A Medical Student’s Guide to Neurocritical Care

Overview
The NSU is the neuro ICU, staffed by a mix of neurologists and neurosurgeons at UH. Patients are generally very sick and very complicated. Typical cases: status epilepticus, subarachnoid hemorrhage, intracranial hemorrhage, severe ischemic stroke, some trauma, respiratory failure due to neuromuscular disorders, lots of patients s/p decompressive hemicraniectomy.

Before you start, understand that a lot of patients will pass away while you are on the rotation. Some will have care withdrawn by families, others will decompensate, and sometimes you’ll come in the morning and discover your patient died overnight.

That said, this is a great rotation for medical students because of how much you learn in a short period of time.

Medical team composition
Attending Neurointensivist
Fellow
1-2 NPs
Pharmacy resident
PGY3 - covers 1pm-11pm
PGY2 x2
PGY1
Medical students & pharmacy students
On rounds, the nurse for the room being discussed usually joins
Sometimes bioethics students show up

Workflow
5:45AM - 6AM: Take the Lerner tower elevators up to floor 4 and turn right; the NSU team room is the first door on the left after the waiting room. You can brew coffee in the breakroom, but once the day starts it may be hard to find a chance to get it. Einstein and the cafeteria aren’t open at this time, by the way.

6AM - 6:30AM: Neurosurgery rounds. If you’re following a nsurg pt, make sure to write down their plans for that pt.

6:30-9AM: Review overnight events, notes from yesterday, overnight vitals in CDV, lab results etc for your patients. Try to catch the overnight nurse before the 7AM nursing shift change occurs. Go see the patient and do an exam, then try to check in with the managing resident about overnight events/plan. Sometimes they are too busy, which is ok. For patients on vEEG, page epilepsy around 8AM to find out if any seizures occurred overnight. Note - do NOT ask about labs, titrating drugs etc at this call. Find out what the weaning parameters to see if extubation is on the table.

9AM-variable: Rounds. Generally, you go in order, starting in room 1 and progressing down the line. People will break off to answer pages, respond to new labs, etc. As a medical student, try to stay for the majority of rounds. Remind your
resident beforehand that you will be presenting the patient. Rounds can end anywhere from before noon to 4pm.

Presenting on rounds is the best way to impress everyone enough to let you take on some real work. Follow the format: 1 line summary, overnight events, vitals, I/O, PE, relevant labs/imaging, assessment, plan. When you’re discussing labs or I/O, don’t read them bc no one will listen. Mention pertinent ones and also their trend, eg labs significant for WBC trending down from 17 to 16 to 14, plts trending up to 250 today. Remember to look at trends in I/O over several days to see if they’re becoming fluid overloaded or depleted. For assessment, you can say something like “In summary, this pt with ICH grade 2 is deteriorating neurologically on serial exam and we are worried about impending herniation.” Don’t bother with a long differential. If it’s a mystery patient you can say something like “In summary, this pt has progressively worsening respiratory failure with increasing FiO2 requirements but is otherwise stable. Neuromuscular team is working him up for myasthenia vs motor neuron disease.” You HAVE to be very complete about all the systems, I mentioned the plan for Neuro, Pulm, CV, GI, GU, HEME, ID, PRX and code status every day.

12PM-1PM: noon conference occurs on Tuesday, Wednesday, Thursday. There’s a second conference Thursday at 4pm-5pm. There is generally food at all the conferences.

6PM: official “sign out” to the PGY3 covering the 1-11pm shift, in reality, many of the residents will stay much later. They are usually very nice about letting us out though. I usually expected to be out by 7pm every day. Sometimes if there’s a lot going on eg patients decompensating it might be worthwhile to stay to see codes, procedures, etc.

Weekends: neurosurgery rounds start at 7am, signout at 3pm (but again, I got out at 4pm). Weekends are actually awesome. The reason is that the NSU staff count drops and as a result, you suddenly get elevated to an important part of the workforce.

Coma Exam

First thing I always do is shake the patient’s shoulder and yell out "Hi Mr. X! I’m Med Student with the medical team! I’m here to examine you!” Yell it really loudly in their ear, even if they look comatose or don’t open their eyes. The reason is because some people are mostly paralyzed but still conscious. I even saw a patient with no pupillary reflex who was conscious and could hear us and follow commands but only had control of her right hand and nothing else. I also prefer to do exams without family in the room, especially if you’re checking brainstem reflexes or noxious stimuli like you do for coma exam.

