Early-Stage Lung Cancer Patients' Perceptions of Presurgical Discussions

Rebecca M. Schwartz, Rowena Yip, Nan You, Christina Gillezeau,
Kimberly Song, David F. Yankelevitz, Emanuela Taioli, Claudia I. Henschke(iD),
and Raja M. Flores; for the IELCART Investigators

Abstract

Background. Patients with early-stage non–small-cell lung cancer (NSCLC) have high survival rates, but patients often say they did not anticipate the effect of the surgery on their postsurgical quality of life (QoL). This study adds to the literature regarding patient and surgeon interactions and highlights the areas where the current approach is not providing good communication. **Design.** Since its start in 2016, the Initiative for Early Lung Cancer Research on Treatment (IELCART), a prospective cohort study, has enrolled 543 patients who underwent surgery for stage I NSCLC within the Mount Sinai Health System. Presurgical patient and surgeon surveys were available for 314 patients, postsurgical surveys for 420, and both pre- and postsurgical surveys for 285. **Results.** Of patients with presurgical surveys, 31.2% said that their surgeon recommended multiple types of treatment. Of patients with postsurgical surveys, 85.0% felt very well prepared and 11.4% moderately well prepared for their postsurgical recovery. The median Functional Assessment of Cancer Therapy–Lung Cancer score and social support score of the patients who felt very well prepared was significantly higher than those moderately or not well prepared (24.0 v. 22.0, $P < 0.001$) and (5.0 [interquartile range: 4.7–5.0] v. 5.0 [IQR: 4.2–5.0], $p = 0.015$). **Conclusions.** This study provides insight into the areas where surgeons are communicating well with their patients as well as the areas where patients still feel uninformed. Most surgeons feel that they prepare their patients well or very well for surgical recovery, whereas some patients still feel that their surgeons did not prepare them well for postsurgical recovery. Surgeons may want to spend additional time emphasizing postsurgical recovery and QoL with their patients or provide their patients with additional avenues to get their questions and concerns addressed.

Highlights

- Pretreatment discussions could help surgeons understand patient priorities and patients understand the anticipated outcomes for their surgeries.
- There is an association between feeling prepared for surgery and higher quality of life and social support scores after adjustment for confounders.
- Despite these pretreatment discussions, patients still feel that they are not well prepared about what to expect during their postsurgical recovery.

Corresponding Author
Claudia I. Henschke, Department of Radiology, Icahn School of Medicine at Mount Sinai, Box 1234, One Gustave L. Levy Place, NY 10029, USA; (claudia.henschke@mountsinai.org).

Institute for Translational Epidemiology, Icahn School of Medicine at Mount Sinai (RMS, CG, ET); Department of Occupational Medicine, Epidemiology and Prevention, Zucker School of Medicine at Hofstra/ Northwell (RMS); Department of Diagnostic, Molecular and Interventional Radiology, Icahn School of Medicine at Mount Sinai (RY, NY, DY, CH); Department of Thoracic Surgery, Icahn School of Medicine at Mount Sinai (KS, RF, ET). The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Dr. David Yankelevitz is a named inventor on a number of patents and patent applications related to the evaluation of chest diseases including measurements of chest nodules. Dr. Yankelevitz has received financial compensation for the licensing of these patents. In addition, he is a consultant and co-owner of Accumetra, a private company developing tools to improve the quality of computed tomography imaging, and is on the medical advisory board of Carestream, a company that develops radiography equipment and has consulted for Genentech, AstraZeneca, and Pfizer. Dr. Henschke is also an inventor of the patents and pending patents owned by Cornell Research Foundation (CRF). As of April 2009, she has divested herself of all royalties and other interests arising from these. The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Financial support for this study was provided by the Simons Foundation International, Ltd. The funding agreement ensured the authors' independence in designing the study, interpreting the data, writing, and publishing the report. IELCART investigators: Icahn School of Medicine, New York, NY: Raja Flores, Andrew Kaufman, Dong-Seok Lee, Daniel Nicastri, Andrea Wolf, Kenneth Rosenzweig, Jorge Gomez, Mary Beth Beasley, Maureen Zakowski, Michael Chung, David F. Yankelevitz, Claudia Henschke, Emanuela Taioli, Rebecca Schwartz, Huiwen Chan, Jeffrey Zhu, Sydney Kantor, Shana Adler; Mount Sinai West, New York, NY: Daniel Nicastri, Wissam Raad, Pathology: Zrzu Buyuk, Adie Friedman, Ronald Dreifuss, Stacey Verzosa, Mariya Yakubox, Karina Aloferdova, Patricia Stacey, Simone De Nobrega, Jeffrey Zhu, Sydney Kantor, Shana Adler; Mount Sinai Brooklyn, Brooklyn, NY: Ardeshir Hakami, Jeffrey Zhu, Sydney Kantor, Shana Adler; New York University Medical Center, New York, NY: Harvey Pass, Benjamin Cooper, Andre Moreirea, Audrey Sorensen; State University of New York, Syracuse, NY: Leslie Kohman, Robert Dunton, Jason Wallen, Christopher Curtiss, Ernest Scalzetti, Linda Ellinwood; Vassar Brothers, Poughkeepsie, NY: Clifford P. Connery, Emilo Torres, Dan Cruzer, Bruce Gendron, Sonya Alyea, Daniel Lackaye, Lauren Studer; Lahey Hospital, Burlington, MA: Syed Quadri, Elliot Servais, Cameron Stock, Andrea McKee, Brady McKee, Shawn Regis; Northwell Health, New Hyde Park, NY: Paul Lee, Kevin Hyman, Julisa Jurado, David Zeltman, Lawrence Glassman, Rajiv Sharma, Vijay Singh, Efstathia Milhelis, Danielle Gibson; IELCART Coordinating Center: principal investigators (PIs): Raja Flores, Claudia Henschke, co-PIs: Emanuela Taioli, David Yankelevitz, Investigators: Rebecca Schwartz, Betsy Becker, Artit Jirapatnakul, Rowena Yip, Huiwen Chan.

Worldwide, lung cancer is a leading cause of death in both men and women.[1] Despite a high mortality rate for lung cancer overall, the 5-y survival rate for early-stage non–small cell lung cancer (NSCLC) is high, between 60% and 95% for stage I tumors.[2–4] With the implementation of Medicare and Medicaid coverage for low-dose computed tomography (LDCT) screening for high-risk individuals based on the guidelines by the United States Prevention Services Task Force,[5] the population of early-stage lung cancer survivors is expected to grow.[6]

For patients with early-stage NSCLC, surgical resection is the preferred treatment.[7] For Stage I NSCLCs, the standard of care is lobectomy, although sublobar (wedge or segmentectomy) resection is increasingly being performed.[8,9] It is generally believed that less invasive surgical methods and greater preservation of lung may be associated with higher health-related quality of life (QoL) for patients.[10] Patients who underwent sublobar resections have reported fewer health-related QoL symptoms 12 mo after surgery compared with patients who underwent lobectomy.[11,12]

There has been little research into NSCLC patient preferences regarding surgical treatment. Despite guidance encouraging discussions of treatment options for early-stage NSCLC, patients often feel that they get incomplete lists of treatment options from their clinicians. As a result, the guidance of their clinicians continues to be a primary driver in patients' decision making.[13] Studies have found that early-stage NSCLC patients indicated that they valued having an active role in their treatment decision making but that they felt uninformed or remained unsure about what treatment decision was right for them, even after receiving treatment.[14] In a separate study with early-stage lung cancer patients, patients who rated their physician's communication as high quality were less likely to experience feelings of decisional conflict and reported greater feelings of self-efficacy.[15]

