

Critical Laboratory Values for Lumbar Puncture/Myelography			
Lab Test	PLT	INR	PTT
Lab Value	>20,000	< 2	Within normal range
When to check labs?			
Inpatients/ER: Check INR, PLT, PTT within 1 week of LP (or within 24 hours if on chemo with low plts)			
Outpatients: If patient has a history of cancer, bleeding disorder or liver disease, follow guidelines for inpatients/ER patients			
If patient is on Coumadin, see below for specific recommendations.			
Otherwise, outpatients do not need labs.			
INR 2 – 3: Needs to be discussed with clinical team and decision made on a case by case basis			
PLT 15K – 20K: Give platelets before / during procedure, no need to recheck			
PLT <15K: Give platelets and recheck prior to procedure			
Pregnancy: Women of child bearing age should confirm negative pregnancy status			

Medication Guidelines for LP/Myelograms		
Medication	Recommendation	Comments
NSAIDS: Ibuprofen, Diclofenac, Ketoprofen, Ketorolac, Indomethacin, Naproxen, Sulindac, Diflunisal, Celecoxib	Do not stop	
ASA	Do not stop	
Aggrenox/persantine (ASA and Dipyridamole), Pletal (Cilostazol)	Stop 1-2 days	Restart after 24 hours
Plavix (Clopidogrel), Prasugrel (Effient), Ticagrelor (Brilinta)	Stop 5 days	Restart 24 – 48 hours
Warfarin	Stop 5 days	INR <1.5 day of procedure
Heparin IV	Stop 4 hours	Restart 2 – 4 hours
Heparin SQ	Stop 6-8 hours	Restart 6 – 8 hours
Enoxaparin (Lovenox), Dalteparin (Fragmin), Tinzaparin	Stop 12 hours	Restart 12 – 24 hours
Fondaparinux (Arixtra)	Stop 72 hours	Restart 24 – 48 hours
Dabigatran (Pradaxa)	Stop 1 – 2 days if Cr Cl > 50ml/min Stop 3 – 5 days if Cr Cl < 50ml/min	Restart 24 hours
Bivalrudin (Angiomax)	Stop 2 – 3 days if GFR >50 Stop 3 – 5 days if GFR < 50	
Lepirudin (Refludan), Argatroban (Novastan)	4 hours	
Desrudin	Stop 12 hours if Cr Cl >30 ml/min Stop 24 hours if Cr Cl < 30 ml/min	
Rivaroxaban (Xarelto), Apixaban (Eliquis)	Stop 24 hours if Cr Cl > 30ml/min Stop 48 hours if Cr Cl < 30ml/min	Restart 24 hours
Edoxaban (Savasya, Lixiana)	Stop 48 hours if Cr Cl >50 ml/min Stop 72 hours if Cr Cl <50 ml/min	Restart 24 hours if Cr Cl >50 ml/min Restart 24 hours if Cr Cl <50 ml/min
Abciximab (Reopro)	Stop 24 hours	
Aggrastat (Tirofiban), Eptifibatide (Intergrelin)	Stop 4 hours	

Guidelines for Head CT/MR prior to LP ⁵

Recommend Head CT in patients with signs/symptoms of increased intracranial pressure:

- New onset seizure
- Papilledema
- Focal neurologic findings
- Altered mental status

American College of Physicians: Practice Guidelines Lumbar Puncture. Physician Information and Education Resource. 2010.

NPO: Patients should be NPO 4-6 hours (except for medication and sips of water) prior to myelography or intrathecal chemotherapy.

Pre-Medication for Allergy to Iodine:

1. Follow standard pre-med guidelines as for any other iodine injection
2. Refer to “contrast corner” at:
<http://www.radiology.wisc.edu/fileShelf/contrastCorner/files/prophylaxisPolicy.pdf>
1. .

