

ASSOCIATION OF COMMUNITY  
CANCER CENTERS

# IMPROVING CARE FOR PATIENTS WITH ADVANCED NON-SMALL CELL LUNG CANCER

RESULTS FROM A NATIONAL QUALITY SURVEY  
FOR THORACIC SURGEONS, RADIATION  
ONCOLOGISTS, AND  
MEDICAL ONCOLOGISTS



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The Association of Community Cancer Centers (ACCC), a collaborative and diverse cancer care organization, conducted a national survey across several cancer programs in the United States, with the aim of informing the design and execution of process-improvement plans to address identified barriers for ideal management of patients with non-small cell lung cancer (NSCLC).<sup>1</sup> NSCLC accounts for 85 percent of all lung cancer cases; it is the second most common cancer in the U.S.<sup>2</sup> Notably, over the past decade, a decline in lung cancer mortality was observed owing to advances in early detection and treatments.<sup>3,4</sup> Understanding molecular subtypes and employing targeted therapies have improved treatment regimens, thereby improving overall survival of patients with metastatic NSCLC.<sup>5</sup> Additionally, immune checkpoint inhibitors after concurrent chemoradiation therapy have become a standard of care for the treatment of unresectable Stage III NSCLC.<sup>5-7</sup> Despite these advances, the 5-year survival rate (2009–2015) is 35 percent for locally advanced NSCLC and 6 percent for those with distant metastasis.<sup>8</sup> Nevertheless, distinct subgroups of Stage III and IV patients may experience much better survival with targeted therapy or immunotherapy,<sup>5,9</sup> highlighting the need for optimal management and an informed patient-centric approach to NSCLC.

### The Role of the Multidisciplinary Team

Multidisciplinary teams help streamline and optimize quality of care. In lung cancer, these teams are associated with enhanced patient involvement in decision-making, timely care delivery, accurate staging, and appropriate treatment planning.<sup>10</sup> Treatment of NSCLC has evolved with the introduction of combined treatment modalities for Stage III NSCLC and a personalized approach for Stage IV NSCLC involving a collaboration of thoracic surgeons, radiation oncologists, and medical oncologists.<sup>11</sup>

Thoracic surgeons play a prominent role in the management of advanced NSCLC by performing diagnostic procedures, such as mediastinoscopy or endobronchial ultrasound (EBUS) transbronchial needle aspiration with mediastinal nodal sampling, to obtain adequate tissue for detailed molecular testing and re-biopsy of a tissue to identify acquired resistance, enabling

appropriate stage-based treatment decision-making and improving survival.<sup>12</sup> Additionally, according to 2020 National Comprehensive Cancer Network® (NCCN) guidelines, thoracic surgeons, as part of the multidisciplinary cancer care team, should play a major role in defining the resectability of tumors in patients with NSCLC, including those with N2-positive lymph nodes.<sup>9,13</sup>

Radiation therapy has a potential role in all stages of NSCLC. A radiation oncologist is key to determining the appropriateness of radiation therapy.<sup>9</sup> As part of the multidisciplinary team, radiation oncologists should be integral to the decision-making process for patients with early-stage NSCLC who are medically inoperable, refuse surgery, or are high-risk surgical candidates and for all patients at Stage III.<sup>9</sup> These professionals should also be involved with the multidisciplinary team for the management of patients with Stage IV NSCLC with limited disease burden, who may benefit from aggressive local consolidative therapies.<sup>9</sup> Additionally, radiation therapy may play a central role in palliative care by reducing pain and hemoptysis and preventing the progression of neurological symptoms due to brain metastases;<sup>14</sup> therefore, it is important that radiation oncologists participate in palliative care to offer options and potentially improve the quality of life of patients.<sup>14</sup>

Medical oncologists have a prominent role in diagnosis, staging, and treatment decision-making.<sup>15</sup> According to the NCCN Guidelines®, patients with NSCLC should be referred to medical oncology for evaluation.<sup>9</sup> These professionals suggest diagnostic and biomarker tests that help decide targeted treatment and identify markers for sensitivity or resistance to specific drugs.<sup>15</sup> Further, the presence of medical oncologists on the multidisciplinary team is essential for the implementation of an appropriate course of treatment.<sup>9</sup> Medical oncologists prescribe the most beneficial treatment by considering the patient's comorbidities, performance status, and organ function<sup>16</sup> and avoid unnecessary toxicity by their understanding of potential drug-drug interactions.<sup>15</sup>

Multidisciplinary management is crucial for patients with advanced stages of NSCLC to minimize low-yield diagnostic procedures, expedite treatment, and provide optimal

management and care.<sup>12</sup>

The objectives of this discipline-specific sub-analysis were to:

- Investigate coordination and communication within multidisciplinary teams
- Understand the value of these teams
- Evaluate the understanding of evolving standards for diagnosis, biomarker testing, and treatment planning
- Identify the barriers to optimal care faced by thoracic surgeons and radiation and medical oncologists for patients with Stage III/IV NSCLC.

