

## Journal Pre-proofs

Neurosurgical residency adaptations for the residency application cycle amid the COVID-19 pandemic: Acute on chronic sequelae

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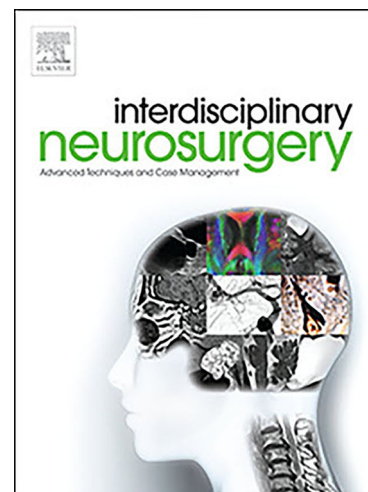
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**Introduction:**

The COVID-19 pandemic has dramatically brought about change to the 2020-2021 residency application process. The Society of Neurological Surgeons (SNS) deferred all external medical rotations or sub-internships (sub-I's) with the guidance that each prospective neurosurgical applicant should rotate 8 weeks at their home institution, or the nearest institution should they not have a home program. Sub-I's are considered integral to the application process in neurosurgery for increased experience prior to specialty commitment, increased preparation for upcoming internship and for letters of recommendation. [1] Loss of in-person interactions and evaluations may significantly limit both individual applicant and program assessments of one another [2, 3]. With neurosurgical programs permitting sub-I's only to home students and nearby students without a home program, this represents a recognizable change in the upcoming application format that has otherwise been largely uniform for decades.

The 2021 match cycle will continue despite the global pandemic. Surgical residency programs need to adapt to this changing dynamic. [3] Herein, we describe how neurosurgical residency programs are adapting to the 2021 application cycle through augmented social media usage, establishment of virtual sub-I's, and hosting virtual open houses.

**Methods:**

An official list of accredited neurological surgery residency programs was obtained from the Electronic Residency Application Service (ERAS), identifying 115 separate programs. All programs were included and reviewed for the presence of departmental and/or residency program Twitter, Instagram, and Facebook accounts. Additionally, the Visiting Student Application

Service (VSAS) was reviewed for all neurosurgical virtual sub-internship opportunities. The Medical Student Neurosurgical Training Center (MSNTC – included due to recurring mentions on social media), American Association of Neurologic Surgeons (AANS), Society of Neurological Surgeons (SNS), Neurosurgery MedEd Website, Uncle Harvey, and Congress of Neurological Surgeons (CNS) websites were reviewed for virtual opportunities. Listings that consisted of informal and interactive meet and greets with faculty and residency members in an informal setting were defined as open houses. Virtual sub-I's were counted as such when specifically labelled and typically consisted of multiple dates (eg. 2-4 hours, 5 days/week for 2-4 weeks) incorporating student-faculty and resident interaction, didactics and shadowing opportunities in a more formal setting. Conferences or other large scale networking events are not included in within these definitions of open houses or sub-internships. Identical listings on discrete platforms were tallied separately. All opportunities are updated as of February 14, 2021.

### **Results:**

Of the 115 separate residency programs, 88 (77%) had some form of social media presence. Social media usage among accredited neurosurgical residency programs is displayed in Table 1. Of the departmental accounts across all platforms, 43 (30%) were created in 2020. In contrast, 24 (57%) of the residency program accounts across all platforms were created in 2020.. Residency program social media account creation trends are visualized in Figure 1. Programs offered 35 (30%) open house opportunities advertised on Twitter, 19 (17%) open house opportunities on Facebook, and 23 (20%) open house opportunities on Instagram. Virtual sub-I opportunities were scarcer with 19 (17%) opportunities on Twitter, 9 (8%) opportunities on Facebook, and 10 (9%) opportunities on Instagram.

Virtual opportunities (open-houses or sub-I's) were posted on 13 (12%) residency specific websites. Fourteen (12%) programs were listed on the MSNTC website with open houses and 10 (9%) with sub-I opportunities in discrete programs. 34 (30%) programs were listed on the National Neurosurgery MedEd website with open houses and 18 (16%) with virtual sub-I's. 9 (8%) programs were listed on Uncle Harvey with open houses and no sub-I's were listed. No program specific virtual opportunities were found on the AANS or CNS websites. VSAS offered only 4 (4%) virtual sub-internships.

### **Discussion:**

The COVID-19 pandemic has had a pervasive impact on the medical education system that will also influence the upcoming 2020-2021 residency application cycle for neurosurgical applicants. Regarding social media, most ERAS listed neurosurgical residency programs had a departmental social media presence prior to the onset of the pandemic, while residency specific accounts have heavily accelerated in 2020. Most programs developed their residency program Twitter and Instagram accounts in 2020, whereas most departmental accounts were founded prior to 2020.

Slightly less than one-third of total programs advertised open house opportunities via Twitter, the most common virtual networking effort seen across neurosurgical residency programs evaluated. Open houses offer an informal interaction between faculty, current residents, and student applicants and typically last from 1-1.5 hours. The social nature of these virtual open houses, often mimicking the pre-interview dinners or social interactions with residents during away rotations may potentially explain the increased presence on Twitter, a generally informal, but real-time, social media platform. The National Neurosurgery MedEd website listed far more virtual opportunities than the other websites surveyed. There were fewer

opportunities for virtual sub-I's especially on more structured websites like VSAS. During a globally tumultuous period, these virtual opportunities can offer applicants advantages, including increasing applicant visibility while decreasing overall cost of the application process. [4, 5]

