CA-1&2 Curriculum Neuroanesthesia
West Virginia University Department of Anesthesiology

Description of Rotation or Educational Experience

This document addresses the general and specific expectations of residents rotating in Neuroanesthesia. It takes into account the expectation that CA1 residents, though may not know Neuroanesthesia in depth, will be taking supervised call during their first year of residency. CA2 residents will be rotating in a specific Neuroanesthesia required rotation during their CA-2 year. These goals quantitate the expectations of residents at each level of training. In CA-3 year there will be an elective month in neuroanesthesia with increased amounts of autonomy.

Patient Care (End of CA-2Year)

Goals

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Residents are expected to:

- Administer Anesthesia safely to patients with Neurological disease who are undergoing neurological or non-neurological surgery, diagnostic procedures requiring Anesthesia or non-surgical interventions requiring Anesthesia.

Competencies

- Be able to review the medical history and physical examination of patients; be able to define the type and severity of their major neurosurgical problem(s), as well as other medical problems that may affect the pathology.
- Understanding of clinical relevant brain physiology.
- Approaches to raised ICP, brain protection and knowledge of evidence.
- Competence to evaluate for brain death.
- Anesthesia for Supratentorial, Infratentorial and Pituitary surgery.
- Anesthesia for Interventional Neuroradiology
- Understand the ICU management of SCI (spinal cord injury).
- Anesthetic/ICU approach to spinal cord protection
- Anesthesia for spinal surgery – minimally invasive, neuronavigational approach, laparoscopic lumbar, video assisted thoracic & open procedures.
- Recognize which patients with spinal cord pathology may require special techniques such as awake intubation and positioning.
- Recognize which patients would be suitable for extubation considering CNS, neuromuscular and other organ system pathology.
- Manage an elective craniotomy, understanding the rationale for the choice of agents.
- Be able to rapidly set up, induce, monitor and manage emergent craniotomy trauma with assistance.

- Pre & intra-op issues with TBI (traumatic brain injury) & anesthetic management.
- Anesthesia for shunt surgery
- Have knowledge of airway management and sedation requirements, as well as potential complications in patients undergoing stereotactic, Brain lab assisted surgery, under general or monitored anesthesia care.
- Anesthesia for epilepsy surgery.
- Awake craniotomy for seizure mapping, functional cortical mapping.
- Anesthesia for Deep brain Stimulator placement, vagal nerve & dorsal column stimulators.
- Understand CT and MRI imaging findings of common CNS pathologies,such as epidural and subdural hematomas, large strokes or masses.
- To understand indications for emergency imaging.
- Clinical application of TCD (transcranial Doppler), cerebral oxymetry and SjVO2 monitoring.
- To be able to manage patients with SAH in ICU/OR.
- Understand the surgical & neuroradiological interventions for SAH.
- Understand extracranial manifestations & management of SAH.
- Intra-OP management of aneurisms and AVM's
- Understand the periop consideration and management of CEA.
- Management of patients with Dysnatemia.

Technical Skills

- Accomplish the various methods of placing a right atrial catheter, transthoracic doppler, and transesophagial echo for diagnosis and management of air embolism.
- Perform awake laryngoscopy, fiberoptic laryngoscopy, utilize fast-track LMA or in-line traction and understand their use in patients with spinal cord injury, with assistance.
- Set up, organize and execute the planning of a complicated case (i.e. fiberoptic intubation, arterial line, central line).

Objectives

- During the last week of the rotation, Pass an Oral Examination demonstrating appropriate knowledge in the area of Neurosurgical Anesthesia. This examination will be based upon the American Board of Anesthesiology format and scored using ABA criteria.
- Pass a Written Examination during the last week of the rotatation.
- Successful knowledge acquisition as assessed by faculty on Written Formative Evaluations
- Complete Portfolio Assignment: Faculty assessment of knowledge exhibited in resident case work up of a specific neuroanesthetic management. Assessment should include a summary of the pertinent evaluation of the patient and anesthesia plan demonstrating evidenced based medical practice as documented with pertinent literature references.

