

Quality of Care in Non–Small-Cell Lung Cancer: Findings From 11 Oncology Practices in Florida

By Tawee Tanvetyanon, MD, Michelle Corman, BA, Ji-Hyun Lee, DrPH, William J. Fulp, MS, Fred Schreiber, MD, Richard H. Brown, MD, Richard M. Levine, MD, Thomas H. Cartwright, MD, Guillermo Abesada-Terk, MD, George P. Kim, MD, Carlos Alemany, MD, Douglas Faig, MD, Philip V. Sharp, MD, Merry-Jennifer Markham, MD, Gerold Bepler, MD, PhD, Erin Siegel, PhD, David Shibata, MD, PhD, Mokenge Malafa, MD, and Paul B. Jacobsen, PhD

H. Lee Moffitt Cancer Center and Research Institute, Tampa; Center for Cancer Care and Research, Lakeland; Florida Cancer Specialists, Sarasota; Space Coast Medical Associates, Titusville; Ocala Oncology Center, Ocala; Robert and Carol Weissman Cancer Center at Martin Memorial, Stuart; Mayo Clinic, Jacksonville; Cancer Centers of Florida, Orlando; North Broward Medical Center, Deerfield Beach; Tallahassee Memorial Healthcare, Tallahassee; University of Florida/Shands Cancer Center, Gainesville, FL; Karmanos Cancer Institute, Detroit, MI

Abstract

Background: Limited data on the quality of care in non–small-cell lung cancer (NSCLC) are available. This study aims to assess the quality of care in NSCLC among 11 medical oncology practices in Florida and to explore the impact of practice volume on care.

Methods: Clinical guidelines and existing indicators were reviewed, and an expert survey was conducted to identify a set of process-based quality of care indicators (QI). Medical records of new patients with NSCLC seen in 2006 were retrospectively reviewed for the adherence to these QIs.

Results: We reviewed the compliance with a set of 11 QIs (four general and seven NSCLC specific) among 531 patients. The

patient median age was 68 years; 51% were male, and 49% had advanced NSCLC. The median adherence rates to general QIs and NSCLC-specific QIs were 95% (range 69% to 99%) and 69% (range 29% to 91%), respectively. We identified three main areas of deficiencies: chemotherapy consenting (69%), brain staging for stage III NSCLC (59%), and performance status assessment for advanced stages (42%). Significant variation in the adherence rates across practice sites was observed in five of 11 QIs.

Conclusion: On the basis of this data set of participating institutions in Florida, several areas in the care of patients with NSCLC were identified as targets for future quality improvement efforts.

Introduction

Lung cancer continues to be a leading cause of cancer death in the United States. Non–small-cell lung cancer (NSCLC) accounts for 85% to 90% of cases, claiming more than 135,000 lives each year.¹

Available literature on the quality of care in NSCLC is relatively limited, is applicable to only a small subset of patients with NSCLC, or no longer corresponds to the current standard of care.^{2,3} Evidence suggests that there is still room for improvement. For example, it has been reported that most patients with metastatic NSCLC do not receive palliative chemotherapy,⁴ and many patients with early-stage NSCLC do not undergo surgery or receive adjuvant chemotherapy.^{4,5} In addition, vulnerable populations, including ethnic minorities and the elderly, frequently receive suboptimal care.⁶ To ensure the best possible patient outcome, there is a clear need to assess the state of care in patients with NSCLC.⁷

As part of an effort to improve the care of cancer patients, the Florida Initiative for Quality Cancer Care (FIQCC) was formed in 2006, consisting of 11 medical oncology practices across the state of Florida.⁸ The consortium encompasses a wide range of practice sizes caring for a large number of patients with cancer, including patients with NSCLC. In 2006 alone, the number of new patients with NSCLC evaluated at each site ranged from 90 to 862. Because the majority of patients with

NSCLC are cared for by medical oncologists, data from FIQCC members offer a unique opportunity to understand the current state of care in NSCLC and the impact of practice volume on the quality of care. The focus of this group's quality improvement effort has been on the process-based quality of care, rather than the outcome-based quality of care. Process-based quality of care focuses on the processing and delivery of care, rather than merely the final outcome, thus making it possible to identify specific areas of care that may need intervention.⁷

