

# Patient satisfaction with service quality in an oncology setting: implications for prognosis in non-small cell lung cancer

DIGANT GUPTA, MARK RODEGHIER AND CHRISTOPHER G. LIS

Cancer Treatment Centers of America<sup>®</sup>, 1336 Basswood Road, Schaumburg, IL 60173, USA

Address reprint requests to: Christopher G. Lis, Cancer Treatment Centers of America<sup>®</sup>, 1336 Basswood Road, Schaumburg, IL 60173, USA.  
Tel: +1-847-342-6625; Fax: +1-847-342-6626; E-mail: christopher.lis@ctca-hope.com

Accepted for publication 8 September 2013

---

## Abstract

**Objective.** To evaluate the relationship between self-reported satisfaction with service quality and overall survival in non-small cell lung cancer (NSCLC).

**Design.** A prospective cohort study.

**Setting.** Cancer Treatment Centers of America<sup>®</sup> from July 2007 and December 2010.

**Participants.** Nine hundred and eighty-six returning NSCLC patients.

**Intervention.** Overall patient experience ‘considering everything, how satisfied are you with your overall experience’ was measured on a 7-point Likert scale ranging from ‘completely dissatisfied’ to ‘completely satisfied.’

**Main Outcome Measure.** Patient survival was the primary end point.

**Results.** The response rate for this study was 69%. Six hundred patients were newly diagnosed, while 386 were previously treated. Four hundred sixty-nine were males, while 517 were females. 101, 59, 288 and 538 patients had stage I, II, III and IV disease, respectively. Mean age was 58.9 years. Six hundred and thirty (63.9%) patients had expired at the time of this analysis. Seven hundred and sixty-two (77.3%) patients were ‘completely satisfied’. Median overall survival was 12.1 months (95% confidence interval (CI): 10.9–13.2 months). On univariate analysis, ‘completely satisfied’ patients had a significantly lower risk of mortality compared with those not ‘completely satisfied’ [hazard ratio (HR) = 0.70; 95% CI: 0.59–0.84;  $P < 0.001$ ]. On multivariate analysis controlling for stage at diagnosis, prior treatment history, age and gender, ‘completely satisfied’ patients demonstrated significantly lower mortality (HR = 0.71; 95% CI: 0.60–0.85;  $P < 0.001$ ) compared with those not ‘completely satisfied’.

**Conclusions.** Self-reported experience with service quality was an independent predictor of survival in NSCLC patients undergoing oncologic treatment, a novel finding in the literature. Based on these provocative findings, further exploration of this relationship is warranted in well-designed prospective studies.

**Keywords:** patient satisfaction, service quality, survival, non-small cell lung cancer

---

## Introduction

Lung cancer is the most common cancer in the USA in terms of incidence and mortality with 219 440 new cases and 159 390 deaths in 2009 [1]. Patients with lung cancer experience a variety of distressing symptoms, many of which begin prior to diagnosis and continue throughout the course of the disease and its treatment, adversely affecting functional status and quality of life [2–5]. While symptom burden in lung cancer is well known, there is little to no data on how the satisfaction

with the quality of the services these patients receive at a health-care institution [6, 7] can affect their treatment outcomes.

Patient satisfaction with service quality is becoming an increasingly important tool for providers to demonstrate patient focus and differentiation in the healthcare community, as well as enhance patient experience. Furthermore, providers are using this information to make important decisions regarding operational and treatment plans [8]. Evaluations of service quality in an oncology setting provide important data concerning the patient satisfaction with the quality of care and

treatment delivered by physicians, paramedical staff and the hospital as a whole [9]. Health providers can use data on service quality to design and track quality improvement over time and compare themselves with other health providers (when the same measures are used), as well as recognize and expeditiously resolve service problems in real time [10, 11].

Evaluation of service quality involves a diverse array of methodologies, including longitudinal surveys, in-depth interviews, focus-group discussions, patient panels, consultation of voluntary groups and analyses of patient feedback and concerns. Such evaluations, when followed by speedy improvements to hospital operations and protocol, can enhance current and future patient satisfaction during and after treatment. Patient-reported service quality survey is the most widely used method for objectively and systematically determining cancer patients' satisfaction with the health care received [12].

