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Teaching Remotely: Educating Radiology Trainees at the Workstation in the COVID-19 Era

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In this bewildering COVID-19 era, physical distancing has created numerous pressures and upended interpersonal relationships as we knew them, from the home front to the grocery store to clinical practice. From the perspective of the academic radiology educator, these new stresses have potential to compromise the valued experience of active side-by-side teaching of trainees at the workstation, which arguably remains the most critical component in the education of our future Radiologists (1–3).

As a remotely positioned academic teleradiologist, I have enjoyed the unique opportunity to educate Radiology fellows and residents at the workstation from afar for over 7 years. While I do not intend to espouse exclusive authority on this topic, I can say with confidence that it is feasible to maintain a constructive, mutually beneficial relationship between attending and trainee despite the physical distance. Whether your trainee is isolated to the office next door or miles away, currently available tools are surprisingly simple to use and enormously helpful in making this experience a positive one for both parties.

THE CHALLENGE

On any regular day our Radiology trainees (particularly our most junior residents) are placed in challenging positions with the onus of tackling image interpretation, accurate reporting, and communication, in many cases on a "trial by fire" basis. Certainly, the immediate availability of the on-site attending for questions and validation on interpretation helps our trainees manage these challenges with greater confidence. And of course, the benefit of the face-to-face encounter cannot be overstated (3–5), in which relationships develop and both parties engage not just with verbal communication and tone of voice but also body language and facial expressions.

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Now that we are intentionally physically distancing, it becomes even more incumbent on us to recognize the difficulty of the trainees' position and do our best to minimize the negative impacts of this "new normal" on their education. In the remote setting, without a direct visual on you as the educator, the trainee may feel abandoned, demoralized, and less motivated to get the most out of the learning experience.

Fortunately, with modern technologies at our disposal, we can get fairly close to the face-to-face encounter by taking greater efforts to communicate with alternate means. Regardless of physical location, a successful interaction with the trainee needs to be based on empathy and respect for the trainee's position and experience. As with any relationship, the remote relationship with trainee can thrive when the trainee feels acknowledged, heard, and valued.

GETTING STARTED

Either the day before or at the start of the workday, provide your trainee with your favored means of contact either by email or in-house messaging platform so you can be reached easily when questions or concerns arise. Similarly, ask for the trainee's best means of contact, be it by text, email, pager or phone.

Give the trainee a call and say hello at the start of the day. Keep in mind that your voice provides the trainee with reassurance and comfort and so a phone conversation at this point would be ideal. Just as you would do in person, ask how they've been, what's new since you last chatted, if toilet paper has been restocked at your local grocery store. . . normal conversational material like that. Formulate a plan and discuss goals for the day, which will likely vary based on clinical rotation and trainee experience. Most importantly, reassure your trainees that despite the distance, they are not alone and that you are available whenever they need you, with no question too fundamental.

Most importantly, plan when the trainee will hear from you next for purposes of read out. Again, this reinforces to trainees that they are on your radar and will not be left stranded. At the time of this writing, we are well into the latter portion of the academic year at most Radiology training programs, so by this point even first years have gained some experience in the image review and dictation process and

most are able to function with some degree of independence. Come the start of the new academic year however, brief discussions for each case reviewed and/or multiple abbreviated read out sessions may be required, depending on experience and comfort level of the trainee. This is something that can be gauged during that first conversation at the start of the day and can be adjusted accordingly as the day progresses.

CASE REVIEW

As you sign off on the trainee's preliminary reports, jot down *specific* small but substantive as well as major changes in reports as well as any discrepancies in findings and interpretations. In anticipation of a planned readout later in the day, keep these comments on a post-it note or open a temporary word document at your workstation. Look for any general trends that can benefit from improvement, for example inaccuracies in reported techniques or word choices that can be improved. Provide specific comments on individual cases, such as expanding a differential diagnosis or pointing out a critical finding that can narrow a differential diagnosis.

Although every educator has different preferences, in general I find it more expeditious to review cases reported by the trainee first, finalize the reports and then discuss any changes and related teaching points later in the day at the prescheduled time.

SCREEN SHARING

The best way to replicate the side-by-side readout experience as much as possible is to provide a context wherein you and the trainee are viewing the same images of a case simultaneously. This can be accomplished through screen-sharing technologies.

There are several platforms available for free or by monthly subscription that offer HIPAA-compliant screen sharing technology that **-are** easy to use with the ability to point, annotate, and even share control of the mouse. Many typically allow for simultaneous video feed from webcams to complement the screen-sharing experience, bringing us a bit closer to the face-to-face encounter at the workstation. These platforms include but are not limited to Zoom (San Jose, CA), Skype for Business (Redmond, Washington) and Microsoft Teams (Redmond, Washington). Consider employing security options such as using passwords to avoid disruption by uninvited attendees which plague larger virtual meetings (so called "Zoom-bombing"). Using a per-meeting ID (rather than personal meeting ID), using the waiting room feature before granting access to guests, disabling the "join before host" function, and locking the meeting once all attendees are present are other security measures that help to maintain the privacy of Zoom meetings. With Microsoft Teams, unique login credentials, multi-factor authentication and encryption are tools that can safeguard protected health information.

