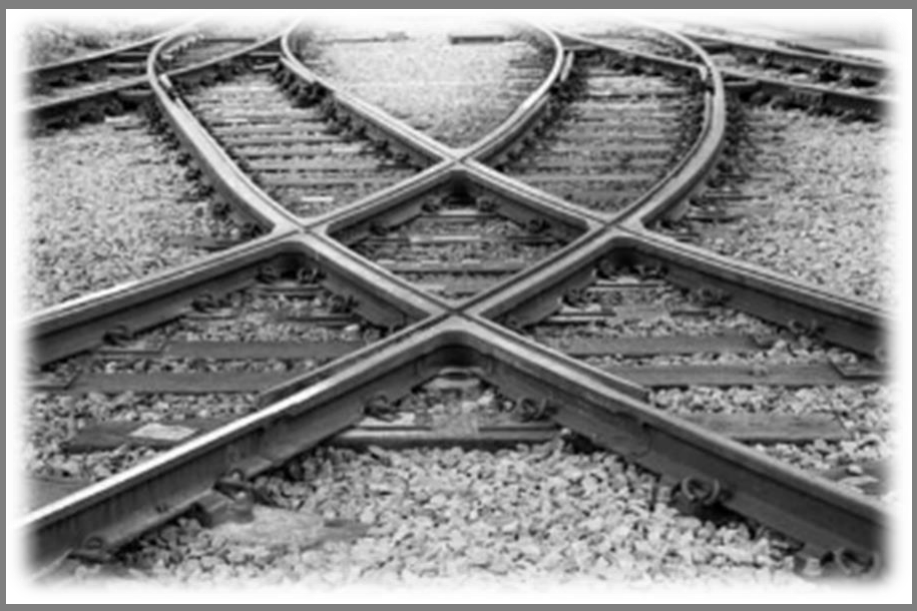
On Track to Success – How Optional Radiology Residency Tracks Provide Leadership Opportunities and Enhance Non-Interpretative Education



By Hernán Bello, MD

Introduction

Allowing residents the opportunity to explore their interests beyond clinical radiology is a fantastic way to introduce our future colleagues to the multifaceted nature of academic radiology and cultivate leadership. Emory Radiology has embraced these tracks, and I believe that this system can be adapted and replicated in a way that is synergistic with the trainees' clinical education and career goals.

Alternative pathways have existed in residency training for many decades. Some entail altering the typical length or structure of clinical training such as part-time residency in internal medicine[1] or accelerated training programs in family medicine[2]. Others have catered to specific societal needs, for example rural or community-focused training in surgery[3] and psychiatry[4]. Special pathways in wilderness medicine or toxicology prepare trainees for future subspecialized clinical practice in emergency medicine[5].

In radiology, dedicated research training during residency has existed since at least the 1980's[6]. Meanwhile, scholarship in radiology has grown ever more diverse and academic institutions are slowly becoming supportive of alternative routes to faculty success apart from the focus on basic science and clinical research. This has led to the organic development of niche areas of scholarly interest shared by both faculty members and, naturally, trainees. It is in this context where optional radiology residency tracks can serve as the perfect avenue for exploration, collaboration, mentorship, and growth. These predominantly non-clinical residency tracks have focused on research, education, administration, leadership, quality improvement, simulation, global and public health, and informatics, among others.

The benefits of residency tracks

Tracks allow residents to explore areas of expertise and advance their professional education in ways that support their career goals without committing to additional years of training. They are a way to offer a more holistic approach to training, going beyond the requirements set by the Accreditation Council for Graduate Medical Education (ACGME). The primary goal of residency is to learn clinical radiology. However, our residents are incredibly smart and naturally curious people that often come to our programs with preexisting and diverse academic interests. This predisposition for innovation should be promoted and not put on hold until after training. Residency tracks represent a positive structure by which to carefully balance learning clinical radiology and pursuing a passion area within medicine.

Setting aside a small amount of time (in our experience usually one day a month) for residents and their advisors to get together and discuss their shared interests serves as a catalyst for relationship-building, peer-to-peer learning, and organic mentorship. These kinds of relationships can otherwise take years to form, if they do at all in a large and busy academic medical center. Potentially counterintuitive, appropriately balancing clinical responsibilities with cultivating an area of personal passion surrounded by a community of peers and mentors invested in your success may be a recipe for combating burnout by gains in sense of belonging and personal accomplishment.

