

# Training in Neurology: Rapid implementation of cross-institutional neurology resident education in the time of COVID-19

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## Abstract

In-person resident didactics are traditionally limited to the faculty within a single institution. Tele-education efforts have been implemented in neurology to various degrees historically, but the coronavirus disease 2019 (COVID-19) pandemic has necessitated a broad and immediate overhaul in neurology didactic training. To respond to the immediate need for resident didactics, we created a rapid onset, volunteer tele-education didactic series publicized on online forums to the American Academy of Neurology A.B. Baker Section via Synapse and the Women Neurologists Group via Facebook. We describe how, with just 1 week of lead time, we created an ongoing neurology lecture series featuring faculty from across the country lecturing on a diverse range of neurology topics. The series is ongoing and draws upwards of 120 residents per lecture. Tele-education offers unique benefits to enhance the education of all neurology trainees everywhere.

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## Introduction

Neurology is traditionally taught in-person through bedside teaching and live face-to-face lectures. However, the use of tele-education in the form of live or recorded online lectures as a means to supplement in-person neurology residency didactic curricula has been discussed in graduate medical education circles for years. There is considerable evidence to support similar outcomes between in-person lectures and online or video lectures in medical education.<sup>1-3</sup>

The traditional in-person educational method limits residents' exposure to the faculty within their institutions. Despite uniformity of core educational requirements for residents, institutional segregation can create different educational experiences, which can be amplified with increasing degrees of medical specialization. Technology-enhanced tele-education allows exposure to a greater variety of educators than would otherwise be available at any single institution.

Due to the coronavirus disease 2019 (COVID-19) pandemic of 2020, typical in-person didactics were abruptly and completely disrupted. All in-person meetings of more than 10 people were deemed unsafe. Our residency didactics simply could not be completed the traditional way. Tele-education became an ideal way to continue education virtually. Across the nation, several programs took to online meeting platforms to replace their in-person didactics. A great advantage of online video lectures during these uncertain times is that it allows the lecturer and learners to be anywhere while maintaining safe physical distancing. The ability to record online lectures also allows asynchronous review of the information for residents unable to attend the live didactic.

In this article, we describe how we took advantage of the opportunity to rise to the challenges of continuing resident education during the pandemic by creating a cross-institutional

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remote lecture series open to learners from around the world. We reflect on our experience thus far and offer lessons learned for others interested in similar educational innovations.

## Intervention

We created an online open-access collaborative teaching platform using the web-based communication platform Zoom (San Jose, CA). This lecture series was designed to be open to all neurology and child neurology residents. With the help of volunteer faculty from the A. B. Baker Section for Neurologic Education of the American Academy of Neurology and the Women Neurologists Group on Facebook (Menlo Park, CA), we took this lecture series from an idea on March 17, 2020, to its first lecture on March 24, 2020.

Faculty were allowed to select the topic with the sole instruction of attempting to avoid redundancy. All available lecture slots were filled by the end of the day of our first lecture. Due to the interest, we extended the series through the end of May. These slots were likewise filled rapidly by board-certified neurologists.

## Results

From our first lecture on March 24 through May 1, we hosted 29 lectures with a total of 3,013 attendee visits from trainees throughout the United States and beyond. In the first week of lectures (Tuesday, March 24–Friday, March 27), we averaged 83 attendees per lecture. In our last 4 lectures prior to the preparation of this publication (Tuesday, April 28–Friday, May 1), that average had climbed than 50% up to 126 attendees per lecture.

These lectures have been given by 27 different specialists from around the country, representing 24 institutions in 19 states. They were on topics spanning the breadth of neurology (data available at [dx.doi.org/10.17632/dg65wscf9s.1](https://dx.doi.org/10.17632/dg65wscf9s.1)). This included topics that may not be easily covered at all institutions, such as pediatric stroke and neuro-oncologic emergencies. Lecturers have incorporated live Q&A, PollEverywhere questions, and use of synchronous chat features to make the didactics more interactive.