However, the overarching goal of the survey was to identify the barriers and suggest improvements in practice patterns to ensure delivery of the highest quality of care for patients with advanced NSCLC.

## Methods and Materials

A comprehensive, double-blind, web-based survey was conducted over a 4-month period between January 2019 and April 2019. The full methodology of the survey can be found in Salgia et al., 2020.<sup>17</sup> ACCC convened an expert Steering Committee consisting of a medical oncologist, thoracic surgeon, radiation oncologist, pathologist, pulmonologist, nurse navigator, and representatives from patient advocacy, who informed and guided the development of the survey questionnaire. Overall, 108 questions were included in the survey and were structured to elicit information and perceptions of teams involved in the direct management of NSCLC during the entire patient journey.

Subsequently, 84 survey questions were customized for thoracic surgeons and medical and radiation oncologists; the responses obtained from these disciplines, including extent of participation in multidisciplinary teams and shared decision-making, familiarity with guidelines, definition and management of unresectable tumors, adoption of clinical pathways, management of immune-related adverse events (irAEs), and barriers to advanced NSCLC care, were the focus of this analysis. Additionally, parameters were sub-analyzed according to respondents' discipline (medical oncologist, radiation oncologist, or thoracic surgeon), program type, and practice region. In terms of scoring to aid interpretation, continuous variables, including engagement in shared decision-making, were labeled "reverse scored;" scores of 1, 2, 3, 4, and 5 indicated "Never," "Rarely," "Occasionally," "Frequently," and "Almost always," respectively.

## Results: Respondents' Disposition and Characteristics

Overall, 639 respondents completed the survey (response rate, 52.8 percent), representing 160 unique cancer programs across 44 states within the U.S. The respondents included thoracic

surgeons, medical oncologists, radiation oncologists, pulmonologists, pathologists, oncology nurses, nurse navigators and advanced practice nurses, financial advocates, social workers who provide financial counseling and support patient access, pharmacists, and cancer program administrators. The characteristics of the survey respondents are presented in Salgia et al., 2020.<sup>17</sup>

Thoracic surgeons (n=72), radiation oncologists (n=114), and medical oncologists (n=114) constituted 46.9 percent of the respondents (see Table 1, page 76). Thoracic surgeons and medical and radiation oncologists were largely associated with a National Cancer Institute (NCI)-Designated Comprehensive Cancer Center Program (NCIP; 59/300, 19.7 percent), a Community Cancer Program (CCP; 55/300, 18.3 percent), and/or an Academic Comprehensive Cancer Program (ACAD; 54/300, 18 percent). A high proportion of the respondents practiced in the urban (174/300, 58 percent) and suburban (101/300, 33.7 percent) regions. Notably, 60.3 percent of respondents treated more than 50 patients with NSCLC annually. Overall, 35.2 percent of treated patients had Stage III and 39.8 percent had Stage IV disease.

## Results: Care Coordination and Patient Engagement

A high proportion of respondents indicated that they "frequently" or "almost always" engaged in shared decision-making.<sup>17</sup> Notably, thoracic surgeons and medical and radiation oncologists had mean engagement scores ranging from 3.29 to 4.73, indicating that these disciplines "occasionally" or "frequently" engaged in shared decision-making. The highest mean engagement score (4.44) was associated with shared decision-making for tailoring care plans based on the values, goals, and preferences expressed by patients, followed by use of decision aids (4.20) and asking patients about their treatment-related values, goals, and preferences (4.16). However, shared decision-making engagement differed among disciplines (see Figure 1, page 78).

## Results: Screening, Diagnosis, and Biomarker Testing

No significant difference was observed between disciplines for familiarity with the eighth edition of the American Joint Commission on Cancer Tumor Node Metastasis staging system and the 2018 update of the College of American Pathologists/International Association for the Study of Lung Cancer/Association for Molecular Pathology molecular testing guideline for lung cancer across program types and regions.

A larger proportion of ACAD respondents were more likely to be familiar or "very" familiar vs. "not" or "somewhat" familiar with broad genomic profiling using next-generation sequencing (NGS; 81 percent vs. 19 percent;  $p=0.023$ ); how

ever, no significant difference for the use of NGS was observed across other program types. Additionally, respondents from an Integrated Network Cancer Program were more likely to be “not” or “somewhat” familiar vs. familiar or “very” familiar with tumor mutation burden (66.7 percent vs. 33.3 percent;  $p=0.031$ ).