There are several studies in the literature that have evaluated service quality in cancers like gastroesophageal [13], breast [10, 14], colorectal [15], lung [16], prostate [16] and gynecological [17, 18]. Collectively, these studies have found that satisfaction with the information provided by medical staff about a patient's illness and the course of treatment is important. This is followed closely by the time spent with the physician and the interpersonal skills of the physician. Other key factors are waiting time to get an appointment, empathy of staff with the patient, the continuity of care provided and satisfaction with the nursing staff [12].

Patient satisfaction with their treatment and services from medical providers is often influenced by patient's overall well-being and health [19, 20]. Similarly, patients who are responding more favorably to treatment will likely have greater survival and are also likely to have better current health and more positive feelings of well-being. Given the interrelationship among these characteristics, and because patient satisfaction is so commonly assessed in health care, we investigated the relationship between patient satisfaction with service quality and survival in non-small cell lung cancer (NSCLC) patients treated at a national network of oncology hospitals. The current study is a sequel to our recently published study evaluating this relationship in colorectal cancer [21].

## Methods

### Study population

All NSCLC patients who were seen in consultation at one of three Cancer Treatment Centers of America (CTCA) hospitals between July 2007 and December 2010 and who elected to have treatment at CTCA were eligible for inclusion in this study. The three CTCA hospitals were CTCA Eastern, CTCA Midwestern and CTCA Southwestern. Patients included in this study were randomly selected from a population that had not responded to a service quality questionnaire within the preceding 60 days. The surveyed cohort included a total of 986 patients. The study was approved by the CTCA Institutional Review Board.

## Questionnaire

The service quality questionnaire used in this study was first implemented at our institution in August 2006. The instrument was developed based on input obtained from patient focus groups, and survey dimensions were collated from several existing studies or questionnaires of oncology patients [22–25]. This service quality questionnaire covers the following dimensions of patient satisfaction: hospital operations and services, physicians and staff, and patient endorsements for others (friends and associates). The questionnaire was administered by trained survey associates at each CTCA hospital during a treating patient's visit. Eligible patients were typically contacted while they were waiting for various appointments. The survey was paper based and was completed by the patient and returned during that same visit at designated locations at each CTCA hospital.

The questionnaire included 13 individual service quality items: the ease of the registration process, the speed of the registration process, the timeliness with which care was delivered, the ease with which care was delivered, team helping you understand your medical condition, team explaining your treatment options, team involving you in decision-making, the amount of time spent with you, team calling you by your name, team genuinely caring for you as an individual, team providing you with a sense of well-being, 'whole person' approach to patient care and satisfaction with the treating medical oncologist (patient's primary physician). The questionnaire also contained one overall service quality item measured using the following question: 'considering everything, how satisfied are you with your overall experience with the institution?'

## Statistical analysis

Patient survival was the primary end point, and was defined as the time interval between the date a patient first returned the patient survey and the date of patient's death from any cause or the date of last contact/last known to be alive.

The 13 individual service quality items and 1 overall service quality item were used as independent variables in this study. The survey items were measured on a 7-point Likert-type scale ranging from 'completely dissatisfied' to 'completely satisfied'. Because of skewed data distributions, each service quality item was dichotomized into two categories for the purpose of this analysis: 'completely satisfied' (7) and 'not completely satisfied' (1–6). Other control variables investigated for their relationship with survival were gender, prior treatment history, stage at diagnosis, age and CTCA hospital. The prior treatment history variable categorized patients into those who had received definitive cancer treatment elsewhere before coming to CTCA and those who were newly diagnosed at CTCA. The stage at diagnosis variable was dichotomized into metastatic (stage IV) and non-metastatic disease (stages I–III). For CTCA hospital, dummy variables were created with CTCA Southwestern as the reference category.

