


The Neurointerventional Fellowship Match: our vision for the future

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North American neurointerventional societies have collaborated to address the longstanding complexities of selection and application to neurointerventional fellowships. The current 'rolling acceptance' process limits visibility and access among programs and fellowship candidates, and the application process is difficult for prospective fellows to navigate, with positions often promised many years in advance. These elements have led to poor transparency for everyone involved. The proposed solution was to codify the pathways using the central vehicle of a Neurointerventional Match—analogue to 'The Match' process currently used for residency programs. There are several important reasons why specialty leaders decided to pursue this lofty goal, despite the intricacies and challenges of bringing together multiple core residency specialties into a common match process.

Neurointerventional practice benefits from its multidisciplinary nature, having three different specialties feeding into the expertise of its practitioners (neurology, neurosurgery, radiology). As final details of the Match are worked out, it is key that the process facilitates equitable participation of applicants from each core specialty.

Approximately 15 years ago, the Society of NeuroInterventional Surgery (SNIS) developed an initiative to create a training family tree.¹ The tree confirmed that the founders of this specialty and most early luminary figures in this field were neuroradiologists, and the specialty was known as interventional neuroradiology. Specialty training was performed at a limited number of well-known centers under the direction of these pioneers.²

Neurosurgeons began training in endovascular neurosurgery in greater number in the early 2000s, and neurologists entered the field soon after. Industry-sponsored

neurointerventional fellows courses began in the mid-1990s. The primary author of this comment attended that Target Fellows Course in 1997, and can recall there was only one neurosurgeon and over 20 neuroradiology fellows in attendance. Contemporary fellows courses have representation from all three core specialties. For example, at the 2023 SNIS Annual Fellows Course, there were 24 trainees from neurosurgery, 23 from neurology, and 13 from radiology programs in the United States. In contrast, outside of the USA, neuroradiology remains the primary specialty training for neurointervention.

From 1992 to 2009, the American Society of Interventional and Therapeutic Neuroradiology (ASITN) was led by presidents who were neuroradiologists. The first endovascular neurosurgeon was elected president in 2010.³ In 2011, the ASITN underwent a name change to the Society of NeuroInterventional Surgery to better reflect the multispecialty representation in the field and global reach of the society.⁴ The first interventional neurologist became president in 2021.

Diagnostic radiology (DR) residents learn basic angiography and image-guided procedures using multiple modalities, like fluoroscopy, ultrasound, and CT, throughout residency. They have the formal training in neuroimaging, especially after an extra year of diagnostic neuroradiology fellowship. This group of trainees has the deepest understanding of imaging physics, artifacts, MRI sequences, imaging appropriateness criteria, and radiation safety, which are all a major part of board certification. Neurosurgeons and neurologists have more experience with clinical neuroscience. Neurosurgeons have the additional skill set to operate on subdural hematomas, place ventricular drains, or, if dual trained, use open techniques to treat aneurysms and arteriovenous malformations. Neurologists have core training in the medical management of ischemic and hemorrhagic neurovascular disease.

The Society of Interventional Radiology developed an integrated interventional radiology (IR) residency pathway for medical students in 2016, and this resulted in fewer radiologists entering diagnostic

neuroradiology with interests in intervention. This current pool of DR residents tends to be less interested in performing interventions than in years past when IR was one of the multiple fellowships to be considered following core DR training. A meaningful subset of interventional neuroradiologists in practice today might have chosen the direct IR pathway from medical school if that had been an option, given the poor visibility into neurointerventional radiology by medical students in that era. It is clear that the direct IR residency pathway has negatively affected the number of neuroradiologists who pursue neurointervention in the USA today.

To maintain a pipeline of radiologists in neurointervention, the Match must welcome IR trainees with a viable pathway. These individuals have approximately 5–6 months of neuroimaging rotations in residency in addition to extensive training in endovascular and percutaneous image-guided techniques, including microcatheter use throughout the body. Body intervention uses many devices similar to those used in neurointervention, including embolic agents, stents, aspiration catheters, etc. While these applicants would have less clinical neuroscience training, their pre-fellowship endovascular training would be the most advanced of any group entering the Match.

The pathway for application to the Match is different for each core specialty. Neurosurgeons have the most straightforward track, which usually involves performing an enfolded preliminary endovascular year during residency, allowing direct application to the Match during late stages of residency. These candidates would often perform a single interventional year of fellowship immediately after residency.

Neurology residents are required to first match into a vascular neurology or neurocritical care fellowship after residency, which then would allow application to the Match. The two-step process after residency is challenging, and many applicants now choose their initial fellowship in an institution strategically where they might have an opportunity to train further in neurointervention. Neuroradiology applications to the Match would require a similar two-step process. Currently, there are several programs where a DR resident can enter diagnostic neuroradiology fellowship combined with neurointerventional training, but most would require two different applications while still in residency or a second application to the Match when just starting the initial fellowship in neuroradiology.

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The proposed details of the Match have been designed by a task force made up of representatives from SNIS, the Society of Vascular and Interventional Neurology (SVIN), and the American Association of Neurological Surgeons/Congress of Neurological Surgeons (AANS/CNS) Joint Cerebrovascular Section. This group has worked diligently developing a Match structure that is intended to provide a workable framework, and more specific detail can be found on the SNIS website.⁵ At the time of this writing, there are 78 training programs which meet the eligibility criteria to participate in the Match. The program directors comprise 71% who are neurosurgeons, 16% neuroradiologists, and 13% are neurologists. The task force expects the number of participating programs to grow over the first years of the Match.

For the Match to work at a basic level, the National Resident Matching Program (NRMP) advises that programs must avoid offering positions outside the Match. To allow for different core specialty applicants, programs should offer fellowship lengths to include 1-year training for those with sufficient prerequisite experience like neurosurgeons with enfolded training or interventional radiologists. Allowance should also be made for those without initial experience, usually neurology and diagnostic neuroradiology fellows, to match and train at a program. To allow for different training lengths, programs would adjust the number of open positions offered annually, as described in the information documents.⁵

The neurointerventional enterprise should make every effort to support the three-core specialty paradigm. Current trends indicating that fewer radiologists enter the field could be exacerbated by the more complicated pathway than a straight-forward single year after completing residency. Should the Match be seen as favorable to one specialty over another, prior experience would suggest that fragmentation could occur, leading certain base specialties to find training alternatives. The neurocritical care pathway of the United Council for Neurologic Subspecialties is a prescient example.⁶

The Match represents a vital crossroads in the future for neurointervention. Its success will help to ensure transparency and greater participation of all core specialties. The authors encourage all eligible programs to participate in the Match and welcome fellows from each core specialty, because each adds significant value from diversity and inclusion of backgrounds and perspectives on patient care. Building a Match that works mutually and equally for all our specialties will be best for our patients, and it will help us thrive as we head into the future.

The first Neurointerventional Fellowship Match will open to applicants in June 2025. The interview period for participating programs will take place from December 2025, leading up to a Match date in spring 2026. The first neurointerventional class will begin fellowship training in July 2027.

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Contributors All authors contributed equally.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Commissioned; internally peer reviewed.

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To cite Milburn JM, Tsai JP, Fraser JF, et al. *J NeuroInterv Surg* 2024;**16**:853–854.

Accepted 19 July 2024

J NeuroInterv Surg 2024;**16**:853–854.
doi:10.1136/jnis-2024-022270

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