Original Study

Survival Outcomes Among Lung Cancer Patients Treated Using a Multidisciplinary Team Approach

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Abstract

We sought to determine whether a multidisciplinary team (MDT) approach to lung cancer care yields superior outcomes to a traditional care model. The present investigation included > 4000 patients and compared the survival outcomes between lung cancer patients participating in an MDT program and those receiving traditional care. The results suggest a significant survival benefit with the MDT approach for the diagnosis and treatment of lung cancer.

Background: Evidence favoring a multidisciplinary team (MDT) approach in the treatment of lung cancer is scarce, especially in the United States. The purpose of the present investigation was to evaluate survival outcomes of lung cancer patients treated with an MDT compared with a traditional care model. **Patients and Methods:** The Stony Brook Cancer Center Registry was used to identify all lung cancer cases diagnosed between 2002 and 2016. We compared survival outcomes among 1956 lung cancer patients participating in our institution's Lung Cancer Evaluation Center's (LCEC) MDT program and 2315 lung cancer patients receiving traditional care. Log-ranks tests were used to evaluate differences in the 1-, 3-, 5-, and 10-year survival outcomes between the 2 groups. To address inherent biases, Cox proportional hazard models were used to estimate the effects on survival outcomes and adjust for possible confounders. Propensity matching was also performed to account for the effects of selection bias. **Results:** The 5-year survival rates in the propensity-matched sample were one third greater among LCEC patients compared with those receiving a traditional care approach (33.6% vs. 23.0%; $P < .001$). After adjusting for potential confounders in the multivariable propensity-matched analyses, the LCEC model demonstrated a significant beneficial effect on 5-year survival outcomes compared with the standard treatment model (hazard ratio, 0.65; 95% confidence interval, 0.54-0.77). **Conclusion:** The results of the present investigation suggest an improved survival benefit from usage of an MDT model versus a traditional care model in the treatment of lung cancer. Despite the use of sophisticated statistical methods to mitigate bias in a nonrandomized study, additional research is needed to determine the extent to which an MDT approach for lung cancer influences patient outcomes.

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Introduction

Lung cancer remains the leading cause of cancer death worldwide with a 5-year survival rate of 17%.[1] Most cases of lung cancer are detected by imaging modalities and are typically first reported to an internist or primary care physician, followed by referral to a pulmonologist and subsequent referrals to an oncologist, a thoracic surgeon, and/or a radiation oncologist. At each of these steps, the patient and responsibility of care is handed over to the next physician. This serial treatment care model has been accentuated in recent years by the ultra-specialization of physicians and is often perceived as slow, fragmented, and poorly coordinated.[2] Multidisciplinary teams (MDTs) of specialized health care professionals have been shown to improve the outcomes of patients with various cancer types[3]; however, the evidence for lung cancer in this regard, especially in the United States, has been scarce.[4-6] To date, questions regarding whether MDTs contribute to increased survival and a better patient experience or whether this model of care simply escalates expenses without cost efficiency and effectiveness remain.

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In 2000, a multidisciplinary program, the Lung Cancer Evaluation Center (LCEC), was established at Stony Brook University Hospital (SBUH) with the intent of implementing an MDT model of care to evaluate, treat, and monitor patients with lung cancer. SBUH also maintains a cancer registry, which captures all patients with a diagnosis of any cancer at SBUH. This repository is tasked with recording the demographic data, medical history, cancer treatment, and outcomes data for all cancer patients, including survival status and death certification, on an annual basis. The purpose of the present investigation was to use the cancer registry to compare the short-term and long-term survival outcomes of lung cancer patients treated within the LCEC's well-defined MDT program with those of patients who had received a traditional model of cancer care at SBUH.

Patients and Methods

Patient Population

The present retrospective investigation included all lung cancer cases diagnosed between 2002 and 2016 entered into the SBUH cancer registry. Cases reported during the 15-year period were divided into 2 groups: LCEC and non-LCEC. Crossing the registry data with the clinical LCEC database yielded a study sample of 1956 lung cancer patients in the LCEC group and 2315 patients in the non-LCEC group. The LCEC patients were defined as those who had, at a minimum, one clinical encounter with the MDT physicians and case presentation at the tumor board. Data abstracted from the registry included age at diagnosis, date of diagnosis (defined as the date the cancer diagnosis was clinically documented at SBUH), gender, race, smoking and alcohol history, marital status, diabetes, hypertension, family history of cancer, cancer histologic type when diagnosed at SBUH, tumor stage, treatment modalities, and survival status and duration. The registry does not capture performance status, preceding treatment, or the date of first detection.