Recommendations indicate that clinicians should discuss the treatment with patients, thus giving patients an opportunity to have an essential role even if they do not feel that they want to take an active role in their treatment decision making.[16] In a study of patient preferences in treatment decision making and patient satisfaction

after treatment, patients who reported that the clinician controlled their decision making were less likely to report excellent quality of care for their treatment, regardless of the patient's stated preference for clinician versus patient control of decision making.[17] Participants in a focus group on surgical decision making among early-stage lung cancer survivors indicated that they trusted their surgeons to make decisions and were content with the decisions they made, despite treatment discussions that they described as "brief."[18] These patients, however, described how unprepared they felt for the physical side effects and emotional stresses they felt after surgery. They further indicated that tools that the clinicians relied on to measure recovery, such as the spirometer, did not measure the true extent of the physical limitations that these patients felt in their daily lives. The lack of preparation for their ongoing physical limitations as well as anxiety, isolation, guilt, and stigma that these patients felt highlights the unmet informational and emotional needs of this patient population.[18] These findings suggest that patients highly value the ability to have input into their treatment decisions, but clinicians must take the time to educate patients and explain their treatment options and provide accurate prognostic and recovery information, all of which should be covered in the discussion.

In qualitative studies, clinicians generally indicated that they tried to tailor the level of information that they provided based on how much they thought patients would be able to understand or how much information the clinicians felt the patients wanted to know,[18] although clinicians in this study did not specifically ask their patients about their preferences and values.[19]

The current study adds to the literature as it relates to early-stage NSCLC surgery as it is the first study to our knowledge to examine the concordance between patients' and surgeons' perceptions regarding the presurgical discussions and QoL issues both pre- and postsurgery The study further examines the role of patients' perceptions of feeling prepared on actual postsurgical QoL and mental health outcomes. We hypothesize that 1) participants who feel that their surgeon did not prepare them well for posttreatment effects will be more likely to experience poor QoL and poorer mental health and 2) lower social support will also be associated with these negative outcomes.

Materials and Methods

Participants

We reviewed all clinical stage I patients enrolled in the prospective cohort study, Initiative for Early Lung Cancer Research on Treatment (IELCART) in the Mount Sinai Health System (MSHS) since its start in 2016 who underwent treatment, either by surgery, radiation therapy, or chemotherapy. The treatment details were documented, including the extent of surgery.[20] This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of MSHS (IRB No. IF 2365016). At enrollment, HIPAA-compliant written informed consent was obtained from all participants. For this report, we included all patients with a first primary clinical stage IA (T1a-1cN0M0) NSCLC (8th AJCC/UICC staging)[18] who did not receive adjuvant chemotherapy, radiation therapy, or subsequent surgery within 12 mo of the initial surgery ($N = 543$). Demographic, comorbidities, social support, presurgical CT findings, and postsurgical pathologic findings were documented. Presurgical treatment decision-making surveys as well as QoL scores were obtained by in-person interviews during the patient's presurgical clinic visit. If that was not possible, telephone interviews were performed or the questionnaires were completed by the patients and returned via mail. Follow-up QoL/mental health measures were obtained at clinic visits within 4, 6, and 12 mo after surgery. For the current study, QoL/mental health measures from the first follow-up questionnaire within 4 mo postsurgery were used for analysis.

Nine surgeons from 3 hospitals within the MSHS completed treatment decision-making measures at pre- and postsurgical visits in reference to their specific IELCART patient. Each treating physician documented, for each patient with first primary clinical stage I lung cancer, the preoperative/pretreatment plan, the discussion with the patient, the timing and nature of the treatment(s), the actual treatment given, and the posttreatment course of the patient. Documentation of the extent and approach of surgery; mediastinal lymph node resection, if done; and pathologic findings identified as a result of the surgery were also collected.

Measures

Measures completed by patients

Treatment decision making. At the presurgery visit, patients completed a set of questions regarding their understanding of how many surgical options were presented to them, what their level of understanding was of the different options, their perceptions of what most influenced the surgical choice, and questions regarding sources of additional information. At the postsurgery visit, patients completed a set of questions regarding how well prepared they felt they were by the pretreatment discussion

for how they would feel after surgery, whether they were presented with options to assist in navigating posttreatment concerns, and whether they believed their surgeons answered their questions thoroughly.

Sociodemographic and medical characteristics. Prior to surgery, at the time of IELCART enrollment, baseline demographic data, smoking history, and 12 different comorbidities (presence of additional cancers, asthma, emphysema or chronic obstructive pulmonary disease, high blood pressure, high cholesterol, angioplasty or stent, myocardial infarction, stroke, peripheral vascular disease, liver disease, diabetes, and kidney disease) were collected on each patient. A comorbidity score was calculated by totaling the number of documented comorbidities for each patient, ranging from 0 to 12. Height and weight were documented, and body mass index (BMI) was calculated in kilograms per meters squared (kg/m^2); obesity was defined as a BMI $\geq$30 kg/m^2. The tumor consistency on the presurgical CT scan was documented as solid, part solid, or nonsolid.[20] The postsurgical pathology results of the tumor cell type and maximum diameter were documented for each patient.

QoL/mental health instruments. The 12-item Short Form (SF-12v2), a shorter version of SF-36v2,[21] was used to calculate two norm-based component scores: the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. These two component scores were calculated using different standardized weighted summaries of 8 domains of health: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health within the previous 4 wk. For the PCS, the 4 physical subscales had a more significant weight, whereas for the MCS, the 4 mental health subscales had more weight. The norm-based average for the United States population is a mean of 50 and standard deviation (*s*) of 10 for both the PCS and MCS; higher scores reflect better physical and mental health. A minimum of a 3-point difference has been suggested as a clinically important difference or change for both scores.[21]

The Functional Assessment of Cancer Therapy–Lung Cancer (FACT-L) is a multidimensional validated self-report instrument to document symptoms of different cancers.[22] We used only the lung cancer subscale (LCS), which asks about symptoms of dyspnea, weight loss, mental clarity, coughing, appetite, tightness in the chest, and difficulty breathing within the previous 7 d. The FACT-LCS scores range from 0 to 28; a higher score means there are fewer symptoms. A 2- to 3-point difference has been suggested as being clinically meaningful.[23]

The Patient Health Questionnaire–4 (PHQ-4) is composed of 2 subscores, the GAD-2 and PHQ-2, each of which have 2 questions. The 2-item GAD-2 Anxiety measure, drawn from the GAD-7 instrument,[24] is obtained by adding the scores for 2 items. Possible scores range from 0 to 6, where lower scores correspond with less anxiety. A GAD-2 score of 3 or higher is the preferred cutoff for identifying patients with generalized anxiety disorder.[25] The 2-item PHQ-2 Depression measure is drawn from the PHQ-9 instrument. The PHQ-2 score is obtained by adding the scores for the 2 items. Possible scores range from 0 to 6, where lower scores correspond to fewer symptoms of depression.[24] A PHQ-2 score of 3 or higher is optimal cutoff score for clinical depression.[26]

Social support as perceived by each patient was documented at baseline enrollment using the Medical Outcomes Study Social Support Survey (MOS index) consisting of a 19-item questionnaire. Its 5 subscales are emotional/informational support, tangible support, positive interaction, affection, and whether there is someone to help keep one's mind off things.[27] The overall MOS index score ranges from 0 to 100, with a higher score corresponding to better patient-perceived social support.

