



Interventional Oncology: Building a Community Hospital Practice

by Brian L. Dunfee, MD

Given the complexity of new methods to diagnose and treat cancer, a multidisciplinary team is now required in order to ensure that all aspects of care are addressed. Diagnostic and interventional radiologists have always been part of this team. More recently, however, an emerging subspecialty known as interventional oncology has taken a larger role in the effort.

The guiding principles of interventional radiology are minimally invasive, precise treatment methods using the latest imaging technology. Throughout the past several decades, interventional radiologists have pioneered many of today's commonly accepted procedures. The success of these procedures and the expanding patient population have resulted in many of these techniques being performed by both interventionalists and non-interventionalists. Such procedures have included:

- Coronary, visceral, renal, and extremity angioplasty and stenting
- Dialysis fistula revisions
- Inferior vena cava filter placement
- Endovascular treatment of varicose veins
- Percutaneous abscess drainages
- Ureteral and biliary stenting
- Recanalization of fallopian tubes
- Various tissue biopsies and drainages.

Previous to the development of such procedures, similar treatments were only obtained by traditional open surgeries, often associated with longer hospital stays, increased patient morbidity, and higher financial costs.

Over the past decade, advances in imaging technology, cancer fighting tools, and knowledge of tumor biology have allowed interventional radiologists to begin treating cancer in a minimally invasive manner. Many of these treatments are used as a last line of therapy for patients after surgery, systemic chemotherapy, and external beam radiation therapy have failed. Increasingly, however, the techniques are used prior to and in combination with other therapies. The potential cost savings from these minimally invasive treatment modalities include minimized operating time, medications and supplies, and complications. More importantly, however, the majority of these procedures can be performed on an outpatient basis, improving patient satisfaction and overall quality of life.

Interventional Oncology Procedures

Every cancer patient will be seen by a diagnostic radiologist, and the majority will encounter an interventionalist at least once during their lifetime. Here's a brief look at the multitude of procedures an interventional radiologist and/or interventional oncologist can perform.

Tissue biopsy for diagnosis. Image-guided tissue biopsy is now the standard for diagnosing disease in the body. With the ever-growing trend of immunotherapy medications and genetic targeting, knowing the primary organ of cancer will no longer suffice. Cancers will be typed and sub-typed in order to gain maximum effect from treatments with minimum side effects (see Figure 1, page 45).

Radiofrequency ablation and cryotherapy. Radiofrequency ablation, microwave ablation, and cryotherapy are commonly used to treat unresectable tumors within the lungs, liver, kidneys, and bones. Under image-guidance, a needle is inserted into the tumor and the device is activated. The tumor and several centimeters of adjacent tissue are either heated to coagulative necrosis or sequentially frozen and thawed, destroying the cancerous cells (see Figure 2, page 45).

Embolization and chemoembolization. Interventional radiologists have long developed techniques for closing off, or embolizing, various blood vessels. These techniques are used extensively in cases of trauma, gastrointestinal bleeding, aneurysms, and other vascular anomalies. In current practice, this concept has been transformed into treating cancers throughout the body. In these procedures, a catheter is inserted into the artery supplying the tumor and various types of particles—with or without chemotherapy—are injected, directly targeting the tumor. The artery is subsequently embolized to prevent oxygen from perfusing the tumor. The most common tumors treated in this fashion occur in the liver and kidneys. This procedure minimizes the dose to other, non-cancerous organs, eliminating the systemic toxicities (see Figure 3, page 46).

Radioembolization with Yttrium-90. More recently, standard embolic agents have been substituted for non-embolic material and impregnated with a radioactive substance called Yttrium-90 to treat tumors of the liver. In a similar manner, the catheter is advanced into the hepatic artery and the radioactive beads or microspheres are injected. Given the higher blood flow to tumors, the majority of the microspheres collects in the tumor bed and irra-

diates it from the inside out. This technology spares the skin and surrounding normal tissue from radiation damage (see Figures 4a-c, page 46).

Immunotherapy. The next generation of embolic agents will most likely involve immunologically or biologically active particles. The agents will allow the immune system to turn against a tumor or simply prevent a tumor's ability to continue replicating. Administering this biotechnology through a catheter placed directly in the tumor will most likely require a smaller dose, at a lower cost, and with decreased systemic side effects. It is quite possible that nanotechnology may also play a role in the future of interventional oncology.

Palliation care. Although the current technologies and advancements in medicine only offer a cure for a small oncology population, the majority of cancer patients now live longer and with a higher quality of life. As the practice of interventional oncology continues to expand, many of the patients will require more palliative care rather than simply treatment. Among the various procedures being performed include draining chest (thoracentesis) or abdominal (paracentesis) fluid, image-guided nerve blocks, radiofrequency ablation of painful bone metastasis, and treatment of vertebral body compression fractures. The diversity of pain management procedures will most likely grow in the future.

Creating an Interventional Oncology Practice

Various levels of interventional oncology services may be offered at a community hospital, depending upon the resources available. Work in conjunction with your hospital administration to determine which level of practice is both desired and feasible. Developing an interventional oncology practice that focuses on the types of cancer most often treated in that hospital is essential for success.

Generally, interventional oncology care is categorized as:

- Level I: Minimal longitudinal care (venous access, biopsies)
- Level II: Intermediate longitudinal care (drainage catheters)
- Level III: Advanced longitudinal care (chemoembolization, radioembolization, radiofrequency ablation).

