

	All respondents (n=123)	Combined Academic (n=100)	Combined Private Practice (n=23)	≥50% FLGPs performed by PEs (n=23)	≥50% FLGPs performed by trainees (n=76)
Bedside LP must be attempted prior to FGLP	72.4	80.0	39.1	69.6	80.3
Do hospitalists or primary clinicians request FGLP without a bedside attempt because they feel uncomfortable with bedside LP	87.0	85.0	95.7	100.0	82.9
Of those that receive this request from hospitalists, how often do you accommodate this request?					
Always	31.8	23.5	63.6	43.5	23.8
Sometimes	43.0	48.2	22.7	43.5	41.3
Refuse until bedside attempt	25.2	28.2	13.6	13.0	34.9
When a patient requests for an FGLP without a bedside attempt, do you oblige?					
Always	41.5	34.0	73.9	52.2	35.5
Sometimes	51.2	57.0	26.1	34.8	56.6
Never	7.3	9.0	0.0	13.0	7.9
If an outpatient is referred for FGLP, does a prior non-image guided bedside LP need to be attempted?					
Always	10.6	13.0	0.0	4.3	14.5
Sometimes	26.0	26.0	26.1	30.4	28.9
Never	35.0	34.0	39.1	34.8	32.9
Not sure, we do not check	28.5	27.0	34.8	30.4	23.7
Are emergent FGLPs performed after regular working hours?	83.7	85.0	78.3	82.6	85.5
Appendix Table 1. Fluoroscopy guided lumbar puncture practices and requirements by practice type and proportion performed by trainees and physician extenders.					
FGLP indicates fluoroscopy guided lumbar puncture; LP indicates lumbar puncture					

Appendix A. Email sent on May 26, 2020 to the neuroradiology fellowship directors inviting them to participate in the survey. A very similar email was also distributed to the neuroradiology division chiefs.

Dear Neuroradiology fellowship directors,

I am the neuroradiology fellowship director at University Hospitals Cleveland Medical Center and I am sending you this email to ask for your participation in a short survey.

Radiology departments across the country continue to receive increasing requests to perform Fluoroscopy guided lumbar punctures (FGLPs). Currently there are no standards on how radiology sections should handle these requests. In many academic hospitals, FGLPs are primarily performed by radiology residents or fellows. Without control measures in place, trainees including neuroradiology fellows can become overburdened in performing FGLPs and could potentially impact their training.

At the beginning of May, through the ASNR E-news we sent out a short survey requesting members to answer a few questions about how their institutions handle FGLP requests. Unfortunately we have had few responses. **I am requesting if you could please fill out this short survey and to please forward the survey to your colleagues, current fellows, and past fellows.**

For your convenience, we have placed the link for the survey here ([This survey](#)) but you can also find it in the ASNR e-news from May. The survey does not ask for any of your personal information and the results are anonymized.

In the future, we hope from these results, radiology sections across the country can establish or refine their FGLP guidelines to better serve their patients and not impact radiology training.

Thank you

Ameya Nayate MD

Tyler Richards MD

Appendix B. Copy of the online Google Forms survey that was open for receiving responses from May 7, 2020 and was closed on June 30, 2020.

Fluoroscopy guided lumbar puncture survey

The current clinical practice for fluoroscopy guided lumbar punctures, including workflow, appropriate indications, and patient requirements, varies widely among institutions. The purpose of this study is to survey current practice patterns among radiologists in a variety of practice settings, so that radiologists will have a better idea of how their practice compares to other radiology departments. This may help to update practice parameters to guide practitioners who perform these procedures and help to provide insight on the safest and most effective way to provide this service to our referring clinicians.

This survey should take less than 5 minutes. We appreciate your participation.

* Required

Please answer the questions to the best of your knowledge. Questions #1-9 pertain only to hospitalized patients or patients in the emergency room.

1. Is it standard practice in your department that a bedside (non-image guided) lumbar puncture is attempted by a clinician on a patient prior to the patient undergoing a fluoroscopy guided lumbar puncture? *

Mark only one oval.

☐ Yes

☐ No

2. On which of the following inpatients is a non-image guided lumbar puncture NOT * required prior to referral for a fluoroscopy guided lumbar puncture? (check all that apply)

Check all that apply.