## Results: Staging and Treatment Planning

Definition of unresectability, primarily evaluated by suspected mediastinal node metastases, computed tomography (CT) or positron-emission tomography (PET)/CT evidence of mediastinal nodal metastases, mediastinal nodal metastases confirmed by biopsy, low-volume single station ipsilateral nodal metastases, low-volume multi-station ipsilateral nodal metastases, bulky multi-station ipsilateral mediastinal nodal metastases, and contralateral mediastinal nodal metastases, was analyzed across disciplines and program types. Notably, a significantly higher proportion of medical oncologists vs. thoracic surgeons considered a tumor unresectable when mediastinal nodal metastases were confirmed by biopsy (64.9 percent vs. 48.6 percent,  $p=0.03$ ). However, no significant difference was observed between thoracic surgeons and medical oncologists in defining unresectability according to suspected mediastinal nodal metastases, CT or PET/CT evidence of mediastinal nodal metastases, low-volume single nodal station ipsilateral nodal metastases, low-volume multi-station ipsilateral nodal metastases, bulky multi-station ipsilateral mediastinal nodal metastases, and contralateral mediastinal nodal metastases (see Figure 2, page 79). Of note, when compared across program types, thoracic surgeons and medical oncologists from Community Cancer Programs were significantly more likely (75 percent vs. 25 percent;  $p=0.012$ ) to define tumors with mediastinal nodal metastases confirmed by biopsy as unresectable vs. resectable, whereas those from the Integrated Network Cancer Program were less likely (22.2 percent vs. 77.8 percent;  $p=0.012$ ) to define tumors with mediastinal nodal metastases confirmed by biopsy as unresectable vs. resectable. Additionally, all thoracic surgeons and medical oncologists from NCI-Designated Comprehensive Cancer Center Programs (100 percent vs. 0 percent;  $p=0.036$ ) and a majority of those from Hospital Associate Cancer Programs (72.2 percent vs. 27.8 percent;  $p=0.036$ ) defined tumors with low-volume single nodal station ipsilateral nodal metastases as resectable vs. unresectable. However, the differences in defining unresectability were not significant between community and academic program types. Moreover, a significantly higher proportion of thoracic surgeons and medical oncologists from urban regions vs. rural/suburban regions (76.9 percent vs. 23.1 percent;  $p=0.002$ ) defined tumors with suspected mediastinal nodal metastases as unresectable.

Additionally, the presence of a resectability protocol was evaluated across program types and regions. Most respon-

dents (81.3 percent) from programs in the rural region indicated that they did not have a specific protocol to define resectability, whereas 48.9 percent of respondents from programs in the urban region had a specific resectability protocol. Moreover, respondents indicated that a significantly higher proportion of programs with multidisciplinary clinics used specific protocols to define unresectable Stage III tumors compared with programs that did not have these types of clinics (79.6 percent vs. 20.4 percent;  $p=0.034$ ). A higher proportion of programs with multidisciplinary clinics vs. programs without these clinics ( $p\leq 0.017$ ) primarily defined unresectable tumors based on suspected mediastinal nodal metastases, CT or PET/CT evidence of mediastinal nodal metastases, mediastinal nodal metastases confirmed by biopsy, low-volume single-station ipsilateral nodal metastases, bulky multi-station ipsilateral mediastinal nodal metastases, and contralateral mediastinal nodal metastases. Furthermore, a significantly higher proportion of thoracic surgeons and medical oncologists from programs with multidisciplinary clinics vs. without these clinics defined suspected mediastinal nodal metastases as unresectable (see Table 2, page 77). Of note, no significant association was observed between the primary definition of an unresectable tumor and who makes the decision of resection—multidisciplinary clinics, thoracic surgeons alone, or medical oncologists who refer their patients to surgeons. Overall, 34.6 percent (44/127) of thoracic surgeons and radiation and medical oncologists indicated that medical oncologists referred patients for resection to surgeons. However, a significant difference ( $p<0.001$ ) was observed among the different disciplines; radiation oncologists (42.5 percent) responded that multidisciplinary clinics decided on the tumor resectability, whereas medical oncologists (55.8 percent) and thoracic surgeons (31.4 percent) responded that it was the task of medical oncologists to recommend resection to the patient and refer the patient to a surgeon.

Overall, 7 percent of radiation oncologists and 6.7 percent of medical oncologists indicated that more than 50 percent of patients with unresectable Stage III NSCLC received radiation alone instead of concurrent chemoradiation therapy. Additionally, 12.7 percent of radiation oncologists and 15.6 percent of medical oncologists indicated that more than 50 percent of patients with unresectable Stage III NSCLC received chemotherapy alone instead of concurrent chemoradiation therapy. Notably, a significantly higher percentage of radiation oncologists compared with medical oncologists responded that less than 5 percent of patients with Stage III NSCLC refused the initial first-line treatment option (73.5 percent vs. 26.5 percent;  $p=0.039$ ); however, no significant difference was observed between the two disciplines for patients with Stage IV NSCLC. Of note, the presence of a multidisciplinary clinic improves the use of clinical pathways for treatment of Stage III/IV NSCLC ( $p=0.035$ ). However, no significant association was observed

between the frequency of use of clinical pathways for patients with unresectable advanced-stage tumors and program type, region, and provision of incentives.

