Goals and Objectives of the Neurosciences ICU Rotation

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Resident Level: PGY-2,4

Setting: Residents will be trained to evaluate critically ill patients with neurologic disease in the neurosciences critical care unit.

Goals: The goal of the neurosciences critical care rotation is to obtain the necessary cognitive and technical skills to manage critically ill patients with neurological diseases. In addition, residents are expected to gain familiarity with basic principles of critical care medicine, neurology, neuroanatomy, neurosurgery, and neurointerventional radiology.

Objectives:

Patient care: Residents are expected to provide patient care that is compassionate, appropriate, and effective for the promotion of health, the prevention of illness, the treatment of disease, and at the end of life.

• Demonstrate a caring and respectful behavior towards patients and families.
• Demonstrate ability to choose appropriate care interventions based on medical facts, patient preferences, and current scientific evidence.
• Demonstrate ability to prioritize competing care needs of patients in the NSICU.
• Diagnose and treat organ failure and hemodynamic instability.
• Use data from various monitoring devices appropriately to guide therapy.
• Explain indications and complications of common ICU procedures and ventilatory strategies.
• Identify patients no longer requiring ICU therapy and identify factors important to facilitate safe transfer of patient care.

Medical Knowledge: Residents are expected to demonstrate knowledge about established and evolving biomedical, clinical, and cognate sciences, as well as the application of this knowledge to patient care and the education of others.

• Demonstrate basic understanding of the following:
  o Physiology of cerebral blood flow and metabolism, intracranial pressure
  o Pathophysiology of increased intracranial pressure, arterial vasospasm
  o Medical, surgical and neurointerventional treatment options for increased intracranial pressure and vasospasm
  o Ventilator management for brain injured patients
o Hemodynamic management for patients with brain or spinal cord injuries
o Hemodynamic consequences of brain and spinal cord injuries
o Airway management for patients with reduced level of consciousness or cranial nerve impairment, patients with cervical spine injuries
o Specific considerations for patients with coexisting critical illness, e.g. ARDS, and intracranial pathologies
o Peri-operative care for neurosurgery patients
o Specific considerations for care after angiography or thrombolytic therapy
o Endocrine consequences of pituitary tumors
o Brain death
o Ethical considerations for end-of-life decisions
o Pathophysiology and treatment of hydrocephalus
o Differential diagnoses of coma
o Diagnosis and treatment of herniation syndromes
o Pathophysiology and treatment of encephalitis/meningitis/brain abscess
o Pathophysiology, diagnosis, complications and treatment options for different forms of intracerebral hemorrhages (epidural/subdural/subarachnoid/intraparenchymal/intraventricular)
o Diagnosis and treatment of cerebral venous thrombosis
o Diagnosis and treatment of ischemic vs. hemorrhagic stroke

o Basic cerebrovascular anatomy and relevance of lesions such as aneurysms and arteriovenous malformations
o Neurological examination techniques
o Management of fluid, acid-base, and electrolyte disturbances in NSICU patients
o Diagnosis and treatment strategies for vasospasm
o Sedation regimes, scores, weaning
o Special considerations of pain management in NSICU patients
o Delirium: forms, diagnosis, treatment
o Interpretation of CXR
o Basics of neurosurgical, neurology imaging techniques
o Basics of TCD monitoring and interpretation
o Basics of EEG application in the ICU
o Basics of EVD handling, sampling
o Basics of CSF diagnostics

• Demonstrate knowledge of complex ventilation modes and strategies as applicable to NSICU patients.
• Describe indications and routes of nutrition, exhibit ability to create basic nutritional plan.
• Describe indications for fluid resuscitation and vasopressor therapy.
• Demonstrate basic knowledge of different ICP monitors and cerebral oxymetry monitoring, and their use in guiding hemodynamic therapy.
• Understand the goals of sedation and analgesia in the ICU. Discuss the various options available for sedation and analgesia, including sedation scales and types of sedatives.
• Understand basic infection control risks and discuss strategies to prevent and treat ventilator associated pneumonia, urinary tract infections, central venous line infections and surgical wound infections in the NSICU; demonstrate basic knowledge of antibiotic therapy, groups of antibiotics, neuro-specific considerations e.g. CSF-penetration
• Discuss techniques to prevent deep venous thrombosis and peptic ulcer disease in the NSICU.
• Exhibit safe order writing and closed-loop communication.

