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Organization of Multidisciplinary Cancer Care for the Surgical Patient: Role of Anesthesiologists

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Abstract

Purpose of review: The purpose of this review is to describe significant recent trends or developments regarding the role of anesthesiologists in a multidisciplinary team approach to cancer care for the surgical patient. We also discuss our own institutional multidisciplinary approach as a comprehensive cancer center with high surgical volume.

Recent findings: Beyond the multidisciplinary team meeting concept, and local, institution-specific, or national programs, more formalized concepts and models of perioperative care have evolved. These provide a framework for robust involvement of anesthesiologists in cancer care for the surgical patient, with the goal of allowing for optimal individualized cancer outcomes.

Summary: Because of the wide-ranging nature of their perioperative expertise, anesthesiologists play an important role in multidisciplinary team cancer care for surgical patients. This role has been seen in the recent trends toward clinical models, such as the perioperative surgical home and enhanced recovery programs. Areas for future research include multidisciplinary assessment of the impact of such models on perioperative cancer outcomes through integration of data from national outcomes groups.

Keywords

Multidisciplinary Team; Anesthesiologist; Perioperative Cancer Care; Cancer Outcomes; Enhanced Recovery After Surgery; Perioperative Surgical Home

Introduction

The role of the anesthesiologist has evolved in the last few decades, leading to a focus on multidisciplinary collaboration as a perioperative physician. This is especially true in the cancer care of the surgical patient. Because of their broad perioperative knowledge base, skill set, and ability to collaborate and interact with colleagues across the spectrum of care,

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Compliance with Ethics Guidelines

Conflict of Interest

Elizabeth F. Rieth, Gregory W. Fischer, and Anoushka M. Afonso declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent

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anesthesiologists are ideally suited to lead a perioperative multidisciplinary team (MDT), with the goal of optimizing surgical and cancer outcomes. Comprehensive anesthesia-led multidisciplinary team models have evolved into defined models of care, including the Perioperative Surgical Home (PSH) and Enhanced Recovery After Surgery (ERAS). Significant value may be added by anesthesiologists leading multidisciplinary efforts to incorporate elements of the PSH and ERAS in the care of the sickest patients with special complex diseases, such as cancer [1**]. The unique nature of perioperative cancer care necessitates qualified anesthesiologists who understand the nuances of comprehensive cancer care, with the goal of improving cancer outcomes in this patient population.

The Multidisciplinary Team Concept

The concept of multidisciplinary collaboration has its origins in the “multidisciplinary team” (MDT) or “tumor board” meeting, which is an established practice within the field of cancer care. Ziabari et al. discussed important concepts of the MDT approach for high-risk surgery, including major cancer surgery [2**]. Key components include an anesthesia-inclusive MDT focusing on patient suitability for surgery, alternatives to surgery when indicated, patient optimization, timing & mode of surgery, patient-centered perioperative and peri-procedural care,, and referral back to primary & secondary care as appropriate. The benefits of these team approaches in the cancer patient have been well described and may include the following:

- Objective risk assessment, risk prediction and risk mitigation (e.g. prehabilitation)
- Effective communication and co-ordination of care between all specialists, especially SODs (single organ doctors)
- Shared and informed decision making with patients regarding diagnosis and treatment options.
- Early planning and consensus on individualized perioperative pathways

As an example, perioperative care for patients undergoing cancer immunotherapy requires nuanced care, including modification of the anesthetic plan in close communication with medical and surgical oncologists, and critical care physicians as needed. Modifications can include the simple elimination of corticosteroids from the postoperative nausea and vomiting prevention regimen for patients receiving immune checkpoint inhibitor therapy, while more complex changes are required to care for complicated issues, such as immunotherapy induced multi-organ dysfunction. Such perioperative modifications can significantly impact short- and long-term outcomes in cancer patients.