Measures completed by surgeons

Treatment decision making. At the presurgery visit, surgeons completed a set of questions regarding the potential choices regarding type of surgery, type of surgery chosen, and the factors associated with the surgical type chosen. At the postsurgery visit, surgeons completed a set of questions regarding whether the type of surgery discussed presurgery was what was actually accomplished and the reasoning behind any change, how well they felt they prepared their patient for how the patient would feel after surgery, whether they presented the patient with options to assist in navigating posttreatment concerns, and whether they believed they answered their patient's questions thoroughly.

Statistical Approach

Statistical analyses were performed by 2 data scientists (N.Y. and R.Y.). Categorical variables were summarized as frequencies (percentages), continuous variables by mean and standard deviation (*s*) for normally distributed variables, or by the median and interquartile range (IQR) for nonparametric variables. Continuous variables were assessed for normal distribution with Shapiro-Wilk test. Agreement between patients' and surgeons' perceptions was measured by B-statistic. The B-statistic can be interpreted as follows: values <0.05 indicate poor

agreement, 0.05 to 0.14 fair agreement, 0.15 to 0.34 moderate agreement, 0.35 to 0.64 substantial agreement, 0.65 to 0.99 almost perfect agreement, and 1 perfect agreement.[28] We assessed differences in QoL scores between participants with different postsurgical perceptions using the χ^2 test/Fisher's exact test for categorical variables and 2-sample t test or Wilcoxon rank-sum test for parametric and nonparametric continuous variables. $P < 0.05$ was considered to be a statistically significant difference. Multivariable analysis of the covariance (MANCOVA) was used to assess the relationship between postoperative PCS and MCS scores on the SF-12 and overall social support and patients' perceptions, adjusting for PCS and MCS scores at baseline, patients' demographics, self-reported comorbidities, and extent of surgery. All analyses were performed using SAS (version 9.4; SAS Institute Inc., Cary, NC, USA).

Results

Among the 543 patients in IELCART who underwent surgery for first primary lung cancer at clinical stage I from 2016 to 2020, 314 (57.8%) had both presurgical surgeon and patient surveys, 420 (77.4%) had both postsurgical surgeon and patient surveys, and 285(52.5%) had both presurgical and postsurgical surgeon and patient surveys. Among the 543 patients, 60.2% identified as female (39.8% male; Table 1). The median age was 70 y (IQR: 63–76 y). A total of 58.0% of patients identified as White, 15.5% as Black, 12.0% as Asian, and 12.0% as other or two or more races. Of the patients, 61.0% had a history of active tobacco smoking, followed by 28.5% patients who never smoked and 10.5% patients who were currently smoking. The median pack-years of smoking was 30 y (IQR: 13–49 pack-years) among patients who ever smoked. Of the 543 patients, 234 (43.1%) had completed 4-y college education or higher; 11.0% had self-reported asthma, 20.1% had chronic obstructive pulmonary disease, 50.1% had hypertension, and 19.7% had diabetes. English was the primary language of 478 (88.0%) patients. Of the patients, 296 (54.5%) underwent limited resection for their first primary lung cancer, 234 (43.1%) underwent lobectomy, and 13 (2.4%) had other types of surgery. Of the cancers, 74.4% were adenocarcinoma, 11.2% were squamous cell, 0.9% were atypical carcinoids, 11.2% were typical carcinoids, and 2.2% were other cell types.

The 543 lung resections were performed by 9 surgeons across 3 hospitals within the MSHS. Of the 9 surgeons, 7 were men and 2 women. The mean age was 47.2 ± 5.3 y. The racial composition of the surgeons was 44.4% (n = 4) White, 33.3% (n = 3) Asian, and 22.2% (n = 2)

Table 1 Characteristics of the 543 IELCART Participants

	n	%
Sex		
Female	327	60.2
Male	216	39.8
Median age, y (IQR)	70.0 (63.0–76.0)	
Smoking status		
Currently smoking	57	10.5
History of prior smoking	331	61.0
Never smoked	155	28.5
Median pack-years of smoking among patients who smoke (IQR)	30.0 (13.0–49.0)	
Race/ethnicity		
White	315	58.0
Black or African American	84	15.5
Asian	65	12.0
Two or more	6	1.1
Other	59	10.9
Missing	14	2.6
Education		
Did not complete high school	74	13.6
Completed high school	209	38.5
Completed 4-y college	130	23.9
Advanced degree	104	19.2
Missing	26	4.8
Occupation		
Higher executives	15	2.8
Business managers	46	8.5
Admin personnel	29	5.3
Clerical sales workers	23	4.2
Skilled manual employees	41	7.6
Machine operators	24	4.4
Unskilled employees	18	3.3
Unemployed	14	2.6
Missing	333	61.3
Self-reported comorbidities		
Asthma	60	11.0
Chronic obstructive pulmonary disease	109	20.1
Hypertension	272	50.1
Diabetes	107	19.7
English as primary language	478	88.0
Type of resection		
Sublobar resection (wedge, segmentectomy)	296	54.5
Lobectomy	234	43.1
Other types	13	2.4
Histology		
Adenocarcinoma	404	74.4
Squamous cell	61	11.2
Atypical carcinoid	5	0.9
Typical carcinoid	61	11.2
Other cell types	12	2.2

of two or more races. All received specialty training in cardiothoracic surgery. The average years of experience since completion of fellowship was 10.9 ± 4.8.
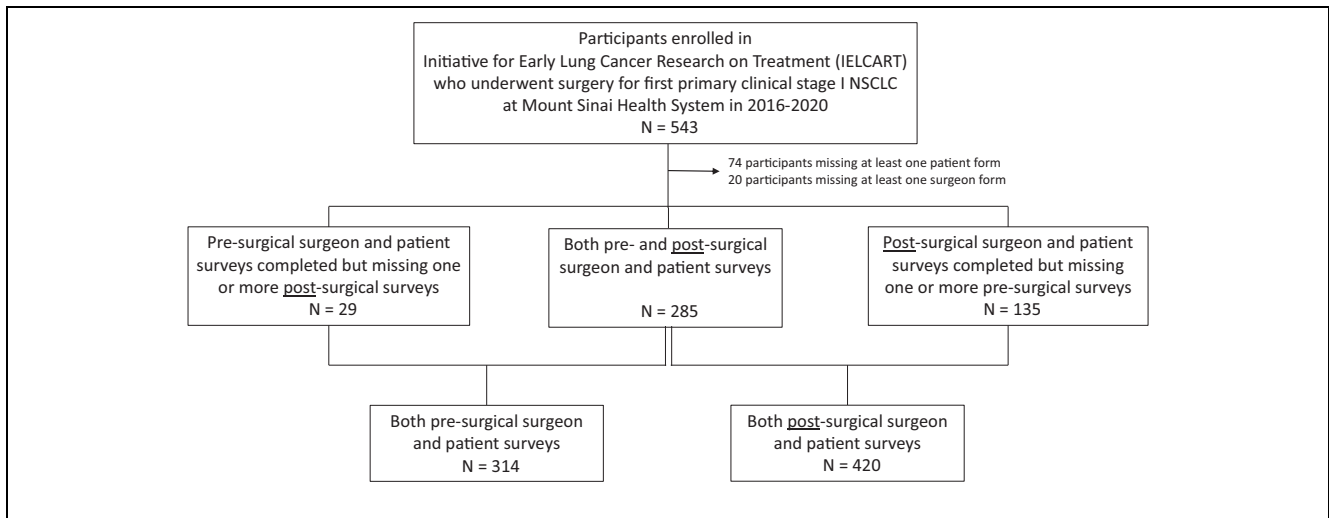
Figure 1 Study population flow diagram.

