SERVICE: Neurosurgery - Sinai, PGY 1

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<th>General description:</th>
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<td>The Sinai surgical residents will rotate in the Department of Neurosurgery at Sinai Hospital during their intern year. The duration of this rotation is 6 weeks. The Sinai resident will be a fully integrated member of the Neurosurgery team, under the supervision of experienced Neurosurgery mid-level provider(s) and the Neurosurgery attending staff. The surgical residents will participate in all care rendered to inpatient Neurosurgery patients at Sinai Hospital: admission, diagnostic work-up, operations, post-operative care and discharge. In addition, the surgical residents will participate in the care/operations of Neurosurgery patients during attending office hours. The surgical residents will attend the following educational activities: Surgery Core and specialty curriculum - 2 hours/week Surgery M&amp;M and resident case based lectures - 2 hours/week Neurosurgery M&amp;M - 1 hour/month Neurosurgery Faculty Office Hours – 1 afternoon/week In addition, the Neurosurgery faculty will provide several lectures to the entire resident class on common Neurosurgery problems during the subspecialty core curriculum: Critical care neurology and clinical neuro-anatomy for the general surgeon; evaluation and treatment of closed head injury; evaluation and management of penetrating head injury; interpretation of cervical spine radiographs and evaluation and management of cervical spine fractures; evaluation and treatment of spinal cord injury; evaluation and treatment of intra-cranial hypertension; ischemic and hemorrhagic stroke; epidemiology, pathology and evaluation and management of common brain tumors; management of common brain metastases; management of common spinal problems/degenerative spine disease; intracranial aneurysms and management of subarachnoid hemorrhage; management of peripheral nerve injury</td>
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<th>Competencies:</th>
<th>Goals and Objectives:</th>
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<td>Patient Care:</td>
<td><strong>Goals:</strong>&lt;br&gt;During this rotation, the resident should learn and practice to:&lt;br&gt;  • Demonstrate caring and <strong>respectful behaviors</strong> when interacting with patients and their families; demonstrate <strong>sensitivity</strong> to gender, age, ethnicity, religion, value systems and other potential differences of patients and their families; practice according to the clinical standards of Sinai Hospital</td>
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• Gather patient and case specific essential, comprehensive multi-source and accurate information about their patients for initial or peri-operative workup and patient follow-up in the inpatient and outpatient setting

• Using all available resources, under the guidance of the Neurosurgery senior resident, expert Neurosurgery mid-level provider(s) and attending(s), make informed decisions about diagnostic and therapeutic interventions based on patient information, up-to-date scientific evidence and clinical judgment; evaluate and implement priorities in patient care and incorporate preventive measures

• Under the guidance of the senior Neurosurgery resident, designated Neurosurgery related expert personnel and attending(s), develop and carry out patient management plans

• Under the guidance of the senior Neurosurgery resident, designated Neurosurgery related expert personnel and attending(s), monitor closely the patient’s clinical progress, review and react to variances in patient progress or response to therapeutic interventions; communicate the details and changes of patient care, progress and complications to the Neurosurgery mid-level provider(s) and/or attending in a timely manner

• Under close and direct supervision of the Neurosurgery senior resident, attending and other designated Neurosurgery related expert personnel, counsel and educate patients and their families on the state of the patient’s disease, necessary diagnostic tests, operative procedures and medical management

• Use information technology (hospital computer system) to support patient care decisions and patient education (electronic patient record, electronic radiology studies, online educational resources, including literature research)

• Work closely with other healthcare professionals, including those from other disciplines (Neurology Endocrinology, (Rehabilitation-)Medicine, mid-level providers, nurses, Neurosurgery office staff, etc.), to provide patient-focused and optimum outcome driven care

• Ensure that the needs of the patient and team supersede individual preferences when managing patient care; incorporate evidence-based medicine into patient care whenever possible; comply with changes in clinical practice and standards given by the senior Neurosurgery resident and/or attending

Objectives:

During the rotation, the resident should:

• Perform neurological history and examination of patients at various levels of consciousness; obtain appropriate radiologic studies, and plan operative and medical management with appropriate supervision
Under one-on-one supervision of the Neurosurgery attending, perform competently and/or assist in procedures (both in the inpatient and outpatient setting) considered essential for the area of practice.