- ☐ Intrathecal chemotherapy
- ☐ Morbid Obesity (cannot palpate necessary bony landmarks to perform the lumbar puncture)
- ☐ Prior lumbar spine surgery with hardware
- ☐ Prior lumbar spine surgery without hardware
- ☐ Severe scoliosis and/or congenitally altered anatomy
- ☐ Surgical wound or infection limiting access by normal beside anatomic landmarks
- ☐ Severe degenerative lumbar disease
- ☐ Patient requiring sedation or general anesthesia in order to perform the lumbar puncture
- ☐ Not applicable, we require a non-image guided attempt on all patients

3. Do hospitalists or primary clinicians caring for inpatients often ask your department to perform a fluoroscopy guided lumbar puncture because they do not feel competent in performing bedside lumbar punctures? *

Mark only one oval.

- ☐ No
- ☐ Yes, and we always accommodate if requested
- ☐ Yes, and we sometimes accommodate depending on the situation
- ☐ Yes, but we refuse until a bedside attempt is made

4. If a patient requests the lumbar puncture to be performed under fluoroscopic guidance prior to bedside attempt, do you oblige (assuming no contradiction to bedside lumbar puncture is present)? *

Mark only one oval.

- ☐ Always
- ☐ Sometimes
- ☐ Never

5. What percentage of fluoroscopy guided lumbar punctures are performed by physician extenders (radiology or physician assistants, nurse practitioners, or equivalent)? *

Mark only one oval.

- ☐ 75-100%
- ☐ 50-74%
- ☐ 25-49%
- ☐ 1-24%
- ☐ Not applicable, we do not have physician extenders

6. What percentage of fluoroscopy guided lumbar punctures are performed by trainees (residents or fellows)? *

Mark only one oval.

- ☐ 75-100%
- ☐ 50-74%
- ☐ 25-49%
- ☐ 1-24%
- ☐ Not applicable, we do not have trainees

7. Are emergent fluoroscopy guided lumbar punctures performed after regular working hours? *

Mark only one oval.

- ☐ Yes
- ☐ No

8. Do you require that the patient has recent head imaging prior to undergoing a fluoroscopy guided lumbar puncture? *

Mark only one oval.

- ☐ Always
- ☐ Only if there is a high suspicion for increased intracranial pressure and CSF is being removed
- ☐ Never

9. In which situations do you require coagulation labs and platelet values prior to a fluoroscopy guided lumbar puncture? (Check all that apply) *

Check all that apply.

- ☐ All patients undergoing a fluoroscopy guided lumbar puncture
- ☐ Patients at increased risk of coagulopathy
- ☐ Patients on anticoagulation (even if they have held their anti-coagulation medications for an appropriate amount of time prior to the procedure)
- ☐ Patients over a specified age cut off

10. If an outpatient is referred for FGLP, does a prior non-image guided bedside LP need to be attempted? *

Mark only one oval.

- ☐ Always
- ☐ Never
- ☐ Sometimes
- ☐ Not sure, we don't check if patient had prior attempt.

11. How would you describe your practice?

Mark only one oval.

- ☐ Academic
- ☐ Private practice
- ☐ Hybrid of academic and private practice
- ☐ Hospital-based radiology practice
- ☐ Trainee
- ☐ Other: _____

12. Which of the following best describes the imaging studies that you read in your daily practice? *

Mark only one oval.

- ☐ Pediatric neuroradiology studies only
- ☐ Adult neuroradiology studies only
- ☐ Only neuroradiology studies, both pediatric and adult
- ☐ Half neuroradiology studies and half other radiology studies
- ☐ Mostly non-neuroradiology studies
- ☐ Trainee

13. In which geographic region do you practice? *

Mark only one oval.