Finally, allowing trainees to cultivate additional areas of interest within academic medicine offers a powerful contrast with the prospect of exclusive clinical practice and has been shown to attract trainees not only into radiology residency but academic medicine more broadly.

Residency tracks offered exclusively to diagnostic and integrated interventional radiology residents at Emory University

There are two residency tracks that medical students can apply to through the Match, Research and Molecular Imaging in Medicine (MIM). MIM is a dual certification clinical pathway that combines training in diagnostic radiology and nuclear medicine. All others are officially presented every year during R1 orientation, when track leaders make a pitch to the group of new residents who then have the option to apply through an internal selection process.

Because of the way residency positions are funded by the Centers for Medicare and Medicaid Services (CMS) if the residents are engaged in patient care activities in U.S. patients, institutional support is mandatory for the success and sustainability of our residency tracks. When residents are on a research elective or outside the country during an international global health rotation, CMS stops providing funding for the resident's salary and benefits. One of the reasons we have been able to provide these tracks is because our department self-funds some of our radiology residency positions, allowing our program the flexibility to have a predetermined number of residents off clinical service at any given time. None of these tracks would be able to function without the continuous support from our department's chairs and educational leadership.

Research

The research track started in 2010 as an adaptation of the Holman Pathway to address the shortage of physician investigators in radiology and to ensure radiology maintains a central role in imaging research[7]. The track provides residents with formal instructional time, a dedicated research course,

space, and equipment, as well as protected academic time spread throughout the 4 years of residency. The program is individualized to each resident who is carefully paired with mentors.

The research track director, Dr. Brent Weinberg, is primarily in charge of the day-to-day operations of the program. This involves the selection of applicants, coordinating resident interviews, ranking candidates, meeting with track residents, coordinating with the residency education team, and ensuring residents make suitable progress. The director is aided by the research track steering committee of 6-8 faculty who assist in the mentorship of track residents.

In brief, successful residents find a lab and mentors, identify a project within the first year, submit research abstracts and attend national meetings, publish articles in relevant journals, apply for research grants, and finally obtain a faculty position at an academic institution where they will continue to grow their research career.

Residents in the research track have consistently obtained Radiological Society of North American and other society grants. They have a higher publication record than non-research track residents (based on unpublished internal data) and tend to continue a successful academic career where graduates often are awarded AUR GE Radiology Research Academic Fellowship (GERRAF) grants as junior faculty. Significantly, many research track graduates are successfully recruited to remain at or return to our institution after fellowship.

Research: Group of research track residents at the Holiday dinner with Dr. Brent Weinberg

Clinical Education

The Clinical Educator Track (CET) was started in 2015 with the objective to provide radiology residents with structured opportunities to practice and home in their teaching skills, to cultivate and develop abilities that will lead to a successful career in academic radiology that includes a focus on teaching[8]. CET's 4-year longitudinal program includes a structured curriculum consisting of three main components: small group series, teaching practicum, and a capstone project.

Residents get together once a month to share ideas, practice teaching skills, and learn from local and external lecturers. While dedicated mentorship and access to teaching different groups of learners are vital components of the track, the impact of the small group series cannot be overstated. The concept of providing a group of like-minded individuals with a full day each month protected from clinical duties to learn and practice education techniques, discuss projects, and share in the excitement of improving their teaching skills was groundbreaking.

CET members achieve success by implementing a capstone project based on their educational research interest or teaching activities. For example, trainees may provide lectures to and facilitate small groups with medical students, radiology technologists, midlevel providers, radiology residents, and residents from other specialties. All activities undergo peer and CET Committee review, currently led by Drs. Smyrna Tuburan and Jesse Conyers. The CET Committee also conducts an annual review with each trainee to provide feedback and to ensure appropriate progression through the program. Past CET capstone projects include the creation of an R1 lecture series and bootcamp, publication of education-related book chapters, RSNA education grant awards, and high viewership of radiology education items on social media.