**Assistance:**
- Craniotomy, laminectomy, intracranial hemostasis
- Removal of specific lesions: tumor, abscess, hematoma, disc
- Vascular repair: clipping of aneurysm
- Problems related to cerebrospinal fluid circulation: hydrocephalus (shunt)
- Repair/replacement of dura and bone
- Reduction of depressed skull fracture

Perform under supervision:
- Diagnosis lumbar puncture
- Insertion of ICP monitor
- Repair of scalp lacerations
- Burr hole for subdural hematoma
- Application and management of skeletal traction by tongs or halo
- Placement of ventriculostomy drainage catheter

Under supervision by the senior Neurosurgery resident, experienced Neurosurgery mid-level provider(s) and attending(s), participate in the pre- and post-operative surgical management of patients before and after Neurosurgery procedures; evaluate new emergency and inpatient consultations, including trauma; participate on daily morning and afternoon patient rounds on the Neurosurgery service at Sinai.

Under supervision by the senior Neurosurgery resident, experienced Neurosurgery mid-level provider(s) and attendings, manage post-operative surgical complications, including wound and CNS infection, bleeding, etc.

Attend Neurosurgery attending clinic at least once a week; and under one-on-one supervision by the Neurosurgery attending, participate in the evaluation of patients in the office setting.

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<th>Medical Knowledge:</th>
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<td><strong>Goals:</strong></td>
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<td>Residents must demonstrate knowledge about established and evolving biomedical, clinical and cognate (e.g., epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.</td>
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<th><strong>Objectives:</strong></th>
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<td>At the end of the Neurosurgery rotation, the resident should be able to:</td>
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<td>- More fully understand the surgical anatomy of the nervous system and the pathophysiology of nervous system trauma, compression, vascular disease and</td>
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neoplastic disease. In addition, the resident should be able to perform screening neurological examinations, and under supervision order appropriate diagnostic tests and participate in the surgical treatment of these disorders.

- Demonstrate knowledge of and skills in examination of patients with neurological or neurosurgical disease or injury so that:
  a. An accurate history can be taken
  b. A sufficient physical examination can be performed
  c. Logical conclusions can be drawn regarding location and nature of the neuropathology, and appropriate diagnostic tests can be scheduled

- Apply basic knowledge of the following clinical, neuro-radiological and electrophysiological methods to decide (after appropriate neurological history and examination) which diagnostic tests or interventions would provide the least risk and most useful information for subsequent determination of the correct diagnosis:
  a. Plain skull and spine radiographs
  b. Computed (axial/sagital / 3D) tomography of the head and spine
  c. Magnetic resonance imaging (MRI) of the head and spine
  d. Contrast studies (myelogram, cerebral or spinal angiogram)
  e. Trans-cranial Doppler, PET-scan
  f. Electroencephalogram, nerve conduction studies, evoked potentials
  g. Lumbar puncture and CSF analysis

- Demonstrate fundamental knowledge of diagnosis and management of patient with altered mental state (somnolence -> coma; confusion -> agitation):
  a. infections, systemic and CNS
  b. CNS trauma
  c. medications and (illicit) drugs and states of withdrawal
  d. dementia (senile, Alzheimer’s, chronic infarct) and other pre-existing conditions
  e. “ICU” and other psychoses

- Demonstrate an understanding of the management of head injuries to include:
  a. Selection, prioritizing and performance of resuscitation efforts to minimize secondary injury
    - Airway support, (controlled) hyperventilation
    - Volume resuscitation, iso- vs. hypertonic solutions
    - use of mannitol, diuretics
    - use of invasive monitoring (CVP, arterial line, PA-catheter, jugular venous bulb catheter, intracranial pressure monitor vs. intra-ventricular drain/monitor)
    - use of pressors/inotropes for guided cerebral perfusion / CPP management
    - seizure prophylaxis and management, including “silent seizure”
    - analgesics and sedatives for the acute phase management
b. Analyzing components and results of baseline and serial neurological examination to determine and evaluate changes in patient neurological status; and use of (serial) neurological exam in conjunction with diagnostic test results to delineate prognosis

c. Treatment of a scalp wounds

d. Initial treatment of compound depressed skull fractures

e. Recognition of cerebral herniation syndromes

f. Initiation and interpretation of intracranial pressure monitoring, management of increased intracranial pressure

g. Recognition and initial management of post-traumatic intracranial hemorrhage

- Demonstrate fundamental knowledge of cervical and thoraco-lumbar spine injuries, including:
  a. Recognition of level of injury by neurological deficit on physical examination
  b. Means of stabilization of spine (sandbags, tongs, halo)
  c. Specifics of resuscitation and minimization of secondary injury
    - see head injury
    - use of corticosteroids
  d. Pathophysiologic responses in quadriplegic or paraplegic patient

