Improving Access to Neurology Care: An Evaluation of the CUSOM Advanced Practice Provider Neurology Fellowship - Year 1

Project Background

Nationally, advanced practice providers (APPs) have been used to supplement the capacity of physician workforces[1,2]. Specialty care, in particular, suffers from inadequate access for patients and long waitlists[2]. Short term specialty care fellowships that provide further didactic training and clinical exposure to APPs in subjects not covered during their general training have been shown to improve patient access to care, offset resident capacities, and expand clinical and research services[1,2]. Duke University has been running an APP fellowship in neurology for ten years and has seen success, including hiring 79% of their graduated fellows into their department (compared to 17% of residents)[1].

To increase access to specialty care and improve capacity in their department, the Department of Neurology at the University of Colorado School of Medicine (CUSOM) developed a Neurology APP Fellowship program.

Evaluation

Utilizing electronic health record (EHR), American Academy of Neurology examination results, and survey data, as well as interviews with project team members and graduated fellows, this evaluation aimed to evaluate the impact of the CUSOM Neurology APP fellowship program on access to neurology care, fellow knowledge in and confidence with neurology, retainment of fellows at CUSOM after graduation from the fellowship, and satisfaction with the fellowship program in year one of implementation.

Program Elements

The CUSOM Neurology APP Fellowship program received supplemental funding in January 2024 with a goal to accept the first cohort of fellows by July 2024. The fellowship directors traveled to Duke University to learn more about the design of their program and adopted key program elements for the CUSOM Neurology APP Fellowship. The two fellowship directors marketed the new program via word-of-mouth and job boards for year one. To be eligible for the Neurology APP fellowship program, applicants must have graduated from an accredited nurse practitioner (NP) or physician assistant (PA) program by the date they submitted their application, have national board certification as an NP or PA with an active DEA number, and be eligible for licensure as a NP or PA in Colorado[3]. The directors interviewed candidates and prioritized those that showed an interest in staying in Colorado and a genuine passion for working in neurology long-term.

The first cohort of two fellows were onboarded into the neurology department in July 2024. Over the course of one year, the APPs cycle through 13 neurological subspecialities: behavioral neurology, epilepsy, epilepsy monitoring unit, general neurology, headache, inpatient consults, movement disorders, multiple sclerosis, neuro-infectious disease, neuromuscular disorders, neuro-oncology, neuro-ophthalmology, and stroke. APPs cycle through subspecialities separately; only one APP fellow is in each subspecialty at a time to reduce the teaching burden on the preceptors.

Each subspecialty rotation includes didactic training, shadowing of neurologists, completing chart notes, and ultimately providing care to patients independently. Fellows are also expected to attend conferences and resident grand rounds, case conferences, journal clubs, and complete asynchronous trainings[3]. The aim of clinical rotations and didactic sessions is to further both outpatient and inpatient clinical exposure, improve their skill sets and confidence with neurological conditions, and allow them to integrate into the neurology department. Ultimately, the goal of the CUSOM Neurology APP Fellow is to retain the graduated fellows in the state of Colorado and, ideally, within the CUSOM healthcare system. The first cohort graduated in June 2025, with the second cohort joining in July 2025.

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[1] Morgenlander, J.C., Simers, L.A., White, K., & Walker, B.D. 2024. Evolution of Advanced Practice Provider Fellowship Training in Neurology Over 10 Years. *Neurology Education*, 3(4): e200173.

[2] Morgenlander, J.C., & Blessing, R. 2016. The Duke Neurology Advanced Practice Provider Residency. *Neurology Clinical Practice*, (6): 277-280.

[3] Department of Neurology School of Medicine. 2025. APP Neurology Fellowship. *University of Colorado Anschutz Medical Campus*. Accessed 7/2025. https://medschool.cuanschutz.edu/neurology/fellowship/app-neurology-fellowship.

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QUANTITATIVE ANALYSIS

Methods Overview

The quantitative analysis focused on year one of the Neurology APP Fellowship, which spanned from July 1, 2024, to June 30, 2025. Epic EHR data from encounters shadowed and billed by the two APP Neurology fellows was characterized to demonstrate impact on Medicaid access to neurology. Results from the American Academy of Neurology (AAN) NeuroSAE exam, a self-assessment that tests neurological knowledge which were completed by the fellows before and after the fellowship, were described. The fellows were asked to complete a baseline and post-fellowship survey to assess confidence with providing neurological care. Post-fellowship questions around their post-graduation plans were asked to assess impact on retainment of capacity: in-state, CUSOM, Anschutz campus, and neurology subspecialities. Confidence and post-graduation plans data were described.

