Title

Small Cell Lung Cancer, Version 2.2022, NCCN Clinical Practice Guidelines in Oncology.

Journal

Journal of the National Comprehensive Cancer Network, 19(12)

ISSN

1540-1405

Authors

Ganti, Apar Kishor P
Loo, Billy W
Bassetti, Michael
et al.

Publication Date

2021-12-01

DOI

10.6004/jnccn.2021.0058

Peer reviewed

HHS Public Access

Author manuscript

J Natl Compr Canc Netw. Author manuscript; available in PMC 2023 May 23.

Published in final edited form as:

J Natl Compr Canc Netw. 2021 December ; 19(12): 1441–1464. doi:10.6004/jnccn.2021.0058.

Small Cell Lung Cancer, Version 2.2022, NCCN Clinical Practice Guidelines in Oncology

Apar Kishor P. Ganti, MD[1,*], **Billy W. Loo Jr., MD, PhD**[2,*], **Michael Bassetti, MD**[3], **Collin Blakely, MD, PhD**[4], **Anne Chiang, MD, PhD**[5], **Thomas A. D'Amico, MD**[6], **Christopher D'Avella, MD**[7], **Afshin Dowlati, MD**[8], **Robert J. Downey, MD**[9], **Martin Edelman, MD**[10], **Charles Florsheim**[11], **Kathryn A. Gold, MD**[12], **Jonathan W. Goldman, MD**[13], **John C. Grecula, MD**[14], **Christine Hann, MD, PhD**[15], **Wade Iams, MD**[16], **Puneeth Iyengar, MD, PhD**[17], **Karen Kelly, MD**[18], **Maya Khalil, MD**[19], **Marianna Koczywas, MD**[20], **Robert E. Merritt, MD**[14], **Nisha Mohindra, MD**[21], **Julian Molina, MD, PhD**[22], **Cesar Moran, MD**[23], **Saraswati Pokharel, MD**[24], **Sonam Puri, MD**[25], **Angel Qin, MD**[26], **Chad Rusthoven, MD**[27], **Jacob Sands, MD**[28], **Rafael Santana-Davila, MD**[29], **Michael Shafique, MD**[30], **Saiama N. Waqar, MBBS, MSCI**[31], **Kristina M. Gregory, RN, MSN, OCN**[32], **Miranda Hughes, PhD**[32]

[1]Fred & Pamela Buffett Cancer Center

[2]Stanford Cancer Institute

[3]University of Wisconsin Carbone Cancer Center

[4]UCSF Helen Diller Family Comprehensive Cancer Center

[5]Yale Cancer Center/Smilow Cancer Hospital

[6]Duke Cancer Institute

[7]Abramson Cancer Center at the University of Pennsylvania

[8]Case Comprehensive Cancer Center/University Hospitals Seidman Cancer Center and Cleveland Clinic Taussig Cancer Institute

[9]Memorial Sloan Kettering Cancer Center

[10]Fox Chase Cancer Center

[11]Patient Advocate

[12]UC San Diego Moores Cancer Center

[13]UCLA Jonsson Comprehensive Cancer Center

[14]The Ohio State University Comprehensive Cancer Center - James Cancer Hospital and Solove Research Institute

[15]The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins

[16]Vanderbilt-Ingram Cancer Center

[17]UT Southwestern Simmons Comprehensive Cancer Center

[*]Discussion Writing Committee member.

[18]UC Davis Comprehensive Cancer Center

[19]O'Neal Comprehensive Cancer Center at UAB

[20]City of Hope National Medical Center

[21]Robert H. Lurie Comprehensive Cancer Center of Northwestern University

[22]Mayo Clinic Cancer Center

[23]The University of Texas MD Anderson Cancer Center

[24]Roswell Park Comprehensive Cancer Center

[25]Huntsman Cancer Institute at the University of Utah

[26]University of Michigan Rogel Cancer Center

[27]University of Colorado Cancer Center

[28]Dana Farber/Brigham and Women's Cancer Center

[29]Fred Hutchinson Cancer Research Center/Seattle Cancer Care Alliance

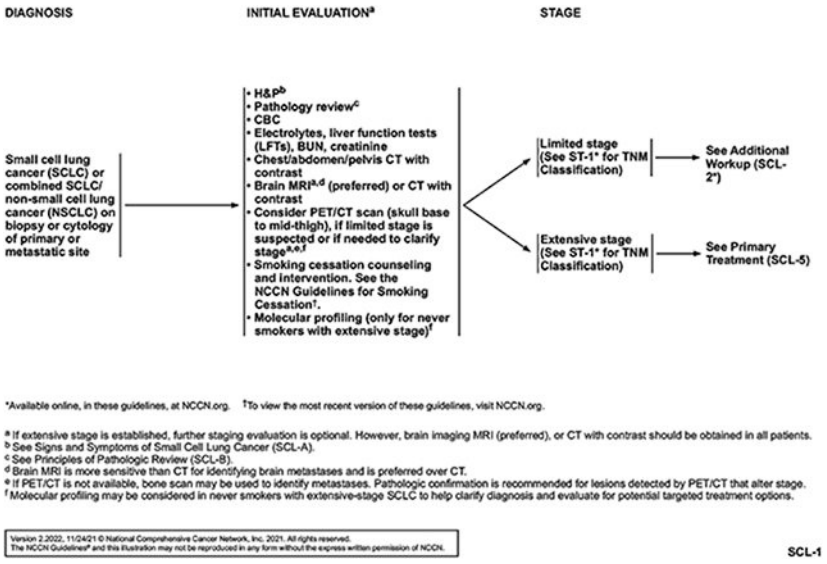
[30]Moffitt Cancer Center

[31]Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine

[32]National Comprehensive Cancer Network.

Abstract

The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) for Small Cell Lung Cancer (SCLC) provide recommended management for patients with SCLC, including diagnosis, primary treatment, surveillance for relapse, and subsequent treatment. This selection for the journal focuses on metastatic (known as extensive-stage) SCLC, which is more common than limited-stage SCLC. Systemic therapy alone can palliate symptoms and prolong survival in most patients with extensive-stage disease. Smoking cessation counseling and intervention should be strongly promoted in patients with SCLC and other high-grade neuroendocrine carcinomas. The “Summary of the Guidelines Updates” section in the SCLC algorithm outlines the most recent revisions for the 2022 update, which are described in greater detail in this revised Discussion text.

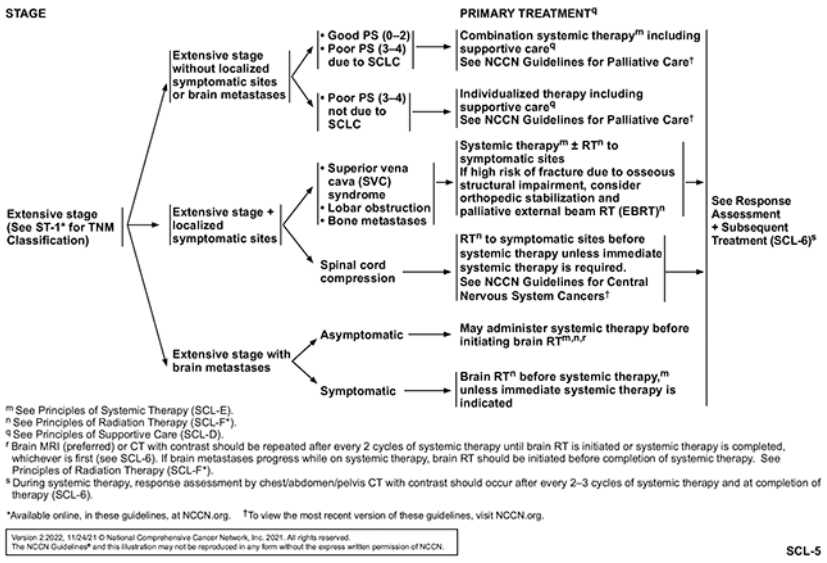


Overview

Neuroendocrine tumors account for approximately 20% of lung cancers; most (approximately 14%) are small cell lung cancer (SCLC).[1,2] In 2021, an estimated 33,000 new cases of SCLC will occur in the United States.[1,3] During the COVID pandemic, the diagnosis and treatment of lung cancer have been hampered; however, this has not been reflected in the 2021 estimates for incidence and mortality because of the typical delays in collecting, calculating, and reporting the data.[3] Nearly all cases of SCLC are attributable to cigarette smoking.[4] Although the incidence of SCLC has been decreasing, the incidence in women is increasing and the male-to-female incidence ratio is now 1:1.[1,2] Recommended management of SCLC is described in the complete version of the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) for Small Cell Lung Cancer (available at NCCN.org). This shorter selection for *JNCCN* has been condensed to focus on metastatic (known as extensive-stage) SCLC, which is more common than limited-stage SCLC. Management of other lung neuroendocrine tumors is described in a different guideline (see "Lung Neuroendocrine Tumors" in the NCCN Guidelines for Neuroendocrine and Adrenal Tumors, available at NCCN.org).

SCLC is characterized by a rapid doubling time, high growth fraction, and early development of widespread metastases. Most patients with SCLC present with hematogenous metastases; approximately one third present with limited disease confined to the chest. SCLC is highly sensitive to initial chemotherapy and radiotherapy; however, most patients eventually die of recurrent disease.[5] In patients with limited-stage SCLC, the goal of treatment is cure using chemotherapy plus thoracic radiotherapy; some patients are eligible for curative surgery followed by systemic therapy with or without mediastinal radiotherapy (see the complete version of the NCCN Guidelines for SCLC, available at NCCN.org).[6,7] In patients with extensive-stage disease, systemic therapy alone can palliate symptoms and prolong survival in most patients; however, long-term survival is rare.[8] Note that the definitions for limited-stage and extensive-stage SCLC incorporate TNM staging (see "Staging," page 1447 and NCCN.org). Surgery is only recommended for certain patients

with surgically resectable stage I to IIA SCLC; stereotactic ablative radiotherapy is an option for certain patients with medically inoperable stage I to IIA SCLC (see the complete version of these guidelines at NCCN.org).[9-12] Clinical trials generally represent state-of-the-art treatment for patients with SCLC. Despite recent advances, the recommended therapy for SCLC as outlined in the NCCN Guidelines still needs to be improved. Thus, participation in clinical trials should be strongly encouraged.

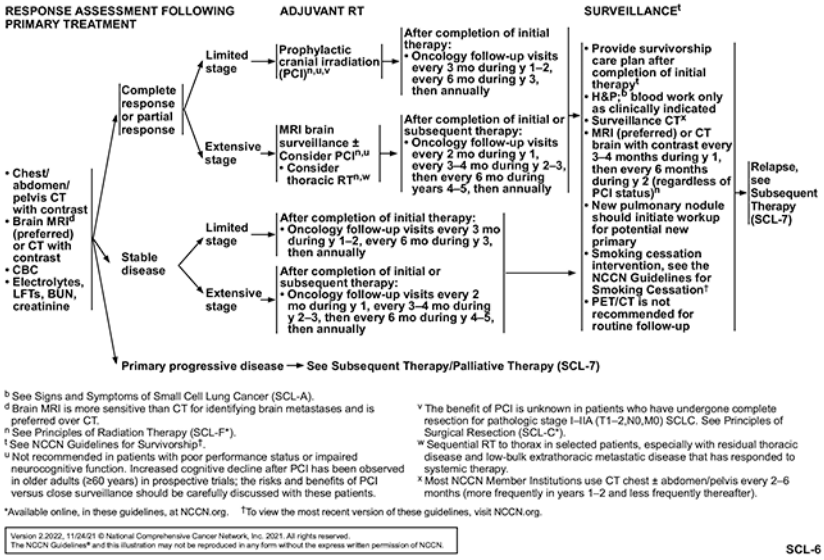


Smoking cessation counseling and intervention should be strongly promoted in patients with SCLC and other high-grade neuroendocrine carcinomas (see the NCCN Guidelines for Smoking Cessation, available at NCCN.org).[13] Former smokers should be strongly encouraged to remain abstinent. Patients with SCLC who continue to smoke have increased toxicity during treatment and shorter survival.[14] Programs using behavioral counseling combined with FDA-approved medications that promote smoking cessation can be very useful.

The NCCN Guidelines for SCLC were originally published 20 years ago and have been subsequently updated at least once every year.[15] The “Guidelines Updates” section in the SCLC algorithm (at NCCN.org) outlines the most recent revisions for the 2022 update, which are described in greater detail in this revised Discussion text; recent references have been added (see “Summary,” page 1458, and the complete version of the NCCN Guidelines for SCLC, NCCN.org). For example, new subsequent therapy options have been added for patients with SCLC. Additional supplemental material in the SCLC algorithm includes “Signs and Symptoms of Small Cell Lung Cancer,” “Principles of Pathologic Review,” “Principles of Surgical Resection,” “Principles of Supportive Care,” “Principles of Systemic Therapy,” “Principles of Radiation Therapy,” and staging tables (see the complete guidelines at NCCN.org).

Literature Search Criteria and Guidelines Update Methodology

An electronic search of the PubMed database was performed to obtain key literature in SCLC using the following search term: *small cell lung cancer*. The PubMed database was chosen because it is the most widely used resource for medical literature and indexes peer-reviewed biomedical literature. The search results were narrowed by selecting studies in humans published in English. Results were confined to the following article types: clinical trial, phase 1; clinical trial, phase 2; clinical trial, phase 3; clinical trial, phase 4; guideline; randomized controlled trial; meta-analysis; systematic reviews; and validation studies.



The data from key PubMed articles as well as articles from additional sources deemed as relevant to these NCCN Guidelines and discussed by the NCCN SCLC Panel have been included in this version of the Discussion section (eg, e-publications ahead of print, meeting abstracts). Recommendations for which high-level evidence is lacking are based on the panel's review of lower-level evidence and expert opinion. The complete details of the development and update of the NCCN Guidelines are available at NCCN.org.

Diagnosis

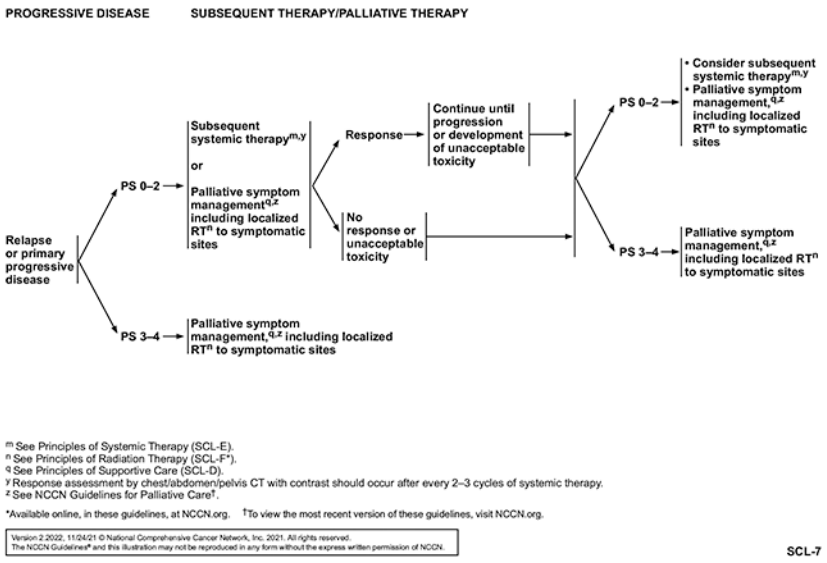
Screening

Ideally, a screening test should detect disease at an early stage when it is still curable. Currently, no effective screening test is available to detect early-stage SCLC; the disease is typically diagnosed when patients present with symptoms indicative of advanced-stage disease (see SCL-A, page 1446).[16] The National Lung Screening Trial reported that screening with annual, low-dose, spiral CT scans decreased lung cancer-specific mortality in asymptomatic high-risk individuals (see the NCCN Guidelines for Lung Cancer Screening, NCCN.org).[17] Although low-dose CT screening can detect early-stage non-small cell lung cancer (NSCLC), it does not seem to be useful for detecting early-stage SCLC.[16-19] Low-dose CT screening is probably not useful for SCLC because of the aggressiveness of the

disease, which results in the development of symptomatic disease between annual scans, thereby limiting the potential effect on mortality.[16]

Manifestations

SCLC typically presents as a large hilar mass and bulky mediastinal lymphadenopathy that cause cough and dyspnea.[20] Frequently, patients present with symptoms of widespread metastatic disease, such as weight loss, debility, bone pain, and neurologic compromise. The algorithm includes a section describing signs and symptoms of SCLC based on the tumor location and type of metastases (see SCL-A, page 1446). It is uncommon for patients to present with a solitary peripheral nodule without central adenopathy. In this situation, fine-needle aspiration may not adequately differentiate small cell carcinoma (which is a high-grade neuroendocrine carcinoma) from low-grade (typical carcinoid), intermediate-grade (atypical carcinoid), or large-cell neuroendocrine carcinoma(LCNEC) (which is also a high-grade neuroendocrine carcinoma) (see “Lung Neuroendocrine Tumors” in the NCCN Guidelines for Neuroendocrine and Adrenal Tumors, at NCCN.org).[21,22]



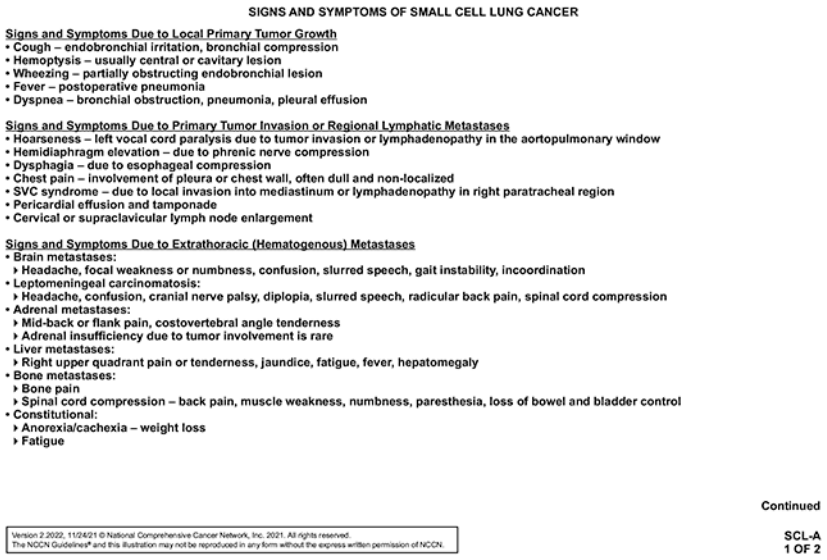
Many neurologic and endocrine paraneoplastic syndromes are associated with SCLC.[23-25] Neurologic syndromes include Lambert-Eaton myasthenic syndrome, encephalomyelitis, and sensory neuropathy. Patients with the Lambert-Eaton myasthenic syndrome present with proximal leg weakness that is caused by antibodies directed against the voltage-gated calcium channels.[26,27] Paraneoplastic encephalomyelitis and sensory neuropathy are caused by the production of an antibody (anti-*Hu*) that cross-reacts with both small cell carcinoma antigens and human neuronal RNA-binding proteins resulting in multiple neurologic deficits; paraneoplastic encephalomyelitis may precede the diagnosis of a tumor.[28] The NCCN SCLC Panel recommends that if neurologic paraneoplastic syndrome is suspected, then obtaining a comprehensive paraneoplastic antibody panel should be considered.