Descriptive statistics and frequencies were computed for each service quality item in the questionnaire. The overall survival was calculated using the Kaplan–Meier method. Service

quality items were evaluated using univariate Cox proportional hazards models to determine which parameters showed individual prognostic value for survival. Multivariate Cox proportional hazards models were then performed to evaluate the joint prognostic significance of all service quality items significant on univariate analysis after controlling for relevant patient characteristics. We used both block entry method (all variables entered together at the same time in one block) as well as the forward stepwise method. Forward stepwise method was used because, as is common in service quality data, many of the individual items are highly correlated. Stepwise regression avoids the problem of multicollinearity because two highly correlated attributes will normally not both be entered in the model. Since 'overall patient satisfaction with service quality' is highly correlated with other individual service quality items, it was not included in multivariate Cox analyses when other service quality items were used, in order to achieve model stability. Instead, 'overall patient satisfaction with service quality' was analyzed separately after adjusting for clinical and demographic factors. The effect of perceived service quality on patient survival was expressed as hazard ratios (HRs) with 95% confidence intervals (CIs).

Cox regression with time-invariant covariates assumes that the ratio of hazards for any two groups remains constant in proportion over time. We checked this assumption by examining log-minus-log plots for categorical predictors. For continuous predictors, this assumption was checked using an extended Cox model with time-dependent covariates. Potential multicollinearity was assessed in two steps. Large values ( $>0.70$ ) of Kendall's tau  $b$  correlation coefficient were used as an initial screen for pairs of service quality measures, with one member of the pair not entered into the multivariate model (the measure that was more meaningful or actionable was retained). Kendall's tau  $b$  is an appropriate measure of association for categorical variables and is commonly used when both variables have the same number of categories. As a second check, the variance inflation factor (VIF) was used with the final model to verify that multicollinearity was not significantly influencing model coefficients [26, 27].

All data were analyzed using IBM SPSS version 20.0 (IBM, Armonk, NY, USA). A difference was considered to be statistically significant if the  $P$  value was  $\leq 0.05$ .

## Results

### Response rate

A total of 1429 returning NSCLC patients were contacted at all three hospitals combined to participate in the survey between July 2007 and December 2010. However, only 986 patients responded. As a result, the response rate for this study was 69%.

### Baseline patient characteristics

Table 1 displays baseline patient characteristics across the entire study population ( $n = 986$ ). At the time of this analysis

(June 2012), 630 (63.9%) patients had expired. The median time duration between the date first seen at CTCA and the date of patient satisfaction survey was 103 days.

### Service quality items

Table 2 describes patient satisfaction with service quality items pertaining to CTCA's operations and services. Table 3 describes patient satisfaction with service quality items pertaining to CTCA's multidisciplinary patient care team. Seven hundred and sixty-two (77.3%) patients were 'completely satisfied'.

**Table 1** Baseline patient characteristics ( $n = 986$ )

Variable	Categories	Number (%)
Age at the time of first survey	Mean	58.9
	Median	58.9
	Range	24.6–92.1
Gender	Males	469 (47.6)
	Females	517 (52.4)
CTCA Hospital	Midwestern	475 (48.2)
	Southwestern	299 (30.3)
	Eastern	212 (21.5)
Stage at diagnosis	Stage I	101 (10.2)
	Stage II	59 (6.0)
	Stage III	288 (29.2)
	Stage IV	538 (54.6)
Stage at presentation	Stage I	39 (4.0)
	Stage II	37 (3.7)
	Stage III	167 (17.0)
	Stage IV	743 (75.3)
Treatment history	Newly diagnosed	600 (60.9)
	Previously treated	386 (39.1)

**Table 2** Service quality items: operations and services

How satisfied are you with	Completely satisfied
The ease of the registration process ( $n = 980$ )	860 (87.8)
The speed of the registration process ( $n = 975$ )	835 (85.6)
The timeliness with which your care was delivered ( $n = 980$ )	737 (75.2)
The ease with which your care was delivered ( $n = 971$ )	813 (83.7)

Items were dichotomized into two groups of 'completely satisfied (7)' and 'not completely satisfied (1–6)'. Some sample sizes are  $>986$  because of missing responses.

fed' with the overall service quality they received. The highest levels of dissatisfaction were observed for the following individual service quality items: team helping you understand your

medical condition, the timeliness with which your care was delivered and team explaining your treatment options. Table 4 displays the patient characteristics and patient satisfaction with service quality stratified by the three CTCA hospitals.

