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Radiology Primer: A Novel Radiology Course for Undecided Medical Students

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DESCRIPTION OF THE PROBLEM

Historically, radiology has not been longitudinally integrated into medical school curricula. When included, the content was often limited and focused on supporting foundational sciences material, such as anatomy or pathology. More recently, there has been a national trend toward the earlier inclusion of some radiology fundamentals in medical school curricula, for example, radiation safety and the use of imaging in a problem-based learning case [1,2]. This type of content, however, is far removed from experiencing the daily practice of radiology in a clinical environment [1,3].

Students often get their first exposure to clinical radiology during nonradiology clerkships, when teams seek imaging consultation for their patients. The first opportunity for dedicated clinical radiology training typically occurs during the fourth year, usually in an elective or, at 25% of schools, through a required clerkship [4]. Although late in training, a fourth-year immersive experience can serve general medical students well; it can consolidate miscellaneous information learned on core clerkships and can build on their foundations of clinical knowledge. A late clinical radiology experience is not well suited, however, for students struggling to decide if radiology is the correct career choice [5].

Herein we describe a novel course addition to our curriculum, which we have dubbed Radiology Primer, for undecided third-year medical students.

ADDRESSING THE PROBLEM

Needs Assessment

We began by mapping the slate of courses we offered and their intents. Our two highest enrollment electives included:

- A 4-week fourth-year general radiology elective, didactically focused and intended to teach appropriate imaging utilization to future ordering providers
- A 4-week fourth-year reading room elective, intended for students who plan to pursue radiology as a career, spent in a single subspecialty area, giving students prolonged exposure to faculty members who can become mentors and write letters of recommendation.

For undecided students in their third year, we provided no formal opportunities to help guide their residency decisions. We determined that the best option would be to create an elective with the following characteristics:

- Timing within the middle of the third year: A time frame after clerkships have begun gives students some clinical perspective but still allows plenty of time to consider their career options.
- A short duration: A shorter time commitment would be more efficient for students considering multiple fields, and fitting in a shorter elective would be easier.

Implementation

Providing clinical radiology experiences in the third year is a challenge at many institutions, as the third year is traditionally occupied by a series of required clerkships. However, students at our institution have some

flexibility with vacation time, which they can defer in favor of academic pursuits, including several 2-week third-year electives. Although it was somewhat surprising to us that students would be willing to defer a vacation, the opportunity to explore a field of interest earlier in their training proved an adequate enticement. In fact, as we begin planning for the second year of this elective's offering, enrollment has more than doubled.

We wanted to ensure that only truly undecided students enrolled. We achieved this by creating a widely distributed list of available radiology courses and their descriptions. The majority of students were directed to our general radiology elective, given its broad focus and emphasis on imaging utilization. Additionally, when students expressed interest in this course specifically, we e-mailed a set of questions designed to explore their motivations. If their intent was still unclear, we followed up with a phone call. Focusing on the target audience also allowed a small class size, with adequate individual attention.

Administration

The course administration was unique in that it included a "resident course director" in addition to a faculty course director. The resident course director interacted with students on a daily basis and ran many of the small-group sessions described later. The involvement of a senior radiology resident in this course is part of a broader effort at our institution to develop future physician educators [6]. All residents involved with medical

student teaching receive direct mentorship and oversight from the faculty course director.

Learning Objectives

The course's stated learning objectives were the following:

1. To explore personal interest in the field of radiology and compare and contrast the experience of a career in radiology with that of other fields of medicine
2. To compare the role of radiologists with the roles of other specialists in the patient care arena
3. To appraise specific characteristics involved in a physician-to-physician consult
4. To describe the array of subspecialties that constitute the practice of radiology

The course did not have any medical knowledge objectives. Rather, all objectives were focused on providing exposure to the day-to-day work life of a radiologist. Given that many students were delaying vacation time to take the course, we also tried to make it fun and engaging.