SCLC cells sometimes produce polypeptide hormones, including vasopressin (antidiuretic hormone [ADH]) and adrenocorticotropic hormone (ACTH), which cause hyponatremia of malignancy (ie, syndrome of inappropriate ADH secretion [SIADH]) and Cushing

syndrome, respectively.[29,30] In patients with SCLC, SIADH occurs more frequently than Cushing syndrome. Cancer treatment and/or supportive care may also cause hyponatremia (eg, cisplatin, opiates).[31] Primary treatment of SIADH includes fluid restriction (which is difficult for patients because of increased thirst) and demeclocycline; vasopressin receptor inhibitors (ie, conivaptan, tolvaptan) can be used for refractory hyponatremia (see SCL-D, page 1449).[31-33] Hyponatremia usually improves after successful treatment of SCLC.

Pathology

The NCCN Guidelines for SCLC include a section on pathology (see SCL-B, page 1448). The WHO classification system is used to classify lung tumors.[34-39] SCLC is a poorly differentiated malignant epithelial tumor that is categorized as a high-grade neuroendocrine carcinoma.[21,40] The classic and distinctive histology on hematoxylin and eosin may be sufficient for identifying SCLC in good-quality histologic samples, including small blue cells with scant cytoplasm, ill-defined cell borders, finely granular nuclear chromatin, and absent or inconspicuous nucleoli.[21,41] The cells are round, oval, or spindle-shaped; nuclear molding is prominent.[42] The mitotic count is high in SCLC compared with the count in atypical and typical carcinoids. However, it can be difficult to count mitotic figures in small biopsy samples with crushed or necrotic cells; immunohistochemistry is useful in this setting (see next paragraph).[43] Up to 30% of specimens from patients with SCLC reveal areas of NSCLC differentiation (mainly large cell carcinoma)[42]; this finding is more commonly detected in specimens from previously treated patients and suggests that pulmonary carcinogenesis occurs in a pluripotent stem cell capable of differentiation along divergent pathways. Although 95% of small cell carcinomas originate in the lung, they can also arise from extrapulmonary sites, including the nasopharynx, gastrointestinal tract, and genitourinary tract.[44,45] Both pulmonary and extrapulmonary small cell carcinomas have a similar clinical and biologic behavior, leading to a high potential for widespread metastases.



SIGNS AND SYMPTOMS OF SMALL CELL LUNG CANCER

Signs and Symptoms Due to Local Primary Tumor Growth
- Cough – endobronchial irritation, bronchial compression
- Hemoptysis – usually central or cavitary lesion
- Wheezing – partially obstructing endobronchial lesion
- Fever – postoperative pneumonia
- Dyspnea – bronchial obstruction, pneumonia, pleural effusion

Signs and Symptoms Due to Primary Tumor Invasion or Regional Lymphatic Metastases
- Hoarseness – left vocal cord paralysis due to tumor invasion or lymphadenopathy in the aortopulmonary window
- Hemidiaphragm elevation – due to phrenic nerve compression
- Dysphagia – due to esophageal compression
- Chest pain – involvement of pleura or chest wall, often dull and non-localized
- SVC syndrome – due to local invasion into mediastinum or lymphadenopathy in right paratracheal region
- Pericardial effusion and tamponade
- Cervical or supraclavicular lymph node enlargement

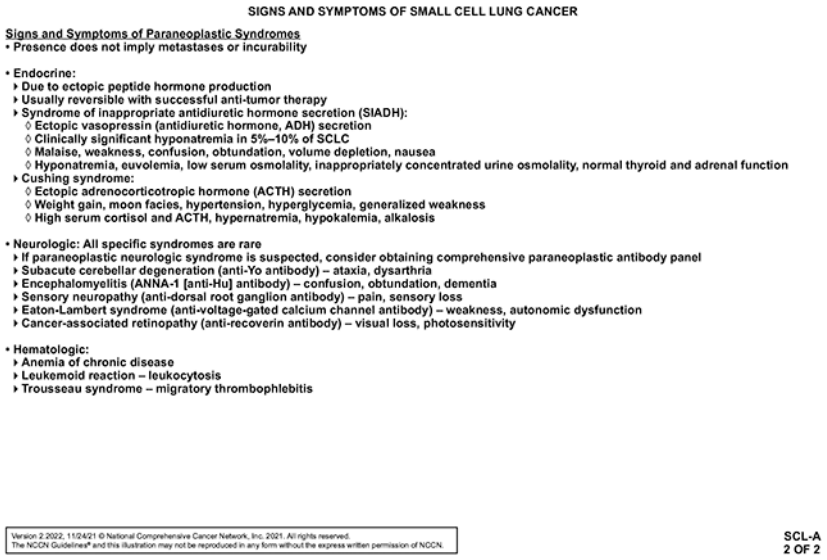
Signs and Symptoms Due to Extrathoracic (Hematogenous) Metastases
- Brain metastases:
  - Headache, focal weakness or numbness, confusion, slurred speech, gait instability, incoordination
- Leptomeningeal carcinomatosis:
  - Headache, confusion, cranial nerve palsy, diplopia, slurred speech, radicular back pain, spinal cord compression
- Adrenal metastases:
  - Mid-back or flank pain, costovertebral angle tenderness
  - Adrenal insufficiency due to tumor involvement is rare
- Liver metastases:
  - Right upper quadrant pain or tenderness, jaundice, fatigue, fever, hepatomegaly
- Bone metastases:
  - Bone pain
  - Spinal cord compression – back pain, muscle weakness, numbness, paresthesia, loss of bowel and bladder control
- Constitutional:
  - Anorexia/cachexia – weight loss
  - Fatigue

Continued

SCL-A
1 OF 2

Immunohistochemistry is useful for diagnosing SCLC in limited samples and distinguishing SCLC from NSCLC or other neuroendocrine tumors·[21,43,46-48] Nearly all SCLCs are

immunoreactive for cytokeratin (AE1/Ae3, CAM5.2); 85% to 90% of SCLCs are positive for thyroid transcription factor-1 (TTF-1).[21,49-51] Napsin A is a marker of adenocarcinoma and p40 (or p63) is a marker of squamous cell carcinoma. Napsin A and p40 (or p63) are generally negative in SCLC and, therefore, useful for distinguishing SCLC from poorly differentiated NSCLC and combined SCLC.[52] However, p40 (or p63) can be focally positive in SCLC. It is important to distinguish SCLC from other neuroendocrine tumors, especially typical and atypical carcinoids, because treatment differs for these tumors (see "Lung Neuroendocrine Tumors" in the NCCN Guidelines for Neuroendocrine and Adrenal Tumors).[37,43] Most SCLCs also stain positively for markers of neuroendocrine differentiation, including insulinoma-associated protein 1 (INSM1), chromogranin A, neuron-specific enolase, neural cell adhesion molecule (NCAM; CD56), and synaptophysin.[21,53,54] Fewer than 5% of SCLCs are negative for all neuroendocrine markers. However, these markers alone cannot be used to distinguish SCLC from NSCLC, because approximately 10% of NSCLCs will be immunoreactive for at least one of these neuroendocrine markers.[55] Ki-67 immunostaining is useful for distinguishing SCLC from carcinoid tumors.[37,43,56,57]

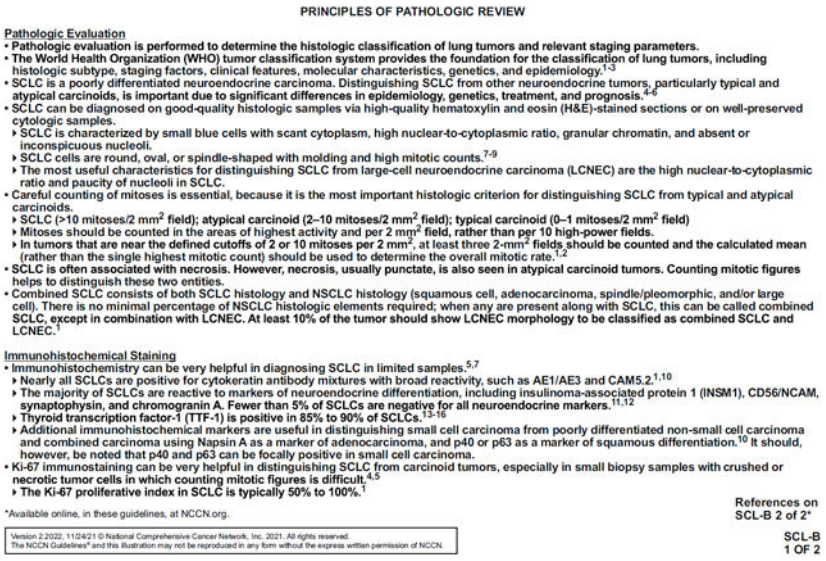


The 2015 WHO classification recognizes 2 types of SCLC: SCLC and combined SCLC.[34,37,39] Combined SCLC consists of both SCLC histology and NSCLC histology (squamous cell, adenocarcinoma, spindle/pleomorphic, and/or large cell carcinoma).[34,37,38] No minimal percentage of NSCLC histologic elements is required for a classification of combined SCLC; if any elements are present along with SCLC, then this can be classified as combined SCLC. The exception is when SCLC is combined with LCNEC. At least 10% of the tumor should show LCNEC morphology to be classified as combined SCLC and LCNEC.[42,58] Patients with combined SCLC are treated using regimens for SCLC, because it is the more aggressive cancer.[58] Combined SCLC is more frequent in patients with limited-stage SCLC. Studies have shown that patients with NSCLC can undergo transformation to SCLC after treatment with EGFR tyrosine kinase inhibitors or immune checkpoint inhibitors.[59,60] Molecular profiling may be considered for patients with extensive-stage

SCLC who have never smoked to help clarify the diagnosis and to evaluate for potential targeted treatment options.[34,61-64]

Staging

The NCCN SCLC Panel adopted a combined approach for staging SCLC using both the AJCC TNM staging system and the older Veterans Administration (VA) scheme for SCLC.[5,65] The VA Lung Study Group's 2-stage classification scheme has historically been used to define the extent of disease in patients with SCLC: (1) limited-stage disease is disease confined to the ipsilateral hemithorax, which can be safely encompassed within a radiation field; and (2) extensive-stage disease is disease beyond the ipsilateral hemithorax, including malignant pleural or pericardial effusion or hematogenous metastases.[66] Contralateral mediastinal and ipsilateral supraclavicular lymphadenopathy are generally classified as limited-stage disease, whereas the classification of contralateral hilar and supraclavicular lymphadenopathy is more controversial and treatment is individualized.[5,65,67] Approximately 66% of patients present with overt hematogenous metastases, which commonly involve the contralateral lung, liver, adrenal glands, brain, bones, and/or bone marrow. The AJCC revised the TNM staging system (8th edition) for lung cancer in 2018 (see the complete version of the NCCN Guidelines for SCLC, NCCN.org).[68,69]



PRINCIPLES OF PATHOLOGIC REVIEW

Pathologic Evaluation

- Pathologic evaluation is performed to determine the histologic classification of lung tumors and relevant staging parameters.
- The World Health Organization (WHO) tumor classification system provides the foundation for the classification of lung tumors, including histologic subtype, staging factors, clinical features, molecular characteristics, genetics, and epidemiology.[1-3]
- SCLC is a poorly differentiated neuroendocrine carcinoma. Distinguishing SCLC from other neuroendocrine tumors, particularly typical and atypical carcinoids, is important due to significant differences in epidemiology, genetics, treatment, and prognosis.[4-6]
- SCLC can be diagnosed on good-quality histologic samples via high-quality hematoxylin and eosin (H&E)-stained sections or on well-preserved cytologic samples.
  - SCLC is characterized by small blue cells with scant cytoplasm, high nuclear-to-cytoplasmic ratio, granular chromatin, and absent or inconspicuous nucleoli.
  - SCLC cells are round, oval, or spindle-shaped with molding and high mitotic counts.[7-9]
  - The most useful characteristics for distinguishing SCLC from large-cell neuroendocrine carcinoma (LCNEC) are the high nuclear-to-cytoplasmic ratio and paucity of nucleoli in SCLC.
- Careful counting of mitoses is essential, because it is the most important histologic criterion for distinguishing SCLC from typical and atypical carcinoids.
  - SCLC (>10 mitoses/2 mm^2 field); atypical carcinoid (2–10 mitoses/2 mm^2 field); typical carcinoid (0–1 mitoses/2 mm^2 field)
  - Mitoses should be counted in the areas of highest activity and per 2 mm^2 field, rather than per 10 high-power fields.
  - In tumors that are near the defined cutoffs of 2 or 10 mitoses per 2 mm^2, at least three 2-mm^2 fields should be counted and the calculated mean (rather than the single highest mitotic count) should be used to determine the overall mitotic rate.[1,2]
- SCLC is often associated with necrosis. However, necrosis, usually punctate, is also seen in atypical carcinoid tumors. Counting mitotic figures helps to distinguish these two entities.
- Combined SCLC consists of both SCLC histology and NSCLC histology (squamous cell, adenocarcinoma, spindle/pleomorphic, and/or large cell). There is no minimal percentage of NSCLC histologic elements required; when any are present along with SCLC, this can be called combined SCLC, except in combination with LCNEC. At least 10% of the tumor should show LCNEC morphology to be classified as combined SCLC and LCNEC.[1]

Immunohistochemical Staining

- Immunohistochemistry can be very helpful in diagnosing SCLC in limited samples.[5,7]
  - Nearly all SCLCs are positive for cytokeratin antibody mixtures with broad reactivity, such as AE1/AE3 and CAM5.2.[1,10]
  - The majority of SCLCs are reactive to markers of neuroendocrine differentiation, including insulinoma-associated protein 1 (INSM1), CD56/NCAM, synaptophysin, and chromogranin A. Fewer than 5% of SCLCs are negative for all neuroendocrine markers.[11,12]
  - Thyroid transcription factor-1 (TTF-1) is positive in 85% to 90% of SCLCs.[13-16]
  - Additional immunohistochemical markers are useful in distinguishing small cell carcinoma from poorly differentiated non-small cell carcinoma and combined carcinoma using Napsin A as a marker of adenocarcinoma, and p40 or p63 as a marker of squamous differentiation.[10] It should, however, be noted that p40 and p63 can be focally positive in small cell carcinoma.
- Ki-67 immunostaining can be very helpful in distinguishing SCLC from carcinoid tumors, especially in small biopsy samples with crushed or necrotic tumor cells in which counting mitotic figures is difficult.[4,5]
  - The Ki-67 proliferative index in SCLC is typically 50% to 100%.[1]

*Available online, in these guidelines, at NCCN.org.