To accomplish this plan, a core set of quality measures is necessary to assess care quality. However, there is still a lack of quality measures that are widely accepted for NSCLC. Ideally, good quality measures should be actionable, strongly associated with patient outcome, and relatively independent of patient characteristics in order to allow comparison across practices with heterogeneous case mixes.⁹ In addition, measures need to be up to date to reflect ever-changing medical progress. In this article, we report on the quality of care in NSCLC using a set of quality indicators (QI) that were selected through a review of relevant literature and a survey of experts. We assessed the care of NSCLC patients by performing a retrospective medical record review among FIQCC institutions. In addition, we explored variation in the quality of care across practices.

Methods

Selection of Quality Measures

Quality measures in this study included general and NSCLC-specific aspects of care. The general QIs were chosen largely from the Quality Oncology Practice Initiative project previously described elsewhere.^{10,11} These measures included aspects of pain measurement, staging information, pathologic confirmation, chemotherapy consent, and body-surface area for chemotherapy dosing. The NSCLC-specific QIs were selected from review of literature and evidence-based practice guidelines available in 2006, including those from the National Comprehensive Cancer Network (NCCN), American College of Chest Physicians, European Society for Medical Oncology, Cancer Care Ontario, and European Lung Cancer Working Party.¹²⁻¹⁷ A list of candidate QIs were then formulated into a survey (Appendix Table A1, online only), conducted among the NCCN NSCLC guideline-writing panelists. The participating experts rated candidate QIs by the extent to which they measured quality of care in NSCLC by using a validity scale of 1 to 5 (1 = not at all, 3 = somewhat, and 5 = very much so). The scores were then used to generate summary statistics for each indicator. To determine the extent of agreement in scores among the panelists (ie, agreement, disagreement, and equivocal), the spread of ratings was graded in a fashion similar to that of previous studies on quality of care.^{18,19} For each indicator, if ratings fell in the region of 1 to 2 and 4 to 5, the scores were considered to be in disagreement. If all ratings fell exclusively in the region of 1 to 2 or 4 to 5, the scores were considered to be in agreement. For the purpose of our study, QIs with a mean rating of ≥ 4 with no disagreement were selected as quality measures.

Patient Eligibility and Sampling

This study was part of the FIQCC's larger effort to examine the quality of care in colorectal, breast, and non-small-cell lung cancers. After approval by an institutional review board, each site identified medical records of new patients who were evaluated and treated for NSCLC in 2006 at their institution. Patients were eligible if the diagnosis of NSCLC was histologically confirmed and they were being treated at the practice as demonstrated by multiple follow-up visits. Patients were excluded if they had other concurrent active malignancies, had a mixed small-cell histology, or were evaluated for a second opinion only. Patients who underwent surgery or radiation at other facilities were allowed. From the available pool of eligible patients with NSCLC, a random sample of medical records was chosen for review. Each site agreed to review a set percentage of records (at least 10% of all eligible records at each site) and submitted data for analysis online according to a strict timetable. Chart sampling was conducted centrally in a random fashion to ensure that each participating site had no influence in the case selection.

Data Collection

Chart abstraction was performed systematically by using a standardized written manual. A master chart abstractor conducted a structured training of field abstractors at all 11 FIQCC practices (2,773 patients). Sampled abstractions were performed before the actual study, and audits were performed to ensure the accuracy and reliability of data collected. During abstraction, regular correspondences with abstractors at each site were held to resolve questions and facilitate timely progress of abstraction. The process began in the fall of 2008. Each patient chart was reviewed, beginning with their first visit record in 2006 up until death or last follow-up as necessary. Staging assignment was as first documented by medical oncologists. Performance status assessment was defined according to the Zubrod or Karnofsky scale, and its presence was considered within 1 month from the first visit with a medical oncologist. Brain staging was considered present if a computed tomography or magnetic resonance imaging of the brain was performed before or within 1 month of the decision to treat with concurrent chemoradiotherapy. A complete surgical resection was defined as the absence of positive margins. Standard chemotherapy regimens were based on regimens published in the 2006 NCCN NSCLC guideline.¹³

