hemorrhage after a stereotactic biopsy. (MK, PC)

Discuss technical considerations to minimize the potential for a non-diagnostic stereotactic biopsy. (MK, PC)

Describe the appropriate trajectories to biopsy a lesion in the pineal region, midbrain, pons, and medulla. (MK, PC)

Compare the advantages and disadvantages of radiosurgery and surgical resection for tumors and vascular malformations. (MK, PC)

**Chief Resident (PGY6 and PGY7)**

Identify signs and systems of patients who would benefit from stereotactic and functional radiosurgery and to perform complex radiosurgery dose-planning. Perform stereotactic craniotomies. (MK, PC)

Perform deep brain stimulation and/or functional lesioning procedures. (MK, PC)

Perform complex radiosurgery dose-planning, stereotactic craniotomies and perform deep brain stimulation and/or functional lesioning procedures. (MK, PC)

Identify the microelectrode recordings of the thalamus, globus pallidus, and subthalamic nucleus. (MK, PC)

Identify the primary indications for medial thalamotomy and cingulotomy. (MK, PC)

Describe the evaluation of a patient with medically intractable epilepsy. (MK, PC)

Discuss the indications for placement of depth electrodes. (MK, PC)

Describe the surgical treatment of epilepsy in detail. (MK, PC)

Explain the effect of patient selection on the reported results of brachytherapy for highgrade gliomas. (MK, PC)

Describe the methods used to localize and percutaneously penetrate the foramen ovale. (MK, PC)

List the potential advantages and disadvantages for the following trigeminal rhizotomy procedures: glycerol, radiofrequency, balloon compression, and radiosurgery. (MK, PC)

Discuss the dose-volume relationships for radiation-related complications after radiosurgery. (MK, PC)

Discuss potential sources of inaccuracy for stereotactic procedures. (MK, PC)
Discuss advantages and disadvantages of deep brain stimulation compared to ablative techniques. (MK, PC)

K. Neuroradiology

A substantial level of competence in interpreting neuroradiological studies is essential to neurosurgical diagnosis as well as the planning of neurosurgical procedures. In addition, endovascular techniques have become an important adjunct to the treatment of many neurosurgical diseases. The goals and objectives of the Neuroradiology rotation are as follows:

**Neurosurgery Intern (PGY1)**

The goal of this rotation is to order appropriate radiological evaluations in a timely fashion and complete radiological requisitions properly and to demonstrate the ability to accurately interpret the radiographic studies of trauma patients. (PC, MK)

Describe the precautions which should be taken when performing radiologic examinations. (PC, MK)

Review the potential complications to intravenous contrast agents and discuss the management of same. (PC, MK)

Describe the concepts of computerized tomographic (CT) scanning. (PC, MK)

**Junior Neurosurgery Resident (PGY2 and PGY3)**

The goal of this rotation is to order appropriate radiological evaluations in a timely fashion and complete radiological requisitions properly and to demonstrate the ability to accurately interpret the radiographic studies of trauma patients. (PC, MK)

Describe the precautions which should be taken when performing radiologic examinations. (PC, MK)

Identify the normal anatomical structures of the skull on antero-posterior, lateral, Towne, and submental vertex radiographs. (PC, MK)

List the indications for carotid and cerebral angiography. (PC, MK)

Review the potential complications to intravenous contrast agents and discuss the management of same. (PC, MK)

Identify the major arteries and veins of the neck and brain on angiograms. (PC, MK)

Describe the concepts of computerized tomographic (CT) scanning. (PC, MK)

Identify the normal anatomical structures of the scalp, skull, dura, brain, and cranial vasculature on CT scans. (PC, MK)
Describe the concepts of magnetic resonance (MR) scanning. Review the various imaging sequences which may be obtained. (PC, MK)

Identify the normal anatomical structures of the scalp, skull, dura, brain, and cranial vasculature on MR scans. (PC, MK)

Recognize common traumatic injuries which may be detected by skull radiographs including: linear skull fractures, depressed skull fractures, pneumocephalus, and foreign bodies (PC, MK)

Recognize common pathologic conditions which may be detected by skull radiographs including: neoplasms, fibrous dysplasia, congenital bone diseases, metabolic bone disorders, and infections (PC, MK)

Recognize common traumatic injuries which may be detected by head CT including: skull fractures, pneumocephalus, intracranial hematomas (epidural, acute subdural, chronic subdural, intraparenchymal, intraventricular), cerebral contusions, subarachnoid hemorrhage, and foreign bodies (PC, MK)

Recognize common pathologic conditions which may be detected by head CT including: ischemic infarction, venous infarction, hydrocephalus, cysts, tumors, cerebral edema, infections, congenital abnormalities, and infections (PC, MK)

Recognize common traumatic injuries which may be detected by head MR scans including: pneumocephalus, intracranial hematomas (epidural, acute subdural, chronic subdural, intraparenchymal, intraventricular), cerebral contusions, and diffuse axonal injury (PC, MK)

Recognize common pathologic conditions which may be detected by head MR scans including: ischemic infarction, venous infarction, hydrocephalus, cysts, tumors, cerebral edema, vascular occlusions, infections, and congenital abnormalities (PC, MK)

Identify the normal anatomical structures of the craniovertebral junction on plain radiographs. (PC, MK)

Review the radiographic diagnoses of platybasia and cranial settling. (PC, MK)

Describe the plain radiographic findings of common traumatic injuries to the craniovertebral junction including: occipital condyle fractures, atlanto-occipital dislocation, Jefferson fractures, posterior atlas fractures, dens fractures, axis body fractures, hangman’s fracture, atlas and axis facet fractures, and atlanto-axial rotatory dislocation (PC, MK)

Distinguish between orthotropic and dystropic os odontoideum. (PC, MK)

Describe the common congenital abnormalities of the craniovertebral junction. (PC, MK)

Recognize common spinal congenital abnormalities on plain radiographs. (PC, MK)

Recognize common spinal traumatic injuries which may be detected by plain radiographs including: vertebral body fractures, facet fractures and dislocations, posterior element fractures, transverse process fractures, and vertebral subluxation/dislocation (PC, MK)
Recognize common spinal degenerative conditions which may be detected by plain radiographs. (PC, MK)

Discuss the indications for CT and MR scanning of the spine in the setting of trauma. (PC, MK)

Describe the CT scan appearance of each of the traumatic spinal lesions previously listed. (PC, MK)

Describe the MR scan appearance of: spinal ligament injury, traumatic disc herniation, spinal cord contusion, and spinal epidural hematoma (PC, MK)

Recognize common spinal degenerative conditions which may be detected by MR including: disc degeneration, disc herniation, degenerative spinal stenosis, facet hypertrophy, osteophyte formation, foraminal stenosis, degenerative spondylolisthesis, degenerative scoliosis, and ossification of the posterior longitudinal ligament (PC, MK)

