Tobacco Cessation May Improve Lung Cancer Patient Survival

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Introduction: This study characterizes tobacco cessation patterns and the association of cessation with survival among lung cancer patients at Roswell Park Cancer Institute: an NCI Designated Comprehensive Cancer Center.

Methods: Lung cancer patients presenting at this institution were screened with a standardized tobacco assessment, and those who had used tobacco within the past 30 days were automatically referred to a telephone-based cessation service. Demographic, clinical information, and self-reported tobacco use at last contact were obtained via electronic medical records and the Roswell Park Cancer Institute tumor registry for all lung cancer patients referred to the service between October 2010 and October 2012. Descriptive statistics and Cox proportional hazards models were used to assess whether tobacco cessation and other factors were associated with lung cancer survival through May 2014.

Results: Calls were attempted to 313 of 388 lung cancer patients referred to the cessation service. Eighty percent of patients (250 of 313) were successfully contacted and participated in at least one telephone-based cessation call; 40.8% (102 of 250) of persons contacted reported having quit at the last contact. After controlling for age, pack year history, sex, Eastern Cooperative Oncology Group performance status, time between diagnosis and last contact, tumor histology, and clinical stage, a statistically significant increase in survival was associated with quitting compared with continued tobacco use at last contact (HR = 1.79; 95% confidence interval: 1.14–2.82) with a median 9 month improvement in overall survival.

Conclusions: Tobacco cessation among lung cancer patients after diagnosis may increase overall survival.

Key Words: Tobacco, Smoking, Cessation, Lung cancer, Lung cancer survival.

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According to the 2014 Surgeon General's Report, smoking by cancer patients and survivors causes adverse outcomes including increased overall mortality, increased cause-specific mortality, and increased risk for second primary cancers.[1] However, few studies have examined whether those who quit as a result of standardized tobacco use assessments with automated referral to cessation support are more likely to survive.[2–5] The majority of published literature utilizes retrospective chart reviews, with nonstandardized tobacco use determination, if recorded at all, to examine the association of tobacco use with cancer outcomes.[3,6–8] Far fewer studies have evaluated the potential benefit of smoking cessation for improving cancer outcomes,[1,5–7] although data strongly suggest that smoking cessation may significantly improve survival for lung cancer.[9]

The need for standardized tobacco use assessments and cessation support has been recognized even though there is little prospective research on tobacco use and cancer survival.[6,7] Since October 2010, Roswell Park Cancer Institute (RPCI) has operated a Tobacco Assessment and Cessation Service (TACS), completing standardized tobacco use assessments for every patient in the thoracic center with automatic referrals to a dedicated tobacco cessation counseling service. Patients can elect to opt out of the service once contacted by a cessation specialist.[10] This article presents data on the following: (1) the lung cancer patients referred to the RPCI TACS; (2) quit rates of the referred patients; and (3) patient survival, comparing patients who stopped smoking with those who did not.

MATERIALS AND METHODS

RPCI Tobacco Cessation Service & Data Collection

This study was approved by the Institutional Review Board of RPCI. The tobacco assessment and automated referral methods for the RPCI TACS have been previously

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described in detail.[10] In brief, during the routine nursing assessment, all ambulatory patients are screened with a standardized tobacco assessment and if they report tobacco use in the past 30 days are automatically referred to a tobacco cessation counseling service. This service is staffed by cessation specialists who provide behavioral counseling with linkage to pharmacologic support if needed.[11] Cessation specialists contact referred patients 1 to 2 weeks after referral, with call priority for patients referred as current users. RPCI TACS is a clinically designed and supported service that offers cessation support to patients, while relieving physicians of the burden of providing smoking cessation support while dealing with complex oncology issues. This service created a prospective cohort of thoracic clinic patients to serve as a base for this analysis exploring the association between cessation and survival.

The goal for the cessation counselors was to complete at least one successful contact attempt for as many patients as possible. Patients were considered not reached after five unsuccessful call attempts; if they were not reached, they were sent a letter informing them of the benefits of quitting and quitting tips, and inviting them to call the RPCI TACS for support. During successful phone calls, cessation specialists asked patients if they had been tobacco free for the prior 24 hours. The cessation specialist asked patients who reported cessation if they had been tobacco free for the prior 7 days.