Statistical Analyses

Summary statistics were constructed appropriately, depending on whether variables were continuous or categorical. Exact Pearson χ^2 and exact Wilcoxon tests, both using Monte Carlo estimation, were used to examine the differences in patient characteristics and quality of care. The adherence rate and its 95% CIs were estimated using the exact binomial distribution. Statistical comparisons across sites were made by the Pearson χ^2 exact test, using Monte Carlo estimation. All analyses used two-tailed tests of significance, with the significance level set at $P < .05$. All analyses were performed using SAS version 9.2.

Results

Selection of Quality Measures

A set of 19 candidate NSCLC-specific QIs was first derived from a literature and clinical guideline review and was used for an expert survey among NCCN panelists. Of the 21 NCCN panelists who were contacted, evaluable responses were available from 11 (52.4%). Of these, five were thoracic surgeons and six were medical oncologists. These individuals had a median of 27 years of experience post-medical school graduation (range = 17 to 43 years). Their practice locations were diverse: four from western, two from midwestern, three from northeastern, and two from southeastern states. Although we initially identified 19 potential NSCLC-specific QIs (Appendix Table A1), only eight of these achieved a mean rating of ≥ 4 with no disagreement in rating (Table 1).

In brief, the panelists had a wide range of opinions. We observed that the rating was low and the disagreement was high particularly among QIs related to advanced NSCLC. The rating was lowest in the item "Chemotherapy for advanced NSCLC patients with performance status 2 used." On the other

Table 1. NSCLC-Specific Quality Indicators

Quality Indicator	Eligible Patient Population to Be Assessed	Eligible Patients (N = 531)	
		No.	%
1. Preoperative PET scan performed	Patients with early stage NSCLC who had surgical resection	141	27
2. Surgical resection for stage I, II NSCLC performed	Patients with stage I, II NSCLC	106	20
3. Cisplatin-based adjuvant chemotherapy used	Patients with stage II or III NSCLC who had surgical resection and who received adjuvant chemotherapy	28	5
4. Postoperative radiation for stage I, II not used	Patients with stage I or II NSCLC who had a complete surgical resection	70	13
5. Brain staging in chemoradiation patients performed	Patients with stage III who received chemoradiation	88	17
6. Concurrent chemoradiation for unresected stage III used*	Patients with unresected stage III NSCLC	102	19
7. Standard chemotherapy for locally advanced stage used†	Patients with locally advanced NSCLC who received concurrent chemoradiation	150	28
8. Performance status assessment performed in advanced stages	Patients with stage III or IV NSCLC	397	75

Abbreviations: NSCLC, non-small-cell lung cancer; PET, positron emission tomography.

* Data included patients with concurrent chemoradiation planned.

† Standard chemotherapy was defined as platinum-based regimens¹³; data included resected stage III NSCLC and unresected stage II or III NSCLC.

hand, the highest rating was observed in the item “Surgical resection for early stage NSCLC performed.” For the purpose of our study, we decided not to select the indicator “Preoperative PET scan performed” for chart abstraction in this project. Among FIQCC members, a number of facilities did not have centralized electronic medical records and were unable to verify the use of preoperative PET scan from medical oncologist charts alone, thus potentially causing document bias when comparing results across sites.

Patient Characteristics

In 2006, the total number of new patients with NSCLC evaluated in the 11 participating sites was 2,773 (median 208; range, 90 to 862). From these, 531 eligible patient charts (19%) were randomly selected and reviewed. The median number of sampled patients from each site was 49 (range, 13 to 97), representing 11.3 to 44.0% of their total new patients with NSCLC in 2006. The median age was 68 years (range, 36 to 91 years); 51% were male, and 82% were white. The vast majority of patients had either Medicare (64%) or private/health maintenance organization (27%) as their primary health insurance. Among the 531 eligible patients, there were 49% stage IV or stage IIIB with malignant pleural effusion, 26% stage III, 6% stage II, and 14% stage I. The major histological subtypes of NSCLC were adenocarcinoma (39%), squamous cell carcinoma (19%), and NSCLC not otherwise classified (30%).