Identify spinal and spinal cord tumors on CT and MR scans. (PC, MK)

Discuss the indications for spinal myelography. (PC, MK)

Review the indications for spinal angiography. (PC, MK)

Discuss the use of both the radiographic contrast and radionuclide shuntogram in evaluating neurosurgical patients. (PC, MK)

**Senior Neurosurgery Resident (PGY4 and PGY5)**

Demonstrate the ability to accurately interpret carotid and vertebral angiograms. (PC, MK)

Demonstrate the ability to accurately interpret spinal angiograms. (PC, MK)

Demonstrate the ability to accurately interpret spinal myelograms and post-myelogram CT scans. (PC, MK)

Demonstrate the ability to accurately interpret cranial and spinal CT and MR scans of nontraumatic lesions. (PC, MK)

Demonstrate the ability to accurately interpret CT angiograms. (PC, MK)

Demonstrate the ability to perform a cerebral angiogram. (PC, MK)

**Chief Resident (PGY6 and PGY7)**

Demonstrate the ability to accurately interpret radiological examinations of neurosurgical patients. (PC, MK)

Demonstrate the ability to perform intraoperative angiography. (PC, MK)

Assist with endovascular neurosurgical procedures. (PC, MK)
Identify the common carotid and vertebral circulation congenital variants on angiograms. (PC, MK)

Recognize intracranial aneurysms on angiograms and CT angiograms. (PC, MK)
Identify and characterize intracranial vascular malformations on angiograms. (PC, MK)

Recognize: arteriovenous malformations, venous angiomas, arteriovenous fistula, feeding vessels, draining veins, associated aneurysms, and degree of shunting (PC, MK)

Discuss the angiographic evaluation of carotid and vertebral disease. (PC, MK)

Review the role of MR angiography and venography in the evaluation of cerebrovascular disease, neoplasms, and trauma. (PC, MK)

Describe the radiological evaluation of CNS vasculitis. (PC, MK)

Discuss the role of myelography in the evaluation of neurosurgical patients. (PC, MK)

Discuss the radiological evaluation of suspected CNS and spinal infection. (PC, MK)

Review MR neurography. (PC, MK)

Describe the appearance of peripheral nerve tumors on MR scans. (PC, MK)

Review the role of radionuclide scans in the evaluation of patients with suspected cranial and spinal disease. (PC, MK)

Discuss the use of intraoperative radiographs and fluoroscopy. (PC, MK)

List the indications for CT- and MR-guided biopsies. (PC, MK)

Describe the concepts of ultrasonography. (PC, MK)

Review the findings of normal and abnormal neonatal cranial ultrasound. (PC, MK)

Review the findings of normal and abnormal carotid ultrasounds. (PC, MK)

Discuss the use of transcranial doppler ultrasonography in the management of patients with subarachnoid hemorrhage, trauma, and occlusive vascular disease. (PC, MK)

Review the indications for interventional endovascular therapies for: aneurysms, vasospasm, cranial vascular malformations, spinal vascular malformations, tumor embolization, carotid and vertebral stenosis, and carotid and vertebral dissection (PC, MK)

Describe the indications and techniques of endovascular trial occlusions. (PC, MK)

Review the role of quantitative cerebral blood flow studies in the management of neurosurgical patients. (PC, MK)
Describe the concepts of positron emission tomography. Review the indications for obtaining such scans. (PC, MK)

Describe the concepts of functional MR imaging. Review the indications for obtaining such scans. (PC, MK)

Describe the concepts of MR spectroscopy. Review the indications for obtaining such evaluations in neurosurgical patients. (PC, MK)

Discuss the indications and technique of discography. Describe the procedure. (PC, MK)

Discuss the indications for percutaneous vertebroplasty. Describe the procedure. (PC, MK)

Understand the importance of correct interpretation of neuroradiological procedures. (PBLI)

Investigate the causes of error and their correction (PBLI)

Learn which neuroradiological procedures are indicated for a variety of neurosurgical diseases. (PBLI)

Participate in the education of other residents and medical students in neuroradiology. (MK, PC, P, ICS)

Learn to communicate effectively with the neuroradiology team. (ICS)

Learn to work harmoniously with the neuroradiologists and the radiologic technicians. (P, ICS)

Learn which tests are appropriate and cost-effective in the workup of common neurosurgical problems. (SBP)

Learn to appropriately consult expert neuroradiologists in the comprehensive management of patients. (SBP)

L.  Research

The goal of the resident’s participation in research is to obtain a deeper understanding of the techniques of modern neurosurgical research in an area compatible with the resident’s own interests. The research can be done either outside or within the department, in laboratories where the techniques of neuroanatomy, neurophysiology, neurochemistry, and molecular biology are used. Developing skills in the design of laboratory or epidemiologic experiments, critical review of the literature, statistical analysis of data and manuscript preparation are the goals of the research experience.

For statistical analysis and for the preparation of grants, manuscripts and presentations, residents have access to computer facilities with the latest software and technology, including scanners and color printers, at the departmental offices within MUSC/MUH Center. All faculty members are also encouraged to provide advice about study design, statistical analysis of data, and manuscript, slide and poster preparation. LCD projectors and other audiovisual equipment are also available for resident use. Residents are strongly encouraged to discuss plans for research with the program directors and are required to participate in the Annual Neuroscience Research Day held in May. They are further required to provide an updated written description of research activity and plans at their end-of-year formal
meeting with the program director.

Project Requirements

The research experience in the laboratory should be comprehensive. The resident should consult with both the clinical and research faculty to select a research project and then he or she should perform a complete and extensive review of the literature relative to the selected project. Furthermore, the resident will develop the experimental design and protocols and compile a list of equipment and supplies needed to conduct the research. In addition, all relevant institutional compliance applications will be completed and submitted for approval by the research faculty before the resident begins the laboratory rotation to expedite the start of the project. Laboratory staff (faculty and technicians) will provide necessary assistance to help the resident conduct the research and complete the project within the scheduled period of time. The resident should conduct as much of the research project as possible in addition to preparing the manuscript of the finished work for publication. The elements of the laboratory experience are outlined in more detail below. The proposed research project should be considered as the following:

**Literature review of subject being studied in the research project**

**Institutional compliance involves the following entities at MUSC**
- IACUC - Institutional Animal Care and Use Committee
- IRB – Institutional Review Board
- IBC – Institutional Biosafety Committee
- RSO – Radiation Safety

**Experimental Design and the research process**
- Research model (in vitro / in vivo)
- Experimental and control groups
- Collection of data
- Statistical analysis of data
- Interpretation of data
- Data documentation
- Equipment and supplies

**Preparation of manuscript for publication of research**

**Project Selection**

The selected project should be within the scope of the laboratory with respect to staff expertise and available equipment. The project should be of interest to the resident and have clinical relevance. In addition, the selected project should have a defined time table that can be completed within the designated time that the resident will spend in the laboratory. The literature review should be extensive enough to give the resident a thorough background from which to approach the research topic. This background information will aid the resident in understanding the premise of the study being undertaken, and should provide insight for the development of the experimental design, selection of research model, experimental
methods, data analysis, data interpretation, and the formulation of future hypotheses. The resident will be required to read and gain knowledge of the institutional compliance protocols involved in the research project.