- Demonstrate the ability to assess and manage (acute and chronic) diseases of the cervical and lumbar region according to:
  a. Anatomical structures involved: disc (cartilage), annulus (ligament), joint capsule, pedicle, nerve root, foramen
  b. Conservative management: traction, rest, physical therapy and analgesic medications
  c. Selection and usefulness of radiological modalities: plain spine films, CT, MRI, myelography
  d. Indications for surgical management: intractable radicular pain, neurological deficit

- Demonstrate the ability to describe and diagnose intracranial and intra-spinal mass lesions (neoplasm, abscess, hematoma):
  a. Signs and symptoms of intracranial and intra-spinal mass lesions
  b. Classification of intracranial and intra-spinal tumors and basic indicators for prognosis and therapy
  c. Pathophysiology of hydrocephalus

- Demonstrate fundamental knowledge in central nervous system hemorrhage
  a. Pathophysiology of spontaneous intracranial and intra-spinal hemorrhage
    - subarachnoid, subdural, epidural, intra-cerebral, cerebellar, intra-ventricular
  b. Pathophysiology of cerebral aneurysms and vascular lesions
  c. Management principles for hypertensive bleed (hemorrhagic stroke) and grade based prognosis
  d. Management principles for subarachnoid hemorrhage (3H-therapy) and grade based
Demonstrate fundamental knowledge in central nervous system infections:
  a. Meningitis, encephalitis, cerebral and (peri-)spinal abscess
  b. Pathophysiology of intracranial and intra-spinal abscess
  c. Diagnosis and management of nervous system infections

Demonstrate fundamental knowledge in the diagnosis and management of peripheral nerve injury:
  a. Physiology of peripheral nerve injury and nerve regeneration
  b. Specifics of facial nerve injury
  c. Specifics of brachial plexus injury

Summarize several factors to consider when making critical decisions about treatment options for the elderly neurosurgical patient, to include:
  a. Patient views
  b. Quality-of-life issues (pre-operative functional status and ability to rehabilitate)
  c. Acceptable risks (consideration of comorbid conditions)
  d. Challenge of making an accurate diagnosis for the elderly patient

Demonstrate an understanding of important “non-surgical problems” and postoperative complications relating to Neurosurgery, including:
  a. Closed head injury: problems related to coma, brain swelling, increased intracranial pressure (ICP), brain anoxia; evaluate prognosis based on day 1/3/7 exam
  b. Spinal cord injury: problems related to paralysis (musculo-skeletal, cardiovascular, gastrointestinal, genito-urinary, integument, sensory deficit, infections); management in hospital and on outpatient basis
  c. Airway and respiratory problems secondary to coma or high cord injury: airway management (ETT, tracheostomy), ventilator management, prevention of atelectasis and pneumonia (see also ICU Goals and Objectives)
  d. Vascular problems in cerebral and spinal cord injuries: hypo- and hypertension, cerebral circulation alteration after trauma and surgery (auto-regulation), effects of cerebral ischemia
  e. Bladder problems: secondary to brain, cord or cauda pathology
  f. Gastrointestinal problems: hyper-metabolic states, dysmotility, stress ulceration
  g. Metabolic and endocrine problems: hypopituitarism, hypoadrenalism, diabetes insipidus, cerebral salt wasting and other causes of hyponatremia
  h. Fever in the Neurosurgery patient: common infections (UTI, pneumonia, line infections, meningitis, encephalitis, wound infections, etc.), drugs, neurologic fever

Discuss ethical and socioeconomic issues relating to Neurosurgery (e.g., brain death, mental incompetence, dysphasia, compensation neuroses, and intractable or chronic pain).
Demonstrate an understanding of the importance of early referral of head and spinal cord injury patients to rehabilitation services; recognize the potential impact of these services for long-term prognosis.

**Objectives – General:**
- Complete the reading assignment (see literature list)
- Attend all ($\geq 85\%$) conferences, M&M conferences, Grand Rounds/other educational activities of the Department of Neurosurgery during the rotation
- Take a post-rotation self-assessment test with at least 75\% correct answers