Results

Over the 12-month fellowship, the APP neurology fellows each rotated through 13 neurology subspecialty clinics. During learning sessions, where they shadowed neurology specialists, the two fellows observed a total of 74 Medicaid encounters across all 13 subspecialties (as evidenced by contribution to those encounter notes). Following shadowing, the fellows began billing for their own encounters (Table 1). Over the course of the fellowship, 28% of the encounters were with Medicaid patients. A higher percentage of new patient encounters were with Medicaid patients than other payors. No lab, procedure, or MRI visits were done with Medicaid patients.

Table 1: Encounters Billed by the APP Fellows, by Location and Payor Type

	Medicaid Encounters (n=187)	Other Payor Encounters (n=480)	Total Encounters (n=667)
Ambulatory Encounters			
Patient visit	36 (19%)	175 (37%)	211 (32%)
New patient	*22 (61%)*	*82 (47%)*	*104 (49%)*
Labs or procedures	0 (0%)	72 (2%)	72 (34%)
Hospital Encounters			
Inpatient stay	151 (81%)	229 (48%)	380 (57%)
MRI	0 (0%)	4 (<1%)	4 (<1%)

Note: Payor as indicated in Epic at time of encounter; final billing payor may be different

Between the start of the fellowship and the end of the fellowship, both APPs had a significant improvement on their AAN NeuroSAE exams (Figure 1), with both post-fellowship scores surpassing the minimum 70% required to pass the exam.

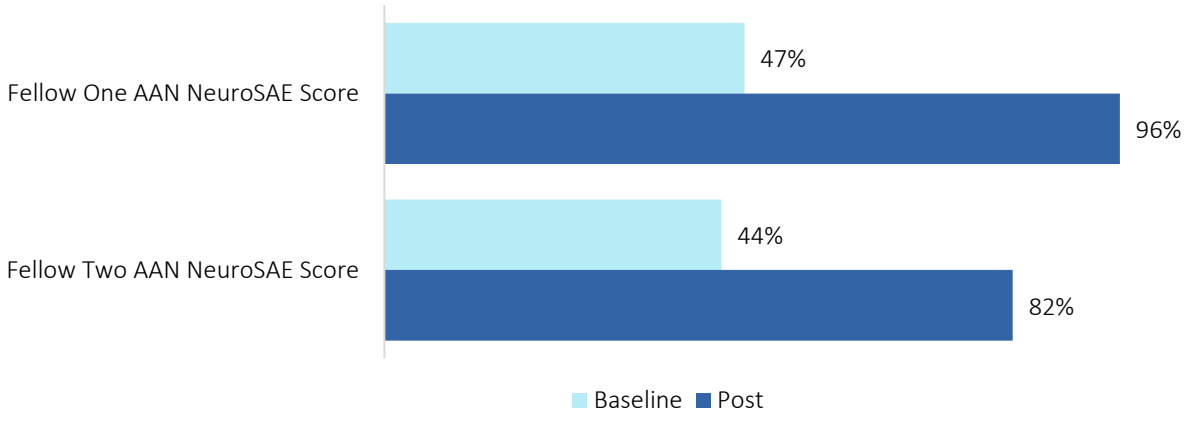
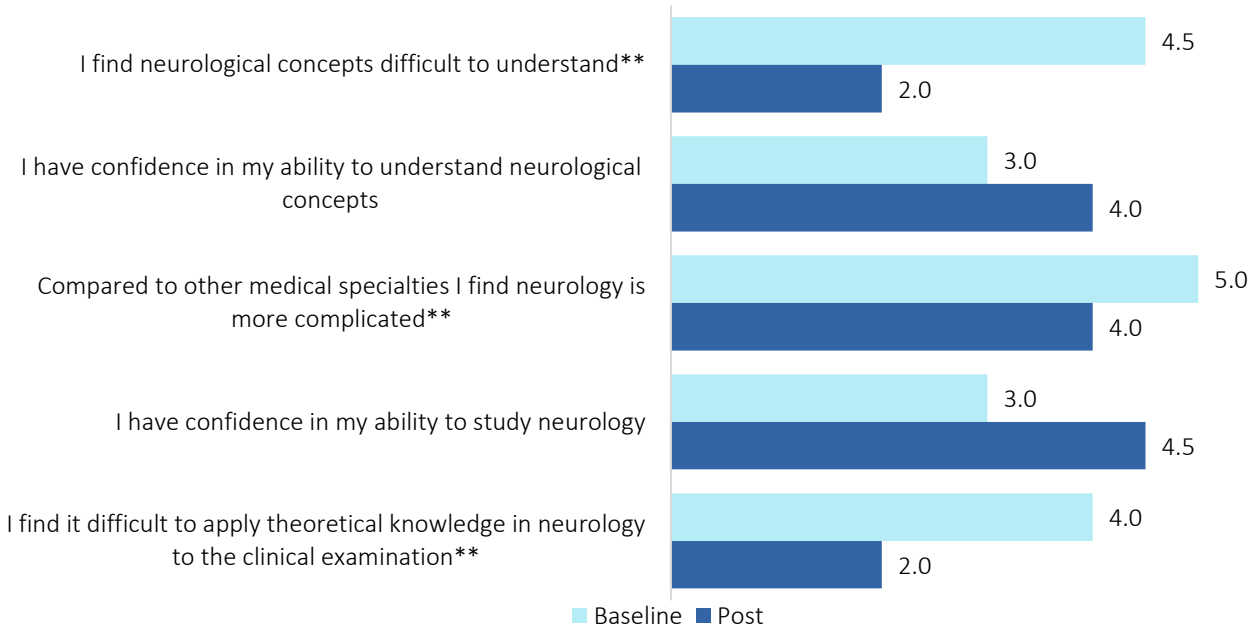