Institutional compliance is fundamental in conducting research in an academic setting. Institutional oversight committees provide a peer review of each study to be conducted. Complying with institutional oversight ensures that the proposed research has scientific validity, and that the researcher is following institutional guidelines with respect to safety in the use of hazardous materials, and that the welfare of both human and animal subjects is maintained.

**Guidelines**

The resident should consult with both the clinical and research faculty to select a research project and then he or she should perform a complete and extensive review of the literature relative to the selected project. This should be done several months prior to starting the research rotation.

**Research Proposal Format**

By developing the experimental design, the resident will gain an understanding of how research is conducted. First, the reason or rationale for the study is framed (i.e. to answer a question about a disease state: what is the pathophysiology? or what can be used as a treatment intervention?) resulting in a research premise. Second, a research model of the disease state is devised. Third, experimental and control groups within the study are determine along with procedural protocols and methods of data collection and analysis are established. Fourth, the research technicians assist the resident in gathering equipment and supplies and setting up a work station. Fifth, in conjunction with the P.I. and laboratory staff, the resident establishes a schedule so he or she can begin the work on the project.

*Statement of hypothesis and rational*- This statement identifies the problem or question to be investigated.

*Background* - Evaluate existing knowledge, and specifically note areas that the project is intended to address. State the importance of the research described by relating the specific aims to the objectives.

*Experimental design (Specific aims and methodology)* - Outline the experimentation that will be used to accomplish the specific aims of the project. Include means by which the data will be collected, analyzed, and interpreted. Discuss the potential difficulties and limitations of the proposed procedures and alternative approaches to achieve the specific aims. Provide a timetable for the investigation.

*Generation of manuscript for publication* – Writing the manuscript will challenge the resident to document the research findings in a prescribed format that will meet peer review standards. The manuscript allows the writer to describe and interpret the research findings. Preparing the manuscript also allows the writer to show knowledge and understanding of the relative literature and how it relates to the current findings. In addition, the writer can state any formulated hypotheses or future follow-up studies. The manuscript usually consists of six (6) parts: the abstract, introduction, materials and methods, results, discussion and bibliography.
1. **Abstract / Summary** – The abstract or summary of the manuscript states the main objective (what was studied and why?). It summarizes the most important results or key data and it gives the major conclusion and significance of the research.

2. **Introduction**: The case is made for why the study was needed and why it is important. A brief statement on the background is presented along with the question or hypothesis. The construction of the bibliography (citation of references) should begin in the introduction.

3. **Materials and Methods** - This section should begin with a statement that ensures that the research was reviewed and approved by institutional compliance. This section can use subheadings that describe the study design, protocols, data collection, data analysis and the equipment & materials used.

4. **Results** – This section of manuscript presents the findings and can include tables and figures. Statements that help interpret data can also be included. Results should parallel the methods sections for clarity and consistency.

5. **Discussion** - The discussion begins by answering the question posed in the introduction, and explains how the results support the answer. The discussion addresses how the conclusions generated in the current study relate to the existing body of knowledge. The discussion also addresses any weaknesses, discrepancies and technical pitfalls encountered in the study. It explains the importance of the findings and potential applications. The conclusion of the discussion section should sum up the discussion by stating perspectives, implications and follow-up studies if applicable.

6. **References** – The bibliography should include only relevant citations and some of these should be recent (if possible), and provide a comprehensive background of the subject.

**Funding**

Residents are required to submit both intramural and extramural grant proposals. These should be small start-up proposal that are funded by the resident’s institution and private foundations. The department of Neurosurgery will provide alternative funding for the research project if neither intra- nor extramural grant funding is achieved.

**Submissions and Presentation**

Residents are required to present their research findings at a national meeting. The presentation can be oral or poster. In addition, the resident is also required to prepare a manuscript of the finished research and submit for publication.

**Failure to Comply**
If the Resident fails to comply with completing the research rotation, his or her standing in the residency program is jeopardize and graduation from the residency program may be delayed.

Results

At the end of the laboratory rotation the resident will have completed the research project and will have achieved the following learning and performance objectives:

- Formulate a research premise based on a clinical question.
- Formulate an experimental design to investigate and answer the clinical question.
- Develop the laboratory skills necessary to conduct the related research project.
- Analyze and interpret research data.
- Communicate effectively research results through both written (manuscript) and oral presentations.
- Demonstrate a commitment to academic and scientific integrity.
- Demonstrate an understanding of policy with respect to institutional compliance.

M. Chief Residency

The ACGME Guidelines state: There must be a 12-month period of time as senior/chief resident on the clinical service of neurological surgery in the sponsoring institution or its approved participating institutions. The senior/chief resident must have major or primary responsibility for patient management with faculty supervision. The senior/chief resident should also have administrative responsibility as designated by the Program Director.

The Chief Resident Rotation is designed to meet these requirements in full. During this year the goals and objectives are as follows:

Trainees in the final year of residency are designated as “chief residents.”

When there are two chief residents on service, one will be assigned to the VA hospital, and one will be assigned to MUH (this resident will serve as both the “OR chief” and the “clinical chief”).

Daytime duties at MUH will be split between an “OR chief” and a “clinical chief.”

Patient Care

The “OR chief” manages the neurosurgical operative service and has first choice of operative cases. Duties include coordinating with neurosurgical, anesthesia, and OR staff to manage the daily operative schedule, assignment of residents to cover operative cases, and ensuring evening cases are staffed to the attending surgeon’s satisfaction.

The “clinical chief” assists in daily patient care and has second choice of operative cases.
Duties include assisting the services with ICU and floor procedures as well as inpatient and emergency room consults. The Clinical chief will also perform clinical rounds on his postoperative patients and participate in their clinical management.

The VA chief resident is responsible for the VA neurosurgical inpatient and outpatient services. This resident is expected to be familiar and compliant with all current intra- and extra-departmental VA policies.

The VA and MUH chief residents will split night-time and weekend call duties. The on-call chief will cover both MUH and the VA hospitals. This will be a “backup” call in which non-chief residents provide the primary call duties at MUH and the VA hospitals. Responsibilities of the chief resident include assisting junior residents with inpatient and emergency room consults and procedures, and serving as the primary resident for all night-time and weekend operative cases.

Become proficient in: patient interview and the comprehensive physical examination.

