American Association of Neuropathologists

AOE Analysis of AANP's Fall 2024 Membership Survey

A survey was sent to the membership base of the American Association of Neuropathologists (AANP) in the fall of 2024. This survey is used for planning of future annual meeting topics by providing a better understanding of current neuropathology practice characteristics. A total of 116 members provided responses to the 28 clinical assertion statement questions within the survey and the summary of these results is described below.

The survey asked individuals to provide responses to demographic questions, shown in figures 1-3, to help further contextualize the results.

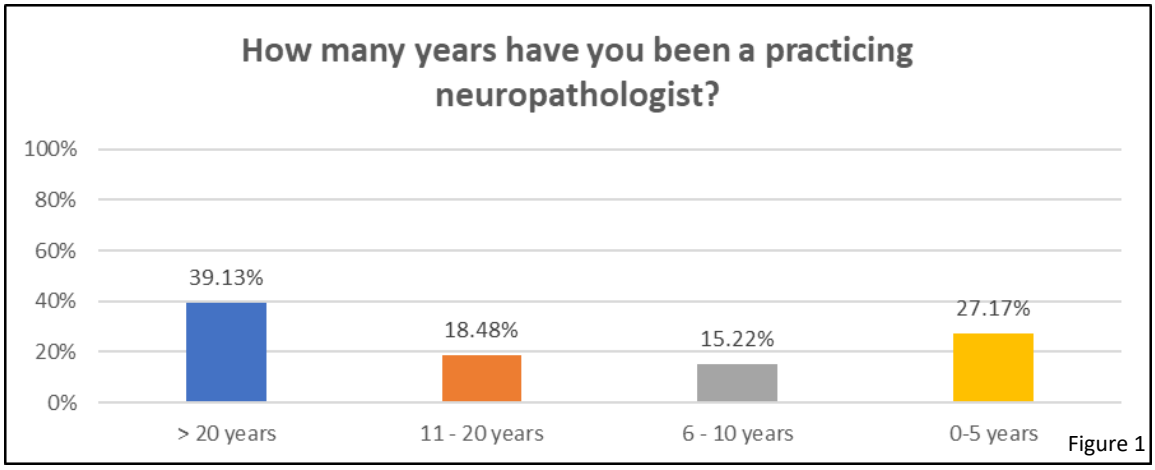


Figure 1

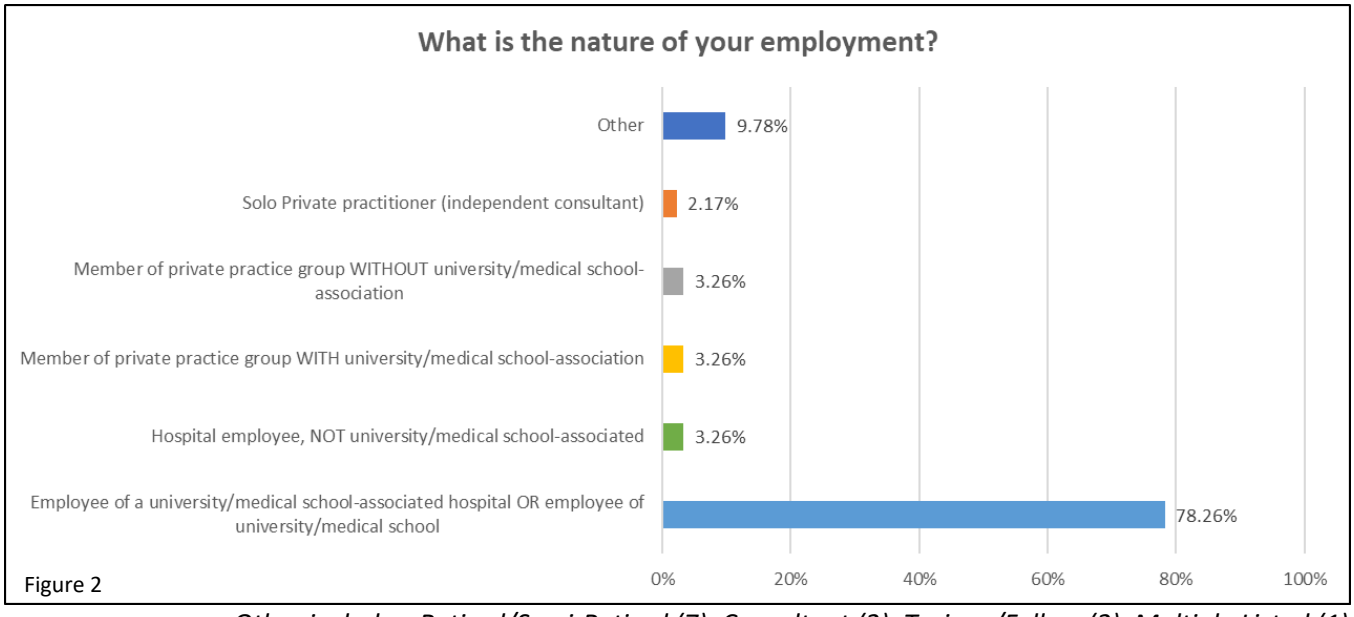


Figure 2

Other includes: Retired/Semi-Retired (7), Consultant (2), Trainee/Fellow (2), Multiple Listed (1)

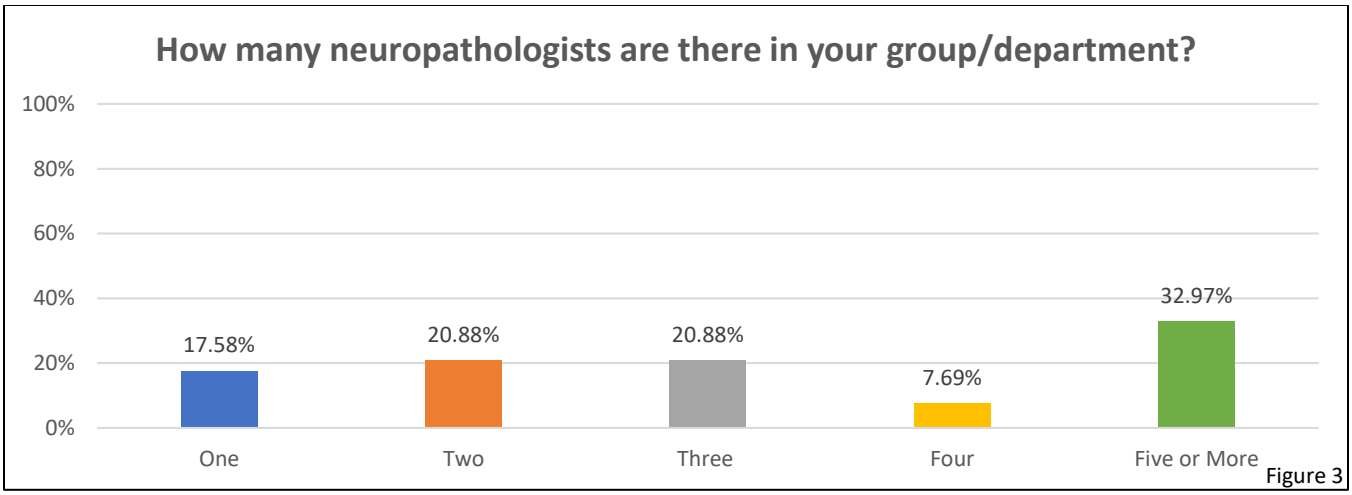


Figure 3

Clinical Assertion Statements

The survey asked members to rate 28 different clinical assertion statements using a 5-point Likert-type scale from 1=Disagree Completely to 5=Agree Completely, with a neutral option of 3=Neither Disagree nor Agree. These questions were developed to determine a member's level of knowledge regarding 7 separate topics in neuropathology. Data is presented as mean +/- percent unknown. Percent unknown indicates the number of responses in the incorrect/neutral position of total responses. For consistency, throughout this summary, a mean was considered close to the neutral position if it fell between 2.75 to 3.25. Further, if more than 50 percent of respondents answered at the neutral/incorrect position, narrative indicates that additional education may be appropriate.