Presurgical Survey

Among the 314 patients with both presurgical surgeon and patient surveys, 98 (31.2%) stated that their surgeon recommended multiple types of treatment (68.8% recommended one type). In these 98 patients, 100% stated that their physician explained the options for treatment, 82 (83.7%) stated that the physician explained the reasons for recommending one particular option among the various choices, 91 (92.9%) understood the difference in the options and the physician's reasons for the recommendation, 88 (89.8%) felt that they had a role in the decision making regarding type of treatment, and 61 (62.2%) had a particular preference regarding the type of treatment. Patient-reported median time spent with their physician was 20.0 min (IQR: 15.0–35.0), ranging from 2 to 95 min. Eighty-six (27.4%) patients got a second opinion about their treatment. Patients obtained information about lung cancer treatment from various sources, with the most common source being the internet (*n* = 128, 40.8%), followed by a family member or friend who is a physician (*n* = 55, 17.5%; Figure 1).

The surgeons who performed surgery for the 314 patients stated that their patient's situation was a case in which there are multiple options regarding the type of surgery in 174 (55.4%) cases. In these 174 cases, when the surgeons were asked to indicate all of the choices being considered, the option that was most considered by the surgeons was lobectomy (94.3%), followed by wedge (87.9%), segmentectomy (46.6%), other (4.0%), and pneumonectomy (1.7%). As the final decision regarding the type of surgery, the most chosen option was lobectomy (52.2%), followed by wedge (48.7%), segmentectomy (25.8%), other (2.2%), and pneumonectomy (1.0%).

Comparing the patients' and surgeons' perceptions of the number of options for surgery type provided before surgery, 49.0% of the patients and surgeons agreed that one or multiple options were recommended. The other 51.0% disagreed, resulting in moderate agreement (B-statistic = 0.27) between the patients and surgeons (Table 2).

Postsurgical Survey

Among the 420 patients with postsurgical surveys who had a corresponding postsurgical surgeon survey, 357 (85.0%) patients felt the pretreatment discussion prepared them very well for how they would feel after treatment, 48 (11.4%) felt moderately well, and 15 (3.6%) felt not well. The same question was asked to the surgeons. In comparison, surgeons felt that they prepared their patient very well for how she or he would feel after surgery in 391 (93.1%), felt moderately well in 26 (6.2%), and did not respond to the question in 3 (0.7%). No surgeon felt that they had not prepared their patient well. There was an almost perfect agreement between the patients and surgeons on this question (concordance = 81.1%, B-statistic = 0.80; Table 3). Of the 63 patients who felt the pretreatment prepared them moderately or not well, when asked about what areas should have been discussed more fully, 29 (46.0%) indicated QoL after treatment, followed by posttreatment pain in 27 (42.9%), recovery time in 25 (39.7%), and other areas in 15 (23.8%).

Table 2 Concordance between Surgeons and Patients on the Number of Surgical Options Offered[a]

| | | Surgeon | | |
		Multiple	one	Total
Patient	Multiple	56 (57.1%)	42 (42.9%)	98 (31.2%)
	One	118 (54.6%)	98 (45.4%)	216 (68.8%)
	Total	174 (55.4%)	140 (44.6%)	317 (100%)

[a]Agreement = (56 + 98)/314 = 49.0%. B-statistic = 0.27 (moderate agreement).

Table 3 Concordance between Patients' and Surgeons' Perceptions on How Presurgery Discussion Prepared for Patients Feeling after Surgery[a]

| | | Surgeon | | | |
		Very Well	Moderately Well	Not Well	Total
Patient	Very well	334 (94.4%)	20 (5.6%)	0 (0%)	354 (84.9%)
	Moderately well	44 (91.7%)	4 (8.3%)	0 (0%)	48 (11.5%)
	Not well	13 (86.7%)	2 (13.3%)	0 (0%)	15 (3.6%)
	Total	391 (93.8%)	26 (6.7%)	0 (0%)	417 (100%)

[a]Agreement = (334 + 4)/417 = 81.1%. B-statistic = 0.80 (almost perfect agreement).

Table 4 Concordance between Patients and Surgeons on Whether Postsurgery Life-Navigating Options Were Presented[a]

| | | Surgeon | | |
		Yes	No	Total
Patient	Yes	24 (23.3%)	79 (76.7%)	103 (24.7%)
	No	76 (24.2%)	238 (75.8%)	314 (75.3%)
	Total	100 (24.0%)	317 (76.0%)	417 (100%)

[a]Agreement = (24 + 238)/417 = 62.8%. B-statistic = 0.52 (substantial agreement).

Among the 420 patients, the surgeon did not report their discussion about navigating life posttreatment in 3 postoperative surgeon surveys. Of the remaining 417, 103 (24.7%) patients stated that their physician presented options to assist them with navigating life posttreatment, such as information on support groups; however, their surgeon denied that they did in 79 of the 103 patients. Similarly, in the remaining 314 patients who stated that options were not presented by their physician, the surgeon indicated that they did so in 76 (24.2%) instances. Thus, agreement between the patients and surgeons on this question was observed in 262 of 417 resections (62.8% of the time; B-statistic = 0.52; Table 4).

Presurgery versus Postsurgery

Among the 543 patients, 285 (52.5%) had both pre- and postsurgical surveys with matching pre- and postoperative surgeon surveys. Surgeons were asked to select one or more options as their presurgical final decision regarding the type of surgery. To compare the final decision with what type of surgery was actually performed, we separately analyzed the percentage of each type of surgery actually performed. The 2 patients with pneumonectomy as the presurgery final decision had pneumonectomy performed. A total of 105 (84.7%) of the 124 patients with wedge resection as one of their presurgical

Table 5 Associations between Postsurgery Perceptions and Postsurgery Mental Health/QoL (N = 441)