Quality of Care

Quality of care was determined on the basis of the adherence to QIs and was considered in two parts: general and NSCLC-specific. In this report, we included four general QIs and seven NSCLC-specific QIs (Table 2). There were generally fewer eligible patients to be assessed for each of the NSCLC-specific QIs than for the general QIs as a result of the items being less relevant to characteristics of their disease or treatment. We

found that the overall adherence to the general QIs was better than to the NSCLC-specific QIs (Table 2). For general QIs, the adherence rate ranged from 69% (chemotherapy consent available for patients receiving chemotherapy) to 95% (pathology report available in the chart for patients who had surgical resection), with a median adherence rate of 94%. For the NSCLC-specific QIs, the adherence rates ranged from 29% (cisplatin-based adjuvant chemotherapy used) to 91% (postoperative radiation for stage I, II not used), with a median adherence rate of 69%.

Variation in the Quality of Care

Of the 11 QIs, a statistically significant variation in the adherence rates was observed in five (Table 2). The variation in adherence rate was sometimes observed even when the level of adherence appeared satisfactory. For instance, the documentation of American Joint Committee on Cancer stage group had a mean and median adherence rate of 94.7% and 95.0%, respectively; however, there was one practice in which staging documentation existed in only 83.3% of charts.

Discussion

In this study, we used a set of 11 QIs to assess the quality of care among patients with NSCLC treated at 11 oncology practices in Florida. We found that the adherence rates for the NSCLC-specific indicators were generally lower than those for the general ones. For the four general QIs, approximately 94% of patient charts were found to be compliant; however, for the seven NSCLC-specific QIs, this number was approximately 69%.

In order to interpret these findings, we believe that it is important to consider the issue of an ideal adherence rate. Is it possible to achieve a 100% adherence rate for these quality measures? For the four general QIs, this appears feasible. The

Table 2. Adherence to Quality Indicators Among FIQCC Members

Quality Indicator	No. of Eligible Charts		Adherence Rate				P*
	No.	%	Mean	95% CI	Median	Range	
General							
AJCC stage group or TNM documented	531	100	94.7	92.5 to 96.5	95.0	83.3-100.0	<.001
Pain assessment documented	531	100	92.3	89.7 to 94.4	92.9	78.6-100.0	.051
Pathology report available in the chart for patients who had surgical resection	106	20	95.3	89.3 to 98.5	100.0	66.7-100.0	.055
Chemotherapy consent available for patients who received chemotherapy	357	67	69.1	64.1 to 73.9	62.5	25.0-100.0	<.001
NSCLC specific							
Surgical resection for stage I, II NSCLC performed	106	20	68.9	59.1 to 77.5	80.0	28.6-100.0	.0001
Cisplatin-based adjuvant chemotherapy used	25	5	28.6	13.2 to 48.7	45.8	0-100.0	.051
Postoperative radiation for stage I, II not used	70	13	91.4	82.3 to 96.8	100.0	66.7-100.0	.25
Brain staging in chemoradiation patients performed	88	17	59.1	48.1 to 69.5	60.0	28.6-80.0	.20
Concurrent chemoradiation for unresected stage III used	102	19	9.2	82.7 to 95.2	90.5	66.7-100.0	.37
Standard chemotherapy for locally advanced stage used	150	28	79.3	72.0 to 85.5	82.7	50.0-100.0	.005
Performance status assessment performed in advanced stages	397	75	42.3	37.4 to 47.4	21.1	0-93.5	<.001

Abbreviations: AJCC, American Joint Committee on Cancer; FIQCC, Florida Initiative for Quality Cancer Care; NSCLC, non-small-cell lung cancer; TNM, tumor nodal metastasis status.