- ☐ Canada
- ☐ Mexico
- ☐ Other North American country
- ☐ Africa
- ☐ Asia
- ☐ Australia
- ☐ Europe
- ☐ South America
- ☐ United States - Alabama
- ☐ United States - Alaska
- ☐ United States - Arizona
- ☐ United States - California
- ☐ United States - Colorado
- ☐ United States - Connecticut
- ☐ United States - Delaware
- ☐ United States - District of Columbia
- ☐ United States - Florida
- ☐ United States - Georgia
- ☐ United States - Hawaii
- ☐ United States - Idaho
- ☐ United States - Illinois
- ☐ United States - Indiana
- ☐ United States - Iowa
- ☐ United States - Kansas
- ☐ United States - Kentucky
- ☐ United States - Louisiana
- ☐ United States - Maine
- ☐ United States - Maryland
- ☐ United States - Massachusetts
- ☐ United States - Michigan

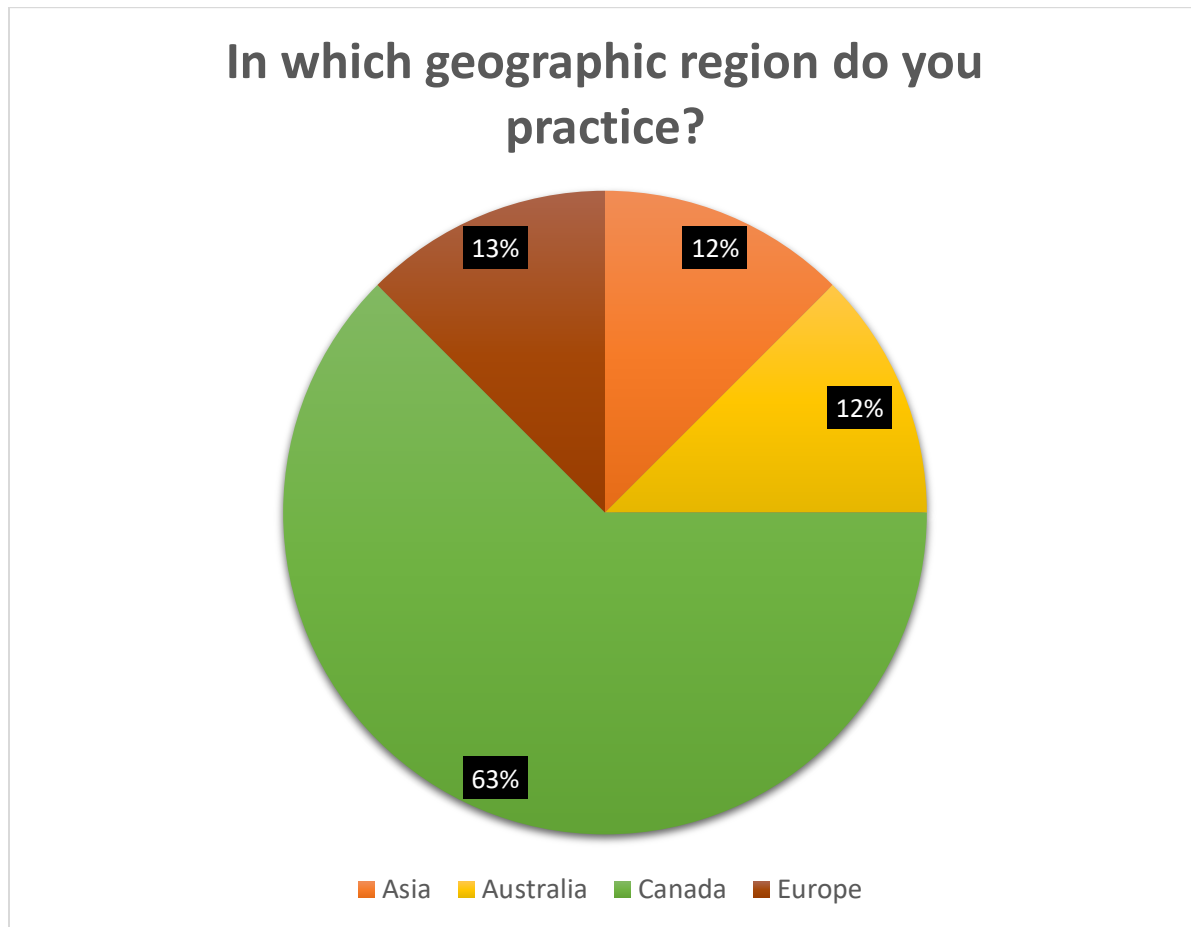
- ☐ United States - Minnesota
- ☐ United States - Minnesota
- ☐ United States - Mississippi
- ☐ United States - Missouri
- ☐ United States - Montana
- ☐ United States - Nebraska
- ☐ United States - Nevada
- ☐ United States - New Hampshire
- ☐ United States - New Jersey
- ☐ United States - New Mexico
- ☐ United States - New York
- ☐ United States - North Carolina
- ☐ United States - North Dakota
- ☐ United States - Ohio
- ☐ United States - Oklahoma
- ☐ United States - Oregon
- ☐ United States - Pennsylvania
- ☐ United States - Rhode Island
- ☐ United States - South Carolina
- ☐ United States - South Dakota
- ☐ United States - Tennessee
- ☐ United States - Texas
- ☐ United States - Utah
- ☐ United States - Vermont
- ☐ United States - Virginia
- ☐ United States - Washington
- ☐ United States - West Virginia
- ☐ United States - Wisconsin
- ☐ United States - Wyoming
- ☐ Other - Please type in below

