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Lung cancer stigma and depression: Validation of the Lung Cancer Stigma Inventory

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Abstract

OBJECTIVE.—In an effort to provide further evidence for the validity of the Lung Cancer Stigma Inventory (LCSI), this paper examined group differences in lung cancer stigma for patients who report clinically significant depressive symptoms and established a suggested scoring benchmark to identify patients with clinically meaningful levels of lung cancer stigma.

METHODS.—Patients (n=231) who were diagnosed with lung cancer and treated within the past 12 months at one of two NCI-designated Cancer Centers located in the northeast and southern parts of the United States completed a single battery of questionnaires examining lung cancer stigma and depressed mood. Group differences, bivariate correlations and receiver operating characteristics (ROC) analyses were conducted.

RESULTS.—Slightly more than a third of patients (35.9%) reported an elevated level of depression. There was a significant correlation ($r = 0.44$) between lung cancer stigma and depressive mood. The ROC curve analysis indicated an AUC of 0.71. A LCSI cutoff score of 37.5 yielded the optimal ratio of sensitivity (0.93) to specificity (0.70) for identifying patients with clinically meaningful lung cancer stigma.

CONCLUSIONS.—Consistent with prior work, lung cancer stigma, as measured by the LCSI, was found to be moderately associated with depressed mood. Clinical investigators may use an LCSI total score above 37.5 (i.e., greater than or equal to 38 on the LCSI scale of integer scores) as a clinical threshold for identifying patients who may be experiencing clinically meaningful stigma and may benefit from stigma-reducing interventions.

Keywords

Cancer; Depression; Lung Cancer; Oncology; Patient-Reported Outcome; Stigma

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Background

Despite recent advances in early detection (1) and treatment (2, 3) of lung cancers, most cases are diagnosed at late stages and have poor prognoses. Patients with lung cancer report high levels of psychological distress (4) and have significant supportive care needs.

Although there are other known environmental and genetic risk factors for lung cancer, exposure to cigarette smoke (primary smoking or secondhand smoke exposure) is responsible for almost 90% of lung cancer cases (5). Largely attributable to this well-established, causal link with cigarette smoke, individuals diagnosed with lung cancer often report a form of health-related stigma in which a patient perceives and potentially internalizes an experience of rejection, blame, or devaluation directly linked to the explicit or implicit assumption that their behavior (i.e., smoking) has caused their disease (i.e., lung cancer).

Lung cancer stigma is thought to be a unique, disease-specific, contributing factor to the high prevalence of depressed mood among patients diagnosed with lung cancer (6–9), has been identified as a barrier to screening (10) and a contributor to diagnostic delay (11). A recent review of the psychosocial and pharmacological interventions for treating depression among cancer patients (12) concluded that further research is needed to identify new modifiable targets and to develop novel interventions addressing specific psychosocial risk factors. It is plausible that interventions designed to ameliorate lung cancer stigma may reduce the depressed mood often observed in this patient population.

Increased recognition of the potential clinical importance of lung cancer stigma calls for reliable and valid assessment of stigma in lung cancer care settings. Our research team has developed and begun psychometric analysis of a new patient-reported outcome (PRO) measure for the clinically meaningful assessment of stigma in patients with lung cancer, the *Lung Cancer Stigma Inventory* (LCSI) (13, 14). Other measures used to assess lung cancer stigma have been developed for use with other stigmatized populations (e.g., HIV) and subsequently reworded for use with lung cancer patients (15) or have been developed without direct input on item content from lung cancer patients (16, 17). Addressing these prior limitations, the LCSI was created using rigorous psychometric procedures recommended for developing PRO measurement tools (18–21), including the involvement of patient input in the development of the conceptual model and item generation. We developed a conceptual blueprint for item development by conducting qualitative interviews with lung cancer patients and eliciting relevant clinical themes of perceived and internalized stigma (13). Prior psychometric analyses (14) have demonstrated internal consistency, test-retest reliability, underlying factor structure and convergence with an existing measure of lung cancer stigma (16). Another strength of LCSI is the ability to assess three conceptually related yet distinct facets of lung cancer stigma: internalized stigma (i.e., directing negative societal attitudes towards oneself), perceived stigma (i.e., negative appraisal and devaluation from others), and constrained disclosure (i.e., avoidance or discomfort in sharing one's lung cancer status with others) (14).