Figure 1. Baseline and Post-fellowship ANN NeuroSAE Results

Between the start of the fellowship and the end of the fellowship, both fellows improved their confidence in neurology (Figure 2) as evidenced by an increase in scores for items around confidence in ability to understand and study neurology and a decrease in scores around items that indicate difficulty with understanding and applying neurology in clinical settings.



Note: **Items reverse coded; a decrease in score is a positive finding. 1 = strongly disagree; 5 = strongly agree

Figure 2. Confidence with Neurological Skills

Both graduating fellows indicated they would be staying in Colorado to work at the Anschutz epilepsy clinic following the completion of the fellowship, indicating retainment in all four goal areas (Figure 3).

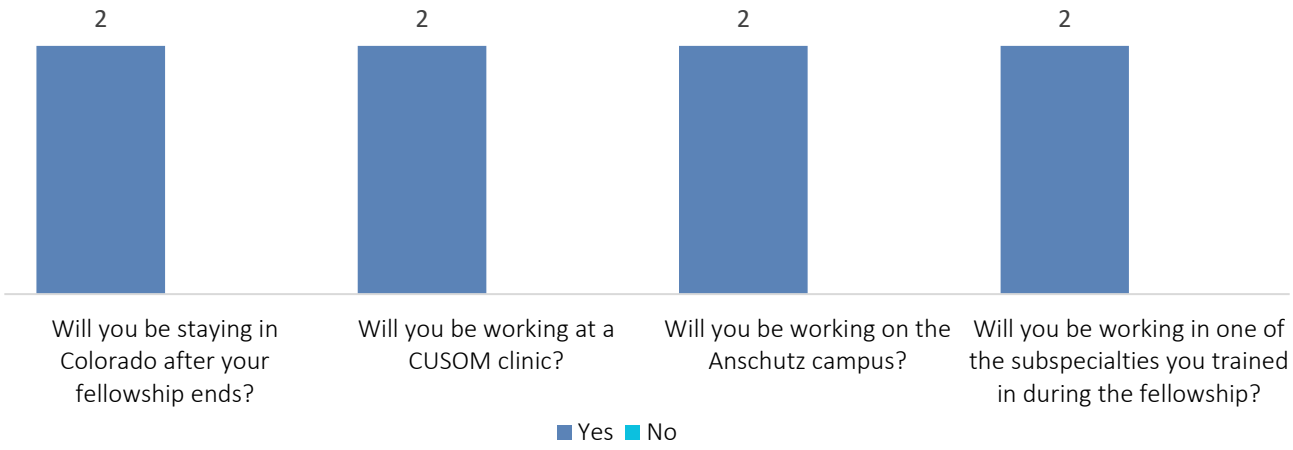


Figure 3. Career plans as indicated at fellowship end

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QUALITATIVE FEEDBACK FROM FELLOWSHIP DIRECTORS AND GRADUATES

Methodology

Interviews were conducted with the program director and associate director of the Neurology APP fellowship as well as the graduating APPs from year one. Responses were thematically analyzed into two domains: successes and challenges.

Project Successes

The directors of the program and the two APPs felt that the fellowship was a successful model that prepared the graduating fellows for a career in neurology. By having a combination of didactic learning, asynchronous online coursework, shadowing, and independent clinical care, APPs of all learning styles could gain information in a way that worked best for them. Additionally, by dividing the focus into subspecialties, they felt it was an easier way to absorb information.

"I honestly don't know how I would have entered the field without this fellowship."

Both fellows commented on the amount of information that was covered and how they felt they gained so much varying experience from the program. While they each had an interest in neurology and some familiarity from personal life or prior work experiences, both felt they learned a tremendous amount and have increased their understanding of the field. As one APP said "it was a very challenging year, but a good year, I learned so much. There are so many things that I didn't even know existed in neurology until [this fellowship]."