**Practice-based learning and improvement:** Residents are expected to be able to appraise and assimilate scientific evidence and use it to investigate, evaluate, and improve care for their patients.

• Recognize and describe patient safety strategies.
• Demonstrate ability to analyze own performance, identify areas for improvement and implement strategies to enhance knowledge, skills, attitudes and processes of care.
• Recognize and describe basic methods for searching, reviewing, and evaluating current scientific literature.
• Apply knowledge of study designs and statistical methods to critically review basic science literature and clinical trials.
• Support ongoing basic and clinical science protocols in the ICU.
• Develop and maintain willingness to learn from errors and use errors to improve the system or processes of care.

**Interpersonal and communication skills:** Residents are expected to demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and other health professionals.

• Respond promptly and courteously to requests, answer pages in a timely manner.
• Write orders and notes in a coherent, legible fashion.
• Communicate care plans effectively to patients, families, nurses, and other health care professionals.
• Communicate effectively in times of dynamically changing conditions.
• Provide effective and professional consultation to other physicians and health care professionals and sustain therapeutic and ethically sound professional relationships with patients, families, and colleagues.
• Deliver concise, organized case presentations.
• Communicate clearly, correctly and concisely in written and verbal reports.
• Communicate effectively and in a timely fashion with primary teams about significant changes

**Professionalism:** Residents are expected to demonstrate behavior that reflects commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to patients of diverse backgrounds.
• Seek consultation with other specialty physicians as appropriate in managing complex ICU problems.
• Consider ethical principle and patient/family wishes in treatment and end-of-life decisions.
• Respect and utilize the particular skills of other critical care practitioners such as nurses, respiratory therapists, physical/occupational therapists, dieticians, speech pathologists, pharmacists.
• Arrive for clinical and learning responsibilities in a timely and punctual fashion, prepared to perform tasks and explain reasoning.
• Exhibit respect, compassion, integrity, empathy and support in patient care and professional interactions.
• Exhibit honesty in recordkeeping.
• Admit to and seek help in remedying errors.
• Demonstrate sensitivity and responsiveness to the gender, age, culture, religion, sexual preference, socioeconomic status, beliefs, behaviors and disabilities of patients and professional colleagues.
• Present information, concerns and suggestions without bias or for personal gain.
• Teach and model responsible behavior.

Systems-based practice: Residents are expected to 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.

• Work cooperatively with other disciplines to provide efficient and effective patient care.
• Establish multidisciplinary relationships needed to effect quality care.
• Understand, access and utilize the resources, providers and systems necessary to provide optimal care.
• Demonstrate ability to work cooperatively with primary and consulting services.

• Demonstrate the Critical Care practitioner’s role as patient advocate and advocate for quality of care.
• Recognize, describe and ensure compliance with unit and institutional policies as well as regulatory policies from accreditation agencies, regulators and payers.
• Demonstrate ability to use algorithms and protocols.
• Demonstrate attention to cost-effectiveness in ordering tests and planning interventions.
• Describe basic compensation methodologies for critical care services.

Instructional methods:
Bedside teaching rounds, radiology rounds, mini seminars, case-based discussions, clinical case discussions, formal reading/didactic material, critical care medicine core lectures, weekly Anesthesiology Grand Rounds, Neurosurgical Grand Rounds, interdisciplinary spine/tumor/cerebrovascular conferences. Adult resident ICU course sponsored by the Society of
Methods of assessment:

- Daily competency-based staff evaluations of medical knowledge, patient care skills, professionalism and interpersonal skills.
- Ancillary care provider evaluations.
- Structured evaluations of procedures.
- Conference attendance and participation.
- Presentation of relevant topic to NSICU team at the end of the rotation.
- Moderate and present at NSICU-M&M and -case conferences

References:

- NICU Key Articles CD
- The ICU curriculum CD
- http://ricu.sccm.org

Resident Responsibilities in the NSICU

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Welcome to the Neurosciences ICU (7C-NSICU)! You will be oriented to the ICU upon beginning your rotation. There is a syllabus outlining important topics in Neurocritical Care and a collection of important relevant articles for you that is available in the NSICU Division Office from the Program manager, Debbie Bird in Multnomah Pavilion 2520: phone 8-1472.