Medical Knowledge (End of CA-2 Year)

Goals

To accomplish all clinical skills residents are required to read widely to expand their knowledge base in Anatomy, Pathophysiology, Pharmacology and relevant clinical Anesthetic topics.

Competencies

- Have an understanding of the basic anatomy of the nervous system, including blood supply to the brain and spinal cord, the organization of the motor and sensory tracts within the spinal cord, and the ventricular system and normal flow of CSF.
- Have a general knowledge of cerebral blood flow (CBF) and the factors that affect it, including normal cerebral blood flow autoregulation, cerebral blood flow response to CO_2, and cerebral metabolism. The effects of the following classes of drugs on the CBF, CO_2 reactivity, coupling of flow and metabolism should be understood: hypnotic agents (barbiturates, benzodiazepines, etomidate, propofol), ketamine, nitrous oxide, potent inhalational agents, opiates and antagonists and muscle relaxants.
- Understand the general use of fluids including crystalloid, colloid, dextrose-containing solutions, osmotic, and non-osmotic diuretics in patients with intracranial pathology.
- Understand the general principles, advantages and disadvantages of the prone, lateral, ¾ prone supine head turned away positions. Understand the hemodynamic and respiratory consequences of the prone and lateral positions.
- Understand the pathophysiology of acute and chronic spinal cord injury at any level, its disruption of normal CNS, hemodynamic and respiratory physiology (with particular attention to autonomic dysreflexia), and what impact this disruption has on anesthetic management. The consequences of using depolarizing muscle relaxants in these patients should be understood.
- Understand spinal cord protection for spinal cord injury and thoracic aortic repair.
- Understand pathophysiology of traumatic brain injury
- Understand general concepts of cerebrospinal fluid physiology (formation, reabsorption, flow).
- Understand the pathophysiology of the cerebral circulation in patients with ischemic cerebrovascular disease and the inherent cardiovascular pathology associated with these patients. Learn to evaluate the vertebral and carotid circulation in these patients
- Understand the management of increased intracranial pressure for craniotomy and the use of hyperventilation, barbiturate infusions, osmotic and loop diuretics and CSF drainage.
- Be able to describe the following types of spine surgery and know the degree of complexity: anterior and posterior cervical laminectomy, foraminotomy and fusion, laminectomy for spinal cord tumors or lumbar/thoracic fusions, corppectomy, foraminotomy.

- Know the differential of intracranial hypertension ("tight brain") and treatment alternatives.
- Know the basic acute changes caused by subarachnoid hemorrhage on the cerebral physiology and its potential effects on other organ systems.
- Understand the natural history of aneurysms (the rationale of timing of aneurysm surgery), the Hunt-Hess classification of neurologic grading, the physiology of transmural pressure in aneurysms and factors that predispose to rupture or cerebral ischemia.
- Understand the consequences of the sitting position with respsect to the hemodynamic, neurological and respiratory dysfunction that can occur.
- Understand veous air embolism – its prevention, diagnosis and treatment in both the sitting and prone positions.
- Understand the basic differences between infratentorial, supratentorial and pituitary tumors, and the implication of their size and speed of growth in management.
- Understand the apthophysiology of neuroendocrine tumors and the systemic implications of the disorders.
- Have a basic knowledge of intracranial pressure and jugular bulb oxygen saturation, cerebral oximetry onitoring and its uses (at least in theory), as well as its use in guiding hemodynamic therapy.
- Understand the basics of neuro-physiologica monitoring in spine surgery, the appropriate effects of anesthetics and the use of intraoperative "wake up" tests for motor evaluation.
- Understand the anatomy of the cervical plexus, and the technique of cervical plexus blockade for carotid surgery.
- Have a basic knowledge of neurointerventional techniques, as well as the anesthetic challenges involved.