- Yell introduction, shake patient’s shoulder
- If unresponsive, rub the sternum to deliver noxious stimuli
- Pull back patient’s eyelids and look for pupillary reflex, ocular bobbing, gaze deviation
- Fundoscopic exam on patients: great chance to practice and can be useful in SAH
- Corneal reflex by dropping a drop of saline in each eye and looking for blink; if saline doesn’t work you can wet a piece of gauze with saline and try that
  Try to watch someone else do this before you try
- Gag/cough reflex
Definitely have someone teach you this

- Doll’s eye reflex: no one else did this but I did it for personal interest
- Pinch each extremity - you may have to do this HARD
- Look for the triple flexion response (will be abbreviated as TF in notes) - basically is dorsiflexion / knee flexion / hip flexion in response to noxious stimuli
- Take a metal thing and press it against the fingernail of each extremity - also serves as noxious stimuli
- Check for edema
- Check reflexes
- Check Babinski
- Listen to heart and lungs
- Press on abdomen - make sure it’s not distended or rigid
  ICU patients loaded with fluids long term are at risk of abdominal compartment syndrome

-Absolutely must know the following:
  - Does pt have Foley vs condom catheter vs diaper
  - What kind of access they have eg PICC v midline v central line etc
  - Are they on video EEG?
  - OGT vs dobbhoff vs other
  - Intubated vs on CPAP (it looks the same, best is to just ask the nurse if you’re not sure) vs nasal cannula on xL
  - Look at vitals monitor, make sure it’s all connected and heart rhythm looks OK
  - Look at what drips they are on and remember to ask the nurse if any are going/stopped
  - If pt has EVD
  - GCS (can change from day to day)
  - Code status (also remember to mention this at the end of your presentation)

For awake patients, do the normal neuro exam and NIH stroke scale if appropriate. You can ask to borrow some stroke cards or alternatively, I bought an app and did it out of my phone

Things you encounter

DNR vs DNR-CC vs no escalation of care
Triple flexion vs withdrawal vs localization
GCS
EVD / ventriculostomy
NIHSS
ICH score
Brain death
Hunt-Hess score
Anticoagulation
Basics of ventilator management and weaning; indications for trach
SAH management & complications (cardiomyopathy, seizures, flash pulm edema, vasospasm)
Transcranial Doppler, nimodipine, BP control
SIADH vs CSW
Venous drainage of the brain
Circle of Willis
MRI sequences T1 vs T2 vs FLAIR vs DWI/ADC & CT, be able to identify what you’re looking at and whether or not it has contrast, also what the indications are for each
Review all your basic medicine
Signs of sepsis / infection
Daily orders, CXR for intubated patient, tube feeds, prx, etc
Status epilepticus
Meds you will encounter: Keppra (leviteracetam), Onfi (vimpat), Dilantin (phenytoin), Ativan (lorazepam), Cardene (nicardipine), propofol, Versed (midazolam), fentanyl, Isosource, Novasource, famotidine, pantoprazole, heparin, aspirin, statins, labetalol, hydralazine, Neo (phenylephrine), Levophed (norepi), amiodarone, oxycodone, rocuronium, lasix, normal saline, 3% saline, 23% saline, PLEX (plasmapheresis)

^This is basically the bread and butter of day to day in the ICU, although we ended up working up some other interesting cases like possible neurosarcoidosis and several mystery neuromuscular vs motor neuron disease cases

Calling consults

To find out a number:
Press 0 on the phone, and wait to reach the operator
Give them a pager number (in general you have to use one of the residents' pagers) if they ask
Ask for the 5 digit pager or extension for the team you’re trying to reach
In general, pagers start with 3 and extensions start with 4 or 6

To page a team:
Press 222 on the phone
At the prompt enter the 5 digit pager number
When you hear the tone enter a callback number - that’s either the ICU (42140? I can’t remember) or the phone in the team room (look at the label on the phone)
If you enter the ICU, someone will announce over the intercom when they call back
I recommend against this because it’s sometimes hard to hear and you can miss it
I prefer just waiting by the phone in team room - however if you put callback as team phone you can’t leave, you have to sit there
Most pages get returned in 5 min, if 10-15min pass and you don’t hear back you can page again
If you still don’t hear back let a resident know
If you’re confused about how to answer the phone, ask a resident or failing that, the lady at the front desk

To call a consult:
“Hi! This is Mary from the NSU, calling about Pt XXX YYY in NSU Bed 18, MRN ********. He had a grade 2 ICH and was subsequently intubated, but has failed all his weaning trials, so we're hoping to get ENT on board to evaluate for a trach.”

For epilepsy reads in the morning for people on vEEG overnight, you call the fellow, let them know you’d like a read on bed x and whether or not there were seizures overnight, and then they will hang up and call you back when the read is ready. Don’t ask the epilepsy fellow about labs or medication management in the morning! They will either let the team know later after rounds or will drop it in the note.

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