Eligibility for image guided LP/myelography

1. Neuroradiology performs myelograms and lumbar punctures (LP) requiring image guidance in patients age 12 and up.
 - a. Please note that fluoroscopic guidance for LP adds ionizing radiation and substantial cost and cannot be justified by staffing concerns alone.
 - b. An attempt at the bedside is expected before requesting fluoroscopic guidance
 - i. Please note that if there are issues with a bedside LP (such as coagulopathy, immune compromise or an anxious/combatative patient) these will be issues under fluoroscopy as well.
 - c. If the primary team requires assistance performing an LP, inpatients should be initially evaluated by the Bedside Procedure Service (pager 8030)
 - i. Available From Monday through Friday 8 – 4:30
 - ii. Order Set IP-Lumbar Puncture – Bedside (2467)
 - iii. Exceptions are patients who require intrathecal chemotherapy
 - d. If there is a contraindication to a bedside attempt (i.e. severe scoliosis, extensive posterior fusion, unhealed surgical wound limiting level options), please call the Neuroradiology Clinical Program Coordinator (CPC) (263-6871 / pager 9245) to discuss the case (Monday – Friday, 8 – 5). After hours and on the weekend, please contact the Neuroradiology reading room (263-8623) or page the Neuroradiology fellow on call.
2. Pediatric patients (patients younger than 12 years old) are performed by the **Pediatric Radiology section**. Please call the following number to coordinate a pediatric lumbar puncture (30670).

Coordinating an LP/myelogram for an inpatient/ ER patient at UW

1. Call the Neuroradiology CPC (263-6871 / pager 9245) to discuss the case (Monday – Friday, 8 – 5). After hours and on the weekend, please contact the Neuroradiology reading room (263-8623) or page the Neuroradiology fellow on call.
2. State that you would like to order a lumbar puncture on an inpatient/ER patient.
 - a. Simply placing the order through EPIC without communicating directly with the Neuroradiology department will delay the procedure.
3. It is best to call first thing in the morning.
4. The CPC will ask the following questions:
 - a. What is the indication/reason for the LP?
 - b. Has someone on the floor/ER attempted to perform the LP?
 - c. Is the patient consentable? If not, who is the power of attorney and what is their contact information?
 - d. What is the INR, PTT and PLT count? We require labs on all inpatients/ER patients. Please refer to lab/medication guidelines for cutoff values.
 - e. Are there any potential issues that the radiologist should know prior to performing the LP? For example, the LP needs to be performed under conscious sedation or general anesthesia.
 - f. If the LP is to be done for intrathecal chemotherapy administration, is the chemotherapy ready and who will be available to administer the chemotherapy?
 - g. Are there any special requests? For example, measure pressures, large volume tap etc.
5. The CPC will bring the request to the Neuroradiology reading room for approval.
6. Place the order for the LP through Epic/Healthlink.
7. Make sure to also place lab orders for the CSF fluid analysis.
 - a. The Neuroradiology department will not place orders for CSF analysis.
8. Once the lumbar puncture is complete, the patient will be transferred back to the floor/ER. The patient should lay flat for at least 1 hour.

After Hours LP/Myelogram at UW

Potential indications for EMERGENT lumbar puncture or myelogram:

These procedures will be likely performed at the earliest possible time. In some situations, these can potentially be deferred to normal business hours.

1. Signs and symptoms of cord compression with MRI contraindicated, and myelography requested by neurosurgery or orthopedic surgery attending with plans to operate based on results.
2. Known or suspected idiopathic intracranial hypertension (IIH) with vision loss.

Potential indications for URGENT lumbar puncture or myelogram:

These procedures, while urgent, will be considered but can often be **deferred until regular working hours with empiric treatment to begin prior to the procedure.**

1. Signs and symptoms of new CNS infection, including altered mental status.
2. Known or suspected diagnosis of idiopathic intracranial hypertension (IIH) without visual changes.
3. Suspicion of subarachnoid hemorrhage uncorroborated by imaging.

