Innovations in Interventional Oncology

Oncology Innovations Series

- Practice 1: Evaluate the Potential for Interventional Oncology
- Practice 2: Engage Interventional Radiology as a Partner in Care
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The Clinical Innovations in Oncology Series

With increasing financial pressures, growing responsibility for costs and outcomes, and increasingly strict reimbursement requirements, cancer programs must revamp their investment strategy. It is essential that program leaders carefully weigh the benefits and risks, evaluate the evidence base, and consider the value of each investment from the perspective of their organization, payers, and community.

This four-part series will help cancer program leaders and administrators evaluate current and upcoming technology and treatment innovations in radiation, medical, surgical, and interventional oncology. Additionally, each provides guidance for creating a best-in-class program and maximizing the return on investment.

For the full series, please visit advisory.com/or/clinicalinnovations

Innovations in Interventional Oncology

Far fewer cancer patients receive interventional oncology procedures compared to surgery, radiation, and medical oncology. However, interventional oncology procedures can provide both palliative and curative treatment to a growing number of patients. In addition, interventional oncology has the potential to improve patient outcomes, increase satisfaction, differentiate the cancer program, and lower costs.

To ensure patients who would benefit from interventional oncology receive it, cancer program leaders must understand the field, seek opportunities to develop a collaborative relationship with interventional radiology, and help providers understand the benefits. To help, this research brief contains four technology overviews and two best practices.

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Growing Recognition of Interventional Radiology

Interventional radiology (IR) has traditionally been considered a subspecialty of radiology. However, that changed in 2012 when the American Board of Medical Specialties elevated it to a primary medical specialty. Since then, interventional radiology has continued to grow. By 2021, the first residency trained interventional radiologists will emerge on the market and will be seeking areas to further subspecialize.

Medical Community Recognizes IR as Its Own Specialty

A variety of medical specialties require interventional radiology procedures. Some specialists, such as cardiologists and neurosurgeons, have developed the expertise to perform these procedures themselves.

In contrast, interventional oncology (IO) procedures are primarily performed by interventional radiologists. Cancer providers have neither the expertise nor capacity to perform these procedures, making oncology an attractive opportunity for IR residents looking to subspecialize.

Oncology Offers Largest Potential for IR Specialization

Recent and Future Events in the Field of Interventional Radiology

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Interventional radiology (IR) approved as a primary specialty</td>
</tr>
<tr>
<td>2013</td>
<td>IR curriculum approved for certification by the Accreditation Council for Graduate Medical Education (ACGME)</td>
</tr>
<tr>
<td>2016</td>
<td>First IR residency programs begin accepting applications</td>
</tr>
<tr>
<td>2021</td>
<td>First residency trained interventional radiologists will emerge in the market</td>
</tr>
</tbody>
</table>

Sample Interventional Radiology Procedures and Ownership by Specialty

<table>
<thead>
<tr>
<th>Specialties</th>
<th>Sample Procedures</th>
<th>Degree of Interventional Radiology Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interventional Cardiology</td>
<td>• Lower extremity angioplasty</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>• Valvuloplasty</td>
<td></td>
</tr>
<tr>
<td>Interventional Neuroradiology</td>
<td>• Diagnostic cerebral angiography</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>• Aneurysm embolizations</td>
<td></td>
</tr>
<tr>
<td>Vascular Interventional Radiology</td>
<td>• Thrombolysis</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>• Uterine fibroid/artery embolization</td>
<td></td>
</tr>
<tr>
<td>Interventional Oncology</td>
<td>• Embolizations</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>• Ablations</td>
<td></td>
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</table>

A Growing Part of Your Business

Today, interventional oncology comprises a small percentage of cancer services, but the volumes are expected to grow. According to Advisory Board estimates, the number of liver ablations will double across the next five years.

