Diagnostic Radiology Residency Program

Mayo Graduate School of Medicine

Mayo Clinic Rochester
Rochester, Minnesota
Diagnostic Radiology Residency Program

The four-year Diagnostic Radiology Residency Program at Mayo Clinic Rochester is designed for physicians who want a career in academic radiology or private practice and who have an interest in education and research. It offers:

- Ample, high-quality, hands-on clinical experience
- Solid academic instruction
- Several research training options
- Gradually increasing independence and responsibility throughout the residency

Mayo’s favorable faculty ratio, large patient population and state-of-the-art diagnostic, therapeutic and research facilities combine to create a truly integrated educational experience. The “Mayo way” of graduate medical education ensures you will have the finest teaching and the broadest patient care experience possible during a busy, hands-on residency.

Training at Mayo

Mayo has a long-standing tradition of practicing both the art and science of medicine. As one of the country’s largest and best-known private group practices of academic medicine, Mayo was founded on the belief that physicians need to work together, teach and learn from others, and conduct research to provide sustained, excellent patient care.

Physicians, scientists, residents, students, nurses and allied health staff members work as a team at Mayo. Our staff clinicians and scientists are called consultants in recognition of their teaching and mentoring role in the team.
Program Description

In accordance with requirements submitted by the American Board of Radiology (ABR) for board eligibility, Mayo requires successful completion of a clinical year prior to commencing its four-year Diagnostic Radiology Residency Program. A combined, Rotating Medical Internship/Diagnostic Radiology Residency — as a five-year option — is also available to five individuals each year. When you successfully complete either of these programs, you will be a highly qualified radiologist — ready for the demands of private practice or a subspecialty fellowship position.
Clinical Training

Your clinical training will cover all subspecialty areas of diagnostic radiology. You will participate in radiological examinations, interpretations and interventional procedures while on rotations in every subspecialty.

Rotation Schedule

Following is a list of the rotations offered to our diagnostic radiology residents.

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Number of Weeks*</th>
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<tbody>
<tr>
<td>Introductory Course</td>
<td>4</td>
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<tr>
<td>Pediatric Radiology</td>
<td>10</td>
</tr>
<tr>
<td>Genitourinary Radiology/Urography</td>
<td>8</td>
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<tr>
<td>Nuclear Medicine</td>
<td>26</td>
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<tr>
<td>Body CT</td>
<td>15</td>
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<tr>
<td>Body MR</td>
<td>6</td>
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<tr>
<td>Ultrasound</td>
<td>15</td>
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<tr>
<td>Neuroradiology</td>
<td>20</td>
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<tr>
<td>Vascular/Interventional</td>
<td>13</td>
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<tr>
<td>Cardiac Radiology</td>
<td>3</td>
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<tr>
<td>Hospital/Trauma/Emergency Radiology</td>
<td>12</td>
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<tr>
<td>Chest Radiology</td>
<td>15</td>
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<tr>
<td>Musculoskeletal Radiology</td>
<td>15</td>
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<tr>
<td>Gastrointestinal Radiology/Fluoroscopy</td>
<td>16</td>
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<tr>
<td>Night Call</td>
<td>6</td>
</tr>
<tr>
<td>Mammography</td>
<td>9</td>
</tr>
<tr>
<td>Mayo Clinic Jacksonville</td>
<td>5</td>
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<tr>
<td>Mayo Clinic Scottsdale</td>
<td>5</td>
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<tr>
<td>A.F.I.P. (elective)</td>
<td>6</td>
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<tr>
<td>Float/Elective</td>
<td>6</td>
</tr>
<tr>
<td>Elective</td>
<td>9</td>
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* Total number of weeks does not equal four years due to multiple rotation offerings.
Rotation Descriptions

PGY-1
The program begins with a highly structured orientation course in general diagnostic radiology. This four-week course, which deals with the essentials and fundamentals of radiology, is taught by Mayo’s radiology staff. Audiovisual materials, didactic lectures, round table discussions, independent study, film packets and case discussions are included.