**Table 3** Service quality items: multidisciplinary patient care team

How satisfied are you with our team in the following areas	Completely satisfied
Helping you understand your medical condition ( <i>n</i> = 960)	703 (73.2)
Explaining your treatment options ( <i>n</i> = 950)	719 (75.7)
Involving you in decision-making ( <i>n</i> = 948)	743 (78.4)
The amount of time spent with you ( <i>n</i> = 960)	744 (77.5)
Team calling you by your name ( <i>n</i> = 963)	864 (89.7)
Team genuinely caring for you as an individual ( <i>n</i> = 963)	857 (89.0)
Institution provided you with a sense of well-being ( <i>n</i> = 960)	817 (85.1)
'Whole person' approach to patient care ( <i>n</i> = 958)	830 (86.6)
Treating medical oncologist ( <i>n</i> = 973)	836 (85.9)

Items were dichotomized into two groups of 'completely satisfied (7)' and 'not completely satisfied (1–6)'. Some sample sizes are <986 because of missing responses.

### Univariate analysis: predictors of patient survival

On Kaplan–Meier analysis, the median overall survival for the entire patient cohort was 12.1 months (95% CI: 10.9–13.2 months). The median survival for 'completely satisfied' patients and 'not completely satisfied' patients was 12.9 and 8.7 months, respectively, log-rank *P* < 0.001. As shown in Table 5, individual service quality items that were significantly predictive of survival on univariate analysis were 'the ease of the registration process', 'the speed of the registration process', 'the timeliness with which care was delivered', 'team helping you understand your medical condition', 'team explaining your treatment options', 'the amount of time spent with you', 'team calling you by your name', 'team genuinely caring for you as an individual' and 'team providing you with a sense of well-being'. In addition, 'overall patient satisfaction with service quality' was also significantly predictive of survival. Among the patient characteristics, prior treatment history, stage at diagnosis and gender were significant predictors of survival. Finally, the CTCA hospital variable was also found to be significantly associated with survival.

**Table 4** Distribution of patient characteristics and service quality items by CTCA hospital

Variable	Eastern ( <i>n</i> = 212)	Midwestern ( <i>n</i> = 475)	Southwestern ( <i>n</i> = 299)	<i>P</i> -value
Patient characteristics				
Age at the time of first survey (mean)	57.5	58.5	60.7	<0.001*
Gender (males)	92 (43.4%)	228 (48.0%)	149 (49.8%)	0.34
Stage at diagnosis (stage IV)	120 (56.6%)	272 (57.3%)	146 (48.8%)	0.09
Stage at presentation (stage IV)	171 (80.7%)	372 (78.3%)	200 (66.9%)	0.001*
Treatment history (previously treated)	105 (49.5%)	184 (38.7%)	97 (32.4%)	<0.001*
Service quality items (completely satisfied)				
The ease of the registration process	179 (84.8%)	419 (88.8%)	262 (88.2%)	0.33
The speed of the registration process	174 (83.3%)	404 (86.0%)	257 (86.8%)	0.51
The timeliness with which your care was delivered	146 (69.9%)	355 (75.2%)	236 (78.9%)	0.06
The ease with which your care was delivered	177 (84.7%)	384 (82.4%)	252 (85.1%)	0.55
Helping you understand your medical condition	149 (72.7%)	334 (72.3%)	220 (75.1%)	0.68
Explaining your treatment options	144 (71.6%)	349 (75.9%)	226 (78.2%)	0.25
Involving you in decision-making	158 (78.2%)	360 (79.1%)	225 (77.3%)	0.84
The amount of time spent with you	158 (77.1%)	356 (77.1%)	230 (78.5%)	0.88
Team calling you by your name	184 (89.8%)	420 (90.5%)	260 (88.4%)	0.65
Team genuinely caring for you as an individual	181 (88.3%)	415 (89.2%)	261 (89.1%)	0.93
Team providing you with a sense of well-being	175 (85.8%)	392 (84.7%)	250 (85.3%)	0.92
'Whole person' approach to patient care	176 (86.3%)	400 (86.6%)	254 (87.0%)	0.97
Medical oncologist	155 (73.1%)	372 (78.3%)	235 (78.6%)	0.72
Overall patient satisfaction with the institution	180 (85.3%)	409 (86.8%)	247 (84.9%)	0.26

\**P* < 0.05.