Data were abstracted from the electronic medical record (e.g., age, marital status, referring clinic, pack-year history, Eastern Cooperative Oncology Group (ECOG) performance status, and smoking status at referral), cessation specialist notes (e.g., call dates and outcomes), and the RPCI tumor registry (e.g., race, ethnicity, clinical stage, vital status, and survival time in months) between October 2010 and May 2014; survival duration was assessed in May 2014. Data were linked by patient medical record number, compiled into a main dataset and deidentified.

Patient Population

Eligibility included patients seen in the RPCI thoracic center with histologically confirmed lung cancer, diagnosed on or after October 1, 2010, and who reported tobacco use within the 30 days before initial evaluation (n = 388). Established patients (i.e., not newly diagnosed with cancer), patients already treated outside of RPCI, and patients presenting for evaluation of biopsy results or for a second opinion were excluded (n = 9). Patients in hospice or end-of-life care, as indicated by the electronic medical record (EMR) or contact with a family member, were also excluded (n = 27 of 388, 7.0%). Only patients referred to the cessation service between October 2010 and October 2012 and with at least one successful contact by the RPCI TACS were included in the survival analyses (n = 250 of 388, 64.4%).

Statistical Analysis

Some patients who had quit at initial referral were lost to follow-up (n = 75 of 388, 19.3%), whereas others had one cessation contact before being lost to follow-up (n = 137 of 388, 35.3%). Patients were included in this analysis if they participated in at least one telephone call with the RPCI TACS. To account for the loss to follow-up and variable nature of quitting, the main cessation indicator was self-reported smoking status at the last contact, which was obtained through May 2014. To be considered as having quit, a patient had to indicate that he or she was tobacco-free for at least 24 hours at time of last contact.

ECOG performance status was routinely documented in the EMR for all patients by a combination of nursing staff, advanced practice providers, and physicians; and was dichotomized into those with a score of 0 (fully active, as if disease free) and those with a score of one or higher (restricted from strenuous activity or more severely limited, including deceased).[12] To control for disease severity, ECOG status, along with tumor stage, were included in the final adjusted model. Clinical stage was included as a categorical variable with three categories; stages I and II combined served as the referent, with stages III and IV as comparison groups.

Descriptive statistics were used to examine the referral patterns, demographics, disease characteristics, self-reported quit rates at each contact, and self-reported status at the last contact. Frequencies and χ^2 tests were used for categorical variables, ANOVA was used to analyze continuous variables and quit rates, and Kaplan–Meier with log-rank test for survival time with quit rates. Survival analysis was conducted using a Cox proportional hazards model. Vital status (alive or deceased at the end of follow-up) and survival time in months were the main outcome variables for the survival analysis. The date of diagnosis served at the date of origin for survival time. Variables included in the Cox proportional hazards model with support in the literature included age at diagnosis, pack-years, days between diagnosis and last contact, sex, clinical stage, ECOG status, tumor histology (NSCLC vs. other), and tobacco use status at time of referral.[3,13,14]

RESULTS

Lung Cancer Patient Referrals to the Cessation Counseling Service

Between October 2010 and October 2012, 388 thoracic clinic referrals to RPCI TACS were lung cancer patients who met eligibility criteria for inclusion in these analyses with a diagnosis date between October 1, 2010 and October 31, 2012 (Fig. 1). About 81% of those referred (313 of 388) had at least one cessation support call attempted, of which 250 of 313 patients (79.9%) participated; only five (1.3%) actively refused participation. Among 58 patients who did not participate, 27 patients (7.0%) were in end of life care or reported to be deceased; 26 patients (6.7%) could not be reached, and five (1.3%) were considered inappropriate referrals as never users or they had quit greater than 30 days before referral. Seventy-five of 388 patients (19.3%) were not called, but were sent an information pamphlet about the benefits of cessation, quit tips and an invitation to call the service. There were, on average, 21.5 days between referral to the RPCI TACS and first contact.

Among the 250 patients who participated in at least one cessation support call, 149 patients (59.6%) had a follow-up call attempted, with 136 patients (91.3%) participating in at