During the rest of the first year, you will participate in film interpretation, special procedures and fluoroscopy under the direct supervision of a staff radiologist. The major emphases are on:
- Musculoskeletal Radiology
- Thoracic Radiology
- CT
- Gastrointestinal Radiology
- Pediatric Radiology
- Ultrasound
- Genitourinary Radiology

PGY-2 and PGY-3
As a second- and third-year resident, you will take rotations through all radiological subspecialties. This two-year period is divided into five-week blocks. While you still work under staff supervision, you will have greater responsibility and function more independently during these rotations. Rotations at both Mayo Clinic Scottsdale and Mayo Clinic Jacksonville are included.

PGY-4
In the fourth year you will be given more responsibility for performing and interpreting examinations. In addition to a rotation in cardiac radiology, you will revisit subspecialty areas, working at a more independent level. Nine weeks of elective time are provided for you to gain additional
expertise in areas of your choice. Most residents choose electives in computed tomography, ultrasonography, interventional radiology, neuroradiology and/or MRI. You also may develop a unique elective course in a specific area of interest.

You may attend the Armed Forces Institute of Pathology Radiology-Pathology Correlation Course in Bethesda, Maryland. Mayo pays the tuition and subsidizes living expenses for this popular off-campus experience. You also are encouraged to return to either Mayo Clinic Jacksonville or Mayo Clinic Scottsdale during your fourth year. Mayo funds authorized travel and living expenses for all rotations at these sites.

Educational Environment

Clinical conferences, formal courses, seminars, small discussion groups, journal clubs and one-on-one instruction are all an integral part of the Diagnostic Radiology Residency Program. This educational environment includes:

• Introductory course for first-year residents
• Didactic and case-conferences (seven per week) given by residents, staff and visiting professors
• Physics/Radiobiology course
• Armed Forces Institute of Pathology rotation
• Faculty-assisted research seminars
• Small discussion groups, journal clubs, one-on-one instruction
• Board review course
• Carmen Diagnostic Radiology Library (ACR & Institution teaching files, texts, periodicals, electronic educational media) with interactive study stations

The Diagnostic Radiology campus includes an MRI Research Laboratory with dedicated staff and an animal research facility.
Physics Education

There are several components to the physics education program for residents:

• Imaging and Radiation Safety Orientation — A 16-hour course offered during the first two months of residency, which presents basic principles of each imaging modality and radiation safety.

• Radiological Physics Course — A 72-hour course covering radiation physics, diagnostic imaging, radiation biology, and radiation protection. The course is offered during the first year of residency. The course is taught by the Department of Diagnostic Radiology’s faculty of eight medical physicists.

• Physics Written Board Review — A series of interactive review sessions offered to residents prior to taking the ABR board exam in radiological physics.

• Informal physics consultation — The Diagnostic Radiology Department’s medical physicists are available to residents for consultation and assistance regarding topics such as clinical imaging principles, research project design and implementation, and radiation safety issues.

Conferences

Seven one-hour radiology teaching conferences are held each week. They encompass all aspects of radiology and include radiology/pathology correlation, resident case conferences, staff case conferences and didactic lectures, visiting professor lectures and satellite teleconferences.

Case Studies

During your third year of study, you will prepare four case-of-the-week presentations. This includes a summary of the pertinent diagnostic imaging procedures of an interesting case, an in-depth discussion of that case, and a current bibliography.
**Practice Board Exams**

During the last six months of your residency, you will spend several hours each week with a consultant in practice examinations that are patterned after the oral board examinations. After each exam the cases will be thoroughly discussed by the presenting staff in an informal setting. These practice exams include:

- Musculoskeletal Radiology
- Cardiac Radiology
- Thoracic Radiology
- Gastrointestinal Radiology
- Mammography
- Neuroradiology
- Nuclear Medicine
- Pediatric Radiology
- Ultrasonography
- Genitourinary Radiology
- Vascular/Interventional Radiology

**Teaching Opportunities**

You will have the opportunity to teach Mayo Medical School students, visiting students from other medical schools, and other residents spending elective time in diagnostic radiology. Normally, this includes discussing cases from the Radiology Teaching File and assisting with daily assignments in film interpretation.

**Advanced Radiologic Life Support Course**

The faculty of the Diagnostic Radiology Department presents an Advanced Radiology Life Support Course™. This course is designed to focus on the unique, life-threatening emergencies that occur within a radiology department. It is designed to teach:

- The proper recognition and treatment of reactions to radiologic contrast material
- The proper use of sedation and analgesic agents employed during interventional procedures
• The proper management of the airway in an emergency situation
• Concepts in basic and advanced life support

This course is fashioned after the Advanced Cardiac Life Support (ACLS) course used to teach physicians and nurses about patient management during cardiac arrest, but tailored to radiologists.