Video phone chat applications like FaceTime (Cupertino, CA) and WhatsApp (Menlo Park, CA) might be tempting to use but not all are necessarily HIPAA-compliant and therefore should be used with caution. In house messaging platforms, texting and email are good ways to communicate provided conversations maintain HIPAA compliance, but these don't afford the benefit of hearing the voice of the other party or allow for the free conversational exchange of ideas in an efficient manner.

At my institution, a screen sharing function is built into our PACS (Carestream, Rochester, NY), allowing me to display images on my screen with the trainee viewing the same screen concurrently. With both of us logged in the PACS, a click on the share screen function prompts the pop-up of a unique code which I share with the trainee, granting access of my screen to the trainee. Although the trainee does not have access to the mouse to control the screen, the trainee can watch me scroll, point, measure and annotate as we discuss individual cases over the phone (utilizing multiway phone dialing if more than one trainee is on the line). Not all PACS platforms allow for this function, so it might be helpful to contact your IT department to find out if it is an option for you.

Our division also utilizes Zoom which can replicate the common reading room experience in the context of a daily meeting among all daytime faculty and trainees where attendees can "call out" to other specific attendee(s) to discuss a case at any point during the day. We also take advantage of "breakout room" options within that meeting, accommodating smaller group read out sessions throughout the day.

THE READ OUT

At your prescheduled time, provide feedback constructively using appropriate word choices and tone. If you are not utilizing video for a face-to-face engagement, the trainee will not have your visual cues, facial expressions and body language to react to, so it's even more important to use a voice with nonjudgmental tone and word choices without hurtful criticisms. Go over the individual cases you noted down earlier, and discuss the specific changes you made in your reports. Emphasize teaching points and discuss differential diagnoses on an as needed or case by case basis. I am a strong believer in positive reinforcement, so during my readouts I don't limit discussions to missed findings. I also make a point to emphasize the great calls made by trainees as well.

The readout sessions don't have to be long, but they should be substantive. Session lengths will vary based on the experience level of the trainee with more junior trainees requiring a little bit more time than senior trainees. For first and second year residents, before even making findings on a specific case, I like to discuss the reasoning behind the imaging study in question, the technique involved in performing the study, and what findings one might expect to see to confirm the suspected diagnosis. For third and fourth year residents, a case review could include a discussion on a broader differential diagnosis for a particular imaging finding and a

best fit diagnosis based on the clinical context of the study supported by a review of the patient's electronic medical record. For fellows, a fruitful discussion could include a review of the benefits and limitations of the imaging modality employed, alternative imaging strategies, and subtle anatomic variations that might be evident on the study.

If workflow is slow, don't limit yourself only to cases on hand. Show cases from your teaching file, share cases you saw the same day which you read independently of the trainee, or have a brief discussion of regional anatomy using cases reviewed earlier. Forward related supplementary educational materials to the trainee: on my desktop I keep a folder of publications in PDF format, particularly review articles, that come up frequently in case discussions which I can easily forward by email after the readout concludes.

At the end of the review session, give the trainees a sense of how they are doing, and what they should work on in the future. For example, "You did a great job on these cases, now moving forward let's try to get a few more cases done in the same amount of time" or "Great job with making findings, now let's work on making your reports more concise."

Very importantly, ask the trainee if there are any unanswered questions or anything else the trainee would like to discuss that did not come up earlier. This prompt is often followed by a pause. Pauses often seem to take longer during virtual conversations, so give the trainee a moment to think on it and don't rush this part of the conversation.

If you happen to be reviewing cases by an overnight or end-of-shift trainee with whom you can't directly talk to, consider sending a brief email with feedback on specific cases or just a general statement related to his or her performance. I find that trainees are very happy to receive these communications and nearly always respond positively to this feedback. With the innumerable issues that require attention on your plate, feedback to the overnight trainee is easy to delay and ultimately forget about. Remind yourself that sending an e-mail doesn't take a whole lot of time, is best to send right away after reviewing the case in question, and the trainees appreciate your feedback.

THE BENEFIT TO YOU

In light of the extra effort to reach out to and engage trainees, you may wonder what's in it for you. Of course there's the gratification we all feel when we pass knowledge onto others and inspire them to learn more. Our trainees help to keep us attendings honest and on our toes on the basis of their inquisitive nature and eagerness to learn. Keep in mind that during these difficult times of physical distancing, you are isolated too. You will be lonely and maybe a little despondent yourself. Consider your time with the trainee as your social engagement: if you're like me, you will find that these interactions are the best part of your clinical workday and something to look forward to.

SUMMARY

I recognize what I've put forth here isn't rocket science. Most Radiology educators already follow many of the suggestions posited above in pre-COVID practice, but I hope this serves as a reminder that with a little extra effort, we can continue to do the same even with physical distancing measures in place. Hopefully, you will find as I have that it is possible to engage remote trainees in a positive way, based on a relationship anchored in mutual respect and empathy. Remember that hearing your voice provides reassurance to the trainee that despite the distance, they are not alone and that you are there to support them. Providing specific feedback shows you care about their development as trainees. Just as importantly, in this strange time of physical distancing, this educational interaction becomes a symbiotic relationship, wherein you benefit from socialization as much as the trainee learns from you.

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