

Abdominal radiology in the era of the Interventional Radiology/Diagnostic Radiology certificate

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The introduction of the Interventional Radiology/Diagnostic Radiology (IR/DR) certificate and the IR Residency in Radiology is an important advance in radiology education. Among many benefits, the new residency will further the integration of non-procedural-based patient care into radiology practices. In so doing, we hope that academic radiology departments will work toward providing infrastructure for out-patient clinics, hospital admitting privileges, and 24/7 coverage. In our view, the IR/DR Residency will promote the development of these infrastructure needs in radiology departments that currently do not provide them. However, with the dawn of the IR Residency, many questions have arisen regarding its impact on radiology practice, particularly those who sub-specialize in abdominal radiology. One question is how should academic radiology departments be organized in the future? This question has existed for many years, and is typically answered based on local factors. The new IR/DR certificate does not dictate how radiology departments should be organized, but how a department is organized may ultimately influence how IR will be practiced. Therefore, the creation of the new certificate is an opportunity to revisit the issue.

Abdominal radiologists have historically practiced both imaging and intervention in many academic centers. In fact, abdominal radiologists have contributed substantially to the development of non-vascular intervention for the diagnosis and treatment of many gastrointestinal and genitourinary diseases. Many abdominal IR procedures are now the standard of care

and include biopsy, catheter drainage of abscess and other fluid collections, biliary tract and urinary tract drainage, gastrostomy, jejunostomy, and tumor ablations. Many of these procedures were pioneered and developed by academic abdominal radiologists. As a result, radiologists in many academic abdominal radiology divisions continue to practice both imaging and intervention. As such, an organ-system subspecialty focus is maintained in which abdominal radiologists conduct both imaging and intervention in the abdomen. Likewise, the remaining organ-system divisions (e.g., each representing an anatomic region, such as the central nervous system, chest, breast, musculoskeletal, and vascular systems) are composed of radiologists who conduct both imaging and intervention in their corresponding anatomic region. However, many academic radiology departments are organized differently. In this alternative organization, a single, general IR division is composed of radiologists who conduct many of the IR procedures (in several anatomic regions or organ-systems) and little to no imaging. Concomitantly, the radiologists in the abdominal radiology divisions perform abdominal imaging and little to no intervention. The question remains: What organizational structure going forward would lead to optimal patient care, present the best opportunity for the practice of IR to flourish in the future and lead to further research and development? With regard to abdominal radiology, should abdominal radiology divisions in academic departments include radiologists who perform intervention? Should an interventional radiologist also perform imaging? This opinion piece will explain why the authors believe that an organ-based approach to image-guided intervention and

imaging is the optimal structure for the practice of both IR and DR, why it is important that abdominal divisions include abdominal radiologists who continue to practice some level of interventional procedures, and why it is also important for radiologists who practice intervention to perform imaging.

Term definition

First, the terms 'IR' and 'DR' used to describe the new certificate are not mutually exclusive, and therefore should not be used for the purposes of defining two separate entities. 'DR,' or 'diagnostic radiology,' includes interventional radiology procedures. For example, a percutaneous biopsy, one of the most common IR procedures performed today is a diagnostic procedure. 'IR' includes many diagnostic radiology procedures (e.g., aortography, transhepatic cholangiography). Therefore, the two entities are not distinct. To refer to two distinct entities, the more appropriate descriptive terms would be 'imaging' and 'intervention,' because 'imaging' does not include IR procedures (in which there is generally a skin puncture) and 'intervention,' or interventional radiology procedures, typically includes only procedures in which there is a skin puncture. Also, the IR and DR residencies both include imaging and intervention. They both remain within the Radiology department. In other words, an interventional radiologist remains a radiologist, and a diagnostic radiologist will still be performing interventional radiology procedures. This latter point may be 'lost' in the perception of the IR residency; some may believe incorrectly that IR will be taught only in the IR residency. Residents in the DR residency will still be trained in interventional radiology. Residents in the IR residency will be trained in imaging. However, the IR residency will provide more training in IR procedures and peri-procedural care than the DR residency.