Research Training

All of Mayo’s diagnostic radiology residents are required to present a seminar project during the second year of their residency. Some residents participate in additional research projects during this time. Three additional options are available if you would like more in-depth research experience:

• A one-year research elective
• The Clinician-Investigator Training Program
• A one-year research fellowship

Seminar Project

Your second-year seminar project will focus on a topic of your choice. The seminar is a 30-minute lecture/presentation prepared under the direction of a consulting staff adviser.

These seminars usually are based on a review of Mayo Clinic’s experience with a particular disease or the investigation of a new technology as it relates to a particular problem. Recent seminar topics have included:

• Accuracy of enhanced MRI in detection of recurrent lumbar discs
• Diagnosis of pulmonary embolism by fast CT
• Hepatic cavernous hemangioma: re-evaluation of CT criteria
• MR flow measurements to screen for chronic mesenteric ischemia
• Intraoperative ultrasound after carotid endarterectomy
One-Year Research Elective

If you would like an extensive research experience, you may apply for the one-year research elective. You can conduct this research at the beginning of your residency or during the latter half of your clinical training. One position per year is available for this elective.

An additional year of training is required in your program (five years total) if you select this option. You may pursue an advanced degree (M.S.) in biomedical sciences while taking this elective.

Clinician-Investigator Training Program

Mayo offers a six-year Clinician-Investigator Training Program designed specifically for individuals who want careers as physician-scientists in diagnostic radiology. It includes two years of research training, extensive clinical training and a detailed didactic core curriculum following a clinical internship year. After completing this program, you will have clinical competence in diagnostic radiology and the skills to conduct independent research. You may pursue an advanced degree (an M.S. or Ph.D. in biomedical sciences) while taking this program. For more information contact:
Carlos Paya, M.D., Director
Clinician-Investigator Training Program
Mayo Graduate School of Medicine
200 First Street S.W.
Rochester, MN 55905
MRI Research Laboratory

Basic research in MRI is performed in Mayo’s MRI Laboratory, which is housed in a separate building with a dedicated 1.5 Tesla Magnet for research. Full-time and part-time research is conducted by members of the department, including diagnostic radiology residents and predoctoral and postdoctoral students. This close collaboration with basic research colleagues enhances Mayo’s clinical research, educational programs and daily clinical practice.

Other Research Opportunities

In addition to the options described above, many other research opportunities are available in Mayo’s Department of Diagnostic Radiology, including work in cine CT, image processing and manipulation, and a wide variety of clinically based projects.

Bench to bedside

Mayo is committed to basic and clinical research that leads to better patient care.

Mayo’s hallmark is teamwork —

• Among basic and clinical investigators
• Among investigators and clinical practitioners
• Across Mayo sites
• Between Mayo and other institutions

Mayo people in research —

• 160+ full-time physicians and scientists
• 260+ associates and fellows
• 930+ administrative and allied health staff

Research funding sources —

• Extramural funds = $81 million+
• Mayo funds/other revenue = $54 million+
General Program Information

Patient and Service Mix
As a regional medical center for the Midwest, Mayo Clinic Rochester registers more than 320,000 patients each year. Eighty percent of the clinic’s patients are self-referred and come from within a day’s drive. Although Mayo has a reputation for successfully handling the most obscure and difficult medical problems for people from around the world, common medical concerns are actually the norm. This allows you to see and treat an exceptional variety of illnesses during your clinical training.

Call Frequency
Your call schedule will vary by individual rotation. Mayo follows the recommendations of the Accreditation Council for Graduate Medical Education.

Evaluation
To ensure that you acquire adequate knowledge and develop your technical skills, your performance will be monitored carefully during the course of your residency. You will be evaluated formally by your supervising faculty member after each clinical rotation.

The Diagnostic Radiology Residency Program is continually monitored by the department’s education committee. Elected junior and senior resident representatives are active members of this committee. In addition, you will regularly evaluate the faculty to ensure that your educational needs are being met.
Career Development
You will meet periodically with various faculty members, administrators and the training program director to discuss your professional goals. Mayo recruits many of its staff physicians from its own training programs. Thus, when you successfully complete the Diagnostic Radiology Residency Program, job opportunities may be available at one of Mayo’s group practices. Mayo’s vast alumni network is an asset and resource, providing opportunities in both academic radiology and private practice.