Objectives

- During the last week of the rotation, Pass an Oral Examination demonstrating appropriate knowledge in the area of Neurosurgical Anesthesia. This examination will be based upon the American Board of Anesthesiology format and scored using ABA criteria.
- Pass a Written Examination during the last week of the rotatation.
- Successful knowledge acquisition as assessed by faculty on Written Formative Evaluations
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Practice- Based Learning and Improvement

Goals

Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life long learning. Residents are expected to develop skills and habits to be able to:

- Identify and access appropriate reference resources to solve neuroanesthesia management problems in a timely manner
- Demonstrate an understanding of the anesthesia provider's role in any adverse outcomes that develop, as well as to discuss the learning points gained from such an experience.
- Independently seek answers to previously unexposed clinical questions and incorporate this knowledge acquisition into appropriate management and care plans
- Review the post-anesthetic hospital course of their patients receiving anesthesia for complications or sub optimal outcomes and devise alternative management plans that could have improved outcomes.
- Access 'on-line' reference sources pertinent to the anesthetic management of neurosurgical patients

Competencies

- Identify personal strengths, deficiencies and limits in knowledge and expertise related to the field of neuroanesthesia.
- Set learning and improvement goals based on patient and colleague feedback
- Actively participate and seek educational opportunities
- Systematically analyze anesthesia practice, peri-operatively and through post-anesthetic assessment of patients and restructure anesthetic practice based on improved patient outcomes
- Incorporate formative evaluation feedback into daily practice
- Incorporate pertinent findings and conclusions of scientific studies to improve neuroanesthesia outcomes
- Use information technology to optimize learning
- Disseminate knowledge acquired for the further education of patients, families, students, residents and other health professionals

Objectives

- Portfolio: Case Management: Residents will identify 1 neurosurgical patient with a related co-morbidity, perform a literature search, identify at least 2 references pertinent to the patient and produce a 1 page synopsis of the evaluation, alternatives, their proposed management of the patient, and anticipated possible complications. The resident will review the case with the attending physician and submit copies for inclusion in their portfolio.
- Portfolio: Post-Anesthetic Rounds: Residents will identify 1 patient on post-anesthetic rounds that they feel had sub-optimal outcomes. Residents will summarize the anesthetic management of the patient in writing and submit a brief

synopsis of alternative management techniques that might have produced more optimal outcome. Residents will review the plans with the attending physician and submit copies for their portfolio.

- During the last week of the rotation Pass an Mock Oral Examination based upon the American Board of Anesthesiology format and scored using ABA criteria Demonstrating appropriate strategies for acquisition of additional skills and knowledge for care and management of the anesthetic of an neurosurgical patient.
- Successful demonstration of adequate practice- based learning and improvement as assessed by faculty on Written Formative Evaluations

Systems Based Practice

Goals

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:

- Function as a member of a care team with nurses, neurosurgeons, interventional neuroradiologists, neurophysiologists, and intensivists.
- Understand the system requirements needed to handle neurosurgical emergencies, including emergency room, radiology and operating room involvement
- Understand the issues involved in providing anesthesia care for off-site neurointerventional procedures, including staffing and timing.

Competencies

- Work effectively with nurses, neurosurgeons, interventional neuroradiologists, neurophysiologists, and intensivists to deliver timely and effective anesthetic care
- Coordinate patient care within the health care system relevant to neuroanesthesia
- Incorporate considerations of risk-benefit analysis in patient care
- Participate as part of inter-professional team to enhance patient safety and improve patient care quality
- Participate in identifying systems errors and in implementing potential systems solutions

Objectives

- Overall satisfactory performance on a 360 evaluation demonstrating satisfactory performance as part of a neurosurgical/neuroanesthesia patient care team.
- Successful acquisition of patient information from hospital based systems as documented in the resident's Portfolio of patient case presentation.
- Successful demonstration of adequate systems based practice as assessed by faculty on Written Formative Evaluations

Professionalism

Goals

Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents are expected to:

- Provide the highest possible quality neurosurgical anesthesia care
- Provide a role model to students and related practitioners as to commitment and professional conduct in the care of patients
- Discuss ethical challenges in the care of the critically ill and serious neurologically impaired patients.