Postpatient	Q1. Pretreatment discussion prepare you for how you would feel after treatment?					Q2. Physician present options to assist you with navigating life posttreatment?					Q3. Physician have you meet with a nurse navigator/social worker?				
	Very Well (n=376)		Moderately Well/Not Well (n=65)		P Value	Yes (n=112)		No (n=329)		P Value	Yes (n=213)		No (n=227)		P Value
	N	Median (IQR)	N	Median (IQR)		N	Median (IQR)	N	Median (IQR)		N	Median (IQR)	N	Median (IQR)	
Post-QoL															
SF-12, median (IQR)															
Physical Component Summary	358	43.2 (34.7–50.8)	63	34.3 (26.9–40.6)	<.001	108	38.1 (31.8–47.8)	313	42.5 (33.5–50.8)	0.026	205	39.8 (31.7–48.2)	215	43.9 (35.2–51.2)	0.002
Mental Component Summary	358	57.1 (50.6–60.8)	63	52.5 (44.7–56.6)	<.001	108	55.2 (48.9–60.5)	313	56.6 (50.2–60.3)	0.60	205	55.9 (49.4–60.2)	215	56.6 (49.9–60.6)	0.49
PHQ-4															
Anxiety ≥3	376	45 (12.0%)	65	11 (16.9%)	0.27	112	14 (12.5%)	329	42 (12.9%)	0.94	213	25 (11.7%)	227	31 (13.7%)	0.57
Depression ≥3	376	34 (9.0%)	65	13 (20.0%)	0.008	112	9 (8.0%)	329	38 (11.6%)	0.30	213	24 (11.3%)	227	23 (10.1%)	0.70
FACT-L, median (IQR)	376	24.0 (20.0–26.0)	65	22.0 (18.0–23.0)	<.001	112	23.0 (19.9–26.0)	329	23.0 (20.0–26.0)	0.60	213	23.0 (20.0–25.0)	227	24.0 (21.0–26.0)	0.019
MOS, median (IQR)															
Emotional/informational support	375	5.0 (4.9–5.0)	65	5.0 (4.1–5.0)	0.045	112	5.0 (4.9–5.0)	328	5.0 (4.8–5.0)	0.78	212	5.0 (4.8–5.0)	227	5.0 (4.8–5.0)	0.77
Tangible support	375	5.0 (5.0–5.0)	65	5.0 (4.0–5.0)	0.138	112	5.0 (4.5–5.0)	328	5.0 (5.0–5.0)	0.26	212	5.0 (4.5–5.0)	227	5.0 (5.0–5.0)	0.056
Affectionate support	375	5.0 (5.0–5.0)	65	5.0 (5.0–5.0)	0.197	112	5.0 (5.0–5.0)	328	5.0 (5.0–5.0)	0.90	212	5.0 (5.0–5.0)	227	5.0 (5.0–5.0)	0.82
Positive social interaction	375	5.0 (5.0–5.0)	65	5.0 (5.0–5.0)	0.41	112	5.0 (5.0–5.0)	328	5.0 (5.0–5.0)	0.55	212	5.0 (5.0–5.0)	227	5.0 (5.0–5.0)	0.48
Overall support	375	5.0 (4.7–5.0)	65	5.0 (4.2–5.0)	0.015	112	5.0 (4.6–5.0)	328	5.0 (4.6–5.0)	0.99	212	5.0 (4.6–5.0)	227	5.0 (4.7–5.0)	0.49

options had it performed. The other types of surgeries in which what was indicated presurgery was actually performed consisted of 83.4% lobectomy, 50.0% bilobectomy, and 42.4% segmentectomy.

Postsurgical Treatment Decision Making and Postsurgical QoL

Both postsurgical patient treatment decision making and postsurgical QoL forms within 4 mo of surgery were completed by 441 patients. The median time between surgery and the postsurgical QoL form completion was 23.0 d (IQR: 16–33 d), ranging from 1 to 121 d. On the postsurgical patient form, 376 (85.3%) of these 441 patients felt that the pretreatment discussion with their surgeon prepared them very well for how they felt posttreatment, whereas the other 65 (14.7%) felt it prepared them only moderately well or not well (Table 5). A total of 112 (25.4%) patients were presented with assistance for navigating postsurgical issues, and 213 (48.3%) met with a nurse navigator or social worker. These percentages vary from the section above, as the sample size was smaller and included a subset that had completed both sets of surveys (treatment decision making and QoL). To assess the sources of missing data, the characteristics of the participants with and without surveys were compared, and no statistically significant difference was found in demographics (sex, age, smoking history, BMI, race), self-reported comorbidities, primary language, extent of surgery, or tumor histology.

QoL scores were compared between the 441 patients with different postoperative perceptions concerning how prepared they felt for how they would feel after surgery. Both the median PCS score (43.2 v. 34.3, P < 0.001) and the median MCS score (57.1 v. 52.5, P < 0.001) were significantly higher for the 376 patients who felt very well prepared compared with the 65 patients who felt moderately or not well prepared (Figure 2). Patients who felt very well prepared also had a significantly lower frequency of depression symptoms (9.0% v. 20.0%, P = 0.008). The median FACT-LCS score of the patients who felt very well prepared was significantly higher than those moderately or not well prepared (24.0 v. 22.0, P < .001). The median overall social support score of the patients who felt very well prepared was also significantly higher than those who felt moderately or not well prepared (5.0 [IQR: 4.7–5.0] v. 5.0 [IQR: 4.2–5.0]; mean rank = 225.8 v. 189.8, U = 12336, P = 0.015).

The median PCS score (38.1 v. 42.5, P = 0.026) was significantly lower for the 112 patients presented with life-navigating options compared with the 329 patients
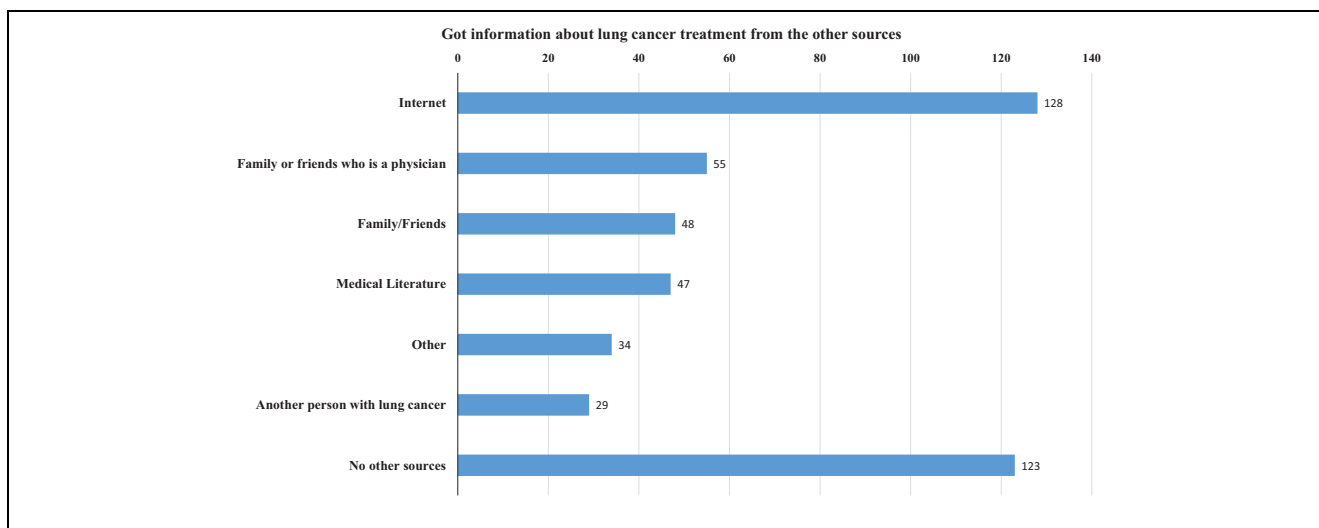
**Figure 2** Sources of information about lung cancer treatment.

who were not. None of the other QoL or social support scores were significantly different between the patients presented with life-navigating options and those who were not.

The median PCS score of the 213 patients who met with a nurse navigator or social worker was significantly lower than that of the 227 patients who did not (39.8 v. 43.9, $P = 0.002$). The median FACT-LCS score of the patients who met with a navigator was also significantly lower than those who did not (23.0 v. 24.0, $P = 0.019$).

