Interventional Oncology Service Development

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Abstract

Keywords

- interventional radiology
- chemoembolization
- radioembolization
- radiofrequency ablation
- practice development

Interventional oncology is rapidly expanding its suite of oncologic therapies, providing unique proven therapeutic benefits. To grow a practice alongside other oncology specialties, knowledge of cancer fundamentals is required. Areas of interest include methods to assess disease stage, treatment toxicity, and response. Additionally, techniques to leverage opportunities and resources available at one's institution toward practice development and efficiency will be reviewed.

Objectives: Upon completion of this article, the reader will be able to describe the importance of creating an interventional oncology service, as well as the opportunities and challenges of creating such a service.

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Interventional oncology (IO) offers an extensive and ever-expanding suite of percutaneous and endovascular oncologic therapies that provide distinct therapeutic benefits that are unique with respect to medical, surgical, and radiation oncology treatments. Large studies, both randomized and retrospective, have expanded the use of intra-arterial and ablative therapies, and have led to their inclusion in national guidelines for the management of hepatobiliary, metastatic

colorectal, neuroendocrine, and renal malignancies.^{1–6} Bolstered by robust evidence, IO has established itself as the fourth pillar of cancer care.

However, for a practice to grow and succeed in this complex multidisciplinary arena, it must invest in a dedicated IO service line, requiring interventionalists to provide the full range of procedural and nonprocedural care. Clearly, the demand for IO services exists, given their proven therapeutic benefit for tumors such as hepatocellular carcinoma (HCC); nevertheless, practices must assess whether they have the necessary expertise, facilities, and personnel to successfully engage in comprehensive cancer care. First and foremost, an interventional oncologist must be well versed in the terminology, tools, and metrics of oncology. Furthermore, success in practice building requires leveraging opportunities and resources available at one's institution, including the referral network, clinical facilities, and physician extenders. A review of critical terms in oncology, as well as different methods to build and support an IO practice, will be discussed in the current review.

Know the Literature

Comprehensive cancer care requires collaboration between a broad range of medical specialties. Effective collaboration is therefore contingent upon a grasp of the lexicon of oncology, including standard terminology, metrics of treatment

assessment, and a precise understanding of specific disease entities. The articles contained in this review provide an excellent framework for the current management of malignancies encountered in IO.

Critical to understanding the framework of oncology is knowledge of tumor staging, which reflects burden of disease, and thus dictates therapeutic options and prognosis.¹ While staging systems vary by tumor type, most are characterized by the TNM classification (tumor, node, metastasis) developed by the International Union Against Cancer and the American Joint Committee on Cancer (AJCC).⁷

Treatment and Assessment

The tools of cancer care include a wide range of medical, surgical, radiation, and interventional oncologic therapies. Comprehensive treatment often requires a combination of various treatments; however, timing of each intervention in the treatment cycle is critical to maximize therapeutic benefit and minimize toxicity. A critical resource for cancer care, the Physician Data Query of the National Cancer Institutes (NCI) and National Comprehensive Cancer Network (NCCN) guidelines provide current recommendations for standard treatment regimens for several malignancies across stages, also including references to experimental protocols and clinical trials.^{8,9}

In addition to a thorough understanding of treatment guidelines, familiarity with assessing treatment response and toxicity is crucial. As radiologists, interventionalists should be well versed in imaging response assessment (World Health Organization [WHO] and Response evaluation Criteria in Solid Tumors [RECIST] criteria).¹⁰ Additionally, a thorough knowledge of clinical response assessment is fundamental to determining long-term outcomes, and facilitates communication within the multidisciplinary oncology team. Three clinical endpoints are particularly relevant to the assessment of locoregional therapies, and are best understood in the context of a clinical trial: overall survival (OS), progression-free survival (PFS), and time to progression (TTP).¹¹

OS remains the gold standard for treatment effectiveness,¹² and is measured as the time period from randomization to death. It represents the most valuable benefit to patients, as long as quality of life is not compromised. Therefore, OS can distinguish between treatments that provide equivalent tumor control by differentiating treatments based on increased toxicity or treatment-related mortality.¹¹ However, OS can be confounded by subsequent therapies after disease progression, or discontinuation of the current treatment regimen.^{12,13}

Given these inherent limitations, the surrogate endpoints of PFS and TTP can be utilized instead, particularly if progression is associated with OS. This permits earlier assessment of therapeutic benefits. TTP is defined as the time period between randomization and objective disease progression. TTP, however, excludes or censors death not related to or without evidence of disease progression. PFS represents the time between randomization and objective disease progression or death. PFS is therefore able to capture deaths secondary to the effects of therapy.¹¹