14. If other geographic region please type in below, otherwise please leave blank.

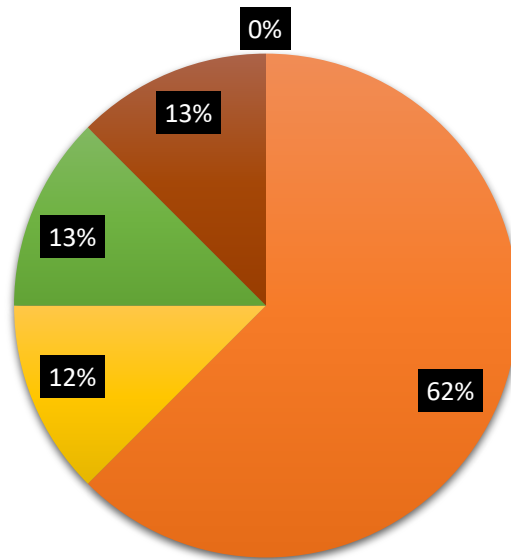
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Google Forms

Appendix 3. The following figures summarize the survey responses of the 8 international respondents for each question. These respondents were excluded from the statistical analysis in the paper due to a small number of responses.

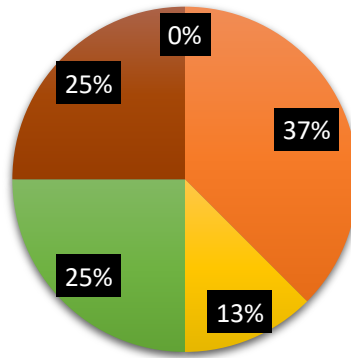


How would you describe your practice?



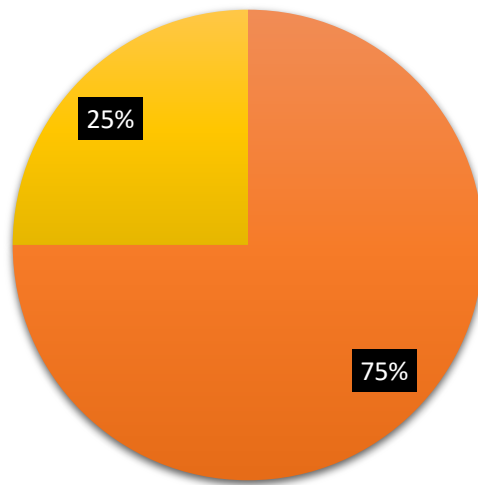
- Academic
- Hospital-based and academic
- Hybrid of academic and private practice
- Hospital-based radiology practice
- Private practice

Which of the following best describes the imaging studies that you read in your daily practice?