Complications of Amyloid Therapy

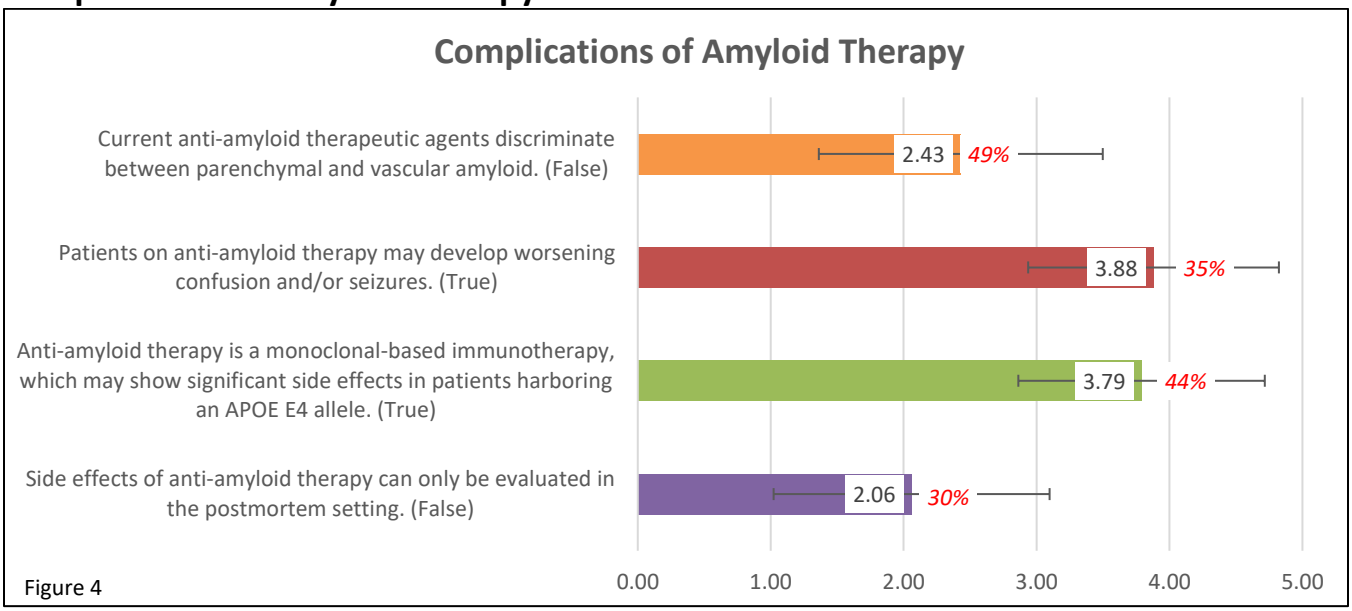


Figure 4

Figure 4 provides the results for the four questions evaluating knowledge in the area of **complications of amyloid therapy**. Statements one and four are false, while statements two and three are true. All four statements had mean scores in the desired direction. In sum, based on the clinical assertion statements, this is not a key area of educational need at this time. However, other data sources may reveal different information.

Diagnosis of LATE (limbic-predominant age-related TDP-43 encephalopathy)

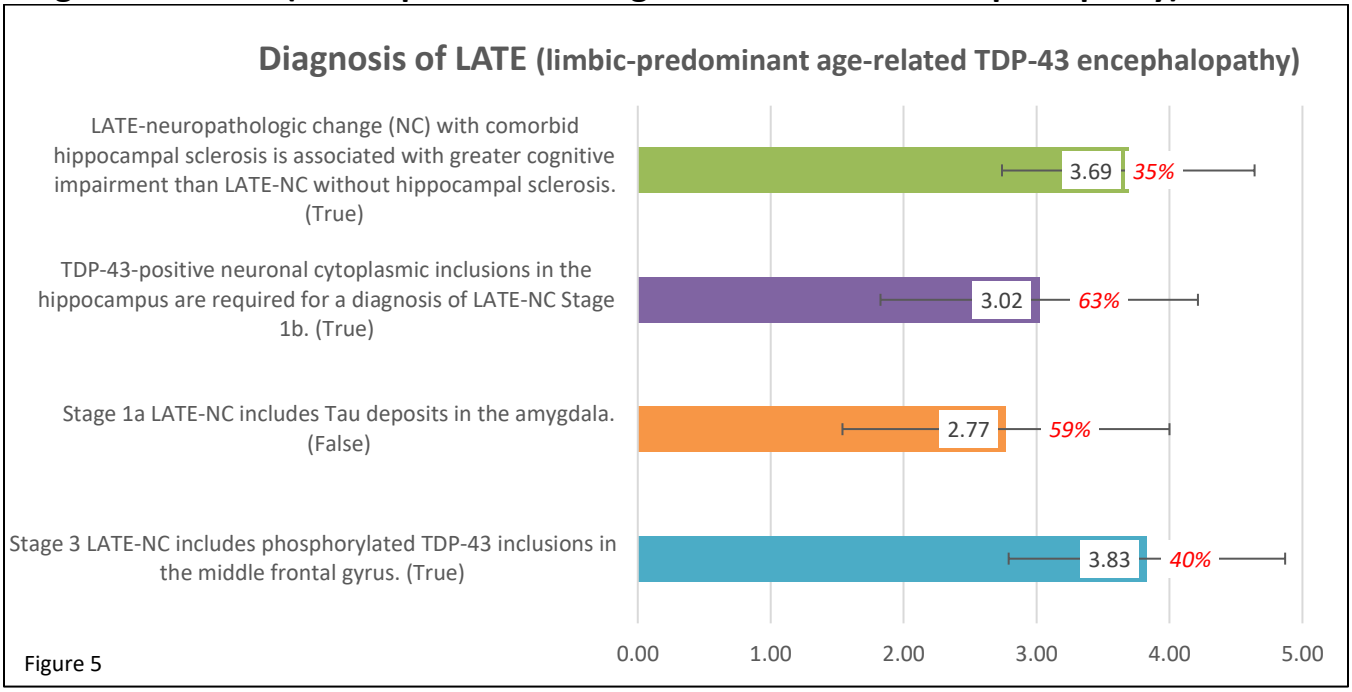


Figure 5

Figure 5 provides the results for the four questions evaluating knowledge in the area of **diagnosis of LATE (limbic-predominant age-related TDP-43 encephalopathy).** Statements one, two, and four are true while statement three is false. Statements one and four had a mean score on the correct side. Statements two and three had a mean close to the neutral position, with 63% and 59% of responses, respectively, in the incorrect or neutral position indicating education is likely appropriate related to these statements. In sum, areas of appropriate additional education include:

- TDP-43-positive neuronal cytoplasmic inclusions in the hippocampus are required for a diagnosis of LATE-NC Stage 1b.
- Stage 1a LATE-NC includes Tau deposits in the amygdala.

Artificial Intelligence (AI)

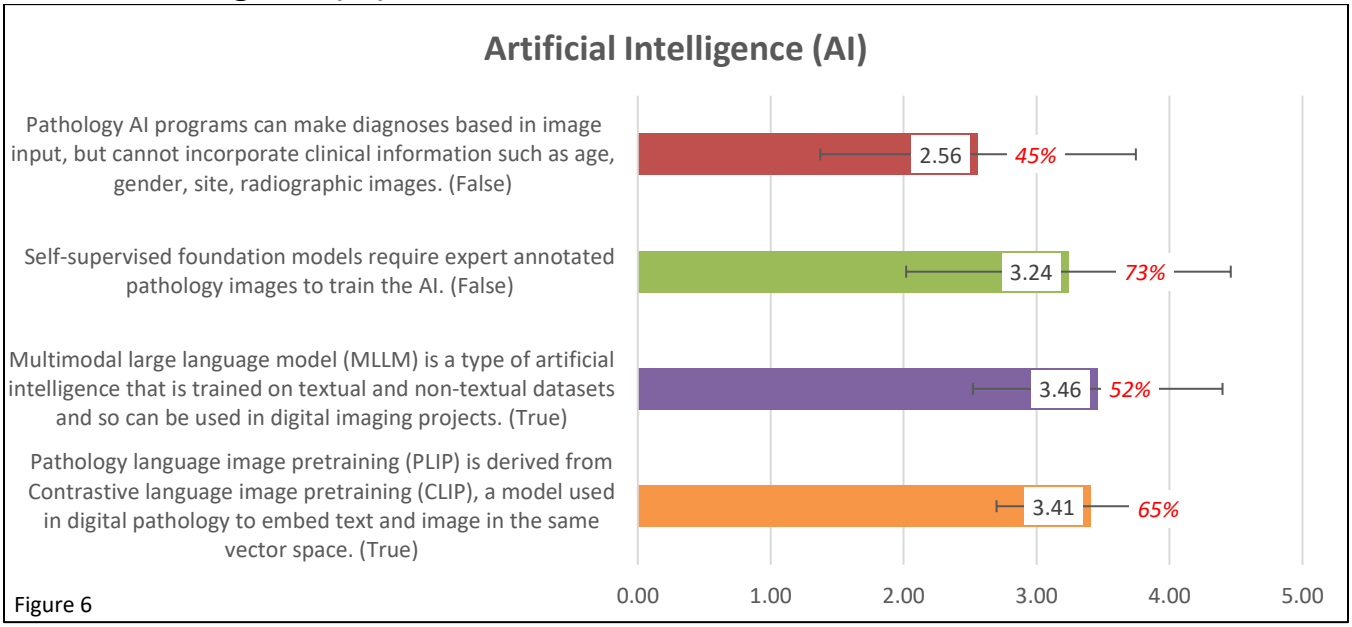


Figure 6

Figure 6 provides the results for the four questions evaluating knowledge regarding **artificial intelligence (AI).** Statements one and two are false while statements three and four are true. Statements two had a mean close to the neutral position with 74% of responses in the incorrect or neutral position indicating education is likely appropriate related to this statement. Statements one, three and four had mean scores in the desired direction. However, statements three and four had over 50% of responses in the incorrect or neutral position, 52% and 65%, respectively, indicating these are also potential areas of educational need. In sum, areas of appropriate additional education include:

- Self-supervised foundation models require expert annotated pathology images to train the AI.
- Multimodal large language model (MLLM) is a type of artificial intelligence that is trained on textual and non-textual datasets and so can be used in digital imaging projects.
- Pathology language image pretraining (PLIP) is derived from Contrastive language image pretraining (CLIP), a model used in digital pathology to embed text and image in the same vector space.