Of the 441 participants, the baseline QoL scores were available for only 253 (57.4%) participants. As a result, two MANCOVAs, one without adjusting for baseline QoL and another adjusting for baseline QoL ($n = 253$), were performed to examine the relationship between patients' postoperative perceptions concerning how prepared they felt for how they would feel after surgery and QoL after surgery. The first MANOVA showed that patients' postoperative perceptions concerning how prepared they felt for how they would feel after surgery (Pillai's trace $= 0.1007$, $F[2, 361] = 20.21$; $P < 0.001$) had an overall discriminant effect on the PCS and MCS scores after surgery. After adjusting for overall social support after surgery and other covariates (patient demographics, self-reported comorbid conditions, and extent of surgery), patients who felt moderately or not well prepared were more likely to report lower postoperative PCS scores compared with those who felt very well prepared (B = -8.87, 95% CI: -12.01, -5.73, $P < 0.001$). Similar results were also found for the postoperative MCS score (B = -4.03, 95% CI: -6.67, -1.38, $P = 0.003$). The

adjusted mean postoperative PCS score for patients who felt moderately or not well prepared was 31.77 compared with 40.65 among patients who felt very well prepared ($P < 0.001$), whereas the adjusted postoperative MCS score means were 47.98 and 52.01 for patients in these two groups ($P = 0.003$), respectively.

The second MANCOVA of 253 participants further adjusted for baseline QoL scores and the results showed that patients' postoperative perceptions concerning how prepared they felt for how they would feel after surgery (Pillai's trace $= 0.1545$, $F[2, 230] = 21.02$; $P < 0.001$) again had an overall discriminant effect on the PCS MCS scores after surgery. After adjusting for the PCS and MCS scores at baseline, overall social support after surgery, and other covariates (patient demographics, self-reported comorbid conditions, and extent of surgery), patients who felt moderately or not well prepared were more likely to report lower postoperative PCS scores compared with those who felt very well prepared (B = -8.74, 95% CI: -12.38, -5.10, $P < 0.001$). Similar results were also found for the postoperative MCS score (B = -5.57, 95% CI: -8.43, -2.71, $P < 0.001$; Table 6). The adjusted postoperative PCS score mean for patients who felt moderately or not well prepared was 30.45 compared with 39.2 among patients who felt very well prepared ($P < 0.001$), whereas the adjusted mean postoperative MCS scores were 46.5 and 52.1 for patients in these two groups ($P < 0.001$), respectively. A small effect was observed for postoperative overall social support score on PCS and MCS scores after surgery (Pillai's trace $= 0.0250$, $F[2, 230] = 2.95$; $P = 0.05$). No
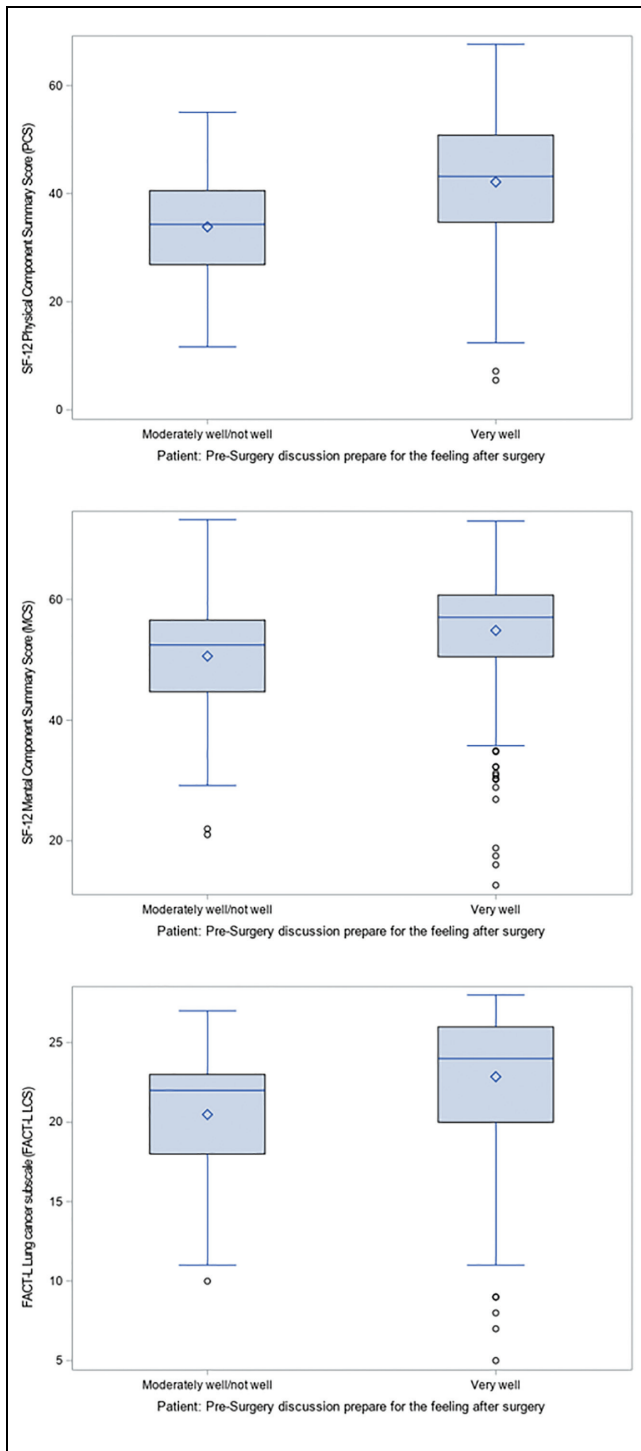
Figure 3 Postsurgery quality-of-life measures in the 376 patients who indicated that the pretreatment discussion prepared them very well for their postsurgery feelings compared with the 65 patients who answered moderately well or not well.

significant association was found between overall social support scores after surgery and postoperative PCS scores (B = 0.45, 95% CI: −1.72, 2.63, P = 0.68). However, patients with higher overall social support scores after surgery were more likely to report higher postoperative MCS scores (B = 2.02, 95% CI: 0.31, 3.73, P = 0.02; Table 6).

Discussion

This study provides important insight into the current patient-physician discussions for surgical treatment of early-stage lung cancer and highlights the areas in which there is open communication as well as those areas in which patients and surgeons do not communicate well. When comparing the number of surgical options recommended, patients and surgeons recalled a discordant number of options recommended 51% of the time, with 68.8% of patients reporting that the surgeons recommended only one type of surgery for them, while only 44.6% of surgeons reported recommending only one type of surgery. This level of discordance indicates that gaps remain in either patient information retention or surgeon communication, and the discussion may not be fully effective. Despite the high level of discordance, among the patients who indicated that their surgeon suggested multiple options, 92.9% of patients felt that they understood the surgical options, 89.8% felt that they had an active role in decision making, and 85.3% felt that they were very well prepared for how they would feel after surgery. This finding adds nuance to the 2016 study that showed that patients undergoing surgery for lung and colorectal cancer who received physician-controlled care without patient input were less likely to report excellent quality of care for their treatment.[17] The current study's findings suggest that the number of surgical options presented may be less important in improving patient satisfaction than ensuring that patients understand what their surgical outcomes may look like.