References on SCL-B 2 of 2*

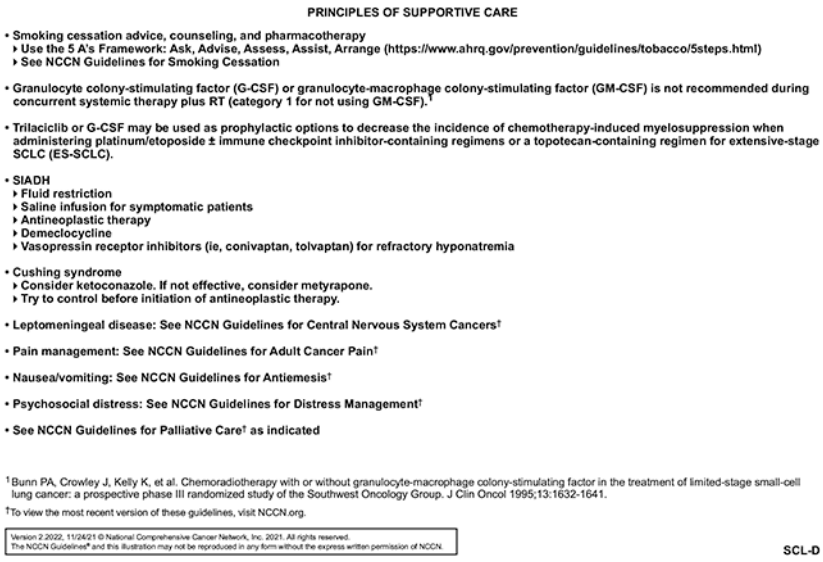
SCL-B 1 OF 2

The NCCN SCLC Panel will continue to use both the VA and the TNM systems for staging SCLC. In applying the TNM classifications to the VA system, *limited-stage* SCLC is defined as stage I to III (T any, N any, M0) that can be safely treated with definitive radiation therapy, excluding T3–4 due to multiple lung nodules that are too extensive or have tumor/nodal volume that is too large to be encompassed in a tolerable radiation plan (see the complete version of the NCCN Guidelines for SCLC, NCCN.org). *Extensive-stage* SCLC is defined as stage IV (T any, N any, M1a/b/c) or T3–4 due to multiple lung nodules as previously described. Because most of the literature on SCLC classifies patients based on the VA's definitions of limited-stage or extensive-stage disease, these definitions are often

used for clinical decision-making. However, the TNM system is useful for selecting patients with T1-2, N0 disease who are eligible for surgery and for radiation treatment planning.[65] Clinical research studies should begin to include use of the TNM system, because it will allow for more precise assessments of prognosis and specific therapy in the future.[68]

All patients with SCLC, even those with radiographically limited-stage disease, require systemic therapy either as primary or adjuvant therapy. Staging provides a therapeutic guideline for thoracic radiotherapy, which is indicated primarily for patients with limited-stage disease. Full staging includes a history and physical examination; CT scan with intravenous contrast of the chest/abdomen/pelvis; and brain imaging using MRI (preferred) or CT scan with intravenous contrast (see SCL-1, page 1442).[67,70] However, once a patient has been found to have extensive-stage disease, further staging is not required, except for brain imaging.[5] Unilateral bone marrow aspirates and biopsies may be indicated in select patients with nucleated red blood cells on peripheral blood smear, neutropenia, or thrombocytopenia suggestive of bone marrow infiltration and with no other evidence of metastatic disease. Bone marrow involvement as the only site of extensive-stage disease occurs in fewer than 5% of patients. If limited-stage disease is suspected, a PET/CT scan (skull base to midthigh) can be considered to assess for distant metastases.[5,65] A bone scan can be performed if PET/CT is equivocal or not available; bone biopsy can be considered if bone imaging is equivocal.

PET scans can increase staging accuracy in patients with SCLC, because SCLC is a highly metabolic disease.[71-73] PET/CT is superior to PET alone.[73] Approximately 19% of patients who undergo PET are upstaged from limited-stage to extensive-stage disease, whereas only 8% are downstaged from extensive-stage to limited-stage disease.[67] For most metastatic sites, PET/CT is superior to CT imaging; however, PET/CT is inferior to MRI or CT for the detection of brain metastases (see the NCCN Guidelines for Central Nervous System Cancers at NCCN.org).[74] Changes in management based on PET staging were reported in approximately 27% of patients, mainly because of alterations in the planned radiation field as a result of improved detection of intrathoracic sites of disease.[67,72,75] Although PET/CT seems to improve staging accuracy in SCLC, pathologic confirmation is still required for PET/CT-detected lesions that would alter the stage.



PRINCIPLES OF SUPPORTIVE CARE

- Smoking cessation advice, counseling, and pharmacotherapy
  - Use the 5 A's Framework: Ask, Advise, Assess, Assist, Arrange (https://www.ahrq.gov/prevention/guidelines/tobacco/5steps.html)
  - See NCCN Guidelines for Smoking Cessation
- Granulocyte colony-stimulating factor (G-CSF) or granulocyte-macrophage colony-stimulating factor (GM-CSF) is not recommended during concurrent systemic therapy plus RT (category 1 for not using GM-CSF).[†]
- Trilaciclib or G-CSF may be used as prophylactic options to decrease the incidence of chemotherapy-induced myelosuppression when administering platinum/etoposide ± immune checkpoint inhibitor-containing regimens or a topotecan-containing regimen for extensive-stage SCLC (ES-SCLC).
- SIADH
  - Fluid restriction
  - Saline infusion for symptomatic patients
  - Antineoplastic therapy
  - Demeclocycline
  - Vasopressin receptor inhibitors (ie, conivaptan, tolvaptan) for refractory hyponatremia
- Cushing syndrome
  - Consider ketoconazole. If not effective, consider metyrapone.
  - Try to control before initiation of antineoplastic therapy.
- Leptomeningeal disease: See NCCN Guidelines for Central Nervous System Cancers[†]
- Pain management: See NCCN Guidelines for Adult Cancer Pain[†]
- Nausea/vomiting: See NCCN Guidelines for Antiemesis[†]
- Psychosocial distress: See NCCN Guidelines for Distress Management[†]
- See NCCN Guidelines for Palliative Care[†] as indicated

[†] Bunn PA, Crowley J, Kelly K, et al. Chemoradiotherapy with or without granulocyte-macrophage colony-stimulating factor in the treatment of limited-stage small-cell lung cancer: a prospective phase III randomized study of the Southwest Oncology Group. J Clin Oncol 1995;13:1632-1641.

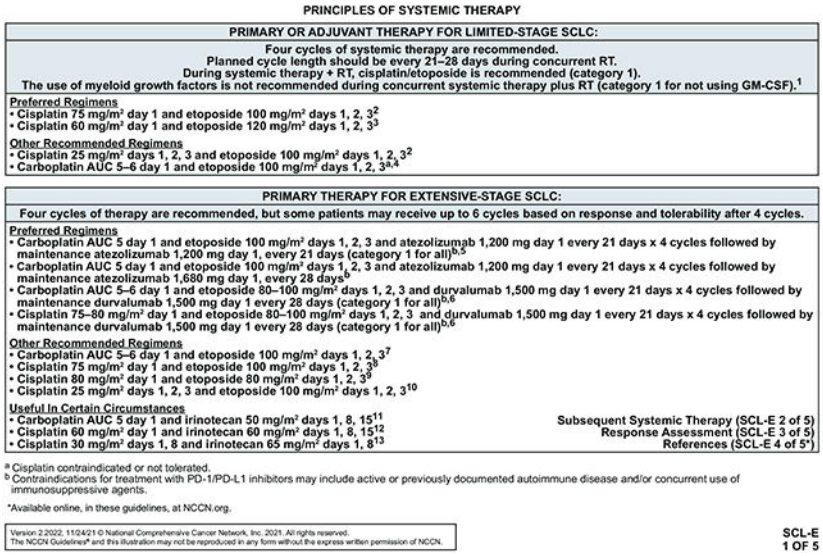
[†] To view the most recent version of these guidelines, visit NCCN.org.

SCL-D

Before surgical resection, pathologic mediastinal staging is required to confirm PET/CT scan results in patients with clinical stage I to IIA SCLC (T1–2,N0,M0) to rule out occult nodal disease.[5] However, mediastinal staging is not required if the patient is not a candidate for surgical resection or if nonsurgical treatment is planned. Invasive mediastinal staging can be performed either by conventional mediastinoscopy or by minimally invasive techniques such as transesophageal endoscopic ultrasound-guided fine-needle aspiration, endobronchial ultrasound-guided transbronchial needle aspiration, or video-assisted thoracic surgery.[76,77]

Thoracentesis with cytologic analysis is recommended if a pleural effusion is large enough to be safely accessed via ultrasound guidance. If thoracentesis does not show malignant cells, then thoracoscopy can be considered to document pleural involvement, which would indicate extensive-stage disease. The effusion should be excluded as a staging element if: (1) multiple cytopathologic examinations of the pleural fluid are negative for cancer; (2) the fluid is not bloody and not an exudate; and (3) clinical judgment suggests that the effusion is not directly related to the cancer. Pericardial effusions are classified using the same criteria.

Staging should not focus only on sites of symptomatic disease or on sites suggested by laboratory tests. Bone scans are positive in up to 30% of patients without bone pain or without an abnormal alkaline phosphatase level. Bone imaging with radiographs or MRI may be appropriate if PET/CT is equivocal. Brain imaging (MRI preferred or CT with contrast) can identify central nervous system metastases in 10%–15% of patients at diagnosis, of which approximately 30% are asymptomatic. Early treatment of brain metastases results in less chronic neurologic morbidity, arguing for the usefulness of early diagnosis in asymptomatic patients. Because of the aggressive nature of SCLC, staging should not delay the onset of treatment for more than 1 week; otherwise, many patients may become more seriously ill in the interval, with a significant decline in their performance status (PS).


PRINCIPLES OF SYSTEMIC THERAPY

PRIMARY OR ADJUVANT THERAPY FOR LIMITED-STAGE SCLC:

Four cycles of systemic therapy are recommended.
Planned cycle length should be every 21–28 days during concurrent RT.
During systemic therapy + RT, cisplatin/etoposide is recommended (category 1).
The use of myeloid growth factors is not recommended during concurrent systemic therapy plus RT (category 1 for not using GM-CSF).[1]

Preferred Regimens
- Cisplatin 75 mg/m² day 1 and etoposide 100 mg/m² days 1, 2, 3[2]
- Cisplatin 60 mg/m² day 1 and etoposide 120 mg/m² days 1, 2, 3[3]

Other Recommended Regimens
- Cisplatin 25 mg/m² days 1, 2, 3 and etoposide 100 mg/m² days 1, 2, 3[2]
- Carboplatin AUC 5–6 day 1 and etoposide 100 mg/m² days 1, 2, 3[a,4]

PRIMARY THERAPY FOR EXTENSIVE-STAGE SCLC:

Four cycles of therapy are recommended, but some patients may receive up to 6 cycles based on response and tolerability after 4 cycles.

Preferred Regimens
- Carboplatin AUC 5 day 1 and etoposide 100 mg/m² days 1, 2, 3 and atezolizumab 1,200 mg day 1 every 21 days x 4 cycles followed by maintenance atezolizumab 1,200 mg day 1, every 21 days (category 1 for all)[b,5]
- Carboplatin AUC 5 day 1 and etoposide 100 mg/m² days 1, 2, 3 and atezolizumab 1,200 mg day 1 every 21 days x 4 cycles followed by maintenance atezolizumab 1,680 mg day 1, every 28 days[b]
- Carboplatin AUC 5–6 day 1 and etoposide 80–100 mg/m² days 1, 2, 3 and durvalumab 1,500 mg day 1 every 21 days x 4 cycles followed by maintenance durvalumab 1,500 mg day 1 every 28 days (category 1 for all)[b,6]
- Cisplatin 75–80 mg/m² day 1 and etoposide 80–100 mg/m² days 1, 2, 3 and durvalumab 1,500 mg day 1 every 21 days x 4 cycles followed by maintenance durvalumab 1,500 mg day 1 every 28 days (category 1 for all)[b,6]

Other Recommended Regimens
- Carboplatin AUC 5–6 day 1 and etoposide 100 mg/m² days 1, 2, 3[7]
- Cisplatin 75 mg/m² day 1 and etoposide 100 mg/m² days 1, 2, 3[8]
- Cisplatin 80 mg/m² day 1 and etoposide 80 mg/m² days 1, 2, 3[9]
- Cisplatin 25 mg/m² days 1, 2, 3 and etoposide 100 mg/m² days 1, 2, 3[10]

Useful In Certain Circumstances
- Carboplatin AUC 5 day 1 and irinotecan 50 mg/m² days 1, 8, 15[11]
- Cisplatin 60 mg/m² day 1 and irinotecan 60 mg/m² days 1, 8, 15[12]
- Cisplatin 30 mg/m² days 1, 8 and irinotecan 65 mg/m² days 1, 8[13]

Subsequent Systemic Therapy (SCL-E 2 of 5)
Response Assessment (SCL-E 3 of 5)
References (SCL-E 4 of 5*)

[a] Cisplatin contraindicated or not tolerated.
[b] Contraindications for treatment with PD-1/PD-L1 inhibitors may include active or previously documented autoimmune disease and/or concurrent use of immunosuppressive agents.

*Available online, in these guidelines, at NCCN.org.

SCL-E
1 OF 5

Prognostic Factors

Poor PS (3–4), extensive-stage disease, weight loss, and markers associated with excessive bulk of disease (such as lactate dehydrogenase [LDH]) are the most important adverse prognostic factors. Female gender, age younger than 70 years, normal LDH, and stage I disease are associated with a more favorable prognosis in patients with limited-stage disease. Younger age, good PS, normal creatinine level, normal LDH, and a single metastatic site are favorable prognostic factors in patients with extensive-stage disease.[78,79]

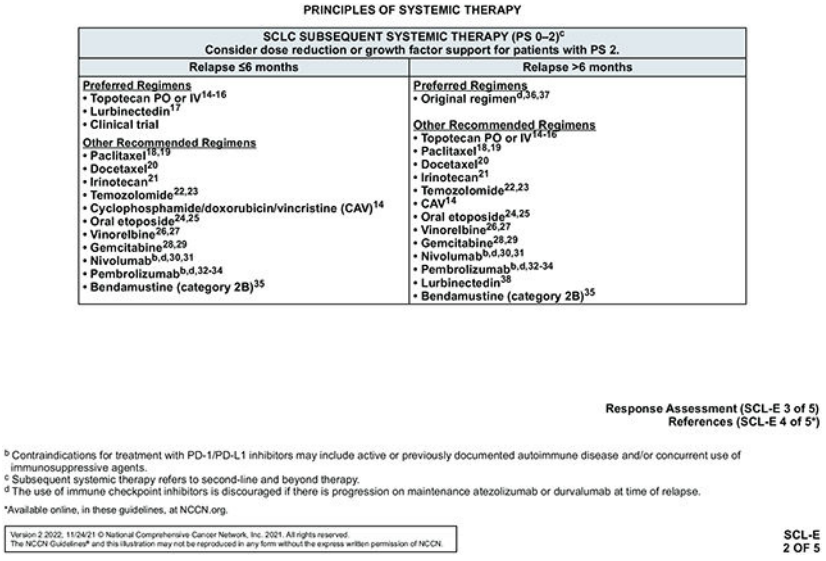
Treatment

Systemic Therapy

For all patients with SCLC, systemic therapy is an essential component of appropriate treatment (see SCL-E 1, page 1450). Many single-agent and combination systemic therapy regimens have been shown to be active in SCLC. The NCCN SCLC Panel has preference stratified all of the adjuvant, first-line, and subsequent therapy options for patients with SCLC. Certain regimens are recommended as “preferred” interventions, whereas others are designated as either “other recommended interventions” or “useful under certain circumstances.” For patients with extensive-stage disease, systemic therapy alone is recommended (see “Extensive-Stage SCLC,” page 1451). However, radiotherapy may be used in select patients for palliation of symptoms (see NCCN Guidelines for Palliative Care, available at NCCN.org).

Cisplatin Versus Carboplatin—In clinical practice, carboplatin is frequently substituted for cisplatin to reduce the risk of emesis, neuropathy, and nephropathy.[80] However, the use of carboplatin carries a greater risk of myelosuppression.[81] Small randomized trials in patients with SCLC have suggested similar efficacy of cisplatin and carboplatin regimens, as did a retrospective analysis in patients with extensive-stage disease.[80,82,83] A meta-analysis of individual patient data from 4 randomized studies compared cisplatin-based versus carboplatin-based regimens in patients with SCLC.[84] Of 663 patients included in this

meta-analysis, 32% had limited-stage disease and 68% had extensive-stage disease. No significant difference was observed in response rate (67% vs 66%), progression-free survival (PFS) (5.5 vs 5.3 months), or overall survival (OS) (9.6 vs 9.4 months) in patients receiving cisplatin-containing versus carboplatin-containing regimens, suggesting equivalent efficacy in patients with SCLC.


PRINCIPLES OF SYSTEMIC THERAPY

SCLC SUBSEQUENT SYSTEMIC THERAPY (PS 0–2)[c]
Consider dose reduction or growth factor support for patients with PS 2.