Course Activities and Curriculum

Orientation. On the first day, the faculty course director and resident director met with the students and reviewed the course activities and expectations. The resident director also reviewed the website materials and provided a tour of the department.

Resident Conferences. Students attended twice-daily resident conferences. Many topics are too advanced for medical students and are therefore not ideal for medical knowledge acquisition. As such, we do not include resident conferences in our other electives. Here, the experience provided insight as to the structure of radiology training, the frequency of resident teaching conferences, and an appreciation for the expansive knowledge base required to practice in the field. Additionally, students were able to

interact with the radiology residents before and after the session and ask questions to obtain different perspectives on the field.

Daily Reading Room Observation. The resident course director took the students to their assigned reading room each day and introduced them to the faculty members, fellows, and residents on service. Assignments were made to pair students with instructors who had expressed interest in teaching. In our experience, having engaged instructors is key to students' experiences on service. Each student spent at least 1 day rotating on the interventional radiology service, as exposure is increasingly important with the development of the new interventional radiology direct-pathway residency. Although clinical observation may not sound novel given that reading room electives are common across the country, it does differ from our fourth-year reading room elective in that we intentionally rotate students to multiple rooms opposed to a prolonged period in one subspecialty.

PACS Sessions. Five PACS sessions were developed with the following topics: fractures, lines and tubes, acute abdomen, acute chest, and acute brain. Cases for each included "easy," "medium," and "hard" difficulty levels. The purpose of the easy cases was to capture the students' attention and to boost their confidence. The medium cases were designed to pose a challenge. The hard cases were included to

emphasize that radiology requires extensive training to achieve a high level of proficiency. Each session started with a 5- to 10-min PowerPoint presentation (Microsoft Corporation, Redmond, Washington) giving an overview of the topic. Then the students worked alone or in small groups to preview the cases on a PACS work list. After completion, an instructor reviewed the cases with the students. The intent was not to foster interpretation skills, per se, but rather to give students a flavor of using a PACS for clinical interpretation (ie, these sessions were a simulation for being a radiologist). By comparison, we do not include PACS use in courses intended to teach future ordering providers, given that it will not be part of their eventual skill set.

Discussion Sessions. Students participated in 3 discussion sessions with the resident course director. The topics included radiology fellowship choices, the radiology job market, and outsourcing and computer-aided detection. Students were assigned 3 articles to read beforehand on each topic. These interactive sessions led to lively discussions and were a good opportunity to debunk many of the myths that surround radiology as they relate to career decisions. Additionally, real challenges, such as reimbursement issues and the cyclical job market, were discussed. The intent was to provide students the necessary information they needed to make informed decisions,

Table 1. Student responses as to their estimated likelihood of pursuing a career in radiology at different time points before and after taking the Radiology Primer course

Student	Precourse Survey Likelihood	Postcourse Survey Change From Baseline	Spring of Third Year Survey Change From Baseline
1	0%-10%	+10%	0%
2	30%-40%	-30%	-30%
3	60%-70%	0%	-30%
4	60%-70%	0%	+30%
5	70%-80%	0%	-20%

not simply to present the positives. A resident discussion leader was considered ideal to promote an open dialogue.

OUTCOMES

Five students enrolled in the Radiology Primer course during its first year. All were deciding between radiology and one or more alternate fields.

Before orientation, students were sent an online prerotation survey. Questions assessed their estimated likelihood of pursuing a career in radiology and their current 3 top residency field choices. They were also surveyed as to various “reasons why you are or are not considering a radiology residency” on a 5-point, Likert-type scale with choices including “limited patient care,” “hours/schedule,” “diversity of diseases studied,” “research interest,” “monetary compensation,” “prestige/competitiveness,” “happiness of practicing radiologists,” “lack of patient contact,” “working in a dark room,” “length of training,” “difficult job market,” “declining reimbursements,” and “outsourcing.”