Recent articles have addressed the essential role of anesthesiologists, who are ideally positioned to bring expertise as perioperative physicians on MDTs, particularly in the care of high-risk surgical patients. This includes roles in improving care coordination, interdisciplinary communication, and patient safety [3–5]. Della Roca and colleagues [6**] discussed the role of the anesthesiologist on a MDT, specifically with regard to the preoperative evaluation of high-risk patients undergoing lung resection surgery. They

concluded that, because anesthesiologists' training and practice require the assessment, evaluation, and preparation of patients with a multitude of complex comorbidities for surgery, the anesthesiologist within a MDT is best equipped to tailor and optimize the perioperative treatment strategy [6**].

The MDT concept has evolved beyond review of complex or high-risk cases at MDT meetings to the development of broader, comprehensive, multi-stage programs that encompass the entire perioperative course of care, with an emphasis on the role of anesthesiologists in improving perioperative outcomes. A national quality improvement program for abdominal aortic aneurysm (AAA) repair in the United Kingdom emphasized the role of the dedicated vascular anesthesiologist in the areas of preoperative assessment, multidisciplinary team meeting participation, and national database performance monitoring. The study concluded that anesthesiologists played a *key* part in reduction of the elective AAA repair mortality rate, which decreased from 7.9% for elective open AAA repair in 2008 to 2.4% for infrarenal AAA repair in 2012 [7]. Another study of a MDT program focusing on an anesthesia-inclusive pelvic exenteration team concluded that the multidisciplinary approach demonstrated safe and effective management of complex pelvic cancers [8]. Preston et al. demonstrated improvement in esophagectomy outcomes with an institution-based anesthesia-inclusive multidisciplinary standardized postoperative pathway. These included an increase in immediate extubation and first-day mobilization, as well as reductions in complications and median length of hospital stay from 17 (12–30) to 7 (6–37) days [9].

The Role of Anesthesiologists in the Perioperative Surgical Home and Enhanced Recovery Programs

More comprehensive and formalized models of care, such as the Perioperative Surgical Home (PSH) and Enhanced Recovery after Surgery (ERAS®), have evolved to deliver care in a multidisciplinary fashion.

The American Society of Anesthesiologists (ASA) states “in the PSH model, the patient's experience of care is coordinated by a Director of Perioperative Services, additional Surgical Home Leadership, and supportive personnel, which constitute an interdisciplinary team. The expected metrics include improved operational efficiencies, decreased resource utilization, a reduction in length of stay and readmission, and a decrease in complications and mortality, resulting in a better patient experience of care.” [10**] Regarding cancer care, some see the PSH as a model of care that is likely to be the future of high-risk and major cancer surgery [2**]. Recent articles have addressed anesthesia-guided palliative care in the PSH model, emphasizing the anesthesiologists' leadership role in discussions regarding expectation management, goals of care, medical comorbidity optimization, a realistic concept of resuscitation, and reduction in futile surgery [11, 12].

ERAS® is described as “a team working together around the patient using a multimodal approach to resolving issues that delay recovery and cause complications; a scientific, evidence-based approach to care protocols; and a change in management using interactive and continuous audit” [13**]. Enhanced recovery programs (ERPs) typically contain several

preadmission, preoperative, intraoperative, and postoperative elements related to areas such as nutritional support, multimodal analgesia, and minimization of fluid shifts, with the goal of minimizing stress and improving the response to stress [13**, 14*]. The specific role of the anesthesiologist in the enhanced recovery multidisciplinary team has been further delineated through the publication of a consensus statement for anesthesia practice related to ERAS® for gastrointestinal surgery [15**]. Several recent publications have addressed the role of anesthesiologists in ERPs, emphasizing that the anesthesiologist, in varying degrees of leadership responsibility, is able to have significant input into the success of the ERP. This is particularly true with regards to preoperative assessment, informed decision-making, and risk assessment when optimizing the cancer patient [13**, 16**, 17*].