This growth will be driven by many factors, particularly increasing awareness of the benefits of interventional radiology. In particular, IR is cost effective, noninvasive, and can improve outcomes when performed in conjunction with other cancer therapies. A recent study showed improved progression-free survival in the liver when Y-90 was performed in addition to chemotherapy for patients with colorectal liver metastases.

Interventional radiology may also help expand the application of precision medicine. With the growth of molecular testing, IR is critical to ensure high-quality biopsies. Furthermore, many interventional radiologists are interested in the prospect of using IR techniques to more precisely deliver targeted treatment and immunotherapy to tumors.

Volumes Low Today, but Many Factors Driving Growth

Interventional Radiology Market Projections

- **9,507** Estimated number of liver ablations (cryoablation and radiofrequency ablations) performed in the US in 2016
- **99%** Expected growth of liver ablations in the US in from 2016 to 2021.

Related Resource

Evaluate the size of your market with the Oncology Roundtable’s Interventional Radiology Market Estimator available on advisory.com.

Factors Driving Increased Importance of Interventional Oncology

- Growing recognition of IR and awareness from both patients and providers
- Increasing importance of high-quality biopsies due to growing use of precision medicine
- Increasing recognition of IO as a means to drive patient satisfaction
- Growing use of IO as a cost-effective treatment in a value-based world
- Emerging evidence of improved outcomes when IO procedures are used in conjunction with surgery, chemotherapy, and/or radiation
- Potential to use IO to deliver new targeted therapies


The Technology Landscape

Interventional oncology encompasses a variety of procedures, ranging from commonly-used portal vein embolizations and thermal ablations to specialized techniques, such as irreversible electroporation and Y-90.

The table to the right provides an overview of interventional oncology procedures. The techniques on the left, such as radiofrequency ablation and transarterial embolization, are widespread and commonly used today. The middle column highlights less common procedures that are generating interest and excitement across experts in the field, especially Y-90. Finally, the right column lists newer technologies still in the research phase that have the potential to expand treatment options for cancer patients. Of note, irreversible electroporation has the potential to treat tumors closer to vital organs and blood vessels than ablative methods.

It is important to note that most interventional oncology procedures are palliative and frequently work in tandem with other oncology modalities. The following pages will provide further detail specific to interventional oncology technologies, starting with ablations.

Overview of Interventional Oncology Technology Adoption

<table>
<thead>
<tr>
<th>Widespread</th>
<th>Limited to Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transarterial embolization (TAE)</td>
<td>Microwave ablation (MWA)</td>
</tr>
<tr>
<td>Portal vein embolization</td>
<td>Selective internal radiation therapy (Y-90/SIRT)</td>
</tr>
<tr>
<td>Radiofrequency ablation (RFA)</td>
<td>Drug-eluting beads (DEB) chemoembolization</td>
</tr>
<tr>
<td>Cryoablation</td>
<td>Irreversible electroporation (NanoKnife)</td>
</tr>
<tr>
<td>Laser ablation</td>
<td>High-intensity focused ultrasound (HIFU)</td>
</tr>
<tr>
<td>Ethanol ablation</td>
<td>Focal laser ablation therapy</td>
</tr>
<tr>
<td>Transarterial chemoembolization (TACE)</td>
<td></td>
</tr>
<tr>
<td>Vertebroplasty and kyphoplasty</td>
<td></td>
</tr>
</tbody>
</table>

Source: Service Line Strategy Advisors interviews and analysis; Oncology Roundtable interviews and analysis.
Technology in Brief: Ablations

Ablations are one of the most commonly used interventional oncology procedures. While ablations often serve a palliative function to decrease pain, they can also be stand-alone curative treatments for small tumors in select organs, such as the liver.

Ablations use extreme temperatures, either cold or hot, to destroy tumor cells. During the procedure, the interventional radiologist percutaneously inserts a probe directly to the tumor site where cold gas or other energy sources will be applied to the tumor.

These procedures are most commonly performed in liver, kidney, lung, prostate, and bone metastases. However, emerging evidence also suggests the potential for ablations to extend to other tumor sites, such as breast.