Orientation Guide to the NSICU Service:

Composition of service, responsibilities or NSICU team members:

The NSICU service includes one or two residents from Anesthesiology and Neurology, a PA, one or two PA-fellows, and, starting July 2007, a neurocritical care or anesthesiology critical care fellow. This core team is supervised by a neurointensivist who is assigned on a weekly basis. A Neurosurgery resident is present in the NSICU to assist with care for Neurosurgery patients. The NSICU team can be reached via a single pager number know to the ICU nursing staff and the paging operator (#17014). This pager number is transferred to the day’s assigned team leader (usually the on-call person) before morning rounds and to the night-call person at 17:00. The neurointensivist can be reached by pager #17015.

The NSICU residents are responsible for day-to day care for critically ill neurosurgery and neurology/stroke service patients under supervision by the neurointensivist and critical care fellow. Residents are responsible for communicating all admissions and significant changes in patient condition to the neurointensivist or fellow. Residents are expected to take overnight in-
NSICU weekly schedule:

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<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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<th>Friday</th>
<th>Saturday/Sunday</th>
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<tr>
<td>5:30-7:00</td>
<td>Pre-rounding</td>
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<tr>
<td>6:00-7:00</td>
<td>NSG rounds with ICU attending</td>
<td>NSG rounds with ICU attending</td>
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<td>7:00-8:00</td>
<td>NSG Grand Rounds HRC 11D03</td>
<td>Spine Conference BICC</td>
<td>Trauma Conference</td>
<td>Neurovascular Conference BICC</td>
<td>NSG Tumor Board HRC 14D03</td>
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<td>8:05-8:15</td>
<td>Stroke rounds with Neurology Image review (CXR, CT, MRI)</td>
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<td>Pre-rounding</td>
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<tr>
<td>8:30-11:00</td>
<td>ICU rounds</td>
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<td>8:00-9:00 NSG rounds</td>
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<td>9:15-9:30 Image review (CXR, CT, MRI)</td>
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<td>12:30-13:30</td>
<td>NS-CCM lecture NS-ICU</td>
<td>CCM Core lecture 8B06</td>
<td>CCM Core lecture 8B06</td>
<td>NS-CCM lecture NS-ICU</td>
<td>NS-CCM lecture NS-ICU</td>
<td>9:30-11:00 ICU rounds</td>
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<td>16:00-17:00</td>
<td>Evening rounds sign-out to on-call residents (NSG/neurol./ICU)</td>
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Policies:

1. All patients must have an admission note to the NSICU. The admission note includes a
brief history, physical exam, lab values, assessment and ICU plan. Admit orders are
written by the primary team. The admitting NSICU team member verifies that orders
have been written and expands on them, as necessary.

2. All patients must have daily progress notes by NSICU team members utilizing the
standardized ICU form.
3. All procedures in the ICU are performed under supervision by the attending physician. The
resident dictates or writes a procedure note in the patient’s chart immediately after the
procedure.
4. All significant changes in a patient’s condition MUST be communicated to the primary
team and the NSICU attending.
5. Appropriate professional dress and demeanor are expected at all times.
6. Residents are required to comply with ACGME duty hour standards.

**DAY-TO-DAY DO’S AND DON’TS:**

**Taking care of post-op patients:**

- Be present at the bedside for sign-out from anesthesiologist or nursing staff when new
  patients are admitted (NSICU nursing staff calls pager #17014 for all new admissions)
- Examine patients (ABCD!), check orders, post-op labs, X-rays and CT scans, write
  admission note.
- For specific groups of patients, concentrate on:
  - For all patients: EBL/urine output/cyrstalloids/blood products given ongoing blood
    loss? Check surgical drains! Intraoperative problems Difficult airway? Pre-existing
disease; re-start home medications as appropriate, fill out medication reconciliation
form, if not already done
  - Spine patients: Was dura opened during the case? Was neurophys. monitoring
    performed, was signal ever lost? What was the pre-op exam? Has it changed? Can
    patient move below or at the level of operation?
  - Craniotomy patients: Were evoked potentials monitored? Were they lost at any time
during the case? What was the pre-op exam? Has it changed? How much tumor was
  resected? Check anticonvulsant levels, if applicable.
  - Pituitary patients: Watch for DI! (high Na⁺, high urine output, low specific gravity)
    Check for visual field loss.
  - Patients after resection of acousticus neurinomas: check for cranial nerve deficits
  - Pneumocephalus: Give 100% O₂ on non-rebreather.
  - Patients post aneurysm clipping: Maintain normotension
  - All patients: Pain control: No patient leaves the NSICU unless pain is well-controlled.
    Avoid continuous opioid infusion in non-ventilated patients. If oral meds fail, use
    PCA early.
Taking care of ICH patients:
- Determine the cause of bleeding
- Control blood pressure, avoid hypo-/hypertension
- Reverse coagulopathy, if applicable (FFP/protamine/vitamin K/factor VII)
- Monitor fluid status, electrolytes, urine output
- Watch for vasospasm
- Avoid/treat hyperthermia

