

## Neurocritical Care Fellowship Description

The fellowship will have two routes. A 1 year rotation for Neurosurgery PGY5 or greater fellows, or a 2 year rotation for non-Neurosurgery fellows (including Neurology, Internal Medicine, Emergency Medicine, and Anesthesiology. In both cases the training goals will be the same.

### Goals and Objectives

#### Patient Care

The Neurocritical Care (NCC) fellow will be able to:

##### Clinical Care

- Formulate and implement clear and concise system-based neurocritical assessments and plans.
- Perform an expert coma examination and declare brain death according to state and national standards.
- Control intracranial hypertension with medical measures (sedation, analgesia, osmotics, hyperventilation, hypothermia, barbiturates) and surgical intervention (CSF diversion, decompressive craniectomy).
- Interpret advanced neurocritical monitors to include ICP, PbO<sub>2</sub>, EEG, and TCD.
- Interpret advanced hemodynamic monitors to include S<sub>jo</sub>O<sub>2</sub>, CVP, ABP, CO, SVV, and SVR.
- Interpret advanced neuroimaging studies, including brain MR, non-invasive and invasive angiography, and perfusion imaging.
- Interpret critical care laboratory studies with a focus on blood gases, acid base, sodium, coagulation, and thromboelastography.
- Direct a team in advanced cardiac life support, including high quality cardiopulmonary resuscitation and defibrillation.
- Perform targeted temperature management after cardiac arrest and for intracranial injury, including the use of surface and intravascular cooling methods.
- Manage mechanical ventilation in respiratory failure, including the use for paralysis, proning, and bilevel.
- Initiate effective and safe renal replacement therapy to minimize osmotic shifts.
- Reverse antithrombotics to affect hemostasis.
- Prescribe common classes of neurocritical medications, including anticonvulsants, osmotics, sedatives, analgesics, antibiotics, immunomodulators, inopressors, antihypertensives, and antiarrhythmics.
- Provide preoperative risk stratification and high level postoperative care to neurosurgical patients.
- Discuss ethical issues in NCC to include capacity/consent in disorders of consciousness, organ support and donation, resuscitation, and comfort care.

##### Technical skills

- Perform neurocritical procedures competently with or without imaging guidance.
- Employ point of care ultrasound and echocardiography to guide resuscitation.
- Perform TCD to identify major vessels in the anterior and posterior circulations.

#### Medical Knowledge

The NCC fellow will be able to:

- Relate the physiology of intracranial volume and ICP to CBF and CVR.
- Understand shared mechanisms of neurocritical pathophysiology, including ischemia, seizure, cortical spreading depression, hydrocephalus, brain edema, brain herniation, and intracranial hypertension.
- Learn symptoms, signs, differential, and principles of management for NCC conditions.
  - Common admission conditions include non-traumatic subarachnoid hemorrhage, non-traumatic intracerebral hemorrhage, ischemic stroke, subdural brain herniation, status epilepticus, brain and spinal tumor, and high morbidity post-operative neurosurgery.
  - Common consult conditions include severe traumatic brain and spine injury, anoxic brain injury after cardiac arrest, neuromuscular respiratory failure, and meningitis/encephalitis.
- Recognize indications for intracranial monitors and CSF drains in TBI, ICH, SAH.

- Learn the fundamentals of critical care, including but not limited to shock, lung protective ventilation, intravenous fluids, sodium, acid base physiology, acute kidney injury, sepsis, thrombosis, hemorrhage, glycemic control, and nutritional support.
- Demonstrate the ability to evaluate neurocritical literature in journal clubs and on rounds.

### Research

The NCC fellow will be able to:

- Demonstrate a high capacity for work and intensity in clinical research and trials
- Use the LSU NCC Registry as a foundation for clinical research

### Practice-Based Learning and Improvement

The NCC fellow will be able to:

- Teach and mentor residents and students.
- Foster learning and inquiry in NCC practice.
- Adapt evidence-based guidelines in critical care to specific patients.
- Appreciate the contribution of quality measures to patient outcomes.
- Seek constructive criticism and review formative assessments.

### Interpersonal and Communication Skills

The NCC fellow will demonstrate a high level of interpersonal communication skills and be able to:

- Communicate effectively with other team members, unit nurses, respiratory therapists, consulting physicians, and other staff.
- Receive and deliver sign out on specified patients at transitions of care (day-night, ED/floor/OR-ICU, on/off service).
- Integrate effectively into the NCCU medical team.

### Professionalism

The NCC fellow will demonstrate a high level of professionalism at all times and be able to:

- Treat patients with compassion and respect.
- Be punctual to shifts and respectful of schedules.
- Maintain confidentiality and safeguard protected health information.
- Demonstrate professional honesty and integrity.

### System-Based Practice

The NCC fellow will be able to:

- Demonstrate an understanding of practice opportunities, practice types, health care delivery systems and medical economics.
- Recognize value of NCC to neurology, neurosurgery, and other allied fields.
- Practice cost-effective care by choosing medications and diagnostics selectively and avoiding duplicate studies.
- Adapt care pathways and hospital policies to specific patients.