Relapse ≤6 months	Relapse >6 months
Preferred Regimens • Topotecan PO or IV[14-16] • Lurbinectedin[17] • Clinical trial Other Recommended Regimens • Paclitaxel[18,19] • Docetaxel[20] • Irinotecan[21] • Temozolomide[22,23] • Cyclophosphamide/doxorubicin/vincristine (CAV)[14] • Oral etoposide[24,25] • Vinorelbine[26,27] • Gemcitabine[28,29] • Nivolumab[b,d,30,31] • Pembrolizumab[b,d,32-34] • Bendamustine (category 2B)[35]	Preferred Regimens • Original regimen[9,36,37] Other Recommended Regimens • Topotecan PO or IV[14-16] • Paclitaxel[18,19] • Docetaxel[20] • Irinotecan[21] • Temozolomide[22,23] • CAV[14] • Oral etoposide[24,25] • Vinorelbine[26,27] • Gemcitabine[28,29] • Nivolumab[b,d,30,31] • Pembrolizumab[b,d,32-34] • Lurbinectedin[38] • Bendamustine (category 2B)[35]

Response Assessment (SCL-E 3 of 5)
References (SCL-E 4 of 5*)

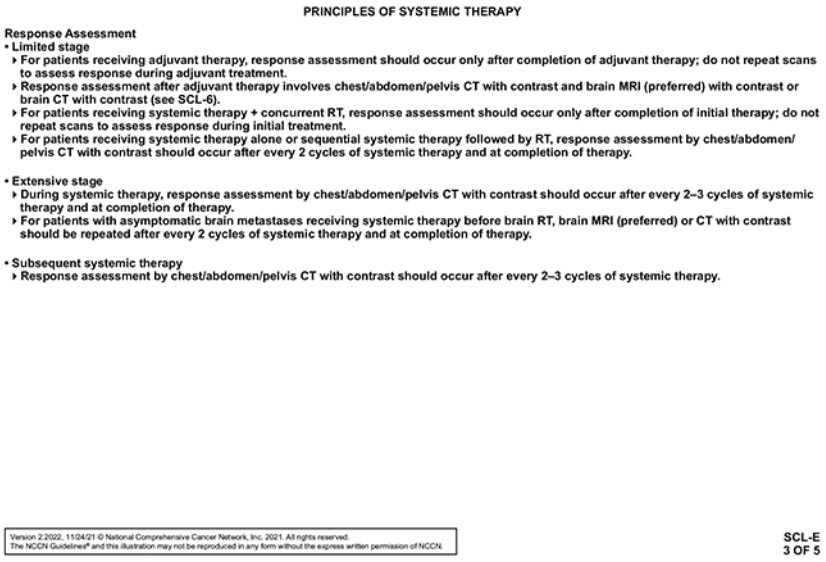
[b] Contraindications for treatment with PD-1/PD-L1 inhibitors may include active or previously documented autoimmune disease and/or concurrent use of immunosuppressive agents.
[c] Subsequent systemic therapy refers to second-line and beyond therapy.
[d] The use of immune checkpoint inhibitors is discouraged if there is progression on maintenance atezolizumab or durvalumab at time of relapse.
*Available online, in these guidelines, at NCCN.org.

Version 2.2022, 11/24/21 © National Comprehensive Cancer Network, Inc. 2021. All rights reserved.
The NCCN Guidelines® and this illustration may not be reproduced in any form without the express written permission of NCCN.

SCL-E
2 OF 5

Extensive-Stage SCLC—The NCCN SCLC Panel recommends certain combination chemotherapy plus immunotherapy regimens as preferred options for patients with extensive-stage SCLC (see SCL-E 1, page 1450).[85-87] In patients with extensive-stage disease and brain metastases, systemic therapy can be given either before or after brain radiotherapy depending on whether the patient has neurologic symptoms (see SCL-5, page 1443).[8,88] If systemic therapy is given first, brain radiotherapy is administered after completion of systemic therapy.

For many years, platinum plus etoposide had been recommended for patients with extensive-stage SCLC, with a preference for carboplatin over cisplatin due to its equivalent efficacy and more tolerable toxicity profile. However, the preferred regimens for extensive-stage SCLC now include the PD-L1–targeted immune checkpoint inhibitors, atezolizumab or durvalumab, plus platinum plus etoposide (see SCL-E 1, page 1450). Contraindications for treatment with PD-1/PD-L1 inhibitors may include active or previously documented autoimmune disease and/or concurrent use of immunosuppressive agents. Atezolizumab or durvalumab may cause unique immune-mediated adverse events that are not seen with traditional cytotoxic chemotherapy; therefore, healthcare providers should be aware of the spectrum of potential immune-mediated adverse events, know how to manage these adverse events, and educate their patients about possible side effects High-dose corticosteroids are generally recommended for immune-mediated adverse events based on the severity of the reaction. In addition, atezolizumab or durvalumab should be withheld or discontinued for severe or life-threatening immune mediated adverse events when indicated (see prescribing information; see also the NCCN Guidelines for Management of Immunotherapy-Related Toxicities, available at NCCN.org).


PRINCIPLES OF SYSTEMIC THERAPY

Response Assessment

- **Limited stage**
  - For patients receiving adjuvant therapy, response assessment should occur only after completion of adjuvant therapy; do not repeat scans to assess response during adjuvant treatment.
  - Response assessment after adjuvant therapy involves chest/abdomen/pelvis CT with contrast and brain MRI (preferred) with contrast or brain CT with contrast (see SCL-6).
  - For patients receiving systemic therapy + concurrent RT, response assessment should occur only after completion of initial therapy; do not repeat scans to assess response during initial treatment.
  - For patients receiving systemic therapy alone or sequential systemic therapy followed by RT, response assessment by chest/abdomen/pelvis CT with contrast should occur after every 2 cycles of systemic therapy and at completion of therapy.
- **Extensive stage**
  - During systemic therapy, response assessment by chest/abdomen/pelvis CT with contrast should occur after every 2–3 cycles of systemic therapy and at completion of therapy.
  - For patients with asymptomatic brain metastases receiving systemic therapy before brain RT, brain MRI (preferred) or CT with contrast should be repeated after every 2 cycles of systemic therapy and at completion of therapy.
- **Subsequent systemic therapy**
  - Response assessment by chest/abdomen/pelvis CT with contrast should occur after every 2–3 cycles of systemic therapy.

SCL-E
3 OF 5

During systemic therapy for patients with extensive-stage disease, response assessment using CT with contrast of the chest/abdomen/pelvis should occur after every 2 to 3 cycles of systemic therapy and again at completion of therapy (see SCL-E 3, this page). Serial brain imaging is also recommended in patients with extensive-stage disease who have asymptomatic brain metastases and are receiving systemic therapy before brain radiotherapy; brain MRI (preferred) or brain CT with contrast is recommended after every 2 cycles of systemic therapy and again at completion of therapy.

Atezolizumab Plus Chemotherapy—IMpower133, a phase 3 randomized trial, assessed the addition of atezolizumab to carboplatin plus etoposide in 403 patients with previously untreated extensive-stage SCLC.[87] In this trial, carboplatin plus etoposide was compared with the same chemotherapy plus atezolizumab followed by maintenance atezolizumab in 403 patients with previously untreated extensive-stage SCLC. Updated data show the median OS was 12.3 months (95% CI, 10.8–15.8) with the addition of atezolizumab versus 10.3 months (95% CI, 9.3–11.3) with chemotherapy alone (hazard ratio [HR], 0.76; 95% CI, 0.6–0.95; P=.0154).[85] Similarly, the 1-year OS rate was 51.9% for the atezolizumab regimen versus 39.0% for chemotherapy alone. Response rates were similar in both arms (60% with chemotherapy plus atezolizumab vs 64% with chemotherapy alone). The rate of grade 3 or 4 adverse events was similar in both groups (67.7% for the atezolizumab regimen vs 63.3% for chemotherapy alone). There were 4 deaths (2%) in the atezolizumab group versus 11 deaths (5.6%) in the chemotherapy alone group. The FDA recently approved different doses for atezolizumab when combined with carboplatin and etoposide for patients with extensive-stage SCLC.

The NCCN SCLC Panel recommends (category 1) carboplatin plus etoposide plus atezolizumab as a preferred first-line systemic therapy option followed by maintenance atezolizumab for patients with extensive-stage SCLC based on clinical trial data and the FDA approval (see SCL-E 1, page 1450).[85,87] For this update, the NCCN Panel now recommends 2 different carboplatin/etoposide/atezolizumab regimens with slightly different doses for the maintenance atezolizumab; either 1,200 or 1,680 mg of maintenance

atezolizumab is recommended. However, the category 1 recommendation is only for the regimen with 1,200 mg of maintenance atezolizumab because that dose was used in the clinical trial.[85,87]

Durvalumab Plus Chemotherapy—CASPIAN, a phase 3 randomized trial, assessed adding durvalumab to etoposide and either carboplatin or cisplatin followed by maintenance durvalumab in 537 patients with previously untreated extensive-stage SCLC.[86,89] In this trial, carboplatin (or cisplatin) plus etoposide was compared with the same chemotherapy plus durvalumab followed by maintenance durvalumab. Most patients received the carboplatin regimen (78%). Updated data from a 3-year analysis showed that the median OS was 13.0 months (95% CI, 11.5–14.8) in the durvalumab plus chemotherapy group and 10.3 months (95% CI, 9.3–11.2) in the chemotherapy alone group (HR, 0.73; 95% CI, 0.59–0.91; *P*=.0047).[90] Similarly, the 1-year OS rate was 52.8% for the durvalumab regimen versus 39.3% for chemotherapy alone. The rate of serious adverse events was similar in both groups (32% vs 36%). The death rate from adverse events was also similar (2% vs 1%). In this trial, adding tremelimumab to durvalumab/etoposide carboplatin (or cisplatin) did not improve OS compared with platinum/etoposide (10.4 vs 10.5 months; HR, 0.82; 95% CI, 0.68–1.0). The NCCN SCLC Panel recommends (category 1) durvalumab plus etoposide plus (carboplatin or cisplatin) as a preferred first-line systemic therapy option followed by maintenance durvalumab for patients with extensive-stage SCLC based on clinical trial data and the FDA approval (see SCL-E 1, page 1450).[86,89-91]

Other Primary Systemic Therapies—Other recommended regimens for extensive-stage SCLC include etoposide with either cisplatin or carboplatin (see SCL-E 1, page 1450). Before the recent favorable data on immunotherapy, many other chemotherapy combination regimens had been evaluated in patients with extensive-stage disease with little consistent evidence of benefit compared with EP. For example, the combination of irinotecan and cisplatin initially appeared to be better than EP. A small phase 3 Japanese trial reported that patients with extensive-stage SCLC who were treated with irinotecan plus cisplatin had a median survival of 12.8 months compared with 9.4 months for patients treated with EP (*P*=.002).[92] In addition, the 2-year survival was 19.5% in the irinotecan plus cisplatin group versus 5.2% in the EP group.[92] However, 2 subsequent large phase III trials performed in the United States comparing irinotecan plus cisplatin with EP failed to show a significant difference in response rate or OS between the regimens.[93,94] A phase III randomized trial of 220 patients with extensive-stage SCLC found that median OS was slightly improved with irinotecan and carboplatin compared with carboplatin and oral etoposide (8.5 vs 7.1 months, *P*=.04).[95] Based on these studies, the cisplatin or carboplatin plus irinotecan regimens are included as options in the NCCN Guidelines for patients with extensive-stage disease. In addition, a meta-analysis suggested an improvement in PFS and OS with irinotecan plus platinum regimens compared with etoposide plus platinum regimens.[96] However, the relatively small absolute survival benefit needs to be balanced against the toxicity profile of irinotecan-based regimens. Therefore, the NCCN SCLC Panel recommends the irinotecan-based regimens as useful in certain circumstances for patients with extensive-stage SCLC (see SCL-E 1, page 1450).

Many other strategies have been evaluated in an effort to improve on the recommended treatment for extensive-stage SCLC, including the addition of a third agent. As previously mentioned, the addition of atezolizumab or durvalumab does improve OS compared with chemotherapy alone.[85-87,89,90] Despite the recent success with atezolizumab/chemotherapy or durvalumab/chemotherapy regimens, other immunotherapy-based strategies have not been as favorable. A phase 3 randomized trial in patients with extensive-stage SCLC reported that the addition of ipilimumab to etoposide with either cisplatin or carboplatin as first-line therapy did not improve either OS or PFS compared with chemotherapy alone.[97] Likewise, another phase III randomized trial reported that first-line therapy with pembrolizumab plus etoposide and either carboplatin or cisplatin followed by maintenance pembrolizumab did not improve OS compared with chemotherapy alone in patients with extensive-stage SCLC.[34]

The benefits of antiangiogenic therapy have been evaluated in SCLC. In patients with limited-stage SCLC, a phase II study of irinotecan, carboplatin, and bevacizumab with concurrent radiotherapy followed by maintenance bevacizumab was terminated early because of an unacceptable incidence of tracheoesophageal fistulae. In extensive-stage SCLC, phase II trials of platinum-based chemotherapy plus bevacizumab have yielded promising response and survival data.[98-101] However, at least 2 randomized trials have demonstrated no survival benefit for the addition of bevacizumab to standard chemotherapy.[102,103] Currently, the NCCN SCLC Panel does not recommend use of bevacizumab in patients with SCLC. Overall, attempts to improve long-term survival rates in patients with SCLC through the addition of more agents or the use of dose-intense chemotherapy regimens, maintenance therapy, or alternating non–cross-resistant chemotherapy regimens have failed to yield significant advantages when compared with recommended approaches.

In 2 trials, the addition of ifosfamide (or cyclophosphamide plus an anthracycline) to EP showed a modest survival advantage.[104,105] However, these findings have not been uniformly observed, and the addition of an alkylating agent, with or without an anthracycline, significantly increases hematologic toxicity when compared with EP alone.[106] Two phase III randomized trials have confirmed the lack of improvement in survival with 3-drug chemotherapy regimens compared with platinum plus etoposide in patients with extensive-stage SCLC. One of these studies assessed the combination of ifosfamide, etoposide, and epirubicin versus EP, whereas the other evaluated carboplatin plus etoposide with or without palifosfamide.[107,108] Similarly, the addition of paclitaxel to either cisplatin or carboplatin plus etoposide yielded promising results in phase 2 trials, but did not improve survival and was associated with unacceptable toxicity in a phase III study.[109] The use of maintenance or consolidation chemotherapy beyond 4 to 6 cycles of recommended treatment produces a minor prolongation of duration of response without improving survival and carries a greater risk of cumulative toxicity.[110] A meta-analysis reported that maintenance chemotherapy did not prolong OS.[111] The inability to destroy residual cells, despite the initial chemosensitivity of SCLC, suggests the existence of cancer stem cells that are relatively resistant to cytotoxic therapy. To overcome drug resistance, alternating or sequential combination therapies have been designed to expose the tumor to as many active cytotoxic agents as possible during initial treatment.[112] However, randomized trials have

failed to show improved PFS or OS with this approach.[113,114] The NCCN SCLC Panel recommends 4 cycles of systemic therapy for patients with extensive-stage disease; however, some patients may receive up to 6 cycles based on the response and tolerability after 4 cycles.

Multidrug cyclic weekly chemotherapy was designed to increase dose intensity. Early phase II results of this approach were promising, although favorable patient selection was of some concern.[115,116] Nevertheless, no survival benefits were documented in randomized trials, and excessive treatment-related mortality was noted with multidrug cyclic weekly chemotherapy regimens.[117-120] The role of higher-dose chemotherapy for patients with SCLC remains controversial. Higher complete and partial response rates, and modestly longer median survival times, have been observed in patients receiving high chemotherapy doses compared with those given conventional doses of the same agents.[121] In general, however, randomized trials comparing conventional chemotherapy doses to an incrementally increased dose intensity up to 2 times the conventional dose have not consistently shown an increase in response rate or survival.[122-125] In addition, a meta-analysis of trials that compared recommended versus dose-intense variations of the cyclophosphamide, doxorubicin, and vincristine (CAV) and EP regimens found that increased relative dose intensity resulted in only a small, clinically insignificant enhancement of median survival in patients with extensive-stage disease.[126]

Currently available cytokines (eg, granulocyte-macrophage colony-stimulating factor [GM-CSF], G-CSF) can ameliorate chemotherapy-induced myelosuppression and reduce the incidence of febrile neutropenia, but cumulative thrombocytopenia remains dose-limiting. Although trials involving patients with SCLC were instrumental in obtaining FDA approval for the clinical use of cytokines,[127] maintenance of dose intensity with growth factors does not prolong disease-free survival or OS.[128,129] Thus, the routine use of growth factors at the start of systemic therapy/radiation therapy is not recommended for patients with limited-stage SCLC. Trilaciclib or G-CSF may be used as prophylactic options to decrease the incidence of chemotherapy-induced myelosuppression when administering certain regimens for patients with extensive-stage SCLC (see SCL-D, page 1449).[130-133]

Older Patients

The incidence of SCLC increases with age. Although the median age at diagnosis is older than 70 years, older patients are underrepresented in clinical trials.[134] Although advanced chronologic age does adversely affect tolerance to treatment, the functional status of an individual patient is much more useful than age in guiding clinical decision-making (see the NCCN Guidelines for Older Adult Oncology, available at NCCN.org). Older patients who are able to perform activities of daily living should be treated with combination systemic therapy (and radiotherapy, if indicated).[135-137] For example, a subgroup analysis of the CONVERT trial suggests that concurrent chemoradiation yields equivalent median survival in older versus younger patients with limited-stage SCLC (29 vs 30 months; P=.38).[135] However, myelosuppression, fatigue, and lower organ reserves are encountered more frequently in older patients; therefore, they must be watched carefully during treatment to avoid excessive risk.[135] Greater attention to the needs and support systems of older

patients is recommended to provide optimal care. Overall, older patients have a similar prognosis as stage-matched younger patients.