PFS and TTP are able to delineate the effects of therapy, while eliminating the confounding effects of treatment crossover or subsequent treatments, unlike OS. As use of a new treatment often occurs in the setting of disease progression, TTP and PFS are able to document this time point. PFS is particularly useful in evaluating the efficacy of second- or third-line therapies, such as the use of Y90 radioembolization in the setting of metastatic colorectal carcinoma. TTP is more useful in the assessment of first-line therapies such as radiofrequency ablation for a small HCC, or chemoembolization in the setting of unresectable HCC.¹¹

When disease progression leads to death, TTP and PFS should be similar. When TTP exceeds PFS, it can be surmised that a treatment causes significant toxicity. In the setting of competing risk of death from comorbid conditions rather than disease progression, TTP becomes the more valuable endpoint. This is particularly useful in evaluating the effects of HCC therapies in patients with underlying cirrhosis. In such cases, TTP may even exceed OS, indicative of a cause of death other than cancer progression.¹¹

In addition to familiarity with measurement of treatment response, an interventionalist must be versed in the assessment of treatment toxicities. The NCI's Common Terminology Criteria for Adverse Events (CTCAE) is a standardized classification of toxicities and side effects related to therapy, graded 1 to 5 according to increasing severity. Grade 1 and 2 toxicities (mild and moderate, respectively) are considered clinically acceptable, whereas grade 3 (severe) or higher are reported as adverse events.¹⁴

To understand IO's role in the cancer armamentarium, one must understand the role of other treatment options. While a comprehensive review of all aspects of medical, surgical, and radiation oncology is beyond the scope of this review, awareness of the basic terminology is critical to communication within the oncology field.

Medical oncology primarily relies on chemotherapy, typically in the form of traditional agents such as alkylating agents, antimetabolites, topoisomerase inhibitors, and platinum agents. Newer agents include molecularly targeted therapies.¹ These agents may be used in several different settings.

Primary induction chemotherapy refers to treatment of advanced disease, in which no alternative therapy exists. Neoadjuvant treatment is given prior to surgical resection, with the intent to either shrink the primary lesion, or increase the likelihood of tumor-free resection margins. Adjuvant chemotherapy is given following surgical resection or radiation, to decrease the likelihood of local or distant recurrence. Particularly relevant to IO is locoregional chemotherapy, treatment directly delivered to the affected organ/tumor, with the goal of maximizing tumor uptake and minimizing systemic toxicity.^{1,15}

Surgical oncology plays a critical role not only with regard to curative resection but also in the setting of metastatic disease.¹⁶⁻¹⁸ In terms of surgical resection, complete tumor removal, with tumor-free margins on pathologic analysis, is termed an R0 resection. An R1 resection refers to the presence of microscopic disease seen at the resection

margin. An R2 resection includes macroscopic unresected disease.¹⁶ An IO corollary for these terms is the concept of ablative margins seen during percutaneous tumor ablations.^{19–21}

The use of surgical resection is dictated by likelihood of technical success as well as performance status. Patients with compromised performance status may thus be better served by IO therapies than operative intervention.

Radiation oncology utilizes radiation-induced DNA damage to cause cell death.²² Radiation dose determines effectiveness, with most carcinomas requiring 60 to 80 Gy divided into multiple fractionations. Effectiveness depends on the duration of treatment and the fraction of dose given at each session. Typical fractionations range from 1.8 to 2.0 Gy/day over 5 days per week.^{23,24} Radiotherapy may also have synergistic effects with certain chemotherapies, yielding results that may be more effective than either therapy alone.^{25–28}

For a more comprehensive discussion of various oncologic subspecialties and disease processes as they relate to IO, readers are encouraged to review Hickey et al.^{1,11}

Interventional Oncology Clinic

Effective participation in oncologic care requires infrastructure to support both inpatient and outpatient care. Inpatient care is self-explanatory; it requires both pre- and postprocedural evaluation and management, and provides a rounding and consults service.

From an outpatient standpoint, dedicated physical clinic space goes a long way toward fostering a patient–physician relationship. For all other participants in the oncology field, the outpatient clinic is the foundation of their clinical practice. Owing to workflow organization, many freestanding or hospital-based radiology practices are not equipped to meet this need. Given their interactions with other medical specialties, patients often expect a clinic with areas for examination and evaluation, as well as treatment counseling and discussion. Furthermore, with IOs being an image-guided specialty, a dedicated viewing station to permit film interpretation and review may be beneficial during consultation.²⁹

Given the physical constraints of various practices, one option is to find clinic space outside radiology. Shared space within a hospital or clinic, or ideally within an oncology clinic, may be economical. It may also facilitate cross-consultation with other specialties,^{29–31} and be a source for potential referrals. This specific model has been employed at our own institution, yielding improved collaboration and increased volume.