Before taking the course, students were on average 40% to 50% certain that they would pursue radiology. Students were again surveyed immediately after the course. This percentage remained the same, with one student more likely to pursue radiology and one student less likely to pursue radiology. Students were again surveyed in the spring of their third year, with some further stratification of their estimated likelihood of pursuing radiology. Results are presented in Table 1. All students indicated “lack of patient contact” as a negative before and after taking the course. All students listed “diversity of diseases,” “hours/schedule,” “happiness of practicing radiologists,” and “monetary compensation” as positives both before and after the course. With our sample size and survey instrument, we could

Table 2. Student responses as to what information they still needed after taking the Radiology Primer course to make an informed decision about pursuing radiology

Student	Response
1	After taking this elective and having more exposure to the field I think my decision will boil down to if I want to see patients in a clinical setting. Once I've done my Medicine/FCM rotations I will have a better gauge on if I want that as part of my career.
2	I think the biggest thing for me is just exposure to the other fields I am considering. I would also like to get more exposure to IR.
3	I feel this course provided a strong overview to the breadth of radiology as well as the day-to-day practical considerations for a career in the field. At this stage, my decision will likely depend on my perspective on competing specialties, rather than any aspect of radiology. However, I would like to learn more about how radiologists practice in other realms outside of academia. Further perspective on where the field is headed in the future could also be useful.
4	I personally might go back and shadow another day in IR to get a better sense for what a typical breadth of procedures and interactions are in that particular subspecialty.
5	I had many people to speak with, and observed a variety of radiology areas, so I think I have all the information I need.

Note: FCM = family and community medicine; IR = interventional radiology.

not detect a significant change in the students' views of radiology before and after the course.

Students were overall very satisfied with the experience, with a mean

evaluation of 8.6 on a 10-point, Likert-type scale. Students were asked, “After taking this elective, what additional information do you still need to make a decision on

Table 3. List of activities included in the Radiology Primer course, the rationale, and the value such activities may or may not have in a general (eg, core) radiology course or clerkship

Activity	Value in a “Career Decision” Course?	Value in a Core Radiology Clerkship/Elective?
Shadowing in reading rooms	If sufficiently varied, this allows broad exposure to the clinical practice of radiology and the training process.	Less valuable. Relatively little information about imaging utilization conveyed for the amount of time required. A notoriously less engaging format for students.
PACS sessions focused on making findings	Mimics practicing as a radiologist.	Can erroneously suggest that a student or nonradiologist trainee/attending radiologist can obtain proficiency without dedicated training.
Radiology career—focused discussion sessions	Highly valuable.	Only highly valuable to the 5% (the national average) of students who select radiology as a career.
Resident conference	Some value. The format and depth of residency training can be appreciated. Facilitates interaction and discussion with the residents.	Very limited value. Not targeted to student level. Additionally, the focus is often on image interpretation rather than appropriate imaging utilization.

whether or not to pursue a radiology residency?” Their answers are presented in Table 2. Overall, students had obtained the information they needed to aid in the decision-making process, though 2 expressed a desire for more interventional radiology exposure. All 5 students would recommend the elective to others considering radiology, with 3 indicating “Absolutely MUST take before deciding” and 2 indicating “Recommended, if you can fit it into your schedule.”

SUMMARY

We developed a new career-decision-focused course that is novel in several ways:

- The objectives and activities were focused solely on providing information about the training of and careers of radiologists. As

such, it included unique teaching experiences that we intentionally do not include in our general radiology elective for future ordering providers. Our rationale behind these choices is highlighted in Table 3.

- It was scheduled early in the clinical years (ie, the middle of the third year).

Overall, the students were very satisfied with their experience in the Radiology Primer course and felt that they obtained sufficient information to make a career decision. Although we do not expect all institutions to have exactly the same curricular structure or timing flexibility to address these problems in an identical manner, these challenges are common, and a range of similar solutions may be used at various institutions.

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