A review addressing the optimization of value in anesthesiology amidst healthcare transformation concluded that the PSH and ERAS are means of expanding the scope of clinical practice throughout the entire care continuum, while further securing a fundamental and differentiating niche for anesthesiologists [18**]. At our cancer institution, anesthesiologists have well-established roles in the pre-intra- and post-op management of patients via their leadership involvement in facets of cancer care. These include roles in presurgical risk assessment and optimization, as well as locations including the operating rooms, acute and chronic pain management locales, and postanesthesia and critical care units. Because of this presence throughout the perioperative continuum, an anesthesiologist was appointed to serve as our institution-wide ERP Director.

In our experience, a MDT model allows anesthesiologists to optimally lead perioperative services in partnership with surgeons. We implemented several components to address the needs of perioperative cancer patients. These include a comprehensive preoperative discussion of the overall goals of care that is patient-centric, with a focus on the risks and benefits of the entire perioperative course. In perioperative cancer care, the multidisciplinary circle is widened to include other professionals, including but not limited to radiation and medical oncologists, interventional radiologists, to provide optimal care and experience for the patient. In addition, allied health professionals, including those from departments such as nutrition, pharmacy, rehabilitation medicine, and exercise physiology, add significant value in terms of risk mitigation and optimization. We view the PSH and ERAS as models for collaborative decision-making, with the overriding goals of patient optimization, decreasing perioperative complications and improving cancer outcomes.

The Value of Anesthesiologists in the Preoperative Assessment and Management of the Cancer Patient

Anesthesiologists play an integral role in preoperative assessment and management of the cancer patient, particularly through identification and amelioration of the functional decline and multisystem organ effects related to both the pathophysiology of their disease and neoadjuvant therapies. The role of anesthesiologists as perioperative physicians has been framed as a major value proposition, in part because they have expertise in early recognition of physiological signs of deterioration before adverse events occur, particularly in patients

with significant comorbidities and chronic disease [19]. Functional status, nutrition, and cancer-related pain syndromes all contribute to the complexity of preoperative cancer care.

Carli et al. described surgical prehabilitation in patients with cancer as “the process on the continuum of care that occurs between cancer diagnosis and surgical treatment” and that is supported throughout the perioperative period through models such as ERAS® [20*]. Such models are often referred to ERAS-plus (ERAS+) and incorporate quality improvement initiatives, e.g. iCOUGH, a respiratory optimization bundle of care [21, 22]. Prehabilitation for the cancer patient may include exercise training, nutritional optimization, smoking cessation, alcohol reuction/cessation, and psychosocial support, as well as supportive cancer symptom management, and integrative cancer interventions [23]. A recent meta-analysis looking at 48 unique randomized controlled trials showed that exercise therapy is an effective adjunctive therapy to improve cardiorespiratory fitness in patients with cancer [24]. Physical therapists work closely with these cancer patients to ensure early mobilization in the postoperative setting. Most benefit of exercise is shown in prehabilitation rather than rehabilitation, with improved preservation of function following neoadjuvant chemoradiotherapy and 4–8 weeks after surgery [25, 26].

As malnutrition and weight loss can negatively affect perioperative cancer outcomes, close involvement of the cancer nutrition department on a MDT is of utmost importance. Perioperative coordination with the nutrition team with regards to nutritional support, on both an inpatient and outpatient basis, and even in a well-nourished patient, is key to reduction of postoperative complications, including infection and delayed wound healing. Maintenance of the gut mucosa and early postoperative enteral feedings can reduce these complications, especially in high-risk surgical patients.

At our institution, implementation of surgical prehabilitation within ERPs has included early preoperative consultations with the departments of nutrition, integrative medicine, and counseling & support services, as well as our tobacco treatment (QUIT smoking) team. This communication occurs in MDT meetings even prior to hospital admission.