Taking care of stroke patients:
- Check the stroke team’s orders, communicate closely with stroke team for all changes
- Control blood pressure, avoid hypo-/hypertension
- Swelling/edema peaks days 2-4 post stroke, discuss early decompressive craniectomy with team and neurosurgery, as appropriate
- Avoid/treat hyperthermia
- Check if patient is involved in clinical study, follow respective protocol

Taking care of neurointerventional patients:
- Review neurorad’s procedure note and orders
- Initiate anticoagulation as indicated
- Check groin for bleeding/hematoma, check distal pulses

ROUNDS:

**Neurosurgery rounds:**
The neurosurgical team does brief rounds with the neurointensivist or critical care fellow on all NSG service patients starting at 6:00 am Monday-Friday and 8:00 on weekends/holidays. NSICU residents are not expected to participate in these rounds. The neurosurgical residents see all patients before these rounds and lead the discussion of the events of the night. Decisions about neurosurgical management for the day are made during these rounds. Transfer orders will be written by the neurosurgical residents by the end of these rounds if the patient is transferring from the NSICU to the ward on the neurosurgical service.

**Stroke/neurology rounds:**
The stroke/neurology team pre-rounds on their patients and presents them to the combined stroke/NSICU team at 8:05. Morning orders are written by the neurology orders after the combined team has agreed on a plan for the day, and routine care for the day is then taken over by the NSICU team.

**Imaging rounds:**
X-ray rounds begin at 8:15 am Monday-Friday and 9:15 am Saturday, Sunday, and Holidays. The post-call resident is expected to lead the group discussion of each x-ray.

**ICU rounds:**
Critical care rounds begin at 8:30 am on weekdays and at 9:30 am on weekends and Holidays. The NSICU team members present the patients they pre-rounded on using a system-oriented format. Assessment and plan for the next 24 hours are discussed by the team.
Orders for the day are written during ICU rounds by a NSICU team member who is not presenting the patient, and are reviewed by the team. Orders must be dated, timed and signed. There are no verbal orders. Telephone orders are acceptable but must be signed at the next earliest time (<24 hrs). These are JCAHO rules and must be adhered to.

**DAILY RESPONSIBILITIES:**

One NSICU team member (usually the on-call person) is the team leader for the day and carries the #17014 team pager. This responsibility alternates daily and is assigned by the neurointensivist or fellow. The team leader is the first contact for all admissions, for communication with other teams, and for changes in patient status. The team leader assigns the patients to be pre-rounded in the morning, and all new admissions to individual team members, and is to be updated on all changes. The team leader also leads evening rounds and assures sign-out to the neurosurgery and stroke/neurology resident on call as well as transfer of the #17014 team pager.

Team members follow the patients they pre-rounded on throughout the day, assure that consultation requests are put in, follow lab and culture results, adjust orders if needed, and, with supervision, perform necessary procedures. They must evaluate and develop a treatment plan for any new change in neurologic or medical condition in their patients. Therefore, a brief event note, in addition to the admission/daily progress note, should be written to describe new problems or significant changes occurring in the treatment plan from admission or earlier in the day. The situation should always be discussed with the attending/fellow responsible for patient care.

If the fellow/attending is not immediately available for a crisis situation (i.e., cardiopulmonary arrest), the resident/nurse should call the “code team” for assistance. Anesthesiology (D1/E1, pager #11856) can also be paged for airway emergencies (stat intubations).