Standard Procedure with Increasing Applications

Ablation uses extreme temperatures or another energy source to target and destroy tumor cells

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Tumor Sites Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryoablation</td>
<td>Liver, kidney, bone, lung, prostate, and potentially breast</td>
</tr>
<tr>
<td>Radiofrequency ablation (RFA)</td>
<td>Liver, kidney, lung, and bone</td>
</tr>
<tr>
<td>Microwave ablation (MWA)</td>
<td>Liver, kidney, lung, and bone</td>
</tr>
<tr>
<td>Ethanol ablation</td>
<td>Liver</td>
</tr>
<tr>
<td>Laser ablation</td>
<td>Brain and spinal tumors; prostate (in research phase)</td>
</tr>
</tbody>
</table>

Considerations

- Curative only in small tumors
- Can be used as a palliative procedure
- MWA has the ability to treat larger tumors closer to the arteries than RFA, but more research is needed to determine clinical superiority
- May be used in conjunction with chemotherapy, radiation, or embolizations

Technology in Brief: Embolizations

Similar to ablations, embolizations are commonly used in cancer therapy. Although early research suggests the potential to expand to other tumor sites, embolizations are currently used to treat tumors that originated or metastasized to the liver.

To perform an embolization, the interventional radiologist percutaneously blocks the hepatic artery of the liver using beads, sponges, or other material. This essentially cuts off the tumor’s life supply, while the portal vein continues to supply blood to the rest of the liver.

Interventional radiologists often deliver chemotherapy or radiation directly to the tumor during the embolization to further enhance the destruction of tumor cells. The chemotherapy or radiation is confined to the tumor site by the embolization of the hepatic artery.

Embolizations are an attractive option to prolong survival for patients with liver cancer who are not eligible for surgery. They can also be performed before surgery to debulk the tumor so that surgical resection becomes possible.

### A Must-Have for Advanced Hepatobiliary Programs

Embolizations use embolic agents to cut off the tumor blood supply through occlusion of the hepatic artery.

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Tumor Sites Treated</th>
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<tr>
<td>Portal vein embolization</td>
<td>• Liver: HCC and metastases</td>
</tr>
<tr>
<td>Transarterial embolization (TAE)</td>
<td>• Liver: HCC and metastases</td>
</tr>
<tr>
<td>Transarterial chemoembolization (TACE)</td>
<td>• Liver: HCC and metastases; potential to expand to</td>
</tr>
<tr>
<td>Drug-eluting beads (DEB-TACE)</td>
<td>other sites</td>
</tr>
<tr>
<td>Selective internal radioembolization (SIRT/Y-90)</td>
<td>• Liver: HCC and metastases; potential to expand to</td>
</tr>
<tr>
<td></td>
<td>other sites</td>
</tr>
</tbody>
</table>

### Considerations

- May be used in conjunction with chemotherapy and/or radiation
- Best suited for the liver because of hepatic artery and portal vein system
- Y-90 requires partnership with radiation oncologists and safety personnel
- Recent studies have shown prolonged PFS and decreased side effects with Y-90 as opposed to TACE
- DEB-TACE is used only in clinical trials in the US, but it has the potential to decrease TACE-associated side effects


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1) Hepatocellular carcinoma.
Technology in Brief: Irreversible Electroporation and HIFU

One new procedure that has generated excitement is irreversible electroporation (IRE), which uses NanoKnife technology to deliver high voltage electrical bursts to destroy the tumor. Although IRE is not expected to replace other ablative therapies, it generates nominal heat compared to thermal ablations. Therefore, it has the potential to be an effective alternative for patients with tumors close to blood vessels and other vital organs who have a higher risk of thermal damage. However, IRE is still in research phase, and, due to the lack of published evidence, payers are not currently reimbursing for this procedure.