Randomized trials have indicated that less-intensive treatment (eg, single-agent etoposide) is inferior to combination chemotherapy (eg, platinum plus etoposide) in older patients with good PS (0–2).[138,139] A retrospective analysis in 8,637 older patients with limited-stage disease reported that chemoradiation increased survival compared with chemotherapy alone.[136] Several other strategies have been evaluated in older patients with SCLC.[83,140-142] The use of 4 cycles of carboplatin plus etoposide seems to yield favorable results, because the area-under-the-curve dosing of carboplatin takes into account the declining renal function of the aging patient.[142] However, targeting carboplatin to an area-under-the-curve of 5, rather than 6, is more reasonable in this population.[143] The usefulness of short-course, full-intensity chemotherapy has also been explored in older or infirm patients, and the results with only 2 cycles of chemotherapy seem to be acceptable, although this approach has not been directly compared with 4 to 6 cycles of therapy.[144] Prophylactic cranial irradiation (PCI) should be used with caution in older patients. Older patients (≥60 years) are at increased risk for cognitive decline after PCI; therefore, the risks and benefits of PCI versus close surveillance need to be discussed in detail with older patients.[145-148] A Dutch analysis in more than 5,000 patients suggests that median survival is decreased in older patients treated with PCI compared with younger patients regardless of stage.[149]

Surveillance for Relapse

Although SCLC is very responsive to initial treatment, most patients relapse with relatively resistant disease (see also “Surveillance,” page 1444).[150,151] The surveillance recommendations to assess for relapse in patients with SCLC are outlined in the algorithm (see SCL-6, page 1444). For the current update, the algorithm now states that most NCCN Member Institutions use CT of the chest (plus/minus abdomen/pelvis) every 2 to 6 months (more frequently in years 1 to 2 and less frequently thereafter). The frequency of surveillance decreases during subsequent years because of the declining risk of recurrence.[152] If a new pulmonary nodule develops, it should prompt evaluation for a new primary lung cancer, because second primary tumors are a frequent occurrence in patients who are cured of SCLC.[153,154] It is important to monitor for brain metastases, which allows for early treatment before the development of potentially debilitating neurologic symptoms. The NCCN SCLC Panel recommends brain MRI (preferred) or brain CT with contrast every 3 to 4 months during year 1 for all patients and then every 6 months during year 2, regardless of the PCI status. Brain MRI is more sensitive than CT for identifying brain metastases and, therefore, is preferred over CT. PET/CT is not recommended for routine follow-up. Smoking cessation intervention is recommended for all patients with SCLC, because second primary tumors occur less commonly in patients who quit smoking (see the NCCN Guidelines for Smoking Cessation available at NCCN.org).[155-157] Former smokers should be encouraged to remain abstinent. The NCCN SCLC Panel also recommends the survivorship guidelines for appropriate patients (see the NCCN Guidelines for Survivorship).

Subsequent Systemic Therapy

Patients who experience relapse or those with primary progressive disease may be treated with subsequent systemic therapy regimens. These patients have a median survival of only 4 to 5 months when treated with older regimens; some of the newer regimens are associated with longer survival. Subsequent systemic therapy provides significant palliation in many patients, although the likelihood of response is highly dependent on the time from initial therapy to relapse.[158] If this interval is 6 months or less (refractory or resistant disease), response to most agents or regimens is poor (≤10%). If more than 6 months have elapsed (sensitive disease), expected response rates are approximately 25%. Note that the ESMO Guidelines use cutoffs of 3 months or more for sensitive SCLC and less than 3 months for resistant SCLC.[159] Response rates are higher with newer agents such as lurbinectedin. For patients on subsequent systemic therapy, response assessment should occur after every 2 to 3 cycles using CT with contrast of the chest/abdomen/pelvis (see SCL-E 3, page 1452). Dose reduction or growth factor support should be considered for patients with a PS of 2 who are receiving subsequent systemic therapy. Recommended subsequent systemic therapy options for patients who have relapsed are listed in the algorithm and described here, including the clinical trial data supporting the recommendations (see SCL-E 2, page 1451).[160-165]

Lurbinectedin

Lurbinectedin inhibits oncogenic transcription, leading to tumor cell apoptosis. A phase 2 basket trial assessed lurbinectedin as second-line therapy in 105 patients with SCLC who had received first-line platinum/etoposide; only 8% of patients had received immunotherapy.[160] Most patients (57%) had not received chemotherapy for 3 months or more. The overall response rate was 35% (95% CI, 26.2%–45.2%). The response rate was 22% (95% CI, 11.2%–37.1%) if the chemotherapy-free interval was less than 90 days. The response rate was 45% (95% CI, 32.1%–58.4%) if the chemotherapy-free interval was 90 days or more. Common grade 3 to 4 adverse events included anemia, leucopenia, neutropenia, and thrombocytopenia. There were no reported treatment-related deaths. The NCCN SCLC Panel recommends lurbinectedin as a preferred subsequent therapy option for patients with SCLC who have relapsed 6 months or less after therapy based on this trial and the FDA approval (see SCL-E 2, page 1451).[160]

In a subset analysis of the phase 2 trial previously discussed, lurbinectedin was assessed as second-line therapy in 20 patients with SCLC who had received first-line platinum/etoposide more than 6 months ago.[161] The overall response rate was 60% (95% CI, 36.1%–86.9%). The median OS was 16.2 months (95% CI, 9.6–upper level not reached). After 1 year, 60.9% of patients were alive; after 2 years, 27.1% were alive. Common grade 3 to 4 adverse events included neutropenia, anemia, thrombocytopenia, fatigue, and increased liver function tests. The NCCN SCLC Panel recommends lurbinectedin as a subsequent therapy option (one of many other recommended regimens) for patients with SCLC who have relapsed more than 6 months after therapy based on this study and the FDA approval (see SCL-E 2, page 1451).[161]

Topotecan

A randomized phase 3 trial compared single-agent intravenous topotecan with the combination regimen CAV as subsequent therapy for patients with SCLC who had relapsed at least 60 days after therapy.[166] Both arms had similar response rates (topotecan: 24.3% [26/107]; CAV: 18.3% [19/104]) and survival (25.0 vs 24.7 weeks), but intravenous topotecan caused less grade 4 neutropenia (37.8% vs 51.4%; P<.001). Compared with CAV, topotecan also improved symptoms of dyspnea, anorexia, hoarseness, and fatigue. In another phase 3 trial, oral topotecan improved OS compared with best supportive care (26 vs 14 weeks).[167] Single-agent topotecan is approved by the FDA as subsequent therapy for patients with SCLC who relapse after initial response to systemic therapy. Either oral or intravenous topotecan may be used, because efficacy and toxicity seem to be similar with either route.[167,168] Many practicing oncologists have noted excessive toxicity when using 1.5 mg/m^2 of intravenous topotecan for 5 days, and studies suggest that an attenuated dose may be equally efficacious with lower toxicity.[169] Published studies have yielded conflicting data regarding the usefulness of weekly topotecan in patients with relapsed SCLC.[170,171] The NCCN SCLC Panel recommends topotecan as a preferred subsequent therapy option for patients with SCLC who have relapsed 6 months or less after therapy based on these trials and the FDA approval (see SCL-E 2, page 1451).[166,167]

Nivolumab and Pembrolizumab

Immune checkpoint inhibitors have been evaluated in patients with relapsed SCLC.[172-175] CheckMate 032, a phase I–II trial, assessed nivolumab alone (n = 147) or various doses of nivolumab plus ipilimumab (n=96) for relapsed SCLC.[172,173] Updated data showed response rates were 11.6% for nivolumab and 21.9% for nivolumab plus ipilimumab. The 12- and 24-month OS rates were similar (nivolumab, 30.5% and 17.9%; nivolumab plus ipilimumab, 30.2% and 16.9%, respectively). Grade 3 to 4 adverse events were 12.9% (19/147) for nivolumab alone and 37.5% (36/96) for nivolumab plus ipilimumab. In patients receiving nivolumab alone, the most common grade 3 or 4 treatment-related adverse events were increased levels of lipase and aspartate aminotransferase and pneumonitis.

CheckMate 331, a randomized phase III trial, assessed nivolumab monotherapy versus topotecan or amrubicin in 569 patients with relapsed SCLC.[176,177] Data show that OS was 7.5 months in patients receiving nivolumab versus 8.4 months in those receiving chemotherapy (HR, 0.86; 95% CI, 0.72–1.04; P=.11).[176] OS was similar regardless of PD-L1 levels. Response rates were 13.7% for nivolumab compared with 16.5% for chemotherapy. Treatment-related deaths occurred in 2 patients receiving nivolumab and in 3 patients receiving chemotherapy. Fewer grade 3 to 4 adverse events occurred in patients receiving nivolumab compared with chemother]apy (14% vs 73%, respectively). A recent comparative effectiveness study reported that third-line therapy with nivolumab was associated with longer survival (5.7 months; 95% CI, 3.5–8.0) compared with other treatments such as paclitaxel or topotecan (3.8 months; 95% CI, 2.8–4.9; HR, 0.63; 95% CI, 0.44–0.90).[178] The 1-year OS rate was 28% with nivolumab versus 4% with the other treatments.

The NCCN SCLC Panel recommends nivolumab as a subsequent therapy option (other recommended) for patients who have relapsed 6 months or less after primary therapy based on clinical trial data, although the FDA has withdrawn the indication (see next paragraph).[172,173,176,177,179] However, the use of nivolumab is discouraged in patients whose disease progresses while on maintenance atezolizumab or durvalumab as part of first-line therapy. There are no data to suggest that if patients have progressed on immune checkpoint inhibitors, then giving them as subsequent therapy will be effective. Previously, the panel had recommended nivolumab plus ipilimumab as an option; however, this regimen was removed for Version 1.2021, because the combined regimen is more toxic and the OS is the same.

A combined analysis of 2 studies, one phase Ib (KEYNOTE-028) and one phase 2 (KEYNOTE-158), evaluated the activity of pembrolizumab in 83 evaluable patients with relapsed SCLC.[180] This analysis reported a response rate of 19.3% and a median OS of 7.7 months (95% CI, 5.2–10.1). Both OS and response rate were higher in those who were PD-L1 positive. Grade 3 or 4 adverse events occurred in 12% of patients and 2 patients died of treatment-related adverse events (pneumonitis and encephalitis). The NCCN SCLC Panel recommends pembrolizumab as a subsequent therapy option (other recommended) for patients with SCLC, regardless of PD-L1 levels, based on phase 1 and 2 data.[174,180]

The FDA has withdrawn the subsequent therapy indications for nivolumab or pembrolizumab for patients with relapsed SCLC, because phase III randomized trial data did not show an improvement in OS.[176] However, the NCCN SCLC Panel still recommends nivolumab or pembrolizumab as subsequent therapy for certain patients (see SCL-E 2, page 1451). The panel feels that nivolumab or pembrolizumab are just as effective as, and sometimes better than, the other subsequent therapy options; nivolumab or pembrolizumab are also less toxic.[176,178,181] In addition, a significant proportion of agents recommended as subsequent therapy options for patients with SCLC do not have an FDA indication in this setting but data show that they are effective (see “Other Subsequent Therapy Options,” next section). Patients with limited-stage SCLC who experience relapse and have not previously received immune checkpoint inhibitors may benefit from subsequent therapy with nivolumab or pembrolizumab. For the 2022 update (Version 1), the NCCN SCLC Panel revised the subsequent therapy recommendations for nivolumab or pembrolizumab to category 2A from category 3 (see SCL-E 2, page 1451).

Immunotherapeutic agents, such as nivolumab and pembrolizumab, may cause unique immune-mediated adverse events that are not seen with traditional cytotoxic chemotherapy; therefore, healthcare providers should be aware of the spectrum of potential immune-mediated adverse events, know how to manage these adverse events, and educate their patients about possible side effects (see the NCCN Guidelines for Management of Immunotherapy-Related Toxicides, available at NCCN.org).[182,183] For patients with immune-mediated adverse events, high-dose corticosteroids are generally recommended based on the severity of the reaction. Nivolumab or pembrolizumab should be withheld or discontinued for severe or life-threatening immune-mediated adverse events when indicated (prescribing information is available online).

The optimal duration of subsequent systemic therapy has not been fully explored. For cytotoxic chemotherapy agents, the duration of treatment is usually short, and the cumulative toxicity is frequently limiting even in patients who experience response. For these reasons, subsequent systemic therapy should be continued until progression of disease or development of unacceptable toxicity (see SCL-7, page 1445). Additional subsequent systemic therapy (eg, third line) can be considered if patients are still PS 0 to 2.

Other Subsequent Therapy Options

Paclitaxel was assessed in a phase II study in patients with refractory or relapsed SCLC; 24% of patients responded (5/21).[184] Grade 3 to 4 toxicity included neutropenia, infection, rash, neuropathy, and pulmonary toxicity. Another phase II study of paclitaxel in patients with refractory SCLC yielded a response rate of 29% (7/24; 95% CI, 12%–51%).[185] A retrospective study in 185 patients showed that third- or fourth-line therapy with paclitaxel was associated with a response rate of 17%. Toxicity was similar in patients with PS 2 compared with PS 0 to 1 (63% vs 62%).[186] Docetaxel was assessed in a phase II trial in patients with previously treated SCLC; 25% of patients responded (7/28). Reported toxicities included neutropenia and asthenia.[187] Irinotecan was assessed in a phase 2 study in patients with refractory or relapsed SCLC; 47% of patients responded (7/15; 95% CI, 21.4%–71.9%); myelosuppression, diarrhea, and pulmonary toxicity were reported.[188]

Data suggest that temozolomide may be useful for patients with SCLC, especially those with brain metastases and methylated O^6-methylguanine-DNA methyltransferase (MGMT).[163,189,190] A phase II study assessed temozolomide in patients with relapsed or refractory SCLC. In patients with sensitive SCLC, the overall response rate was 23% (95% CI, 12%–37%). The response rate was improved for patients with methylated MGMT compared with those with unmethylated MGMT (38% vs 7%; P=.08).

Another phase III randomized trial assessed carboplatin plus etoposide compared with oral topotecan in 162 patients with SCLC who had relapsed more than 3 months after therapy.[191] The median PFS was 4.7 months (90% CI, 3.9–5.5) in the chemotherapy group versus 2.7 months (90% CI, 2.3–3.2) in the oral topotecan group (HR, 0.57; 90% CI, 0.41–0.73). Grade 3 to 4 adverse events included thrombocytopenia, neutropenia, anemia, febrile neutropenia, and asthenia. In the topotecan group, 2 treatment-related deaths occurred; no deaths occurred in the chemotherapy group. The NCCN SCLC Panel recommends the original platinum regimen as preferred for patients with SCLC who have relapsed more than 6 months after therapy based on this trial.[191] The panel added a caveat that the use of immune checkpoint inhibitors is discouraged if patients have progressed on maintenance atezolizumab or durvalumab.[5,158,192] Since topotecan is also effective in this setting, it is a recommended option (other recommended regimen) based on this trial.

A phase III trial (JCOG0605) from Japan in patients with sensitive relapsed SCLC reported that the combination of cisplatin, etoposide, and irinotecan improved survival compared with topotecan (median survival, 18.2 vs 12.5 months; HR, 0.67; 90% CI, 0.51–0.88; P=.0079). However, the toxicity of this approach was significant and it is not recommended for subsequent therapy.[193] Amrubicin is an active drug in patients with relapsed or refractory SCLC.[194-197] However, grade 3 to 4 toxicity, primarily neutropenia, is common.[198,199] A

phase 3 trial reported that amrubicin did not improve OS as second-line treatment of SCLC when compared with topotecan, except in a subset of patients with refractory disease.[200] Amrubicin is not approved by the FDA for patients with SCLC.