There are several limitations to this study. This sample was collected entirely from Mount Sinai's Health System at 3 institutions and thus reflects the ethnic diversity of patients presenting for treatment at Mount Sinai. As Mount Sinai's location within New York City, patients have access to several major medical centers, making second opinions and medical education more accessible than in more rural areas with fewer medical resources. Also, preferred decision role was not assessed, which could add further context to the associations found in the current study, as it is possible that those participants who preferred to have a greater role in the process were less likely

Table 6 Factors Associated with Postsurgery QoL as Measured by the SF-12[a]

| | Postsurgical PCS | | | | | | Postsurgical MCS | | | | | |
| | Unadjusted | | | Adjusted[b] | | | Unadjusted | | | Adjusted[b] | | |
	Parameter Estimate	SE	*P* Value	Parameter Estimate	SE	*P* Value	Parameter Estimate	SE	*P* Value	Parameter Estimate	SE	*P* Value
QoL at baseline												
PCS	0.23	0.07	0.001	0.21	0.08	0.007	0.03	0.06	0.57	0.00	0.06	0.94
MCS	0.15	0.07	0.03	0.10	0.07	0.16	0.28	0.05	<0.001	0.20	0.06	<0.001
MOS (overall social support) after surgery	1.95	1.05	0.06	0.45	1.10	0.68	3.33	0.83	<0.001	2.02	0.87	0.02
Pretreatment discussion prepare you for how you would feel after treatment?												
Very well		Ref.			Ref.			Ref.			Ref.	
Moderately well/not well	−7.65	1.86	<0.001	−8.74	1.85	<0.001	−5.41	1.53	<0.001	−5.57	1.45	<0.001

[a]MCS = mental component summary score; PCS = physical component summary score; QoL = quality of life; Ref. = reference; SE = standard error.

[b]Adjusted for sex, age, smoking status (current/former/never), pack-years of smoking, body mass index, race (White/African American/Asian/other), completed 4-y college or higher, self-reported comorbidities (asthma, chronic obstructive pulmonary disease, hypertension, diabetes), and extent of surgery (wedge resection or segmentectomy/lobectomy/other).

to feel well prepared. In addition, all measures were self-reported, which, although much more feasible to implement than an analysis of recorded consultations/appointments, has inherent subjectivity involved, although it could be argued that perception (at least on the part of the patient) is just as relevant as objective third-party observations. Similarly, although this may have been even more likely had direct observation or recording been used, it is possible that the Hawthorne effect was taking place, with a bias toward surgeons answering survey questions in a positive light as they knew that their responses were being analyzed, thereby potentially limiting validity and generalizability.[29] We also did not examine differences by surgeon because of the sensitivity of the topic, particularly given the small number of surgeons who participated and the fact that the analyses were limited to surgeons within a single institution, perhaps somewhat limiting the degree of differences between surgeons. Future research, however, will examine this topic in more depth. An additional limitation is the variability in time between surgery and postsurgical QoL measures being administered, with times ranging from 1 d to 121 d (median = 23 d). Finally, previous studies have shown that although clinicians have discussions with their patients, they may overestimate the degree to which they are communicating with patients regarding the patients' priorities.[18,19] It is similarly possible that the surgeons in this study had somewhat limited insight into their communication with the patients and may rate themselves as clearer or more communicative than they actually are.

Despite these limitations, this research provides important insight into the perceptions of patients and points to several areas where patient and surgeon communication can be improved. Our results indicate that, in addition to providing patients with health information, health care providers should also discuss from what other sources patients are getting information as well as the nature of that information. This will enhance the provider-patient discussions regarding decision making as well as postsurgical expectations. This will also help to understand the level of preexisting information that patients have as well as help to ensure that patients are receiving accurate information from their sources. The research findings also indicate that despite the discussions, 14.7% of patients still felt that they were not well prepared for the level of pain and symptoms they would feel post surgically. Although this is a minority of patients, a goal of providing full preparation to all patients should be the standard that is set. Comparatively, none of the surgeons felt that they did not do a good job of preparing patients for how they would feel postsurgically. This indicates that additional emphasis on postsurgical symptoms is needed, especially because those who felt unprepared experienced poorer physical and mental health QoL and more depression symptoms postsurgically than those who felt well prepared. These rates of depression symptoms are higher and physical health QoL is significantly lower than what would be expected in the general population and therefore clinically meaningful and important for providers to understand and consider the implications of in and of themselves.[30,31] The findings also emphasize the potential benefit of additional education for surgeons and lung cancer clinicians regarding the need for improved

presurgical preparation for patients as well as the residual physical and mental health needs of early-stage lung cancer patients after surgery. Surgeons consider surgery curative for early-stage lung cancer patients,[30] and as such, they do not always consider residual survivorship impacts and needs. Continuing medical education surrounding these issues and how to more effectively implement the patient-physician treatment discussion may be helpful for these clinicians.

In previous studies, surgeons identified limited time as a potential barrier to having these conversations.[32] Nurse navigators or social workers may be a beneficial resource to provide for patients prior to surgery both to ease the time burden of these conversations on surgeons and to ensure that patients are well prepared for the postsurgical recovery process. In this study, 49% of patients indicated that they met with a nurse navigator or social worker, and referrals to these resources are currently based on the surgeons' perception of their patients' needs. This was confirmed in the finding that those who received referrals had significantly lower physical health QoL but that mental health QoL (something perhaps not as readily noticed by providers) was not significantly different. It may be beneficial, therefore, for providers to offer a referral to these resources to all patients.

Providing patients with a means of communication outside of their appointment time, for example, the use of a patient portal or physician email access, may also increase patient understanding and satisfaction. Messaging between patients and physicians allows patients to ask questions of their surgeons as they arise outside of appointment times and allows patients to reread responses, which may help to increase information retention. In a study of patient portal usage among patients with chronic illnesses, patients generally had a positive opinion of patient portals, feeling that they facilitated better communication with their physicians and helped them to coordinate care between different clinical teams.[33] A review of patient opinions on email access to physicians found that patients found email to be a useful communication tool with physicians and felt more secure asking questions regarding embarrassing or sensitive topics via email rather than in face-to-face interactions. This study further notes that despite patient overuse of messaging being a concern among some physicians, patients typically substitute emails for phone calls, meaning that there was not an increased work load for the physicians surveyed.[34]

Finally, patients who felt well prepared presurgically also had better social support. This indicates that perhaps caregivers, family members, and other sources of support may be important to include in the presurgical discussions. Patients' social supports may leave presurgical discussions with a clearer understanding of postsurgical needs, allowing them to better support patients as they recover. The patient-physician discussion is a valuable tool that can help to increase patient understanding and satisfaction. Surgeons are generally positively inclined toward patient-physician discussion, and the current study provides some useful insight into the areas where the patient-physician discussion approach is working well, as well as the areas where more training or better communication on the part of surgeons and their clinical teams may be needed. Decision support tools may also be beneficial in facilitating these critical discussions between patients and their physicians and should also be considered.