## Lessons learned

Rather than choosing to invite lecturers, we instead chose a more open-source approach and allowed lecturers to join on a

**Table** Benefits, barriers, and lessons learned from the online learning program

	Residents	Faculty	Program directors
<b>Benefits</b>	<ol style="list-style-type: none"> <li>1. Exposure to subspecialty topics not available locally</li> <li>2. Exposure to different pedagogical methods</li> <li>3. Opportunity to interact with other programs</li> <li>4. Additional online resource for learning</li> <li>5. Potential for forming community of learning</li> </ol>	<ol style="list-style-type: none"> <li>1. Opportunity to teach to a wider audience</li> <li>2. Opportunity to interact with other programs</li> <li>3. Career development opportunity with skill development and building resume</li> <li>4. Opportunity to teach for faculty who may lack local opportunities</li> </ol>	<ol style="list-style-type: none"> <li>1. Access to subspecialty experts who are not available within the department</li> <li>2. Resident exposure to pedagogical methods from other programs</li> <li>3. External support for didactic curriculum</li> <li>4. Potential for cross-institutional interactions</li> </ol>
<b>Challenges</b>	<ol style="list-style-type: none"> <li>1. Time zone differences</li> <li>2. Program commitment to allow time for attending the lectures</li> <li>3. Conflict with local lectures, meetings, and clinical responsibilities</li> </ol>	<ol style="list-style-type: none"> <li>1. Lack of skills for virtual teaching</li> <li>2. Lack of familiarity with the online platform</li> <li>3. Lack of recognition at local program for these efforts</li> </ol>	<ol style="list-style-type: none"> <li>1. Integration to local curriculum and resident schedules</li> <li>2. Understanding significance and effectiveness of the participation</li> <li>3. Lack of control (ability to participate in the program development and execution)</li> <li>4. Inability to implement residents' feedback on the program</li> </ol>
<b>Lessons learned</b>	<ol style="list-style-type: none"> <li>1. Need speaker feedback for quality of lectures</li> <li>2. Increasing interactions and incorporating active learning</li> <li>3. Adding case-based or discussion sessions, breakout rooms, round tables</li> <li>4. Formal feedback process for the residents to participate in program development</li> </ol>	<ol style="list-style-type: none"> <li>1. Providing formal recognition as invited national speakers</li> <li>2. Some vetting process for presenters</li> <li>3. Better registration process to be a speaker</li> <li>4. Better ways to recruit speakers</li> <li>5. Developing a core cohort of speakers</li> </ol>	<ol style="list-style-type: none"> <li>1. Involving program directors early on may enhance engagement</li> <li>2. Learning surveys</li> <li>3. Better program structure and organization</li> <li>4. More clear effectiveness needs to be studied</li> <li>5. Program director feedback process needs to be developed</li> </ol>
<b>Actionable items</b>	<ol style="list-style-type: none"> <li>1. Establish process to collect feedback from residents</li> <li>2. Create a simple postlecture speaker feedback survey</li> <li>3. Incorporate active learning sessions</li> <li>4. Survey timing of sessions</li> <li>5. Provide resource for residents to reach out to their program directors and involve them</li> </ol>	<ol style="list-style-type: none"> <li>1. Introduction video on basics of online teaching (how-to video)</li> <li>2. Develop a speaker signup platform/process</li> <li>3. Develop a dissemination plan for recruitment</li> <li>4. Offer certificate of recognition</li> <li>5. Ask for recording lectures</li> <li>6. Identify tools and technologies for hosting and recording</li> <li>7. Provide feedback to the speakers and have a reinvitation process</li> </ol>	<ol style="list-style-type: none"> <li>1. Conduct learning and engagement survey</li> <li>2. Establish a process of feedback and updates</li> <li>3. Identify areas of need and focus for most programs</li> <li>4. Understand integration with the local programs</li> </ol>

volunteer basis. We have demonstrated that this is a feasible method to fill a lecture series and that this method can generate a wide variety of lecture topics that cover content basics (e.g., status epilepticus) but also include topics we may not have otherwise considered (e.g., Parsonage-Turner syndrome) (full topic list available at [dx.doi.org/10.17632/dg65wscf9s.1](https://dx.doi.org/10.17632/dg65wscf9s.1)). Volunteer lecturers were eager to teach and to reach a broader audience. Their contribution is recognized on their curriculum vitae as evidence of external speaking. This approach can continue to be used to build future online lecture series, to encourage participation from neurologists who enjoy teaching and to create content diversity.