Emerging Evidence May Increase Use of NanoKnife

**Irreversible electroporation** delivers high-voltage electrical bursts that provide non-thermal, targeted tumor destruction, sparing adjacent healthy tissue from heat-based damage.

- **Tumor Sites Treated**
  - Potential to treat wide variety of tumor sites, including non-resectable pancreatic cancer, liver cancer, and prostate cancer

- **Potential Benefits**
  - Causes minimal damage to surrounding tissue, so IRE can be used on tumors close to blood vessels and vital organs

- **FDA Approval**
  - NanoKnife approved for ablation of soft tissue but not treatment of a specific disease

- **Reimbursement**
  - Not reimbursed due to lack of clinical evidence

High-intensity focused ultrasound (HIFU) delivers ultrasound waves to destroy cancer cells and is predominantly performed by urologists as an alternative to radiation or surgery for prostate cancer patients. The minimally invasive procedure has garnered both positive and negative press since its development. HIFU promises fewer side effects than traditional cancer treatment, but many are concerned that the evidence is too preliminary to make confident claims about its benefits. Therefore, it remains critical that cancer providers help patients understand the benefits and risks when selecting treatment.

Benefits Uncertain, but Some Betting on Its Potential

**High-intensity focused ultrasound** delivers focused ultrasound waves to the tumor, creating heat ablation to destroy cancer cells.

- **Tumor Sites**
  - Prostate

- **Potential Benefits**
  - Promises potential of lower rates of incontinence and erectile dysfunction
  - Offers an alternative to surgery, radiation, and active surveillance

- **Reimbursement**
  - Not reimbursed due to lack of clinical evidence and studies demonstrating decreased side effects

- **Considerations**
  - Procedure currently performed by urologists

IO Not Yet a Key Component of Cancer Care

Despite the benefits of interventional oncology, adoption of the specialty has been limited to date due to two main factors.

The first centers around challenges in trial design. Most studies evaluating IO treatments have small sample sizes and do not evaluate the benefit of the procedure in conjunction with other cancer therapies.

The second barrier is cultural. Most Americans are not familiar with IR and its benefits. In addition, many providers view interventional radiologists as proceduralists, leading to a lack of communication and coordination.

Many Barriers Have Prevented Widespread Adoption

<table>
<thead>
<tr>
<th>Challenges with Trial Design</th>
<th>Cultural Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of comparative effectiveness studies</td>
<td>Lack of patient awareness</td>
</tr>
<tr>
<td>Currently there are mostly one-armed studies documenting technical success or efficacy</td>
<td>Patients often do not understand IO and do not realize IO treatments are an option for them</td>
</tr>
<tr>
<td>Isolated nature of most IO studies</td>
<td>Provider hesitation</td>
</tr>
<tr>
<td>Few studies evaluate the benefits of IO in conjunction with other cancer treatments</td>
<td>Referring physicians have limited IO treatment knowledge and may not understand which patients could benefit</td>
</tr>
<tr>
<td>Need for long-term measurements</td>
<td>Perception of IR as “just proceduralists”</td>
</tr>
<tr>
<td>More studies are needed that measure long-term outcomes, costs, and patient quality of life</td>
<td>Cancer programs tend to view IRs similar to diagnostic radiologists instead of clinicians, leading to poor communication and coordination</td>
</tr>
</tbody>
</table>

Start Building the Bridge

Given the benefits and increasing importance of IO, programs need to make sure that patients who can benefit are able to access these specialists. To accomplish this, there are two best practices.

First, program leaders need to evaluate the potential for interventional oncology, including volumes, revenues, and strategic benefits, at their organization.

Next, the cancer program needs to engage interventional radiology as a partner in care. To provide the best care to each patient, program leaders need to establish effective communication and coordination protocols between the oncology and interventional radiology teams.

Two Practices to Enhance Interventional Oncology at Your Organization

1. Evaluate the Potential for Interventional Oncology
2. Engage Interventional Radiology as a Partner in Care

Practice 1: Evaluate the Potential for Interventional Oncology

Take the Time to Craft an Informed Strategy

As a first step, cancer programs should perform a comprehensive opportunity assessment before developing or investing further in interventional oncology services.