Two principles that support an organ-system subspecialty approach to interventional radiology and including intervention in abdominal radiology divisions

The rationale for an organ-system-based IR practice can be based on two guiding principles. The first guiding principle is our observation that disease focus is the 'rule' of medicine. It is acknowledged that medical and surgical practices offer 'general' divisions, such as general internal medicine and general surgery. In addition, there are diseases that cross multiple organ-systems such as oncology, trauma, and genetics. However, specialization is the natural evolution of any growing profession. In medicine, specialization typically occurs first based on broad disciplines, sometimes differentiated by technical expertise (e.g., medicine, surgery, and radiology) but ultimately within each discipline; further specialization is

often based on organ-systems or diseases. When given the choice, in our view, patients with a problem confined to a specific organ would prefer an organ-based specialist rather than a generalist. For example, most patients would choose a pancreatic surgeon rather than a general surgeon for pancreatic surgery. As a result, many medical (e.g., cardiology, nephrology, endocrinology) and surgical (e.g., thoracic surgery, neurosurgery, and urology) practices are organized and sub-specialized by organ-system. Within radiology, this concept is already in practice in breast and neuroradiology where imaging and intervention are almost universally housed within a single subspecialty division.

Surgery is particularly analogous to both diagnostic radiology and interventional radiology because it is a discipline defined by a specific skill set or group of techniques. Radiology is indeed a technique-based specialty; the technique is imaging. However, just as in surgery, radiology has gradually become organ-system-based. For example, articles in general radiology journals and general radiology society meetings are organized for the most part by organ-system. Like the Society of Abdominal Radiology, there are organ-system-based subspecialty societies in neuroradiology, thoracic, musculoskeletal, and cardiovascular radiology among others. Societies that focus on US, CT, and MRI still exist. However, clinical radiology practices in academic radiology departments that are large enough have gradually become organ-system-based, although sometimes co-existing with 'general' divisions. There used to be 'CT divisions' and 'MRI divisions,' but CT and MRI examinations are increasingly becoming organ-system-based in most large academic centers. IR can be viewed as a group of techniques within radiology, like CT and MRI, and could also be included in organ-system-based divisions. As a result, a radiologist who practices both imaging and intervention in the abdomen would be considered an 'abdominal radiologist' or more specifically an 'abdominal interventional radiologist.' The names, 'abdominal radiology' or 'abdominal imaging and intervention' would be more appropriate descriptors of an abdominal division which includes IR procedures as opposed to the term "abdominal imaging" which would describe a practice that does not include intervention.

The second principle is that imaging is the foundation of interventional radiology, and as such, we believe an interventional radiologist should practice both. The need for imaging knowledge during an image-guided procedure is intuitive. An operator cannot accurately guide instruments using image guidance without knowing how to obtain and optimize the images and understanding what the images show. An organ-system-based organizational approach to IR allows both imaging and intervention to be practiced by the same radiologists. The importance of practicing both imaging and intervention

cannot be emphasized enough. Fundamentally, an interventional radiologist is a radiologist. Imaging is what defines an interventional radiologist, and distinguishes radiologists from other 'interventionists' and 'proceduralists' (including surgeons) who generally perform procedures not guided by imaging. It is important that an interventional radiologist knows and practices at a minimum the fundamentals of imaging, including image acquisition and optimization, and radiation dose minimization when using x-rays in its various forms. IR services which exclude organ-system-based imaging as part of their practice may fall behind and not be aware of imaging advances (e.g., new contrast agents and MRI pulse sequences) that can be used to make diagnoses with imaging alone. In addition, an interventional radiologist who does not practice imaging may not be familiar with new and emerging imaging techniques (e.g., PET/CT, MR or US Elastography, and contrast-enhanced sonography) that can be used to guide new IR procedures. IR/DR practices in which IR physicians conduct both intervention and imaging have the best chance to bring new imaging developments rapidly into an interventional radiology practice.

The fact that imaging is included in the IR residency emphasizes the importance of imaging in IR. However, in the future, we believe that additional organ-based subspecialty imaging training will become more important as part of IR sub-specialization. Even with a full DR training as currently constituted, the level of imaging training, in our view, is not sufficient for a diagnostic radiologist to be an organ-system-based subspecialist; hence, many DR graduates currently seek fellowship training, typically in an organ-system. Therefore, after an IR residency training, we believe that there will still be the need for organ-system or disease focus, and that IR/DR-certified 'general' interventional radiologists will increasingly seek subspecialty training in an organ-system-based fellowship. For example, to become an interventional neuroradiologist, IR/DR-certified radiologists (and DR-certified radiologists) will still seek a fellowship in which both imaging and intervention of the central nervous system are included. Similarly, to become an abdominal interventional radiologist, DR- and IR/DR-certified radiologists will seek additional training in an abdominal radiology fellowship. In so doing, these subspecialty radiologists will gain the knowledge and expertise that are comparable to non-radiologists who also are organ-system or disease focused.

What are the obstacles and pitfalls to an organ-system-based abdominal imaging and intervention practice?