Additional Training
At the conclusion of your diagnostic radiology residency, you may wish to continue your graduate training at Mayo Graduate School of Medicine. Mayo offers radiology fellowships in most subspecialty fields.

If you are accepted for a fellowship, you will continue to receive in-depth, daily, one-on-one training with a consultant. You also will have the opportunity to increase your supervisory and administrative skills. Contact your faculty adviser for more information about these opportunities.

Faculty
In addition to caring for patients in their clinical practices, Mayo Clinic’s radiology faculty members are committed to teaching and facilitating the growth of medical knowledge. Many of our faculty have published and lectured extensively and are highly regarded in their field. You will have direct access to these individuals throughout your training program.
Advisers

You will be assigned a faculty member to serve as your adviser throughout your residency program. Quarterly meetings will be held to discuss your needs and performance, and to provide you with comprehensive educational advice and personal support. Your adviser also will serve as a contact point, introducing you and your family to Rochester and the Mayo system.

Visiting Professors

Approximately eight prominent professors visit the Department of Diagnostic Radiology at Mayo each year. Each visit lasts for two or three days. The professors present their work during noon and/or morning lectures. You also will have the chance to meet with them informally. You are encouraged to take full advantage of these opportunities.

Facilities and Resources

Facilities

The Mayo campus in Rochester includes two hospitals with nearly 1,300 hospital beds and a designated Level One Trauma Center. The campus also includes a comprehensive outpatient medical complex, a variety of research facilities, and several full-service laboratories and on-site pharmacies. More than 800 staff physicians represent virtually all clinical specialties.
Libraries

Main Library System

Mayo’s library system in Rochester has one of the largest medical collections in the world — more than 4,300 journal subscriptions, nearly 353,000 bound volumes, and several medical databases and search engines. The main library provides study space, computers, microfilm readers and reader-printers, translations, duplicating machines, and book ordering and audiovisual services.

Reference librarians can arrange interlibrary loans, perform literature searches, and teach you how to use the computer database services that link Mayo to a global network of scientific information. More than 625 clinical conferences are preserved on videotape each year. You can view these tapes at the library or check them out for use at home.

Branch libraries include a health-related sciences library, two hospital libraries and the Learning Resource Center (LRC). The LRC, devoted mainly to the Mayo Medical School curriculum, offers special collections emphasizing women’s issues in medicine and health, medical education, and ethics.

Radiology Teaching File and Library

The Mayo Radiology Teaching File, which is constantly updated, contains thousands of pathologically proven Mayo Clinic cases. These interesting cases are worked up, researched, and entered into the permanent file for resident education. In addition, we have the American College of Radiology Film and Videodisc Teaching File. The department’s library contains computers for residents and fellows, proprietary database search software, extensive audiovisual materials, and a large collection of pertinent journals and textbooks.
Computer Services

Macintosh and IBM personal computers and software are available for residents and fellows to use. In addition, Mayo’s Microcomputer Education Center provides training in the use of computers for word processing, data collection and data analysis.

Telecommunications System

Mayo’s clinics in Rochester, Scottsdale and Jacksonville are linked via a sophisticated satellite telecommunications system, which provides video teleconferencing and data transmission. Staff in Rochester, Scottsdale and Jacksonville can have live, interactive consultations with physicians and their patients at the other sites via TV monitors. In addition, X-rays, laboratory test results, CT scans, ECG tests, angiograms and pathology slides can be transmitted between sites.

An advanced telecommunications system also is the foundation for Mayo’s unique five-digit telephone dialing and pager system. Physicians can be easily accessed for consultations or updates, strengthening the teamwork among consultants, fellows, residents and allied healthcare staff at all three practice sites.

Dan Abrahams Healthy Living Center

The Mayo Rochester campus offers two on-site exercise facilities, which are available to Mayo’s employees for a nominal monthly charge.
Compensation and Benefits

Vacation and Trip Policy

You may take up to 15 working days (three weeks) each year for vacation.