Describe indications, contraindications, perioperative management, complications, and surgical sequence for and perform pertinent portions of: Lumbar puncture, Ventriculostomy, and Minimally invasive approaches to the spine.

To provide patient care that is compassionate, appropriate and effective for the treatment of health problems and the promotion of health.

Communicates effectively and demonstrates caring & respectful behavior when interacting with patients and their families.

Develops and carries out patient management plans.

Provides health care services aimed at preventing health problems

**Medical Knowledge**

Chief Residents are expected to master the medical knowledge categories described as “senior” in all previous subspecialty medical knowledge descriptions.

Chief Residents are expected to present the core lectures in neurosurgery which have been selected to systematically cover all knowledge objectives previously enumerated in this document.

Be able to discuss and describe: Trauma to the central and peripheral nervous systems, Fractures of the skull and spine, Cranial and spinal cord metastases, Cushing's disease and syndrome, Intervertebral disc disease and its operative approaches, CSF shunting and its operative approaches, Cerebrovascular disease, Chronic pain and its palliation, Musculoskeletal biomechanics and physiology, Shock and circulatory physiology, and Fluid and electrolyte imbalance.

Demonstrates appropriate knowledge about established and evolving biomedical, clinical and cognate (e.g. epidemiological and social-behavior) sciences and the application of this knowledge to patient care.

Demonstrates intellectual ability regarding retention, comprehension, abstraction, discrimination and logical thinking.
Exhibits knowledge of anatomy, physiology and pathology in surgical cases.

Is punctual, organized and prepared for conferences

**Practice Based Learning and Improvement**

The chief resident will coordinate the monthly quality assurance and morbidity and mortality conferences. These case reviews provide feedback to the faculty and staff on medical and surgical errors, either as a result of individual or systematic problems. This conference provides a tremendous opportunity for practice based learning and improvement.

Learns and demonstrates practice-based learning and improvement that involves investigation and evaluation of their patient care, appraisal and assimilation of scientific evidence, and improvements in patient care.

Exhibits motivation with an active and aggressive attitude toward learning.

Demonstrates field of knowledge through evidence of literature, methods of management, advantages and disadvantages of alternative treatments of their own patient care, appraisal and assimilation of scientific evidence and improvements in patient care.

Exhibits research aptitude with curiosity, creativity, and ability to evaluate and analyze data through the utilization of resources and independent work.

**Professionalism**

The Chief Residents are expected to lead the other residents by example. This includes the highest levels of professional behavior when interacting with other residents, nurses, health care personnel, families and patients.

Manifests a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.

Displays integrity through honesty, discretion and a commitment to excellence and ongoing professional development.

Ethical principles are evident through a commitment to provision or withholding clinical care, confidentiality of patient information, informed consent and business practices.

**Interpersonal and Communication Skills**

Develops and uses interpersonal and communication skills that result in effective information exchange and teaming with patients, their families, and professional associates.

Demonstrates oral communication skills through clarity of expression, articulateness, and grammar allowing effective information exchange with patients, their families and other health professionals.
Displays written communication skills with accurate and timely documentation, progress, operative and discharge notes are written completely and promptly.

In relating to patients, the resident is interested, honest, understanding and explains clearly to the patient’s satisfaction the details related to diagnosis, proposed treatment and its implications.

**Systems Based Practice**

Chief Residents coordinate the chief call schedule.

Chief Residents supervise the resident vacation and meeting schedule.

Chief Residents provide overall supervision of resident manpower assignments on a daily basis for this very busy neurosurgical service.

Chief Residents conduct a monthly residents-only meeting to discuss programmatic issues in preparation for the monthly resident meeting with the Program Director.

Manifests actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.

Demonstrates resourcefulness through management of available resources.

Understands roles of support personnel and makes maximum use of their assistance.

Demonstrates an awareness and responsiveness to the large context and system of health care.

Has the ability to effectively call on system resources to provide care for optimal value.

Is an advocate for quality patient care and helps patients deal with system complexities.
III. Didactic Education

A. Board Exam

The ABNS written examination must be passed for credit before graduation from the program. In addition, a resident may not advance to his/her chief year without passing the exam. (Administrative/Senior Chief) Residents are required to sit for the examination beginning in the PGY1 year. The examination is taken that year and in subsequent years for self assessment, rather than for credit, until the resident’s performance is deemed satisfactory in the judgment of the program director. The resident must pass the exam on self-assessment before they are able to take the examination for credit. Each resident will have significant input in determining when he or she will be allowed to take the examination for credit. It is anticipated that most residents will take the exam for credit in the PGY4 year, after scoring well on the exam (for self assessment) during the previous year.

B. Independent Study

Recommended Books

The following list primarily features texts recommended for reading, as opposed to reference. Each resident will receive a yearly book-fund (used for travel and book purchasing. Additionally, many of these books form are recommended readings for select rotations. Also included in the list, recommended board review study guides.

- Advanced Trauma Life Support (ATLS) manual, American College of Surgeons
- Marino, The ICU Book, 2006
- Blumenfeld, Neuroanatomy Through Clinical Cases, 2002
- Brain, Aids to The Examination of the Peripheral Nervous System, 4th ed, 2000
- Gilman, Manter and Gatz's Essentials of Clinical Neuroanatomy and Neurophysiology, 2002
- Fowler, Clinical Neurology, 2nd ed, 2004
- Adams & Graham’s Introduction to Neuropathology, 3rd edition
- Fuller and Goodman, Practical Neuropathology, 2001
- Rengachary & Ellenbogen, Principles of Neurosurgery, 2005
- Greenberg, Handbook of Neurosurgery, 6th ed, 2006
- Schmidek and Sweet, Operative Neurosurgical Techniques, 5th ed, 2006
- Salcman, Heros, Laws, Sonntag, Kempe’s Operative Neurosurgery, 2nd ed, 2004
- Berger & Prados, Textbook of Neuro-oncology, 2004
- Valadka, Neurotrauma: Evidence Based Answers to Common Questions, 2004
- Citow, Comprehensive Neurosurgery Board Review, 2000
- Moore, Definitive Neurological Surgery Board Review, 2004
**Live Lectures**

Goodman/Fuller Review, Neuropathology  
Diaz Review, Neuroradiology

**C. Rotation Specific Syllabi**

*Neurosurgery Intern (PGY1)*

I. General Surgery Rotation

**Books**
- Advanced Trauma Life Support (ATLS) manual, American College of Surgeons
- Blumenfeld, *Neuroanatomy Through Clinical Cases*, 2002

