



Headache Education Adaptation During the COVID-19 Pandemic: Impact on Undergraduate and Graduate Medical Education

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Abstract

Purpose of Review Our goal was to describe the changes to headache and neurological education that occurred as a result of the COVID-19 pandemic, and the impact this had on medical learners. We also discuss subsequent implications for the future of education in the field of headache medicine.

Recent Findings Both educators and learners faced many challenges during the pandemic. These include the following: cancellation of in-person educational meetings, limited in-person networking and wellness events, disengagement from virtual didactic curricula, limitations in procedure-based learning, redeployment to inpatient settings with a decrease in outpatient exposures, and blurred boundaries between home and work life due to more virtual collaboration and home computer use. The development of telehealth programs and trainee wellness initiatives, improved collaboration opportunities among geographically distant institutions, and greater access to conferences for learners are among the many improvements forged by these challenging times in medical education.

Summary Given the high prevalence of headache disorders and the paucity of headache specialists, training new clinicians with competency in headache medicine is essential. There were many educational challenges and opportunities identified in the literature that resulted from the pressures of the pandemic. Educators need to develop assessments that capture any gaps in learning that may have occurred during this tumultuous time and be vigilant of remediation needs in our learners over the coming years. It is imperative to intentionally design curricula for the future by harnessing new pedagogical tools, innovations, and perspectives gleaned from our experience with the COVID-19 pandemic.

Keywords Headache · Education · Neurology · Pandemic · Virtual education · Medical education

Introduction

The SARS-CoV-2 (COVID-19) global pandemic forced a re-imagining of education delivery across disciplines to optimize virtual experiences when safety in the physical

learning environment was compromised for educators and learners. Both required more pedagogical flexibility in order to respond to constantly changing national and local public health recommendations. Despite the strains on the health-care system across our country, medical education needed to find innovative ways to persevere. Medical students continued to graduate and enter residencies, and residents and fellows graduated and moved on to the next stage of their careers. In this review of the literature, we describe the changes to education as a result of the pandemic, their impact on trainees (medical students, residents, and fellows), and some of the implications of these findings on the future of headache medicine education.

Ensuring the safety of our trainees, faculty, and staff was the primary reason education pivoted initially. As physicians and educators in supervisory roles, we must balance maintaining trainee safety with providing necessary educational opportunities to ensure clinical competency while avoiding

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fragmented experiences. Given the importance of learning in the direct care environment, isolating trainees from the bedside or clinic for longer than necessary could be deleterious.

Headache education was explicitly listed as a required sub-competency in the Accreditation Council for Graduate Medical Education (ACGME) common program requirements for neurology residency training programs in 2020 [1]. In 2021, it was also removed from the milestones [2] along with the other sub-specialty areas of neurology, making it more challenging for programs to monitor resident progress in headache medicine. The pandemic also impacted the availability of in-person experiences for medical students and may have influenced the amount of procedural experience in headache medicine fellowships, particularly during the spring of 2020. Prior to the pandemic, neurology residency program directors in an ACGME-based survey reported between zero and one grand round lecture on headache medicine per year despite 75% of departments having a board-certified headache specialist at their institution [3]. Now with the added challenge of the pandemic, educators need guidance on how to identify and address gaps in headache education in the coming years.

Given the high prevalence of headache disorders and paucity of headache specialists, training new clinicians with competency in headache medicine is essential regardless of whether they intend to pursue training in the subspecialty. Up to one-third of all general neurologist outpatient visits primarily address headache. The development of telehealth programs, trainee wellness initiatives, and virtual collaboration opportunities are among many improvements forged by these challenging times in education and medicine. After a review of the literature on changes to headache and neurological education imposed by the pandemic, we will discuss the importance of intentionally designing curricula for the future by harnessing these new pedagogical tools and perspectives.

Methods

MEDLINE/PubMed databases were searched to review the educational impact of COVID-19 on headache medicine education. The search was conducted using the following search terms: pandemic education neurology, pandemic education headache, and COVID education headache, with some articles appearing in more than one search group. While articles from all years were included, the review focused mostly on articles published from January 2020 to September 2021 during the COVID-19 pandemic.

English language abstracts were manually reviewed by author MLR and articles were included if the information therein was pertinent to medical student, resident, or headache fellowship education during the COVID-19 pandemic.

Relevant articles from the authors' collections were also included. Articles were excluded if they did not address the impact of the COVID-19 pandemic on neurological education. English abstracts for articles written in another language were reviewed and included if the inclusion criteria were met. The literature was examined to critically analyze systemic challenges in medical education with an emphasis on technologies such as telemedicine, remote education, or wellness initiatives in order to determine the impact of COVID-19 on medical education and trainees.