Eye Pathology

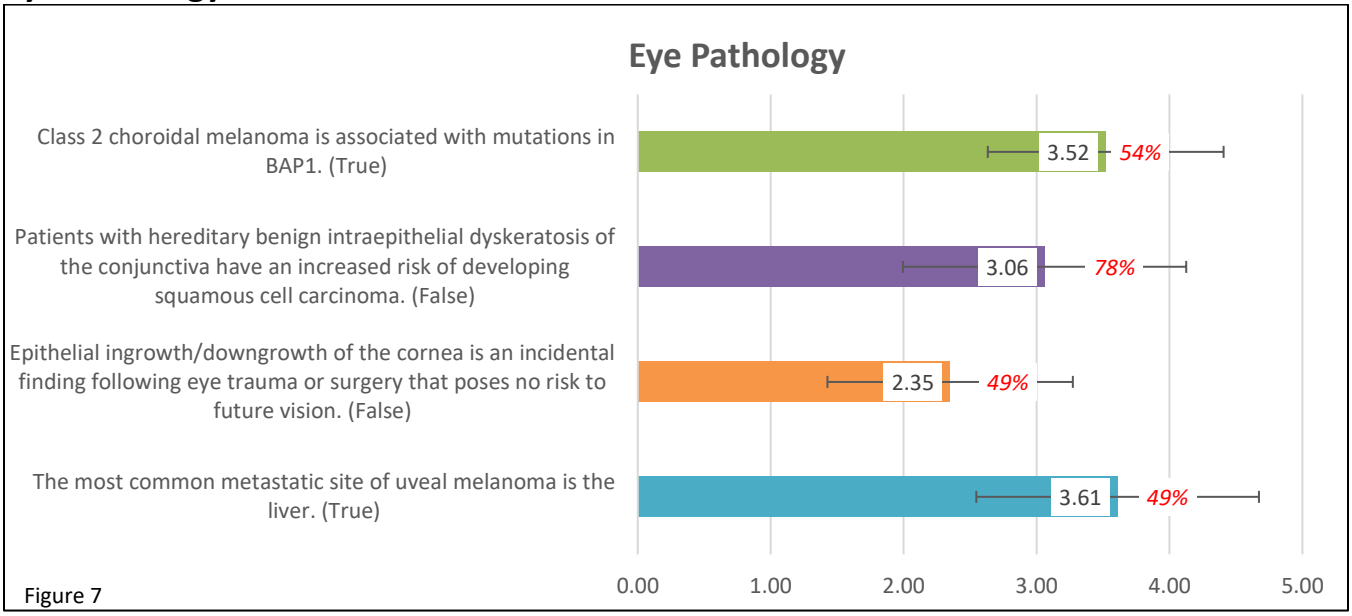


Figure 7

Figure 7 provides the results for the four questions evaluating knowledge in the area of **eye pathology**. Statements one and four are true while statements two and three are false. Statements one, three, and four had mean scores in the desired direction. Statement two had a mean score close to the neutral position with 78% of responses in the incorrect or in the neutral position indicating education is appropriate related to this statement. Additionally, statement one had 54% of responses in the incorrect or neutral position indicating this is also a potential area of educational need. In sum, areas of appropriate additional education include:

- Class 2 choroidal melanoma is associated with mutations in BAP1.
- Patients with hereditary benign intraepithelial dyskeratosis of the conjunctiva have an increased risk of developing squamous cell carcinoma.

Vascular Neuropathology

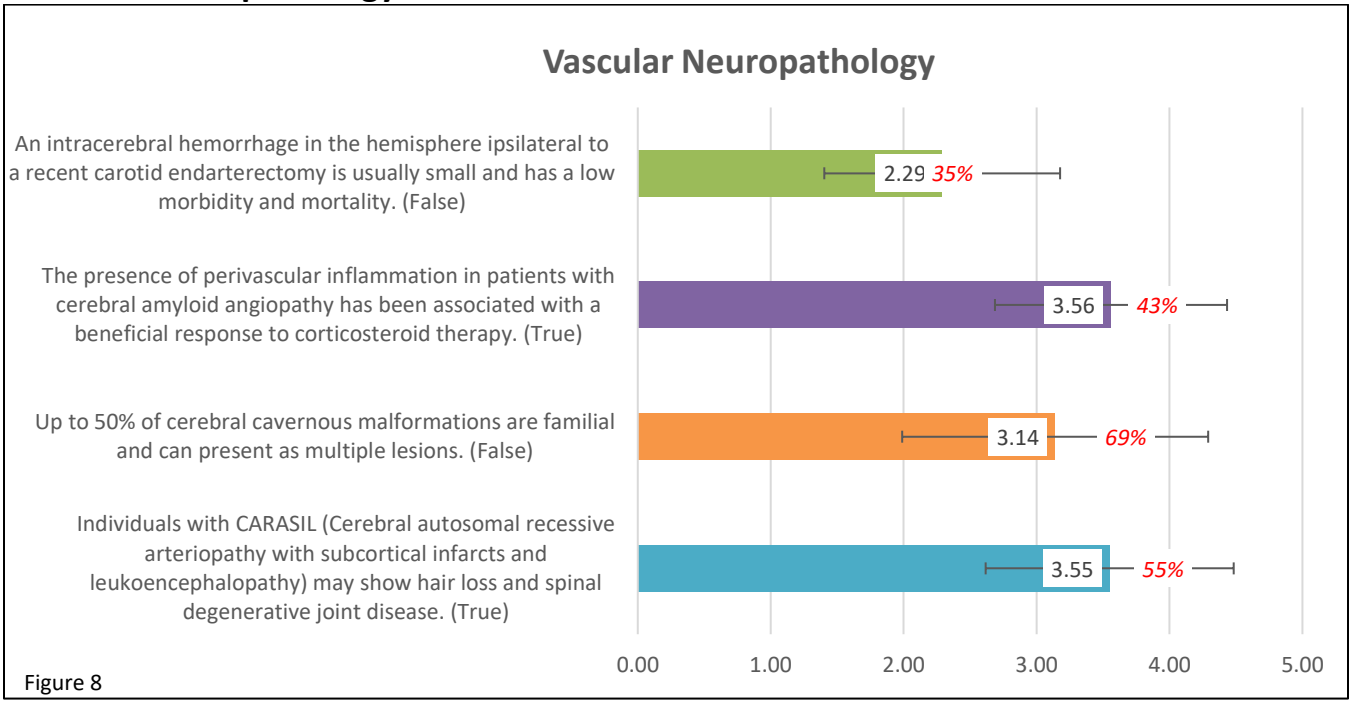


Figure 8

Figure 8 provides the results for the four questions evaluating knowledge in the area of **vascular neuropathology**. Statements one and three are false while statements two and four are true. Members selected responses in the desired direction for statements one, two and four. Statement three had a mean score close to the neutral position with 69% of responses in the incorrect or in the neutral position indicating education is appropriate related to this statement. Additionally, statement four had 55% of responses in the incorrect or neutral position indicating this is also a potential area of educational need. In sum, areas of appropriate additional education include:

- Up to 50% of cerebral cavernous malformations are familial and can present as multiple lesions.
- Individuals with CARASIL (Cerebral autosomal recessive arteriopathy with subcortical infarcts and leukoencephalopathy) may show hair loss and spinal degenerative joint disease.

Competency-based Medical Education

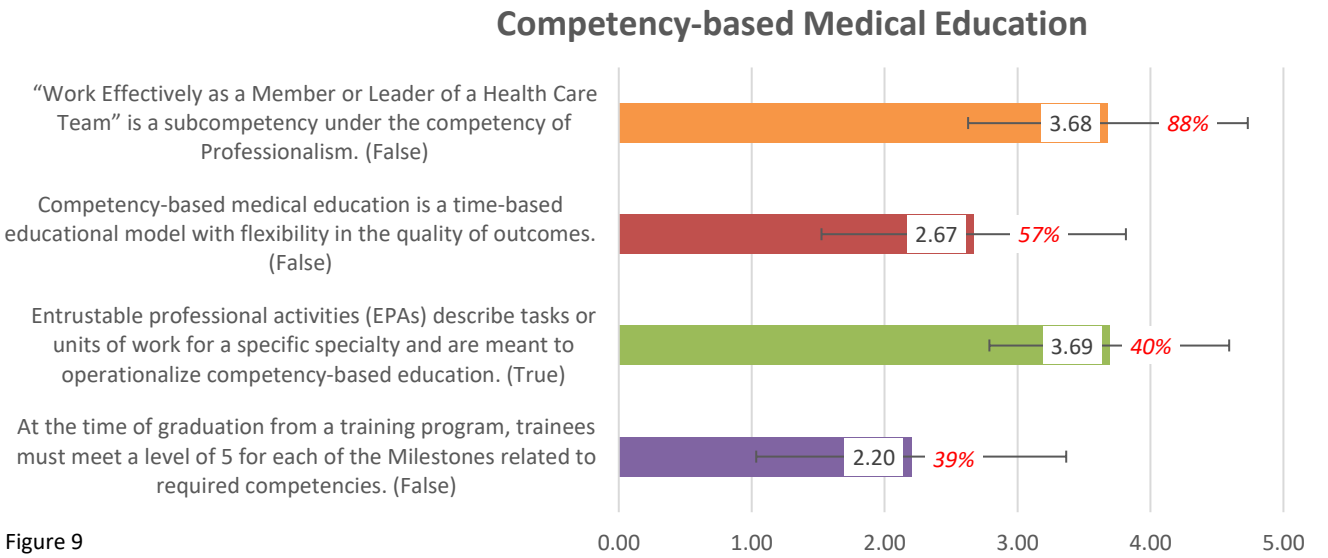


Figure 9

Figure 9 provides the results for the four questions evaluating knowledge in the area of **competency-based medical education**. Statements one, two, and four are false and statement three is true. Statements two, three, and four had a mean in the desired direction. Statements one had a mean on the incorrect side, indicating that education may be appropriate. Additionally, statement two had 57% of responses in the incorrect or neutral position indicating this is also a potential area of educational need. In sum, an area of appropriate additional education include:

- "Work Effectively as a Member or Leader of a Health Care Team" is a sub-competency under the competency of Professionalism.
- Competency-based medical education is a time-based educational model with flexibility in the quality of outcomes.