In this next phase of this research, we focus further on LCSI validation and establishing a scoring benchmark of lung cancer stigma—a term we call *clinically meaningful stigma*—

that corresponds with clinically significant symptoms of depression. Given the hypothesized association between lung cancer stigma and depressive symptoms, our specific aims were to: 1) demonstrate incremental evidence for validity of the LCSi total and subscale scores by examining correlations and group differences (high and low lung cancer stigma) in depressive symptoms; and 2) identify a clinical cutpoint for the LCSi with optimal sensitivity and specificity that identifies patients likely experiencing clinically meaningful lung cancer stigma.

Methods

Overview

Guided by best practices for the validation of PROs (18) and building upon our multi-phase, multi-site, efforts to develop and validate a psychometrically sound measurement tool for the assessment of stigma experienced by patients with lung cancer (13, 14, 22), this paper reports secondary data analyses establishing incremental evidence for validity of the LCSi. Detailed information about the recruitment, sample characteristics and measurement tools was previously reported (14). This study was approved by the Institutional Review Boards at both sites.

Patient Recruitment

Participants were recruited from two NCI-designated cancer centers located in the northeast and southern parts of the United States. Eligible individuals were adult patients with pathologically confirmed lung cancer diagnosis (either non-small cell lung cancer [NSCLC] or small cell lung cancer [SCLC], any stage) who were diagnosed or treated within the last 12 months and able to read and comprehend English. At time of study enrollment, participants were either undergoing cancer treatment (chemotherapy or radiation therapy) or had undergone surgical resection, radiation treatment, or chemotherapy within the prior 12 months. Participants with significant cognitive impairment that rendered them incapable of providing informed consent and/or study participation were excluded. Of the 356 eligible patients identified, 231 consented and provided analyzable data (65% response rate). Study participants were instructed to complete a 30-minute battery of PRO questionnaires reflecting measurement of depression and other potentially important concepts related to lung cancer stigma.

Study Procedures

Participants completed the questionnaire in one of the three ways: 1) on a tablet computer provided by the research assistant; 2) through a secure electronic (web-based) portal from their own computer; or 3) a paper-based version of the survey. Web-based, questionnaire completion was supported by REDCap (Research Electronic Data Capture)¹ data management software system. Data from participants who completed paper surveys were subsequently entered into REDCap by study staff.

¹<http://project-redcap.org/>

Measures

Demographic and Clinical Information—Demographic and clinical information was obtained via patient self-report (e.g., age, sex, race, ethnicity, education level, marital status, time since diagnosis, treatment history, smoking status). Disease type and stage were obtained from both patient-report and the electronic health record (EHR).

Smoking Status—Smoking status was determined with the following two questions: a) “Have you smoked at least 100 cigarettes in your lifetime?” and b) “Do you smoke cigarettes every day, some days, or not at all?” Those participants who reported smoking at least 100 cigarettes and who were currently smoking (e.g., every day or some days) were categorized as current smokers. Those who reported not currently smoking were categorized as former smokers. Finally, those who reported < 100 cigarettes/lifetime were considered never smokers.

Depressive Symptoms—Depressive mood was assessed using the 10-item short form of the Center for Epidemiological Studies-Depression Scale (CES-D) (23–25). Participants were asked to consider their mood during the past week. Participants responded on a 4-point Likert scale ranging from “Rarely” to “All of the Time”. Sample items include “I felt depressed,” and “I felt lonely.” The full CES-D and its short-form versions have been shown to be valid measures of depressive symptomatology with excellent internal consistency, as well as test-retest reliability in a sample of cancer patients (26). In previous literature using the 10-item CES-D, a cutoff scale score of 10 has been the most often used threshold for clinically significant depression (24, 27).

