

## NEURORADIOLOGY DARTMOUTH HITCHCOCK MEDICAL CENTER

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Welcome to the neuroradiology section at Dartmouth Hitchcock Medical Center. This document should guide you through your rotations in neuroradiology and enhance your educational experience.

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### EXPECTATIONS

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#### **PREPARATION:**

Review this manual prior to your rotation.

Review anatomy prior to your first day on the rotation, and throughout your rotation (at every PGY level). Anatomy is a pillar on which all other knowledge is built on neuroradiology.

Make note of topics to read about throughout the day, and read about them after the work day ends.

#### **TYPICAL WORK DAY:**

- The day starts at 7:30am unless there is a 7:00am conference, in which case your day will start at 8:00am.
- The days usually ends between 5:15 and 6:00pm.
- You are excused at 4:50pm if you are on late shift.
- Check out with the fellow or evening attending before leaving for the day to see if there is anything pending that needs to be wrapped up before concluding the day.
- The neuroradiology service is a combination diagnostics and intervention.

## DIAGNOSTICS:

- All neuro cases to be read are listed in the “North Neuro” worklist.
- We generally read emergent cases and “oldest” studies first (top of the list down).
- First-year residents should concentrate on reading head and spine CTs for their first rotation as detailed below.
- Emergent cases should be staffed with an attending within 1 hour, they do not need to be staffed immediately and readout should be timed to not interrupt interpretation of other cases.
- All other cases should be read-out within 2 hours.

## PROCEDURES:

- Residents participate in CT, US and fluoroscopic guided interventions while on service under the supervision of a neuroradiologist and/or fellow.
- Lumbar Puncture (LP) for diagnosis and chemotherapy usually occur in the core. LP are worked up and performed by the fluoroscopy resident under supervision of a neuroradiology attending or fellow.
  - Lumbar punctures do not require approval by a neuroradiology attending to be scheduled.
  - Coagulation status must be evaluated prior to the procedure and coagulation abnormalities discussed with the attending or fellow.
  - Inpatients and those with acute symptoms need a head CT/MRI prior to LP intervention.
  - First years should be proficient in performing LPs by the end of their fluoroscopy rotation.
- Most other procedures occur in CT room 1 or IR angio room 4. The location of US guided interventions is variable.
- If you would like to participate in a case, please discuss beforehand with the neuroradiology fellow and/or the attending scheduled for procedures that day. Assignments/requests for procedures should occur the day before. If assigned to a case you are responsible for reviewing imaging, coagulation status, immune status, medications, and allergies of the patient. You are also responsible for ordering procedural medications, consenting the patient, writing the pre-procedure note, and doing the pre-procedure checklist.
- Most first-years do not participate in procedures their first time through.

## PROTOCOLING:

- Residents are responsible for protocoling all CT examinations at the beginning and throughout the day. Please consult fellow, senior resident or attending for questions.
- MRI protocoling will be completed by neuro fellow and capable senior residents.

## **CONSULTS:**

Please triage phone calls appropriately. If you cannot answer a question then defer to a senior resident, fellow, or attending as available. If a clinician is asking about a specific case it is helpful to call up the case on your monitor then call the fellow or attending over to review it. Most of the attendings prefer to review a case in real time with a clinician when they call.

Trillian is used as the primary means of communication between Neuroradiology and the rest of the department. Make sure communication is close looped.

## **LECTURES:**

Residents are required to go to noon conference and are excused from the rotation between 12-1.

Residents are required to attend the neuroradiology/ENT conference which occurs the 3<sup>rd</sup> Friday of the month at 7:15am. You are excused from night float to attend the conference.

## **CLINICAL CONFERENCES:**

There are several clinical conferences that you are encouraged to go to, particularly when the case volume in the reading room is low. You are required to go to at least one epilepsy conference, one neurovascular conference and 2 Head and Neck tumor conferences each rotation. Conferences are variable but are usually scheduled as below. Please check with the fellow/staff to verify if a conference is happening and where.

Monday: 3:00pm Case of the week / interesting neuro cases

Tuesday 7am Cerebrovascular conference

Tuesday: 4:00pm Neuro tumor board

Wednesday: 7:00am Neuroradiology Lecture series, 4:30pm Neurovascular conference

Thursday: 7:00am Head and Neck tumor board, 11:00am Brain cutting in Pathology

Friday: 11:00am Neurology grand rounds, 12:00 Neurology conference, 4:00pm Epilepsy Conference

## **MEMBERSHIP:**

Become a member of ASNR, membership is free for residents and gives you access to educational resources.

<https://secure.asnr.org/membership-application/asnr-member>

## **RESOURCES:**

Textbooks

Neuroradiology: The Requisites, 4th Edition

Online

<https://www.asnr.org/>

<https://www.asnr.org/education/fellowship-portal/educational-resources/>

Online lectures: <https://www.asnr.org/education/neurocurriculum-live/>

## RADIOLOGY RESIDENT 1<sup>ST</sup> NEURORADIOLOGY ROTATION

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The first year of neuroradiology is designed to provide a foundation for future learning and preparation for call. By the conclusion of the first rotation a resident should understand neuroanatomy and should begin to understand the imaging workup and evaluation of emergent neurologic conditions.