**Web-based Lectures:**
(View select neuroscience course lectures: [http://ercweb2.lrc.bcm.tmc.edu/](http://ercweb2.lrc.bcm.tmc.edu/))
- Blood Brain Barrier and CSF
- Dorsal Columns
- Ventrolateral System I & II
- Neurochemistry of Pain
- Physiology of the Neuronal Membrane
- Synaptic Transmission: GABA and Glutamate
- Peripheral Nervous System
- Skeletal Reflexes I & II
- Cortically Originating Motor Pathways I & II
- Basal Ganglia and Motor Function
- Cerebellum I & II
- Control of Ocular Motility
- Control of the Pupil
- Vestibular System I & II
- Auditory System

II. Neurology Rotations

**Books**
- Fowler, *Clinical Neurology*, 2nd ed, 2004
- Adams & Graham’s Introduction to Neuropathology, 3rd edition
- Blumenfeld, *Neuroanatomy Through Clinical Cases*, 2002
III. Neuroradiology/Neuro-Ophthalmology

Books


IV. Neuro-ICU

Books


Selected Readings

*Journal articles, prepared handouts in Neuroanesthesia*

*Junior Neurosurgery Resident (PGY2 and PGY3)*

I. Valadka, *Neurotrauma: Evidence Based Answers to Common Questions*, 2004
   Chapters 1-48

II. Brain, *Aids to The Examination of the Peripheral Nervous System, 4th ed*, 2000
   Pages 1-62

   Chapters 8 – 9
   Chapters 24 -25

   Chapters 2 – 4
   Chapter 6
   Chapters 9 – 10
 Chapters 13 – 17
Chapter 19 – 53


Chapters 3 – 9
Chapters 121 – 123
Chapter 126
Chapter 128
Chapter 131 – 136
Chapter 139
Chapters 142 – 144
Chapters 147 – 148
Chapter 150
Chapters 152 – 154


Chapters 12 – 33
Chapters 37 – 44
Chapters 47 – 58

**Senior Neurosurgery Resident (PGY4 and PGY5)**


Chapters 6 – 11
Chapters 13 – 14
Chapters 16 – 74


(Vascular Module)
Chapters 72 – 87

(Intracranial Malformation Module)
Chapters 88 – 93

(Epilepsy Module)
Chapters 94 – 99

(Movement Disorder Module)
Chapters 100 – 112

Chapters 1 – 42


Chapters  59 – 87
Chapters  91 – 106

**Chief Resident (PGY6 and PGY7)**

I. Research

Reading is based on the research project of the resident’s choosing.

II. Chief Rotation

Review of current journals, articles, atlases, and textbooks individual case preparation and patient management

**D. Conferences**

All Conferences are mandatory for all Residents, unless on Night Float. The only exception to that rule - the epilepsy conference (only the PGY1 must attend, while on the EEG/Epilepsy rotation).

Residents and Faculty are expected to sign-in and maintain an attendance average of *at least 75%.*

*Refractory Epilepsy Conference, Weekly, Monday, 10 AM*

Epilepsy patients evaluated at the Center and their treatment plans are discussed by the multidisciplinary team, with an emphasis on surgery. Conference is overseen by the Neurology epilepsy faculty. Residents and faculty are welcome, but not required to attend. (Again, when the PGY1 resident is on the EEG/Epilepsy rotation attendance is required.)

*Neurosurgery conference (M & M, Case Presentation, and Topic Presentation), Weekly, Thursday, 8 AM*

These are organized such that it allows for an open discussion of cases, resident presentations of patient, faculty participate with questioning and open discussions. Case summaries for M&M are the responsibility of the senior most resident at each hospital. This responsibility applies even for the June M&M conference; the new chief residents are responsible for gathering this information from outgoing chiefs when the responsibility for the service is transferred. The other residents on the service are expected to help facilitate this. Case summaries should be submitted to the chief resident designated to run monthly M&M. The chief resident who is coordinating M&M will then meet with Program Director to designate specific cases for further discussion. The chief resident will notify the senior-most resident the specific cases that were selected. The senior-most resident is responsible for gathering all relevant
radiological images from these cases for presentation on the computer system at the actual M&M conference.

**CV Conference (M & M and Case Presentation), Weekly, Thursday, 10 AM**

Cases from the Neurosurgical Service are presented by the residents and discussed with the faculty. Practical teaching conference reviewing principles of neurovascular surgery including imaging, anatomy, physiology, and operative and endovascular considerations. All residents required to attend.

**Tumor Board, Weekly, Thursday, 1 PM**

Multi-disciplinary conference reviewing clinical presentation, imaging, operative findings, and pathology for pediatric brain and spine nerve tumor cases. Clinical options are discussed and decisions are made regarding clinical care. All residents are required to attend.

**Journal Club, Monthly, First Thursday Morning each Month, 8 AM**

Journal Club articles will be chosen by the designated chief resident and the presenters and distributed electronically to all faculty and residents at least 2 weeks prior to the conference. Residents are encouraged to discuss article choices with faculty before finalizing their decisions. We have 100% participation since reorganization by the residents.

**Visiting Professorship, Lecture and Workshop, Annually Held, TBD**

This multiple-day endowed workshop includes a lecture and hands-on didactic surgical workshop presented by a visiting professor of international renown. Residents are required to attend.

**Peripheral Nerve Review, Monthly, Thursday, TBD**

Peripheral Nerve Review conference review highlights and new insights into indications and guidance during procedures for continuous peripheral nerve blocks. These continuous reviews of peripheral nerve blocks are essential in the perioperative anesthetic management of in-hospital or ambulatory patients.
IV. **Ethical and Medicolegal Consideration**

A. **Ethical Issues**

Through lecture and computer-based instructional and examination programs, the department provides all residents with federally mandated Health Insurance Portability and Accountability Act (HIPAA) training. Issues of patient rights and privacy are addressed through formal lectures sponsored by MUSC. These issues, including the proper protection of patient names and information, appropriate and inappropriate case discussions and the showing of respect for each patient, are also addressed during a departmental meeting held at the beginning of each academic year. Additionally, ethics in research are addressed through a series of computer-based lessons and examinations. All residents are required to pass annual examinations on ethics and patient confidentiality.

The faculty members also provide residents with education concerning socioeconomic issues through daily teachings. Didactic teachings include the following:

- Relevant weekly lectures during grand rounds.
- Lectures on the clinical care pathways and on hospital costs by members of the hospital committees on the operating room, pharmacy and clinical care pathways.
- Lectures on maintaining a supportive and non-harassing workplace environment by the legal departments of MUSC Graduate Medical Education Office.
- Focused discussions of the social, economic and legal issues of the cases presented at the weekly clinical conferences and at the monthly mortality and morbidity conferences.

