Applying for Residency: Interventional Radiology

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Part I: Overview of Interventional Radiology

Description of Specialty, Common condition, types of patients
Interventional radiology is a medical specialty incorporating the imaging skills of a diagnostic radiologist with the manual skills of a surgeon to perform diagnostic and therapeutic procedures. The specialty was recognized as a primary specialty by the American Board of Medical Specialties (ABMS) in 2012. The field of interventional radiology involves using imaging to perform diagnostic and therapeutic procedures across a wide range of organ systems and medical conditions. Areas of intervention can be divided into vascular and nonvascular interventions, which encompasses a wide array of procedures from image guided biopsy and drainage of various organs and fluid collections to angiography for both diagnostic and therapeutic purposes. Interventional radiologists treat a broad group of patient populations including dialysis patients, cancer patients, trauma patients, postoperative patients, gynecology patients, urology patients, infectious disease patients, gastroenterology patients, cardiology patients, transplant patients, hepatology patients, neurology patients and pediatric patients, among other patient populations. In fact, there are only a few patient populations and conditions for which there is not a potential for interventional radiology to be involved.

Career trajectories: academics, clinical, research, teaching, etc.: Interventions Hospital radiologists have a variety of career opportunities from private practice, which tends to be more clinical, to academics, which usually consists of a balance of teaching, clinical practice and research.

Practice Models
Interventional radiologists can practice in a variety of settings and their scope of practice can vary widely depending on the practice and culture of the clinical environment. Many private practice interventional radiologists practice as part of a larger radiology group employing both diagnostic and interventional radiologists. In these situations, there are variable arrangements from the interventional radiologist practicing 100% interventional radiology to some combination of diagnostic and interventional radiology. In academic interventional radiology, a greater percentage of interventional radiologist exclusively practice interventional radiology with any diagnostic component typically being related to
interventional radiology, such as vascular ultrasounds and CT angiograms. In academic interventional radiology, there is usually an expectation to produce scholarly material whether it be primary research, educational materials or in the form of innovation like the creation of new devices or interventional tools.

Residency: Length, typical curriculum
Since becoming its own specialty, interventional radiology, which was traditionally a fellowship after a radiology residency, will no longer have accredited fellowships after the year 2020. There are instead two residency pathways:

1. The **integrated** pathway: 1 year of internship (surgery or medicine) followed by ~3 years rotating through diagnostic radiology followed by ~2 years of dedicated interventional radiology rotations (or ACGME-approved equivalent rotations). Internship is traditionally matched separately followed by a 5-year program combining diagnostic and interventional experience. There are combined programs in which the internship is included (typically surgery) all at one institution (6-years total). The combined programs, at present, are scarcer. While it is more convenient for some applicants to match all at one place, some may prefer to complete internship at a different institution of their choosing, since the internship may be of a different quality than the interventional program.

2. The **independent** pathway: This pathway is for those who decide they want to pursue interventional radiology after choosing a diagnostic radiology residency (or did not want to commit to interventional radiology initially), those who did not match into an integrated program initially, and individuals who started a general diagnostic radiology residency planning to do fellowship, who were affected by the change to a distinct specialty. The Independent pathway is called a residency but for all intents and purposes for the applicant, is more like a fellowship whereby the trainee applies for and matches into a 2-year program for interventional training after completing a full diagnostic radiology residency. Typically, applicants apply during their 3rd year and are on the NRMP match cycle with other radiology fellowships. The 2-year independent program is meant to provide an experience similar to the last two years of the integrated program. Since this is slightly less efficient than the integrated program, it amounts to a total of 7 years of post-graduate training (including the internship year) instead of 6 years for the integrated program.