The NCCN SCLC Panel recommends the following subsequent therapies for patients with SCLC based on clinical expertise and trial data. For relapse of 6 months or less, the preferred regimens are topotecan (orally or intravenously), lurbinectedin, or a clinical trial; other recommended regimens include paclitaxel, docetaxel, irinotecan, temozolomide, CAV, oral etoposide, vinorelbine, gemcitabine, nivolumab, and pembrolizumab (category 2A for all agents). Bendamustine is also recommended (category 2B). For the 2022 update, the panel voted to recommend all of these subsequent therapy options regardless of the time since relapse.[201] Previously, these agents were only recommended for relapse of 6 months or less. For relapse more than 6 months, the preferred regimen is the original regimen.[191,192,202,203] However, the NCCN SCLC Panel added a caveat that the use of immune checkpoint inhibitors is discouraged in patients who relapse after 6 months while on maintenance atezolizumab or durvalumab.[5,158,192] Other recommended options for relapse greater than 6 months now include topotecan, paclitaxel, docetaxel, irinotecan, temozolomide, CAV, oral etoposide, vinorelbine, gemcitabine, nivolumab, pembrolizumab, and lurbinectedin (category 2A for all agents). Bendamustine is also recommended (category 2B).

Radiotherapy

The “Principles of Radiation Therapy” section in the algorithm describes the radiation doses, target volumes, and normal tissue dose-volume constraints for limited-stage SCLC, and includes references to support the recommendations; PCI and treatment of brain metastases are also discussed (see the complete version of the NCCN Guidelines for SCLC). The “Principles of Radiation Therapy” section in the NSCLC algorithm (available at NCCN.org) may also be useful (eg, general principles of radiotherapy, palliative radiotherapy).

Summary

SCLC is a poorly differentiated high-grade neuroendocrine carcinoma.[21] Most cases of SCLC are caused by cigarette smoking.[4] The full NCCN Guidelines for SCLC provide recommended management for patients with SCLC, including diagnosis, primary treatment, surveillance for relapse, and subsequent treatment.. This section of the NCCN Guidelines focuses on metastatic (known as extensive-stage) SCLC, which is more common than limited-stage SCLC.

The NCCN SCLC Panel now recommends the following subsequent therapies for patients who have relapsed more than 6 months after therapy: topotecan, paclitaxel, docetaxel, irinotecan, temozolomide, CAV, oral etoposide, vinorelbine, gemcitabine, nivolumab, pembrolizumab, and lurbinectedin (category 2A for all); bendamustine is a category 2B recommendation in this setting (see SCL-E 2, page 1451).[201] However, the original regimen is the preferred regimen for patients who have relapsed more than 6 months after therapy.[191,192,202,203] The FDA has removed the subsequent therapy indications for

nivolumab or pembrolizumab for SCLC, because phase III randomized trial data did not show an improvement in OS.[176] However, the NCCN SCLC Panel still recommends subsequent therapy with nivolumab or pembrolizumab in certain settings. Patients with limited-stage SCLC who progress and have not previously received immune checkpoint inhibitors may benefit from subsequent therapy with nivolumab or pembrolizumab. The panel feels that nivolumab or pembrolizumab are just as effective as, and sometimes better than, and less toxic than the other subsequent therapy options.[176,181] For the current version, the NCCN SCLC Panel revised the subsequent therapy recommendations for nivolumab or pembrolizumab to category 2A from category 3, regardless of the time since relapse.

The FDA recently approved different doses for atezolizumab when combined with carboplatin and etoposide for patients with extensive-stage SCLC. The NCCN Panel now recommends a new carboplatin/etoposide/atezolizumab regimen with slightly different dosing for the maintenance atezolizumab; 1,680 mg of maintenance atezolizumab is recommended. However, the category 1 recommendation is only for the regimen with 1,200 mg of maintenance atezolizumab because that dose was used in the clinical trial.[85,87]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Howlader N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2018, based on November 2020 SEER data submission, posted to the SEER web site, April 2021. Bethesda, MD: National Cancer Institute. Available at: https://seer.cancer.gov/csr/1975_2018/.
2. Govindan R, Page N, Morgensztern D, et al. Changing epidemiology of small-cell lung cancer in the United States over the last 30 years: analysis of the surveillance, epidemiologic, and end results database. J Clin Oncol 2006;24:4539–4544. [PubMed: 17008692]
3. Siegel RL, Miller KD, Fuchs HE, et al. Cancer Statistics, 2021. CA Cancer J Clin 2021;71:7–33. [PubMed: 33433946]
4. Pesch B, Kendzia B, Gustavsson P, et al. Cigarette smoking and lung cancer–relative risk estimates for the major histological types from a pooled analysis of case-control studies. Int J Cancer 2012;131:1210–1219. [PubMed: 22052329]
5. Jett JR, Schild SE, Kesler KA, et al. Treatment of 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:e400S–e419S. [PubMed: 23649448]
6. Kalemkerian GP. Advances in the treatment of small-cell lung cancer. Semin Respir Crit Care Med 2011;32:94–101. [PubMed: 21500128]
7. Stinchcombe TE, Gore EM. Limited-stage small cell lung cancer: current chemoradiotherapy treatment paradigms. Oncologist 2010;15:187–195. [PubMed: 20145192]
8. Demedts IK, Vermaelen KY, van Meerbeeck JP. Treatment of extensive-stage small cell lung carcinoma: current status and future prospects. Eur Respir J 2010;35:202–215. [PubMed: 20044461]
9. Yang CJ, Chan DY, Shah SA, et al. Long-term survival after surgery compared with concurrent chemoradiation for node-negative small cell lung cancer. Ann Surg 2018;268:1105–1112. [PubMed: 28475559]
10. Shioyama Y, Onishi H, Takayama K, et al. Clinical outcomes of stereotactic body radiotherapy for patients with stage I small-cell lung cancer: analysis of a subset of the Japanese Radiological Society multi-institutional SBRT study group database. Technol Cancer Res Treat 2018;17: 1533033818783904. [PubMed: 29983096]

11. Verma V, Simone CB II, Allen PK, et al. Multi-institutional experience of stereotactic ablative radiation therapy for stage I small cell lung cancer. Int J Radiat Oncol Biol Phys 2017;97:362–371. [PubMed: 28011047]
12. Yu JB, Decker RH, Detterbeck FC, et al. Surveillance epidemiology and end results evaluation of the role of surgery for stage I small cell lung cancer. J Thorac Oncol 2010;5:215–219. [PubMed: 20101146]
13. Leone FT, Evers-Casey S, Toll BA, et al. Treatment of tobacco use in lung cancer: diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2013;143:e61S–e77S. [PubMed: 23649454]
14. Videtic GMM, Stitt LW, Dar AR, et al. Continued cigarette smoking by patients receiving concurrent chemoradiotherapy for limited-stage small-cell lung cancer is associated with decreased survival. J Clin Oncol 2003;21:1544–1549. [PubMed: 12697879]
15. Demetri G, Elias A, Gershenson D, et al. NCCN Small-Cell Lung Cancer Practice Guidelines. Oncology (Williston Park) 1996; 10 (11, Suppl)179–194. [PubMed: 8953602]
16. Cuffe S, Moua T, Summerfield R, et al. Characteristics and outcomes of small cell lung cancer patients diagnosed during two lung cancer computed tomographic screening programs in heavy smokers. J Thorac Oncol 2011;6:818–822. [PubMed: 21623258]
17. Aberle DR, Adams AM, Berg CD, et al. Reduced lung-cancer mortality with low-dose computed tomographic screening. N Engl J Med 2011; 365:395–409. [PubMed: 21714641]
18. Thomas A, Pattanayak P, Szabo E, et al. Characteristics and Outcomes of Small Cell Lung Cancer Detected by CT Screening. Chest 2018;154:1284–1290. [PubMed: 30080997]
19. Kondo R, Yoshida K, Kawakami S, et al. Different efficacy of CT screening for lung cancer according to histological type: analysis of Japanese-smoker cases detected using a low-dose CT screen. Lung Cancer 2011; 74:433–440. [PubMed: 21663995]
20. Rivera MP, Mehta AC, Wahidi MM. Establishing the diagnosis of lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2013;143:e142S–e165S. [PubMed: 23649436]
21. Travis WD. Advances in neuroendocrine lung tumors. Ann Oncol 2010;21(Suppl 7):vii65–vii71. [PubMed: 20943645]
22. Renshaw AA, Haja J, Lozano RL, et al. Distinguishing carcinoid tumor from small cell carcinoma of the lung: correlating cytologic features and performance in the College of American Pathologists Non-Gynecologic Cytology Program. Arch Pathol Lab Med 2005;129:614–618. [PubMed: 15859631]
23. Gandhi L, Johnson BE. Paraneoplastic syndromes associated with small cell lung cancer. J Natl Compr Canc Netw 2006;4:631–638. [PubMed: 16813730]
24. Kazarian M, Laird-Offringa IA. Small-cell lung cancer-associated autoantibodies: potential applications to cancer diagnosis, early detection, and therapy. Mol Cancer 2011;10:33. [PubMed: 21450098]
25. Marchioli CC, Graziano SL. Paraneoplastic syndromes associated with small cell lung cancer. Chest Surg Clin N Am 1997;7:65–80. [PubMed: 9001756]
26. Titulaer MJ, Wirtz PW, Willems LN, et al. Screening for small-cell lung cancer: a follow-up study of patients with Lambert-Eaton myasthenic syndrome. J Clin Oncol 2008;26:4276–4281. [PubMed: 18779614]
27. Meriney SD, Hulsizer SC, Lennon VA, et al. Lambert-Eaton myasthenic syndrome immunoglobulins react with multiple types of calcium channels in small-cell lung carcinoma. Ann Neurol 1996;40:739–749. [PubMed: 8957015]
28. Graus F, Keime-Guibert F, Reñe R, et al. Anti-Hu-associated paraneoplastic encephalomyelitis: analysis of 200 patients. Brain 2001;124:1138–1148. [PubMed: 11353730]
29. Delisle L, Boyer MJ, Warr D, et al. Ectopic corticotropin syndrome and small-cell carcinoma of the lung. Clinical features, outcome, and complications. Arch Intern Med 1993;153:746–752. [PubMed: 8383484]
30. Johnson BE, Chute JP, Rushin J, et al. A prospective study of patients with lung cancer and hyponatremia of malignancy. Am J Respir Crit Care Med 1997;156:1669–1678. [PubMed: 9372692]

31. Castillo JJ, Vincent M, Justice E. Diagnosis and management of hyponatremia in cancer patients. Oncologist 2012;17:756–765. [PubMed: 22618570]
32. Schrier RW, Gross P, Gheorghiade M, et al. Tolvaptan, a selective oral vasopressin V2-receptor antagonist, for hyponatremia. N Engl J Med 2006;355:2099–2112. [PubMed: 17105757]
33. Verbalis JG, Zeltser D, Smith N, et al. Assessment of the efficacy and safety of intravenous conivaptan in patients with euvolaemic hyponatraemia: subgroup analysis of a randomized, controlled study. Clin Endocrinol (Oxf) 2008;69:159–168. [PubMed: 18034777]
34. Rudin CM, Brambilla E, Faivre-Finn C, et al. Small-cell lung cancer. Nat Rev Dis Primers 2021;7:3. [PubMed: 33446664]
35. Raso MG, Bota-Rabassedas N, Wistuba II. Pathology and classification of SCLC. Cancers (Basel) 2021;13:820. [PubMed: 33669241]
36. Schnabel PA, Junker K. [Pulmonary neuroendocrine tumors in the new WHO 2015 classification: Start of breaking new grounds?]. Pathologe 2015;36:283–292. [PubMed: 25956813]
37. Travis WD, Brambilla E, Burke AP, et al. WHO Classification of Tumours of the Lung, Pleura, Thymus and Heart, 4th Ed. Geneva, Switzerland: World Health Organization; 2015.
38. Travis WD, Brambilla E, Burke AP, et al. Introduction to the 2015 World Health Organization classification of tumors of the lung, pleura, thymus, and heart. J Thorac Oncol 2015;10:1240–1242. [PubMed: 26291007]
39. Travis WD, Brambilla E, Nicholson AG, et al. The 2015 World Health Organization Classification of Lung Tumors: impact of genetic, clinical and radiologic advances since the 2004 classification. J Thorac Oncol 2015;10:1243–1260. [PubMed: 26291008]
40. Travis WD. Pathology and diagnosis of neuroendocrine tumors: lung neuroendocrine. Thorac Surg Clin 2014;24:257–266. [PubMed: 25065926]
41. Zakowski MF. Pathology of small cell carcinoma of the lung. Semin Oncol 2003;30:3–8.
42. Nicholson SA, Beasley MB, Brambilla E, et al. Small cell lung carcinoma (SCLC): a clinicopathologic study of 100 cases with surgical specimens. Am J Surg Pathol 2002;26:1184–1197. [PubMed: 12218575]
43. Pelosi G, Rodriguez J, Viale G, et al. Typical and atypical pulmonary carcinoid tumor overdiagnosed as small-cell carcinoma on biopsy specimens: a major pitfall in the management of lung cancer patients. Am J Surg Pathol 2005;29:179–187. [PubMed: 15644774]
44. Brenner B, Tang LH, Klimstra DS, et al. Small-cell carcinomas of the gastrointestinal tract: a review. J Clin Oncol 2004;22:2730–2739. [PubMed: 15226341]
45. Galanis E, Frytak S, Lloyd RV. Extrapulmonary small cell carcinoma. Cancer 1997;79:1729–1736. [PubMed: 9128989]
46. Bellizzi AM. Immunohistochemistry in the diagnosis and classification of neuroendocrine neoplasms: what can brown do for you? Hum Pathol 2020;96:8–33. [PubMed: 31857137]
47. Thunnissen E, Borczuk AC, Flieder DB, et al. The use of immunohistochemistry improves the diagnosis of small cell lung cancer and its differential diagnosis. An international reproducibility study in a demanding set of cases. J Thorac Oncol 2017;12:334–346. [PubMed: 27998793]
48. Rindi G, Klersy C, Inzani F, et al. Grading the neuroendocrine tumors of the lung: an evidence-based proposal. Endocr Relat Cancer 2013;21:1–16. [PubMed: 24344249]
49. Masai K, Tsuta K, Kawago M, et al. Expression of squamous cell carcinoma markers and adenocarcinoma markers in primary pulmonary neuroendocrine carcinomas. Appl Immunohistochem Mol Morphol 2013;21:292–297. [PubMed: 23060301]
50. Ordóñez NG. Value of thyroid transcription factor-1 immunostaining in distinguishing small cell lung carcinomas from other small cell carcinomas. Am J Surg Pathol 2000;24:1217–1223. [PubMed: 10976695]
51. Kaufmann O, Dietel M. Expression of thyroid transcription factor-1 in pulmonary and extrapulmonary small cell carcinomas and other neuroendocrine carcinomas of various primary sites. Histopathology 2000;36: 415–420. [PubMed: 10792482]
52. Rekhtman N, Pietanza CM, Sabari J, et al. Pulmonary large cell neuroendocrine carcinoma with adenocarcinoma-like features: napsin A expression and genomic alterations. Mod Pathol 2018;31:111–121. [PubMed: 28884744]