**Table 5** Univariate cox regression analysis

Variable	HR	95% CI	P-value
Individual service quality items			
The ease of the registration process	0.72	0.58–0.90	0.004*
The speed of the registration process	0.81	0.65–0.99	0.049*
The timeliness with which your care was delivered	0.82	0.69–0.98	0.03*
The ease with which your care was delivered	0.86	0.70–1.06	0.15
Helping you understand your medical condition	0.75	0.63–0.89	0.001*
Explaining your treatment options	0.72	0.60–0.87	<0.001*
Involving you in decision-making	0.83	0.69–1.01	0.06
The amount of time spent with you	0.82	0.68–0.99	0.04*
Team calling you by your name	0.69	0.54–0.89	0.004*
Team genuinely caring for you as an individual	0.70	0.55–0.88	0.003*
Team providing you with a sense of well-being	0.66	0.54–0.82	<0.001*
'Whole person' approach to patient care	0.82	0.65–1.04	0.10
Medical oncologist	0.83	0.67–1.03	0.09
Overall service quality item			
Overall patient satisfaction with the institution	0.70	0.59–0.84	<0.001*
Patient characteristics			
Treatment history (newly diagnosed as referent group)	1.71	1.46–2.01	<0.001*
Stage at diagnosis (stages I–III as referent)	1.63	1.39–1.91	<0.001*
Age at first survey (used as a continuous variable)	0.99	0.98–1.01	0.38
Gender (males as referent)	0.79	0.67–0.92	0.003*
CTCA hospital (overall effect)			
Eastern versus southwestern	1.67	1.33–2.07	<0.001*
Midwestern versus southwestern	1.18	0.98–1.42	0.09

Individual and overall service quality questions were dichotomized into two categories: 'completely satisfied' (7) and 'not completely satisfied' (1–6). 'Not completely satisfied' was the referent group.  
\* $P < 0.05$ .

### Multivariate analysis: predictors of patient survival

Before proceeding with multivariate analysis, we checked the bivariate Kendall's tau  $b$  correlation among the service quality predictors in order to screen for observable multicollinearity. 'Ease of the registration process' and 'speed of the registration process' were highly correlated (tau  $b = 0.77$ ). Of these two, 'speed of the registration process' was chosen to be included in multivariate analysis because it is a more straightforward concept to understand from the patient's point of view. Similarly, 'team explaining your treatment options' was highly correlated with 'team helping you understand your medical condition' (tau  $b = 0.78$ ). Of these two, 'team helping you understand your medical condition' was considered for multivariate analysis because it represents the primary point of beginning for a patient with cancer. Table 6 displays the results of the multivariate Cox regression for the following two models: 'Model I' investigated six service quality items controlling for stage at diagnosis, prior treatment history, gender and CTCA hospital. 'Model II' investigated the overall service quality item controlling for stage at diagnosis, prior treatment history, gender and CTCA hospital. In 'Model I', only one service quality item 'team providing you with a sense of well-being' reached marginal statistical significance. Other service quality items were non-significant. Stage at diagnosis, prior treatment

history, gender and CTCA hospital were also found to be statistically significant. In 'Model II', the item pertaining to overall service quality was found to be significant along with stage at diagnosis, prior treatment history, gender and CTCA hospital. The results of both models were confirmed using the forward stepwise approach. VIF values for the service quality measures ranged from 1.3 to 2.4, none of which indicates a significant problem with multicollinearity [26, 27]. There was no evidence of non-proportional hazards in the multivariate models presented.

### Discussion

We investigated association between patient satisfaction with service quality and survival in NSCLC patients treated in an acute care national oncology hospital network.

The univariate and multivariate findings of this study suggest that patients completely satisfied with their service quality experience better survival outcomes compared with those who are not. One possible explanation could be that more satisfied patients might experience positive emotions that may favorably influence biologically relevant factors (e.g. enhanced immune function, patient-focus on maintaining