Setting

SBUH is a public suburban university hospital in the Northeast serving the County of Suffolk, which includes ~ 1.5 million people. Hospital personnel include full-time faculty and staff, as well as community physicians. As in many such settings, care is not institutionally dictated, and the principle of "choice" by patient and physician is upheld, making it possible for an LCEC physician to treat a non-LCEC patient. This was especially true for patients receiving radiation therapy.

LCEC Multidisciplinary Care and Surveillance Model

The LCEC program includes thoracic surgery, interventional pulmonology, medical oncology, radiation oncology, and 2 dedicated nurse practitioners as the core group. Interventional radiology, radiation therapy, chest radiology, and social and nutritional support are also on site. Referrals to LCEC, from within and external to SBUH, are provided at the discretion of the referring physician. Physicians who opt to treat their patients outside the program do so without institutional pressure.

LCEC patients are seen in 1 location, with most initially evaluated in an outpatient setting. Ancillary help is available to facilitate referrals, authorizations, and appointments which shift the burden for these from the patient to the clinic. Patients with concerning findings are further discussed at an MDT tumor board conference. All LCEC patients and those under surveillance for the development of lung cancer are followed using the National Comprehensive Cancer Network and Fleischner Society guidelines as the standards of care.

Statistical Analysis

Descriptive statistics are presented separately for LCEC and non-LCEC cases. Differences between the 2 groups were determined using χ^2 tests for categorical data and t tests for continuous data. Log-rank tests were used to evaluate differences in the 1-, 3-, 5-, and 10-year survival outcomes between LCEC and non-LCEC patients, stratified by tumor stage. Cox proportional hazard (CPH) models were used to provide estimates of factor effects on survival, with adjustment for possible confounders, including LCEC status, age at diagnosis, gender, race, marital status, smoking status, alcohol consumption, history of diabetes, history of hypertension, family history of cancer, tumor stage, and histologic type. Additionally, the date of entry into the registry was included in the model to adjust for the possible influence of temporal confounding related to improvement in survival outcomes over time. Hazard ratios (HRs) and 95% confidence intervals (CIs) are presented. To address the differences between groups resulting from selection, referral, or other biases, propensity-matched analyses were also conducted. The LCEC and non-LCEC patients were matched on age, gender, race, cancer type, stage, and treatment (surgery vs. no surgery). Any crossover patient entering or exiting LCEC was defined as an LCEC patient. To address the possible effect of crossover for those exiting LCEC care prematurely, a subgroup analysis of patients who were actively treated or who had died under the care of the LCEC was performed.

SPSS, version 21, was used to conduct these analyses. The SBUH's committee on research involving human subjects approved this study (approval no., 1007483-1).

Results

The present investigation included 4271 patients with a diagnosis of lung cancer at SBUH between 2002 and 2016. The demographic and other characteristics of all lung cancer cases, stratified by LCEC status, are presented in Table 1. The average age at diagnosis among LCEC and non-LCEC patients was 67 years, and the racial composition for both groups was predominantly white (93%-94%). The groups were also similar in gender distribution, smoking history, and marital status. Significant differences were noted between the 2 groups with respect to a history of alcohol consumption, diabetes, hypertension, a family history of cancer, and tumor histologic type. Only 18.7% of LCEC patients had histologic information that had not been certified by the SBUH pathology department or was otherwise unknown compared with 34.8% of non-LCEC patients ($P < .001$; Table 1). Since cancer care occurs predominantly in the outpatient setting, the noted asymmetry likely resulted from the predominant number of non-LCEC patients having their tissue confirmation performed external to SBUH.

The LCEC patients were registered at a significantly earlier stage than were the non-LCEC patients, with lung cancer diagnosed in approximately one half of LCEC patients at stage I/II compared with 20% of non-LCEC cases. Additionally, the percentage of