The directors had previous experience working with APPs in-clinic and as students, and both shared that this fellowship resulted in APPs that they felt they could trust more with neurological care than APPs who come into the department without a fellowship. Further, they felt the fellows' eagerness to learn brought a sense of excitement to the department. As one director said, "I think that's important for all of our more senior faculty…to work with people who are excited about and passionate about neurology."

Project Challenges and Suggestions for Improvement

The fellows shared challenges and suggestions for improvement regarding the topics covered. While both felt most topics were necessary, both shared that very rare, complicated conditions ended up filling time that could have better been used to cover more foundational subspecialties. Specifically, they felt time spent on pediatric neuromuscular disorders or neuro-ophthalmology could have been better spent on neuro-palliative care or sleep medicine. Additionally, both fellows felt that time on neuroanatomy or neuroradiology earlier in the year would have been a helpful foundation to have as they moved through other subspecialities.

"I think some [physicians] have biases against PAs from previous working relationships."

Fellows also shared difficulties with some of the preceptors of the subspecialities. They felt one or two gave the impression that APPs didn't belong in the neurological rotations with the residents and instead "were a nuisance." Both shared that perhaps, ahead of rotations in future years, putting out a survey to gauge preceptor interest in training APPs might help avoid those tensions. Additionally, they suggested forming a peer support group of APPs might be helpful, since they were often trained alongside residents but supports available for residents weren't appropriate for them.

The directors shared challenges with communication and expectation setting. Each director had their own approach to the fellowship and overseeing the APPs and acknowledge they didn't always communicate what was happening in the program to the other, which lead to frustrations both among the APPs and the directors themselves. This was particularly apparent when it came to figuring out next steps for the APPs after graduation as each director had their own advice to give to the APPs. To mitigate this issue with communication happening again in the future, another role has been hired onto the team. One duty of this role will be "to make sure that we as a team, are communicating with the fellows more, and that we as a team, are communicating with ourselves."

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EVALUATION SUMMARY

Based on the EHR data and career plan answers, the APP Neurology fellowship program improves neurological care access and retains that increased capacity. Increased access was seen for new Medicaid patients, though there are still areas for improvement regarding labs, procedures, and MRIs. Based on knowledge and confidence assessments, the fellowship is improving APP knowledge and confidence with neurological concepts. The graduating APPs felt the fellowship was a successful endeavor, trained them well for a career in neurology, and would recommend the program to other APPs.

RECOMMENDATIONS TO THE PROJECT TEAM

While the data available trends toward positive outcomes of the training, this is only year one and the sustainability of the program will need to be evaluated in future years. Additionally, themes from conversations with team members indicate areas for program improvement. Below are our recommendations for your consideration.

While retainment of the two graduating APPs from year one of the fellowship has been shown immediately following graduation, **sustained retainment** will be of interest over the coming years.

Recommendation 1: Ensure that contact information (e.g. full names, DEA numbers, phone, and email address) for all graduates is collected before the fellowship ends. Store that information in a shared location so all team members have access and can edit, if necessary. Use this information to conduct follow-ups at 3- 5- and 10-year intervals to determine long-term retainment.

While it is encouraging to see new patient encounters skew higher for Medicaid patients, **no labs, procedures, or MRIs were done with Medicaid patients**.

Recommendation 2: Strategize on how to increase the number of Medicaid patients receiving labs, procedures, and MRI with the APP neurology fellows. Overall, determine if it is possible to assign more Medicaid patients to the neurology fellows across encounters.

There are **concerns from those on the project team about expectations after graduation** for future hiring in the neurology department and providing care in the resident clinic for graduating APPs. Specifically, some people are curious about the funding available to hire 2.0 FTE indefinitely in neurological subspecialties of interest. Additionally, folks don't understand how time spent providing care in the resident clinic following graduation will impact capacity within the hiring clinics.

Recommendation 3: Have a team discussion to outline all expectations for future graduates. Outline the processes that will lead to new positions being created each spring, including where funding for those positions will come from. If there are expectations that graduates will provide care in the resident clinics, discuss with each subspecialty whether this would be allowed and how capacity or revenue might be impacted. Once decisions are made, be sure to include this in recruitment and onboarding materials so fellows are clear on what will be expected of them.

While summary data was available for the ANN NeuroSAE and post-fellowship feedback was collected, some people on the team were interested in the more specific **APP-level, question-level data and in more timely feedback, which were unavailable.**

Recommendation 4: Develop consistent practices for collecting and storing data. Consider using Qualtrics for all survey-based data, which will ensure high data quality and the ability to drill down to person- and question-level results. This will also allow for easier yearly extraction and analysis of survey data. Consider doing mid-year check-ins for any timely feedback. For baseline and post-fellowship data collected outside of Qualtrics (e.g. AAN NeuroSAE) select a point-person on the team to collect downloadable results and store that information in a shared location so all team members have access.