Regarding post-treatment care, compared with 44.5 percent of radiation oncologists, 89.7 percent of medical oncologists were “familiar” or “very familiar” with irAE guidelines. Notably, approximately one-third (30 percent to 41 percent) of radiation oncologists and medical oncologists indicated that standard processes, including completion of forms at each visit or reporting symptoms on the portal regarding irAEs, nurses scheduling visits to assess irAEs, and nurses following up with patients and inquiring about irAEs, were followed.

## Results: Barriers to the Management of Advanced NSCLC

Thoracic surgeons and radiation and medical oncologists indicated that there were several barriers to the optimal management of patients with Stage III/IV NSCLC. More radiation oncologists vs. respondents from other disciplines, respectively, suggested that lack of patient interest in lung cancer screening (46.1 percent vs. 33.4 percent;  $p=0.045$ ); cost of diagnosis and/or staging (43 percent vs. 32 percent;  $p=0.011$ ); biopsy tissue handling, storage, and transport (63.1 percent vs. 50 percent;  $p=0.047$ ); and improper communication of test results (71.6 percent vs. 59.6 percent;  $p=0.029$ ) had minimal impact on the management of patients with advanced NSCLC. Moreover, a higher proportion of radiation oncologists vs. respondents from other disciplines (56.3 percent vs. 42.3 percent;  $p=0.006$ ) indicated that lack of coverage and reimbursement of biomarker testing could have had some impact on the care of patients. Additionally, more thoracic surgeons vs. other respondents indicated that patients refusing biopsy or other tests could have had some impact (50.7 percent vs. 36.7 percent;  $p=0.039$ ), whereas biopsy tissue handling, storage, and transport (17.9 percent vs. 9.8 percent;  $p=0.027$ ) and accurately interpreting biomarker test results (19.1 percent vs. 6.4 percent;  $p<0.001$ ) had a significant impact on NSCLC care. Alternatively, according to a higher proportion of medical oncologists vs. respondents from other disciplines, biopsy tissue handling, storage, and transport (47.2 percent vs. 33.8 percent;  $p=0.018$ ) had some impact on NSCLC care (see Table 3, page 80).

## Discussion

The national quality survey performed across several U.S. cancer program types provides important insights into the different perceptions and practice patterns of thoracic surgeons and medical and radiation oncologists for NSCLC care management. Overall, 47 percent of respondents were from these three disciplines, of which, 60 percent treated more than 50 patients annually, with almost one-third of all patients with Stage III or

IV of the disease. Notably, thoracic surgeons and medical and radiation oncologists “occasionally” to “frequently” engaged in shared decision-making. Of note, 55 percent to 63 percent of medical and radiation oncologists indicated that 5 percent to more than 20 percent of patients with unresectable Stage III and Stage IV NSCLC refused initial first-line treatment, necessitating shared decision-making and patient-primary care provider (PCP) communication. Further, some medical and radiation oncologists indicated that a high number of their patients who could be prescribed concurrent chemoradiation therapy were treated with chemotherapy or radiotherapy alone. Notably, medical oncologists were more likely to define tumors as unresectable based on mediastinal nodal metastases confirmed by biopsy compared with thoracic surgeons, suggesting that resectability protocols and a multidisciplinary approach are essential to ensure all patients receive optimal and equitable care.

Of note, 81.3 percent of respondents indicated that programs in rural regions did not have a specific protocol, and the presence of multidisciplinary clinics positively correlated with the use of resectability protocols patients with Stage III disease. Moreover, these clinics improved the use of clinical pathways. However, the survey revealed several barriers to care delivery, further emphasizing the need for standardizing the quality of care.

Medical oncologists were significantly more familiar with irAE guidelines vs. respondents from other disciplines. Moreover, only one-third of medical and radiation oncologists indicated that an irAE protocol was followed, highlighting the need for increased awareness and standardization of processes.

Shared decision-making ensures that the decisions made are evidence based and aligned with patient preference.<sup>18</sup> Benefits associated with shared decision-making include enhanced patient satisfaction, improved treatment adherence and outcomes, and decreased healthcare costs.<sup>19,20</sup> This survey indicated that thoracic surgeons and medical and radiation oncologists “occasionally” to “frequently” participated in shared decision-making.

A randomized controlled trial reported that training medical oncologists on shared decision-making processes improved information provision skills, response to patient emotions, and patient decisions, eventually enhancing patient-centered care.<sup>21</sup> The quality of communication affects patient satisfaction and decision-making and addresses patient distress.<sup>22</sup> Additionally, implementation of shared decision-making using decision aids could improve the proportion of lung cancer screening, consequently improving prognosis.<sup>23</sup> Interestingly, respondents from all disciplines equally understood patient treatment goals, and the highest engagement score was associated with shared decision-making for tailoring care plans according to patient preference, followed by use of decision aids.

