



Overcoming Educational Challenges and Impact of COVID-19 in a Pathology Residency Program

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Abstract

Our program is a 4-year combined anatomic pathology (AP) and clinical pathology (CP) program located in New Hampshire. Prior to the novel coronavirus (COVID-19) pandemic, double-headed sign-outs and multi-headed scope didactic conferences took place daily. On the autopsy service, cases were performed in-house under attending supervision, and forensic cases were performed at the off-site Office of the Medical Examiner. In CP, residents engaged in weekly didactic CP lectures and engaged in in-person resident-attending discussions, laboratory rounds, and direct patient contact on a daily basis. Institutional Universal Guidelines from the Emergency Order from New Hampshire were imposed at the beginning of the pandemic. These included exposure mitigation and employee screening strategies. Changes to resident rotations and didactic sessions, strategies to maintain resident wellness, and the program director perspectives are described. Amid the pandemic, digital pathology, teleconferencing platforms, and social media became important resources for pathology education. Digital platforms allowed groups of people to communicate and watch live presentations while social distancing. In AP, whole slide imaging allowed both attendings and residents to scan slides for personal learning, slide conferences, and didactic learning sessions. Following these measures, we supported the clinical needs of our medical center and learning needs of our residents while enacting social distancing and prevention guidelines early in the pandemic. Although the full impact of COVID-19 on pathology residency programs is still unknown, we incorporated new facets of communication technologies. These were immensely helpful in maintaining social distancing and helping to reduce the spread of disease.

Keywords

COVID-19, education, pathology resident, residency program, autopsy

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Introduction

To become a pathologist and laboratory director in the United States, a physician must complete a rigorous residency program and learn to manage difficult situations. Many skills are taught throughout residency, including microscopic tissue analysis, laboratory medicine and laboratory management, molecular diagnostics, microbiological diagnostics, forensics, and transfusion medicine.

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Prior to the novel coronavirus (COVID-19) pandemic, double-headed sign-outs and multi-headed scope didactic conferences took place every morning. On the autopsy service, cases were performed in-house under attending supervision, and forensic cases were performed at the off-site Office of the Medical Examiner in Concord, New Hampshire. In CP, residents engaged in weekly didactic CP lectures and engaged in in-person resident-attending discussions, laboratory rounds, and direct patient contact on a daily basis.

At the onset of the COVID-19 pandemic that began to affect New Hampshire in mid-March-to-April 2020, strict hospital-wide social distancing measures were implemented in order to decrease the spread of disease. These measures had a significant impact on pathology residents as well as medical education.¹ New strategies were rapidly put in place to conform to the new institutional rules while keeping the members of our program safe and preserving our culture of learning. Here, we document the challenges that our residency program faced at the onset of the COVID-19 pandemic in regard to resident education and the strategies used to overcome them. Our goals are to document the challenges that were faced throughout the early response to the pandemic, and the methods we used to adapt to them.

Methods

The following is a summary of the Universal Guidelines from the Emergency Order for the State of New Hampshire² that were imposed on an institution-wide level³:

1. Exposure mitigation:
 - a. Use a cloth face covering at all times while inside the building.
 - b. Modify employee schedules to reduce the number of physical interactions.
 - c. Meetings and conferences should be conducted by phone or computer conferencing applications.
 - d. In-person meetings should be limited and employees should maintain a safe distance of at least 6 feet from others at all times.
2. Employees screening
 - a. Each employee should be screened daily for symptoms of COVID-19 and possible exposures before they enter the workplace (see below).
 - b. Employees who are sick or not feeling well are required to stay home and notify their supervisors by phone.
 - c. The screener should ask the following questions:
 - i. Have you been in close contact with a confirmed case of COVID-19?
 - ii. Have you had a fever or felt feverish in the last 72 hours?
 - iii. Are you experiencing any respiratory symptoms including a runny nose, sore throat, cough, or shortness of breath?
 - d. The screener would evaluate the temperature of all employees daily as they enter the building.
 - iv. Are you experiencing any new muscle aches or chills?
 - v. Have you experienced any new change in your sense of taste or smell?

From the Program Director perspective, educating resident pathologists through didactics and hands-on learning while abiding to the new institution-wide regulations was a challenge. To focus the efforts of the administration, the following 3 priorities were set out for our program:

1. Compliance with institutional COVID-19 guidelines to reduce viral transmission:

These guidelines were instituted at a national, state, and institutional level. Local hospital leadership implemented the guidelines swiftly, but the institutional priorities were understandably stretched thin as massive changes to patient care were enacted. These changes included universal personal protective equipment (PPE)/mask policies which were reviewed and updated on a weekly basis, elective procedure cancellations, emergency room visit management, new restrictive guest visitation policies, and dramatic changes in demand to laboratory testing. In the grossing room, it is part of our standard procedure to perform lung tissue frozen preparations and fresh lung processing under the biological safety cabinet (BSC). At the beginning of the pandemic, there was some anxiety over handling placental tissue as well. Because of this, the clinical chart was reviewed for every placenta specimen, and if any COVID-19 suspicion was present, then the fresh processing would be done under the BSC. We also have an institutional policy in place that requires every patient having a procedure to have COVID-19 testing done. The program director worked with the Autopsy director, state medical examiner, and the Pathology Department Chair to ensure that there was a coherent and safe plan for autopsies. As PPE shortages were prevalent throughout the country early in the pandemic, and our Autopsy suite did not have full-room ventilation, our institution quickly enacted a policy wherein hospital autopsies were only performed on patients with a known negative-COVID-19 status. As PPE became more widely available, postmortem examination of patients suspected of having COVID-19 was offered but limited to brain-only evaluation, under special circumstances. The cases were treated as Creutzfeldt-Jakob disease cases, for which we have an institutional policy in place. This includes the use of powered air purifying respirator and covering of the skull with a plastic bag over the Stryker saw. With support from our medical examiner, we began internal validation of a postmortem COVID-19 nasopharyngeal swab testing in August 2020. Our Chair and Autopsy director worked with hospital General Counsel to change the Autopsy consent so that we were able to perform COVID-tests on deceased patients whose families had consented to an autopsy. After the first few months of the pandemic, it became clear that New Hampshire was within a group of states with a low rate of virus-related deaths, but the need to comply with the

newly implemented social distance and travel rules were felt to be all the more important for keeping the virus under control and out of the community. Additional measures included canceling all conference-related travel for the trainees, canceling elective rotations at outside institutions, and canceling visiting medical student rotations. Given the rapidly changing institutional landscape, the Program Director instated brief weekly virtual-meetings with the residents to update them on all relevant information pertaining to the program and department in a timely and transparent manner.

2. Changes to resident rotations:

Our residency curriculum is comprised of 13 4-week rotation blocks per year. Each rotation director evaluated how the new institutional regulations and changes in resources and workflow would affect the residents' experience while on their rotation. Rotations were temporarily adjusted where appropriate, and these adjustments were reevaluated on a monthly basis. The Medical Examiner rotation, for example, was suspended for 3 months due to a lack of appropriate PPE for our trainees. On-site evaluations in Cytopathology were performed by the fellow or histology-techs alone, while the resident on rotation would preview slides from other cases in the resident's room. Residents previewing slides on site were separated in the resident/fellow's room to keep social distancing measures, masks used at all times. In Hematopathology, residents reviewing bone marrows have a separate hematopathology room where they can individually preview slides. To keep the social distancing measures, the resident rotating on hematopathology service was reduced to one, as long as the hematopathology fellow was not on service at the same time. In Transfusion Medicine, residents previously presented to the clinical floors during massive transfusion protocols to assist with orders. At the onset of the pandemic, this was limited to phone assistance to decrease crowding in the operating rooms (ORs). Several rotations, including the Molecular, Microbiology, and Chemistry rotations, were performed remotely for 2 months in order to perform social distancing. Daily webinar check-ins and on-line assignments were offered. The faculty were asked to use the same evaluation forms for evaluation of residents that were used prior to COVID-19. Our evaluations offer an option of "N/A" after certain questions, so that an evaluation element that is not evaluated can be skipped and only the evaluable elements filled out. We also have a narrative box in each evaluation. Faculty described any virtual tutorials that the resident was asked to perform, to account for the independent learning component of rotations that became virtual. For the midyear summative evaluation with the program director, the Accreditation Council for Graduate Medical Education (ACGME) allowed milestone data from the prior period to be used. The Program Director reviewed evaluations, milestones data from the prior period, self-learning portfolios including resident self-assessments, goals and scholarly activities, and wrote a summative evaluation for each resident. Residents were invited to make a socially distanced appointment with the Program

Director to discuss the evaluation, or they could choose to accept the evaluation virtually. It was nevertheless important that residents continued to learn as it was unknown how long the pandemic would last.

3. Wellness:

In addition to making sure our residents were practicing COVID-19-related transmission reduction practices, the emotional wellness of the group was monitored. Most residents in the program were from different states or countries. As news began to emerge about illness and death abroad, many residents learned that their family or friends contracted the disease. One resident learned that the Dean of their medical school had died. Social distancing can degrade support systems that become important for dealing with sadness and fear. This was an area that required monitoring. Wellness counseling offered by the institution was an important resource.

Residents experienced a number of challenges during the COVID-19 pandemic. In addition to the changes to didactic and hands-on learning outlined above, the role that pathology residents would play in clinical response to COVID-19 was often uncertain. Early in the pandemic, the pathology residents at numerous institutions throughout the United States were re-deployed to medical services due to a shortage of personnel.⁴ Pathology residents were also shifted within programs from high risk rotations to remote learning.⁴ Although there was never a personnel shortage at our own institution, plans were laid out in case such a need arose. This would have involved placing postgraduate year 1 (PGY1) and postgraduate year 2 (PGY2) residents on medical services with direct supervision from medical interns and residents. The justification was that PGY1 and PGY2 pathology residents were closer to their medical school training and could function at the level of a senior medical student or intern. The PGY3 and PGY4 residents would be kept in the pathology departments to help with workload. The justification was that these more senior residents had more specialized pathology training that was helpful for the department, and they were farther away from their broad medical school training. The prospect of leaving the lab for direct clinical care, outside of the context of the transfusion medicine service, was stressful to a number of residents. The new weekly meeting with the Residency Program Director was invaluable in addressing the concerns of the residents and disseminating pertinent news.