ORCID iD

Claudia Henschke https://orcid.org/0000-0002-6085-5305

References

1. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. *CA Cancer J Clin*. 2015;65(2):87–108. doi:10.3322/caac.21262
2. Martini N, Bains M, Burt M, et al. Incidence of local recurrence and second primary tumors in resected Stage I lung cancer. *J Thorac Cardiovasc Surg*. 1995;109:120–9.
3. Mountain CF. Revisions in the International System for Staging Lung Cancer. *Chest*. 1997;111(6):1710–7. doi:10.1378/chest.111.6.1710
4. International Early Lung Cancer Action Program Investigators;Henschke CI, Yankelevitz DF, Libby DM, et al. Survival of patients with stage I lung cancer detected on CT screening. *N Engl J Med*. 2006;355(17):1763–71. doi:10.1056/NEJMoa060476
5. Moyer VA, US Preventive Services Task Force. Screening for lung cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med*. 2014;160(5):330–8. doi:10.7326/M13-2771
6. Sugimura H, Yang P. Long-term survivorship in lung cancer: a review. *Chest*. 2006;129(4):1088–97. doi:10.1378/chest.129.4.1088
7. Howington JA, Blum MG, Chang AC, Balekian AA, Murthy SC. Treatment of stage I and II non-small cell lung cancer: diagnosis and management of lung cancer. 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. 2013;143(5 suppl): e278S–313S. doi:10.1378/chest.12-2359
8. Altorki N, Yip R, Hanaoka T, et al. Sublobar resection is equivalent to lobectomy for clinical stage 1A lung cancer in solid nodules. *J Thorac Cardiovasc Surg*. 2014;147(2): 754–62. doi:10.1016/j.jtcvs.2013.09.065
9. Flores R, Bauer T, Aye R, et al. Balancing curability and unnecessary surgery in the context of computed tomography screening for lung cancer. *J Thorac Cardiovasc Surg*. 2014;147(5):1619–26. doi:10.1016/j.jtcvs.2013.11.001

10. Bendixen M, Jorgensen OD, Kronborg C, Andersen C, Licht PB. Postoperative pain and quality of life after lobectomy via video-assisted thoracoscopic surgery or anterolateral thoracotomy for early stage lung cancer: a randomised controlled trial. *Lancet Oncol.* 2016;17(6): 836–44. doi:10.1016/S1470-2045(16)00173-X

11. Stamatis G, Leschber G, Schwarz B, et al. Perioperative course and quality of life in a prospective randomized multicenter phase III trial, comparing standard lobectomy versus anatomical segmentectomy in patients with non-small cell lung cancer up to 2cm, stage IA (7th edition of TNM staging system). *Lung Cancer.* 2019;138:19–26. doi:10.1016/j.lungcan.2019.09.021

12. Fevrier E, Yip R, Becker BJ, et al. Change in quality of life of stage IA lung cancer patients after sublobar resection and lobectomy. *J Thorac Dis.* 2020;12(7):3488–99. doi:10.21037/jtd-20-402

13. Hopmans W, Damman OC, Senan S, Hartemink KJ, Smit EF, Timmermans DR. A patient perspective on shared decision making in stage I non-small cell lung cancer: a mixed methods study. *BMC Cancer.* 2015;15:959. doi: 10.1186/s12885-015-1974-6

14. Mokhles S, Nuyttens J, de Mol M, et al. Treatment selection of early stage non-small cell lung cancer: the role of the patient in clinical decision making. *BMC Cancer.* 2018;18(1):79. doi:10.1186/s12885-018-3986-5

15. Nugent SM, Golden SE, Thomas CR Jr., et al. Patient-clinician communication among patients with stage I lung cancer. *Support Care Cancer.* 2018;26(5):1625–33. doi:10.1007/s00520-017-3992-1

16. President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research. *Making Health Care Decisions: The Ethical and Legal Implications of Informed Consent in the Patient-Practitioner Relationship.* Washington (DC): President's Commission; 1982.

17. Kehl KL, Landrum MB, Arora NK, et al. Association of actual and preferred decision roles with patient-reported quality of care: shared decision making in cancer care. *JAMA Oncol.* 2015;1(1):50–8. doi:10.1001/jamaoncol.2014 .112

18. Schwartz RM, Gorbenko K, Kerath SM, et al. Thoracic surgeon and patient focus groups on decision-making in early-stage lung cancer surgery. *Future Oncol.* 2018;14(2): 151–63. doi:10.2217/fon-2017-0254

19. Golden SE, Thomas CR Jr., Moghanaki D, Slatore CG; Early Stage Lung Cancer Comparative Effectiveness Research Consortium. Dumping the information bucket: a qualitative study of clinicians caring for patients with early stage non-small cell lung cancer. *Patient Educ Couns.* 2017;100(5):861–70. doi:10.1016/j.pec.2016.12.023

20. Flores R, Taioli E, Yankelevitz DF, et al. Initiative for early lung cancer research on treatment: development of study design and pilot implementation. *J Thorac Oncol.* 2018;13(7):946–57. doi:10.1016/j.jtho.2018.03.009

21. Ware JE. *User's Manual for the SF-36v2 Health Survey.* 2nd ed. Johnston (RI): Quality Metric Inc.; 2007.

22. Cella DF, Bonomi AE, Lloyd SR, Tulsky DS, Kaplan E, Bonomi P. Reliability and validity of the Functional Assessment of Cancer Therapy—Lung (FACT-L) quality of life instrument. *Lung Cancer.* 1995;12(3):199–220.

23. Cella D, Eton DT, Fairclough DL, et al. What is a clinically meaningful change on the Functional Assessment of Cancer Therapy–Lung (FACT-L) questionnaire? Results from Eastern Cooperative Oncology Group (ECOG) study 5592. *J Clin Epidemiol.* 2002;55(3):285–95.

24. Kroenke K, Spitzer RL, Williams JB, Lowe B. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics.* 2009;50(6):613–21. doi:10.1176/appi.psy .50.6.613

25. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med.* 2007; 146(5):317–25.

26. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care.* 2003;41(11):1284–92.

27. Sherbourne C, Stewart A. *The MOS Social Support Survey.* Santa Monica (CA): RAND Corporation; 1993. Available from: https://www.rand.org/pubs/reprints/RP218.html

28. Shankar V, Bangdiwala SI. Observer agreement paradoxes in 2x2 tables: comparison of agreement measures. *BMC Med Res Methodol.* 2014;14(1):100. doi:10.1186/1471-2288-14-100

29. Choi WJ, Jung JJ, Grantcharov TP. Impact of Hawthorne effect on healthcare professionals: a systematic review. *Univ Toronto Med J.* 2019;96(2):21–32.

30. Verstegen NE, Oosterhuis JW, Palma DA, et al. Stage I-II non-small-cell lung cancer treated using either stereotactic ablative radiotherapy (SABR) or lobectomy by video-assisted thoracoscopic surgery (VATS): outcomes of a propensity score-matched analysis. *Ann Oncol.* 2013;24(6): 1543–8. doi:10.1093/annonc/mdt026

31. Substance Abuse and Mental Health Services Administration. *Key Substance Use and Mental Health Indicators in the United States: Results from the 2019 National Survey on Drug Use and Health.* HHS Publication No. PEP20-07-01-001, NSDUH Series H-55. Rockville (MD): Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration; 2020.

32. Mokhles S, Maat A, Aerts J, Nuyttens J, Bogers A, Takkenberg JJM. Opinions of lung cancer clinicians on shared decision making in early-stage non-small-cell lung cancer. *Interact Cardiovasc Thorac Surg.* 2017;25(2):278–84. doi: 10.1093/icvts/ivx103

33. Hefner JL, MacEwan SR, Biltz A, Sieck CJ. Patient portal messaging for care coordination: a qualitative study of perspectives of experienced users with chronic conditions. *BMC Fam Pract.* 2019;20(1):57. doi:10.1186/s12875-019-0948-1

34. Wallwiener M, Wallwiener CW, Kansy JK, Seeger H, Rajab TK. Impact of electronic messaging on the patient-physician interaction. *J Telemed Telecare.* 2009;15(5):243–50. doi:10.1258/jtt.2009.090111