Methylation-defined Diagnostic Entities in CNS Tumors

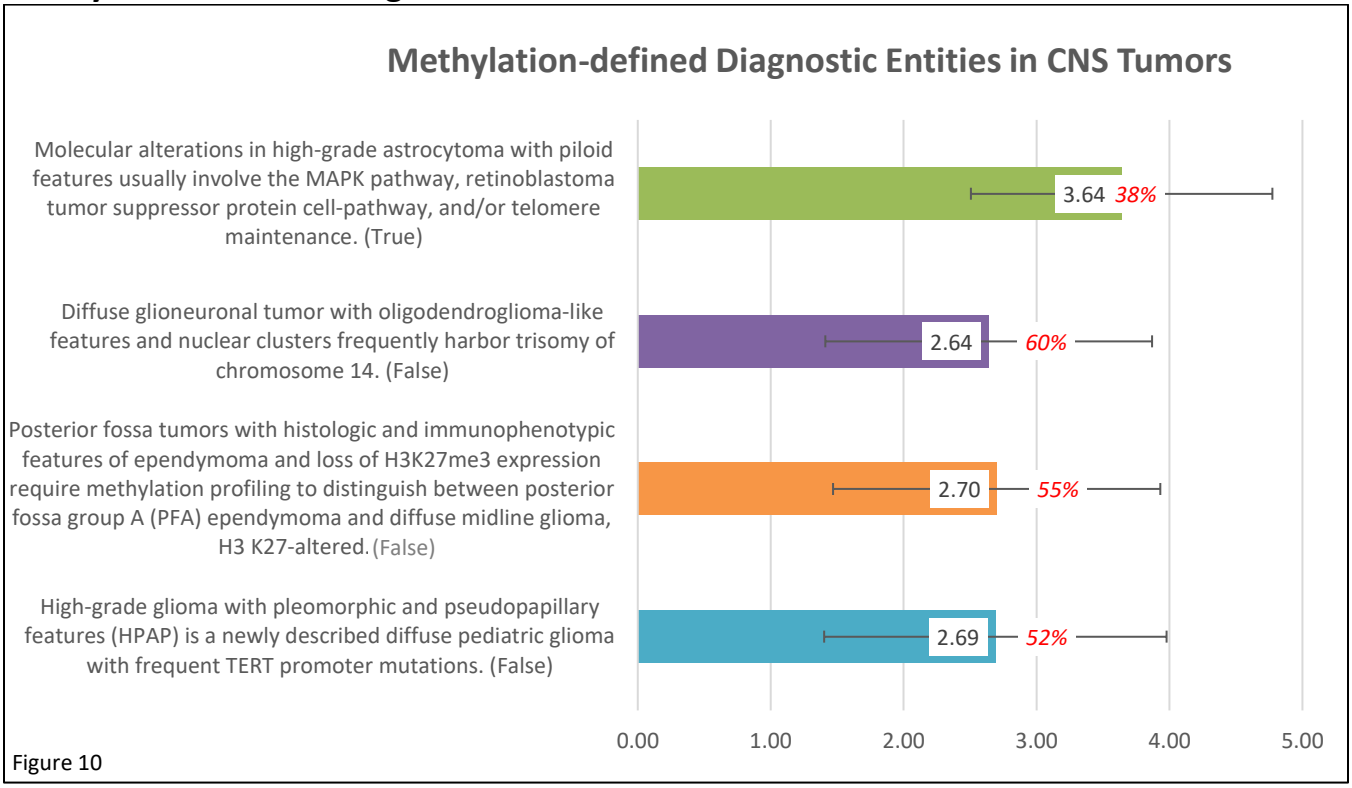


Figure 10

Figure 10 provides the results for the four questions evaluating knowledge in the areas of **methylation-defined diagnostic entities in CNS tumors**. Statements two, three and four are false, while statement one is true. All four statements had a mean score in the desired direction. However, for statements two, three, and four, though the mean did not fall within the range of 2.75 – 3.25, 60%, 55%, and 52% of respondents, respectively, answered in the incorrect or neutral position, indicating additional education may be appropriate. In sum, areas of appropriate additional education include:

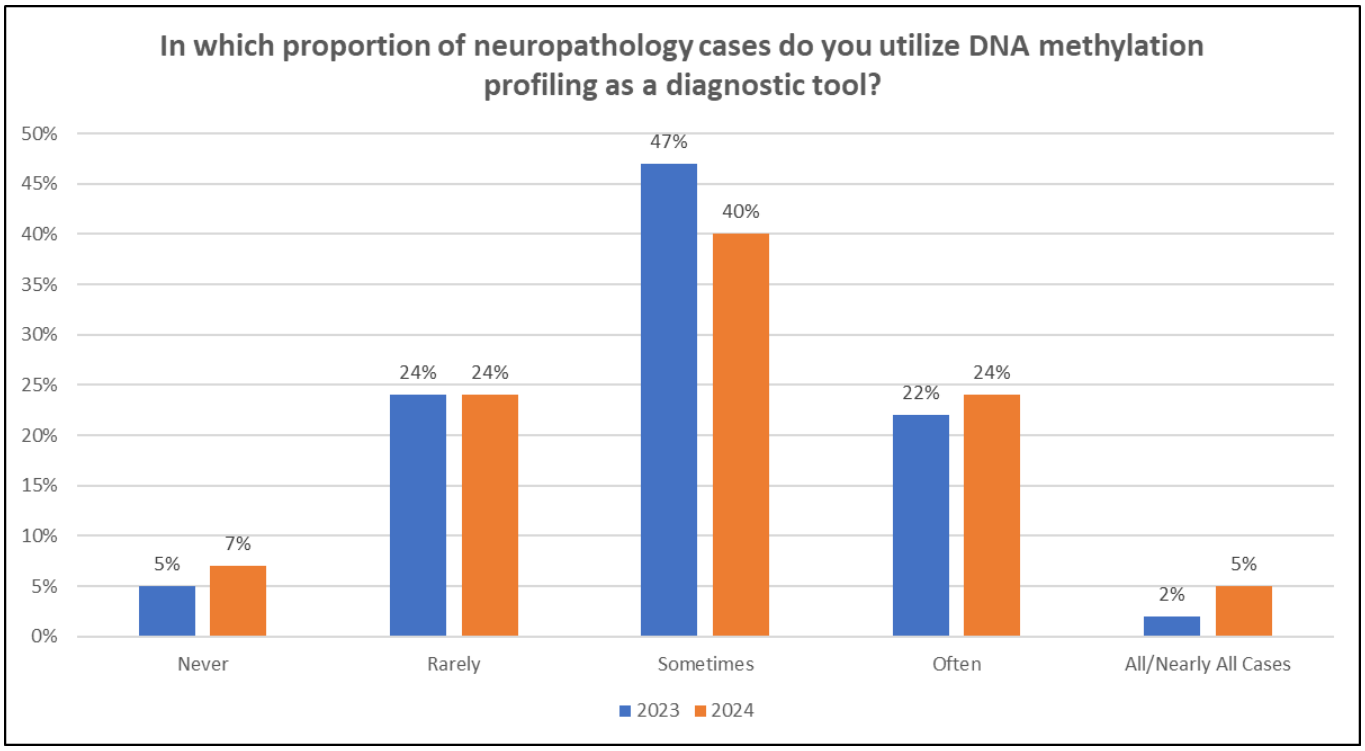
- Diffuse glioneuronal tumor with oligodendroglioma-like features and nuclear clusters frequently harbor trisomy of chromosome 14.
- Posterior fossa tumors with histologic and immunophenotypic features of ependymoma and loss of H3K27me3 expression require methylation profiling to distinguish between posterior fossa group A (PFA) ependymoma and diffuse midline glioma, H3 K27-altered.
- High-grade glioma with pleomorphic and pseudopapillary features (HPAP) is a newly described diffuse pediatric glioma with frequent TERT promoter mutations.

