Simulation 3: Pontine Hemorrhage and Coma

Clinical Objectives:

- ☐ Recognize coma and the need to determine if there is a structural etiology of coma
- ☐ Perform a coma exam (mental status, cranial nerve testing, noxious stimulation to all extremities)
- ☐ Recognize the impact of sedation on the neurologic exam
- ☐ Order the appropriate neuro-imaging, including a CTA head & neck
- ☐ Institute management of ICH
  - Control blood pressure, reverse coagulopathy
- ☐ Identify signs of hydrocephalus
  - Consult NSGY

Behavioral Objectives:

- ☐ Do not anchor on an ED diagnosis

Environment and Persons:
Environment: ED
Persons: Mannequin, ED RN (Embedded Person)

Patient Demographics/PMH :

Age	75	Allergies	None	Social	Retired, history of smoking
Gender	M			PMH	HTN A fib TIA DM2
Height/Weight		Ethnicity		Medication	Warfarin Insulin Glargine Carvedilol Losartan Amlodipine
Labs	None	X-ray		Other History	

Room Setup :

- Medical Record will be printed out
  - Patient is on Warfarin
- Patient will already have IV access
- Patient is intubated
- Patient is already hooked up to the monitor
- Need cotton swabs or gauze or saline drops
- Drugs needed: Propofol drip, nicardipine/labetalol/hydralazine
- Images needed:
  - Pontine bleed
  - Hydrocephalus
- Videos needed (alternatively can be described by the ED RN)
  - Pinpoint pupils
  - Oculomotor exam
  - Corneals

- Aspects of exam to be described by RN
    - LUE Withdrawing – RN to say “He moved that arm away”
    - RUE extensor posturing – RN will demonstrate arm in extensor posturing
    - Triple flexion RLE – RN to say “Looks like his toe, ankle and knee all flexed, for both sides.”

CASE SCENARIO:
Case begins with resident being paged:
“ED CONSULT STAT: **75 yo M w/ AMS - ?seizure, intubated in the field for vomiting**”

PART ONE: H&P
RN at bedside relays the EMS passoff. “Patient” is an intubated Sim Man.

HISTORY
RN: “Per the EMS report, family at home witnessed the patient collapse. Apparently, they thought there were some “jerking movements” and then the patient vomited. EMS reported that he was noted to have a pulse the whole time during their evaluation. He was lethargic on EMS arrival and then became unresponsive. **He was intubated with RSI with etomidate and succinylcholine about 25 mins prior to arrival in the ED. He is still on Propofol. We haven’t examined him yet, because we thought he might be seizing.”**

If resident asks any further questions, should answer “I’m not sure, but I found the patient’s chart in Epic if you want to look at that.”

[Resident should request Propofol be weaned]

RN: “Are you really sure we should be weaning his Propofol? I think because he could be seizing, we should wait until he is admitted. I don’t want him to go into Status! And, it’s also really busy down here; they’re running a code in the room over and I may need to go to that. **How about I just send off some labs instead, what do you want me to send?”**

[Resident should still request to have the Propofol turned off to get an initial neurologic exam given unclear “jerking” history”[

Depending on how quickly the case is going, RN can either continue to give push back or suggest they get more information from the patient’s chart [which is available in the room.]

PHYSICAL:
Vitals: HR 55, BP 215/98, Afebrile
COMA EXAM:
MS: Despite escalating noxious stim there will be no communication or ability to follow command. ED RN will say, “It looks like he moved his left arm a little bit, but otherwise he didn’t react at all”
CN:
- Pupils: pinpoint and non-reactive [displayed with video]
- Corneal Reflex: Present bilaterally [displayed with video]
- Oculomotor exam: patient’s eyes do not move in the horizontal plane in either direction of horizontal head turn, but there is motion of the eyes when head is tilted in the vertical direction [displayed with video]
- Cough / Gag: ED RN will note a very weak gag and cough when the resident asks them to test

Motor:
- RUE: Extensor posturing – demonstrated by RN

- LLE: withdraws – described by RN as “he looks like he pulled away”
- LLE/RLE: Triple flexion bilaterally – described by RN as “triple flexed”

Reflexes:

- Babinski reported bilaterally; RN describes “his toes go up.”