Multimodal Pain Management Strategies in Perioperative Cancer Care and the Role of Anesthesiologists in Cancer-Specific Outcomes

Anesthesiologists are qualified to address pain through their specialty training in administration of pain medication and techniques to ensure that the surgical cancer patient is optimally treated. Acute and chronic pain management strategies to maximize patient comfort are individualized to minimize stress on patients. Cancer-related pain management techniques require that anesthesiologists work in a collaborative approach with other members of the MDT. The acute and chronic pain management team is ideally alerted ahead of time to carefully screen, manage, and optimize at-risk patients during the entire perioperative period.

Effective perioperative multimodal analgesia plays a significant role in enhanced recovery pathways and is emphasized in all ERAS® Society Guidelines [27]. Kamdar et al. addressed the opportunity provided by multidisciplinary perioperative protocols to inculcate a

multimodal pain management philosophy [28**]. Cancer pain management is an important realm for critical appraisal of traditional pain management strategies, due to a possible association between opioid administration and cancer recurrence in the surgical oncology population. A review of the effects of opioids on cancer progression, metastasis, and recurrence concluded that there is sufficient *in vitro* and animal model work to make a biologically plausible case for a detrimental effect of opioids on cancer progression. The authors and others also found that clinical evidence is sparse, but there are some retrospective data that suggest perioperative opioid sparing may lead to better long-term cancer outcomes [29, 30]. Recent trends toward opioid free analgesia, now feasible through multimodal pain management, provide opportunities to minimize opioid tolerance and potentially reduce cancer recurrence in cancer patients [28**].

A recent review regarding perioperative anesthesia care and tumor progression concluded that regional techniques have not been shown to be universally beneficial in cancer surgery. However, optimal prevention of the surgical stress response, coupled with effective pain treatment and potentially decreased all-cause mortality after major cancer surgery, indicate that regional techniques are good options for major open cancer surgery. In addition, the authors concluded that preliminary evidence on nonsteroidal anti-inflammatory drugs warrants their use in perioperative regimens whenever feasible [31**]. Although there may currently be a lack of convincing clinical evidence to indicate a particular anesthetic technique to improve cancer-related outcomes, perioperative cancer care should be comprehensive and targeted to maintain homeostasis, with emphasis on reducing the adrenergic-inflammatory-immune perturbation [32]. Further research in this area is warranted, however studies have pointed to an essential role for anesthesiologists in enhancing longer-term cancer-specific outcomes through techniques such as multimodal pain management.

Return to Intended Oncologic Therapy: Multidisciplinary Pathways and the Role of Anesthesiologists

Inability to complete all intended adjuvant cancer therapies due to postoperative complications and disability may negate the oncologic benefits of surgery. This idea has been formally conceptualized as “return to intended oncologic therapy” (RIOT), proposed in 2014 as a novel quality metric for evaluating the quality of oncosurgical therapy for malignancy [33]. Kim et al. further defined this concept as a continuous variable that examines the degree to which all adjuvant therapy, including second-stage operations, interventional radiology and endoscopic cancer therapies, radiotherapy, and biological and hormonal therapies, is completed [34**]. One study of an enhanced recovery program in liver cancer surgery concluded that enhanced recovery’s primary mechanism of action is reduction in life interference by postoperative surgical symptoms, allowing patients to return sooner to normal function, with a high likelihood to initiate RIOT, and a shorter time to RIOT, compared to the traditional recovery pathway [35]. In our institutional experience, the close nature of teamwork between our medical, radiation, and surgical oncologists has augmented anesthesia-led perioperative ERPs and objectives. This includes an important role for anesthesiologists in minimizing preventable complications through perioperative

interventions including postoperative nausea and vomiting prophylaxis, multimodal analgesia, regional analgesia, hypothermia prevention, and balanced fluid administration. The broad aim is timely initiation of RIOT, with the overarching goal of enhancing short- and long-term surgical and cancer outcomes.