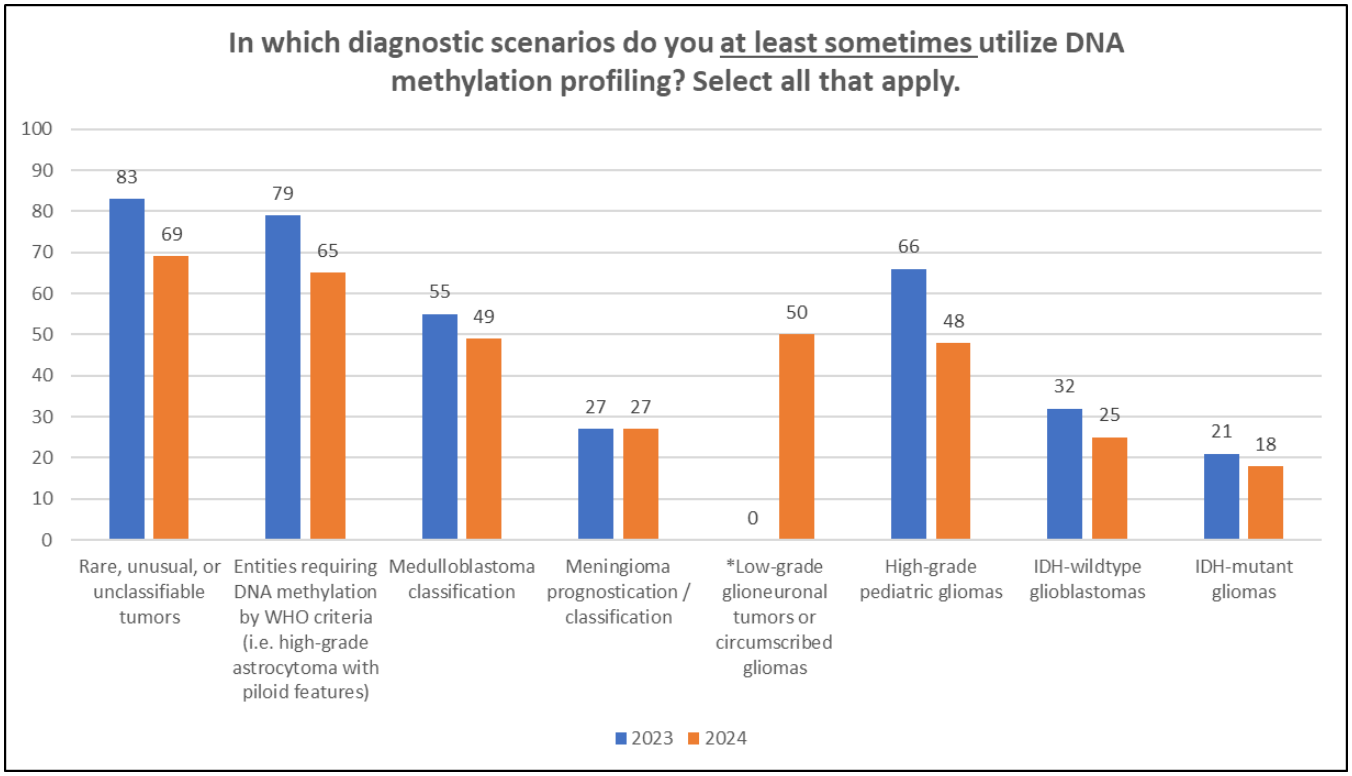
Conclusion:
Based on the analysis of the 2024 Annual Membership Survey, there were some statements where responses were close to neutral, and many respondents answered in the neutral position which indicates areas where there may be need for additional education. Further, several scores were on the opposite/wrong side of the scale. Both situations indicate that the following are areas of need for additional education:

- **Diagnosis of LATE (limbic-predominant age-related TDP-43 encephalopathy)**
  - TDP-43-positive neuronal cytoplasmic inclusions in the hippocampus are required for a diagnosis of LATE-NC Stage 1b. (True)
  - Stage 1a LATE-NC includes Tau deposits in the amygdala. (False)
- **Artificial Intelligence (AI)**
  - Self-supervised foundation models require expert annotated pathology images to train the AI. (False)
  - Multimodal large language model (MLLM) is a type of artificial intelligence that is trained on textual and non-textual datasets and so can be used in digital imaging projects. (True)
  - Pathology language image pretraining (PLIP) is derived from Contrastive language image pretraining (CLIP), a model used in digital pathology to embed text and image in the same vector space. (True)
- **Eye Pathology**
  - Class 2 choroidal melanoma is associated with mutations in BAP1. (True)
  - Patients with hereditary benign intraepithelial dyskeratosis of the conjunctiva have an increased risk of developing squamous cell carcinoma. (False)
- **Vascular Neuropathology**
  - Up to 50% of cerebral cavernous malformations are familial and can present as multiple lesions. (False)
  - Individuals with CARASIL (Cerebral autosomal recessive arteriopathy with subcortical infarcts and leukoencephalopathy) may show hair loss and spinal degenerative joint disease. (True)
- **Competency-based Medical Education**
  - "Work Effectively as a Member or Leader of a Health Care Team" is a sub-competency under the competency of Professionalism. (False)
  - Competency-based medical education is a time-based educational model with flexibility in the quality of outcomes. (False)
- **Methylation-defined Diagnostic Entities in CNS Tumors**
  - Diffuse glioneuronal tumor with oligodendroglioma-like features and nuclear clusters frequently harbor trisomy of chromosome 14. (False)
  - Posterior fossa tumors with histologic and immunophenotypic features of ependymoma and loss of H3K27me3 expression require methylation profiling to distinguish between posterior fossa group A (PFA) ependymoma and diffuse midline glioma, H3 K27-altered. (False)
  - High-grade glioma with pleomorphic and pseudopapillary features (HPAP) is a newly described diffuse pediatric glioma with frequent TERT promoter mutations. (False)

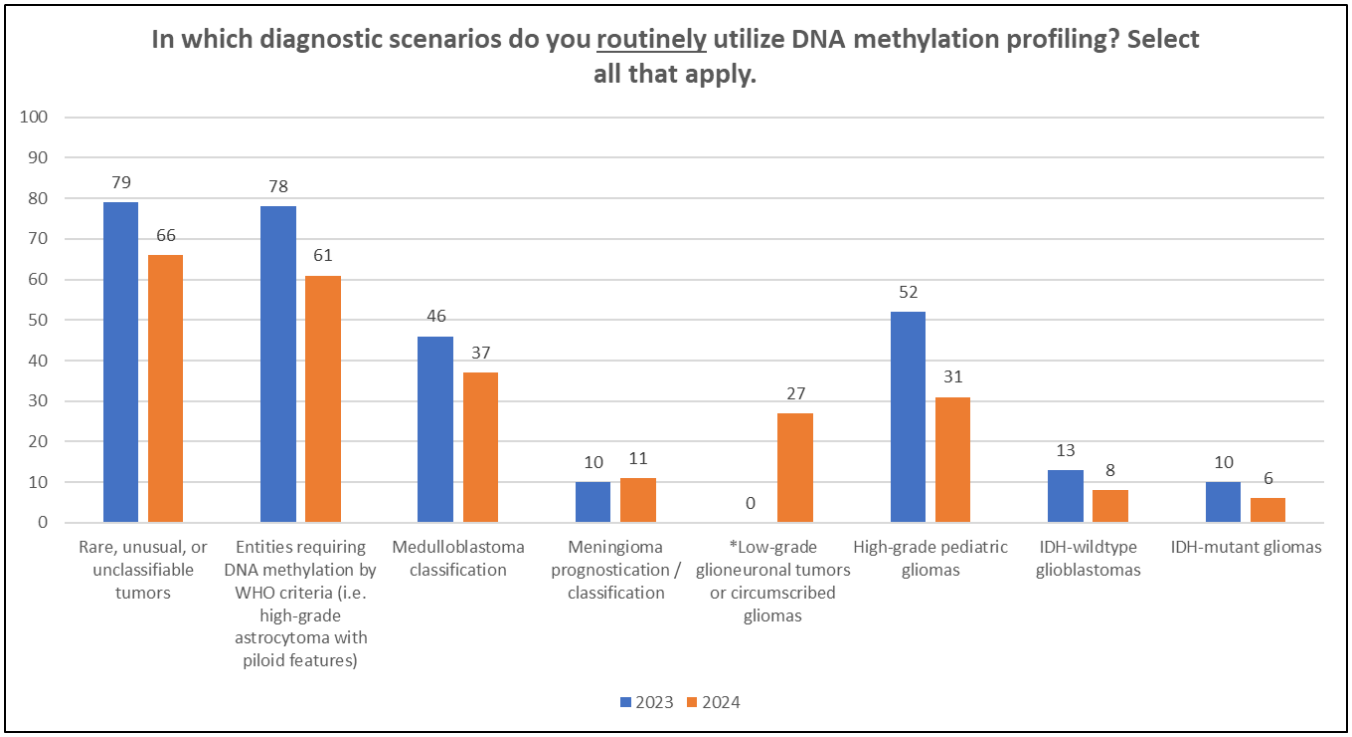
Additional Survey Questions

The following data regarding utilization of DNA methylation were included by the AANP Education Committee to garner data on this topic. The data below compares data collected in 2023 versus data collected in 2024.