3. Early Specialization in Interventional Radiology (ESIR): is not a pathway per se but is worth mentioning here. Technically, ESIR is a curriculum in select diagnostic radiology programs whereby a diagnostic radiology resident (selection into the curriculum varies by institution) can complete 12 rotations of interventional radiology experience to will allow him/her to apply for an independent program and potentially only train for one additional year instead of two. ESIR may be thought of as allowing for advanced-placement into the second year of the independent program. This allows the possibility for a diagnostic radiology resident to do a diagnostic radiology residency with ESIR and finish at the same time (6 total years) as an integrated pathway resident.

Some things to think about and controversies: Note not all training programs or institutions are offering both pathways (even ones which presently have an interventional radiology fellowship). As the process evolves, more programs may apply for approval for these programs. ESIR requires approval from the ACGME as well and is a curriculum through diagnostic radiology. A diagnostic radiology residency
without an integrated or independent program may potentially offer ESIR, but not all diagnostic radiology departments have ESIR even if they have an integrated and/or independent pathway program. ESIR residents are diagnostic radiology residents and so they have to apply to independent programs and match separately. Acceptance into ESIR does not automatically mean a resident can continue into the independent residency at an institution (if they have one). Also, programs offering ESIR may have limits on the number of diagnostic residents accepted from a given class of trainees to participate (if everyone is on interventional radiology, who will help read the X-rays?). There is no specific or universal certificate for those who complete an ESIR program and so a case log and some sort of letter from the diagnostic program director will likely be the extent of ‘credit’ that a trainee will receive for completing the program. While is there is an understanding between the program directors that ESIR applicants are anticipating receiving ‘credit’ for the first year of training, this is not contractual and so if an independent program who takes an ESIR resident decides they need to complete the full 2 years (presumably, because their skills are not satisfactory to move into the second year of training), they can do that. The technical expectation is all independent residents are agreeing to train for two years but that the ESIR trainees may be allowed to complete the program in one year. It is unclear on the appeal process if an ESIR trainee disagrees with the independent program’s assessment of their need to complete both years of the program. ESIR is presently very popular and there is debate as to whether this gives those independent applicants an advantage because they come into the independent program with experience and that independent programs may prefer to have trainees for one year rather than two (the fellowship was only one year so this is what many programs are used to). Obviously, all programs are different and there may be programs that prefer training their interventional radiologists ‘from the beginning’ with the continuity of having them for two years. Irrespective of the integrated or independent program or the ESIR and independent program, there is the requirement that interventional radiologists complete a minimum of 1000 procedures during their training. The exact mix of procedures or difficulty of procedures is not specified and was not historically specified for the fellowship. Minimums in some procedure categories will likely be established in the future. Data collection for certain procedures is currently underway for the first classes of interventional radiology residents to serve as benchmark for setting these minimums.

What are the advantages of the integrated program? Well, matching once (not including the internship) and having one program to complete the interventional radiology training to many is an advantage. It is the fastest and most guaranteed route without having to worry about matching again, ESIR and those other details. The potential downside would be for someone who is not sure they want a career in interventional radiology and want to experience diagnostic radiology and then decide. Interventional radiologists get a combined certificate in interventional radiology and diagnostic radiology (IR/DR) and can practice both. That said, interventional radiology residents have to complete and pass the diagnostic and interventional portions of their final certification exams to be able to practice either. This means that if a trainee passes the diagnostic and fails the interventional portion, they get no certification and the same is true if the trainee passes the interventional portion and fails the diagnostic portion. For the independent resident, they have the option of taking the diagnostic portion of the certification exam (since she/he completed a full diagnostic radiology residency) and can practice diagnostic radiology (and potentially interventional radiology) without getting the interventional certification. Some employers,
particularly in private practice, do not require board certification in interventional radiology to get privileges to practice interventional radiology and that the certificate having completed an interventional radiology training program may be sufficient. This gives those independent radiology residents the choice to stop with the diagnostic certificate or go for the combined certificate (IR/DR) whereby not passing the interventional portion does not impact getting credit for passing the diagnostic portion. The final certification exam for diagnostic radiology is an image-rich computer-based exam and the interventional portion is an oral board exam with questions on image interpretation, image guided procedures and periprocedural patient management. Depending on the applicant, doing the integrated or independent pathway may make more sense given the commitment to the specialty, competitiveness of the applicant’s application, tolerance for risk, future career goals and desire or aversion to train at multiple places. There is currently discussion amongst trainees on message boards and other like forums about the motivations of the independent programs to continue to take applicants if they have a steady stream of integrated residents and that the number of independent positions may be fewer than the demand from independent applicants. Given the pathway begins 2020-2021 and the first match for the independent program takes place this year in 2019, it remains to be seen if the supply and demand are well balanced. Over the next few years the validity of this concern will be tested.