* P value for variation in the adherence to each quality indicator across practice sites.

adherence rates to these QIs have been previously reported.^{10,11} When the Quality Oncology Practice Initiative first reported results for seven oncology practices,¹⁰ adherence to pain assessment was 69%, pathology report was available in 96%, staging was available in 87%, and chemotherapy consent was available in 58%. However, when these QIs were surveyed among 71 oncology practices a few years after the first report, performance had improved considerably.¹¹ In September 2006, pain assessment was addressed in 78%, pathology report was available in 96%, staging was available in 90%, and consent was documented in 93%. Our compliance rates for these measures were 92%, 95%, 95%, and 69%, respectively. It appears that, with the exception of chemotherapy consent, the quality of care based on general QIs was satisfactory among our group.

However, we believe that, for four of the seven NSCLC-specific QIs, reaching a 100% adherence rate is not always feasible for various reasons. For instance, surgical resection can be recommended only for patients with an adequate lung reserve. Many patients prefer no adjuvant chemotherapy.²⁰ Concurrent chemoradiotherapy with standard platinum-based regimen for patients with stage III NSCLC may be harmful for patients with poor performance status.²¹ These issues may result in an apparent poor adherence to the quality measure, but do not necessarily reflect poor performance by the care providers. In fact, previous studies have shown that the adherence rates to these recommendations are typically well below 100%. For example, on the basis of the Surveillance Epidemiology and End Results database, surgical resection for stages I and II NSCLC occurred in 67% of patients.²² The use of cisplatin-based chemotherapy for resected stages II and III NSCLC took

place in only 20% to 24% of eligible patients,^{20,23,24} and concurrent chemoradiotherapy for stage III NSCLC was used in 37% to 55% of patients.^{4,25} Because the adherence rates in each practice vary on the basis of patient characteristics, it can be problematic to evaluate the level of care quality according to these measures. Additional work is still needed to address this issue before these indicators can be reliably used to measure the quality of care in NSCLC.

Nevertheless, for the remaining three NSCLC-specific QIs (brain staging in stage III NSCLC, no postoperative radiation for completely resected stage I, II, and performance status assessment in advanced NSCLC), we believe it is feasible to reach a nearly 100% adherence rate because patient characteristics are less relevant. In our study, the adherence rate to avoidance of postoperative radiation in completely resected stages I and II NSCLC (91%) seemed acceptable. However, the brain staging for stage III NSCLC (59%) and the performance status assessment for advanced NSCLC (42%) appeared suboptimal as these rates were well below the traditional benchmark of 85%.²⁶ In addition, for the general quality measures, the adherence to chemotherapy consent availability (69%) was also suboptimal. It is important to note that adherence to these quality measures is important. Brain staging is crucial because approximately 20% of patients with stage III NSCLC ultimately develop brain metastasis.²⁷ Adequate brain staging can help identify patients with brain metastasis for appropriate treatment and help avoid unnecessary toxicities from chemoradiotherapy. Postoperative radiation for completely resected early-stage NSCLC can increase the absolute risk of death by 7% at 2 years and is not recommended.²⁸ Performance status assessment among pa-

tients with advanced NSCLC is essential. For stage III NSCLC, it helps determine whether concurrent chemoradiotherapy should be offered, and for stage IV or IIIB with malignant pleural effusion, it helps tailor the chemotherapy regimen.¹³

There are a number of limitations to this study. First, there is a limitation related to the NSCLC-specific QIs. Although they were derived from clinical guidelines, to our knowledge, some QIs have never been linked to improved patient outcomes. In addition, as the care of NSCLC continues to evolve, more up-to-date QIs, preferably those insensitive to the patient mix, applicable to a large number of patients, relevant to the practice setting, and able to be operationalized for abstraction should be developed.²⁹ However, since 2006, there has been no change in the standard care that affects the validity of the quality measures used in our report. Second, the observed quality of care in our study does not necessarily reflect the quality of the surveyed practices because many patients may have undergone surgery or radiation therapy elsewhere. Third, patients who present to a medical oncologist, especially with early-stage disease, are a unique subset of the entire population of patients with lung cancer, and this may affect the generalizability of our findings. Finally, as a retrospective medical record review, our findings are subject to bias from the difference in charting quality among practices.