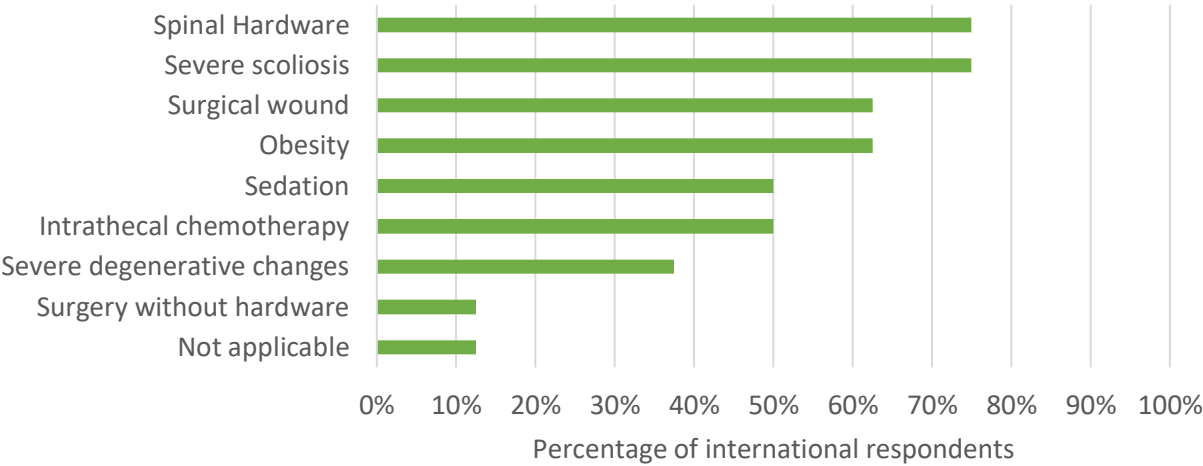
- Adult neuroradiology studies only
- Only neuroradiology studies, both pediatric and adult
- Pediatric neuroradiology studies only
- Half neuroradiology studies and half other radiology studies
- Mostly non-neuroradiology studies
- Trainee

Is it standard practice in your department that a bedside (non-image guided) lumbar puncture is attempted by a clinician on a patient prior to the patient undergoing a fluoroscopy guided lumbar puncture?

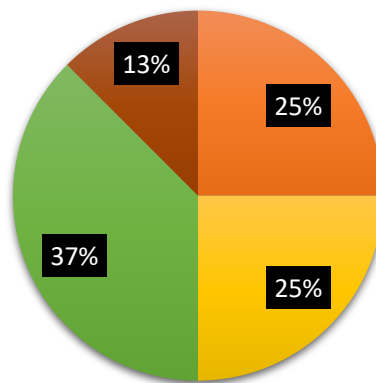


■ Yes ■ No

On which of the following inpatients is a non-image guided lumbar puncture NOT required prior to referral for a fluoroscopy guided lumbar puncture?

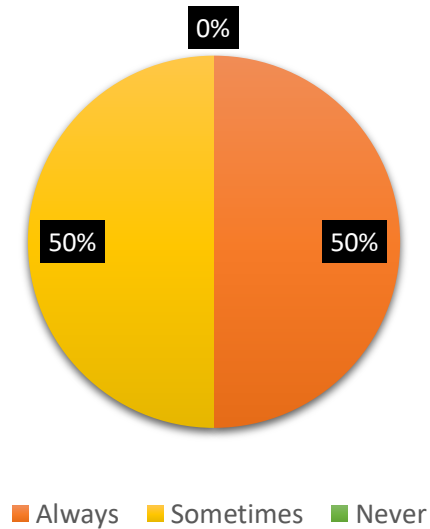


Do hospitalists or primary clinicians caring for inpatients often ask your department to perform a fluoroscopy guided lumbar puncture because they do not feel competent in performing bedside lumbar punctures?