Lung Cancer Stigma—To measure lung cancer stigma, patients completed the 25-item *Lung Cancer Stigma Inventory* (14, 28), that assesses overall lung cancer stigma as well as three related subscales: Perceived stigma, Internalized stigma and Constrained disclosure. Participants are asked to endorse the strength of lung cancer stigma experienced since diagnosis using a 5-point Likert scale (1 = Not at all to 5 = Extremely). Examples of items include: “I have blamed myself for having cancer” and “I have felt guilty about my lung cancer” The overall LCSi score is a sum total of all 25 items. Internal consistency (Cronbach’s $\alpha = 0.89$) and test-retest correlation ($r = 0.90$) of the total LCSi is high, suggesting stability of measurement over time. The LCSi has three subscales: Internalized stigma (9 items), Perceived stigma (10 items), and Constrained disclosure (6 items) which all demonstrate good internal consistency (Cronbach’s α ’s > 0.74). Good convergent validity has been established between the LCSi and an existing measure of lung cancer stigma, the *Cataldo Lung Cancer Stigma Scale* (CLCSS; $r = 0.58$ ($p < 0.001$)).

Analytic Plan—First, descriptive statistics were calculated for demographic and clinical variables, depressive symptoms and lung cancer stigma. Second, bivariate correlations, t-tests, and ANOVAs (as appropriate) were conducted to examine relationships between selected demographic variables (i.e., age, gender, education, marital status, ethnicity, race), smoking status, depressive symptoms, and lung cancer stigma, and the LCSi subscales. We used the dichotomous variable of ever and never smoker (smoked more than 100 or less than 100 lifetime cigarettes) because of the low percentage of current smokers. Third, using data

from 196 participants with non-missing LCSi and CES-D data, receiver operating characteristic (ROC) analysis was performed to determine whether LCSi total and subscale scores could identify whether a patient met criteria for clinically significant depression as determined by the CES-D cutoff score of 10 (24, 27). To do this, sensitivity and specificity of each score in the LCSi's range was calculated and used to determine how well the score distinguished individuals who surpassed the CES-D cutoff score from those who did not. The ROC curve graphically represents the sensitivity and specificity coefficients that would be generated using each possible cutoff score in the LCSi's range, with the accuracy of the cutoff score determined by calculating the area under curve (AUC). Calculating the AUC generates scores from 1.0 (perfect accuracy) to 0.5 (accuracy no better than chance). This analysis allowed us to estimate the rate of true positives, true negatives, false positives (i.e., cases wrongly identified as likely depressed/experiencing lung cancer stigma), and false negatives (i.e., cases wrongly identified as not depressed/experiencing lung cancer stigma) using a specific LCSi cutoff score. We used Youden's Index to maximize both specificity and sensitivity (29). Analyses were completed using SPSS version 25 (IBM SPSS Statistics for Windows, Version 25.0).

Results

Participant Characteristics

Eligible patients ($n=231$, 64.9%) consented and provided at least partial survey data. Participants were lung cancer patients with mean age of 62.8 years old ($SD=11.0$). The majority of participants identified as White (78.8%), married (62.8%), and female (63.6%). Patients were represented across all four disease stages: 11.7% Stage I, 8.2% Stage II, 18.6% Stage III, and 55.4% Stage IV (with 6.1% missing staging information). The majority of participants were former smokers. For more detailed sample demographic and clinical characteristics (see Table 1).

Lung cancer stigma and depressive symptoms

The LCSi had a mean of 49.61 ($SD=15.06$) and the CES-D had a mean of 8.43 ($SD=6.14$). More than a third (35.9%) of patients reported CES-D scores above 10, indicating an elevated level of depressed mood.

There was a significant bivariate correlation ($r=0.44$, $p<0.001$) between lung cancer stigma and depressive symptoms. Additionally, there were significant positive correlations between the CES-D score and LCSi subscales: internalized stigma ($r=.30$, $p<.001$), perceived stigma ($r=.35$, $p<.001$), and constrained disclosure ($r=.35$, $p<.001$). There were statistically significant differences between smoking status groups in lung cancer stigma, such that ever smokers (current and former) reported more overall stigma ($t(196)=-4.23$, $p<.001$) and internalized stigma ($t(210)=-6.81$, $p<.001$), compared to never smokers. Correlations between LCSi and CES-D were robustly positive and statistically significant for never smokers ($r=0.69$; $p<0.001$) and ever smokers ($r=0.39$; $p<0.001$). Participants who identified as White reported significantly higher internalized lung cancer stigma ($M=24.17$; $SD=9.82$) than those who identified as non-White ($M=20.38$; $SD=$

8.89), $t(209) = 2.32$, $p = .021$. No other demographic or smoking-related variable was associated significantly with LCSi or CES-D scores (all $p > .05$).