**Table 6** Multivariate cox regression analysis

Variable	HR	95% CI	P-value
Model I: individual service quality items			
The speed of the registration process	1.04	0.79–1.35	0.80
Helping you understand your medical condition	0.85	0.67–1.09	0.21
The amount of time spent with you	1.08	0.81–1.43	0.59
Team calling you by your name	0.94	0.65–1.36	0.74
Team genuinely caring for you as an individual	1.06	0.74–1.53	0.74
Team providing you with a sense of well-being	0.73	0.51–1.04	0.08
Patient characteristics			
Treatment history (newly diagnosed as referent group)	1.74	1.47–2.06	<0.001*
Stage at diagnosis (stages I–III as referent)	1.64	1.39–1.94	<0.001*
Gender (males as referent)	0.74	0.63–0.88	<0.001*
CTCA hospital (overall effect)			0.002*
Eastern versus southwestern	1.48	1.18–1.87	0.001*
Midwestern versus southwestern	1.10	0.91–1.33	0.34
Model II: overall service quality item			
Overall patient satisfaction with the institution	0.71	0.60–0.85	<0.001*
Patient characteristics			
Treatment history (newly diagnosed as referent group)	1.80	1.53–2.12	<0.001*
Stage at diagnosis (stages I–III as referent)	1.67	1.42–1.97	<0.001*
Gender (males as referent)	0.74	0.64–0.87	<0.001*
CTCA hospital (overall effect)			0.007*
Eastern versus Southwestern	1.40	1.12–1.75	0.003*
Midwestern versus Southwestern	1.07	0.89–1.30	0.47

Individual and overall service quality questions were dichotomized into two categories: ‘completely satisfied’ (7) and ‘not completely satisfied’ (1–6). ‘Not completely satisfied’ was the referent group. Model I investigates the individual service quality items controlling for stage at diagnosis, prior treatment history, gender and CTCA hospital. Model II investigates the overall service quality item controlling for stage at diagnosis, prior treatment history, gender and CTCA hospital.

\* $P < 0.05$ .

adequate nutrition). Another possible interpretation is that a third variable, such as the patient’s general state of health which was not measured in the current study, may affect both patient satisfaction and survival, leading to a spurious association. Patients with a better state of general health may rate their satisfaction with service quality more highly than patients whose general health is not as good.

There were systematic differences across the three CTCA hospitals with regard to the baseline patient characteristics as reported in Table 4. CTCA Southwestern had a significantly smaller number of patients with advanced stage and recurrent disease, which could perhaps explain its better survival outcomes. It is also likely that the three CTCA hospitals differ from each other with regard to some unknown/unmeasured factors which could have confounded the results. As a result, the CTCA hospital variable, which could be considered a proxy for differences across hospitals, was controlled for in the multivariate analysis.

Patient satisfaction, which is often assessed by health-care organizations, may be viewed as a useful, if imprecise, indicator of survival in NSCLC patients, whether that association be due to improved general health, more positive emotions or a combination of these. Although clinical indicators of

prognosis are primary, these findings suggest that health-care providers pay close attention to those patients who are less than completely satisfied during treatment. Doing so and alleviating any readily remedied causes of dissatisfaction may improve commitment to treatment protocols and secondary factors such as adequate nutrition.

A recently published prospective cohort study by Fenton *et al.* [28] investigated the relationship between patient satisfaction and mortality in adult respondents. Patient satisfaction was assessed using five items from the Consumer Assessment of Health Plans Survey. It was found that respondents in the highest patient satisfaction quartile (relative to the lowest patient satisfaction quartile) had higher mortality (adjusted HR, 1.26; 95% CI, 1.05–1.53). Another prospective cohort study by Mold *et al.* [29] investigated whether the quality of the primary care measured using the Components of Primary Care Index (CPCI) was associated with subsequent changes in health-related quality of life and/or survival in older patients greater than 64 years of age. Neither total CPCI nor any CPCI subscale score was associated with quality of life change over time or survival. The authors argued that patient satisfaction scores should not be relied on as measures of clinical effectiveness, although they might still be regarded as subjective

indicators of other aspects of quality. These results are in contrast to the results observed in our study, where better overall patient satisfaction was associated with greater survival. However, there are several differences between our study and those by Fenton and Mold *et al.* that are worth mentioning. The patient population in the Fenton study comprised a national sample of adults with a variety of underlying medical conditions excluding cancer, while the Mold study included only older patients. The Fenton study did not include psychosocial measures of patient satisfaction with the exception of the question on 'time spent with the physician'. The Mold study used the following eight subscales of CPCI: comprehensiveness, accumulated knowledge, coordination, preference for regular primary care physician, interpersonal communication, advocacy, family context and community context. The Fenton study did not adjust for the main underlying disease/medical condition, although the authors did control for a surrogate measure of underlying disease, the self-reported health. Similarly, the Mold study controlled for the severity of illness as well as baseline general health. Collectively, these observations suggest that the relationship between patient satisfaction and survival might well be a function of the underlying disease population being investigated. Clearly, future prospective studies among diverse patient populations are warranted to better elucidate the relationship between patient satisfaction and survival.