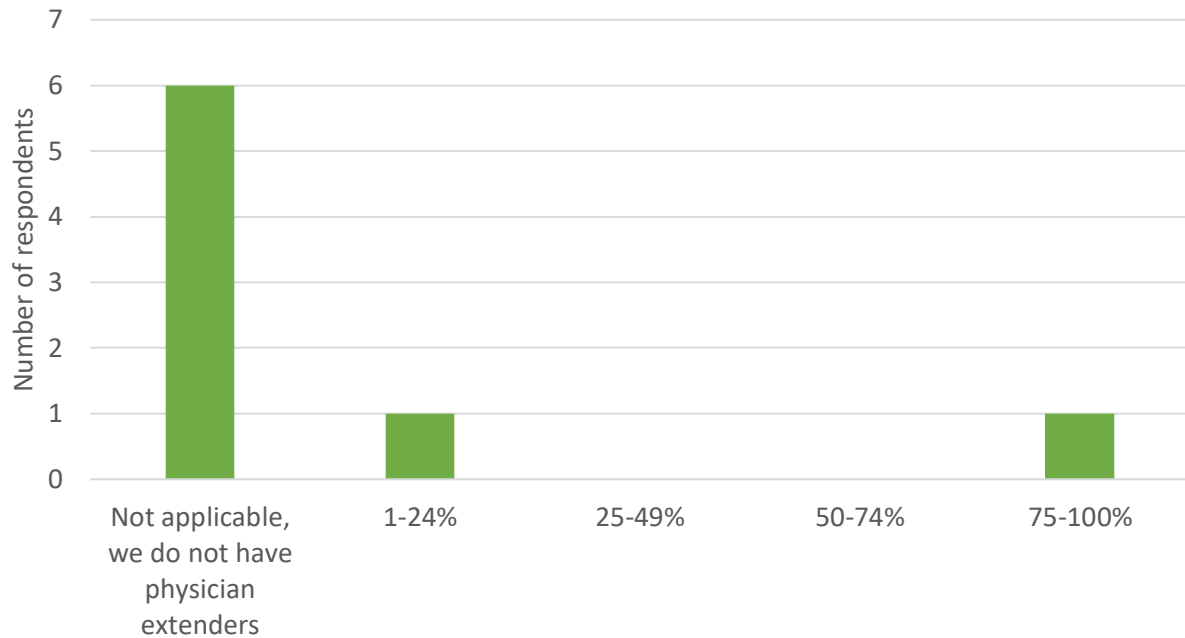


- No
- Yes, but we refuse until a bedside attempt is made
- Yes, and we sometimes accommodate depending on the situation
- Yes, and we always accommodate if requested

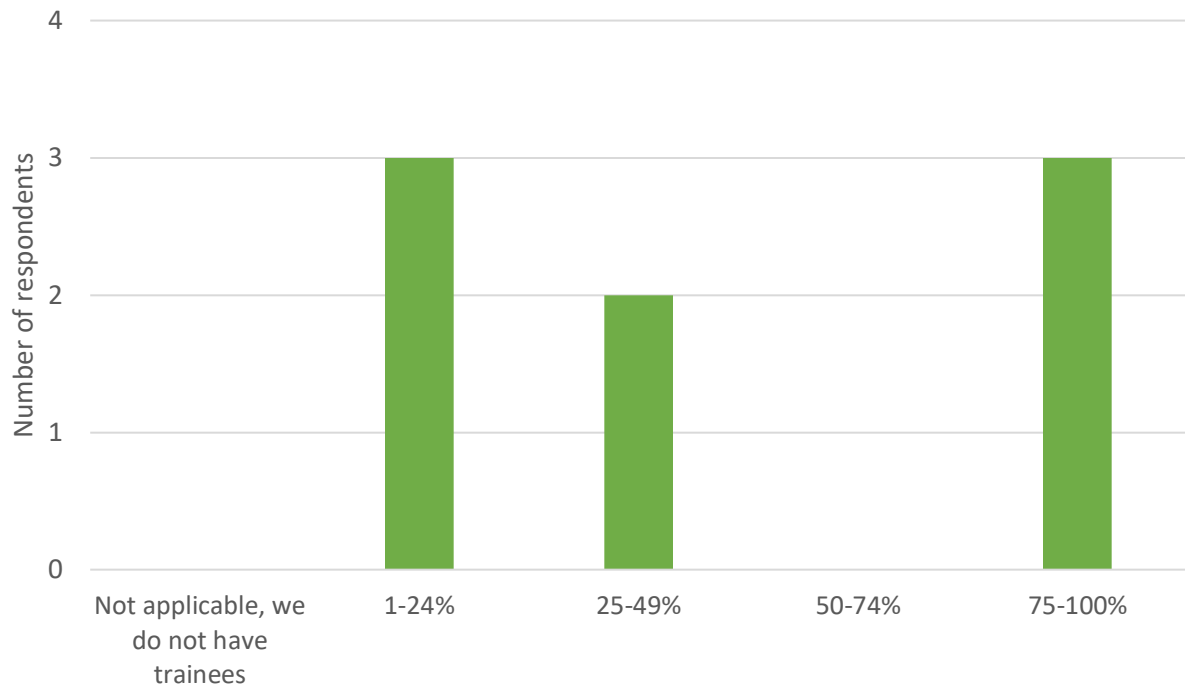
If a patient requests the lumbar puncture to be performed under fluoroscopic guidance prior to bedside attempt, do you oblige (assuming no contradiction to bedside lumbar puncture is present)?



