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Clinics in Dermatology (2021) **39**, 907–910

Clinics in Dermatology

COVID-19: Important Updates and Developments
Edited by Franco Rongioletti, MD, Leonard J. Hoenig, MD

Dermatopathology resident training and education during the COVID-19 pandemic: Challenges faced and lessons learned ☆

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Abstract Clinical laboratory services and associated training programs faced unprecedented challenges during the coronavirus disease 2019 pandemic. With the introduction of pandemic related strictly mandated institutional policies of physical distancing, dermatopathology rotations, a key component of both dermatology and pathology residency programs, were impacted. In order to adapt to this new environment, a few modifications in resident training and education were introduced at various institutions. These disruptions initiated a change in the standard teaching approach, with a shift from face-to-face learning to a virtual and online model. These adaptations and innovations are discussed here with their likely benefits and limitations.

In an interesting and thoughtful presentation, Jones et al.[1] highlight the disruption of resident and medical student dermatology training caused by the coronavirus disease 2019 (COVID-19) pandemic. Considering the current uncertain and unprecedented circumstances, this contribution is timely for all those involved in educating dermatologic sciences to our next generation. Because dermatopathology is an important component of dermatology training, the authors aptly emphasize the modifications made in the learning approach of this discipline by concisely communicating important points in a dedicated section. I shall further focus and elaborate on the points made by Jones et al.[1] from the perspective of pathologists and laboratory medicine departments and share insights and our viewpoint on the impact of the widespread disruption of laboratory services on resident education in dermatopathology.

Impact on laboratory medicine and pathology

The World Health Organization formally designated COVID-19 as a pandemic in March 2020. As the number of cases escalated internationally, like other aspects of health care, clinical laboratory services and associated pathology training programs in North America faced unprecedented challenges. As strict regulations to contain the case escalation were implemented by government organizations and institutions, proper maintenance of traditional resident education became increasingly challenging. As elective surgical procedures dried up and workload demands increased on certain clinical laboratory services, some pathology departments adjusted by redeploying personnel and residents-in-training to services like molecular diagnostics, diagnostic immunology, transfusion medicine, and informatics.[2] Other

☆ In response to: Jones VA, Clark KA, Puyana C, Tsoukas MM. Rescuing medical education in times of COVID-19. *Clin Dermatol*. 2021;39:33-40.

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https://doi.org/10.1016/j.clindermatol.2021.08.016
0738-081X/

programs adapted by transitioning from a standard to a hybrid on-site and remote training model.[3]

Dermatopathology rotations, a major component of both dermatology and pathology residency programs, were impacted like most other anatomic pathology rotations. The pre-pandemic standard educational modalities used for dermatopathology teaching mainly included traditional multi-head microscope glass slide case sign-outs, theme-based didactic lectures, and use of a gamut of online platforms and applications for learning.[4] The disruptions and interruptions caused by this pandemic initiated a change in the delivery of the standard teaching model, with a general shift from face-to-face learning modalities to more virtual and online tools.

Traditional dermatopathology teaching

Historically, in-person glass slide microscopy on a multi-head microscope had been the center of diagnostic and educational dermatopathology. The resident reviewed slides of all cases, formulated a diagnosis, preferably generated a draft pathology report, and then sat down with a qualified dermatopathologist to review and discuss the cases. Case presentation by the resident while reviewing the slides with the faculty dermatopathologist followed by short practical dialogues had been the tried and tested way of teaching for decades. This method allowed the trainee to observe how an experienced dermatopathologist employed clinicopathologic correlation, used necessary ancillary studies and formulated the final diagnosis. Observing this exercise of dealing with real-life cases in a real-time manner helped dermatology residents develop an overall picture that further strengthened their clinical diagnostic acumen, clinicopathologic correlation and management abilities. For residents who were thinking of a career focused on dermatopathology or Mohs surgery, this exercise was absolutely necessary. Review of cases allowed for a robust discussion and helped in the development of an academic relationship between the student and the teacher. In the past, one pinnacle of this modality could be witnessed at Ackerman Academy of Dermatopathology (New York, NY, USA), where Dr. A. Bernard Ackerman would sit at the helm of a 27-head octopean multi-head microscope, zealously instructing practical and conceptual dermatopathology to a multi-generational full house of medical students, residents, fellows, and experienced dermatopathologists.

Virtual multi-head microscope teaching

With the advent of pandemic-related, strictly mandated institutional policies of physical distancing, performing traditional in-person glass slide microscopy on a multi-head microscope became increasingly challenging. Policies like physical distancing of 6 feet, limiting the number of people in a room, continuous indoor masking, and eye protection (eg, goggles, face shields) made sitting closely together at a microscope untenable. Use of customized portable large plastic or glass protective shields between individuals was initially suggested; however, the idea had logistic and practical limitations. In addition, as the number of surgical procedures and clinics decreased, the volume of dermatopathology specimens also shrunk. This reduced and uneven flow of cases resulted in fewer specimens being reviewed and managed by residents.