## **Sites**

The fellow will rotate at West Jefferson Medical Center (WJMC) and University Medical Center (UMC). An office will be provided for the fellow in the WJMC NCCU. A call room will be designated for the fellow on any overnight call.

## **Rotations**

1 year rotation schedule (Neurosurgery PGY5 or greater):

WJMC NCCU 4 months  
UMC Medical/Trauma ICU 2 months  
WJMC Neurointerventional/Stroke 2 months  
WJMC Anesthesia 1 month  
WJMC Neurodiagnostics 1 month  
Elective 2 months

2 year rotation schedule (non-Neurosurgery fellows, including Neurology, Internal Medical, Emergency Medicine, and Anesthesiology applicants)\*:

WJMC NCCU 8 months  
UMC Medical/Trauma ICU 4 months  
WJMC Neurointerventional/Stroke 4 months  
WJMC Anesthesia 2 months  
WJMC Neurodiagnostics 2 month  
Elective 4 months

Vacation will be 4 weeks yearly scheduled in non-NCC Unit rotations. 3 weeks of vacation will be scheduled in time at WJMC. 1 week of vacation will be scheduled in time at UMC.

## **Supervision**

Supervision with independence appropriate to competence will always be provided.

The neurointensivists in the program who will primarily supervise the fellow are Alan Velander, M.D. (Neurocritical Care), Merritt Brown, M.D. (Neurocritical Care, Endovascular Neurosurgery), and (expected in 9/21) Luciano Ponce, M.D. (Neurocritical Care, Endovascular Neurosurgery). In parallel, the fellow will benefit from ongoing neurosurgical supervision from Frank Culicchia, M.D. (Neurosurgery). Attending medical and surgical intensivists, anesthesiologists, neurologists, and neurosurgeons will supervise the fellow on rotations outside of the Neurocritical Care Unit.

Lines of responsibility will be defined in each rotation. The first contact will be the attending on each rotation. The next contact will be the fellowship director. The next contact will be the program director. The final contact will be the Neurosurgery chair.

Credentialed attendings will directly teach and supervise neurocritical procedures. If the fellow can demonstrate competence in a procedure from previous training as evidenced by case log, privileging may be accelerated. If the procedure is new to the fellow, a necessary number of each procedure will be supervised before privileging is extended.

Central venous catheter (femoral, internal jugular, subclavian) 5 per site  
Arterial catheter (radial, brachial, axillary, femoral) 5 per site  
Endotracheal intubation 10  
Flexible bronchoscopy 10  
Percutaneous tracheostomy 10  
Paracentesis 5  
Thoracentesis 5  
Tube thoracostomy 10

Lumbar puncture 5  
Lumbar drain 5  
Intracranial monitor 5  
External ventricular drain 10

Credentialed attendings will review Neurophysiology interpretations (TCD, EEG) by the fellow.

Work hours for the fellow will comply with the ACGME Clinical and Educational Work Hours requirements and be limited to 80 hours per week, averaged over a 4 week period, inclusive of clinical and educational activities on site, clinical work at home, and all moonlighting. Work hours will be monitored by the fellowship director.

An office will be provided for the fellow in the West Jefferson Medical Center Neurocritical Care Unit. A call room will be designated for the fellow on any overnight call.

### **Evaluation**

In each rotation, supervising attendings will provide formative evaluation. In the longer WJMC NCCU rotation, supervising attendings will complete formative evaluations at the end of each block. All evaluations will assess proficiency in the ACGME competencies and milestones.

A summative evaluation will be created by the fellowship director at the end of the fellowship to review the fellow's performance. This evaluation will address the fellow's procedure numbers and competence to perform independently. The summative evaluation will be part of the fellow's permanent record at LSU.

The fellow will submit evaluations of the supervising attendings twice a year. These evaluations will assess teaching ability, educational commitment, clinical knowledge, and scholarly activities. These evaluations will be included in the biannual program review. If the fellow wishes to communicate concerns about the faculty before or outside these evaluations, the fellow may contact the fellowship director or the LSU ombudsman as an impartial third party.

### **Impact**

The NCC fellow will be a resource to the training of residents in the NCCU at WJMC. The NCCU is a new independent ICU that has been created to accommodate Neurosurgery and Neurology patients with neurocritical illness. Previously those patients had been located in the Intensive and Coronary Care Units under the primary care of the Hospitalist team. To accommodate this new NCCU, WJMC has hired 5 APP to supplement patient care. This new NCCU will result in more clinical work and yield excellent training to a fellow.

Some procedures are shared by the Neurosurgery residents and the NCC fellow. The procedures chiefly include lumbar drains, external ventricular drains, and intracranial monitors. For a NCC fellow with Neurosurgery privileges, other operations may include decompressive craniectomy, subdural and intraparenchymal hematoma evacuation, and aneurysm coiling and clipping. This fellow will only participate in the surgeries of patients currently admitted to the NCCU.

As the focus of this fellowship is neurocritical care, the LSU Neurosurgery residents will be prioritized in operations, and the Neurosurgery program director will monitor case assignments and logs to guarantee optimal resident training.