

Stereotactic EEG (SEEG) Practices: A Survey of United States Level 4 Epilepsy Centers

Jay Gavvala, MD, MSCI^a; Saurabh R. Sinha, MD, PhD^b; Muhammad Zafar, MBBS^c; Giri Kalamangalam, MD, DPhil^d; Stephan Schuele, MD, MPH^e; on behalf of the American SEEG Consortium

^aDepartment of Neurology, Baylor College of Medicine, Houston, TX; Departments of ^bNeurology and ^cPediatrics, Duke University School of Medicine, Durham, NC; ^dDepartment of Neurology, University of Florida, Gainesville, FL; ^eDepartment of Neurology, Feinberg School of Medicine, Northwestern University, Chicago, IL



OBJECTIVE

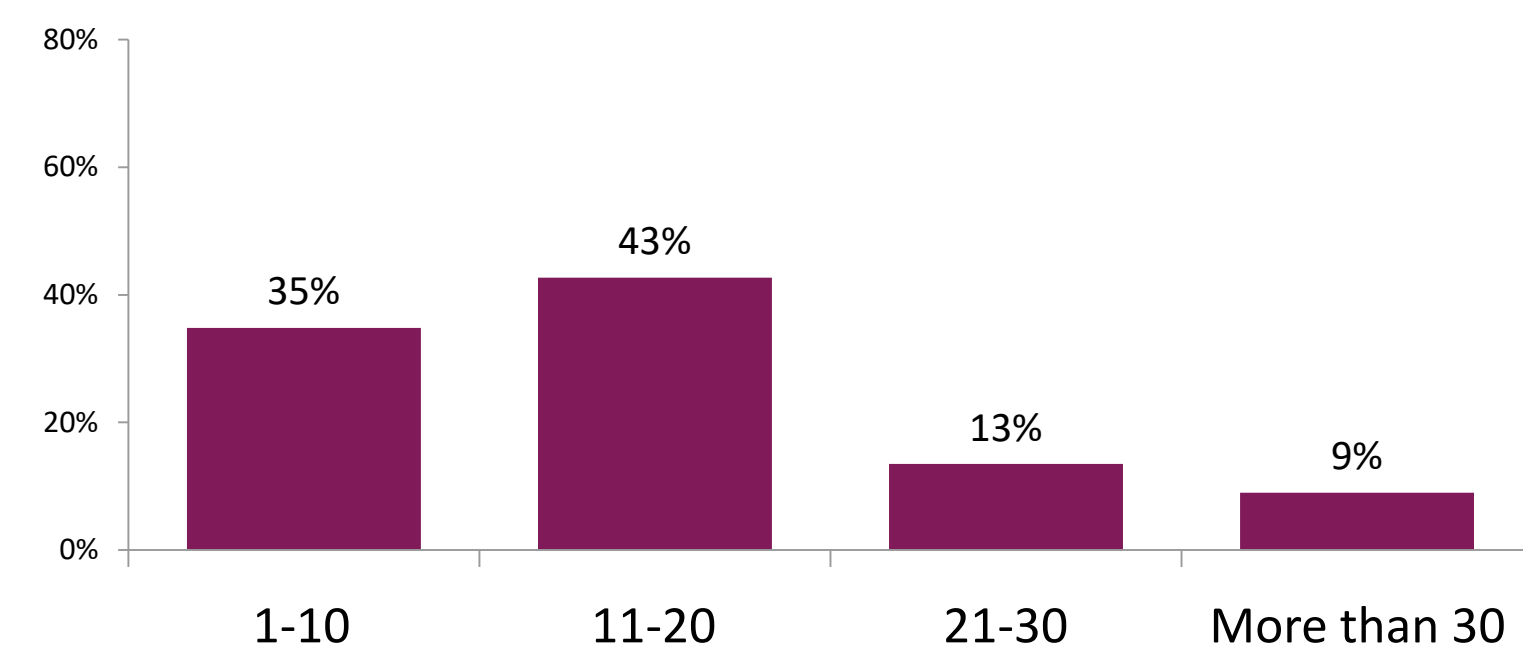
Stereotactic EEG (SEEG) is increasingly used as an alternative to subdural electrodes (SDE) for epilepsy surgery evaluations in the USA. As a step towards developing uniform standards for SEEG, we describe current practice among National Association of Epilepsy Centers (NAEC) level IV institutions.