Resident feedback has continued to be positive. We frequently receive unsolicited emails from the attendees praising the series. We have also learned there seems to be a great interest from trainees in continuing with a series like this in some fashion.

Given the quick start of the project with urgency and lack of precedence, there are clear areas for improvement. To ensure lack of redundancy and ensure coverage of all critical topics, a loose rubric of the number of lectures within given topical areas could have been provided at the outset. Online lectures also allow the opportunity to formally integrate surveys and serial assessments of attendees. An online platform for safe sharing of lecture materials and recordings could have been created at the outset. We also noted varying levels of comfort with presenting virtual lectures over an online platform that would likely change in the future and could represent an area of future faculty development efforts. We have summarized the benefits, drawbacks, and lessons learned from this program in the table.

## Future directions

Rapid implementation of crowd-sourced, cross-institutional far-reaching tele-education is possible and highly desired by faculty and residents. Starting the process of tele-education has allowed us to take advantage of the traditional quality improvement plan-do-study-act cycle.<sup>4</sup> We are now in the study phase, and have assembled a team to look at how we can continue to improve these lectures that we are currently giving and how we can improve content delivery to residents moving forward. There may also be a role for including medical students and other neurology learners, such as fellows, in this curriculum. Based on what we have seen thus far, there should continue to exist a curriculum given by experts that can be accessed by any trainee regardless of program. This would allow residents access to resources they may otherwise lack. A multi-institutional online didactic series also presents multiple opportunities for qualitative and quantitative education research given the large sample size available. This would allow for rigorous analysis of teaching interventions.

As the next steps, we plan to follow up this initial educational endeavor with a more formal needs assessment to craft an

ongoing cross-institutional curriculum that will enhance the knowledge of all future neurologists. This needs assessment should allow us to ensure that the curriculum we present is addressing areas that will be the most helpful and may include subspecialty topics not broadly available, interprofessional speakers, and more global topics. In the ongoing curriculum, speakers will be directly invited with a goal of keeping a broad representation of speakers from the field. We plan to use learner feedback to ensure that excellent speakers are recognized and invited back. We can use this platform to identify qualities associated with speakers who are highly rated by the residents and use that information to inform faculty selection and faculty development tools in the future.

Disruptions on the scale of a global pandemic force adaptation and innovation and can create opportunities for experimentation and change that otherwise might not have been easily achieved. Just as the global pandemic has made tele-medicine a necessity for safe patient care, so too has tele-education become a necessity for safe neurology education. Increased use of tele-education offers unique benefits to enhance the education of all neurology trainees everywhere.

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## Appendix Authors

Name	Location	Contribution
<b>Daniel J. Weber, DO</b>	St. Louis University, MO	Designed and conceptualized study, analyzed the data, drafted the manuscript for intellectual content
<b>Dara V.F. Albert, DO, MED</b>	Nationwide Children's Hospital, Columbus, OH	Revised the manuscript for intellectual content
<b>Bhooma R. Aravamuthan, MD, DPhil</b>	Washington University in St. Louis, MO	Revised the manuscript for intellectual content
<b>Miya E. Bernson-Leung, MD, EdM</b>	Boston Children's Hospital, MA	Revised the manuscript for intellectual content
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<b>Tracey A. Milligan, MD, MS</b>	Brigham and Women's Hospital, Boston, MA	Revised the manuscript for intellectual content

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