You will have the opportunity to attend at least one major diagnostic radiology meeting at Mayo’s expense during your residency. If you are selected to present a paper or scientific exhibit at a radiology meeting, you will be given additional time for attendance and your authorized expenses will be paid by Mayo.

Two residents, who are elected by the department as resident representatives, attend the annual meeting of the American Association of Academic Chief Residents in Radiology. Their authorized expenses also are paid by Mayo.

Stipends and Other Benefits

Mayo has highly competitive stipends and a benefits package that includes:

- A comprehensive medical care plan
- Short-term disability insurance
- Voluntary basic life insurance, disability insurance, and family life insurance
- Voluntary additional life insurance
- Voluntary accidental death and dismemberment insurance
- A dental assistance plan
- Excess personal liability insurance
- Professional liability coverage

Additional information about stipends and benefits will be provided during personal interviews.
The Rochester Community

Home of the original Mayo Clinic and the largest IBM manufacturing plant under one roof, Rochester, Minnesota, welcomes thousands of visitors from around the world each year. Rochester, with a population of over 75,000, has the amiable qualities of many small Midwestern towns while offering big-city amenities.

If you’re interested in the fine arts, you’ll find an active network of arts enthusiasts who support a symphony orchestra and chorale, a civic theater, a community art center, and several choruses and bands.

Rochester has much to offer in sports and physical fitness also. Within the city limits are several golf courses; tennis and health clubs; an extensive network of walking, biking and in-line skating trails; nearly 2,000 acres of city parks; and a community recreation center. Several state parks are nearby, and it’s a very short drive to fishing, hunting, hiking, camping, boating, skiing or skating.

The Twin Cities of Minneapolis and St. Paul are only 80 miles north of Rochester. Among many attractions are the nationally famous Guthrie Theatre, the Minnesota Orchestra and the Walker Art Center. Both professional and Big Ten baseball, football and basketball teams are based there. The Twin Cities also have world-class shopping and restaurants, including the Mall of America.

Good housing in Rochester is relatively easy to find and is moderately priced. The school system is one of the best in the state.
Awards

C. Allen Good Travel Award
This award is given annually to recognize outstanding research by a Mayo diagnostic radiology resident. The award paper is presented at the scientific session of the Mayo diagnostic radiology alumni meeting. Travel expenses to and from the meeting are included in the award. In addition, funding is provided to underwrite a trip of up to two weeks to a recognized academic center of the resident’s choosing in the United States or abroad.

McMillan Fellowship Award
This award is given annually to recognize outstanding clinical work by a Mayo diagnostic radiology resident. The award consists of travel expenses to a week-long meeting of the resident’s choice within the United States.

David Reese Award
This award is given to an outstanding resident who has an interest in the political and organizational aspects of radiology. The resident will be given a grant to cover expenses for attendance at the annual American College of Radiology meeting.
Appointments and Applications

There are 10 positions available in Mayo’s Diagnostic Radiology Residency Program each year on a competitive basis. You can enter the combined program, which includes an internal medicine year immediately after medical school or opt to enter the four-year program after one or more years of postgraduate training in a clinical medical field. Appointments are made through the National Resident Matching Program (NRMP).

To apply to Mayo’s Diagnostic Radiology Residency Program, you need to submit the Association of American Medical Colleges (AAMC) electronic application through your medical school dean’s office.

To use this application process, you need the following information:

- Official college, graduate school and medical school transcripts
- An official record of board scores (NBME, FLEX, USMLE, LMCC, VQE or FMGEMS)
- A dean’s letter and two other letters of recommendation
- A curriculum vitae
- A personal statement
- A valid ECFMG certificate (if you graduated from medical school outside of the United States or Canada)

Applications for each academic year, which begins at the end of June, should be completed by December 1 of the previous calendar year. If you are considered for an appointment, you will be asked to visit Mayo Clinic Rochester for an interview with selected faculty. Interviews are conducted from mid-November through early February each year.
Inquiries

If you would like more information, please contact:

Bradley Lewis, M.D., Director
Diagnostic Radiology Residency Program
Mayo Clinic
200 First Street S.W.
Rochester, MN 55905
507-284-5114
8 a.m.- 5 p.m.
Central Time

If you would like to discuss the Diagnostic Radiology Residency Program with Mayo alumni living in your area, please write to us for a list of their names.