METHODS

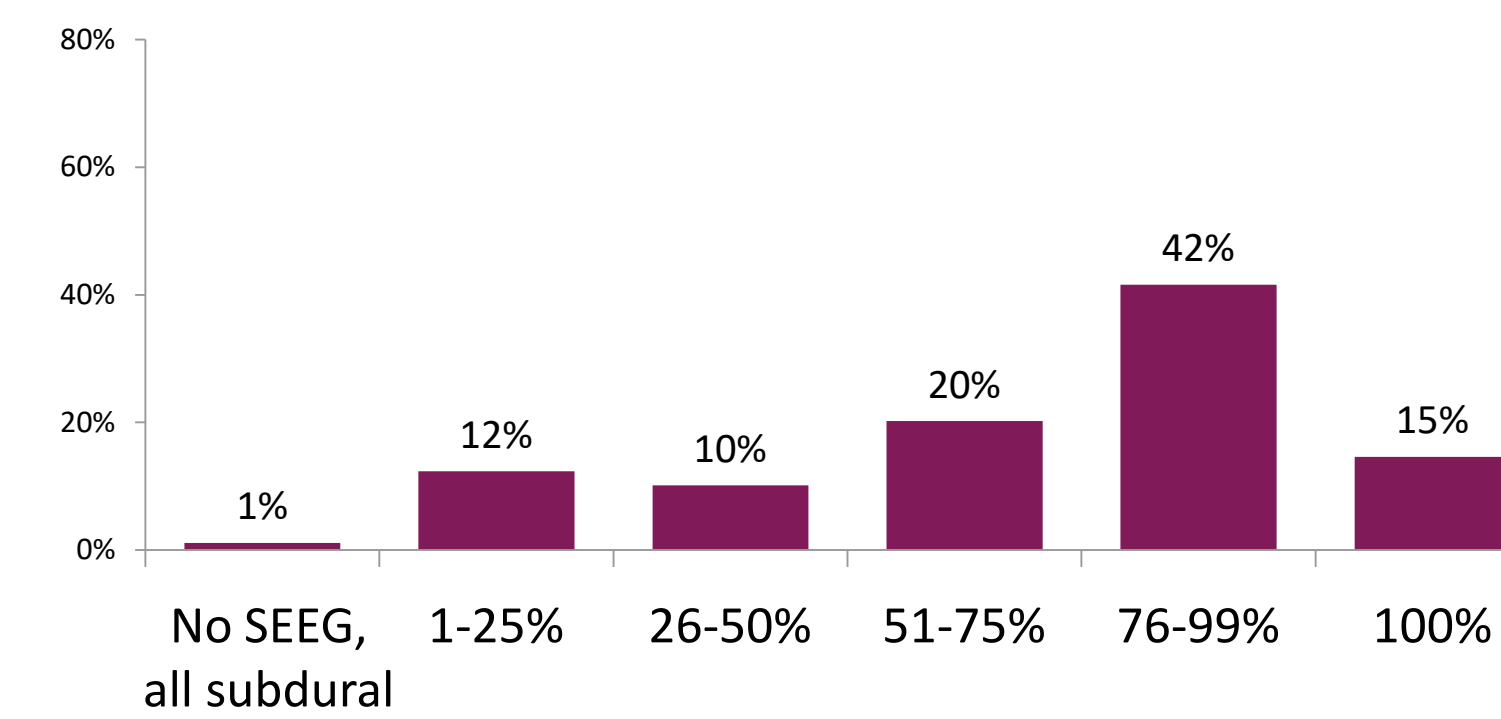
- An online survey was sent to directors of all level IV epilepsy centers as defined by the NAEC (192 centers).
- A Survey Monkey online survey was sent in August 2019.
- The survey consisted of 63 questions.
- Survey had questions assessing the following: institutional information, institutional criteria for SEEG utilization, planning and implantation of SEEG electrodes, analysis and technical recording parameters of SEEG, epilepsy monitoring unit care for SEEG patients, cortical stimulation in SEEG and treatment options and complications after SEEG.