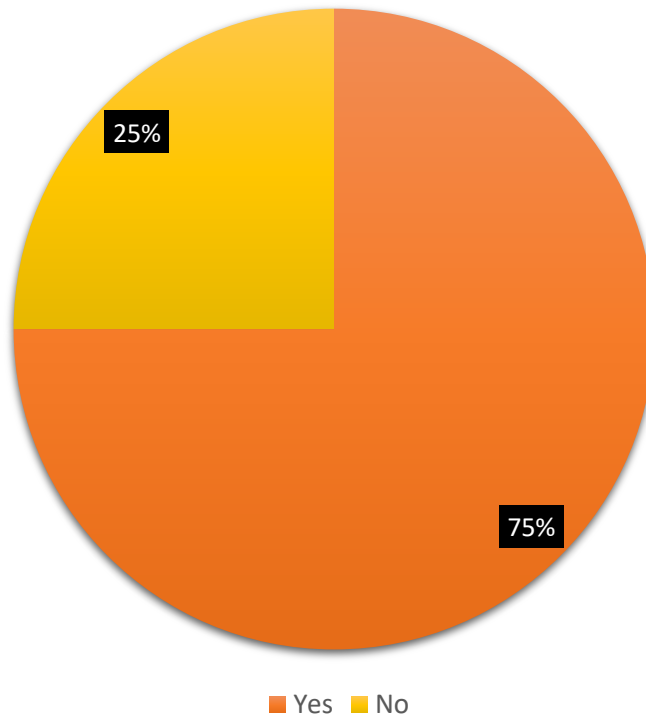
What percentage of fluoroscopy guided lumbar punctures are performed by physician extenders (radiology or physician assistants, nurse practitioners, or equivalent)?



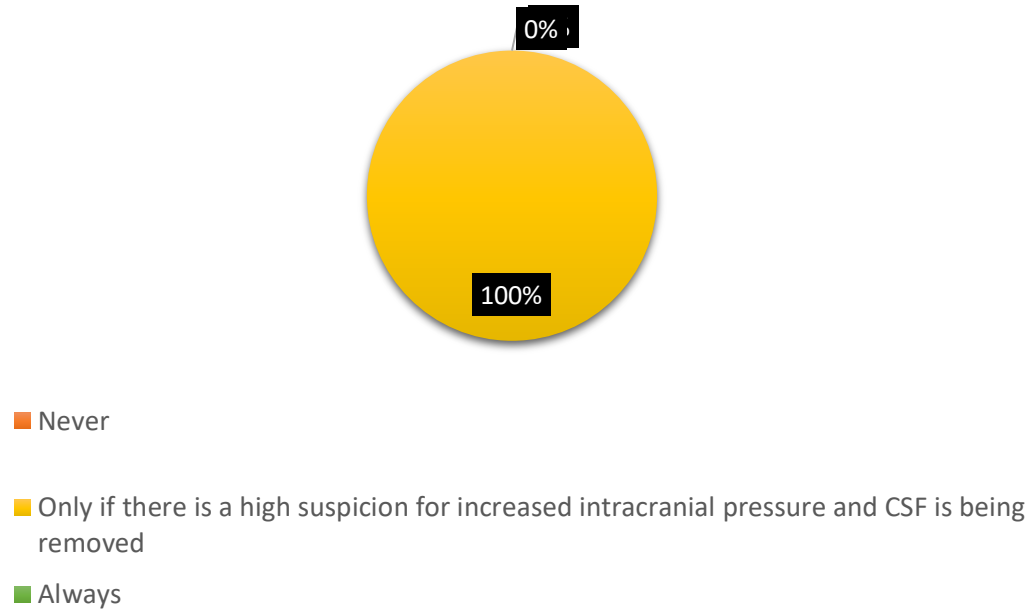
What percentage of fluoroscopy guided lumbar punctures are performed by trainees (residents or fellows)?



