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Making the Evidentiary Case for Universal Multidisciplinary Thoracic Oncologic Care

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Abstract

The goal of this article is to provide an overview of the state of the evidence for, and challenges to, sustainable implementation of multidisciplinary thoracic oncology programs. Multidisciplinary care is much advocated by professional groups and makers of clinical guidelines, but little practiced. The gap between universal recommendation and scant evidence of practice suggests the existence of major barriers to program implementation. We examine 2 articles published in this issue of *Clinical Lung Cancer* to illustrate problems with the evidence base for multidisciplinary care. The inherent complexity of care delivery for the lung cancer patient drives near-universal advocacy for multidisciplinary care as a means of overcoming the heterogeneous quality and outcomes of patient care. However, the evidence to support this model of care delivery is poor. Challenges include the absence of a clear definition of "multidisciplinary care" in the literature, a consequent hodge-podge of poorly-defined examples of tested models, methodologically flawed studies, exemplified by the near-total absence of prospective studies examining this model of care delivery, and absence of scientifically sound dissemination and implementation studies, as well as cost-effectiveness studies. Against this background, we examined the results of a recent large single-institutional retrospective study suggesting the survival benefit of care within a colocated multidisciplinary lung cancer clinic, and an ambitious systematic review of existing literature on multidisciplinary cancer clinics. Better-quality evidence is still needed to establish the value of the multidisciplinary care concept. Such studies need to be prospective, use standardized definitions of multidisciplinary care, and provide clear information about program structure.

Overview of Lung Cancer Care Challenges

Lung cancer is the oncologic public health challenge of this age. Every year, approximately 1.8 million individuals worldwide and 230,000 in the United States are diagnosed with lung cancer; 1.6 million people worldwide and 160,000 Americans die of this disease.[1,2] In the United States lung cancer accounts for 14% of all cancer diagnoses, but is responsible for 25% of all cancer deaths.[2] To put this in perspective, lung cancer accounts for almost as many US cancer deaths as colorectal, breast, prostate, and pancreas cancer (the next 4 most lethal cancers) combined.[2] In the United States, aggregate relative 5-year survival improved from 12% in 1975 to 1977 to only 13% in 1987 to 1989. Recent advances in

diagnosis and treatment had driven improvement to 19% in 2006 to 2012.[3] Dismal as these survival statistics are, they are even worse in most other countries, where high-quality care is less accessible.[4] Our collective failure to achieve major improvement in the aggregate population-level lung cancer survival statistics reflects the difficulty of lung cancer biology, the absence of effective means of early detection (a problem that now has a partial solution with the advent of low-dose computed tomography [CT] screening),[5] but also the complexity of the care-delivery problem lung cancer poses.[6-8]

The Inherent Complexity of Lung Cancer Care

Several demographic, clinical, and care-delivery characteristics conspire to make provision of care for the lung cancer patient complicated, high-risk, and therefore, needful of a carefully coordinated, evidence-based approach to planning and execution. The combination of cumulative age and tobacco-related comorbidities makes the lung cancer patient relatively frail, compared with patients with other types of cancer. For example, the median age of the US lung cancer patient is approximately 72 years,[9] more than 90% of patients have a smoking history of >10 years, and 79% have at

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least 1 major comorbid illness (including 27% with chronic obstructive lung disease, 22% who are survivors of a previous cancer, and 26% with major heart disease).[9,10]

Second, the danger associated with access to structures within the chest cavity limits diagnostic, staging, and treatment options to highly trained professionals using expensive technology for routine care. Furthermore, the wide range of diagnostic, staging, and treatment options means that a range of experts (radiologists, pulmonologists, thoracic surgeons, medical oncologists, radiation oncologists, palliative care specialists, among others) are involved in the routine course of care delivery. Combinations of treatment modalities (surgery, radiation therapy, chemotherapy, palliative care) are increasingly deployed to maximize patient benefit.[11-21]

In addition, treatment selection and outcome depend on the stage of the cancer. Curative-intent treatment is risky, and limited to physiologically fit patients with early stage disease, who have to be identified accurately to avoid overtreating those with advanced disease (who would not benefit), and undertreating those with early stage disease (who would thereby miss the potential benefit of curative-intent, albeit relatively toxic, treatment). There is increasing awareness of the high degree of variability in the performance and interpretation of staging tests, and the effect this has on patient survival.[22-27] Finally, further complicating matters, lung cancer in the United States is a disease of racial, socioeconomic, and geographic disparity.[28-30] It is most prevalent, but also most lethal, in patients from the lower end of the socioeconomic scale, the underinsured, African Americans, rural and inner city dwellers, and residents of the Upper Midwestern and Southern United States.[28-35] For example, the states of Kentucky, Mississippi, Arkansas, Tennessee, and Alabama have the 5 highest lung cancer incidence and death rates in the United States.[2,3] Ironically, politicians in Mississippi, Tennessee, and Alabama, 3 of the poorest states in the United States, with some of the least well-organized health care infrastructures, have thus far resisted the opportunity to expand access to health care through the Affordable Care Act.[36]