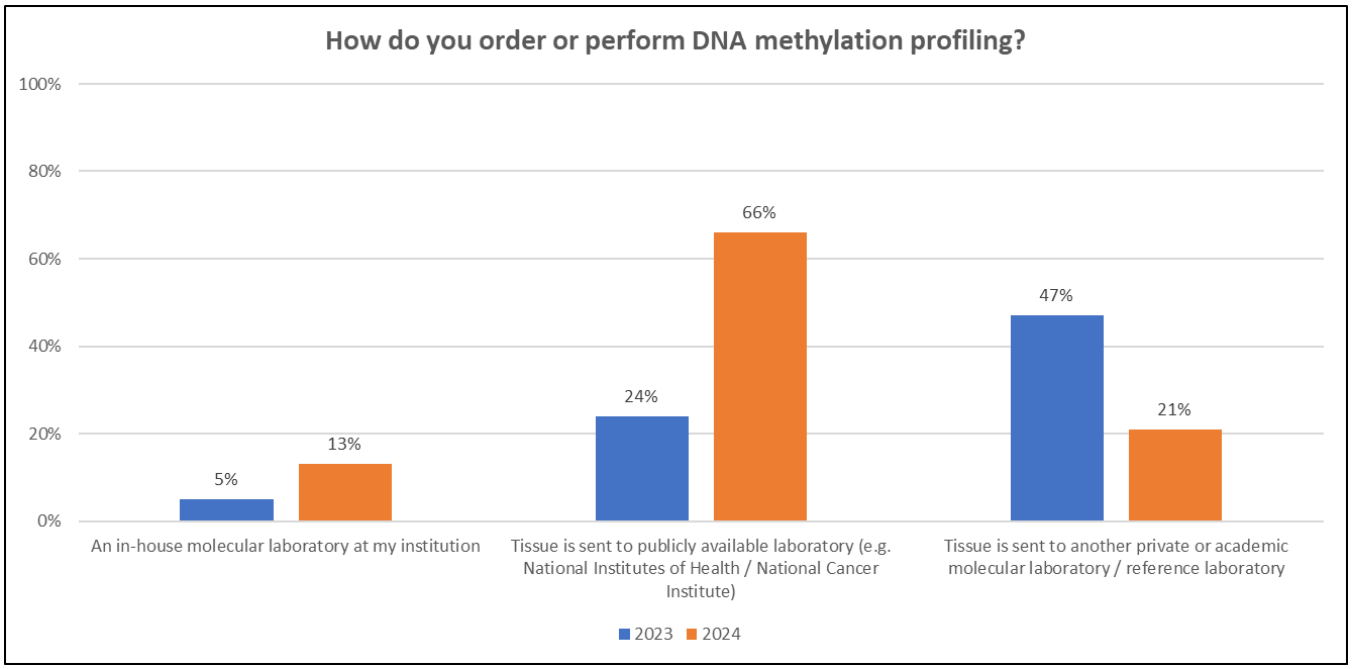


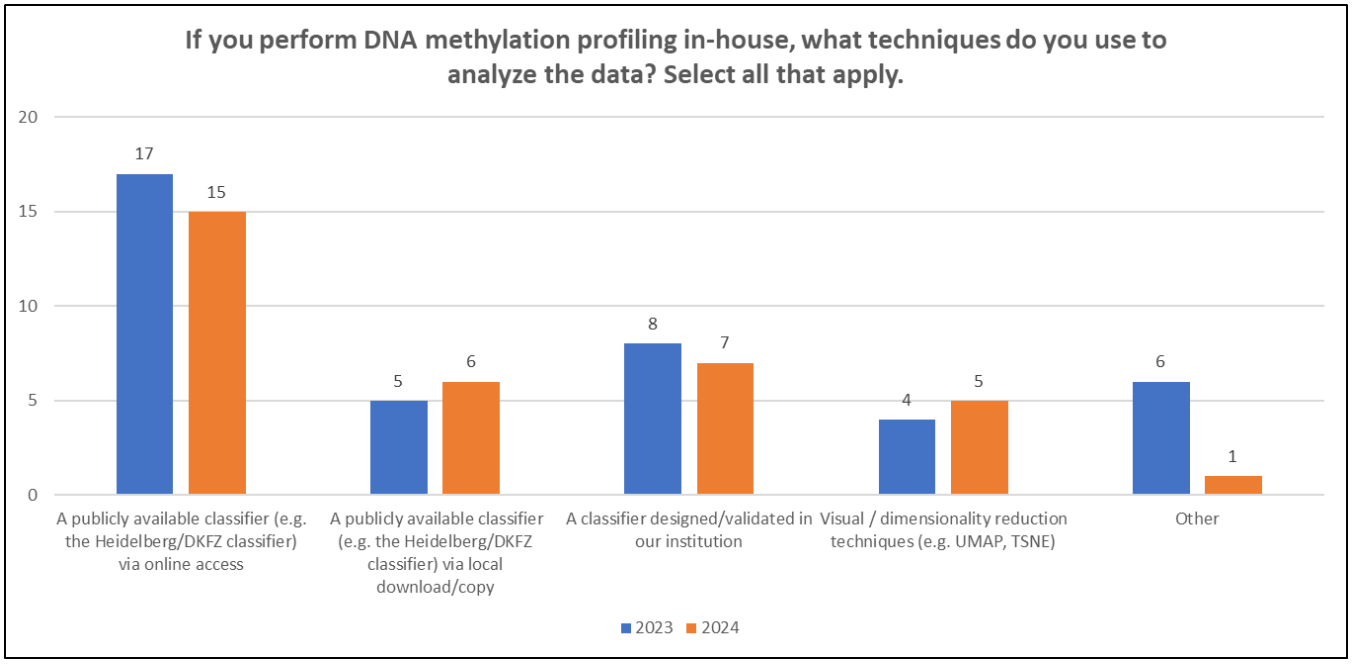


**The answer choice low-grade glioneuronal tumors or circumscribed gliomas was inadvertently left off the survey question in 2023.*



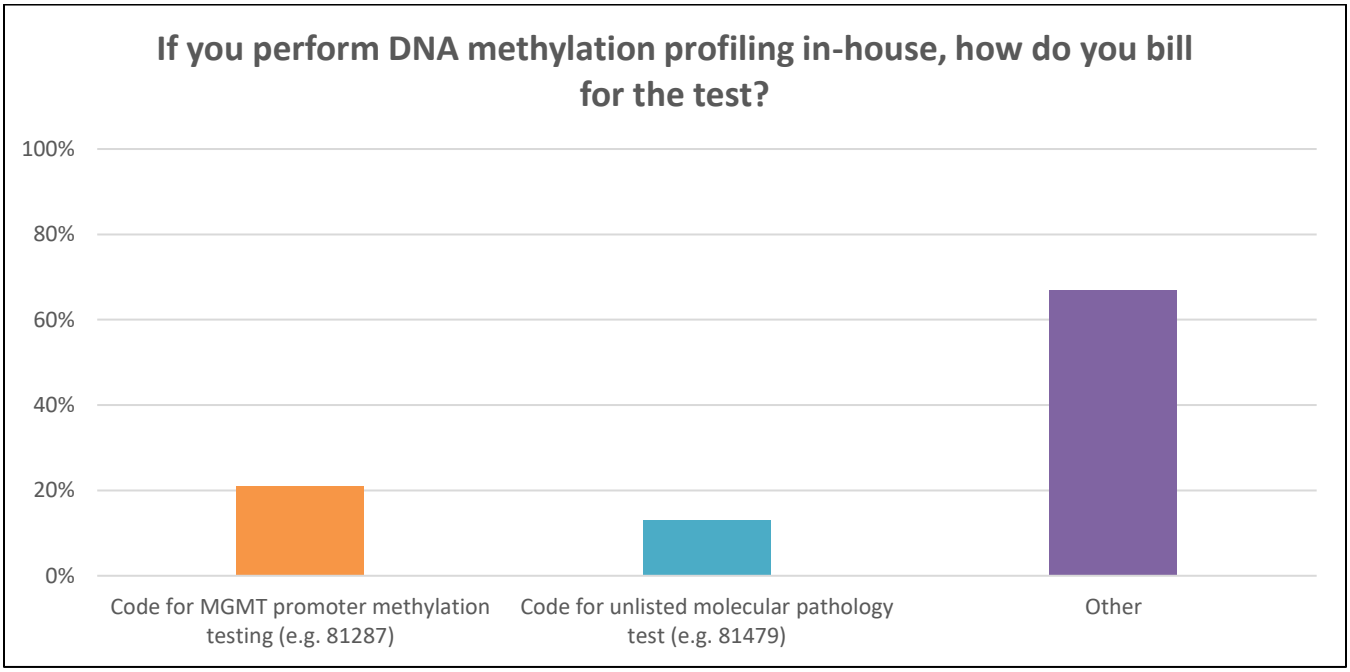
**The answer choice low-grade glioneuronal tumors or circumscribed gliomas was inadvertently left off the survey question in 2023.*

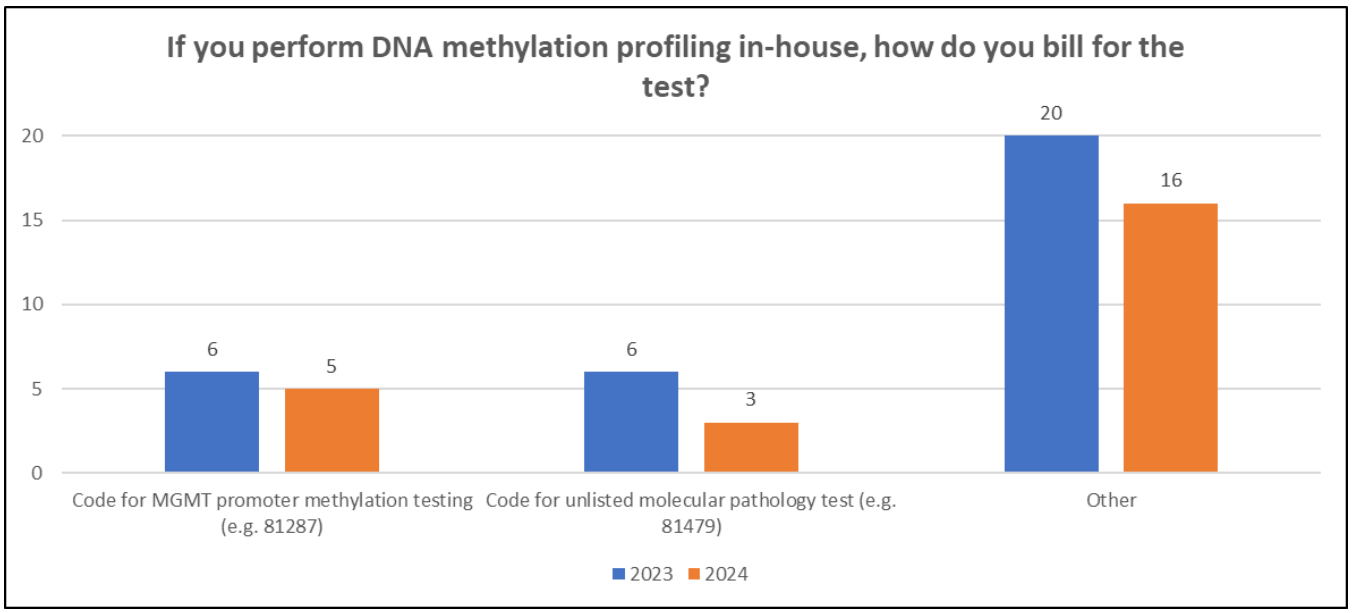




Other Responses Included the Following:

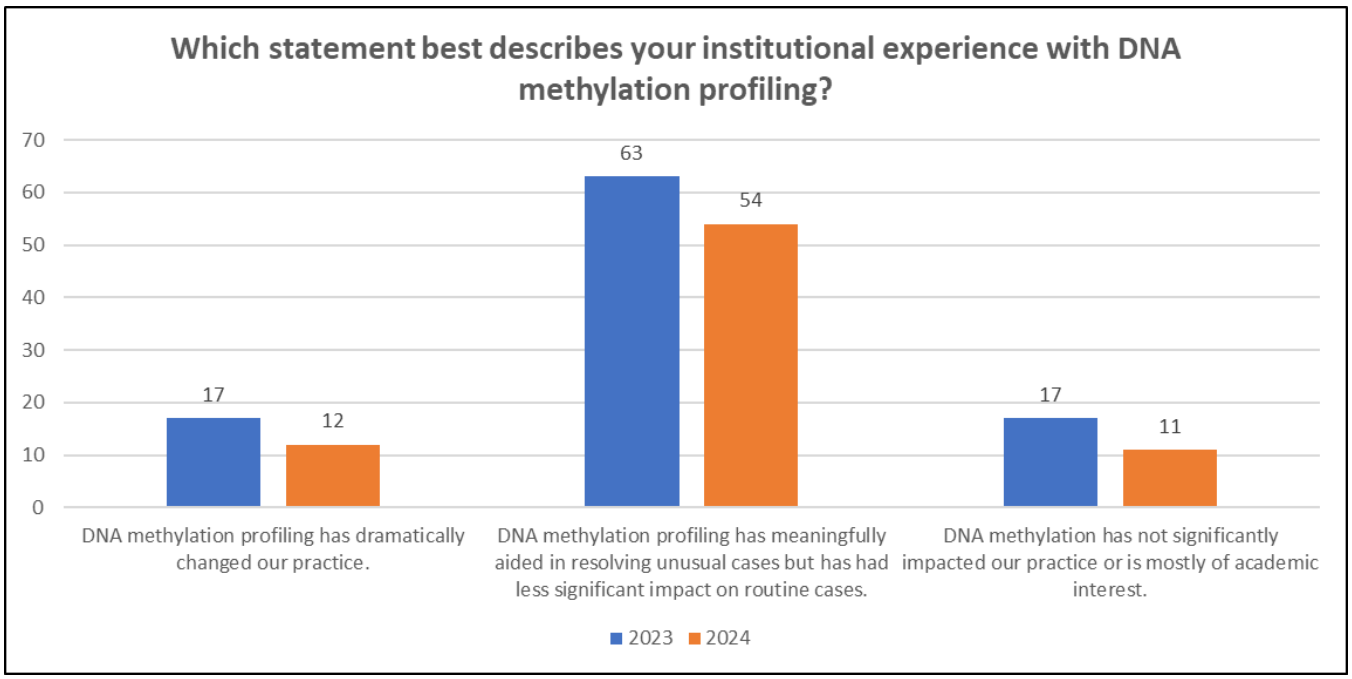
- 2023
  - Send idats directly to NIH for the NCI/Bethesda classifier
  - I no longer provide tumor diagnosis services so am not answering this block of questions
  - I don't use it
  - NIH
  - Classifier results and UMAP embedding provided by publicly available laboratory (NCI)
  - Unsupervised clustering (graph-based modularity optimization)
- 2024
  - NCI Methylscape

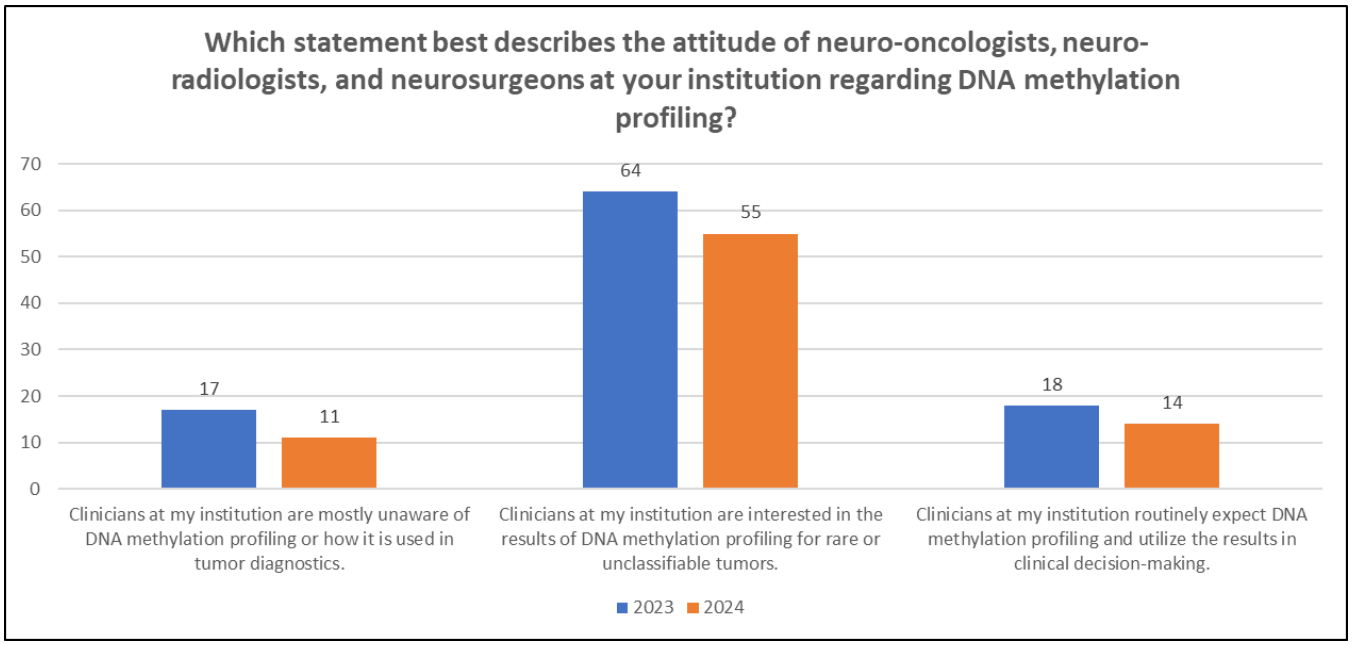




Other Responses Included the Following:

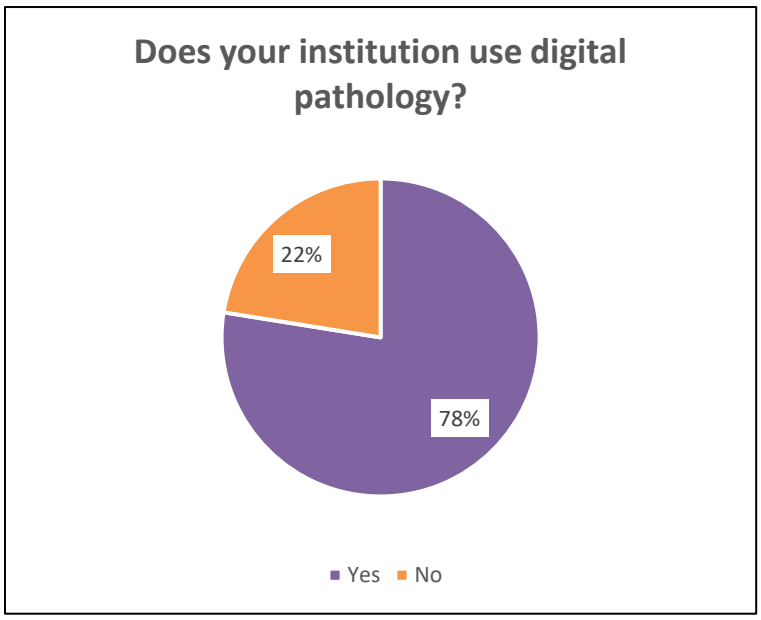
- 2023
  - No billing
  - Don't know/Not sure
  - It's free
  - Institution absorbed cost
  - No code yet
  - Indecipherable answer
  - Not available in house
- 2024
  - Not Applicable (8)
  - Not Sure (5)
  - Not performed in house (1)
  - currently some of the cases can be run as research cases for free thanks to internal funds (1)
  - Private billing (1)