Discussion

Amid the pandemic, digital pathology, teleconferencing platforms, and social media became great resources for pathology education.⁵⁻⁷ Organizations such as the College of American Pathologists and the United States and Canadian Academy of Pathology offered abundant lectures and resources for resident learning from their homes.^{5,6} The residency program purchased self-directed question banks for the residents working off-site. However, the problem of everyday or on-site training at our

residency program was still a challenge. With the need for social distancing, the use of digital communication platforms became widespread throughout the department. Platforms such as WebEx, Zoom, and GoToMeeting allowed groups of people to communicate and watch live presentations at their workstation, cellphone, or digital tablet. Guidelines for optimal use of these digital platforms have been described elsewhere.⁸

A change that occurred during the pandemic was the August 24, 2020, announcement from the American Board of Pathology (ABPath) of a decrease of the number of autopsies required for primary certification from 50 to 30 cases. Although discussions about changing the autopsy requirements preceded COVID-19, due to the ABPath's recognition that the pathology training curriculum "has significantly expanded to include such areas as molecular pathology, informatics, and laboratory management, and therefore reducing the numerical requirement is a reasonable adjustment." As autopsy cases from patients with unknown COVID-19 status were initially deferred, this change helped offset the initial drop in autopsy cases.⁹ The ABPath also "recognized that the COVID-19 pandemic has affected the number of autopsy cases in some training programs and this adjustment will help those programs" without penalizing the trainees.

In AP, we made use of whole slide imaging (WSI) via the Leica Aperio AT2 scanner (Buffalo Grove) and the Leica eSlide Manager database. These allowed both attendings and residents to scan slides at $\times 20$ magnification or $\times 40$ magnification for personal learning, slide conferences, and didactic learning sessions. In this manner, weekly slide conferences were able to resume, though digital-slide sign-out was not implemented. The residents learned important clinical informatics and Health Insurance Portability and Accountability Act (HIPAA) compliance lessons with the use of digital platforms, such as eSlide and PathPresenter, where cases could be easily shared but deidentification was needed. Tutorials were given to both residents and faculty to learn to use these platforms and expand their teaching/learning techniques. Online digital pathology resources were also used, such as PathPresenter. This platform allowed residents to upload WSIs that were stripped of all patient information, which could then be accessed off-site using a hyperlink or Quick Response (QR) code.¹⁰ Although using the platform initially required training for both attendings and residents, the platform was successfully used for surgical pathology and lymph node slide review conferences. Links to interesting learning cases from slide conferences from both the eSlide manager and PathPresenter platforms were compiled into a shared document with the accompanying diagnosis. This shared document eventually became a valuable new learning resource during board review. Given the ease with which these cases could be shared, some slide conferences such as the Unknowns Conference may remain digital even after the pandemic. A bigger challenge came for examination of digital cytopathology slides which famously require z-stacking, a feature that was not available with our WSI scanner. Given this limitation, cytology slide-review conferences were abandoned until alternative social

distancing measures could be enacted. Early in the pandemic, other strategies were put in place to replace in-person sign-out. After previewing cases on-site, residents would give the slides to the attendings, who would then give feedback through email and messaging services. Although the system likely made learning more difficult for the more junior residents who would have benefitted from real-time feedback, it was more efficient for senior residents who benefitted from more succinct feedback. Given this feedback from senior residents, a similar system may be used in the future for senior residents.

As didactic learning sessions were entirely conducted over WebEx, residents were able to watch from their office. The resident experience was similar to prepandemic didactic sessions, though it is likely they were more susceptible to distractions.

These measures, though effective, still did not exactly replicate the prepandemic teaching and learning process. Our medical center, as well as our state, enacted social distancing and prevention guidelines early in the pandemic, which led to a low rate of infection.¹¹⁻¹⁴ Eventually, when the effectiveness of masks became more obvious, in-person sign-out was reinstated. Teaching sessions in our 9-headed scope room have been reinstated, including cytopathology slide lectures, albeit with the residents split in 2 groups in order to maintain adequate social distancing.

In addition to keeping the aforementioned technologies to some degree, we plan to keep the self-directed question banks. Since our experience with virtual meetings have been very favorable, we plan to offer virtual invitations to meetings for all off-site residents.

Conclusion

The full impact of COVID-19 on pathology residency programs is still unknown. All programs likely faced unique challenges, depending on their location and local community infection rate. Our program has adapted to this pandemic, evolving our teaching methods and broadening opportunities for residents to grow and express their concerns. We incorporated new facets of communication technologies that were immensely helpful in maintaining social distancing to help reduce the spread of disease. We believe the COVID-19 pandemic pushed us to adapt along the same track we were on already, but at an accelerated rate. We are optimistic that once the pandemic is over, resident education will have changed for the better.

Authors' Note

All authors participated in drafting and reviewing the manuscript, and contributed equally to this work.

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