Results

The literature review produced 512 articles from searching “pandemic education neurology,” 103 articles from searching “pandemic education headache,” and 154 articles from searching “COVID education headache,” with some articles appearing in more than one search groups. Only two of the above articles specifically addressed education within headache medicine and were published after the pandemic started [4••, 5], though only Zhang et al. specifically addressed the impact of the pandemic on headache medicine education. Several themes emerged from the remainder of the literature reviewed regarding the effect of the pandemic on neurological education, including (1) transition to virtual didactic formats, (2) transition to virtual outpatient care and changes in patient care delivery, and (3) trainee well-being. We review the impact of the pandemic on these themes as it relates to undergraduate (medical student) and graduate (resident and fellow) medical education.

Zhang et al. [4••] was the only identified manuscript to specifically report the impact of the pandemic on headache medicine educational delivery at their single-center headache medicine fellowship program. Therefore, we will expand upon their findings in a bit more detail before moving on to impacts of the pandemic on neurological education at large. This manuscript described the situation at the Stanford University School of Medicine headache fellowship program through the late summer of 2020. Initially in March 2020, their outpatient clinics were outright cancelled as they worked to transition to telehealth services, though their program already featured telemedicine services at their institution. In transitioning their clinics to telehealth, they were able to reach over 70% of their pre-pandemic non-procedure visit volume. The program also reported a drop in no-show rates from 10 to 1% initially. Like many other neurological practices, their center noticed that patients appreciated the convenience of not having to travel, but interpretation services for non-English-speaking patients and the limitations in

physical examinations were challenging. Their center was also fortunate to report “minimal” technological issues with telemedicine, which may not be representative of all centers and patient populations.

Impressively, the fellowship faculty signed up to directly observe all fellow telehealth encounters with the faculty video/microphone turned off after obtaining patient consent for fellow participation in patient care. A review of the fellowship program’s website [6] showed that they have two fellowship spots per year. Attending physicians then joined the virtual visit at the end to finalize the encounter after direct observation of the fellow encounter. This allowed faculty to provide timely feedback to the fellows on their history and physical examination skills, though authors describe some initial reluctance to adapt to this format. A similar all-virtual format was used for out-of-department elective experiences, though these were mostly observational. The program did not require fellows in the 2019–2020 academic year to return to the clinic to perform in-person procedures, as they were already deemed proficient in trigger point injections, peripheral nerve blocks, and onabotulinum-toxin injections after performing a few procedures per day prior to the pandemic. However, in the 2020–2021 academic year, fellows were scheduled to have consolidated full procedure days with appropriate personal protective equipment once per week. The ongoing frequency of those clinics was determined by supervising attending physicians thereafter based on whether proficiency was achieved.

Academic conferences were initially cancelled over a period of 2 weeks in order to ensure fellow safety and comply with local/institutional social distancing requirements. However, all didactic conferences were transitioned to a virtual format quickly, including monthly case discussions, weekly journal clubs, and neuroradiology conferences. Learner engagement could be challenging, though they were able to expand the conference audience to the rest of the department (including residents) and also invited speakers from outside institutions more frequently due to ease of access. Teaching opportunities for fellows were limited in both the late 2019–2020 and early 2020–2021 academic years as fellows were no longer able to interface with residents and medical students in clinic, though they continued and planned to expand lecture-based interactions with these trainees. Research projects were required still but were largely carried out virtually. Like many other patient-facing clinicians during the pandemic, Zhang et al. also described challenges in protecting fellow well-being despite utilizing regular check-ins with program faculty, requiring video-on participation in virtual events, coordinating with the residency program for virtual wellness/social events, and providing

appropriate personal protective equipment. The authors did not describe redeployment of their fellows or faculty to direct COVID care settings, but for headache fellowships in New York City, 4 out of 5 fellows (80%) and 4 out of 15 (27%) faculty members were redeployed [7].

Pace et al. [5] described the state of headache medicine education as of February 2021 at institutions throughout the USA and Canada, though the manuscript did not specifically address how headache education was impacted by the pandemic. Seventy-eight institutions responded to their survey study via communication with curricular deans or clerkship/module directors. Of these, only 84.6% reported a mandatory session on headache medicine in undergraduate medical education. Just over 70% of the sessions occurred during the preclinical years, and a similar percentage of sessions occurred in the clinical years; 44.9% said their institution coordinated headache education across the preclinical and clinical years. Only 65% of respondents felt the preclinical sessions adequately prepared students for clinical experiences in headache medicine, and 55% felt that their medical school adequately prepared their students in headache medicine overall. Responses were recorded in July and August of 2020, so it is unclear if these curricula reflect changes as a result of the pandemic, or if institutions preserved the proportion of headache medicine educational sessions from before the pandemic. Either way, given the prevalence and disability associated with headache disorders in society, this study highlighted the significant gaps in undergraduate headache medical education.