Stage III NSCLC is highly heterogeneous and associated



with poor prognosis; therefore, a patient-centered management approach is critical.<sup>24</sup> Additionally, data suggest that a trimodal therapy approach involving surgical intervention, radiotherapy, and chemotherapy demonstrates a survival benefit and improved rates of locoregional recurrence compared with a bimodal approach without surgery.<sup>25,26</sup> However, treatment decisions should be tailored to individual patient needs. According to the recent NCCN and European Society for Medical Oncology guidelines, prior to treatment, it is important to carefully evaluate the nodal status using invasive staging techniques, such as EBUS-guided procedures, and to consult a multidisciplinary team that includes a thoracic surgeon.<sup>9,27</sup> While some tumors with N2 nodal disease may be resectable, these patients warrant careful multidisciplinary assessment and staging,<sup>9,27</sup> and although surgical resection is not recommended for patients with N3 nodal disease, pathological confirmation is necessary.<sup>9,27</sup> Decisions for the management of Stage III NSCLC require expertise and consideration of patient preferences; thus, a multidisciplinary approach is paramount.<sup>24</sup>

A retrospective study indicated that multidisciplinary clinics support enhanced adherence to clinical pathways and ensure accurate mediastinal staging, thereby improving median overall survival.<sup>28</sup> Similarly, this survey suggested that the presence of multidisciplinary clinics significantly improved the use of clinical pathways for treatment of Stage III/IV NSCLC. Therefore, a multidisciplinary approach involving thoracic surgeons and medical and radiation oncologists is essential.<sup>24</sup> However, 41 percent of cancer programs did not have a multidisciplinary clinic.<sup>17</sup>

Additionally, this survey indicated a discrepancy in defining resectable vs. unresectable tumors across program types for thoracic surgeons and medical oncologists. Presence of a standard protocol for unresectable tumors could help overcome inconsistency in the treatment of patients with Stage III NSCLC. However, most program types in rural regions did not have a resectability protocol. Notably, this survey indicated that the presence of multidisciplinary clinics positively correlated with the presence of resectability protocols, further highlighting the importance of multidisciplinary teams in the management of Stage III NSCLC.

NCCN guidelines recommend the use of concurrent chemoradiation therapy followed by immunotherapy for unresectable Stage IIIA patients with positive mediastinal lymph nodes and Stage IIIB patients with positive ipsilateral and contralateral mediastinal lymph nodes.<sup>9</sup> In concordance with the guidelines, medical and radiation oncologists preferred the use of concurrent chemoradiation therapy over chemotherapy or radiotherapy alone for patients with Stage III NSCLC; however, a small proportion of medical and radiation oncologists also indicated that more than 50 percent of patients were treated with chemotherapy or radiotherapy alone. The variation in

treatment approach emphasizes the importance of guideline familiarity, education and awareness, and the presence of standard protocols or clinical pathways to ensure consistency in patient care. The fear of additive effects of concurrent chemoradiation therapy often prescribed could have contributed to patients refusing initial treatment, consequently necessitating shared decision-making and communication of risks/benefits to patients for optimal outcomes.

Immune checkpoint inhibitors have revolutionized the treatment of NSCLC; however, the benefits are associated with a spectrum of adverse events owing to the difference in mechanism of action compared with other systemic therapies.<sup>29</sup> Occurrence of irAEs is associated with improved clinical benefit, progression-free survival, and overall survival.<sup>30,31</sup> Although discontinuation of immunotherapy could alleviate irAEs, it could also result in poor patient outcomes; cautious management of irAEs could maximize clinical benefit.<sup>30</sup> Therefore, it is imperative that disciplines involved in cancer care are aware of the guidelines for the management of irAEs. More than 50 percent of radiation oncologists were unfamiliar or somewhat familiar with the irAE guidelines, suggesting a need for further education. Additionally, two-thirds of the medical and radiation oncologists indicated noncompliance with important procedures to assess irAEs in cancer programs; PCP education and implementation of irAE protocols could resolve this issue. Moreover, a multidisciplinary approach could facilitate timely input and opinions from experts, thereby ensuring an informed and streamlined mode of irAE management.<sup>32</sup> Furthermore, multidisciplinary teams could facilitate early detection and intervention of irAEs, ensuring optimal patient management and outcomes.<sup>33</sup>

In addition, this survey identified several barriers encountered by thoracic surgeons and medical and radiation oncologists in the management of patients with advanced NSCLC. A barrier faced by all three disciplines was biopsy tissue handling, storage, and transport. In the era of personalized treatment, biopsy samples should be handled judiciously for appropriate histopathological and molecular analysis, thereby optimizing diagnosis, staging, and treatment planning, consequently improving patient management and prognosis.<sup>34</sup> Moreover, interpretation and communication of biomarker results were perceived as barriers by thoracic surgeons and radiation oncologists, respectively. Tumor board meetings and multidisciplinary clinics that facilitate communication between medical oncologists and surgeons could help to overcome this barrier.<sup>35</sup> Furthermore, some or minimal impact was caused by patients refusing to undergo biopsy or other tests, lack of coverage of and reimbursement for molecular tests, lack of patient interest in screening, and cost of tests. Adoption of shared decision-making could improve patient confidence and management in these areas.