53. Rooper LM, Sharma R, Li QK, et al. INSM1 demonstrates superior performance to the individual and combined use of synaptophysin, chromogranin and CD56 for diagnosing neuroendocrine tumors of the thoracic cavity. Am J Surg Pathol 2017;41:1561–1569. [PubMed: 28719469]
54. Sakakibara R, Kobayashi M, Takahashi N, et al. Insulinoma-associated protein 1 (INSM1) is a better marker for the diagnosis and prognosis estimation of small cell lung carcinoma than neuroendocrine phenotype markers such as chromogranin A, synaptophysin, and CD56. Am J Surg Pathol 2020;44:757–764. [PubMed: 32118626]
55. Guinee DG Jr., Fishback NF, Koss MN, et al. The spectrum of immunohistochemical staining of small-cell lung carcinoma in specimens from transbronchial and open-lung biopsies. Am J Clin Pathol 1994;102:406–414. [PubMed: 7524299]
56. Rindi G, Klimstra DS, Abedi-Ardekani B, et al. A common classification framework for neuroendocrine neoplasms: an International Agency for Research on Cancer (IARC) and World Health Organization (WHO) expert consensus proposal. Mod Pathol 2018;31:1770–1786. [PubMed: 30140036]
57. Pelosi G, Rindi G, Travis WD, et al. Ki-67 antigen in lung neuroendocrine tumors: unraveling a role in clinical practice. J Thorac Oncol 2014; 9:273–284. [PubMed: 24518085]
58. Qin J, Lu H. Combined small-cell lung carcinoma. OncoTargets Ther 2018;11:3505–3511.
59. Marcoux N, Gettinger SN, O'Kane G, et al. EGFR-mutant adenocarcinomas that transform to small-cell lung cancer and other neuroendocrine carcinomas: clinical outcomes. J Clin Oncol 2019;37:278–285. [PubMed: 30550363]
60. Sehgal K, Varkaris A, Viray H, et al. Small cell transformation of non-small cell lung cancer on immune checkpoint inhibitors: uncommon or under-recognized? J Immunother Cancer 2020;8:e000697. [PubMed: 32581048]
61. George J, Lim JS, Jang SJ, et al. Comprehensive genomic profiles of small cell lung cancer. Nature 2015;524:47–53. [PubMed: 26168399]
62. Su S, Zou JJ, Zeng YY, et al. Tumor mutational burden and genomic alterations in Chinese small cell lung cancer measured by whole-exome sequencing. BioMed Res Int 2019;2019:6096350. [PubMed: 31781628]
63. Wakuda K, Kenmotsu H, Serizawa M, et al. Molecular profiling of small cell lung cancer in a Japanese cohort. Lung Cancer 2014;84:139–144. [PubMed: 24657128]
64. Liguori NR, Lee Y, Borges W, et al. Absence of biomarker-driven treatment options in small cell lung cancer, and selected preclinical candidates for next generation combination therapies. Front Pharmacol 2021;12:747180. [PubMed: 34531756]
65. Kalemkerian GP, Gadgeel SM. Modern staging of small cell lung cancer. J Natl Compr Canc Netw 2013;11:99–104. [PubMed: 23307985]
66. Micke P, Faldum A, Metz T, et al. Staging small cell lung cancer: Veterans Administration Lung Study Group versus International Association for the Study of Lung Cancer–what limits limited disease? Lung Cancer 2002;37:271–276. [PubMed: 12234695]
67. Kalemkerian GP. Staging and imaging of small cell lung cancer. Cancer Imaging 2012;11:253–258. [PubMed: 22245990]
68. Amin MB, Greene FL, Byrd DR, et al. AJCC Cancer Staging Manual, 8th Ed. New York, NY: Springer International Publishing; 2016.
69. Nicholson AG, Chansky K, Crowley J, et al. The International Association for the Study of Lung Cancer lung cancer staging project: proposals for the revision of the clinical and pathologic staging of small cell lung cancer in the forthcoming eighth edition of the TNM Classification for Lung Cancer. J Thorac Oncol 2016;11:300–311. [PubMed: 26723244]
70. Seute T, Leffers P, ten Velde GP, et al. Detection of brain metastases from small cell lung cancer: consequences of changing imaging techniques (CT versus MRI). Cancer 2008;112:1827–1834. [PubMed: 18311784]
71. Podoloff DA, Ball DW, Ben-Josef E, et al. NCCN task force: clinical utility of PET in a variety of tumor types. J Natl Compr Canc Netw 2009;7(Suppl 2):S1–S26.
72. Bradley JD, Dehdashti F, Mintun MA, et al. Positron emission tomography in limited-stage small-cell lung cancer: a prospective study. J Clin Oncol 2004;22:3248–3254. [PubMed: 15310768]

73. Fischer BM, Mortensen J, Langer SW, et al. A prospective study of PET/CT in initial staging of small-cell lung cancer: comparison with CT, bone scintigraphy and bone marrow analysis. Ann Oncol 2007;18:338–345. [PubMed: 17060487]
74. Brink I, Schumacher T, Mix M, et al. Impact of [18F]FDG-PET on the primary staging of small-cell lung cancer. Eur J Nucl Med Mol Imaging 2004;31:1614–1620. [PubMed: 15258700]
75. Kamel EM, Zwahlen D, Wyss MT, et al. Whole-body (18)F-FDG PET improves the management of patients with small cell lung cancer. J Nucl Med 2003;44:1911–1917. [PubMed: 14660716]
76. Rintoul RC, Tournoy KG, El Daly H, et al. EBUS-TBNA for the clarification of PET positive intra-thoracic lymph nodes-an international multicentre experience. J Thorac Oncol 2009;4:44–48. [PubMed: 19096305]
77. Medford AR, Bennett JA, Free CM, et al. Mediastinal staging procedures in lung cancer: EBUS, TBNA and mediastinoscopy. Curr Opin Pulm Med 2009;15:334–342. [PubMed: 19395972]
78. Foster NR, Mandrekar SJ, Schild SE, et al. Prognostic factors differ by tumor stage for small cell lung cancer: a pooled analysis of North Central Cancer Treatment Group trials. Cancer 2009;115:2721–2731. [PubMed: 19402175]
79. Albain KS, Crowley JJ, LeBlanc M, et al. Determinants of improved outcome in small-cell lung cancer: an analysis of the 2,580-patient Southwest Oncology Group data base. J Clin Oncol 1990;8:1563–1574. [PubMed: 2167954]
80. Hatfield LA, Huskamp HA, Lamont EB. Survival and toxicity after cisplatin plus etoposide versus carboplatin plus etoposide for extensive-stage small-cell lung cancer in elderly patients. J Oncol Pract 2016;12: 666–673. [PubMed: 27352949]
81. Bishop JF, Raghavan D, Stuart-Harris R, et al. Carboplatin (CBDCA, JM-8) and VP-16-213 in previously untreated patients with small-cell lung cancer. J Clin Oncol 1987;5:157–1578.
82. Skarlos DV, Samantas E, Kosmidis P, et al. Randomized comparison of etoposide-cisplatin vs. etoposide-carboplatin and irradiation in small-cell lung cancer. A Hellenic Co-operative Oncology Group study. Ann Oncol 1994;5:601–607. [PubMed: 7993835]
83. Okamoto H, Watanabe K, Kunikane H, et al. Randomised phase III trial of carboplatin plus etoposide vs split doses of cisplatin plus etoposide in elderly or poor-risk patients with extensive disease small-cell lung cancer: JCOG 9702. Br J Cancer 2007;97:162–169. [PubMed: 17579629]
84. Rossi A, Di Maio M, Chiodini P, et al. Carboplatin- or cisplatin-based chemotherapy in first-line treatment of small-cell lung cancer: the COCIS meta-analysis of individual patient data. J Clin Oncol 2012;30:1692–1698. [PubMed: 22473169]
85. Liu SV, Reck M, Mansfield AS, et al. Updated overall survival and PD-L1 subgroup analysis of patients with extensive-stage small-cell lung cancer treated with atezolizumab, carboplatin, and etoposide (IMpower133). J Clin Oncol 2021;39:619–630. [PubMed: 33439693]
86. Paz-Ares L, Dvorkin M, Chen Y, et al. Durvalumab plus platinum-etoposide versus platinum-etoposide in first-line treatment of extensive-stage small-cell lung cancer (CASPIAN): a randomised, controlled, open-label, phase 3 trial. Lancet 2019;394:1929–1939. [PubMed: 31590988]
87. Horn L, Mansfield AS, Szczesna A, et al. First-line atezolizumab plus chemotherapy in extensive-stage small-cell lung cancer. N Engl J Med 2018;379:2220–2229. [PubMed: 30280641]
88. Postmus PE, Haaxma-Reiche H, Gregor A, et al. Brain-only metastases of small cell lung cancer; efficacy of whole brain radiotherapy: an EORTC phase II study. Radiother Oncol 1998;46:29–32. [PubMed: 9488124]
89. Goldman JW, Dvorkin M, Chen Y, et al. Durvalumab, with or without tremelimumab, plus platinum-etoposide versus platinum-etoposide alone in first-line treatment of extensive-stage small-cell lung cancer (CASPIAN): updated results from a randomised, controlled, open-label, phase 3 trial. Lancet Oncol 2021;22:51–65. [PubMed: 33285097]
90. Paz-Ares L, Chen Y, Reinmuth N, et al. LBA61 - Durvalumab ± tremelimumab 1 platinum-etoposide in first-line extensive-stage SCLC (ES-SCLC): 3-year overall survival update from the phase III CASPIAN study [abstract]. Ann Oncol 2021;32(suppl_5):S1283.
91. Mathieu L, Shah S, Pai-Scherf L, et al. FDA Approval Summary: atezolizumab and durvalumab in combination with platinum-based chemotherapy in extensive stage small cell lung cancer. Oncologist 2021;26: 433–438. [PubMed: 33687763]

92. Noda K, Nishiwaki Y, Kawahara M, et al. Irinotecan plus cisplatin compared with etoposide plus cisplatin for extensive small-cell lung cancer. N Engl J Med 2002;346:85–91. [PubMed: 11784874]

93. Lara PN Jr., Natale R, Crowley J, et al. Phase III trial of irinotecan/cisplatin compared with etoposide/cisplatin in extensive-stage small-cell lung cancer: clinical and pharmacogenomic results from SWOG S0124. J Clin Oncol 2009;27:2530–2535. [PubMed: 19349543]

94. Hanna N, Bunn PA Jr, Langer C, et al. Randomized phase III trial comparing irinotecan/cisplatin with etoposide/cisplatin in patients with previously untreated extensive-stage disease small-cell lung cancer. J Clin Oncol 2006;24:2038–2043. [PubMed: 16648503]

95. Hermes A, Bergman B, Bremnes R, et al. Irinotecan plus carboplatin versus oral etoposide plus carboplatin in extensive small-cell lung cancer: a randomized phase III trial. J Clin Oncol 2008;26:4261–4267. [PubMed: 18779613]

96. Lima JP, dos Santos LV, Sasse EC, et al. Camptothecins compared with etoposide in combination with platinum analog in extensive stage small cell lung cancer: systematic review with meta-analysis. J Thorac Oncol 2010;5:1986–1993. [PubMed: 20978445]

97. Reck M, Luft A, Szczesna A, et al. Phase III randomized trial of ipilimumab plus etoposide and platinum versus placebo plus etoposide and platinum in extensive-stage small-cell lung cancer. J Clin Oncol 2016;34:3740–3748. [PubMed: 27458307]

98. Petrioli R, Roviello G, Laera L, et al. Cisplatin, etoposide, and bevacizumab regimen followed by oral etoposide and bevacizumab maintenance treatment in patients with extensive-stage small cell lung cancer: a single-institution experience. Clin Lung Cancer 2015;16:e229–e234. [PubMed: 26072097]

99. Spigel DR, Townley PM, Waterhouse DM, et al. Randomized phase II study of bevacizumab in combination with chemotherapy in previously untreated extensive-stage small-cell lung cancer: results from the SALUTE trial. J Clin Oncol 2011;29:2215–2222. [PubMed: 21502556]

100. Spigel DR, Greco FA, Zubkus JD, et al. Phase II trial of irinotecan, carboplatin, and bevacizumab in the treatment of patients with extensive-stage small-cell lung cancer. J Thorac Oncol 2009;4:1555–1560. [PubMed: 19875975]

101. Horn L, Dahlberg SE, Sandler AB, et al. Phase II study of cisplatin plus etoposide and bevacizumab for previously untreated, extensive-stage small-cell lung cancer: Eastern Cooperative Oncology Group Study E3501. J Clin Oncol 2009;27:6006–6011. [PubMed: 19826110]

102. Tiseo M, Boni L, Ambrosio F, et al. Italian, multicenter, phase III, randomized study of cisplatin plus etoposide with or without bevacizumab as first-line treatment in extensive-disease small-cell lung cancer: the GOIRC-AIFA FARM6PMFJM trial. J Clin Oncol 2017;35:1281–1287. [PubMed: 28135143]

103. Pujol JL, Lavole A, Quoix E, et al. Randomized phase II-III study of bevacizumab in combination with chemotherapy in previously untreated extensive small-cell lung cancer: results from the IFCT-0802 trial. Ann Oncol 2015;26:908–914. [PubMed: 25688059]

104. Loehrer PJ Sr., Ansari R, Gonin R, et al. Cisplatin plus etoposide with and without ifosfamide in extensive small-cell lung cancer: a Hoosier Oncology Group study. J Clin Oncol 1995;13:2594–2599. [PubMed: 7595712]

105. Pujol JL, Daurès JP, Rivière A, et al. Etoposide plus cisplatin with or without the combination of 4′-epidoxorubicin plus cyclophosphamide in treatment of extensive small-cell lung cancer: a French Federation of Cancer Institutes multicenter phase III randomized study. J Natl Cancer Inst 2001;93:300–308. [PubMed: 11181777]

106. Miyamoto H, Nakabayashi T, Isobe H, et al. A phase III comparison of etoposide/cisplatin with or without added ifosfamide in small-cell lung cancer. Oncology 1992;49:431–435. [PubMed: 1334539]

107. Berghmans T, Scherpereel A, Meert AP, et al. A phase III randomized study comparing a chemotherapy with cisplatin and etoposide to a etoposide regimen without cisplatin for patients with extensive small-cell lung cancer. Front Oncol 2017;7:217. [PubMed: 28975084]

108. Jalal SI, Lavin P, Lo G, et al. Carboplatin and etoposide with or without palifosfamide in untreated extensive-stage small-cell lung cancer: a multicenter, adaptive, randomized phase III study (MATISSE). J Clin Oncol 2017;35:2619–2623. [PubMed: 28605291]
109. Niell HB, Herndon JE II, Miller AA, et al. Randomized phase III inter-group trial of etoposide and cisplatin with or without paclitaxel and granulocyte colony-stimulating factor in patients with extensive-stage small-cell lung cancer: Cancer and Leukemia Group B Trial 9732. J Clin Oncol 2005;23:3752–3759. [PubMed: 15923572]
110. Schiller JH, Adak S, Cella D, et al. Topotecan versus observation after cisplatin plus etoposide in extensive-stage small-cell lung cancer: E7593a phase III trial of the Eastern Cooperative Oncology Group. J Clin Oncol 2001;19:2114–2122. [PubMed: 11304763]
111. Zhou H, Zeng C, Wei Y, et al. Duration of chemotherapy for small cell lung cancer: a meta-analysis. PLoS One 2013;8:e73805. [PubMed: 24023692]
112. Goldie JH, Coldman AJ. A mathematic model for relating the drug sensitivity of tumors to their spontaneous mutation rate. Cancer Treat Rep 1979;63:1727–1733. [PubMed: 526911]
113. Fukuoka M, Furuse K, Saijo N, et al. Randomized trial of cyclophosphamide, doxorubicin, and vincristine versus cisplatin and etoposide versus alternation of these regimens in small-cell lung cancer. J Natl Cancer Inst 1991;83:855–861. [PubMed: 1648142]
114. Roth BJ, Johnson DH, Einhorn LH, et al. Randomized study of cyclophosphamide, doxorubicin, and vincristine versus etoposide and cisplatin versus alternation of these two regimens in extensive small-cell lung cancer: a phase III trial of the Southeastern Cancer Study Group. J Clin Oncol 1992;10:282–291. [PubMed: 1310103]
115. Miles DW, Earl HM, Souhami RL, et al. Intensive weekly chemotherapy for good-prognosis patients with small-cell lung cancer. J Clin Oncol 1991;9:280–285. [PubMed: 1846406]
116. Murray N, Gelmon K, Shah A. Potential for long-term survival in extensive stage small-cell lung cancer (ESCLC) with CODE chemotherapy and radiotherapy [abstract]. Lung Cancer 1994;11 (Suppl 1):99 Abstract 377.
117. Sculier JP, Paesmans M, Bureau G, et al. Multiple-drug weekly chemotherapy versus standard combination regimen in small-cell lung cancer: a phase III randomized study conducted by the European Lung Cancer Working Party. J Clin Oncol 1993;11:1858–1865. [PubMed: 8410110]
118. Souhami RL, Rudd R, Ruiz de Elvira MC, et al. Randomized trial comparing weekly versus 3-week chemotherapy in small-cell lung cancer: a Cancer Research Campaign trial. J Clin Oncol 1994;12:1806–1813. [PubMed: 8083704]
119. Fukuoka M, Masuda N, Negoro S, et al. CODE chemotherapy with and without granulocyte colony-stimulating factor in small-cell lung cancer. Br J Cancer 1997;75:306–309. [PubMed: 9010043]
120. Murray N, Livingston RB, Shepherd FA, et al. Randomized study of CODE versus alternating CAV/EP for extensive-stage small-cell lung cancer: an Intergroup Study of the National Cancer Institute of Canada Clinical Trials Group and the Southwest Oncology Group. J Clin Oncol 1999;17:2300–2308. [PubMed: 10561291]
121. Cohen MH, Creaven PJ, Fossieck BE Jr., et al. Intensive chemotherapy of small cell bronchogenic carcinoma. Cancer Treat Rep 1977;61:349–354. [PubMed: 194691]
122. Johnson DH, Einhorn LH, Birch R, et al. A randomized comparison of high-dose versus conventional-dose cyclophosphamide, doxorubicin, and vincristine for extensive-stage small-cell lung cancer: a phase III trial of the Southeastern Cancer Study Group. J Clin Oncol 1987;5:1731–1738. [PubMed: 2824707]
123. Ihde DC, Mulshine JL, Kramer BS, et al. Prospective randomized comparison of high-dose and standard-dose etoposide and cisplatin chemotherapy in patients with extensive-stage small-cell lung cancer. J Clin Oncol 1994;12:2022–2034. [PubMed: 7931470]
124. Arriagada R, Le Chevalier T, Pignon JP, et al. Initial chemotherapeutic doses and survival in patients with limited small-cell lung cancer. N Engl J Med 1993;329:1848–1852. [PubMed: 8247036]
125. Thatcher N, Girling DJ, Hopwood P, et al. Improving survival without reducing quality of life in small-cell lung cancer patients by increasing the dose-intensity of chemotherapy with granulocyte

colony-stimulating factor support: results of a British Medical Research Council Multicenter Randomized Trial. J Clin Oncol 2000;18:395–404. [PubMed: 10637255]

