



The Impact of Teleradiology on Resident and Fellow Education

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Outline & Disclosures

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Overview of teleradiology intersecting with education in the era of remote work



Understand the resident & fellow perspective regarding teleradiology



Become familiar with an academic faculty perspective of teleradiology use



Summary and take-home points of utilization of teleradiology in academics

THE GROWTH OF TELERADIOLOGY

Teleradiology is growing and it's happening at academic centers

→ The COVID-19 pandemic has accelerated the growth of teleradiology, particularly in academic settings

→ **71%** of academic centers increased home workstations ¹

→ **59%** of community practices increased home workstations ¹

→ Teleradiology growth is expected to continue in the future

→ Market reports project an increase in the teleradiology market from **7.3 billion** USD in 2021 to **14.8 billion** USD in 2026 ²



TELERADIOLOGY IN ITS MANY FORMS

An Academic Radiology Perspective



Intra-organizational teleradiology is reading for one's own institution remotely. **Extra-organizational** teleradiology is reading for external institutions.



Residency programs may have attendings work remotely while **residents read studies on site**. Commonly occurring afterhours and during nights.



Residency programs may have both residents and attendings working remotely while **communicating with one another and onsite staff virtually**.



Organizations may **siphon off excess volume** by employing extra-organizational teleradiologists to reduce volume by employed faculty or residents.

Understanding what's required!

VIRTUAL PLATFORMS

- **Zoom** leads the way as the most used platform among residency programs with **Google Meets** a close second

- Both platforms allow for HIPAA compliance through signing of HIPAA Business Association Agreements (BAA)

- Both platforms allow for live meeting recording as well as screen sharing

- **Zoom** has the added benefit of optimizing bandwidth, allowing it to continue functioning under poor network conditions

Revisiting the Pandemic Impact

In many ways the pandemic accelerated our knowledge of these workflows

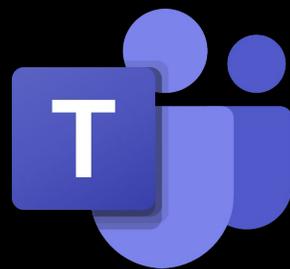


★ **SEEING CASES** is best done at the PACS workstation in a high-volume professional work environment

★ **READOUT** experience is where knowledge and diagnostic judgment are most efficiently passed from one generation to the next... the purpose of residency training.

★ **The COVID-19 pandemic** made one of most essential components of radiology residency (the side-by-side readout) an unsafe practice! This was especially significant for R1s

MITIGATING SOLUTIONS



Variety of enterprise videoconferencing platforms (VCPs) available for “Virtual Readouts” after remote interpretation and live educational conferences.

Virtual Read-Out: Radiology Education for the 21st Century During the COVID-19 Pandemic

Charles H. Li, MD, Anandh G. Rajamohan, MD, Patricia T. Acharya, MD, Chia-Shang J. Liu, MD, PhD, Vishal Patel, MD, PhD, John L. Go, MD, Paul E. Kim, MD, Jay Acharya, MD

LORI A. DEITTE, MD, PRISCILLA J. SLANETZ, MD, MPH

Coronavirus Disease 2019 (COVID-19) and Radiology Education—Strategies for Survival

Sharing experiences and educational approaches between academic radiology departments through journal articles, social media, and national meeting conference sessions

Some of these strategies we learned during the COVID19 pandemic can be adapted to provide a successful educational structure to interaction between residents and faculty who are located in different geographies due to teleradiology

VIRTUAL PLATFORMS IN PRACTICE



Self Learning

- Least affected method of learning
- Recorded lectures allow residents to re-watch recordings as needed and on their own time



Didactics

- Live virtual lectures allow programs to continue resident conferences
- Added benefits of increasing attendance and allowing for guest lecturers from distant locations



VIRTUAL READOUT

- Screen sharing allows readouts to continue remotely
- Annotation from both the host and viewer aids in communication of findings
- “Open” readouts can involve residents from other sites or programs

We're focused here on optimizing the clinical interaction! Although we can and do want to optimize items 1 and 2, those are largely outside the scope of this exhibit!

Effects of Teleradiology by Trainees

Residents and fellows participating in interpreting teleradiology cases

✓ Increased Quality of Life

- Ability to work some fraction from home or even take call from home highly valued and contributes to wellbeing and quality of life¹

✓ Expanded educational opportunities

- Ability to read from sites that may be physically infeasible to commute to in order to expand educational opportunities and see cases that may not be available at home institution

✗ Decreased Faculty Interaction

- Impacts ability to form mentor-mentee relationships with less “face time”

✗ Decrease in quality of Education

- Less opportunity for spur of the moment teaching
- Higher barrier to asking questions of other trainees or faculty because of need to communicate via software¹

Intra-Organizational Teleradiology: Trainee Impact

- ✓ Increased Time for Education
 - Availability of additional faculty can decompress the list allowing for increased time for teaching and readouts

- ✓ Increased faculty availability
 - Availability of faculty when there otherwise would not be one available – for example on call which leads to decreased anxiety/stress regarding call and improved patient care¹

- ✗ Disproportionate negative impact on younger residents

- R1 residents often report lower satisfaction and education when reading out with remote faculty, perhaps because of higher required knowledge base to optimize remote readouts²

- ✗ Decreased faculty-resident connection

¹Spitler, K., Vijayasarithi, A., Salehi, B., Dua, S., Azizyan, A., Cekic, M., Yaghmai, N., Homer, R., & Salamon, N. (2018, October 9). 24/7/365 neuroradiologist coverage improves resident perception of educational experience, referring physician satisfaction, and turnaround time. *Current Problems in Diagnostic Radiology*.