B. **Medicolegal Issues**

Throughout each academic year, mandatory lectures are held that address various medicolegal issues including federal HIPAA guidelines and malpractice insurance requirements. These lectures are usually presented by the MUH Office of Risk Management or the MUSC Office of General Counsel.
V. **Lines of Supervision and Work Environment**

The chair of the Department, or the chief of the neurosurgical service at each hospital, and each individual in the line of command are responsible for maintaining a dignified and ethically proper work environment for the medical staff, students and patients for whom they are responsible. The chief of the neurosurgical service at each hospital has the responsibility of assuring the quality of the patient care and teaching. The lines of clinical responsibility and command are to be followed when any question arises concerning patient care, and with respect to consultations with and interaction among other clinical and laboratory services. The lines of responsibility are as follows:

**Program-Wide Issues**

- Chair: Sunil J. Patel, M.D.
- Program Director: Raymond Turner, IV, M.D.
- Associate Program Director: Alejandro Spiotta, M.D.
- Residency Coordinator: Caroline Diez

**Ralph H. Johnson VAMC (Veteran’s Medical Affair Center)**

- Chief of Neurosurgical Service: Abhay Varma, M.D.

Any unresolved questions are to be promptly referred to the Program Director or the Associate Program Director at Site #1 – MUH or Site #2 the VAH/VAMC, Chief of Neurosurgery Service. The Chair of the Department of Neurological Surgery and who has the ultimate responsibility for the quality of the residency program.

Residents are required and must communicate with the faculty when to be contacted in the care of the patient. While communication with the attending should be frequent and ongoing, the timeliness of communication will vary with the severity and urgency of the patient. At minimum, significant changes, events or circumstances in the patient’s condition must be communicated to the supervising attending. Examples of significant changes requiring faculty involvement: admission, transfer to and from ICU, need for intubation or other ventilator support, DNR or other end of life decision, cardiac arrest, changes in hemodynamic status requiring intervention fluid or ionotropic support, neurological changes, medication errors requiring clinical intervention, clinical problem requiring an invasive procedure, care of medically complex patient, or any incident that compromises patient safety.
VI.  Duty Hours

Duty hours are set according to the regulations of the Program Requirements for Residency Education in Neurological Surgery of the Accreditation Council for Graduate Medical Education (ACGME). The requirements stress an environment that is both optimal for resident education and for patient care. Duty hours are defined as all clinical and academic responsibilities related to residency, including patient care, in-house call and scheduled academic activities such as conferences. Specific guidelines are as follows:

Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities.

Residents must be provided with one day in seven free from all educational and clinical responsibilities, averaged over a four-week period. One day is defined as a continuous 24-hour period free from all clinical, educational and administrative responsibilities. There should be a 10-hour time period between all daily duty periods and after in-house call.

In-house call must not exceed 24 consecutive hours. A resident may remain on duty for up to six additional hours to participate in didactic activities, transfer care of patients, conduct outpatient clinics and maintain continuity of medical and surgical care.

Residents taking at home call must be provided with one day in seven completely free from all educational and clinical responsibilities, averaged over a four-week period. When residents are called into the hospital from home, the hours spent in-house are counted towards the 80-hour limit.

Residents are required to alert the chief of service or the associate program director if they are in jeopardy of exceeding the duty hour guidelines as soon as they are aware of the problem.

Moonlighting is not permitted.

On-call coverage for each hospital is organized by the senior-most resident on each service, with supervision from the hospital chief of service or educational director. Any conflicts or ambiguities may also be resolved by contacting the hospital chief of service/educational director or the residency coordinator.

The junior and mid-level residents will each take two blocks of night float/call and one weekend per month. Each of these residents will leave after neurosurgical intensive care unit (NICU) rounds, and after the appropriate hand-offs occur.

When surgery rotators are assigned to the service, this schedule will be modified to include them in the call schedule.
VII. Leave

Residents must notify the residency program coordinator, program director, and the chief resident of any planned leave in writing.

A. Vacation/Coverage

To ensure that all residents have the opportunity to schedule vacations optimally, vacation requests must be submitted to the Residency Coordinator, Caroline Diez, no later than the 14th day of the first month of a new rotation. These requests should be emailed to diezc@musc.edu and must include the dates you are requesting and whom you have arranged to cover for you. Residents will need to copy all other residents on the rotation, the resident providing coverage and the Educational Director at the assigned institution.

Once the vacation request is reviewed and coverage is approved, you will receive an email back confirming that you are approved to take vacation. Additionally, the resident will need to complete and sign the Medical University’s time off request form. You are advised not to make final travel arrangements until your vacation is approved.

No vacations will be permitted after the second week of June or in the month of July.

All residents are entitled to a three-week long vacation during the year. If you are traveling outside the country and require a two week vacation, this must be approved by the Program Director. A week is five business days, plus the preceding or succeeding weekend. Dividing the vacation into time blocks less than one week long is discouraged. Residents may only take one week of vacation per clinical rotation. Residents may not take vacations “back-to-back.”

Vacations may need to be restricted during certain periods if there are unusual shortages in the number of available residents. Vacations during the first week of a clinical rotation or during the last two weeks of June are discouraged.

No vacation may be taken when assigned to Night Float.

During basic science elective rotations, residents may take more than one consecutive week of vacation, provided that the vacation time is approved and does not exceed two weeks at a time. The total for the year, however, remains three weeks.

Senior resident vacation coverage will be provided by the neurosurgical resident on the research rotation or on the neurology/pathology rotation. During vacation coverage, the neurosurgical resident on the research rotation will take up to three nights of call per week. Junior residents on clinical rotations may not schedule vacations simultaneously with other junior residents.

If a resident takes off a full week during a clinical rotation to present a paper at a meeting, he or she will not be able to take a vacation during that rotation, with the exception of the chief residents, unless he or she obtains direct approval from the program director or associate program director. All vacation and meeting requests for each four-month rotation must be submitted within the first week of the rotation; otherwise, the residency coordinator will assign vacation time. Requests for subsequent changes in
vacation dates will be considered only if coverage is arranged.

No more than two senior residents or chief residents may be away from MUH at any given time to eliminate the need for a junior resident to cover a senior resident’s position. Vacations will be scheduled on a first-come-first-served basis, based on submitting e-mail request in advance to the residency coordinator.

Resident must schedule vacations in compliance with the above guideline by obtaining coverage from the appropriate resident. Once vacation coverage is agreed upon, the resident must e-mail the vacation plan to the residency coordinator and the covering resident. Any disputes about vacation scheduling should be directed to the residency coordinator who will, if necessary, involve the program directors.

**B. Educational**

Residents are strongly encouraged to present their work at neurosurgical and scientific meetings. A single project should generally be presented once (one paper = one meeting), and only the presenting author is entitled to attend. Meeting attendance offers residents multiple benefits including: didactic education through courses; exposure to national neurosurgical scene; reward for academic productivity; forum to practice and develop presentation skills.