Specifically, program leaders should evaluate their market opportunity, including the patient populations that could benefit from IO and estimated growth across the next five to ten years.

Next, leaders should consider which resources are currently available within their organization. Institutions with a robust interventional radiology department might already have the capability to perform most IO procedures. Leaders should develop relationships with the IR department and determine if interventional radiologists have experience and/or interest in working more closely with cancer patients.

Program leaders also need to determine whether or not investing in interventional oncology fits within the organization’s strategic priorities.

Questions to Consider Before Investing in IO

**Market Assessment**

- What is the projected five- and ten-year IO volume growth?
- What percentage of cancer patients could benefit from interventional oncology?
- Do competitors offer interventional oncology procedures?

**Internal Evaluation**

- Do you have an interventional radiologist interested in oncology?
- What additional technology would you need to purchase?
- What is the current relationship between interventional radiology and oncology?

**Financial Analysis**

- What are the reimbursement rates for the procedures you plan to offer?
- What are the start-up costs (e.g., new hires, technology investments)?
- What are the fixed costs?

**Organization Strategy**

- How does interventional oncology align with your organization’s strategic goals?
- How can IO improve clinical quality and patient satisfaction?
- Is there interest in developing niche tumor site programs (e.g., hepatobiliary)?

Related Resources

Evaluate the potential for interventional oncology in your market using the following Oncology Roundtable resources, available on advisory.com:

- [Cancer Incidence Estimator](#)
- [Interventional Radiology Market Estimator](#)

Source: Oncology Roundtable interviews and analysis.
To evaluate the risks and benefits of offering Y-90, Bell Memorial (a pseudonym) conducted a comprehensive assessment after an interventional radiologist proposed offering Y-90 to the organization’s Value Analysis Team (VAT).

After presenting the potential benefits of the procedure and evidence of the organization’s growing liver cancer volumes, the team suggested he perform a small clinical trial to demonstrate the benefits. The Value Analysis Team assessed three major criteria when deciding whether to offer Y-90: its impact on patients, the cancer program, and the health system.

The trial showed that patients receiving Y-90 had favorable outcomes. Offering Y-90 would also align with the system’s goal to grow the cancer program by providing a new procedure for liver cancer patients. However, while reimbursement has improved over the last few years, Y-90 is still a high cost procedure with relatively low reimbursement.

Ultimately, Bell Memorial decided to offer the procedure because the benefits to the patient and the system outweighed the cost of the procedure.

**Consider a Small-Scale Trial Before Offering IO Service**

**Bell Memorial Hospital’s Process to Assess the Value of Y-90**

- **Interventional radiologist was interested in offering Y-90 to liver cancer patients**
- **Collected information on patient need, potential volumes, competition, and needed resources**
- **Presented information to institutional Value Analysis Team, which approved small trial to assess benefits**
- **Performed trial with 15 patients; collected and analyzed clinical and financial outcomes**
- **Presented results back to Value Analysis Team**
- **Organization decided to offer Y-90 because of favorable outcomes, despite small profit margins**

**Sample VAT Clinical Services Criteria**

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Metrics</th>
</tr>
</thead>
</table>
| Patients | - Patient outcomes (e.g., progression-free survival, quality of life)  
- Patient out-of-pocket costs  
- Patient need (volumes) |
| Program  | - Supply costs  
- Procedure costs  
- Revenue  
- Margins |
| System   | - Aligns with other services  
- Supports larger system goals |

**Sample Service Decision Dashboard**

- **Y90: Approved**
  - **Patients**: Favorable patient outcomes
  - **Program**: High cost, relatively low reimbursement
  - **System**: Aligns with system strategy to grow cancer program