²Koo, S., Yen, A., Obrzut, S. and Hoh, C., 2022. *Resident Education in the time of the COVID-19 Pandemic*. [online] *Journal of Nuclear Medicine*. Available at: https://jnm.snmjournals.org/content/62/supplement_1/2060.abstract

Extra-Organizational Teleradiology: Resident & Fellow Impact

✓ Lower Stress

- Availability of additional help often leads to lower anxiety regarding call and off-hours shifts which may otherwise be unsupervised¹

✓ Increased time for learning

- Ability of outside radiologists to “decompress” worklists so that residents can focus more on educational activities like readouts or informal didactics with on-site faculty



✗ Decreased resident independence

- Clinicians may bypass the resident in order to get a faster interpretation
- Decreased pressure to form a final impression



✗ Missing out on educational cases

- As compared to a remote faculty, extra-organizational teleradiologists may not alert the resident to interesting or educational cases

¹Joffe SA, Burak JS, Rackson M, Klein DA, Joffe MM. The effect of international teleradiology attending radiologist coverage on radiology residents' perceptions of night call. J Am Coll Radiol. 2006 Nov;3(11):872-8. doi: 10.1016/j.jacr.2006.02.014. PMID: 17412187.

Teleradiology and Education: A Faculty Perspective

The Goal

24hr Attending radiologist coverage with fast/accurate results, while maintaining a robust academic/training environment

Rapid turnaround of final reads to assist clinicians in providing the best patient care and minimize length of hospital stay (Especially true in the emergency department and inpatient settings)

The Problem

Increasing imaging utilization and hospital system growth leading to high study volumes and understaffing, making this goal is difficult to obtain without internal or external assistance.

The Solution

Employ additional radiologists working off-site. Two Scenarios:

Employ faculty radiologists to read remotely when not working regularly assigned shifts (intraorganizational)

Academic center employing remote teleradiology services to read studies (extraorganizational)

Institutional-, Faculty- and Trainee-level benefits with this model

Faculty Perspective on Retention, Work-Life Balance and Trainee Education

Four major ways that teleradiology and remote reading can improve the faculty *and* trainee experience

1 Shorter shift lengths

- ✓ Better work-life-balance can improve morale and promote faculty retention
- ✓ Shorter shifts may improve resident retention of salient case findings and pertinent teaching while on shift
- ✓ Increased off-shift time allows more formal and informal learning
- ✓ Shorter shifts are more likely to be possible with teleradiology assistance as commute is not relevant.

2 Offload study volume

- ✓ Excessive study volume can lead to burnout and errors in interpretation, which negatively impacts work environment for faculty and trainees, as well as lead to medicolegal struggles at the institutional level
- ✓ Burnout decreases faculty retention, which places institutions in a constant hiring flux to maintain staffing; continuity in the workplace provides stability and may provide a better environment for learning
- ✓ Decreased study volume allows for reading at a more manageable pace, which promotes more accurate interpretations and increases time for at-the-workstation teaching
- ✓ Decreased volume may increase faculty zest/willingness to pursue other academic endeavors that improve resident education, such as didactic lectures and/or case review conferences

Faculty Perspective on Retention, Work-Life Balance and Trainee Education

Four major ways that teleradiology and remote reading can improve the faculty *and* trainee experience

3 Expert opinion on difficult cases

- ✓ Off-site subspecialty trained radiologists can provide expert consultation on challenging cases, particularly in evening/nighttime hours
- ✓ These consults provide higher level of service for the institution and its constituents, while trainees benefit from real-time problem solving and discussion

4 Remote reading can improve staffing levels, promoted work-life balance, and help with extra coverage (when needed).

- ✓ No commute means less travel expense and less room for unexpected difficulties (traffic, vehicle related issues, etc.)
- ✓ Less time away from family and personal pursuits
- ✓ May help with childcare situations
- ✓ Increased availability for rapid coverage in volume surge situations
- ✓ Ability to augment income for academic radiologists in a competitive environment (extra-duty pay).

Teleradiology: Faculty Perspective on Retention, Work-Life Balance and Trainee Education

Teaching remotely can be a successful endeavor!

Microsoft Teams, Zoom, or similar

Real time readouts with video conferencing, screen-sharing and chatting for case review

Review of Resident Prelim Reports with feedback

Can occur via Teams or similar software; faculty can screen-capture case images and highlight missed findings for educational purposes.

Intraorganizational

Central case repositories can be referenced for teaching by off-site faculty and trainees

Key Takeaways

Teleradiology is a powerful technological tool and is what we make of it: implement it well and use it wisely



Teleradiology can be a key tool to improve trainee educational opportunities and case breadth, increase dedicated time available for education, and reduce stress during call



Good implementation plan is key to avoid detracting from the educational experience by reducing access to interesting cases or restricting resident independence.



Familiarity with and effective use of teleconferencing software by both faculty and residents is key to minimizing impact on education



Use of teleradiology to adequately deal with staffing issues (including fractional FTE coverage) can improve faculty morale and increase faculty time to devote to educational endeavors.



Be aware that distancing faculty and trainees can have negative implications on an organizations culture, including impeding mentor-mentee relationship formation. Work actively against this!