In summary, on the basis of data from FIQCC members, there is still room for improvement in the care of patients with NSCLC with regard to the underutilization of brain staging for patients with stage III NSCLC undergoing chemoradiotherapy, performance status assessment in patients with advanced NSCLC, and the documentation of chemotherapy consent among patients undergoing chemotherapy. On the basis of these findings, efforts are underway to improve these aspects of care. Our group has recently published the quality of care performance in breast cancer.³⁰ The findings from this NSCLC study have been disseminated to our group members, and planning is underway for an upcoming re-evaluation of these measures among the same practices, using data from patients seen in 2009.

Accepted for publication on May 25, 2011.

Acknowledgment

Supported by an unrestricted grant from Pfizer.

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Authors' Disclosures of Potential Conflicts of Interest

Although all authors completed the disclosure declaration, the following author(s) indicated a financial or other interest that is relevant to the subject matter under consideration in this article. Certain relationships marked with a "U" are those for which no compensation was received; those relationships marked with a "C" were compensated. For a detailed description of the disclosure categories, or for more information about ASCO's conflict of interest policy, please refer to the Author Disclosure Declaration and the Disclosures of Potential Conflicts of Interest section in Information for Contributors.

Employment or Leadership Position: None **Consultant or Advisory Role:** None **Stock Ownership:** None **Honoraria:** None **Research Funding:** Tawee Tanvetyanon, Pfizer; Michelle Corman, Pfizer; Ji-Hyun Lee, Pfizer; William J. Fulp, Pfizer; Fred Schreiber, Pfizer; Richard Brown, Pfizer; Richard M. Levine, Pfizer; Thomas Cartwright, Pfizer; George P. Kim, Pfizer; Douglas Faig, Pfizer; Philip Sharp, Pfizer; Merry-Jennifer Markham, Pfizer; Erin Michelle Siegel, Pfizer; Mokenge Malafa, Pfizer **Expert Testimony:** None **Other Remuneration:** Paul B. Jacobsen, Pfizer

Author Contributions

Conception and design: Tawee Tanvetyanon, Michelle Corman, Gerold Bepler, Erin Siegel, David Shibata, Paul B. Jacobsen

Financial support: Paul B. Jacobsen

Administrative support: Gerold Bepler, Mokenge Malafa, Paul B. Jacobsen

Provision of study materials or patients: Fred Schreiber, Richard H. Brown, Richard M. Levine, Thomas H. Cartwright, Guillermo Abesada-Terk, George P. Kim, Carlos Alemany, Douglas Faig, Philip V. Sharp, Merry-Jennifer Markham

Collection and assembly of data: Tawee Tanvetyanon, Michelle Corman, Ji-Hyun Lee, William J. Fulp, Guillermo Abesada-Terk, Paul B. Jacobsen

Data analysis and interpretation: Tawee Tanvetyanon, Michelle Corman, Ji-Hyun Lee, William J. Fulp, Erin Siegel, David Shibata, Paul B. Jacobsen

Manuscript writing: Tawee Tanvetyanon, Michelle Corman, Ji-Hyun Lee, William J. Fulp, George P. Kim, Gerold Bepler, Paul B. Jacobsen

Final approval of manuscript: All authors

Corresponding author: Tawee Tanvetyanon, MD, H. Lee Moffitt Cancer Center, 12902 University of South Florida Magnolia Dr, Tampa, FL 33612; e-mail: Tanvett@moffitt.org.