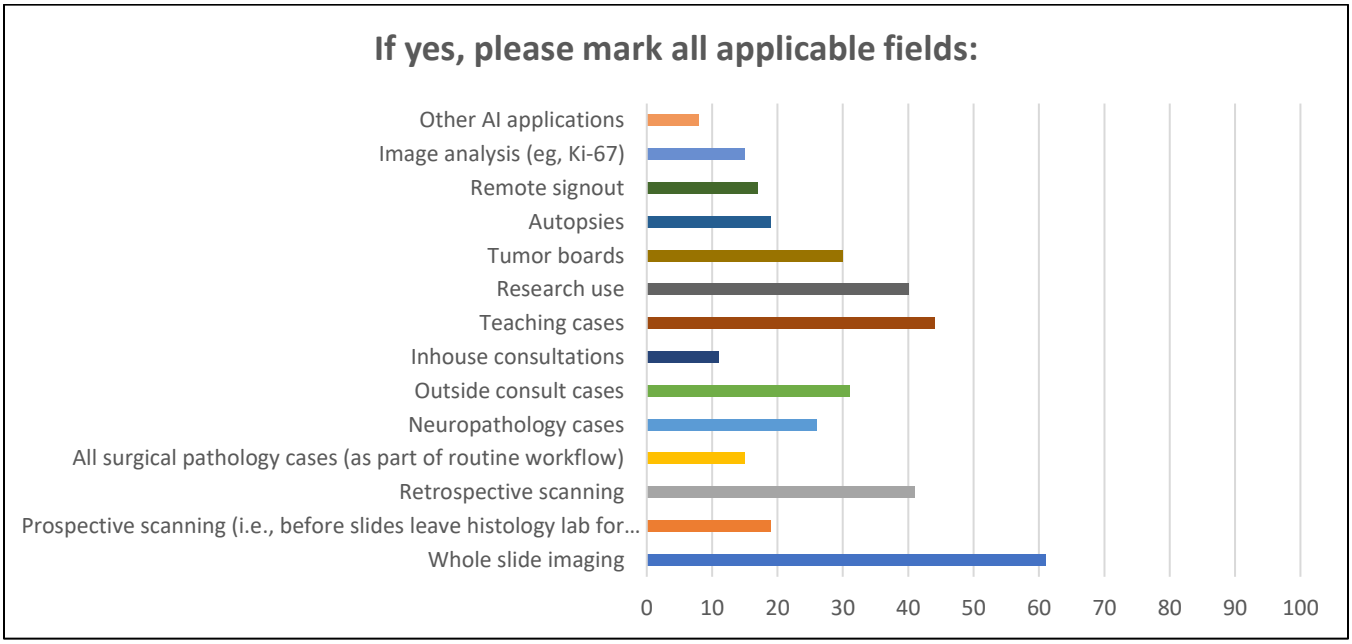

Which statement best describes your institutional experience with DNA methylation profiling?
70
60
50
40
30
20
10
0
17
12
63
54
17
11
DNA methylation profiling has dramatically changed our practice.
DNA methylation profiling has meaningfully aided in resolving unusual cases but has had less significant impact on routine cases.
DNA methylation has not significantly impacted our practice or is mostly of academic interest.
2023
2024

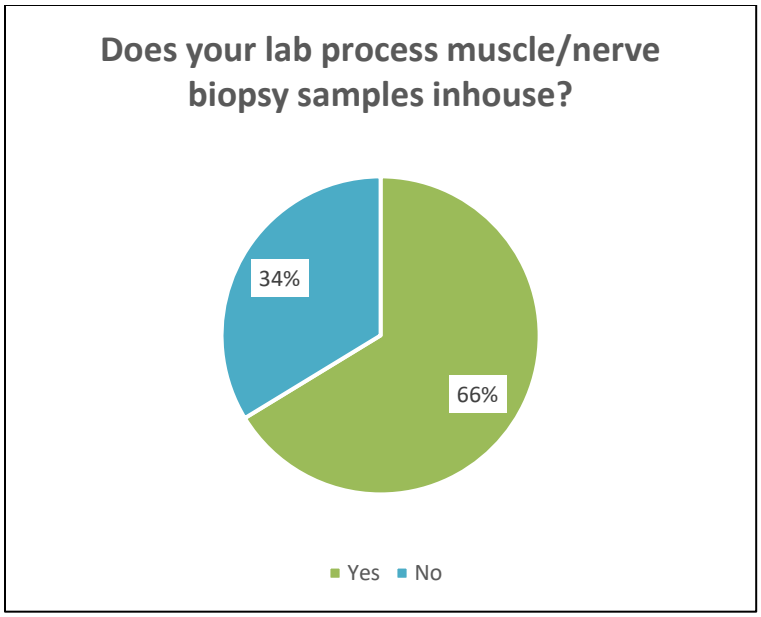

Which statement best describes the attitude of neuro-oncologists, neuro-radiologists, and neurosurgeons at your institution regarding DNA methylation profiling?
70
60
50
40
30
20
10
0
17
11
64
55
18
14
Clinicians at my institution are mostly unaware of DNA methylation profiling or how it is used in tumor diagnostics.
Clinicians at my institution are interested in the results of DNA methylation profiling for rare or unclassifiable tumors.
Clinicians at my institution routinely expect DNA methylation profiling and utilize the results in clinical decision-making.
2023
2024

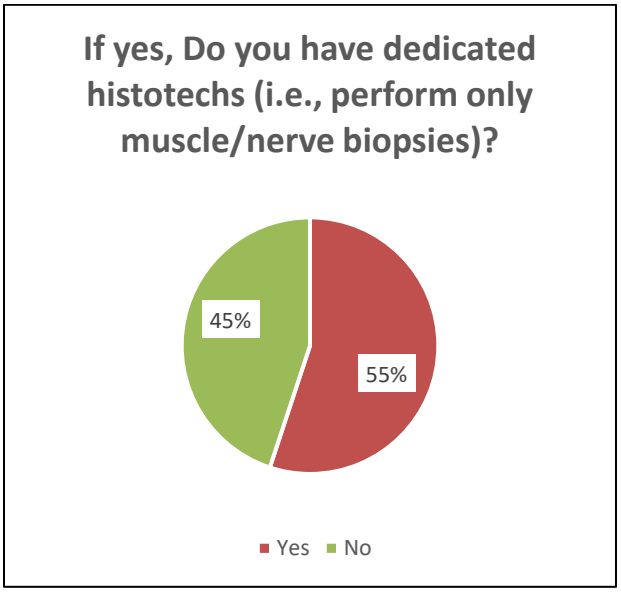
Additional Survey Questions

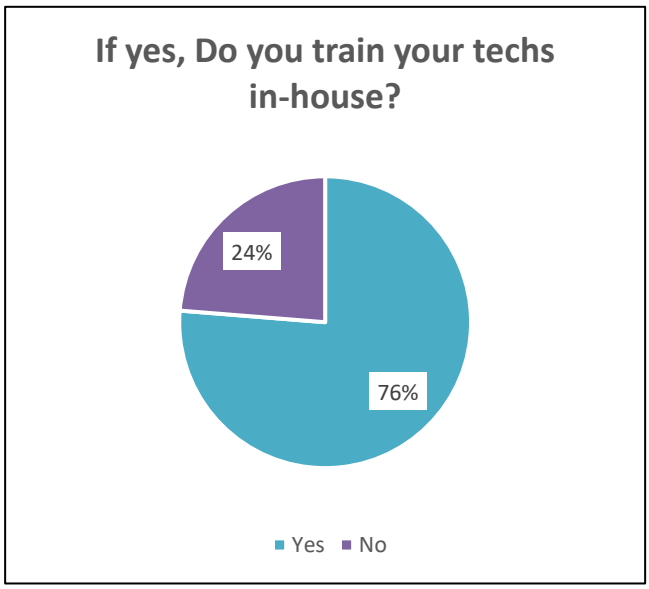
The following data regarding utilization of digital pathology were included by the AANP Professional Affairs Committee to garner data on this topic.











If yes to "Do you train your techs in-house", how do you assess/monitor performance?

- Twice yearly CAP alternative proficiency testing review of slides/stains - Medical director review of cases as part of regular service activities - Feedback from neuropathologists
- CAP protocol
- case by case
- Constant interaction with neuropathologists
- Continuous and case by case feedback. No formal assessment of performance.
- Fill out a QA sheet (3)
- Feedback (i.e., Immediate feedback; Individual feedback on histology quality; Provide individualized feedback; pathologist feedback; provide feedback based on the slides we receive)
- Muscle/nerve pathology is done in the Neurology Dept.
- Quality control of slide prep
- quality control sessions

- Routine documentation of quality in EHR, and evaluation of cases with techs at the microscope
- Staining quality and reproducibility, feedback from attendings, correlation with outside case reviews.
- The techs perform EM and IF in addition to the NM stains, but are trained in house. The EM/IF/NM lab has two medical directors (one for renal stains and one for NM stains), and the NM medical director formally evaluates the staff performance once a year (and informally provides feedback to the staff all the time).
- Trying to limit is to a subset of techs. A mandate/statement form AANP would help tremendously in this area. Also, online/videos/etc. training from histotechs at high volume muscle centers to help out histotechs at lower volume centers would be a huge help.