**Chief resident meetings**

Each Chief resident is entitled to attend one of the two major national neurosurgical meetings (AANS or CNS). This privilege is afforded to each chief resident even is he/she is not presenting at the meeting, although it is preferable to make a presentation. Chief residents will typically be granted three weekdays off, combined with one of their scheduled weekends off, to attend the national meeting. The chief resident will need to arrange for coverage, with input from the Administrator of the residency program. The Department will cover all travel and meeting expenses of this trip.

**Presenter**

Residents are encouraged to participate in research projects throughout their training, and are particularly encouraged to present at the AANS and CNS. The Education Office (Residency Coordinator, Caroline Diez) will help facilitate coverage. Availability of coverage will to a large extent determine the length of stay. For residents on rotations that require clinical coverage, meeting attendance is typically three weekdays and can be combined with a regularly scheduled weekend off. If the meeting takes place during a research rotation, the time away can be readily extended for the full meeting. The Department will cover all travel and meeting expenses of these trips. A copy of the abstract needs to be submitted to the Administrator of the residency program, followed by a draft of the subsequent manuscript intended for publication within one year.

Residents are also encouraged to present at major national meetings other than the AANS or CNS, such as the Society for Neuroscience. However, for logistical reasons, residents will need to obtain specific approval from the Program Director before submitting a paper for presentation at these alternative forums in order to be sure of coverage and funding.
Industry Sponsored Travel

Industry sponsored courses can be valuable for resident education. Attendance at these courses must be approved in advance by the Program Director. The Department will not cover the expenses for these courses. Residents will need to arrange coverage with their colleagues prior to requesting time off. If arrangements for special coverage cannot be worked out, vacation time may be used for coverage. Typically, the time off allotted to attend will be a regular weekend off plus one additional workday.

Examples of Industry Sponsored travel are: SNS Conferences, The Annual Ozark’s Conference, and SNS Boot Camps

Neurosurgical Society Courses

Residents may request to attend society courses at the expense of the Division of Neurosurgery, approval must come from the program director and the department chair. The requests will be determined on a case-by-case basis.

Examples of Neurosurgical Society Courses; AANS Spine or Skull Base Courses

RUNN Course

The PGY3 resident is required to attend the Research Update in Neuroscience for Neurosurgeons (RUNN Course). The annual course is held in the fall in Woods Hole, MA.

Chicago Review

The year a resident takes the ABNS Board Exam for credit, they may choose to attend the Chicago Review course for exam preparation at the department’s expense.

Regional Meetings

If a resident wishes to present their work at a regional neurosurgical meeting, he or she must submit a request through the program director prior to submitting an abstract.

C. Personal

Three calendar days per year are provided for personal or family reasons with the approval of the program director or associate program director. Additional “personal days” for emergencies may be arranged with the chief of service. Attendance at meetings as part of the educational activity of the house staff is not
considered as “leave”; such attendance is allowed with the approval of the program director or associate program director.

D. Interviews

Chief residents will be allowed up to five (5) days for job interviews. Coverage will be arranged.

E. Military Reserve and Jury Duty

Leave for military reserve duty can only be taken during non-clinical rotations and must be arranged in advance by the resident and his or her commanding officer; 14 calendar days of leave for military duty are allowed and do not count against vacation time. Leave is also provided for jury duty as required by the court system. Submit request for leave in advance with a copy of the military orders or jury summons to the residency coordinator.

F. Illness or Injury

Residents are entitled to 14 calendar days of paid sick leave per academic year. Unused sick days are carried forward and are subsequent academic years. Sick leave may also be used for maternity-related leave. Residents are entitled to Family Medical Leave as per MUSC policies and procedures.

Report work-related illness or injury to the residency coordinator within 24 hours. In the event a house officer suffers a work-related illness or injury and uses all accumulated sick leave before he or she is able to return to work, additional pay may be granted to supplement any benefits available under workers’ compensation in order to bring the house officer’s gross pay up to his or her current stipend level.

The additional pay will end once disability insurance payments begin. Illnesses and injuries are considered work related only when a workers’ compensation claim is filed and approved.

Pay for non-work related illness or injury is limited to the residents’ accrued sick leave. A physician’s statement is necessary if the illness or injury extends beyond 14 consecutive calendar days. Any additional time required for program completion will be paid at the appropriate salary level.

G. Other Absence

A resident may request and take an unpaid leave of absence for up to six months with the approval of the program director. A letter stating the purpose of the leave, arrangements made for completing the training program and the mechanism for payment of insurance premiums must be signed by both the program director and the resident, with a copy kept on file at MUSC Office of Graduate Medical Education. If all or any part of this level of absence is due to illness or injury, the department may require a physician’s statement.
VIII. Counseling

During the orientation provided every June for all incoming residents, there is a discussion regarding physician impairment, including substance abuse. All residents receive a brochure on substance abuse, which is distributed by the MUSC Department of Human Resources. These brochures include, “Do You Know A Resident Who Needs Our Help? Physician’s Health and Rehabilitation Program” and “Substance Abuse Among Physicians, Early Symptoms and Future Consequences: A Guide For Medical Students, Residents and Practicing Physicians.” A 24-hour confidential hotline number is also provided. In addition, MUSC has a Substance Abuse Assistance Council whose members may be contacted for assistance, and confidential report lines are available. The MUSC Substance Abuse Assistance Council and its subcommittees maintain confidentiality of all matters and records.

Concerns about possible impairment of residents should be promptly brought to the attention of the residency program director, who will then discuss the concerns with the resident. If appropriate, referral will be made to the BCM Psychiatric Counseling Service or other appropriate counseling service. If it is determined the resident is too impaired to function on the clinical service, he or she may, at the discretion of the program director, be taken off the service until deemed ready to resume. It is important in dealing with an impaired resident or physician that the following occur:

The resident gets treatment
Confidentiality is maintained
Patients are not put at risk because of the impairment

All residents are also encouraged to attend the “Impaired Physician” programs at the General Surgery Lecture Series, which are open to residents of all specialties.
IX. Selection and Evaluation Procedures

A. Resident Selection Process

The selection of residents for the Department of Neurosurgery is based upon such factors as preparedness, ability, aptitude, academic credentials, communication skills, motivation and integrity. Selection is not influenced by race, gender, age, religion, color, national origin, disability or veteran status. The selection of neurosurgical residents is done via the National Resident Matching Program (NRMP), following ranking of the applicants by the department’s Neurosurgery Residency Selection and Evaluation Committee, which consists of the full-time neurosurgical clinical faculty. The process is as follows:

An applicant is eligible to apply if he or she is

- A graduate of a medical school in the United States or Canada accredited by the Liaison Committee on Medical Education (LCME)
- A graduate of a college of osteopathic medicine in the United States accredited by the American Osteopathic Association
- A graduate of a medical school outside of the United States and Canada with:
  - a valid certificate from the Educational Commission for Foreign Medical Graduates (ECFMG); or
  - a full and unrestricted license to practice medicine in a U.S. licensing jurisdiction; or
  - a graduate of a medical school outside of the United States and Canada who has completed a Fifth Pathway program provided by an LCME-accredited medical school

The resident applicant is required to complete the PGY-1 internship year at MUSC.