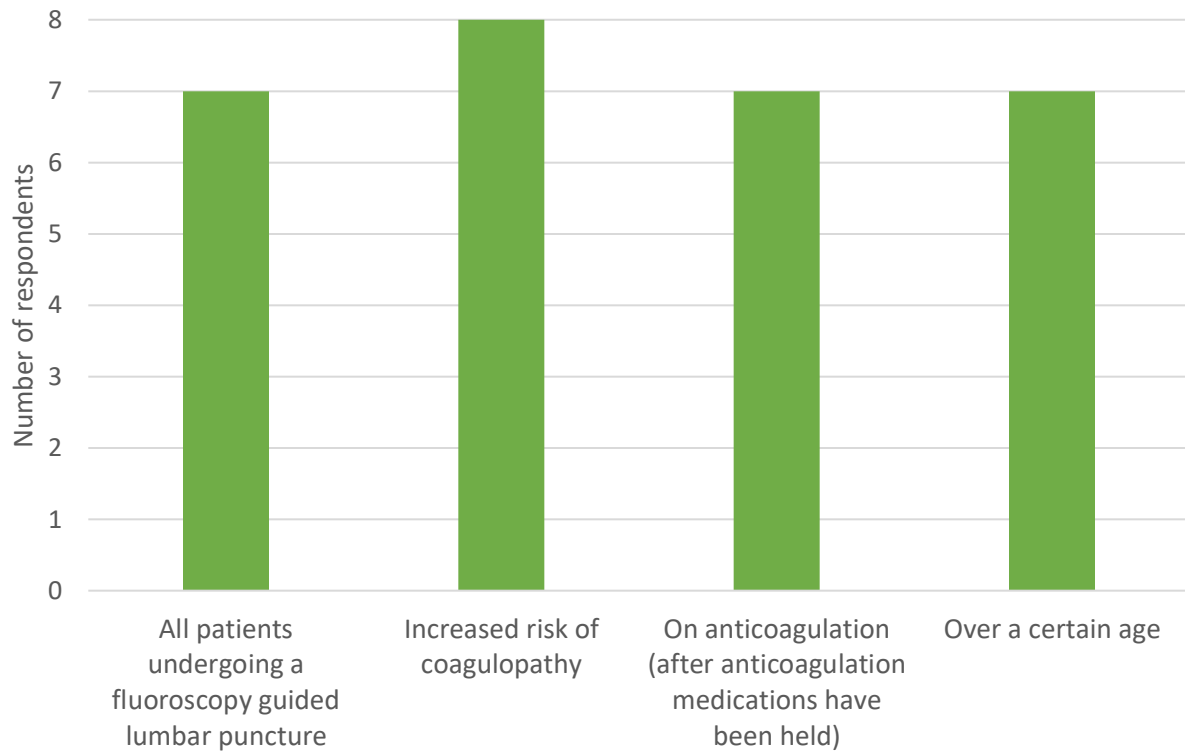
Are emergent fluoroscopy guided lumbar punctures performed after regular working hours?



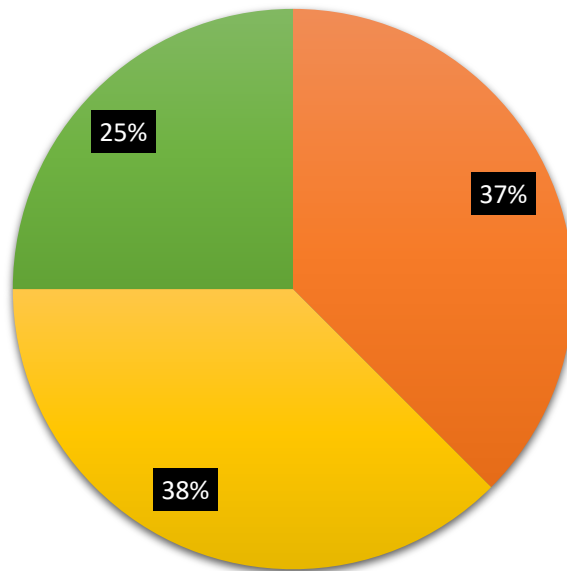
Do you require that the patient has recent head imaging prior to undergoing a fluoroscopy guided lumbar puncture?



In which situations do you require coagulation labs and platelet values prior to a fluoroscopy guided lumbar puncture?



If an outpatient is referred for FGLP, does a prior non-image guided bedside LP need to be attempted?



■ Never ■ Not sure, we don't check if patient had prior attempt ■ Always