As traditional teaching on multi-head microscope became unfeasible, virtual simulation of the multi-head microscope was employed by some pathologists for teaching.[5] A microscope with a mounted camera was used to project live glass slide microscopy on the computer. The live images were then displayed to the trainees via screen sharing through videoconferencing (eg, Zoom, Skype, Microsoft Teams, WebEx, etc.). This technique was used for regular daily sign-outs and slide review sessions. The residents and faculty were able to communicate through speaking or typing questions or comments in the chat box. Institutions with high-quality digital slide scanners and other required technical infrastructure also initiated incorporation of whole slide digital imaging platforms (eg, Aperio ImageScope) for daily operations.[3] In these unprecedented circumstances, these technical innovations came to our rescue, as we were able to virtually continue our multi-head sign-outs with residents; however, these innovations were not without limitations. Because these technologies required robust hardware and software systems, data networks, and storage facilities, which were optimized for digital pathology, the quality of the experience was not uniform. The virtual sign-outs were highly dependent on the familiarity of the presenter with the technology and the resolution of the camera and screen used. Although the pathologist and resident could communicate through speaking and using the chat function, all nonverbal communication and feedback was completely missing.

Didactic lectures via videoconference

The shift of theme-based didactic lectures from in-person to online platforms was much smoother and relatively straightforward. Along with didactic lectures, other recurring conferences like tumor boards and journal clubs were also moved online. This modification in morning conferences or academic half days was welcomed by the current millennial-generation residents. Using videoconferencing, the lectures could be attended from anywhere. This was particularly beneficial in the early phase of the pandemic, when some of the residents and faculty worked from home. This also allowed for a larger pool of presenters from various institutions and hospitals. During this period, the quantity of lectures via videoconferencing increased; however, the quality did not necessarily improve. The major negative feedback from the presenters and attendees was mainly about lack of

Table 1 Benefits and limitations of modifications in resident dermatopathology training and education during the coronavirus disease 2019 pandemic

	Online videoconference lectures	Virtual microscopy	Online learning tools	Social and psychological	Other
Benefits	Quantitative increase in lectures Better flexibility of time and place, "any site, any time" Bigger pool of presenters	Adjunct to traditional sign-outs during pandemic Unknown slide conferences	Many easily available online platforms and apps for self-directed learning Free online resources from professional societies and universities Adds a different pedagogic tool to traditional methods	More time spent at home and around family Removed from stressors of conventional resident life Focused environment for more productive self-study	Acceleration in adoption of new technologies (eg, whole slide digital imaging) Increase in teledermatology, leading to better clinicopathologic correlation for trainees Virtual "coffee breaks"
Limitations	Less-interactive sessions Reduced audience response and visual prompts Diminished quality of lectures	Dependent on quality of available technology, camera, and computer screen resolution Dependent on presenters' familiarity with technology Challenging in cases with high slide count or requiring greater cytologic details Reduced nonverbal communication	Sudden increase in resources during pandemic requires development of structured approach and proper navigation	Social isolation and reduced teamwork Disturbance in work-life balance "Zoom fatigue" Reduced career opportunities for remote learner, "out of sight, out of mind"	Difficult to enroll elective rotations owing to space shortage in resident rooms caused by physical distancing measures

interaction.[3] The presenters expressed concerns including feeling as if chatting to a computer screen, nominal audience response, failure to have an interactive session, and no visual prompts. Some educators deemed that their delivery method online was not as engaging as their in-person presentations.

Online learning tools and resources

In the current era, even before the COVID-19 pandemic, the residents were already using a number of online tools and resources as one method of learning dermatopathology.[3,6] Many easily accessible online websites and mobile-based or computer-based applications provided an interactive platform of teaching images, virtual slide libraries, textbooks, and live or recorded lectures or workshops. During the pandemic, the use of these resources grew exponentially, and a number of leading professional organizations increased the accessibility of educational materials to trainees. The American Society of Dermatopathology[7] provided an excellent resource and list of online educational tools for learning. Some popular online resources included the Clearpath app, myDermPath app, PathPresenter, Dermpath-PRO, and Dermpedia. These innovative pedagogic methods of self-study provided an excellent adjunct to the traditional teaching modalities.

Trainee and faculty perception of change

This paradigm shift in teaching modalities did introduce us to some new and innovative ways of learning; however, some perceived that their use diminished the overall educational experience. A survey[8] of pathology trainees and faculty was conducted about the use of digital pathology modalities during the COVID-19 pandemic. Most of the faculty and program directors in pathology concurred that these modifications had negatively impacted both the quality (59% and 62%, respectively) and effectiveness (66%) of their teaching. This adverse perception was comparable among trainees regarding the influence on quality (59%)

and effectiveness (64%) on their education. There was also a survey of pathology trainees[3] to assess the quality of remote versus the in-person learning experience. The trainees indicated that the remote experience was less useful for reviewing cases, generating reports, and sign-outs with faculty; however, they did find the remote experience to be at par in quality to in-person learning for didactic conferences, unknown-slide sessions or quizzes, and better for quality improvement and research projects. Some of the trainees found the virtual slide review to be difficult, particularly in cases with high slide counts or those which involved assessing cytologic details at high magnification.

Conclusions

The word "doctor" derives from the Latin word "docere," which means "to teach." The COVID-19 pandemic has challenged our ability to teach through traditional methods. According to Professor Albert Mehrabian's 7-38-55% rule about face-to-face personal communication, 55% of personal communication occurs through body language.[9] Although these virtual educational methods are helpful in these unprecedented times, they almost completely lack in the nonverbal aspects of communication and learning. As Jones et al[1] highlighted in their contribution, adaptability and innovation will play a pivotal role in physicians improvising as educators in these trying times. The modifications in dermatopathology resident training have their perceived benefits and limitations (Table 1); however, only time will reveal the long-term effects of these changes. We remain optimistic and hope that we emerge as better doctors and better teachers on the other side of this tribulation.

Conflict of interest

The author has no conflict of interest to disclose.

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