	N	%
Total Respondents	105	54.6
Currently Performing SEEG	97	92.4
Location		
Northeast	27.2	
Northwest	6.5	
Midwest	19.6	
South	7.6	
Southeast	25.0	
Southwest	14.0	
Patient Population		
Adult	23.9	
Pediatric	27.1	
Both	48.9	
Patient Care Assistant in Room	46.2	
Bathroom Level		
Bedpan Only	3.8	
Bedside Commode	27.5	
Bathroom with Supervision	66.3	
Activity Level		
Strict Bedrest	26.3	
Out of Bed to Chair ad lib	45.0	
Out of Bed with Supervision	18.8	
No Restrictions	3.8	
Nursing Level of Care		
1:1	5.0	
1:2	12.5	
1:3	43.8	
1:4	25.0	
1:5	5.0	
Complications from SEEG Seen at Your Institution	14.3	

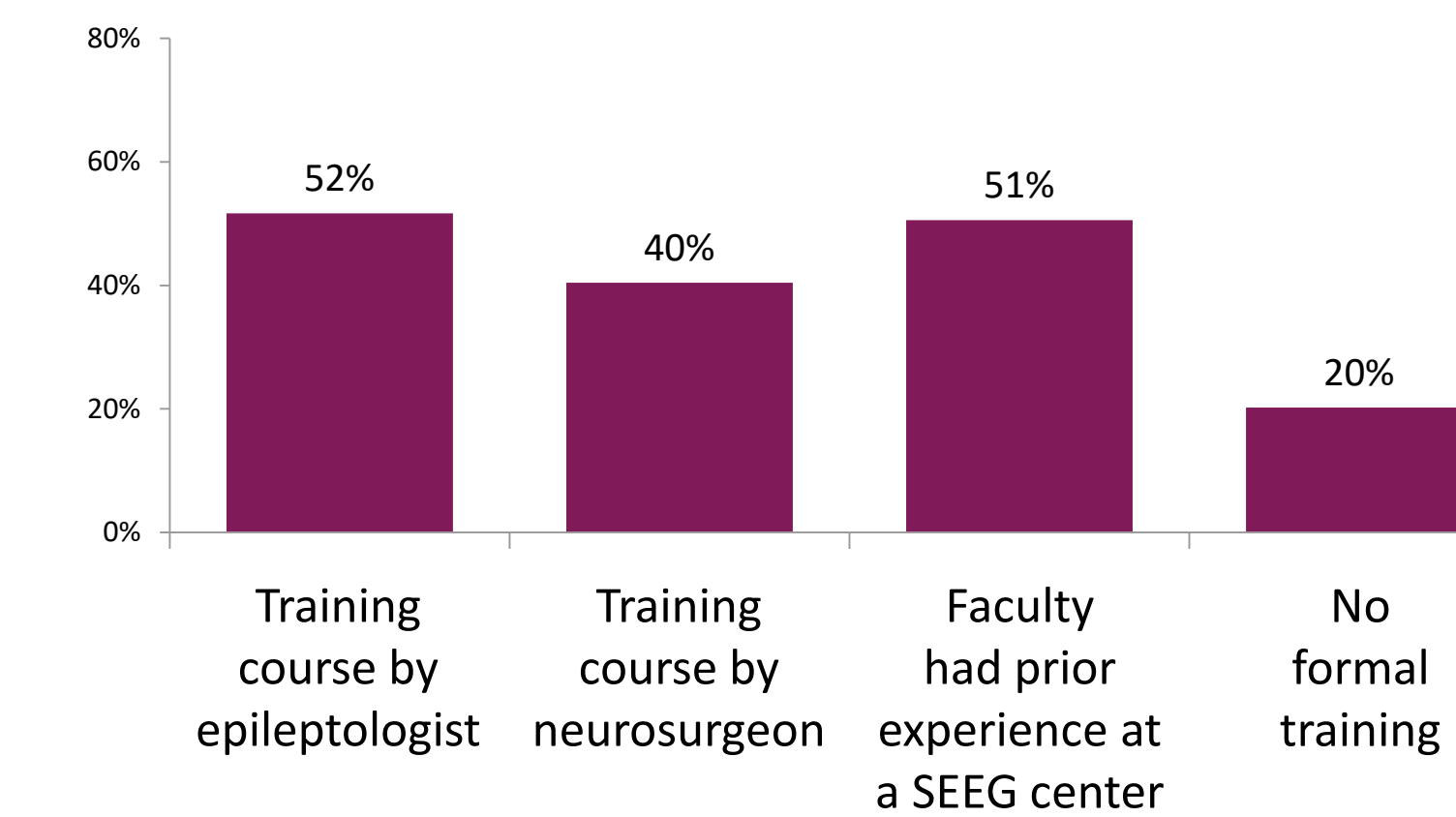
SEEG Cases Over the Last 12 Months



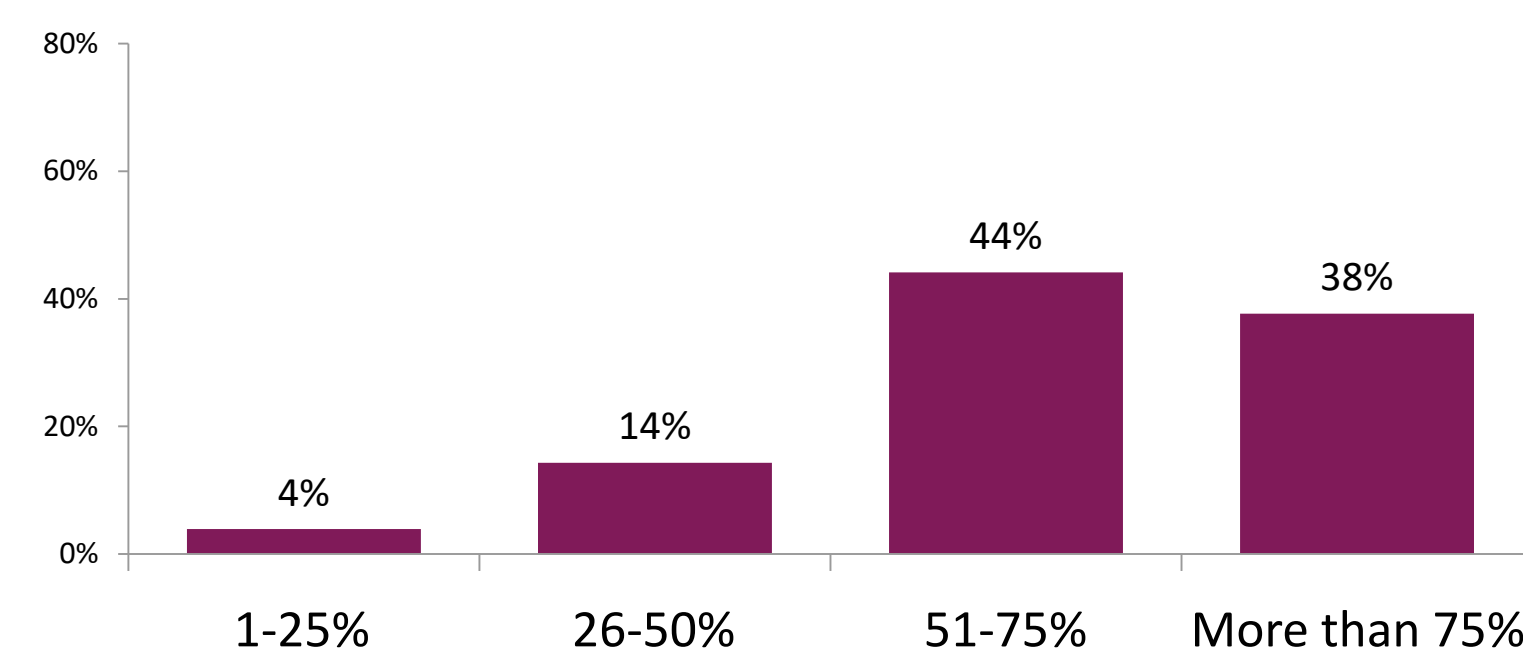
What Fraction of Intracranial Electrode Cases are SEEG Versus Subdural?