Establishment of an LCSi cutoff score for clinically meaningful lung cancer stigma

Examination of the LCSi's ROC curve indicated an AUC of 0.71. A cutoff score of 37.5 yielded the maximum sum of sensitivity (0.93) and specificity (0.70) (Youden's $J = .63$) when the CES-D cutoff score of 10 is used as a criterion, (see Figure 1).

The frequencies of true positives, true negatives, false positives, and false negatives generated using the LCSi cutoff score of 37.5 were examined (see Table 2). Results from ROC analyses of 196 participants with complete CESD and LCSi data indicated that 72 participants (36.7%) were classified as reporting depressed mood, including 67 (34.2% of total sample; 93% true positive probability) identified by both the LCSi and the CES-D as experiencing clinically significant symptoms, and 37 (18.9% of total sample; 29.9% true negative probability) identified by both the LCSi and the CES-D as not experiencing clinically significant symptoms. False positives were identified as 87 participants (44.4% of the total sample; 70.1% false positive probability). False negatives were identified as a small percent of the sample (5 patients, 1.5% of total sample; 6.9% false negative probability); who were identified by the CES-D as having clinically significant depressive symptoms, but who scored below 37.5 on the LCSi. A total of 154 participants (78.6%) scored above the clinical cutpoint of 37.5 on the LCSi (see Table 2).

Conclusions

To assess and ameliorate stigma commonly experienced by patients with lung cancer, there is a need to validate psychometrically robust PRO measures and establish a clinically meaningful cutpoint for identification of lung cancer patients who might benefit from stigma-reducing interventions. Building upon prior reported evidence for internal consistency, convergent validity, and test-retest validity (14), the current finding of a moderately strong association between lung cancer stigma and depressed mood suggests that these psychosocial constructs are related but not redundant. These findings are consistent with prior published work (7, 8) that demonstrated a moderately robust correlation between lung cancer stigma and depressive mood. The ROC curve provides a useful illustration of the relationship between these two constructs providing incremental evidence for the construct validity of the LCSi and a clinically meaningful benchmark for interpretation of LCSi scores. Using a LCSi clinical cutoff of 37.5 (i.e., greater than or equal to 38 on the total LCSi scale of integer scores) best enables clinicians and researchers to identify at-risk patients with lung cancer who may be experiencing levels of lung cancer stigma associated with depressed mood. These findings add to the growing body of cross-sectional and longitudinal research demonstrating that lung cancer stigma is associated with poorer health-related adjustment across psychological (6, 9), physical (15, 30), and functional domains (15, 31).

We recommend that clinical investigators use LCSi as tool for measuring lung cancer stigma as a primary outcome in clinical trials of psychosocial support interventions for patients with lung cancer. We hypothesize that psychosocial interventions that target lung cancer stigma

will improve upon existing interventions targeting the depression experienced by patients with lung cancer. Quite simply, psychosocial interventions for patients with lung cancer must confront the “elephant in the room” in order to engage patients and address their socioemotional needs.