How to coordinate an LP for a VA patient

1. Follow steps 1-3 as outlined in the inpatient/ER patient section
2. State that you would like to coordinate an LP/Myelo for a patient at the VA
3. The procedure requires approval by the medical director, Alan Bridges, who can be contacted through the VA operator (256-1901, option 0)
4. Once the procedure is approved, contact the VA interventional radiology department and talk to one of the radiology technologists (280-7126)
5. The VA technologists will then coordinate with the UW radiology scheduler to officially schedule the procedure (263-9729, option 3). After hours or during the weekends, the UW technologist will schedule the procedure directly.
6. The UW technologists (262-5314) will coordinate a time with the neuroradiology team
7. After the LP is performed, CSF is sent back to the VA with the patient
8. Post procedure orders: The patient should lay flat for an hour after the procedure

Intrathecal chemotherapy

1. For intrathecal chemotherapy cases, there must be a physician or non-physician provider available and ready to administer chemotherapy.
2. Patients will **NOT** be transferred to the procedure room until the chemotherapy is ready and there is a physician or non-physician provider available to inject the chemotherapy.
3. INR, PTT and PLT count are required on all patients receiving ITC (Please refer to lab/medication guidelines for cutoff values)

Image guidance for procedures

1. Image guidance will be provided as needed for the clinical services for lumbar drain placement
2. The clinical team will need to contact the Interventional Radiology quarterback (2-5341) to arrange a mutually agreeable time for the procedure
3. Neuroradiology will be available for back up as needed but will not be involved in primary needle placement

How to handle post-procedure headaches?

1. Conservative measures include:
 - a. Recommendations for bed rest:
 - i. For the first 12 hours after the LP, lie flat, NO lifting, NO straining
 - ii. If patient gets a headache after getting up, recommend again lying flat for an additional 12 hours
 - iii. If headaches do not improve after lying flat this may indicate a more serious complication and the patient should be evaluated by the ordering physician
 - b. Instructions for hydration: Recommend hydration. Caffeine may be helpful.
2. Pain management: If headaches persist despite conservative measures, pain medication such as Tramadol may be indicated. Prescriptions for this type of medication should be coordinated through the clinician who ordered the procedure.
 - a. The neuroradiology staff will not prescribe narcotic pain medication

How to coordinate a blood patch?

1. A blood patch may be indicated for patients who have persistent unrelenting headaches after conservative measures have been attempted
2. Blood patches may be performed by neuroradiology or anesthesiology at UW depending on availability
 - a. First call - Neuroradiology CPC (263-6871 / pager 9245) to discuss the case (Monday – Friday, 8 – 5). After hours and on the weekend, please contact the Neuroradiology reading room (263-8623) or page the Neuroradiology fellow on call.
 - b. Second call - pager “**PAIN**” or **7246** to coordinate
 - i. Regular business hours: An anesthesiology nurse or anesthesiology resident will respond, assess eligibility and help to facilitate blood patch if indicated
 - ii. During off hours: The on call anesthesiology resident will respond. It will likely take much longer to coordinate after hours.
 - iii. The anesthesiology department will work up each patient individually and assess whether the procedure is indicated

References for lab guidelines and additional reading:

1. Roos KL. Lumbar Puncture. *Semin Neurology*, 2003 March; (23) 1:105-114
2. ACR-ASNR practice guidelines on Myelography, 2008.
3. Layton KF, Kallmes DF, MD, and Horlocker TT. Recommendations for Anticoagulated Patients Undergoing Image-Guided Spinal Procedures. *AJNR* Mar 2006 27:467–71.
4. From *Neuroradiology Requisites*. Third edition, 2010. Page 19.
5. American College of Physicians: Practice Guidelines Lumbar Puncture. Physician Information and Education Resource. 2010.
6. Sandow BA and Donnal JF. Myelography Complications and Current Practice Patterns. *AJR* 2005; 185:768–771.
7. Healthcare provider information for Pradaxa (dabigatran etexilate); University of Utah Health Care System.
8. Healthcare provider information for Apizaban (Eliquis): Meriter Antithrombotic Service, May 2014
9. Domingues R, Bruniera G, Brunale F, Manguera C, Senne C. Lumbar puncture in patients using anticoagulation and antiplatelet agents. *Arq Neuropsiquiatr* 2016; 74(8):679-686.
10. Patel IJ, Rahim S, Davidson JC et al “Society of Interventional Radiology Consensus Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions – Part II: Recommendations” *JVIR* 2019; 30(8):1168-1184.