**Case in Brief: Bell Memorial Hospital**

- 530-bed hospital located on the East Coast
- Interventional radiologist interested in offering Y-90 treatment to liver cancer patients evaluated the procedure, resources needed, number of eligible patients, and competitors’ offerings; presented to Value Analysis Team (VAT), which determines the procedures offered by system
- VAT allowed physicians to set up small-scale trial to assess benefits of Y-90; results demonstrated low profitability, but a positive impact on patient outcomes
- Value Analysis Team decided that organization should make necessary investments to offer Y-90 to eligible patients

*Source: Imaging Performance Partnership interviews and analysis; Oncology Roundtable interviews and analysis.*
Room for Improvement

Regardless of the extent to which an organization invests in interventional oncology, it is imperative that cancer programs engage interventional radiology as a partner in care.

Communication is critical to ensure that all necessary patient and procedure information is conveyed to the interventional radiologist in a timely, efficient manner. Cancer providers should also consult with IR during treatment planning and follow up when appropriate.

Even simple, routine procedures, such as biopsies, require communication and coordination. In particular, as the use of precision medicine grows, high-quality biopsies with sufficient tissue are essential for genomic testing. This is a major barrier for many programs. In fact, up to 20% of biopsies that were submitted to the NCI’s MATCH trial were ineligible for next-generation sequencing because the sample was deficient.

Sample Communication Breakdowns with Interventional Radiology Along Cancer Patient Pathway

![Diagram showing communication breakdowns]

- Failure to provide feedback on biopsy quality
- Failure to share pertinent patient information with the IR
- Failure to realize that patient is eligible for an ablation
- Failure to send all pertinent patient information to IR
- Failure to follow up with IR following treatment

Lack of Coordination Can Impact Care

10%–20% Of biopsies in the MATCH trial were ineligible for next-generation sequencing

Ensure Quality Biopsies

Advances in Precision Medicine Increase Importance of Biopsies

To improve the quality of biopsies, cancer providers must communicate essential patient details and the goals of the biopsy to interventional radiologists. To accomplish this, there are three models.

Edison Cancer Center (a pseudonym) takes a comprehensive and resource-intense approach that requires an in-person consult for every patient scheduled for a biopsy in the interventional radiology clinic.

In contrast, Gundersen requires a virtual consult between the IR and referring provider before the procedure. The clinicians review patient scans over the phone, discuss the purpose of the biopsy, and identify the best location to sample during the procedure.

Lastly, Avera McKennan prioritizes biopsies that will be sent for next-generation sequencing, such as those being submitted to the MATCH trial. In those cases, a representative from their genomics lab will review scans with the interventional radiologist and will be physically present during the biopsy procedure.

Three Models to Improve Biopsies

1. **IN-PERSON CONSULTS**

   **Edison Cancer Center**¹
   - Every patient is seen in IR clinic for a consult before biopsy
   - Allows the IR to perform comprehensive evaluation and form relationships with patients by reviewing scans and purpose of procedure with them

2. **VIRTUAL CONSULTS**

   **Gundersen**
   - IRs have a virtual consult with referring providers before a biopsy is sampled
   - Discuss patient treatment plan, purpose of the biopsy, and review patient scans to determine the best location to sample

3. **SELECTIVE CONSULTS**

   **Avera McKennan**
   - Focus to improve biopsies for precision medicine MATCH trial
   - Group from the genomics lab helps IRs review patient scans and is present during biopsies that will be sent for genomic testing

**Case in Brief: Edison Cancer Center**¹

- 450-bed hospital located on the East Coast
- All patients receiving a biopsy or other procedure are seen in a walk-in IR clinic for a consult first
- Consults allow IRs to form a relationship with their patient, evaluating them in-person to determine the best location to sample, explain the procedure, and answer any questions

**Case in Brief: Gundersen Lutheran Medical Center**

- 268-bed hospital located in La Crosse, Wisconsin
- Virtual consults between IRs and referring providers are conducted over the phone and typically last 5-10 minutes; providers discuss patient history, purpose of the biopsy, and treatment plan while reviewing patient scans on the computer

**Case in Brief: Avera McKennan Hospital**

- 545-bed hospital located in Sioux Falls, South Dakota
- Biopsies for the MATCH trial are flagged to prompt a consult between the IR and genomics lab
- Lab technician from the genomic team is present during biopsies, handles and prepares the specimen, and completes blood work at the time of the biopsy

Source: Avera McKennan Hospital, Sioux Falls, SD; Gundersen Lutheran Medical Center, La Crosse, WI; Oncology Roundtable interviews and analysis.