### ORIENTATION AND EXPECTATIONS

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Your first day depending on your comfort level with neuroimaging, you may want to shadow the fellow and/or the attendings. Once you begin reading start with head CT's take your time and review normal anatomy. If there are no head CTs read spine, then face/sinus CTs. If no CTs are available then read MR cases. If you open a complex tumor follow up case (in your first few weeks) feel free to put it back on the list, unless there is nothing else to read.

During your first rotation learning is graduated with your focus as follows (if there are no cases to read at your level go to the next level):

- 1<sup>st</sup> week – Head CT
- 2<sup>nd</sup> week – Head and Spine CT
- 3<sup>rd</sup> week – Head and Spine CT and CTA/CTV
- 4<sup>th</sup> week – All CT Neuro (except head and neck cancer)
- 5<sup>th</sup> week – All the above and MR brain
- 6<sup>th</sup> week – MR brain and spine
- 7<sup>th</sup> week - All neuro studies
- 8<sup>th</sup> week - Review how to create 3D reformats and focus on stat exams

Note after the 7<sup>th</sup> week and throughout the rest of your career reading of the list should start at the top and move down (stat, then old to new)

### STRUCTURE

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#### FOUNDATIONS

##### *Learning objectives*

*Upon completion of this rotation, the resident will:*

#### *Anatomy*

1. Understand the anatomy of the brain, calvarium, skull base, temporal bone, and neck

#### Hemorrhage

1. Understand the appearance of hemorrhage and blood products on CT and MRI.
2. Develop an appropriate differential for intracranial hemorrhage.
3. Understand critical findings to communicate to referring clinicians.

#### Infarction

1. Recognize the appearance of infarction on CT and MRI.
2. Evaluate for hemorrhage
3. Understand the team approach to stroke management.

#### Herniation

1. Be able to evaluate patients for herniation on imaging.
2. Efficiently and effectively communicate these findings to referring clinicians

#### Infection

1. Consider infection appropriately among differential considerations.
2. Understand the routes and path of spread of infection in the head, neck, and spine.

#### Hydrocephalus

1. Differentiate hydrocephalous from atrophy
2. Evaluate for etiologies of hydrocephalous and understand the workup of hydrocephalous.

#### Masses

1. Accurate description of CT and MR characteristics of a mass

#### *Assignments*

1. Read relevant chapters of Osborn's Brain.

#### *Resources*

1. <http://headneckbrainspine.com/>
2. Neurographics
3. Radiographics
4. Radiology assistant, topic focused website

### **Evaluation**

1. Qualitative evaluation by staff during one-on-one sessions.

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## **RADIOLOGY RESIDENT 2<sup>ND</sup> YEAR NEURORADIOLOGY**

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In the second year residents continue to develop knowledge of specific entities while developing differential diagnosis for imaging findings. They also begin to participate in image guided procedures.

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### **ORIENTATION AND EXPECTATIONS**

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Reorient yourself to the workflow described above and discuss expectations with the fellow or education director.

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### **STRUCTURE**

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#### **Learning objectives**

*Upon completion of this rotation, the resident will understand and evaluate:*

*Overall*

1. Give location based differential diagnosis.

- a. Including: brain (white matter/cortex), posterior fossa, sellar, suprasellar, pineal, ventricular, clival, off midline skull base, jugular foramen, petrous apex, middle ear/temporal bone

#### Brain

1. Demyelination
2. CSF dynamics
3. Vascular abnormalities
4. Epilepsy

#### Spine

1. Degeneration. Use appropriate spine terminology ([https://www.thespinejournalonline.com/article/S1529-9430\(14\)00409-4/abstract](https://www.thespinejournalonline.com/article/S1529-9430(14)00409-4/abstract)).
2. Infection

#### Assignments

1. Read relevant chapters of Osborn's Brain.

#### Evaluation

2. Qualitative evaluation by staff during one-on-one sessions.

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## RADIOLOGY RESIDENT 3<sup>ND</sup> YEAR NEURORADIOLOGY

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In the third year residents will develop deeper understanding of differential considerations and improve their knowledge of neck anatomy and head/neck cancer evaluation.

#### Learning objectives

*Upon completion of this rotation, the resident will understand and evaluate:*

### *Head and neck*

1. Anatomy and pathology
2. Differential based on location
3. Brachial Plexus

### *Brain*

1. Tumor progression/ pseudoprogression
2. Toxic / Metabolic processes

### *Spine*

1. Post op spine
2. Infection and inflammation
3. Congenital abnormalities
4. Vascular abnormalities

### *Assignments*

1. Read relevant chapters of Osborn's Brain.

### *Evaluation*

1. Qualitative evaluation by staff during one-on-one sessions.

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## **RADIOLOGY RESIDENT 4<sup>ND</sup> YEAR NEURORADIOLOGY**

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This year residents have the opportunity to perform more complex neurointerventions and lead tumor boards. Learning is geared toward preparing residents for practice and fellowship.