We acknowledge several limitations of this study. The patient cohort was limited to only those patients who spoke English and so this study sample is, therefore, not broadly representative of NSCLC patients in general. Further, our study, which is exploratory and hypothesis generating by nature, used a non-validated patient satisfaction questionnaire. As discussed above, it might be argued that patients with greater satisfaction with service quality might be the ones with better general health, leading to a confounded association between patient satisfaction and survival. However, we did control for the effects of tumor stage and prior treatment history in our analysis. These two variables can be considered proxies for self-rated health, given that patients with advanced stage disease who have been extensively treated are likely to have a worse general health compared with patients who are newly diagnosed with early stage disease. That said, it is imperative for future studies to control for self-reported health when analyzing the relationship between patient satisfaction and survival. We were not able to control for patient co-morbidities due to lack of relevant data. Given that co-morbidities are significantly associated with patient survival, lack of adjustment for them leaves room for residual confounding in our analysis. Finally, we could not perform a comparison of baseline characteristics between responders and non-responders since we did not have any information available on non-responders.

The strengths of our study include a prospective cohort study design, a large randomly selected sample size, a good response rate of 69%, the fact that we measured service quality as close to the time service was delivered as possible and the fact that we used patient survival (the most objective and most commonly used health outcome measure in oncology) as our dependent variable. To the best of our knowledge, this exploratory

study is the first in the health-care literature to report on the association between patient satisfaction with service quality and survival in a large sample of NSCLC patients.

In conclusion, our study suggests the predictive significance of patient satisfaction with service quality as it relates to survival in NSCLC, an entirely new finding in the oncology literature to the best of our knowledge.

## Acknowledgements

This study was funded by Cancer Treatment Centers of America<sup>®</sup>. We wish to thank Kristine Stolfi, Sara Mortensen, Jody Wehrwein and Cindy Rawlings for data collection for this project. We would also like to thank Diane Ottersen, Shelly Ware and Jane Fridman for providing us with the updated demographic and survival data. Finally, we thank all our patients and their families.

## Funding

This work was supported by Cancer Treatment Centers of America<sup>®</sup>. Funding to pay the Open Access publication charges for this article was provided by Cancer Treatment Centers of America<sup>®</sup>, Digant Gupta, MD, MPH.

## References

1. Jemal A, Siegel R, Ward E *et al.* Cancer statistics, 2009. *CA Cancer J Clin* 2009;**59**:225–49.
2. Akin S, Can G, Aydinler A *et al.* Quality of life, symptom experience and distress of lung cancer patients undergoing chemotherapy. *Eur J Oncol Nurs* 2010;**14**:400–9.
3. Belani CP, Pereira JR, von Pawel J *et al.* Effect of chemotherapy for advanced non-small cell lung cancer on patients' quality of life. A randomized controlled trial. *Lung Cancer* 2006;**53**:231–9.
4. Mohan A, Singh P, Singh S *et al.* Quality of life in lung cancer patients: impact of baseline clinical profile and respiratory status. *Eur J Cancer Care (Engl)* 2007;**16**:268–76.
5. Tishelman C, Lovgren M, Broberger E *et al.* Are the most distressing concerns of patients with inoperable lung cancer adequately assessed? A mixed-methods analysis. *J Clin Oncol* 2010;**28**:1942–9.
6. Kleeberg UR, Feyer P, Gunther W *et al.* Patient satisfaction in outpatient cancer care: a prospective survey using the PASQOC questionnaire. *Support Care Cancer* 2008;**16**:947–54.
7. Williams B, Coyle J, Healy D. The meaning of patient satisfaction: an explanation of high reported levels. *Soc Sci Med* 1998;**47**:1351–9.
8. Crow R, Gage H, Hampson S *et al.* The measurement of satisfaction with healthcare: implications for practice from a systematic review of the literature. *Health Technol Assess* 2002;**6**:1–244.
9. Cleary PD. The increasing importance of patient surveys. *Qual Health Care* 1999;**8**:212.