Competencies

- Demonstrates Courtesy and Respect for patients, nurses, physicians, and ancillary staff
- Demonstrates Compassion and Integrity for others
- Completes patient care tasks and provides appropriate follow-up and feedback to patient and staff
- Recognizes the urgency of various neurosurgical cases and proceeds efficiently
- Acts in the best interest of the patient
- Advocates quality and timely patient care
- Respects patient privacy and autonomy
- Accountable to patients, society, and the profession
- Sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in age, culture, race, religion, disabilities, and sexual orientation

Objectives

- Demonstration of professionalism on 360 degree evaluation
- Successful demonstration of adequate professionalism as assessed by faculty on Written Formative Evaluations

Interpersonal and Communication Skills

Goals

Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and teaming with patients, their families, and professional associates. Residents are expected to:

- Effectively obtain pertinent medical history from the patient.
- Effectively describe available anesthetic options at appropriate age and education specific levels
- Obtain informed consent for anesthesia and invasive monitoring. Explain related risks including neurological, cardiac, and respiratory complications.

Competencies

- Communicate effectively with patients and families across a broad range of socioeconomic and cultural backgrounds
- Communicate effectively with physicians, nurses, and ancillary staff

- Work effectively as a member of the health care team
- Act in a consultative role to other physicians and health professionals
- Maintain comprehensive, timely, and legible medical records

Objectives

- Positive assessment of interpersonal and communication skills on 360 degree evaluation
- Successful demonstration of adequate interpersonal and communication skills as assessed by faculty on Written Formative Evaluations

Teaching Methods

What teaching methods are you using on this rotation or educational experience?

- Didactic Lectures
- Review and discussion of Preoperative evaluations and anesthetic plans
- Intraoperative discussions of pertinent physiologic changes and case management
- Review and discussion of post-anesthetic evaluation
- Case Scenario discussions
- Portfolio assignments
- Suggested Readings
- Socratic Method

Assessment Method (residents)

- Global Rating Scale
- 360 Degree Evaluation (implementing)
- Chart Stimulated Recall (implementing)

	Patient Care	Med Knowledge	Practice Based Learning	System Based Practice	Profess-ionlism	Communi-cation
Global Rating Scale	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly
Chart Stimulated Recall (proposed)	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly

Assessment Method (Program Evaluation)

- Assessment of successful Patient Care Competency in oral examinations and faculty evaluations of observations of clinical practice.
- Performance of residents on written and oral examinations
- Performance on the Neuroanesthesia subset of In-Service Examinations administered by the American Board of Anesthesiology
- Performance on the Neuroanesthesia subset of Anesthesia Knowledge Test
- Performance of program graduates on the Neuroanesthesia subset of the written examination of the American Board of Anesthesiology
- Review of Resident Evaluations of Faculty Performance
- Review of Resident Program Evaluations
- Post-graduate assessments of adequacy of training

Level of Supervision

- Residents are supervised 1:1 or 2:1 by an attending anesthesiologist with sub-specialty training or documented subspecialty interest in Neuroanesthesia.

Educational Resources

Recommended readings and references:

PRIMARY TEXT: Cottrel, James E., and David S. Smith. Anesthesia and Neurosurgery. 4th ed. Mosby, Inc. St. Louis, Missouri. 2001.

REFERENCE TEXT: Barash, Paul G., Bruce F. Cullen, and Robert K. Stoelting. Clinical Anesthesia. 5th ed. Lippincott Williams & Wilkins. Philadelphia. 2006.

REFERENCE TEXT: Matta, Basil F., David K. Menon, and John M. Turner. Textbook of Neuroanaesthesia and Critical Care. Greenwich Medical Media Ltd. London. 2000.

REFERENCE TEXT: Haines, Duane E.. Neuroanatomy: An Atlas of Structures, Sections, and Systems. 6th ed. Lippincott Williams & Wilkins. Philadelphia. 2004.

WEB REFERENCES:
Society of Neurosurgical Anesthesia and Critical Care:
http://www.snacc.org/Links.html

American Society of Anesthesiologists:
http://www.asahq.org/

Social Justice

West Virginia University is committed to social justice. We concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color, or national group. Any suggestions as to how to further such a positive and open environment in this rotation will be appreciated and given serious consideration.

Written by Suraj Fernando, MD, 2-23-2007
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