NEUROLOGY RESIDENT BEHAVIOR CHECKLIST:

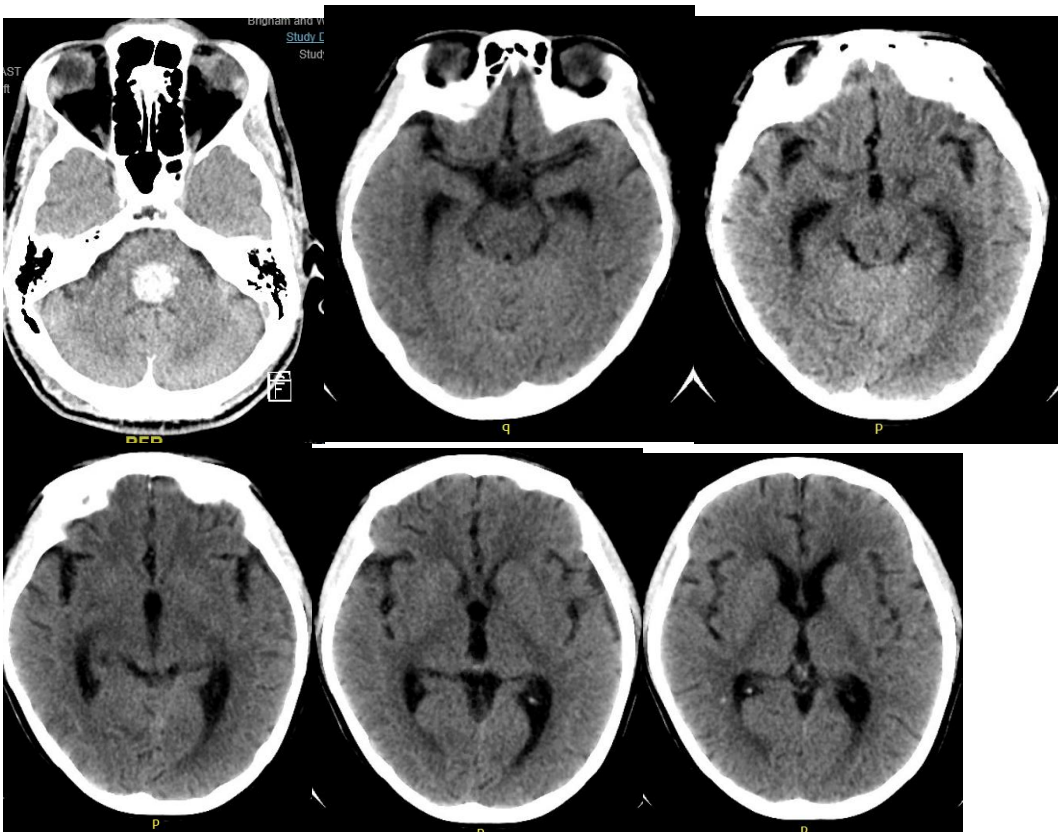
- ☐ Request that sedation be held
- ☐ Request workup for acute mental status
    - BMP, CBC, LFTs, Urine tox, serum tox, blood cultures, UA, ABG, fingerstick glucose, coagulation profile
- ☐ Check for nuchal rigidity
- ☐ Uncover the patient and look for any evidence of trauma, track marks, other findings
- ☐ Mental status: Neuro residents speaks loudly, escalates to sternal rub / nasal irritation / nailbed pressure / supra-oribital ridge pressure/ nasal tickle
- ☐ Pupillary reflex
- ☐ Oculomotor exam
- ☐ Corneal reflex
- ☐ Cough, gag
- ☐ Motor exam in all four extremities
- ☐ Communicate that focal findings and AMS are highly concerning for a structural etiology of coma
- ☐ Request stat neuro-imaging – CT and CTA head and neck

PART TWO: DISCOVERY AND MANAGEMENT OF ICH

Case should move to the CT Scanner for CT/CTA

1) **Patient:**
    a. Continues to be intubated and sedated
    b. VITALS: HR: 51, BP: 225/92, SpO2 99%
    c. If the resident does not recognize the acute hydrocephalus, patient’s blood pressure will continue to elevate despite nicardipine and heart rate will continue to drop
2) **ED RN:**
    a. Ask if resident want vessel imaging if the resident does not specify
    b. Ask if they need any medication or other labs given on Warfarin if resident doesn’t recognize need for a/c reversal
    c. If resident did not request coagulation profile initially, pull up “Epic Chart” AMS monitoring which demonstrates that patient is always in the 2-3 range
    d. If the resident doesn’t respond to BP, ask “what is the BP goal?”