Study Limitations

Despite its many strengths, this study also has some limitations. First, the cross-sectional design limits the conclusions that can be drawn from the findings. Although the results can be interpreted as suggesting that stigma contributes to depression, the possibility that depression contributes to lung cancer stigma cannot be ruled out. Second, though participants were recruited from two lung cancer care settings, the study’s sample was relatively homogeneous with respect to race, ethnicity and English-language speaking, limiting the ability to generalize the findings to the entire lung cancer patient population. Future studies with more diverse sample should attempt to replicate our finding that internalized stigma was greater among White than non-White patients. Similarly, most participants were former smokers, and, though we had good representation of never smokers, current smokers were underrepresented. Future studies should pay greater attention to representative recruitment of current smokers. Third, there were shortcomings in our measurement of depression such that patient-reported depressive symptoms were measured rather than a structured clinical interview assessing clinical depression conducted by a mental health professional. As such, the measure of depression may not be fully accurate in capturing clinical levels of depression. The suggested LCSF scoring benchmark was established in conjunction with a single measure of depressive symptoms, and future research should further investigate convergent validity of this cutoff score by conducting ROC analyses with additional measures of psychological distress. Lastly, we recognize that our suggested LCSF clinical cutoff score balances specificity for sensitivity, limited by AUC, and yields what could, in conventional parlance, be considered a high proportion of patients identified by the LCSF who are not likely to meet criteria for depression (false positives). Given that lung cancer stigma and depressed mood are only moderately correlated and that our ultimate goal in using the LCSF is to screen for and identify patients with clinically meaningful stigma who may benefit from stigma-reducing interventions, we suggest that using an LCSF cutpoint that is inclusive of patients who do and some who do not report depressed mood is both expected and acceptable. Along these lines, we considered raising the suggested LCSF clinical cutoff but decided against doing so, as to be most consistent with our goal of identifying all patients with lung cancer who may be experiencing clinically meaningful levels of lung cancer stigma. Also, our false negative rate was extremely small, indicating that most of those in this study who scored above the CES-D’s threshold for clinically significant depressive symptoms were identified using the cutoff score recommended here; it has good utility as a screening tool. Finally, our AUC, sensitivity, and specificity scores were acceptable ($<.70$) and aligned with other similar validation papers and standards (32). Other LCSF users may consider using a higher LCSF threshold for targeting patients for other psychosocial interventions.

Clinical Implications

Nonetheless, these findings underscore the clinical importance of measuring stigma and provide incremental evidence for use of LCSi as a primary outcome for the evaluation of targeted stigma-reducing psychosocial interventions for use in lung cancer care settings. The next step is to use the LCSi to assess for clinically meaningful levels of lung cancer stigma and identify patients most likely to benefit from psychosocial interventions to ameliorate lung cancer stigma. Recognizing the paucity of psychosocial interventions for patients with lung cancer (33), our research team is currently developing stigma reduction interventions designed to reduce patients' self-blame, shame, and guilt and increase medical providers' use of empathic communication skills. Our broad long-range goal is to develop effective multi-level interventions to reduce stigma so as to improve depressive mood and other psychosocial outcomes for patients with lung cancer (34). In conclusion, these findings underscore the theoretical and clinical importance of stigma for the health and well-being of lung cancer patients and highlight the need for appropriate measurement of lung cancer stigma as well as supportive care and intervention efforts for this patient population.

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Figure 1.
ROC† analysis comparing LCSIT‡ scores to CES-D§ cutoff score

Table 1.Demographic and clinical characteristics of the sample ($N=231$).

Characteristic	Number	Percentage
Age (in years)	$M=62.80$	$SD=10.96$
Gender		
Female	147	63.6
Male	84	36.4
Marital status		
Married/partnered	145	62.8
Race		
White	182	78.8
Black	33	14.3
Other	16	6.9
Ethnicity		
Hispanic	7	3.0
Education		
Less than college degree	117	50.6
College degree or higher	113	48.9
Clinic Location		
Parkland Oncology (Dallas, TX)	32	13.9
UTSW/Simmons (Dallas, TX)	39	16.9
Memorial Sloan Kettering Cancer Center (NY, NY)	160	69.3
Type of Lung Cancer		
Non-small cell lung cancer (NSCLC)	198	78.9
Small cell lung cancer (SCLC)	26	10.4
Missing	27	10.7 [†]
Stage of disease		
Stage I	27	11.7
Stage II	19	8.2
Stage III	43	18.6
Stage IV	128	55.4
Missing	14	6.1
Smoking Status		
Never smoker (<100 lifetime cigs)	60	26.0
Ever smoker (former & current; >100 lifetime cigs)	168	72.7

[†]Not All Percentages equal 100% Due to Missing Data.

Table 2.

Frequency of overlap when using the LCSI cutoff score of 37.5, with the CES-D cutoff score of 10 used as a classification criterion.

	Cutoff score		
	Below CES-D [†]	Above CES-D	
Cutoff score			
Below LCSI [‡]	37 (18.9%)	5 (2.6%)	42 (21.4%)
Above LCSI	87 (44.4%)	67 (34.2%)	154 (78.6%)
	124 (63.3%)	72 (36.7%)	196 (100%)

[†]CES-D is Center for Epidemiological Studies-Depression Scale.

[‡]LCSI is Lung Cancer Stigma Inventory. These analyses were conducted using data from 196 participants with non-missing LCSI and CES-D data.