¹) Pseudonym.
Build Communication and Coordination

The cancer program’s partnership with IR should not stop at biopsies. Rather, cancer programs should treat interventional radiologists who work with cancer patients as members of the multidisciplinary cancer care team.

The first step to improving IR’s integration with the cancer program is to find a physician champion in interventional radiology who has experience working in oncology and is interested in working more closely with the cancer program.

To help interventional oncologists learn more about other facets of cancer care, the World Conference on Interventional Oncology has developed its own IO University oncology curriculum.

To ensure ongoing collaboration, cancer programs should invite interventional radiologists to tumor board meetings and encourage them to participate in treatment planning.

Programs should also standardize communication protocols between IR and the cancer center, such as developing referral triggers so oncologists know which patients should be referred to an interventional radiologist and when.

Four Strategies to Improve IR Integration with the Cancer Program

- **Identify a physician champion**
  - Identify and engage physicians who are:
    - Interested in oncology
    - Fellowship trained
    - Experienced in cancer care
    - Willing to participate in cancer program initiatives

- **Provide educational opportunities**
  - Allow IRs to present to oncologists at continuing education events
  - Consider including an IR rotation as part of staff, technician, and nurse orientation
  - Provide oncology-specific education to IRs

- **Ensure ongoing collaboration**
  - Require IR tumor board participation
  - Invite IRs to participate in cancer program quality improvement and strategic planning events
  - Include IR leaders in tumor-specific initiatives and programs (e.g., hepatobiliary program)

- **Integrate IR into patient care**
  - Standardize patient eligibility and referral protocols for IR
  - Develop standardized communication processes between IR and the cancer program

World Conference on Interventional Oncology (WCIO): IO University

- IO University created to address lack of oncology knowledge in the field of interventional radiology; made available to WCIO members in 2015
- Curriculum in development, but currently includes courses that cover tumor sites, other oncology treatment modalities, IO literature, clinical trial design, and overviews of interventional oncology treatments
- WCIO working to develop more interactive components such as webinars and patient simulations that will provide guidance on how to effectively communicate with patients and other providers, and how to integrate interventional oncology into cancer treatment plans
- Successful creation of IO University, growth of the field, and support from industry partners led to the establishment of the Society of Interventional Oncology in 2017

Making the Investment

Vanderbilt is an example of an institution that has benefited greatly from improving integration of interventional oncology with its cancer program.

In 2014, Vanderbilt hired an interventional radiologist to head and develop a new interventional oncology program. The IO clinic is open three afternoons a week to see patients for consults. The clinic is staffed by three interventional radiologists, a dedicated nurse practitioner, and a registered nurse. A key component of this program’s success is its location within the cancer center. This increases convenience for patients and facilitates interaction and communication across the teams.

To evaluate the impact of the dedicated interventional oncology program, Vanderbilt compared key metrics one year before and after establishing the program. It found that embolization procedures increased by almost 300% and clinic visits rose from just 9 to 193 visits. Interventional radiologists have also become more involved in the cancer program, demonstrated by the ten-fold increase in the number of hours they spend at tumor board.