DOI: 10.1200/JOP.2011.000228

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Appendix

Table A1. Results of Expert Survey on Potential NSCLC-Specific Quality Indicators

Stages and Potential Quality Indicators	Rating*		Rating Agreement†	Valid‡
	Mean	SD		
Early stages				
Smoking cessation advised and documented: For patients who were active smokers, smoking cessation was advised and documented.	4.3	± 1.25	Disagree	
Preoperative PET scan performed: For patients who had surgery for NSCLC, a preoperative PET scan was performed.	4.2	± 0.42	Agree	✓
Surgical resection for stage I, II NSCLC performed: For patients with a clinical stage I or II NSCLC at presentation and no medical contraindications, surgical resection for NSCLC was performed.	5.0	± 0	Agree	✓
Adequate mediastinal lymph node station assessed: For patients who had a surgical resection for NSCLC, the status of at least two N2 lymph node stations was assessed and available in the pathological report	4.6	± 1.26	Disagree	
Cisplatin-based adjuvant chemotherapy used: For patients who had a complete surgical resection and a pathological stage II or III NSCLC, adjuvant chemotherapy with a cisplatin-based regimen was used	4.4	± 0.84	Equivocal	✓
Postoperative radiation for stage I, II not used: For patients who had a complete surgical resection and a pathological stage I or II NSCLC, adjuvant radiation therapy was not to be given.	4.8	± 0.42	Agree	✓
Postoperative radiation for stage I, II used when positive margins: For patients who had an incomplete surgical resection and a pathological stage I or II NSCLC, postoperative radiation therapy was given.	4.1	± 1.28	Disagree	
Neoadjuvant chemotherapy for stage I, II not used: For patients who had a surgical resection for stage I or II NSCLC, neoadjuvant chemotherapy was not to be given.	3.7	± 0.95	Disagree	
Locally advanced stages				
Brain staging in chemoradiation patients performed: For patients who underwent chemoradiation or surgery for stage III NSCLC, a staging MRI or CT scan with contrast of the brain was performed.	4.6	± 0.69	Equivocal	✓
Concurrent chemoradiation for unresected stage III used: For patients with an unresected stage III NSCLC (except stage IIIB with malignant pleural effusion) and good performance status, concurrent chemoradiation was used as part of treatment.	4.4	± 0.69	Equivocal	✓
Standard chemotherapy for locally advanced stage used: For patients who underwent concurrent chemoradiation, the concurrent chemotherapy regimen was platinum based.	4.7	± 0.50	Agree	✓
Performance status assessment performed: For patients with a clinical stage III or IV NSCLC, performance status was assessed.	4.4	± 0.84	Equivocal	✓
Advanced stages				
Standard chemotherapy for advanced stage used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC with normal organ function and good performance status, first-line chemotherapy was a platinum-based doublet OR a third-generation agent doublet; bevacizumab may be added in selected cases.	4.0	± 1.25	Disagree	
Response assessment performed: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC who received chemotherapy, an imaging study to assess response was performed at least once after a completion of one to three cycles.	4.0	± 1.05	Disagree	
Chemotherapy for patients with performance status 2 used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC and a performance status 2 at presentation, chemotherapy was given.	3.4	± 1.01	Disagree	
Chemotherapy for elderly, good performance status patients used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC who were elderly, but with good performance status and organ function, chemotherapy was given.	3.9	± 0.74	Equivocal	
Bevacizumab for squamous cell histology not used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC who had a confirmed predominantly or entirely squamous cell carcinoma histology, bevacizumab was not used	4.0	± 1.32	Disagree	
Chemotherapy beyond 6 cycles not used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC, first-line cytotoxic chemotherapy was not to be given beyond six cycles.	4.0	± 1.00	Disagree	
Standard second-line chemotherapy used: For patients with a stage IV or IIIB with malignant pleural effusion NSCLC who received second-line chemotherapy, the regimen was a single agent with either erlotinib, pemetrexed, or docetaxel.	3.9	± 0.99	Equivocal	

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; NSCLC, non-small-cell lung cancer; OR, odds ratio; PET, positron emission tomography.

* Rating scale: 1-2, not measuring quality of care; 3, equivocal; 4-5, measuring quality of care.

† Rating agreement: Agree, all experts rated item as 1-2 or 4-5; Disagree, ≥ 1 expert rated item as 1-2 and ≥ 1 expert rated item as 4-5; Equivocal, neither agree nor disagree.

‡ Validity is defined as mean rating scale ≥ 4.0 without disagreement.