Throughout the remaining reviewed literature examining the effect of the pandemic on neurological education, we identified the following themes: (1) transition to virtual didactic formats, (2) transition to virtual outpatient care, and (3) trainee well-being. The vast majority of manuscripts reviewed reported a shift to virtual didactic sessions from in-person sessions for at least some time after the start of the pandemic. In a global survey on the impact of the pandemic on neurological educational programs, the pandemic only impacted about 60% of respondent neurological departments across both high and low income countries [8]. However, the transition to virtual didactic sessions seemed to be more universal across most of Europe [9–11], Canada [12], and the USA [13–15], impacting both adult and pediatric [16] neurology. Most departments reported a greater proportion of invited lecturers from outside institutions, and the development/utilization of shared educational resources across institutions globally [17]. Nationally, the American Headache Society had adapted a number of their programs to address the limitations due to the pandemic. The Next Generation Migraine Therapies initiative is a comprehensive migraine education program designed for existent

healthcare providers that had been in person prior to the pandemic and migrated to a virtual program via the AHS Education On Demand platform that allowed the program to continue to run virtually. Similarly, the AHS had started an in-person cadaver dissection course as part of procedural training at the 2019 AHS scientific session. The education was so highly valued that a new live dissection was included as part of the virtual program for the 2020 Scottsdale meeting and returned to a live demonstration at the hybrid 2021 Scottsdale meeting.

Clinical educational opportunities were routinely impacted by the pandemic in most of the reviewed literature. In the outpatient setting, most manuscripts reported a transition to telemedicine for at least some time during the pandemic [11, 15, 18•, 19–25], which often limited the degree of engagement of medical students and residents in treating and examining patients with headache and other neurological disorders to some extent. Procedural visits also decreased throughout other specialties, and the American Society of Interventional Pain Physicians proposed guidelines on how to triage which procedures should be offered during times of increased local COVID-19 activity [26]. Inpatient elective admissions decreased or stopped in many institutions as a result of increased local COVID-19 activity, and many patients avoided inpatient settings due to fear of COVID-19 infection even when they might have otherwise sought urgent care at a hospital [27, 28]. Also, redeployment of neurology residents or their supervising faculty to other clinical departments in areas of high COVID-19 activity or altered inpatient schedules [11, 12, 14, 29–32] might have detracted from headache education opportunities for neurology residents and medical students. People of color and underserved populations were disproportionately impacted by the pandemic in many ways, including reduced access to telemedicine [33], which may have also decreased the educational opportunities for trainees to care for these populations and learn from that experience.

Preserving clinician well-being was a challenge across medicine during the pandemic. Trainees were particularly vulnerable to affronts on well-being, and the reasons for this likely vary by institution [15, 29]. Possible explanations include decreased autonomy relative to faculty, increased time in direct patient care, and continued educational demands. Programs commonly reported a decrease in the number of networking and social events to comply with social distancing guidelines [14, 15]. Despite the initial satisfaction and appreciation for virtual social and educational sessions, enthusiasm for these events has certainly waned over the last several months [34]. Residents in heavily pandemic-impacted areas like New York City

also reported increased levels of anxiety and fear [35] and even suicidal ideation [36]. Over the last few months where some areas of the country have had improvements in COVID-19 activity overall, it is largely unknown how or if individual programs are re-introducing in-person social events. Some national meetings like the American Headache Society's Scottsdale Headache Symposium are now returning to in-person gathering with a virtual option as of fall 2021, and the American Headache Society Resident Education Program was successfully redesigned in a virtual format and took place in October 2021 with high levels of resident participation. However, the American Academy of Neurology recommended that neurology residency interviews remain virtual for the 2022 match season [37] in accordance with guidelines from the Coalition for Physician Accountability [38], and this process largely remained for the headache fellowship recruitment process in 2022. Across medicine, there seems to be a strong desire to connect with our colleagues in person again for the sake of our well-being, though anxieties about travel and gatherings persist.

Discussion

Neurological and headache medicine educators and trainees have met and overcome many challenges since the start of the COVID-19 pandemic. We have also witnessed many silver linings and opportunities to improve education for our trainees as a result of these hardships. We summarize these challenges and opportunities in Fig. 1.

Several limitations of our literature review exist. It is possible that we may have omitted some important educational literature by not broadening our search terms. We did not include educational literature from other subspecialties within neurology or within other medical specialties, which may have limited the scope of our findings. The single manuscript we identified that addressed the impact of the pandemic on headache education was based on a single center's experience and may not be generalizable to other programs nationally and internationally. As there were previously documented shortcomings in undergraduate headache medicine education, the nature and extent of the pandemic's impact in this setting are unclear. A lag in publishing experiences and educational outcomes from this era may exist, and more positive experiences reported may also result in a publication bias. It is possible that our personal experiences as medical educators at our own institutions biased our conclusions and interpretations of the literature.

