



OBJECTIVES:

Evaluate student feedback regarding the implementation of a computer-based simulation into a medical student diagnostic radiology rotation curriculum.

BACKGROUND:

Traditional diagnostic radiology medical student rotations have primarily involved students observing a radiologist(s) at the workstation dictating studies or interacting with other clinical providers. Medical students may also attend conferences/lectures associated with a radiology residency or present interesting cases to one another, clerkship directors, or residents.

These passive radiology rotations, therefore, are in contrast to other clinical rotations where the student has an active role in patient assessment and treatment. At our institution, we have implemented several activities into our medical student radiology rotations to increase student interaction. For example, one activity involves providing students with multiple (20+) case-based clinical scenarios which are discussed in a group setting. The discussion emphasizes how imaging is utilized according to ACR appropriateness criteria.

To provide an even greater opportunity for active participation, our radiology department decided to offer a simulation experience for medical students. The ability to interact with one's environment and receive feedback has been shown to be a valued aspect of medical educational training for students in their assessment of a rotation or environment experience [1]. The development of a medical student curriculum to meet the need for increased interaction can be balanced with an understanding of radiology workflow with the aid of a radiology simulation [2-4]. Simulation provides students an independent activity to "try" diagnostic radiology by presenting them a set of exams to review and interpret at the workstation on their own with subsequent feedback. This feedback allows the medical student to compare their analysis of the imaging to the radiologist's interpretation (Fig 1) [5].

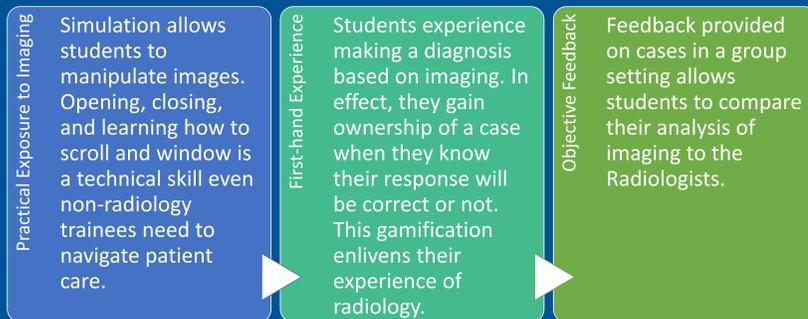


Fig 1: Simulation in radiology clerkship provides technical skills, experience, and opportunity for objective feedback.

Implementation of the medical student simulation was modeled after the 8.5 hr computer-based simulation program which had been designed at our institution. That simulation, over the last four years, has been taken by 538 residents from 34 radiology residency programs. Each radiology resident simulation has consisted of 65 emergent/critical care cases in multiple imaging modalities (taken from a bank of 256 cases) with full image manipulation.

Analysis of resident performance on the simulation has aided in identifying a root cause for "missed" cases. For example, data analysis has allowed us to categorize the type of diagnostic error type (observational vs interpretative) in "missed" cases. Example cases from the simulation program along with a distribution of their error types is shown (Table 1). Determining a root-cause of these errors allows one to target knowledge/educational gaps in resident training.