The organ-system approach satisfies both principles. However, many radiology departments currently do not have a sufficient number of interventional radiologists to

populate every organ-system division. This may in part be due to an insufficient demand for IR procedures in a particular anatomic region, either because of the size of the practice, patient population, or other factors. Currently, some academic abdominal radiology divisions do not perform any interventions. We believe that excluding intervention from an academic abdominal radiology practice represents a lost opportunity to capitalize on the synergies that are possible with embedded expertise in both imaging and intervention, and falls short of training radiologists in all aspects of the abdominal radiology subspecialty. Although there are abdominal divisions that do not include radiologists who perform intervention, it is possible that with time these abdominal divisions can be populated with radiologists who are trained to do these procedures. In fact, the new IR residency may lead to a greater supply of radiologists who do intervention and can be added to existing organ-system-based divisions. Overall, with an organ-system-based practice model, each division can be built gradually by adding members with interventional knowledge and expertise. Not all radiologists in a given division need to practice intervention. An organ-system approach to an IR practice can be achieved in which only some radiologists in each division practice intervention, a sufficient number to meet the demand.

Regarding the principle that an abdominal radiology practice should include both imaging and intervention, it is challenging to stay current in both areas. However, we believe that it is easier to grasp both the imaging and interventional aspects of a group of related diseases (in addition to the non-radiology signs and symptoms of disease, and other forms of diagnosis and treatment) than it is to learn a group of related IR techniques and apply them across many disparate organ-systems and diseases. Surgeons recognized this many years ago. Overall, there is less to know in an organ-system approach, and the material is easier to learn because it is related and subject to collateral learning. Also, limiting a practice to a smaller group of procedures will facilitate maintaining competency in each, and provide a better means to attain a sufficient volume to achieve expertise.

There is also the question of how to organize and manage the support personnel and technical infrastructure of an IR practice. Some may contend that it is simpler operationally to have one IR division, where all physicians, support personnel, and technical resources are led by one administrative structure. However, we believe that an IR infrastructure organization and management can be independent of an organ-system-based-physician organization. In surgery for example, surgeons are sub-specialized along organ-systems, but the operating room is often independently organized and managed (sometimes by the Department of Anesthesia). A similar administrative structure can be applied successfully to a multi-division, organ-system-based IR practice.

Finally, it is important not to let the current state dictate the future. Just because the current state is not ideal, does not mean we should not work toward what ultimately we believe is the best way to organize. It is axiomatic that practices differ in size and scope; an organ-system-based IR practice requires a sufficient number of physicians who perform intervention to populate each division, and a sufficient patient demand in IR. This opinion piece speaks to large academic centers, and the principles could be applied to large private practices. Smaller groups can organize differently as they do in other specialties. In smaller groups, 'general' interventional radiologists may be sufficient, so 'one size does not necessarily have to fit all.' For large academic centers, recognizing that a general IR division is the current state at many institutions, for those abdominal radiology divisions that do not now include intervention as part of their practice, an initial goal might be a hybrid system where physicians who perform intervention could be included in both a general IR division and an abdominal radiology division.

Summary

In summary, the new IR/DR residency is a welcome advance in radiology education and will incorporate much needed clinical care components into the training programs and practices of all radiologists. As the field of radiology matures and interventional radiology grows in its scope, the organization of IR practices, particularly in academic institutions where all future interventional radiologists will be trained, is critical to the future of

radiology and to the care of our patients. We believe that the practice of interventional radiology should migrate toward an organ-system approach, akin to surgery and other related specialties. Whether and how this might be accomplished will almost certainly vary among institutions. As in other medical disciplines, how a particular IR practice is organized needs to conform to the local environment and wishes of both the healthcare teams and patients. We recognize that the issues surrounding how an individual IR practice is organized are complex and extend beyond the particular aspects described in this opinion piece. Nevertheless, we believe that the subspecialty of abdominal radiology should include radiologists who practice both imaging and intervention, and that IR practices should include both imaging and intervention. The subspecialty of abdominal radiology, the mission of the Society of Abdominal Radiology and of the Journal in which this article appears (heralded by the recent name change) are all founded and based on an organ-system, disease-focused approach that includes both imaging and intervention. In our opinion, an organ-system organization that includes both imaging and intervention aligns with the broader trends in medicine, and is the best way to care for patients and achieve the goals of the subspecialty of abdominal radiology and radiology in general.

Conflict of interest SGS—no conflict of interest to report; DSL—Consultant/Speaker: Amgen Inc., Philips Healthcare, Covidien Ltd, BSD Medical; Research/educational funding: Bayer Healthcare, Ethicon Endosurgery Inc., Endocare Inc., and Neuwave Medical; FTL—Patent holder and royalties, Covidien; Shareholder, patent holder, and board of directors, Neuwave Medical.

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