To the best of the authors' knowledge, this was the largest health-based survey performed among U.S. cancer programs to date. The survey included a diverse array of care delivery settings, structures of care, systems, staffing, and a robust process of development. However, the survey had a few limitations, such as the absence of cognitive interviews with a demonstrative cohort before study initiation, lack of validation of self-reported data, and lack of a direct link between multidisciplinary teams and clinical care delivery and outcomes. Additionally, discipline-based analyses reduced the sample size. Therefore, further studies are required to validate the self-reported data and explore the relationship between patient outcomes and cancer care delivery.

This discipline-specific analysis provides an overview of the perceptions and differences in management protocols followed by thoracic surgeons and medical and radiation oncologists across various U.S. cancer programs. This survey

highlights multiple opportunities to improve screening, diagnosis, and treatment of patients with advanced NSCLC. Notably, the engagement of thoracic surgeons and medical and radiation oncologists in multidisciplinary clinics and shared decision-making could standardize patient management and enhance quality of care.

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**Table 1. Demographic Data of Thoracic Surgeons, Radiation Oncologists, and Medical Oncologists**

Parameter	Thoracic Surgeons n/N (%)	Radiation Oncologists n/N (%)	Medical Oncologists n/N (%)
<b>Respondent number</b>	72/639 (11.3)	114/639 (17.8)	114/639 (17.8)
<b>Region</b>			
Urban	45/72 (62.5)	65/114 (57.0)	64/114 (56.1)
Suburban	24/72 (33.3)	39/114 (34.2)	38/114 (33.3)
Rural	3/72 (4.2)	10/114 (8.8)	12/114 (10.5)
<b>Program Type</b>			
CCCP	4/72 (5.6)	12/114 (10.5)	18/114 (15.8)
CCP	11/72 (15.3)	21/114 (18.4)	23/114 (20.2)
INCP	6/72 (8.3)	2/114 (1.8)	10/114 (8.8)
ACAD	21/72 (29.2)	15/114 (13.2)	18/114 (15.8)
NCIP	12/72 (16.7)	40/114 (35.1)	7/114 (6.1)
NCIN	2/72 (2.8)	2/114 (1.8)	0/114 (0.0)
VACP	0/72 (0.0)	2/114 (1.8)	0/114 (0.0)
HACP	4/72 (5.6)	5/114 (4.4)	7/114 (6.1)
FCCP	3/72 (4.2)	12/114 (10.5)	10/114 (8.8)

ACAD = Academic Comprehensive Cancer Program; CCP = Community Cancer Program; CCCP = Comprehensive Community Cancer Program; FCCP = Free Standing Cancer Center Program; HACP = Hospital Associate Cancer Program; INCP = Integrated Network Cancer Program; NCI = National Cancer Institute; NCIN = NCI-Designated Network Cancer Program; NCIP = NCI-Designated Comprehensive Cancer Center Program; VACP = Veterans Affairs Cancer Program