Overview of Vanderbilt’s IO Program

**Operations**
- Open three afternoons a week
- Interventional radiologists perform consults, follow-up visits, and simple procedures
- Pre-procedure consult required for all patients
- During consults, IRs review scans with their patients and answer any questions
- Patients receive educational discharge forms created by the nurse practitioner following their procedure

**Staff**
- Chief of Interventional Oncology
  - Hired to develop program
  - Staffs clinic one afternoon per week
- Two IR physicians
  - Staff clinic one afternoon per week
- Nurse practitioner
  - Runs clinic, triages calls, and orders imaging
- Nurse
  - Responsible for scheduling and precertification

**Integration with Oncology**
- Clinic space located within the cancer center
- All IR physicians have time built into their schedule to attend tumor boards
- IR physicians who staff the clinic can perform full spectrum of IO procedures

**After First Year of Operation**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Increase</th>
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<tbody>
<tr>
<td>Increase in embolization procedures (from 60 to 239)</td>
<td>298%</td>
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<tr>
<td>Increase in IO clinic visits (from 9 to 193)</td>
<td>2,000%</td>
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<tr>
<td>Increase in number of hours IRs spend at tumor boards (from 6 to 70 hours)</td>
<td>12x</td>
</tr>
</tbody>
</table>

**Case in Brief: Vanderbilt Ingram Cancer Center**
- 868-bed academic medical center in Nashville, Tennessee
- Hired an interventional radiologist in July 2013 to head new interventional oncology service line
- Interventional oncology clinic located in the cancer center; all IO patients are seen for a pre-procedure consult
- Tracked improvements in IO program one year after development, including increases in number of embolizations, clinic visits, and hours interventional radiologists spend at tumor boards

Interventional Oncology Innovation Overview

Potential Impact in the Next Three to Five Years

To determine the right level of investment in interventional oncology, cancer program leaders need to thoroughly evaluate existing resources and develop a comprehensive strategy for building out interventional oncology services. To help cancer programs strategize, the interventional oncology innovation overview on this page outlines how different IO investments could benefit both patients and the cancer program.

<table>
<thead>
<tr>
<th>Innovation</th>
<th>Impact on Outcomes</th>
<th>Impact on Cost Savings</th>
<th>Impact on Volumes</th>
<th>Impact on Research</th>
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</thead>
<tbody>
<tr>
<td>Ablations</td>
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<td>Embolizations¹</td>
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<td>Radioembolization</td>
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<td>Irreversible Electroporation</td>
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<tr>
<td>Interventional Oncology Program</td>
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</table>

Potential Impact in the Next Three to Five Years

- **What is the potential to improve patient outcomes?**
- **How much can this decrease costs? (e.g., replace a more expensive therapy; improve efficiency)**
- **What is the potential number of patients impacted?**
- **How much will this differentiate us as a research program?**

**Key Takeaways**

1. **Develop and foster a collaborative relationship with interventional radiology.**
   Intervventional oncology has the potential to improve patient outcomes, increase patient satisfaction, differentiate a cancer program, and lower costs. To fully realize these benefits, cancer program leaders should find opportunities to partner more closely with IR. Providers must treat interventional radiologists as a member of the care team by including IR in tumor boards, quality improvement initiatives, and patient follow up when appropriate.

2. **Find the right level of partnership.**
   To evaluate the best path for an organization, cancer program leaders should take into account patient volumes, tumor site programs, internal expertise, and available resources. Given the increasing importance of precision medicine, biopsies are becoming more critical—every organization should ensure standardized communication before and after a biopsy is taken. Larger organizations with robust interventional radiology departments and organizations that wish to enhance their hepatobiliary offerings should evaluate the benefits and risks of developing a dedicated interventional oncology program.

3. **Recognize the benefits of including IR as a key component of cancer care.**
   IO procedures provide both curative and palliative benefits to patients and can be used alongside other specialties. Cancer program leaders should consider developing protocols for when patients would benefit from an IR procedure alone or in combination with other therapies, and encourage participation in clinical trials that aim to evaluate the effectiveness of interventional oncology treatments alongside chemotherapy or radiation.

Source: Oncology Roundtable interviews and analysis.