Challenges

- Cancellation/limitations of in-person scientific and educational meetings.
- Limited in-person networking, mentoring, and social opportunities; the novelty of virtual social events has worn off making continued team-building efforts difficult.
- “Zoom fatigue” with virtual didactics, with more participants turning their videos off.
- Blurred boundaries between home/work life with increased virtual access to work.
- Procedure-based education was stopped/limited.
- Shifts to inpatient coverage/redeployment reduced outpatient and sub-specialty clinic exposure.
- Increased fear and anxiety, increased suicidal ideation in some settings.
- Inadequate assessment tools to identify educational gaps specifically caused by the pandemic.

Opportunities

- Increased flexibility with virtual educational sessions; younger trainees seem to have a higher rate of satisfaction with virtual didactics [39].
- Residency program social media campaigns increased significantly after the start of the pandemic, facilitating communications with interested medical students [40].
- Improved access to national meeting content for trainees (though cost can still be a barrier).
- Increased geographically-distant and institutionally-diverse collaboration.
- Increased camaraderie/solidarity in medicine.
- Improved wellness initiatives and greater institutional acknowledgement of its importance.
- Larger audiences for grand rounds and lectures with international speakers from diverse fields.
- Trainees acquired a skillset in telemedicine.

Fig. 1 Challenges and opportunities in education during the pandemic

Conclusions and Future Directions

Many educational challenges persist, and many challenges have yet to be uncovered in the eventual aftermath of this pandemic. We may just be starting to identify the ways in which the pandemic has impacted our trainees and may still see large learning gaps revealed over the next few years. It is therefore crucial to identify as many educational gaps in the coming years as possible so that we can help our trainees and colleagues to rectify them. Identifying the proportion of encounters on telemedicine and the proportion of inpatient to outpatient care may help to identify particularly at-risk trainees. We may have to modify the assessment and evaluation processes accordingly, especially with sub-specialty performance removed from the ACGME milestones and United States Medical Licensing Exams moving to pass/fail scoring. We must carefully forge with intention the educational paradigms of today as we move into our post-pandemic future.

So, what should be held on to in the years to come? We believe the flexibility afforded by virtual formats is something to keep, but not at the expense of meaningful connection and hands-on experience. Normalization of remote work has provided more options for educators and adult learners with young families and other home responsibilities. We hope that educational conferences, for example, continue to provide hybrid options. This may expand access to those who may not have travelled to attend but also provide the opportunity for in-person meaningful connections. Cost-effective options for

trainees and students in particular to attend should be strongly considered by organizations. In headache medicine, though national meetings took a hiatus, the Resident Education for the Assessment and Care for Headache (REACH) program flourished with virtual program deployment for dozens of neurology departments with residency programs during the pandemic [41]. Virtual collaboration should be encouraged, especially when collaborators are geographically distant (we virtually collaborated on this manuscript via Zoom, for example). This modality can continue to enrich grand rounds curricula and facilitate inter-institutional research opportunities for our trainees. We hope to continue telemedicine in warranted clinical circumstances to continue care when patients or clinicians are sick, to alleviate travel times for rural/urban patients, and minimize precious time away from work for patients suffering from disabling headache. We believe transitioning to telemedicine gave our trainees a very important skillset for future practice. However, it is our duty as educators to not exclude from the clinical and learning environment underserved patients without access to telehealth in our communities and subsequently provide the means and opportunities for our learners to care for these vulnerable patients.

Flexibility in remote work, when unchecked, can also create unreasonable expectations of constant access to work, and personal/professional boundaries must be set and respected to prevent burn-out. Although educator and trainee well-being has been an ongoing challenge, we hope that training programs, departments, and institutions continue

to acknowledge their roles in promoting and elevating well-being as a priority. As educators, we must intentionally structure our programs with administrative resources and accountability to support well-being. As headache specialists, we must acknowledge the impact that our work environment has on our health and strive to make that healthier as well. Mentoring structures and activities to foster inclusion, professional and personal growth may be particularly beneficial to our trainees. Education leaders should be well-informed about local, regional, and national initiatives to nominate their trainees for such career development programs. Educators must also be stewards of our institutional resources that support learners, especially but not limited to mental health supports. We must continue to strive for the right combination of in-person and virtual modalities to promote a strong educational environment in headache medicine.

Compliance with Ethical Standards

Conflict of Interest Melissa L. Rayhill, MD declares no conflict of interest. Noah Rosen, MD is a section editor for the journal; he has not been involved in the review of this paper. Matthew S. Robbins, MD receives an editorial stipend from Springer and book royalties from Wiley.

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