Fellowships offered after residency
None

Part II: LIFE AS AN INTERVENTIONAL RADIOLOGIST

Demographics
While recent data is not available, a study using faculty data from 2012 indicates the percentage of black interventional radiology faculty is 1.8%, Hispanic faculty is 1.8%, and female faculty is 7.3%, all of which are underrepresented groups in interventional radiology with respect to the prevalence of these populations in the US census and within medicine (Higgins et al. Underrepresentation of women and minorities in the united states IR academic physician workforce. J Vasc Interv Radiology. December 2016; 27(12): 1837-1844). The Society of Interventional Radiology (SIR) has committees for Women in IR and Diversity & Inclusion to promote diversity in response to these and similar findings.

Earnings Potential
There is a wide range of salaries depending on academic practice or private practice, employed physician or partner and percentage of practice time devoted to IR compared to a mixture of diagnostic radiology and interventional radiology. Other activities such as call may allow for additional compensation. Many private practices may offer a “buy in” where you invest in the practice by paying for a share of the business; like all investments, a buy-in carries risk but has the potential to generate significantly more money on top of a salary generated from clinical work. According to salarysumo.com, the average salary of an interventional radiologist is $371,700 with the lower end being $278,000 and higher end being $485,000. This is a general estimate and can also vary by geography. Needless to say, interventional radiologists are often compensated reasonably well for their contribution to medicine.
**Lifestyle**
This is also highly variable with those who practice at a large academic medical center with level 1 trauma potentially being called in on-call with some frequency and other practices serving outpatient centers or community hospitals being less busy. A mix of diagnostic radiology and interventional radiology can also impact the intensity of the lifestyle. Often, the lifestyle of an interventional radiologist is similar to a general surgeon and less like diagnostic radiology, given the mix of scheduled and emergent cases. The complexity of cases will also depend on the hospital setting, for example large urban referral center, trauma center or an organ transplantation program.

**Academic Medicine**
There are many opportunities to practice in an academic setting with clinical and academic time for research and participation in scholarly activity. Almost every category of research is represented in interventional from those conducting benchtop and translational research to those performing retrospective studies, prospective studies and registries. There are even opportunities for device development and biomedical engineering.

For more information you may wish to see the latest Medscape 2019 Physician Compensation and Job Satisfaction Report for different specialties, listing Radiology at the top of the list, at medscape.com.

**Part III: Applying in Interventional Radiology**

**How Competitive is Interventional Radiology?**
Quite competitive. Last year (2018), interventional radiology was the most competitive specialty in medicine according to NRMP data. There was a 58.3% match rate for those whom interventional radiology was their preferred specialty. This works out to 1.86 applicants per position. This is in comparison to other competitive specialties like dermatology with a 81.6% match rate and a 90.6% match rate for vascular surgery. There are some mitigating factors, however. There are fewer spots in the initial IR matches (compared to past years when radiology graduates entered IR fellowships), and there may be a novelty effect of a new specialty. Additionally, not all of the applicants may be ‘qualified’ to go into interventional radiology and so a more valuable statistic would be the number of minimally qualified applicants (which is hard to define) and their match rate. IR is likely to stay competitive for the near future as there still will be limited spots for this generally well-paying, high-tech specialty.