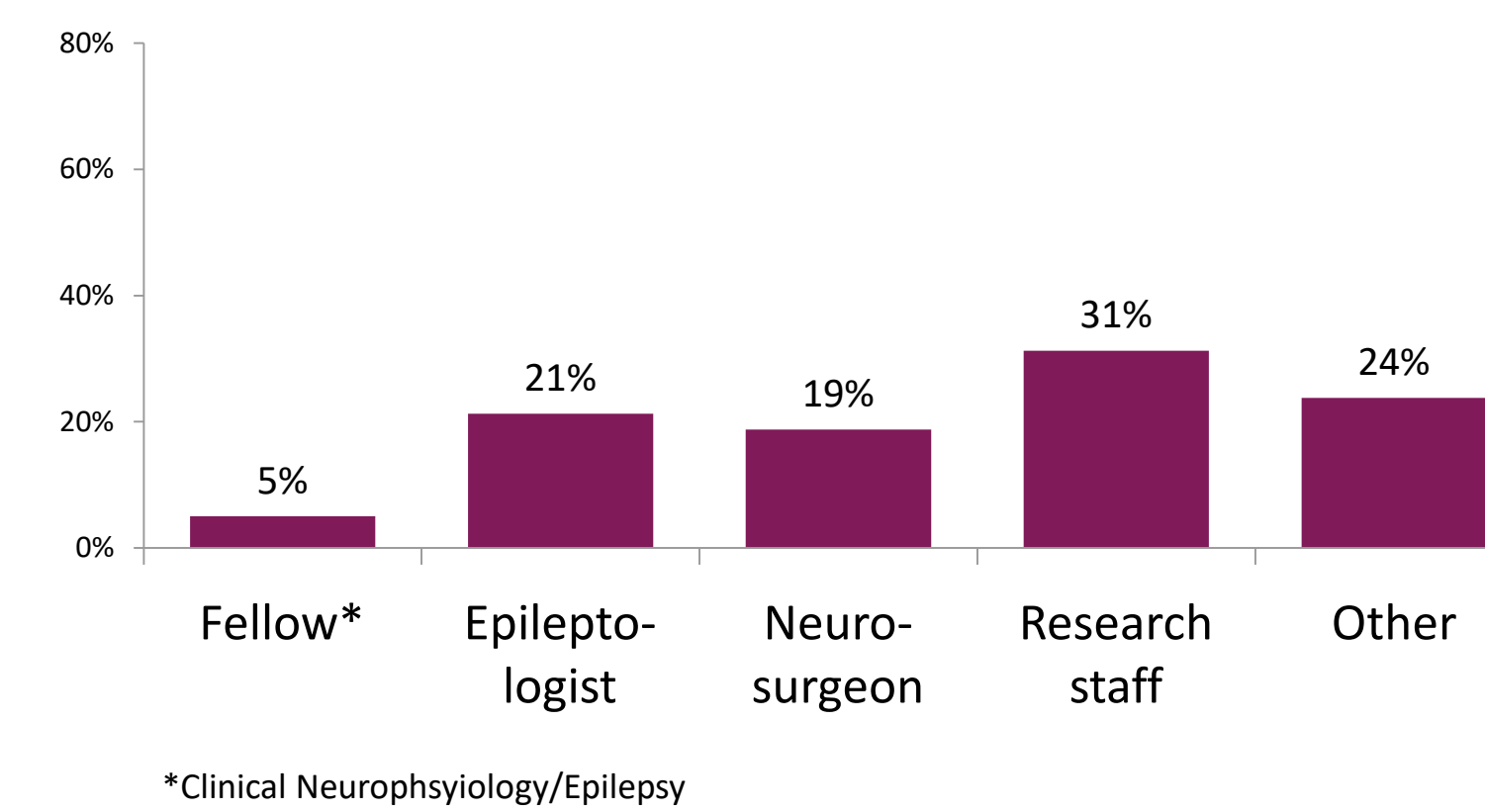
Training Prior to Development of SEEG Program