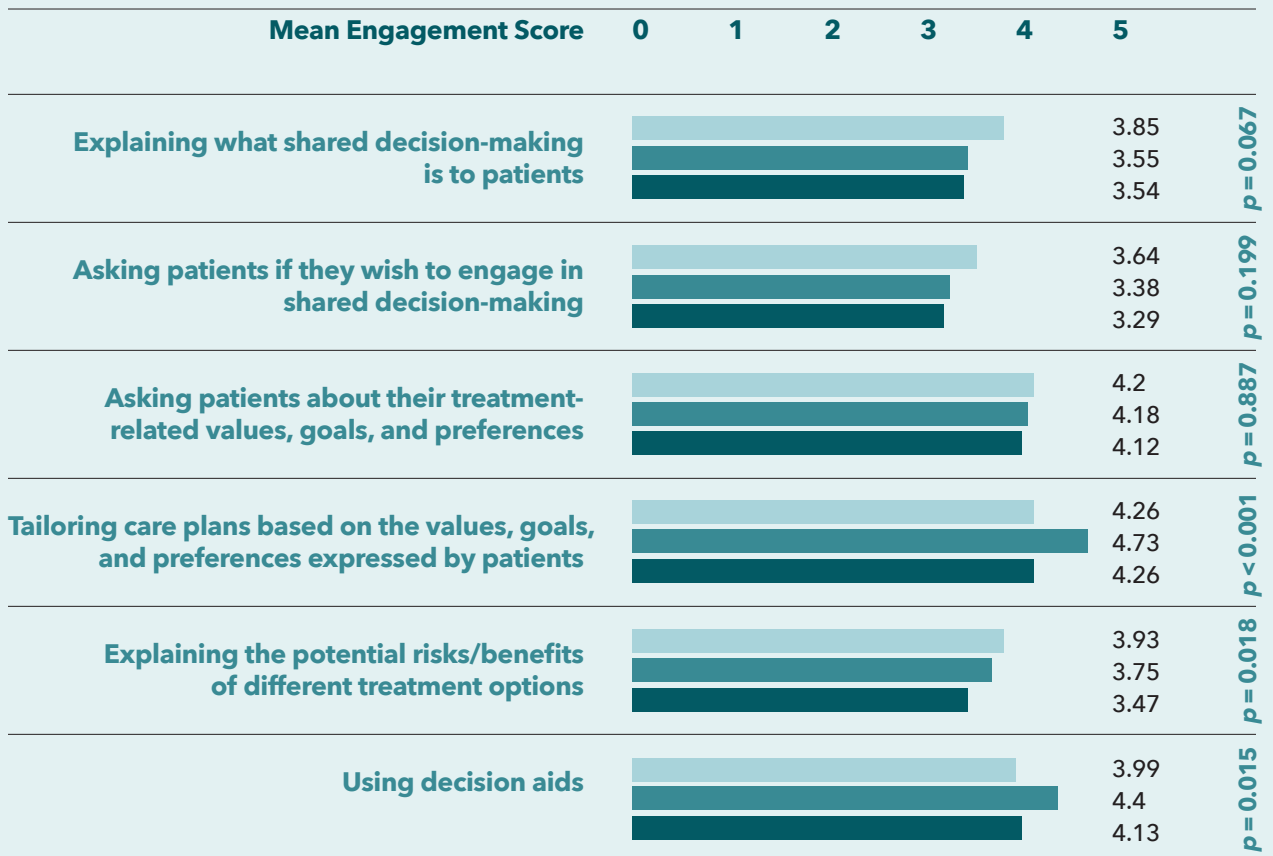
**Table 2. Association Between the Primary Definition of Unresectability and Presence of a Multidisciplinary Clinic**

<b>THORACIC SURGEON</b>			
<b>Parameter to Define Unresectable Tumors</b>	<b>Unresectability Defined by the Following Parameters n/N (%)</b>		
	<b>Presence of MDC</b>	<b>Absence of MDC</b>	<b>Significance</b>
Suspected mediastinal nodal metastases	12/12 (100.0)	0/12 (0.0)	<i>p</i> =0.035
CT or PET/CT evidence of mediastinal nodal metastases	18/25 (72.0)	7/25 (28.0)	<i>p</i> =0.522
Mediastinal nodal metastases confirmed by biopsy	27/35 (77.1)	8/35 (22.9)	<i>p</i> =0.884
Low-volume single nodal station ipsilateral nodal metastases	10/10 (100.0)	0/10 (0.0)	<i>p</i> =0.058
Low-volume multi-station ipsilateral nodal metastases	13/16 (81.3)	3/16 (18.8)	<i>p</i> =0.604
Bulky multi-station ipsilateral mediastinal nodal metastases	32/41 (78.0)	9/41 (22.0)	<i>p</i> =0.703
Contralateral mediastinal nodal metastases	38/51 (74.5)	13/51 (25.5)	<i>p</i> =0.558
<b>MEDICAL ONCOLOGIST</b>			
<b>Parameter to Define Unresectable Tumors</b>	<b>Unresectability Defined by the Following Parameters n/N (%)</b>		
	<b>Presence of MDC</b>	<b>Absence of MDC</b>	<b>Significance</b>
Suspected mediastinal nodal metastases	22/28 (78.6)	6/28 (21.4)	<i>p</i> =0.032
CT or PET/CT evidence of mediastinal nodal metastases	34/53 (64.2)	19/53 (35.8)	<i>p</i> =0.574
Mediastinal nodal metastases confirmed by biopsy	43/74 (58.1)	31/74 (41.9)	<i>p</i> =0.326
Low-volume single nodal station ipsilateral nodal metastases	8/13 (61.5)	5/13 (38.5)	<i>p</i> =0.992
Low-volume multi-station ipsilateral nodal metastases	12/22 (54.5)	10/22 (45.5)	<i>p</i> =0.462
Bulky multi-station ipsilateral mediastinal nodal metastases	40/68 (58.8)	28/68 (41.2)	<i>p</i> =0.491
Contralateral mediastinal nodal metastases	42/70 (60.0)	28/70 (40.0)	<i>p</i> =0.698

CT = computed tomography; MDC = multidisciplinary clinic; PET = positron-emission tomography