Multidisciplinary Perioperative Cancer Care at Memorial Sloan Kettering Cancer Center

There is little published literature regarding multidisciplinary perioperative cancer care and the specific role of the anesthesiologist. At Memorial Sloan Kettering Cancer Center (MSKCC), a high-volume cancer center, we have refined a MDT model. With the oversight of our institution's ERP Director, anesthesia-led teams have developed and implemented ERPs across multiple surgical subspecialties (Fig. 1). The ERP clinical leaders for each surgical subspecialty are a surgeon and an anesthesiologist with expertise in the subspecialty. Other ERP team members include physician, nursing, and advanced practice provider staff, as well as staff from the surgeons' office practices, presurgical testing clinic, and the departments of social work, case management, nutrition, physical medicine and rehabilitation, patient education, information technology, the postanesthesia care unit, and the inpatient floors. A nurse manager from our hospital's quality and safety division serves as the ERP project coordinator.

Weekly meetings with all involved staff focus on delineating the specialty-specific ERPs by looking to the literature and resources, including the ERAS Society clinical considerations and recommendations [15**]. Further work includes modification and standardization of order sets and patient education material, as well as identification of metrics used to evaluate outcomes. Staff education by the ERP team members from each department occurs prior to launch of the surgical subspecialty ERPs. After the pathway launch, weekly and then biweekly meetings continue, focusing on any issues encountered during the launch, as well as later meetings concentrating on evaluation of metrics and outcomes data.

The first ERP at MSKCC was implemented in the colorectal service, where well-established literature and guidelines exist, followed by other subspecialty ERPs in various stages of development, implementation, and metric evaluation. This includes pathways for mastectomy and breast reconstruction with flap surgery, major gynecology debulking, cystectomy, hepatobiliary surgery (liver and pancreas resection), thoracic surgery (open and minimally invasive procedures, including esophageal and lung resections), head and neck resection with plastic surgery reconstruction, major pediatric surgery (including neuroblastoma resection and thoracic surgery), and spine tumor surgery. We have also implemented ERPs for procedures at our ambulatory surgery center, including outpatient, as well as extended recovery, or 23-hour stay, procedures. These procedures include mastectomy with non-flap breast reconstruction, thyroidectomy, robotically assisted prostatectomy & nephrectomy, and hysterectomy.

Our ERPs in breast reconstructive surgery demonstrated decreased opioid consumption and reduced length of stay by over 1 day [36, 37*]. Future research at MSKCC will continue to focus on the implementation and success of cancer ERPs, evaluating their role in the

optimization of postoperative outcomes, including patient-reported outcome measures (PROMs). One PROM assessing long-term outcomes within the surgical oncology population is the BREAST-Q, a validated, condition-specific, patient-reported outcome instrument, which measures satisfaction and breast-related quality of life associated with breast reconstructive techniques [38]. Similar patient-centric objective measures of quality of life may be employed to capture the perioperative patient experience in the setting of multidisciplinary efforts to impact cancer outcomes.

Fleisher et al. discussed integration of research between groups such as the Multicenter Perioperative Outcomes Group, a global perioperative anesthesiology registry, and the American College of Surgeons National Surgical Quality Improvement Project [39]. Areas for future research include assessment of the impact of multidisciplinary team models on perioperative and longer-term cancer outcomes through integration of data from *both* surgical and anesthesia national outcomes groups. Patient-centric health outcome measures that evaluate the entire disease process are important areas for future research, with organizations such as The International Consortium for Health Outcomes Measurement focusing on improving value in cancer care [40].

Conclusion

Anesthesiologists add significant value to perioperative cancer care as integral members of multidisciplinary efforts that focus on impacting short- and long-term cancer outcomes. Because of the wide-ranging nature of their perioperative expertise, anesthesiologists play an essential role in multidisciplinary team perioperative cancer care, through individualized institutional pathways, or via more defined models, such as the PSH, ERAS, or an amalgam of such models. As we see the future of anesthesiology evolving and encompassing broader patient care, we see our own value to our colleagues, hospital administrators, and, most importantly, to the cancer patient, increasing as well.

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Figure 1.
Memorial Sloan Kettering Cancer Center model of multidisciplinary care for the surgical patient.