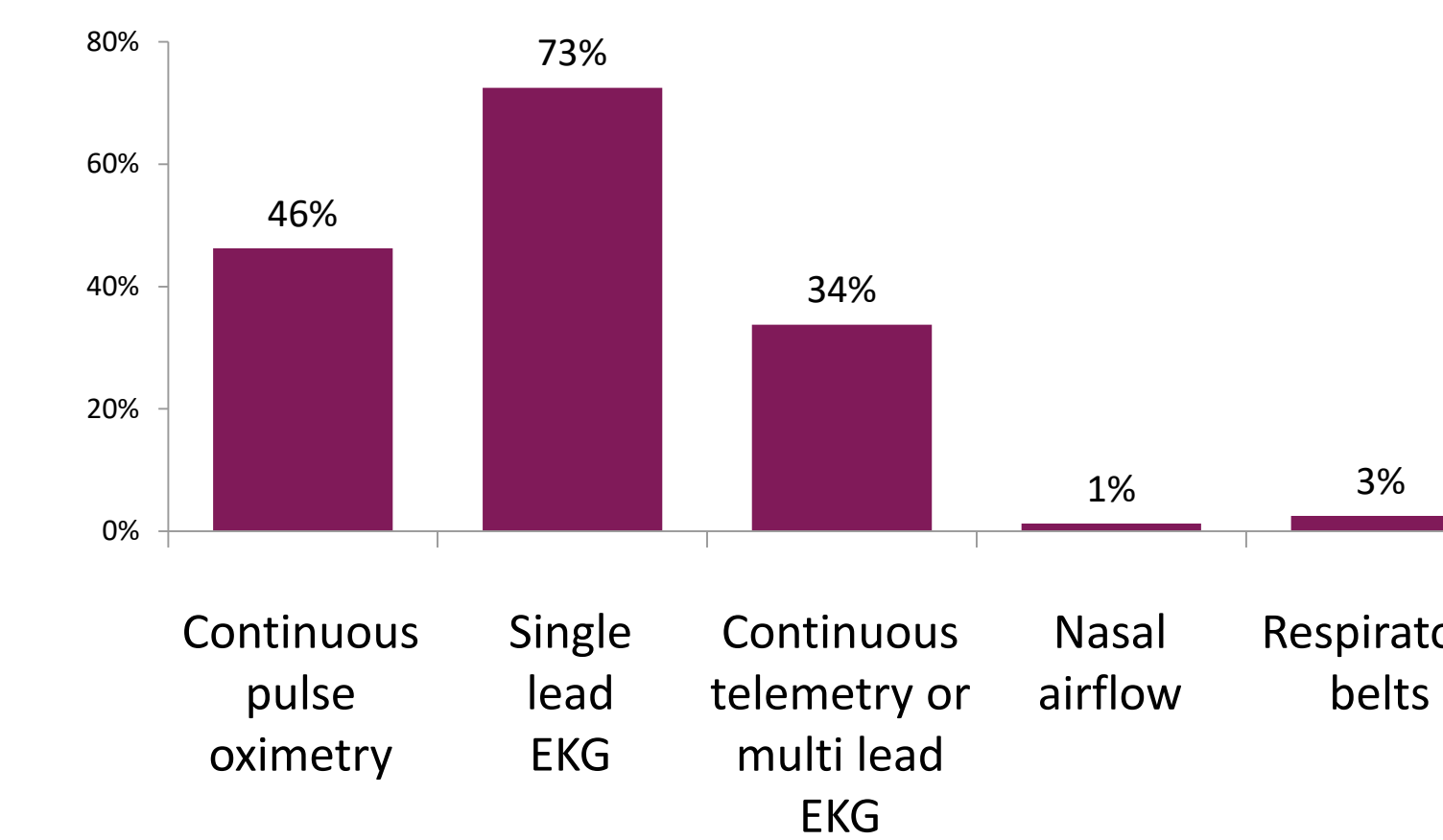
What is the Percentage of Patients Who Ultimately had a Resection or Ablation After Their SEEG Implantation?