CET was funded by an intramural grant awarded to Dr. Dexter Mendoza, Emory Radiology's Adopt-a-Resident Award. This started a trend that has proven successful at our institution: Innovative programs conceived by residents and their faculty advisors and brought to fruition through internal funding. CET's leadership structure also proved to be an effective combination of alternating resident leadership and consistent faculty oversight. Other tracks have since followed this blueprint including Imaging Informatics and Global Health.

Clinical Educator Track: Dr. Carolyn Meltzer discussing academic advancement with a group of CET residents

Imaging Informatics

Radiologists are some of the most tech-savvy of medical specialists and are expected to take the lead in the management of imaging information systems. Radiologist can pursue formal training in imaging informatics through a fellowship program, and at Emory, with our Integrated Imaging Informatics track or "I^3T", residence can obtain longitude instruction throughout the 4 years of residency[9]. The informatics track was started in 2017 by a resident-driven initiative funded by an intramural grant following the footsteps of the CET.

The I^3T supports further education for residents interested in the field of clinical informatics, which deals with the management of

information during all steps of the imaging chain – from ordering an imaging test to the communication of findings –using technology such as Electronic Health Records (EHRs), picture archiving and communication systems (PACS), radiology information systems (RIS), hospital information systems (HIS), and many other information technology (IT) tools.

Residents on the I^3T track learn skills needed to improve the quality and efficiency of imaging services while supporting clinical, educational, and research efforts. Many of the track member's capstone projects are designed to improve the residency training experience using innovative IT solutions while gaining hands-on experience in the field through a combination of early exposure to the National Imaging Informatics Course (NIIC), recommended readings and modules, small group discussions and activities, lectures, and organized leadership, operational, and research opportunities.

Leadership and scholarship are embedded in the track, which is led by track members with close mentorship and guidance from the track directors, Drs. Patricia Balthazar and Peter Harri. I^3T members' projects have already changed the residency program for the better, and many past and current members have received prestigious national awards including from the RSNA and SIR.

Informatics Track: Dr. Patricia Balthazar with track member Dr. Hanssen Li at RSNA. Dr Li received the 2023 GE Healthcare/RSNA Research Resident Grant for his project titled "Patient-Centered, AI-Synthesized Video Explanation of Radiology Reports Generated with NLP"

Global Health

The gap in access to radiology is astonishing: two thirds of the world's population have no access to medical imaging[12]. Despite such harrowing statistics, radiology remains a relatively new player in the global health arena. Recruiting and educating new generations of radiologists whose skillset, including cultural and

clinical competency, allows them to design and successfully implement sustainable solutions is key to overcoming these challenges.

Emory University has one the top Public Health Schools in the country and a considerable global footprint. Emory University School of Medicine's (EUSOM) Global Health Residency Scholars Program (GHRSP), a year-long curriculum including a month-long international rotation, has aimed at enhancing and expanding ongoing collaborations between Emory and Ethiopian institutions, particularly Addis Ababa University and Black Lion Hospital, since 2012. It was after my own GHRSP experience as a resident that the need for a radiology-specific global health track became clear. With the help of track co-director Dr. Jay Shah and passionate resident leaders Drs. Zofia Lasiecka and Fiza Khan, the Global Health Track (GHT) recruited its first cohort in July 2021.

The track's global health and policy curriculum aspires to equip residents with the tools to plan sustainable initiatives in resource-limited settings around the world as well as in the United States, while considering specific health care systems, disease patterns, political environments, and cultures. The program consists of monthly small group sessions where residents learn from interactive discussions with local and external radiologists with global health experience, invited speakers from relevant institutions such as the U.S. State Department's President's Emergency Plan for AIDS Relief (PEPFAR), Radiology in Global Health textbook discussions, and journal clubs. GHT residents are also enrolled in the EUSOM-wide GLOBE course, which provides general instruction in public health policy and awards them a Certificate of Distinction in Global Health upon graduation.

Given ultrasound's prominence as a diagnostic tool in resource-limited settings and the longstanding trend in the United States of relying on sonographers for imaging acquisition, the GHT has a

robust hands-on ultrasound curriculum with monthly workshops and simulation labs. Residents are also encouraged to participate in our volunteer-run and resident-driven free ultrasound clinic in Clarkston Georgia, an incredibly diverse city just outside of Atlanta which is also a refugee resettlement site, where they not only gain ultrasound scanning experience but continually develop cultural competency.