To offer Level III: advanced longitudinal care, many additions to an interventional radiology department may be necessary, including:

- A reception and waiting area

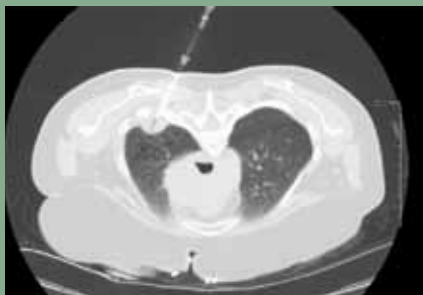


Figure 1: 68-year-old man with a posterior left upper lung nodule undergoing a CT-guided needle biopsy for accurate tissue typing.



Figure 2: 81-year-old woman with a right lower pole kidney tumor. Radiofrequency ablation of the tumor was performed using CT-guidance.

- Private clinic offices
- Medical records systems
- Dedicated procedure rooms
- Billing office and payment information area.

Patients expect these spaces from interventional oncologists, as they would from other clinicians. A solid interventional oncology practice is essential in growing a community cancer center or hospital.

Although the importance of building a referral base with other clinicians cannot be emphasized enough, direct advertising to the public to promote procedures is also important. Communication methods include hospital newsletters, brochures, billboards, and radio and television advertisements. More importantly, each type of promotion needs to be targeted to the appropriate patient population.

Reimbursement Outlook

According an analysis by the American Cancer Society, the overall costs associated with cancer in the United States last year accounted for an estimated \$206 billion. Due to a multitude of factors, including an increasing average lifespan of oncology patients, this expense is only expected to increase. The competition for providing the full continuum of services to cancer patients has already begun. Hospitals must promote themselves as both as a cancer fighting and patient comfort center.

Cost efficacy will play an even larger role in the future, given the aging population, increasing healthcare costs, and decreasing reimbursement. More and more cost-effective treatment measures will be necessary in order to continue to provide the best care for patients. As randomized clinical trials continue to demonstrate equivalent benefit to surgery, minimally invasive techniques may replace traditional surgery for many patients. This change may allow interventional oncology treatments to produce even better results, rather than just applying them to

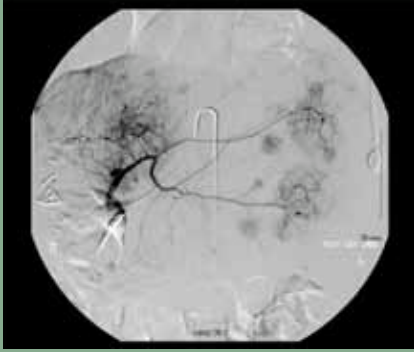


Figure 3: 59-year-old woman undergoing a hepatic angiogram revealing multiple vascular liver tumors. Chemoembolization of the hepatic artery was subsequently performed.



Figure 4: 78-year-old man with two dominant hepatocellular tumors who underwent Yttrium-90 radioembolization. CT imaging shows (left to right): a) two large vascular tumors prior to treatment, b) increasing central necrosis of the tumors, 3 months post treatment and c) significantly shrunken and necrotic tumors, 6 months post treatment.

patients who have exhausted all other treatment options.

The largest expense in creating and developing an interventional oncology practice is related to human resources. Personnel costs can be a large investment for community cancer programs, but very good reimbursement rates can make the investment worthwhile. More and more oncologists are referring patients for image-guided interventions, both diagnostic and therapeutic. And, by offering the latest technology, hospitals will attract more patients and perhaps more research opportunities. In turn, research opportunities will help to expand a hospital's name and reputation, further increasing the success of the cancer program.

A large portion of revenues from a radiology practice comes from referrals for interventional radiology. The combined professional reimbursement that an interventional oncology patient can generate is considerable. In addition to the procedure itself, patient evaluation and management is a large source of revenue for many programs.


Besides the positive financial outlook, adding an interventional oncology component can bring name recognition for a hospital. When coronary angiography was first pioneered, very few hospitals realized the leading role it would play in the future, including replacing open-heart surgery for a majority of patients. Minimally invasive treatment of cancers will certainly take a larger role in the coming decades. In fact, many hospitals have already begun to invest significant resources into oncology programs.

What's Ahead?

Interventional oncologists diagnose, admit, treat, and follow-up with patients in clinics. However, gaining acceptance of the medical community is yet another obstacle

that the subspecialty continues to juggle. To gain referrals from clinical oncologists and surgeons, interventional oncologists must prove the value of the services they offer, despite sometimes "overlapping" with traditional treatments. Interventional oncologists are beginning to offer their experience and expertise at hospital-based tumor boards and national and international meetings. In addition, the Interventional Oncology Society was recently created and held its first worldwide meeting in October 2009.

Throughout the country, radiology departments are expanding to include receptionists, nurse practitioners, and physician assistants to provide the support needed for the interventional oncologist. For those larger universities involved in clinical research, research nurses and coordinators are also required to provide documentation and proper follow-up care. Good communication with patients and other specialties are critical for a successful interventional oncology practice. And, the role of nurses and physician assistants in providing continuity of care for each patient cannot be overemphasized.

Similar to radiation oncology in the past, interventional oncology is already metamorphosing into a separate clinical entity at many hospitals. This trend is likely to continue, as the new breed of interventionalists brings both image-guided expertise and complete clinical patient management to community hospitals. 

Brian L. Dunfee, MD, is a board certified diagnostic radiologist and fellowship trained interventional radiologist with Diagnostic Imaging, Inc., the largest private practice radiology group in Philadelphia, Pa.