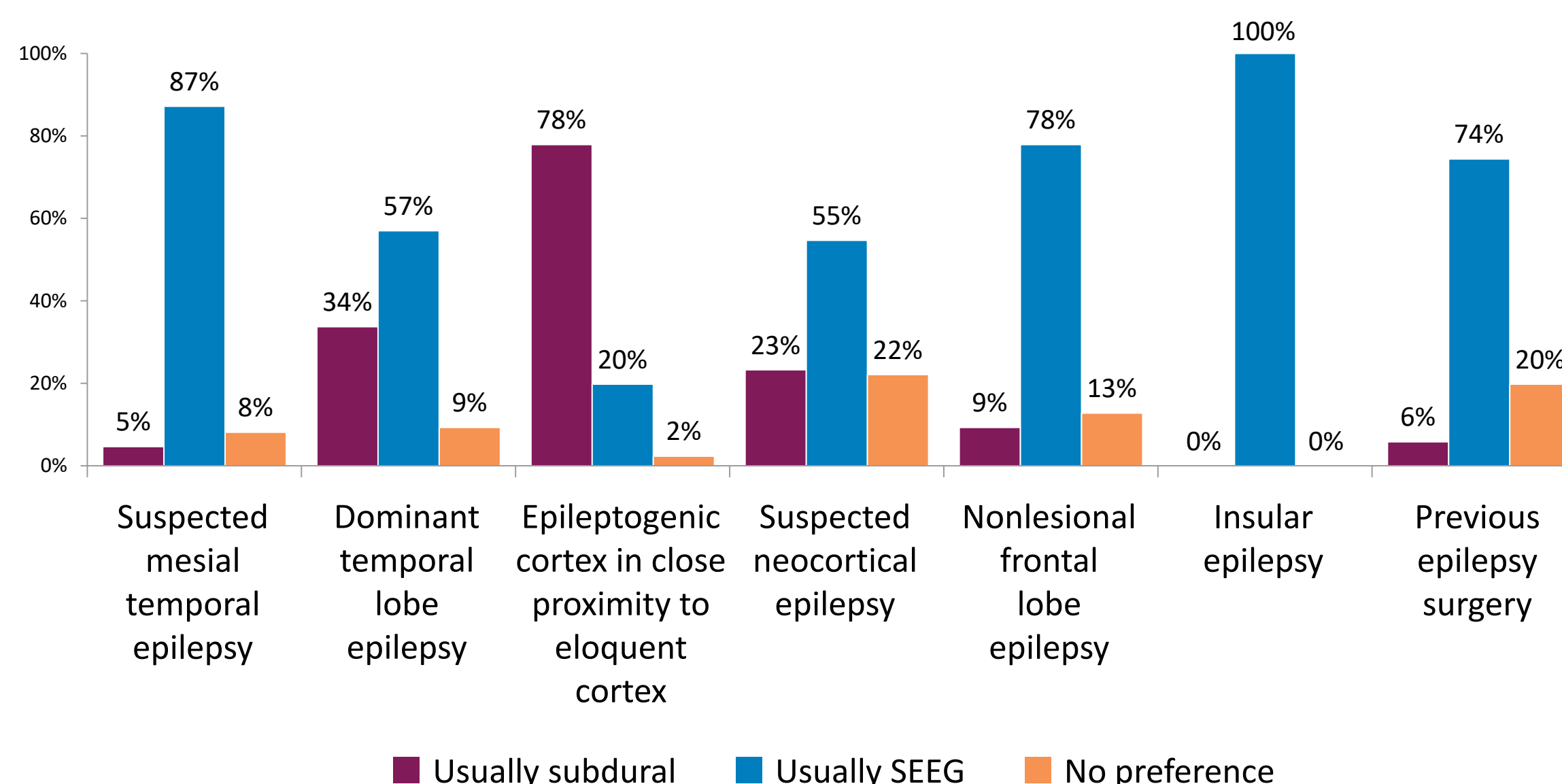
Who is Responsible for Image Coregistration?



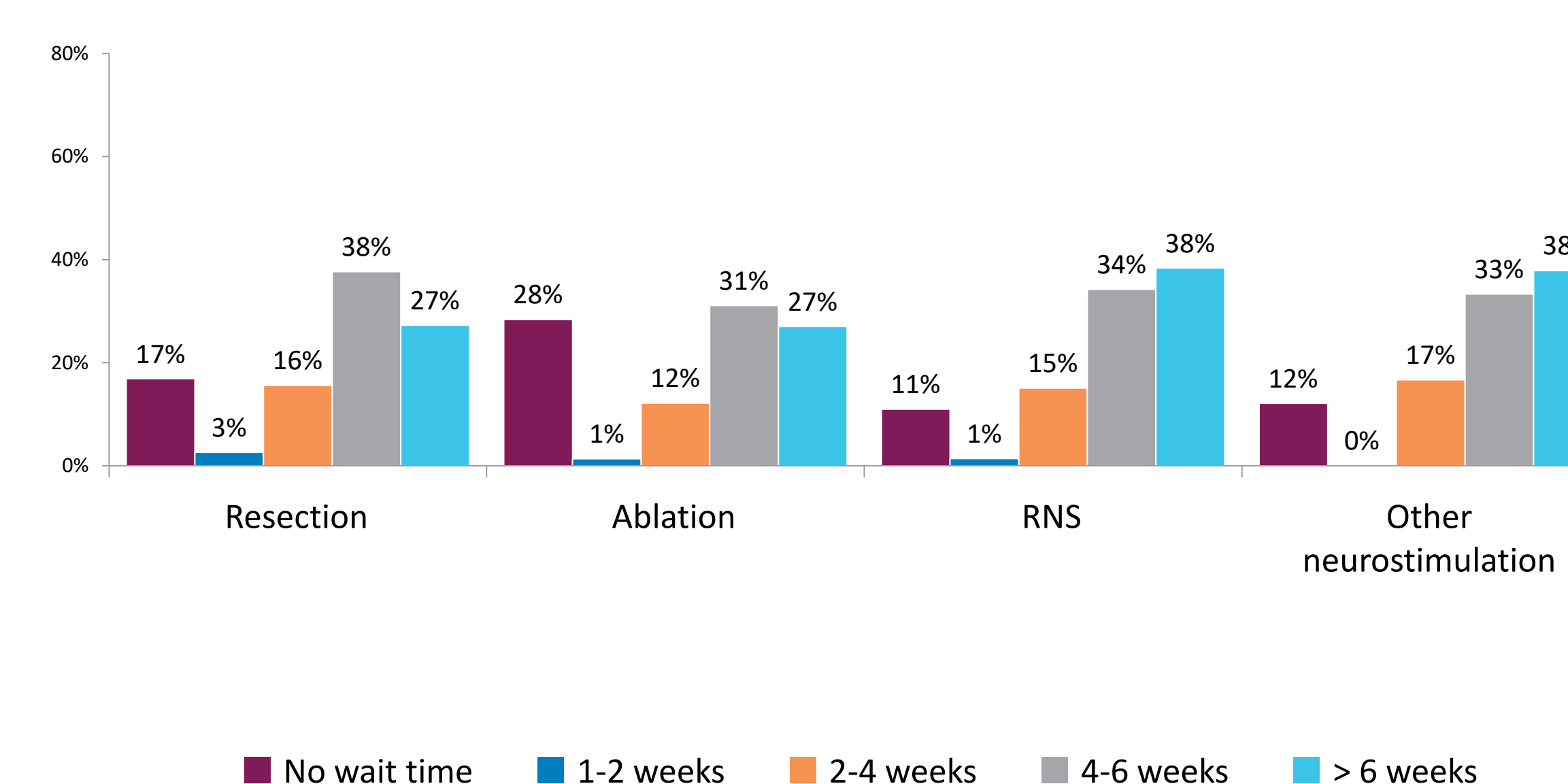
Utilization of Cardiopulmonary Monitoring