Track members are paired with mentors, typically members of the Department of Radiology Global Health Committee, who help guide them as they start to develop their capstone projects. Some of the current projects include performing a radiology needs assessment for Black Lion Hospital in Addis Ababa, Ethiopia after a few years of pandemic-induced travel hiatus; exploring an exchange program between Emory and the residency program in 37 Military Hospital in Accra, Ghana; deploying a breast-imaging specific needs assessment in Clarkston, GA to determine the feasibility of expanding our clinic's services; and contributing with the development of a women's health fellowship in Tanzania. Upon graduation, track members should feel capable of advocating for and working in a team implementing solutions to address access to health care and radiology medical education in a variety of settings.

Global Health Track: Drs. Bello and Shah with a strong representation of Emory GHT residents at the 2022 RAD AID meeting in Washington, DC

Quality Improvement

Radiologists lead quality improvement and patient safety initiatives in both academic medicine and private practice settings alike, not only within the radiology department, but increasingly serving on, and leading multidisciplinary teams.

The radiology residency Quality Improvement and Innovations Track (QI^2) consists of a longitudinal curriculum across the four years of residency with three main components: A radiology-specific QI curriculum organized and administered by the radiology department's quality team, participation in the EUSOM quality improvement and patient safety GME course, and successful completion of a capstone project to deeply explore and

address a quality improvement or patient safety issue with the guidance of a faculty mentor.

The QI^2 track builds essential skills through real-world experience with quality improvement activities, including the resident's capstone project, as well as through structured study and scholarship. Residents in the track can expect a graduate with both a GME Certificate of Distinction in Quality Improvement & Patient Safety with the RNA Advanced Certificate for Quality and Safety.

Additional tracks

There are several 12 to 24-month long residency tracks offered by EUSOM to all GME programs with a more general approach. These include: Medical Innovation, Medical Education, Simulation, Healthcare Management, Ethics, and Health Equity, Advocacy & Policy, in addition to the QI & Patient Safety and Global Health (GLOBE) courses previously mentioned.

The Medical Innovation track is led by Dr. Zach Bercu from Interventional Radiology and Dr. Jeremy Ackerman from Emergency Medicine and Georgia Tech's Biomedical Engineering, with funding from the Georgia Clinical and Translational Science Alliance (CTSA). Guided by their mentors and with the help of a textbook on biodesign, residents receive the foundation to pursue their own innovation projects. Ideally, residents will develop the skills to know how to identify problem, think innovatively about a solution, understand what might be needed next and where to go for support, how to develop and rely upon a team of experts, and how to seek similar resources elsewhere. Residents participate in monthly group sessions where they get to meet honored guest speakers including engineers, regulatory experts, entrepreneurs, and investors.

While not a substitute for a master's level degree, residents should come away from the tract with a sense of, "I can do this!".

Conclusions

Optional residency tracks in radiology offer trainees the opportunity to explore their academic interests without committing to additional years of training. When balanced appropriately, a residency track can complement the primary focus of learning clinical radiology and enhance the trainee's experience of academic medicine, potentially awakening an area of personal and professional passion that may otherwise have gone unexplored. Tracks are an excellent way of forming community and building relationships around a common goal, serving as a catalyst for collaboration between peers and for organic mentorship to develop, which can be otherwise challenging in a large academic medical center.

Institutional backing is key for the success of residency tracks, not only because of funding needs, but because a culture of support for the holistic development of residents should permeate the organization. Providing residents with a nurturing environment dedicated to pursuing their passions in academic medicine may provide a way to combat burnout and boost recruitment into academic radiology.

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Further reading:

- Emory Radiology Residency Tracks Website: https://med.emory.edu/departments/radiology/education/diagnostic-radiology-residency/residency-tracks/index.html
- Emory University School of Medicine GME Residency Tracks Website: https://med.emory.edu/education/gme/housestaff/residency-tracks/index.html

Residents from multiple tracks collaborate in the Clarkston Imaging Clinic, our volunteer-run free ultrasound clinic in Clarkston Georgia, where they get hands-on practice with ultrasound, teach volunteer medical students, and help set up and maintain imaging informatics solutions.