Adverse Consequences of Complexity: Low Quality and Mind-Numbing Heterogeneity

There is a great deal of heterogeneity in the quality of clinical care for lung cancer patients, with consequent variability in outcomes of care. The amplitude of variability is wide, crosses the full spectrum of care from diagnosis to post-treatment follow-up (and even palliative care), and has a profoundly negative effect on patient survival, the extent of which is only now being recognized. For example, only 3.9% of the estimated 6.8 million Americans eligible for low-dose CT screening had participated as recently as 2015[6]; the median duration of time from initial presentation with symptoms to diagnosis of lung cancer in the United States is approximately 138 days[37]; fewer than 10% of patients have a confirmatory staging biopsy to establish the extent of spread of their disease[22]; fewer than 30% of patients who had surgical resection in Commission of Cancer-accredited hospitals in 2001 had a preoperative mediastinoscopy, of whom fewer than 50% had any lymph node material provided from the procedure[38]; 12% to 18% of patients who have surgical resection have no lymph nodes examined, even though this is the single most important prognostic factor in patients who have

surgery[39-43]; 62% of patients said to have "mediastinal lymph node-negative disease" after surgery in the Surveillance, Epidemiology and End Results database from 1998 to 2002 actually had no mediastinal lymph nodes examined[44]; only 8% of curative-intent surgical resections performed in all hospitals within a single metropolitan area from 2004 to 2007 met the basic oncologic surgical resection quality criteria set by the National Comprehensive Cancer Network.[39]

The use and outcomes of all treatment modalities—surgery, radiation therapy, chemotherapy, palliative care—individually, or in combination, varies significantly and is markedly affected by nonclinical factors such as age,[45-47] race,[45,48-54] geographic location,[55,56] socioeconomic factors,[55] insurance status,[28,34] type of institution,[55,57-59] and type of provider.[60-64] For example, the use of curative-intent surgical resection for patients with clinical stage I and II non—small-cell lung cancer varies across 40 US states, ranging from approximately 50% in Wyoming and Louisiana and to almost 80% in Massachusetts, New Jersey, and Utah.[65] The absence of a structure for standardizing access, and for overseeing the planning, coordination, and execution of care and its outcomes, no doubt contributes to these striking variances in quality and outcomes in the prevailing environment of lung cancer care delivery.

Simplifying the Inherent Complexity of Lung Cancer Care: Conceptualizing and Modeling Approaches to Care Delivery

Lung cancer care begins with an abnormal x-ray or CT scan. It then proceeds through a series of steps including a diagnostic biopsy, tests to determine the stage, evaluation of physiologic fitness for various treatment options, eventually to definitive treatment and post-treatment surveillance and survivorship care. Each step has multiple options, each of which is performed by a specific highly trained specialist, and requires expensive, hi-tech equipment, such as image-guided biopsy procedures (by interventional radiologists), positron emission tomography/CT scans (nuclear radiologists), bronchoscopy (pulmonologists), endobronchial ultrasound-guided biopsies (interventional pulmonologists), mediastinoscopy (thoracic surgeons), radiation therapy (radiation oncologists), chemotherapy (medical oncologists), surgical resection (thoracic surgeons), palliative care (pain or palliative care specialists), to give a few examples.[8,66]

In the usual care model, patients are sequentially referred to each of these specialists for evaluation and care. This process often excludes direct patient input (non—patient-centered),[67,68] takes too long (nontimely),[37,69-72] and is also often duplicative (inefficient) and incomplete.[22,73] Furthermore, it is difficult for disadvantaged patients to access (inequitable),[74] and lacks effective oversight.[26,27,75] There is a high level of non—evidence-based treatment selection,[45,76] and variation in quality,[22,23,25-27,39,40,44,73] and safety.[57-59] These all contribute to poor patient outcomes (poor effectiveness).

"A Land Flowing With Milk and Honey?"

Conceptually, the goal of any well functioning lung cancer program must be to quickly, efficiently, and accurately triage patients