**Planning the post-clerkship and senior years**
Demonstrated interest in the field is important, as are personal relationships with faculty. For these two reasons, it is wise for most students who are interested in interventional radiology to do an advanced elective in IR and/or an away rotation. This demonstrates interest, and can generate a letter of recommendation from a faculty member in those programs. Ideally, the timing should enable you to get a letter of recommendation prior to applying for residency. A recent applicant gave the following example (as of 3/22/2019): “you could do the second sub-I/away in the July month of your application
cycle. IR applicants have a bit of flexibility in that the mandatory HMS medicine sub-I is not required in order to apply into Interventional Radiology. As such, the medicine sub-I can be done as late as January of your graduating year”.

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Clinical Rotations
All clinical rotations, and the evaluations associated with them, are taken into consideration. Obviously, consistently higher grades are preferable. Programs want to see consistency for excellence because, with what little correlative data we have between medical school and performance in an IR residency, past performance is likely the best predictor of future performance. Rotations on surgery and medicine usually carry more weight than less directly related rotations.

Sub-Internships
See planning post-clerkship and senior years

Away electives
See above

Other Recommended Electives
Any surgical subspecialty or critical care electives can be helpful but are not required. A recent applicant commented, “There is a slight preference among IR program directors for residents that do a surgery intern year (though this is only a requirement in categorical programs). If you decide to apply for surgery intern year, a surgery sub-I month may be helpful”.

Research
Some research experience is valuable and research of some sort in interventional radiology is preferred. You are likely to get a good letter of recommendation from a research mentor, and research experience shows you are knowledgeable about the specialty and have some vested interest. The biggest concern for programs is accepting trainees who don’t complete the program. Having done research helps demonstrate you know what IR is and you are committed to the specialty. Other research is also good but doesn’t indicate interest the same way IR-dedicated research does. An argument can be made too much research is not always a good thing, as highly clinical programs might feel your focus and strength is on research rather than clinical work. That is to say, programs might be unsure of your dedication to coming in on-call at 1 am for a bleeding patient if your interest, as evidenced by 20 papers, seems to be on VEGF release from tumor cells after ablation. The goal is to show a high level of interest in the field but not make research your sole defining characteristic as an applicant. Academic programs may value research highly and may even have a research track, but this is the minority.
National Meetings
Attendance and presentation of a poster or case at national meetings is beneficial but not a prerequisite. National meetings are helpful for networking, getting face time with a variety of program directors and getting a sense of what programs are doing clinically. By going to a national meeting, you may get a better sense of what programs are popular and cutting edge, where most of the teaching faculty for the sessions are from and what their passions are, to help narrow down or add programs to your list of programs. It’s a small field and the faculty at an institution will have an impact on your training experience (personality and interaction with a faculty member, expertise, interests, etc.). A recent applicant commented, “The main IR conference is the SIR annual conference, which offers medical student travel awards and dedicated medical student programming”.

Other degrees
Per the 2018 match data, additional degrees did not confer a statically significant advantage. Additional degrees are nice, especially if you can relate them to your future IR career, but are not likely to make-or-break the application. As mentioned above when discussing research, having a focus on research, especially on an area unrelated to IR, may make a program director take pause and make a judgment (correctly or incorrectly) about your interest in the clinical aspects of the IR residency. Programs want you to be happy training and want you to complete the training. They want to avoid bringing someone in who is very interested in research or business and leaves during the course of training to pursue a business or research venture or completes the program but is miserable.

Part IV: Assessing your Competitiveness

What Criteria do Programs Consider?

1. Grades and your DSA
Naturally, grades are important. Ideally, applicants will achieve a DSA of honors with distinction, and HwD in post-clerkship rotations. Performance clinically and any comments are important in the programs forming an opinion on how the applicant will perform clinically.

2. USMLE Step Scores
Per the 2018 match data, the mean US allopathic medical student Step 1 and Step 2 scores for matched applicants was 246 and 255, respectively. Unmatched applicants had a mean Step 1 and Step 2 score of 242 and 248, respectively. This means there is not much difference in Step scores between matched and unmatched applicants a score in the mid to upper 240’s for Step 1 is beneficial.