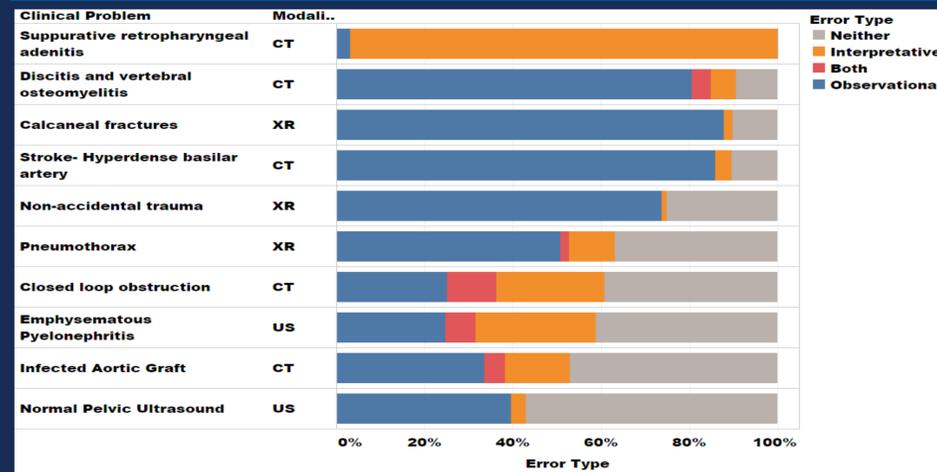


Table 1: Example simulation cases with their representative error types during "missed" cases.

METHODS:

With the student simulation, radiography is the only imaging modality used due to most students being largely unfamiliar with other modalities. The two hr student simulation consists of 25 cases with the answer format as free text. An example case showing an aspirated tooth in the right main bronchus is demonstrated (Fig 2).

Since July 2017, the simulation has been taken by 44 third and fourth year medical students. Each simulation is graded by one faculty member followed by the cases reviewed in a group setting. This review includes a discussion of the pathology represented in the cases and the associated imaging findings. At the conclusion of a student's rotation, they evaluate the diagnostic radiology rotation (including the simulation) via a subjective course evaluation survey form.

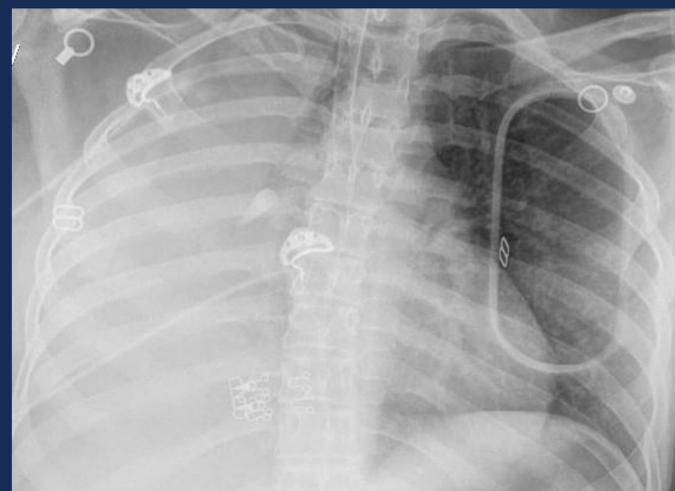


Fig 2: Aspirated tooth in right main bronchus with right lung collapse.

RESULTS:

Course evaluation responses regarding the simulation on the medical student radiology rotations have been highly positive and include the following:

- Enjoying the interactive experience of taking the simulation and understanding the importance of time management.
 - Reporting that the simulation gave them autonomy in formulating their own diagnosis which was not possible by just observing others dictate studies.
 - Enjoying the follow-up discussion of simulation cases in the group setting.
- Negative comments regarding the simulation include the following: Simulation does not encompass dictation system, monitors used during simulation are not of diagnostic quality, and students have no prior experience with the image viewer.

DISCUSSION:

Exposure to radiology for medical students is imperative given the increase in imaging utilization. This ubiquitous use of medical imaging necessitates that all medical students, regardless of their desire to pursue (or not) a career in diagnostic radiology, understand the role of a radiologist and radiology workflow. At our institution, the use of simulation has assisting us in meeting the three key objectives of our medical student radiology rotation which include the following:

- Being able to formulate an imaging plan based on the ACR Appropriate Use Criteria and to recognize appropriate and inappropriate use of imaging.
- Having an opportunity to experience a sampling of radiology workflow at the workstation.
- Being able to discuss imaging in consultation and understand the impact of imaging on patient treatment.

CONCLUSION:

Traditional diagnostic radiology medical student rotations have been passive due to largely involving observation. Although typically limited to radiology resident trainees, introducing simulation to medical students allows for active participation/interaction and student autonomy. Such autonomy is rewarding to the student and allows them to explore radiology in a novel way which may help them determine if radiology is the right career pathway for them.

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