Support Staff and Physician Extenders

Efficient IO clinic operation requires not only physical infrastructure but also personnel, including nurse coordinators, physician assistants (PA), and nurse practitioners (NP). Nurse coordinators expedite preprocedure workup, schedule clinic visits and follow-up, and communicate with referring providers to obtain the necessary history, laboratories, and imaging required for IO consultation. If any of these elements

are lacking, they can order laboratories and studies as needed.³²

Owing to demands both inside and outside the interventional suite, many physicians are unable to meet their practice's growing clinical needs alone, shifting from a solely physician–patient relationship to a more broad practice patient relationship, incorporating physician extenders.²⁹ In the context of an IO practice, NPs and PAs can obtain history and physicals, write orders, round and write progress, and discharge notes.^{32–34} This frees up the attending physician to focus on developing a treatment plan, and addressing any patient or family concerns.

Following consultation, the support staff can schedule procedures with appropriate preprocedure workup (fasting, laboratories, anesthesia, etc.). Following procedures they play a role in patient discharge instructions and follow-up arrangements. When fully integrated into a practice, these physician extenders may become the patient's primary contact and advocate, which can increase patient confidence, comfort, and satisfaction.^{34–36}

Practice Building and Promotion

In the IO realm, potential referrals may originate from the other oncologic subspecialties previously described, but may also include transplant/hepatobiliary surgery, hepatology/gastroenterology, urology, and pain medicine.³² Participation in multidisciplinary tumor boards is another opportunity in which IO can educate referring providers about the myriad of treatment options it offers. As stated previously, familiarity with the language of oncology and level of evidence supporting various treatment options is critical to conveying knowledge and establishing credibility. Participation also facilitates cross-collaboration, and helps organize and plan the timing of therapy (first or second line, etc.).³⁷

Regardless of which route leads a patient to IO clinic, communication with the referring service is critical to optimize longitudinal care and foster future referrals. While IO assumes clinical responsibility for the patient in the peri- and postprocedural period, image-guided therapies remain only a portion of the patient's overall treatment plan.²⁹ Thus, the results of an IO assessment and plan, technical success of intervention, and results of follow-up must be conveyed to the referring physician. At some point, the patient will return to their care, and thus an open dialogue will smooth that eventual transition. These physician-to-physician communications can also serve as a tool to market the IO practice.²⁹

Web Presence and Social Media

There are many opportunities through which one can engage in targeted practice promotion to increase both physician and patient awareness of IO services. Direct marketing has been successful in uterine fibroid practices,³⁸ and can easily be adopted to an IO practice.

Utilizing the Internet and social media offers another potential marketing channel. Virtually all medical centers now have an Internet presence, with or without a social

media component. This has increasingly become the way patients form their first impression of providers. A dedicated practice Web site can therefore be utilized as an introduction to the IO team and services provided, as well as a resource for patient education materials. Social media offers tools to share information while engaging and educating patients and colleagues.³⁹ It can be used to develop a professional network, consult and make referrals, and market a practice.^{40–42} The robust growth of social media has made these outlets the patient's initial source of health care information, as well as a source of reviews regarding clinical experiences. Studies have demonstrated that a social media presence can enhance a practice's image and attract patients.⁴² Therefore, a practice's social media presence must be carefully constructed and curated to maximize practice awareness and patient education. Regardless of the approach taken, it is critical to follow the web and social media guidelines of one's institution.⁴³

Conclusion

Dedication to and implementation of this framework has yielded tangible results.³⁷ In our own practice, the establishment of a dedicated IO service line, incorporating the aspects outlined in this review, resulted in significantly increased clinic visits, and a 150% increase in procedural volume. This clearly demonstrates the value of dedication to service line development.

The success of an IO practice is not limited to the knowledge and skills required to perform oncologic procedures. A successful practice must also provide longitudinal patient care within the larger context of oncology, which includes colleagues in medical, surgical, and radiation oncology. To do so will require investment in practice building, including growing a referral base, investing in infrastructure, and employing dedicated support staff. This will not only cultivate a relationship with referring providers but also strengthen the physician–patient relationship.

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