**Figure 1. Frequency of Shared Decision-Making Engagement**

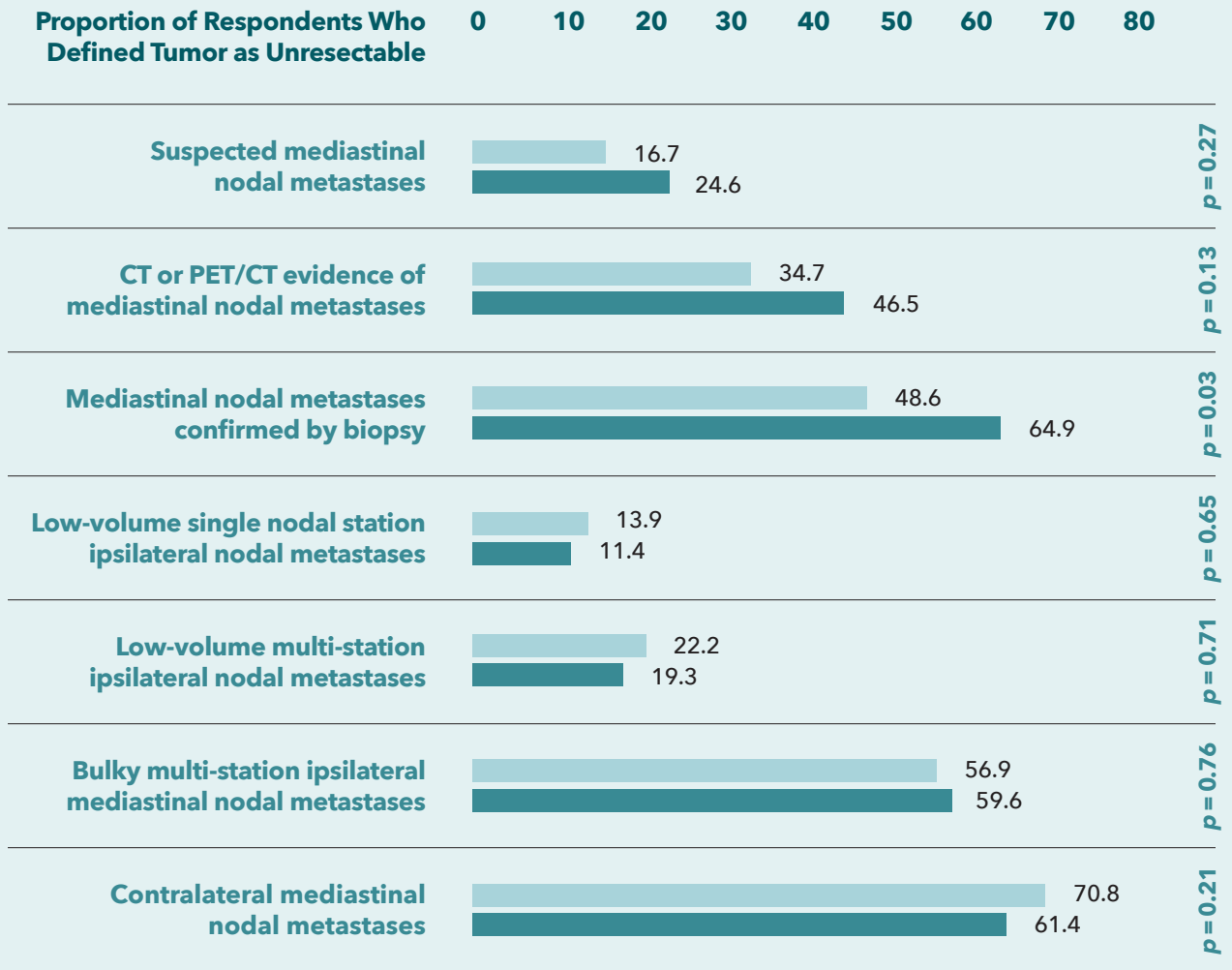


**Score indication:**

- 1 – Never
- 2 – Rarely
- 3 – Occasionally
- 4 – Frequently
- 5 – Almost always

- Thoracic Surgeons
- Radiation Oncologists
- Medical Oncologists

**Figure 2. Comparison Between Thoracic Surgeons and Medical Oncologists in the Primary Definition of Unresectability\***



\*p-values represent the association between perception of thoracic surgeons and medical oncologists in defining unresectability.

CT = computed tomography; PET = positron-emission tomography

- Thoracic Surgeons
- Medical Oncologists

**Table 3. Challenges Faced by Thoracic Surgeons and Medical and Radiation Oncologists in the Management of Advanced NSCLC**

<b>Discipline</b>	<b>Minimal Impact</b>	<b>Some Impact</b>	<b>Significant Impact</b>
<b>Thoracic Surgeons</b>		<b>Patients refusing biopsy or other tests</b>	<b>Biopsy tissue handling, storage, and transport</b>  <b>Interpretation of biomarker results</b>
<b>Radiation Oncologists</b>	<b>Lack of patient interest in screening</b>  <b>Costs</b>  <b>Biopsy tissue handling, storage, and transport</b>  <b>Improper communication of test results</b>	<b>Coverage and reimbursement of biomarker testing</b>	
<b>Medical Oncologists</b>		<b>Biopsy tissue handling, storage, and transport</b>	

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