3. Research Experience
As noted above
4. Publications
Publications tend to tie into the research experience. A student who is involved in a lot of projects but with few publications suggests the applicant was only superficially involved (not enough to be named on the publication) or the projects didn’t yield a publication. While it may not be the applicant’s fault, it can give the impression of an inability to execute or bring the project to completion. Ideally, applicants would be better served with fewer or small projects resulting in publication than being involved in large research projects that are in various stages of completion. This is a generality but is good advice for most applicants.

5. Extracurricular Activities
Naturally, programs want an applicant who is relatable, friendly, reliable and going to get along well with the culture of the institution and the referring services and physicians. Having extracurricular activities is an important part of being well-rounded. It also gives material to generate small talk during interviews. Extracurricular activities give a window into your personality, but remember you are completing an application for employment. Unusual hobbies and activities may intrigue a selection committee in a positive or negative way. Ideally, applicants should list several extracurricular activities and be prepared to talk in detail about these activities. Listing a hobby or talent an interviewer happens to share but upon questioning, you really don’t know much about, can only harm your chances. If the interviewer gets any sense you are disingenuous with your application, it can severely harm the credibility of other parts of your application. The bottom line is, if you say you like Russian literature, you should know a lot about Russian literature.

Getting an Interview: Attributes Residency PD’s Consider in Granting Interviews:

Letters of recommendation
Most programs require 3-4 letters, often including a by a letter from the Director of the Radiology clerkship from your institution. If you plan a career focused on research, a letter from your research advisor is important as well. Always review the letter of recommendation requirements on the residency websites for the programs you’re interested in for the most up to date information.

How many programs should you apply to?
Given the competitive nature of the specialty applicants should apply to 12-20 programs depending on the perceived competitiveness of their application.

Common questions you may be asked – specialty specific:
● What got you interested in interventional radiology?
● Tell me about the most interesting case you have been involved in?
● What is your favorite type of procedure?
● Tell me about a complication of a procedure you have seen?
● What sorts of things have you been able to do independently?
Communication with Programs: NRMP Code of Conduct for Applicants and Programs

I would recommend sending thank you notes after each interview. It can be by email, but some communication is generally advised as a way of thanking the program for the interview day. Include a few specific comments about the program to show your attention and interest in the program. If you decide a program is your number one choice, it can also be helpful to let them know. It is unlikely to move you to the top of the rank list but if you are on the borderline, it could tip things in your favor. Recent applicants do recommend letting your number one choice know you will be ranking their program first. Programs want to take applicants who want to be there. Many program directors I have spoken to would rather take an applicant with slightly less impressive credential who is very enthusiastic about the program than a highly qualified applicant who does not want to be in the program. If you tell a program you are ranking them number 1, you MUST be sincere. IR is a small field, program directors talk to one another, and your integrity is important, not only to secure a training program but for your career. You never know who is going to become president of the society or chair of a department where you may want to work in the future.

Advocating for Interviews

Since IR is a small specialty, the saying “It’s who you know, not what you know” is partially true. Programs have historically hired residents for a fellowship and were able to receive a report from the residency reflecting actual clinical performance while on IR rotation; the concept of interviewing and hiring a medical student is new since the specialty training transformed to a residency. Looking at board scores, and medical student transcripts are confusing, and it isn’t clear how it translates to a student becoming an excellent IR resident. Program directors may feel a call or email from a faculty member you know to be highly influential. Even a less competitive applicant may get more interviews from a direct communication on their behalf extolling their virtues. This is what program directors are used to when they interviewed residents for fellowship and is familiar. Bottom line—if you are having trouble getting interviews, see if you can get someone in the field to reach out for you. Reaching out to programs is generally not very effective unless you can articulate a reason you would like to interview at a specific program (need to move to the area for family/partner, family member works in the department, etc.).