The resident applicant must apply through the Electronic Residency Application Service (ERAS) and the NRMP.

After receipt of a completed application from an eligible applicant, the application along with other completed applications is reviewed by the program director, Raymond D. Turner, IV, M.D., and members of the Neurosurgery Residency Selection and Evaluation Committee.

Approximately 40 applicants are selected to visit the Medical University of South Carolina and meet with neurosurgical faculty and residents. In general, groups of ten applicants are scheduled for a Thursday visit in the fall and winter.

At that visit, all neurosurgical faculty, the program director, and residents interview each resident applicant.

The program director, with the assistance of the Neurosurgery Residency Selection and Evaluation Committee, establishes the rank order of applicants for the NRMP.

The program director provides the selected applicants with a contract for one year of training at the PGY-1 level.
The applicant must qualify for a South Carolina Limited License or have an active South Carolina license to practice medicine.

The goal of the Neurosurgical Residency Selection and Evaluation Committee is to select the best-qualified applicants for the program based on factors as outlined above.

The MUSC Neurosurgical Residency Program follows the ACGME guidelines for evaluating each resident’s progress, the program’s faculty members and the program itself. The evaluation process for each is described below.

**B. Evaluation of Residents**

The academic progress of each resident is monitored, in part, by his or her performance on the on the primary, written examination of the American Board of Neurological Surgery (ABNS), taken each year by the junior residents. The examination is taken for self-evaluation beginning in the PGY1 year and then for credit once the resident has passed the exam under self-evaluation.

The line-of-supervision (see Section VI) provides informal day-to-day feedback on each resident’s performance, which is critical to address promptly any deterioration in performance or other problems, such as personality conflicts.

Each resident is responsible for their Operative procedures reports at the end of each rotation. These reports are generated from the raw operative data that the residents enter using ACGME Case Log System, an internet-based data collection tool developed by the American Board of Neurological Surgery for resident case log accumulation. These reports allow detailed and ongoing analysis of each resident’s operative experience.

The resident’s overall performance is systematically evaluated twice per year. For each rotation, the chief of service or director of resident education for each rotation and other key faculty are required to fill out an “End-of-Rotation Evaluation of Resident by Faculty / Attending Physician” form with numerical scores, along with written comments, to help track each resident’s strengths, weaknesses and progress. This master tracking record is prepared by the residency database coordinator. The individual evaluations are reviewed by the program director and the associate program director.

Each resident is discussed in terms of the twenty-four (24) ACGME established Milestones (i.e., spine, tumor, functional, pediatrics, etc.), which are based on the six (6) core competencies: (1) patient care, (2) medical knowledge, (3) practice-based learning and improvement, (4) interpersonal and communication skills, (5) professionalism, and (6) systems-based practice. In addition, the resident’s surgical skill and general strengths and weaknesses are addressed and, if necessary, recommendations are made to address any perceived deficiencies. These evaluations are discussed and then finalized by the department’s Clinical Competency Committee (CCC). This evaluation is read by the resident and subsequently reviewed in detail with the program director during a private meeting held with each resident.

The program director formally meets with each resident individually twice a year to discuss his or her evaluations and general performance, any education committee recommendations, the number and type of operative procedures the resident has performed relative to operative expectations, and any concerns of the resident. Constructive criticism, positive reinforcement, and the development of goals for the near future are emphasized at this meeting. The resident is also asked to provide his/her feedback on the
program during this meeting, but also has the opportunity to provide anonymous feedback through the mechanisms described in the section below. In addition, the resident’s upcoming schedule, research activity, and job/fellowship prospects are reviewed as well. This session of formal, scheduled mentoring complements the informal mentoring and other scheduled meetings that occur throughout the residency.

After obtaining feedback from the resident, the program director and associate program director together write a summary record of each meeting with each resident. The resident’s biannual evaluation is then finalized and retained in that resident’s confidentially maintained file. Additionally, after this meeting takes place, the resident’s Milestone score will then be entered into the ACGME Database.

C. Evaluation of Faculty

Using the web-based E*Value medical education management system (Advanced Informatics, Minneapolis, MN). The residents are able to log in their faculty evaluations and provide the program director with easy access to statistical data about each faculty member’s performance. This will be reviewed by the program director and department chair on a semi-annual basis.

In addition, the program director (chair of the department) evaluates the faculty who participate in the residency program according to criteria established by the faculty. These criteria include: (1) resident evaluation scores and comments; (2) teaching (operative and didactic teaching including participation in clinical conferences, journal club and the resident seminar); (3) service (including community outreach, involvement with the public hospitals, and participation in national, state and local medical organizations); (4) research; (5) professionalism; (6) communication skills; (7) administrative skills; (8) development of new clinical services; (9) grants or other funding; and (10) publications. The program director has an annual scheduled meeting with each faculty member who is involved with the residency program to discuss this evaluation.

D. Evaluation of Residency Program

The residents formally evaluate the program in three ways. First, their end-of-rotation anonymous evaluations, which are summarized and reported to the program director at regular intervals, contain valuable information about the quality of teaching, the conferences, the strength of the rotations, and other aspects of the program.

Second, the residents are encouraged to discuss the program during their bi-annual meetings with the program director. The residents are also regularly polled by the residency program coordinator regarding needs of the residents. Although these discussions usually involve physical needs such as computers or software, residents can also use these opportunities to indirectly relay to the program director some concern or problem that needs to be addressed.

Third, all residents meet annually to evaluate the program. During this meeting, one resident (usually one of the chief residents) is chosen to summarize in writing the discussion and to discuss the issues raised with the chair and the faculty. This is a group document that is approved before submittal by all of the residents and which does not attribute any concerns to individual residents by name. The program director and faculty review and discuss this annual document in June of each year, addressing each issue raised as appropriate.
X. **Discipline**

Major deficiencies in a resident’s performance will result in the program director calling a meeting with that resident and any involved faculty members. Each particular problem will be discussed, and specific corrective steps will be laid out and documented. Persistent problems will result in the resident being formally placed on probation for a defined length of time in accord with the policies of MUSC. The program director will then meet with the resident on a monthly basis to review his or her performance during the period of probation. Failure of the resident to bring his or her performance to a satisfactory level by the end of the probationary period will result in non-renewal of his or her contract for the next academic year, or, in certain cases, dismissal from the program.
By signing this form, I am acknowledging receipt of the updated Neurological Surgery Residency Handbook. I understand that it is my responsibility to review all general and specific goals and objectives prior to beginning each rotation as well.

Resident Signature: ________________________________________________

Resident Name: _________________________________________________

PGY: ________________________

Date: ________________________