Transfer orders to the wards are the responsibility of the accepting services, however in times of urgency a patient transfer should not be delayed by lack of orders. The NSICU team (PAs/residents/fellow) may facilitate this process by writing transfer orders to the ward for later co-signature by the accepting team.

All changes in neurologic status in any neurosurgical, stroke service, or interventional neurovascular patient must be discussed with the respective on-call resident in a timely fashion so that they, in turn, can examine the patient, notify and discuss these issues with their superior as necessary.

It is the primary team’s responsibility to fill out death certificates and dictate discharge summaries when a patient dies in the NSICU. However, the NSICU team writes a respective note in the chart. The primary team and the neurointensivist must be notified immediately of a patient’s death. The death notice should be communicated to the patient’s family by the attending physician.

It is the responsibility of the resident and nursing group to begin to develop discharge planning. This includes consultation to Physical and Rehabilitation Medicine and Social Services. If the patient will be transferred to neurology service, a consult should be called the morning after admission. Some patients are already seen in the ED and will have a neurology consult which will suffice.
The primary MD/RN group should have regular meetings with the family (can be informal at the bedside), should identify the need for a family meeting with the attending (identify attending availability and family constraints for scheduling during the usual family meeting time, typically 2-4:00 pm or before 6:00 pm on weekdays, any convenient time on weekends), and schedule meetings with the attending. Care management/social work can help with scheduling/facilitating such meetings. Guidelines for when to consider attending-family meetings include end of life discussions, unusual and aggressive therapies (angioplasty, emergency surgery), families with special needs, and unexpected deterioration of patient status. The NSICU team obtains consent from patient/family for certain procedures (blood product transfusion, central venous catheter, arterial line, pulmonary artery catheter placement, intubation, elective lumbar drains). Consent for neurosurgical procedures (craniotomy, VP Shunt, intraventricular drain placement) is the responsibility of the NSG service.

Between the hours of 2:00-4:00 pm, the NSICU observes quiet time. During this time, lights are dimmed and disturbances to the patients (procedures, visitors) should be limited.

There will be a formal didactic teaching session by the attendings and fellows in the NSICU division from 12:30-1:30. A lecture schedule is made at the beginning of the month that covers a whole range of topics over the month rotation.

ADMISSIONS:
The NSICU team gets called by the nursing staff for all new admissions. Patients are assigned to individual team members by the team leader. The admitting NSICU team member is present at the bedside for sign-out be the transferring team.

After an initial brief examination (ABCD!) of the patient, the nurse should be given some time to get the patient settled in. This time can be used to check and expand admit orders written by the primary team, check or order post-op labs, X-rays and CT scans, and start writing the admission note. A complete physical examination of the patient must be performed as soon as possible. The admission note includes a brief history, physical examination findings, lab values, X-ray findings assessment and ICU plan. Formal transfer/acceptance of care must be noted in the admission note written by the NSICU team member. This is JCAHO mandated.

For all new admissions, the “Admit to NSICU Order Sheet” in front of the chart must be dated, timed and signed to activate unit protocols. Fill out supplemental potassium, sedation and insulin infusion order sheets as appropriate for individual patients. Admitting orders written by another service must be reviewed and corroborated in conjunction with critical care management. In particular, discuss patient mobility restrictions (especially spine patients) with the surgeon on arrival from the OR or ED. Admitting orders will be written by the neurology resident on all non-surgical (i.e., neurology and some neurovascular) admissions to the NSICU.

EVENING ROUNDS:
Evening walk rounds take place between 4:00-5:00 pm. Patients are presented briefly by the team leader, lab and culture results are updated, patient needs and care plans for the remainder of the night are discussed, and transfer patients for night/morning are identified.

There is an on-call room specifically reserved for the NSICU Resident on the hallway outside of the unit (room #7C47).
PROCEDURES:
Procedure notes are required for all procedures. They include consent to the procedure (elective vs. emergency), medications given, description of prep and procedure in full, any complications, follow up tests ordered if necessary and statement of oversight by the attending or senior fellow. Only emergency procedures should be performed between 2:00 – 4:00 pm. However, elective bedside percutaneous tracheostomy and percutaneous endoscopic gastrostomy can be performed during this time.