Opportunities for in-person sub-I's have been drastically restricted based on home program location. While virtual opportunities are growing, the SNS does not presently endorse these opportunities as an equivalency to in-person rotations, indicating that this will not satisfy the previously described 8 week requirement and that letters should only come from in-person rotations. [1] Opportunities are thereby limited by home program presence and location. Indeed, metrics such as letters of recommendation or personal connections may carry increased weight in the 2021 match. Medical students applying into the competitive field of neurological surgery may be concerned with the acute on chronic effect the COVID-19 pandemic's effect on their medical education. Medical education governing bodies and school leadership have been developing strategies to continue clinical education without compromising competency standards such as prioritizing more senior students for rotations to preserve social distancing practices. [6] However, despite these efforts, navigating medical education continues to be a dynamic challenge for upcoming applicants. To date, there have been changes implemented for the upcoming interview cycle with all programs offering virtual-only interviews as per SNS guidance. [1] This has potentially broad implications for future cycles, striking a cost-benefit balance for applicants and programs alike [3, 5, 7]. In a 2020 survey by Guadix *et al.* of student attendees of virtual neurosurgery training camps, students self-reported an increased likelihood of taking an additional year off from medical school before applying into residency since the onset of the pandemic.[8] The reduced ability to connect with outside program directors and

network with faculty and residents remains one of the largest concerns for applicants and could be responsible for this trend [2].

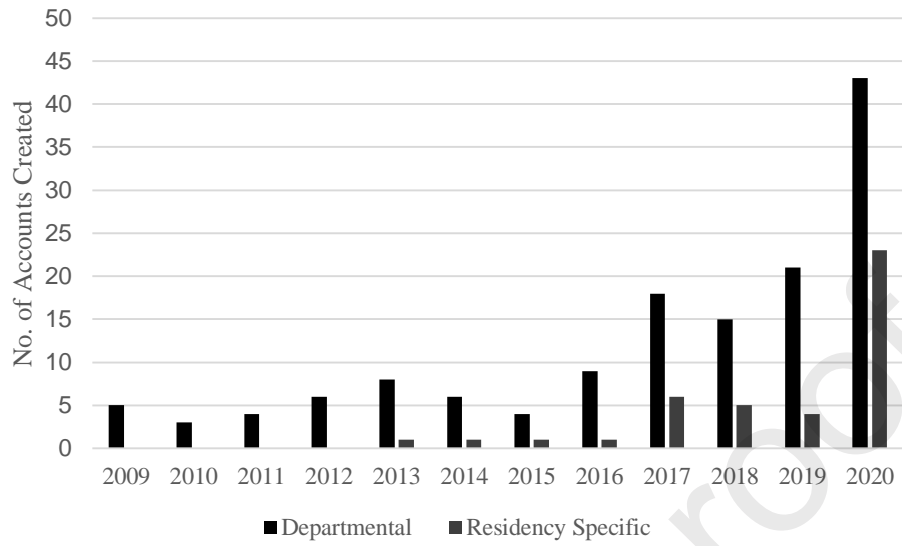
Timing is a limitation of this survey. At the time of this survey, the outcomes of the 2021 residency application cycles are unknown. Therefore, there is the potential for subsequent assessment of match outcomes once data is available for the 2020-2021 cycle. Applicant-account engagement was not assessed in this survey, which is also a limitation. Account presence does not directly indicate account utility and the authors recognize this constraint. However, given the acute timeframe of the application season and multiple modalities in which a user may engage with an account on a virtual platform, tracking the surge in virtual presence during 2020 allows for general trends in virtual neurosurgical medical education to be visualized.

**Conclusion:**

In a time of social distancing, virtual interactions have become the norm and this does not exclude training opportunities for prospective neurosurgical applicants. We are seeing increased efforts by programs to offer virtual opportunities to applicants but found this to be far from being the majority of programs. It is plausible that virtual interviews and interactions are here to stay thanks to the dynamic shift caused by the COVID-19 pandemic. Therefore, neurosurgical residency programs must continue to adapt to this new virtual landscape to recruit the best-suited applicants and future surgeons.

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**Figure 1. Neurosurgery Social Media Presence by Year Created**

**Table 1. Virtual Characteristics of Neurosurgical Residency Programs**

Neurosurgical Residency Characteristics	Number of Programs (%)
ERAS Listed Neurosurgical Residency Programs	115 (100)
Departmental or Resident Twitter	72 (63)
• Departmental Twitter	65 (57)
• Departmental Twitter Created in 2020	17 (28)
• Residency Program Twitter	16 (14)
• Residency Program Twitter Created in 2020	9 (56)
• Open House Opportunities* on Twitter	35 (30)
• Virtual sub-I Opportunities on Twitter	19 (17)
Departmental or Resident Facebook	47 (41)
• Departmental Facebook	42 (37)
• Departmental Facebook Created in 2020	9 (21)
• Residency Program Facebook	6 (5)
• Resident Program Facebook Created in 2020	0 (0)
• Open House Opportunities on Facebook	19 (17)
• Virtual sub-I Opportunities on Facebook	9 (8)
Departmental or Resident Instagram	52 (45)
• Departmental Instagram	35 (30)
• Departmental Instagram Created in 2020	17 (49)
• Residency Program Instagram	20 (17)
• Residency Program Instagram Created in 2020	14 (70)
• Open House Opportunities on Instagram	23 (20)
• Virtual sub-I Opportunities on Instagram	10 (9)
Residency Website Specific Virtual Updates	13 (12)
Virtual sub-I's Listed on VSAS	4 (4)
Open Houses Listed on MSNTC	14 (12)
Virtual sub-I's Listed on MSNTC	10 (9)
Open Houses Listed on Uncle Harvey	9 (8)
Open Houses Listed on National Neurosurgery MedEd	34 (30)
Virtual sub-I's Listed on National Neurosurgery MedEd	18 (16)

\*Opportunities defined per program, not per listing

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