10. Bergenmar M, Nylen U, Lidbrink E *et al.* Improvements in patient satisfaction at an outpatient clinic for patients with breast cancer. *Acta Oncol* 2006;**45**:550–8.
11. Bolus R, Pitts J. Patient satisfaction: the indispensable outcome. *Manag Care* 1999;**8**:24–8.
12. Lis CG, Rodeghier M, Gupta D. Distribution and determinants of patient satisfaction in oncology: A review of the literature. *Patient Prefer Adherence* 2009;**3**:287–304.
13. Kavadas V, Barham CP, Finch-Jones MD *et al.* Assessment of satisfaction with care after inpatient treatment for oesophageal and gastric cancer. *Br J Surg* 2004;**91**:719–23.
14. Defossez G, Mathoulin-Pelissier S, Ingrand I *et al.* Satisfaction with care among patients with non-metastatic breast cancer: development and first steps of validation of the REPERES-60 questionnaire. *BMC Cancer* 2007;**7**:129.
15. Mathiesen TP, Willaing I, Freil M *et al.* How do patients with colorectal cancer perceive treatment and care compared with the treating health care professionals? *Med Care* 2007;**45**:394–400.
16. Sherlaw-Johnson C, Datta P, McCarthy M. Hospital differences in patient satisfaction with care for breast, colorectal, lung and prostate cancers. *Eur J Cancer* 2008;**44**:1559–65.
17. Vashisht A, Domoney CL, Handscomb K *et al.* Patient satisfaction with the care provided at a gynaecology oncology clinic. *J Obstet Gynaecol* 2000;**20**:183–4.
18. von Gruenigen VE, Hutchins JR, Reidy AM *et al.* Gynecologic oncology patients' satisfaction and symptom severity during palliative chemotherapy. *Health Qual Life Outcomes* 2006;**4**:84.
19. Bleich SN, Ozaltin E, Murray CK. How does satisfaction with the health-care system relate to patient experience? *Bull World Health Organ* 2009;**87**:271–8.
20. Lis CG, Rodeghier M, Grutsch JF *et al.* Distribution and determinants of patient satisfaction in oncology with a focus on health related quality of life. *BMC Health Serv Res* 2009;**9**:190.
21. Gupta D, Lis CG, Rodeghier M. Can patient experience with service quality predict survival in colorectal cancer? *J Healthc Qual* 2012 doi: 10.1111/j.1945-1474.2012.00217.x. [Epub ahead of print].
22. Bredart A, Robertson C, Razavi D *et al.* Patients' satisfaction ratings and their desire for care improvement across oncology settings from France, Italy, Poland and Sweden. *Psychooncology* 2003;**12**:68–77.
23. Kleeberg UR, Tews JT, Ruprecht T *et al.* Patient satisfaction and quality of life in cancer outpatients: results of the PASQOC study. *Support Care Cancer* 2005;**13**:303–10.
24. Loblaw DA, Bezjak A, Bunston T. Development and testing of a visit-specific patient satisfaction questionnaire: the Princess Margaret Hospital Satisfaction with Doctor Questionnaire. *J Clin Oncol* 1999;**17**:1931–8.
25. Sixma HJ, Kerssens JJ, Campen CV *et al.* Quality of care from the patients' perspective: from theoretical concept to a new measuring instrument. *Health Expect* 1998;**1**:82–95.
26. Besley D, Kuh E, Welsch R. *Regression Diagnostics: Identifying Influential Data and Sources of Multicollinearity*. New York: Wiley, 2004.
27. O'Brien RM. A caution regarding rules of thumb for variance inflation factors. *Quality Quantity* 2007;**41**:673–90.
28. Fenton JJ, Jerant AF, Bertakis KD *et al.* The cost of satisfaction: a national study of patient satisfaction, health care utilization, expenditures, and mortality. *Arch Intern Med* 2012;**172**:405–11.
29. Mold JW, Lawler F, Schauf KJ *et al.* Does patient assessment of the quality of the primary care they receive predict subsequent outcomes? An Oklahoma Physicians Resource/Research Network (OKPRN) Study. *J Am Board Fam Med* 2012;**25**:e1–12.