3) **Data:**

1) 

2) **CTA is normal**

NEUROLOGY RESIDENT BEHAVIOR CHECKLIST:

- ☐ Ask to transport to the ED Scanner for stat NCHCT / CTA H&N
- ☐ Request Nicardipine (or alternative blood pressure medication) STAT, avoid labetalol given bradycardia
- ☐ Consider arterial line for real-time BP monitoring
- ☐ Ask if coagulation profile has come back.
  - If coags were requested, the INR is 2.3
  - If coags were not requested, review prior INRs
- ☐ Recognize need for A/C reversal
  - Correctly order Vitamin K 10mg IV
  - Give K-Centra 20-30 IU/kg

<u>PART THREE: RECOGNITION OF HYDROCEPHALUS</u>

4) **Patient**
   a. If the resident does not recognize the acute hydrocephalus, patient's blood pressure will continue to be elevated despite nicardipine and heart rate will continue to drop
   b. If residents still do not recognize elevated ICP, patient will develop a 6th and 3rd nerve palsy from worsening herniation (the 3rd nerve palsy will be displayed on the manikin)
5) **RN:**
   a. **Point out to the resident that he is becoming hypertensive and bradycardic**
   b. **Ask if there is something else they should do to "treat the elevated intracranial pressure" if they are having a hard time recognizing elevated ICP**
   c. **If the residents still are having a difficult time recognizing the need to treat ICP, point out the manikin's dilated pupil**

NEUROLOGY RESIDENT BEHAVIOR CHECKLIST:

- ☐ Recognize features of increased ICP from obstructive hydrocephalus (bradycardia, hypertension… and if needed to be explicit about unilateral and then bilateral 3rd nerve palsies)
- ☐ Review labs to review sodium
- ☐ Request NSGY consult for acute CSF diversion
- ☐ Discuss appropriateness of hyperosmolar as a temporizing measure
- ☐ Recognize need for placement in the neuroICU
- ☐ Resident should page neuroICU fellow. We'll discuss paging the triage RN in the debriefing as well.

Case ends after the patient has been passed off to the NeuroICU fellow.

Case 3: COMPREHENSIVE BEHAVIORAL CHECKLIST

- ☐ Request that sedation be held, even if the RN gives push back
- ☐ Request workup for new coma, possible seizure
  - BMP, CBC, LFT, Urine tox, serum tox, blood cultures, UA, ABG, fingerstick glucose, coags
- ☐ Check for nuchal rigidity
- ☐ Uncover the patient and look for any evidence of trauma, track marks, other findings
- ☐ Mental status: Neuro residents speaks loudly, escalates to sternal rub / nasal irritation / nailbed pressure / supra-oribital ridge pressure
- ☐ Pupillary reflex
- ☐ Oculomotor exam
- ☐ Corneal reflex
- ☐ Cough, gag
- ☐ Motor exam in all four extremities
- ☐ Communicate that focal findings and AMS are highly concerning for a structural etiology of coma
- ☐ Request stat neuro-imaging – CT and CTA
- ☐ Requests propofol be restarted
- ☐ Ask to transport to the ED Scanner for stat NCHCT / CTA
- ☐ Request Nicardipine STAT, avoid labetalol given bradycardia
- ☐ Note need for a-line for real-time BP monitoring
- ☐ Ask if coags have come back.
  - If coags were requested, the INR is 2.3
  - If coags were not requested, review prior INRs
- ☐ Recognize need for A/C reversal
  - Correctly order Vitamin K 10mg IV
  - Give K-Centra 24 units/kg
- ☐ Recognize features of obstructive hydrocephalus (bradycardia, hypertension… and if needed to be explicit a 3rd nerve palsy)
- ☐ Review labs to review sodium
- ☐ Discuss whether or not to give mannitol
  - Dose mannitol correctly a 1g/kg
- ☐ Request NSGY consult
- ☐ Recognize need for placement in the neuroICU
- ☐ Resident should page neuroICU fellow. We'll discuss paging the triage RN in the debriefing as well.