Choice of SEEG Versus Subdural Phase II Evaluation



Average Wait Time After SEEG for Interventions



RESULTS

SEEG Utilization

- The majority of respondents (76%) felt that age of the patient did not impact their decision of phase II implantation method (subdural vs SEEG).

Technical Recording Parameters

- Most centers are currently implanting SEEG electrodes via a robot (75%).
- Most centers report an average of 11-15 SEEG electrodes per implantation case (53%).
- About half of centers utilize electrocorticography at the time to SEEG electrode implantation (53%), typically utilized to assure good EEG signal quality (76%).
- Reference electrodes vary among institutions with 21% utilizing scalp EEG electrodes, 24% placing additional intracranial electrodes as a reference and 43% utilizing selected contacts from one of the SEEG electrodes.
- Few centers consistently place concurrent scalp EEG electrodes (25%).

SEEG Interpretation

- Few institutions have SEEG monitoring performed by a group of dedicated SEEG faculty (17%).
- While most centers report a standard SEEG nomenclature at their institution (59%), there is variability among centers on the specifics of the nomenclature.
- Most centers utilize cortical stimulation for SEEG cases, both to identify eloquent cortex (84%) and to provoke habitual seizures (73%).
- There was variable use of cortico-cortico evoked potentials (15%), high frequency oscillations (HFO) (57%), ictal baseline shifts (43%) and automated spike, seizure or HFO detectors (38%).

SEEG Perception

- Most respondents felt that the perceived benefits of SEEG are patient comfort (97%), ability to perform bilateral exploration (92%), testing multiple hypothesis (79%) and ability to perform repeat epilepsy surgery evaluations (77%).
- Disadvantages of the use of SEEG compared to SDE were significantly increased workload and challenging data interpretation issues.

CONCLUSIONS

- SEEG has been rapidly adopted in the USA and is now the principal invasive EEG modality in many centers.
- While substantial similarities exist in the overall practice of SEEG, this survey finds significant differences between centers in implant planning protocol, electrode nomenclature, technical aspects of SEEG, the use of advanced signal processing techniques and concurrent cardiopulmonary monitoring.

REFERENCES

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- Lhatoo S, Lacuey N, Ryvlin P. Principles of stereotactic electroencephalography in epilepsy surgery. *J Clin Neurophysiol.* 2016;33(6):478-82.
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Contact Information:
Jay Gavvala, MD, MSCI
7200 Cambridge 9A
Houston, TX 77030
Jay.Gavvala@bcm.edu