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<th>Practice-based Learning and Improvement:</th>
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<td><strong>Goals and Objectives:</strong></td>
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<td>Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices. Residents are expected to:</td>
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<td><strong>Self-assessment:</strong> Analyze practice experience during the rotation, as well as own performance, based on interaction with the senior Neurosurgery resident, attending(s) and other key Neurosurgery staff; accept and use constructive criticism to improve performance in the six core competencies</td>
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<td><strong>Medical knowledge:</strong> Self-directed and under mentorship of Neurosurgery resident and attending(s) staff, locate, appraise and assimilate evidence from scientific studies related to patients’ health problems. Use evidence based medicine approach to patient care whenever possible; apply knowledge of study designs and statistical methods to the appraisal of clinical studies and other information on diagnostic and therapeutic effectiveness; use information technology to manage information, access online medical information and support own education; facilitate the learning of students and other healthcare professionals on the Neurosurgery service by sharing pre-existing and newly acquired knowledge (general and case-based) on rounds and during formal educational activities. Residents are encouraged to ask/question the Neurosurgery resident, attending staff and/or other Neurosurgery surgery related expert providers for clarification of unclear concepts/practices at any time.</td>
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<td>Participate in the <strong>peri-operative management of neurosurgery patients</strong> in the in-patient and outpatient setting as outlined in patient care competency. During the rotation, the resident should become familiar/proficient with:</td>
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<td>a. Fundamentals of focused neurosurgery history and exam; neurosurgery diagnostic tests and procedures</td>
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<td>b. Common neurological and neurosurgical diseases, benign and malignant and fundamental therapeutic options</td>
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<tr>
<td>c. Common neurosurgical complications and management thereof</td>
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- Perform/participate in **Neurosurgery service related operations** as outlined in patient care competency; during the rotation the resident should become familiar/proficient with:
  a. CNS/spinal anatomy and common diseases, including trauma
  b. Fundamental (technical) principles of surgery on the brain (exposure, hemostasis, drainage, monitors) and spine (exposure, drainage, stabilization)

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<th><strong>Interpersonal and Communication Skills:</strong></th>
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<td><strong>Goals and Objectives:</strong> Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, their patient’s families and professional associates. Residents are expected to:</td>
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<td>- Develop interpersonal skills necessary to <strong>communicate effectively</strong> with patients, patient families, nursing staff, mid-level healthcare providers, ancillary staff, medical students, fellow residents and attending staff in the complex multi-specialty environment that constitutes Neurosurgery</td>
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<td>- Contribute to <strong>creating an atmosphere of collegiality and mutual respect</strong> with all providers involved in the care of patients</td>
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<td>- Develop <strong>effective listening, questioning and documentation skills</strong></td>
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<td>- Demonstrate <strong>ability to work effectively as a member of a team</strong></td>
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<td>- Demonstrate <strong>ethically sound behavior</strong> (see also Professionalism)</td>
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<td>- <strong>Share own knowledge</strong> with other members of the team to foster an environment of learning</td>
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<th><strong>Professionalism:</strong></th>
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<td><strong>Goals and Objectives:</strong> Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles and sensitivity to a diverse patient population. Residents are expected to:</td>
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<td>- Demonstrate <strong>adherence to institutional and departmental standards and policies</strong></td>
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<td>- Demonstrate <strong>respect, compassion, integrity and ethical behavior</strong> consistent with the values of the department and institution; develop and sustain sensitivity toward differences of age, gender, culture, religion, ethnicity or other diversities in both co-workers and patients</td>
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<td>- Demonstrate ability to appropriately take on, <strong>share and delegate responsibilities</strong> with regard to patient care; balance own rights and privileges appropriately with responsibilities and accountability resulting from being a member of a team dedicated to patient care</td>
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<td>- Demonstrate <strong>commitment to excellence and on-going professional development</strong></td>
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<td>- Under attending and other Neurosurgery staff guidance, develop skill to resolve</td>
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potential problems and conflicts that occur in a complex corporate environment using the appropriate channels and methods of communication to maximize patient care and surgical service performance

- Evaluate and formulate a response to **ethical questions**, including:
  
a. Brain death, and withdrawal of care in patients with (anticipated) vegetative state or coma; advanced directive vs. family wishes.

- narcotic analgesics in patients with chronic pain.

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<th>Systems-based Practice:</th>
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<td><strong>Goals and Objectives:</strong></td>
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<td>Residents must demonstrate an awareness of and responsiveness to the larger context and system of healthcare and the ability to effectively call on system resources to provide care that is of optimal value. Residents are expected to:</td>
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<td>- Understand how choices in patient care and other professional practices affect other healthcare professionals, the healthcare organization and the larger society and how these elements of the system affect their own practice:</td>
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<td>a. Average cost of Neurosurgery vs. conservative management of chronic pain syndromes</td>
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<td>b. Cost of rehabilitation after neuro-trauma or stroke, including productive years lost, etc.; cost of injury prevention</td>
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<td>c. The relevance and components of clinical pathways and how to deal with deviation.</td>
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<td>- Practice cost-effective healthcare and resource allocation that does not compromise quality of care</td>
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<td>- Know how to partner with healthcare managers (Neurosurgery coordinator, social work, case management, PT/OT and Rehabilitation medicine, etc.) and other healthcare providers (PMD, specialty providers in and out of the hospital) to assess, coordinate and improve healthcare for the individual patient and cohorts of patients.</td>
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