126. Klasa RJ, Murray N, Coldman AJ. Dose-intensity meta-analysis of chemotherapy regimens in small-cell carcinoma of the lung. J Clin Oncol 1991;9:499–508. [PubMed: 1847968]
127. Crawford J, Ozer H, Stoller R, et al. Reduction by granulocyte colony-stimulating factor of fever and neutropenia induced by chemotherapy in patients with small-cell lung cancer. N Engl J Med 1991;325:164–170. [PubMed: 1711156]
128. Berghmans T, Paesmans M, Lafitte JJ, et al. Role of granulocyte and granulocyte-macrophage colony-stimulating factors in the treatment of small-cell lung cancer: a systematic review of the literature with methodological assessment and meta-analysis. Lung Cancer 2002;37:115–123. [PubMed: 12140132]
129. Sculier JP, Paesmans M, Lecomte J, et al. A three-arm phase III randomised trial assessing, in patients with extensive-disease small-cell lung cancer, accelerated chemotherapy with support of haematological growth factor or oral antibiotics. Br J Cancer 2001;85:1444–1451. [PubMed: 11720426]
130. Ferrarotto R, Anderson I, Medgyasszay B, et al. Trilaciclib prior to chemotherapy reduces the usage of supportive care interventions for chemotherapy-induced myelosuppression in patients with small cell lung cancer: Pooled analysis of three randomized phase 2 trials. Cancer Med 2021;10:5748–5756. [PubMed: 34405547]
131. Hussein M, Maglakelidze M, Richards DA, et al. Myeloprotective effects of trilaciclib among patients with small cell lung cancer at increased risk of chemotherapy-induced myelosuppression: pooled results from three phase 2, randomized, double-blind, placebo-controlled studies. Cancer Manag Res 2021;13:6207–6218. [PubMed: 34408488]
132. Weiss J, Goldschmidt J, Andric Z, et al. Effects of trilaciclib on chemotherapy-induced myelosuppression and patient-reported outcomes in patients with extensive-stage small cell lung cancer: pooled results from three phase II randomized, double-blind, placebo-controlled studies. Clin Lung Cancer 2021;22:449–460. [PubMed: 33895103]
133. Hart LL, Ferrarotto R, Andric ZG, et al. Myelopreservation with trilaciclib in patients receiving topotecan for small cell lung cancer: results from a randomized, double-blind, placebo-controlled phase II study. Adv Ther 2021;38:350–365. [PubMed: 33123968]
134. Hurria A, Kris MG. Management of lung cancer in older adults. CA Cancer J Clin 2003;53:325–341. [PubMed: 15224973]
135. Christodoulou M, Blackhall F, Mistry H, et al. Compliance and outcome of elderly patients treated in the concurrent once-daily versus twice-daily radiotherapy (CONVERT) trial. J Thorac Oncol 2019;14:63–71. [PubMed: 30391573]
136. Corso CD, Rutter CE, Park HS, et al. Role of chemoradiotherapy in elderly patients with limited-stage small-cell lung cancer. J Clin Oncol 2015;33:4240–4246. [PubMed: 26481366]
137. Gridelli C, Casaluce F, Sgambato A, et al. Treatment of limited-stage small cell lung cancer in the elderly, chemotherapy vs. sequential chemoradiotherapy vs. concurrent chemoradiotherapy: that's the question. Transl Lung Cancer Res 2016;5:150–154. [PubMed: 27186510]
138. Girling DJ. Comparison of oral etoposide and standard intravenous multidrug chemotherapy for small-cell lung cancer: a stopped multicentre randomised trial. Lancet 1996;348:563–566. [PubMed: 8774567]
139. Souhami RL, Spiro SG, Rudd RM, et al. Five-day oral etoposide treatment for advanced small-cell lung cancer: randomized comparison with intravenous chemotherapy. J Natl Cancer Inst 1997;89:577–580. [PubMed: 9106647]
140. Neubauer M, Schwartz J, Caracandas J, et al. Results of a phase II study of weekly paclitaxel plus carboplatin in patients with extensive small-cell lung cancer with Eastern Cooperative Oncology Group Performance Status of 2, or age > or 5 70 years. J Clin Oncol 2004;22:1872–1877. [PubMed: 15143079]
141. Westeel V, Murray N, Gelmon K, et al. New combination of the old drugs for elderly patients with small-cell lung cancer: a phase II study of the PAVE regimen. J Clin Oncol 1998;16:1940–1947. [PubMed: 9586913]

142. Okamoto H, Watanabe K, Nishiwaki Y, et al. Phase II study of area under the plasma-concentration-versus-time curve-based carboplatin plus standard-dose intravenous etoposide in elderly patients with small-cell lung cancer. J Clin Oncol 1999;17:3540–3545. [PubMed: 10550152]

143. Matsui K, Masuda N, Yana T, et al. Carboplatin calculated with Chatelut′s formula plus etoposide for elderly patients with small-cell lung cancer. Intern Med 2001;40:603–606. [PubMed: 11506300]

144. Murray N, Grafton C, Shah A, et al. Abbreviated treatment for elderly, infirm, or noncompliant patients with limited-stage small-cell lung cancer. J Clin Oncol 1998;16:3323–3328. [PubMed: 9779708]

145. Wolfson AH, Bae K, Komaki R, et al. Primary analysis of a phase II randomized trial Radiation Therapy Oncology Group (RTOG) 0212: impact of different total doses and schedules of prophylactic cranial irradiation on chronic neurotoxicity and quality of life for patients with limited-disease small-cell lung cancer. Int J Radiat Oncol Biol Phys 2011;81:77–84. [PubMed: 20800380]

146. Le Péchoux C, Laplanche A, Faivre-Finn C, et al. Clinical neurological outcome and quality of life among patients with limited small-cell cancer treated with two different doses of prophylactic cranial irradiation in the intergroup phase III trial (PCI99-01, EORTC 22003-08004, RTOG 0212 and IFCT 99-01). Ann Oncol 2011;22:1154–1163. [PubMed: 21139020]

147. Farooqi AS, Holliday EB, Allen PK, et al. Prophylactic cranial irradiation after definitive chemoradiotherapy for limited-stage small cell lung cancer: do all patients benefit? Radiother Oncol 2017;122:307–312. [PubMed: 28073578]

148. Lok BH, Ma J, Foster A, et al. Factors influencing the utilization of prophylactic cranial irradiation in patients with limited-stage small cell lung cancer. Adv Radiat Oncol 2017;2:548–554. [PubMed: 29204521]

149. Damhuis RAM, Senan S, Belderbos JS. Usage of prophylactic cranial irradiation in elderly patients with small-cell lung cancer. Clin Lung Cancer 2018;19:e263–e267. [PubMed: 29208355]

150. Hurwitz JL, McCoy F, Scullin P, et al. New advances in the second-line treatment of small cell lung cancer. Oncologist 2009;14:986–994. [PubMed: 19819917]

151. Schneider BJ. Management of recurrent small cell lung cancer. J Natl Compr Canc Netw 2008;6:323–331. [PubMed: 18377850]

152. Manapov F, Klöcking S, Niyazi M, et al. Timing of failure in limited disease (stage I-III) small-cell lung cancer patients treated with chemoradiotherapy: a retrospective analysis. Tumori 2013;99:656–660. [PubMed: 24503787]

153. Johnson BE, Linnoila RI, Williams JP, et al. Risk of second aerodigestive cancers increases in patients who survive free of small-cell lung cancer for more than 2 years. J Clin Oncol 1995;13:101–111. [PubMed: 7799009]

154. Johnson BE. Second lung cancers in patients after treatment for an initial lung cancer. J Natl Cancer Inst 1998;90:1335–1345. [PubMed: 9747865]

155. Richardson GE, Tucker MA, Venzon DJ, et al. Smoking cessation after successful treatment of small-cell lung cancer is associated with fewer smoking-related second primary cancers. Ann Intern Med 1993;119:383–390. [PubMed: 8393311]

156. Kawahara M, Ushijima S, Kamimori T, et al. Second primary tumours in more than 2-year disease-free survivors of small-cell lung cancer in Japan: the role of smoking cessation. Br J Cancer 1998;78:409–412. [PubMed: 9703291]

157. Parsons A, Daley A, Begh R, et al. Influence of smoking cessation after diagnosis of early stage lung cancer on prognosis: systematic review of observational studies with meta-analysis. BMJ 2010;340(jan21 1):b5569. [PubMed: 20093278]

158. Owonikoko TK, Behera M, Chen Z, et al. A systematic analysis of efficacy of second-line chemotherapy in sensitive and refractory small-cell lung cancer. J Thorac Oncol 2012;7:866–872. [PubMed: 22722788]

159. Dingemans AC, Früh M, Ardizzoni A, et al. Small-cell lung cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up*. Ann Oncol 2021;32:839–853. [PubMed: 33864941]

160. Trigo J, Subbiah V, Besse B, et al. Lurbinectedin as second-line treatment for patients with small-cell lung cancer: a single-arm, open-label, phase 2 basket trial. Lancet Oncol 2020;21:645–654. [PubMed: 32224306]

161. Subbiah V, Paz-Ares L, Besse B, et al. Antitumor activity of lurbinectedin in second-line small cell lung cancer patients who are candidates for rechallenge with the first-line treatment. Lung Cancer 2020;150:90–96. [PubMed: 33096421]

162. Lammers PE, Shyr Y, Li CI, et al. Phase II study of bendamustine in relapsed chemotherapy sensitive or resistant small-cell lung cancer. J Thorac Oncol 2014;9:559–562. [PubMed: 24736081]

163. Pietanza MC, Kadota K, Huberman K, et al. Phase II trial of temozolomide in patients with relapsed sensitive or refractory small cell lung cancer, with assessment of methylguanine-DNA methyltransferase as a potential biomarker. Clin Cancer Res 2012;18:1138–1145. [PubMed: 22228633]

164. Cheng S, Evans WK, Stys-Norman D, et al. Chemotherapy for relapsed small cell lung cancer: a systematic review and practice guideline. J Thorac Oncol 2007;2:348–354. [PubMed: 17409809]

165. Masters GA, Declerck L, Blanke C, et al. Phase II trial of gemcitabine in refractory or relapsed small-cell lung cancer: Eastern Cooperative Oncology Group Trial 1597. J Clin Oncol 2003;21:1550–1555. [PubMed: 12697880]

166. von Pawel J, Schiller JH, Shepherd FA, et al. Topotecan versus cyclophosphamide, doxorubicin, and vincristine for the treatment of recurrent small-cell lung cancer. J Clin Oncol 1999;17:658–667. [PubMed: 10080612]

167. O'Brien ME, Ciuleanu TE, Tsekov H, et al. Phase III trial comparing supportive care alone with supportive care with oral topotecan in patients with relapsed small-cell lung cancer. J Clin Oncol 2006;24:5441–5447. [PubMed: 17135646]

168. Eckardt JR, von Pawel J, Pujol JL, et al. Phase III study of oral compared with intravenous topotecan as second-line therapy in small-cell lung cancer. J Clin Oncol 2007;25:2086–2092. [PubMed: 17513814]

169. Huber RM, Reck M, Gosse H, et al. Efficacy of a toxicity-adjusted topotecan therapy in recurrent small cell lung cancer. Eur Respir J 2006;27:1183–1189. [PubMed: 16481389]

170. Shah C, Ready N, Perry M, et al. A multi-center phase II study of weekly topotecan as second-line therapy for small cell lung cancer. Lung Cancer 2007;57:84–88. [PubMed: 17399850]

171. Shipley DL, Hainsworth JD, Spigel DR, et al. Topotecan: weekly intravenous (IV) schedule similar to standard 5-day IV schedule as second-line therapy for relapsed small cell lung cancer (SCLC)–a Minnie Pearl Cancer Research Network phase II trial [abstract]. J Clin Oncol 2006;24 (Suppl 18):Abstract 7083.

172. Ready NE, Ott PA, Hellmann MD, et al. Nivolumab monotherapy and nivolumab plus ipilimumab in recurrent small cell lung cancer: results from the CheckMate 032 randomized cohort. J Thorac Oncol 2020;15:426–435. [PubMed: 31629915]

173. Antonia SJ, López-Martin JA, Bendell J, et al. Nivolumab alone and nivolumab plus ipilimumab in recurrent small-cell lung cancer (CheckMate 032): a multicentre, open-label, phase 1/2 trial. Lancet Oncol 2016;17:883–895. [PubMed: 27269741]

174. Ott PA, Elez E, Hiret S, et al. Pembrolizumab in patients with rxtensive-stage small-cell lung cancer: results from the phase Ib KEYNOTE-028 Study. J Clin Oncol 2017;35:3823–3829. [PubMed: 28813164]

175. Horn L, Reck M, Spigel DR. The future of immunotherapy in the treatment of small cell lung cancer. Oncologist 2016;21:910–921. [PubMed: 27354668]

176. Spigel DR, Vicente D, Ciuleanu TE, et al. Second-line nivolumab in relapsed small-cell lung cancer: CheckMate 331?. Ann Oncol 2021;32:631–641. [PubMed: 33539946]

177. Reck M, Vicente D, Ciuleanu T, et al. LBA5: Efficacy and safety of nivolumab (nivo) monotherapy versus chemotherapy (chemo) in recurrent small cell lung cancer (SCLC): Results from CheckMate 331. [abstract] Ann Oncol 2018;29:43.

178. Keeping ST, Cope S, Chan K, et al. Comparative effectiveness of nivolumab versus standard of care for third-line patients with small-cell lung cancer. J Comp Eff Res 2020;9:1275–1284. [PubMed: 33140652]

179. Hellmann MD, Ott PA, Zugazagoitia J, et al. Nivolumab (nivo) ± ipilimumab (ipi) in advanced small-cell lung cancer (SCLC): First report of a randomized expansion cohort from CheckMate 032. [abstract] J Clin Oncol 2017;35(15_suppl):35. (Abstract 8503)
180. Chung HC, Piha-Paul SA, Lopez-Martin J, et al. CT073 - Pembrolizumab after two or more lines of prior therapy in patients with advanced small-cell lung cancer (SCLC): Results from the KEYNOTE-028 and KEYNOTE-158 studies [abstract]. AACR Annual Meeting. Atlanta, GA; 2019:Abstract CT073. Accessed November 8, 2021. Available at: https://cancerres.aacrjournals.org/content/79/13_Supplement/CT073.
181. Ganti AKP, Loo BW, Bassetti M, et al. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Small Cell Lung Cancer (Version 2. 2022). Evidence Blocks. © 2021 National Comprehensive Cancer Network, Inc. To view the most recent and complete version of the NCCN Guidelines®, go online to NCCN.org. Available at: www.NCCN.org®
182. Davies M, Duffield EA. Safety of checkpoint inhibitors for cancer treatment: strategies for patient monitoring and management of immune-mediated adverse events. ImmunoTargets Ther 2017;6:51–71. [PubMed: 28894725]
183. Khunger M, Rakshit S, Pasupuleti V, et al. Incidence of pneumonitis with use of programmed death 1 and programmed death-ligand 1 inhibitors in non-small cell lung cancer: a systematic review and meta-analysis of trials. Chest 2017;152:271–281. [PubMed: 28499515]
184. Yamamoto N, Tsurutani J, Yoshimura N, et al. Phase II study of weekly paclitaxel for relapsed and refractory small cell lung cancer. Anticancer Res 2006;26(1B):777–781. [PubMed: 16739353]
185. Smit EF, Fokkema E, Biesma B, et al. A phase II study of paclitaxel in heavily pretreated patients with small-cell lung cancer. Br J Cancer 1998;77:347–351. [PubMed: 9461009]
186. von Eiff D, Bozorgmehr F, Chung I, et al. Paclitaxel for treatment of advanced small cell lung cancer (SCLC): a retrospective study of 185 patients. J Thorac Dis 2020;12:782–793. [PubMed: 32274145]
187. Smyth JF, Smith IE, Sessa C, et al. Activity of docetaxel (Taxotere) in small cell lung cancer. Eur J Cancer 1994;30A:1058–1060. [PubMed: 7654428]
188. Masuda N, Fukuoka M, Kusunoki Y, et al. CPT-11: a new derivative of camptothecin for the treatment of refractory or relapsed small-cell lung cancer. J Clin Oncol 1992;10:1225–1229. [PubMed: 1321891]
189. Pietanza MC, Waqar SN, Krug LM, et al. Randomized, double-blind, phase II study of temozolomide in combination with either veliparib or placebo in patients with relapsed-sensitive or refractory small-cell lung cancer. J Clin Oncol 2018;36:2386–2394. [PubMed: 29906251]
190. Zauderer MG, Drilon A, Kadota K, et al. Trial of a 5-day dosing regimen of temozolomide in patients with relapsed small cell lung cancers with assessment of methylguanine-DNA methyltransferase. Lung Cancer 2014;86:237–240. [PubMed: 25194640]
191. Baize N, Monnet I, Greillier L, et al. Carboplatin plus etoposide versus topotecan as second-line treatment for patients with sensitive relapsed small-cell lung cancer: an open-label, multicentre, randomised, phase 3 trial. Lancet Oncol 2020;21:1224–1233. [PubMed: 32888454]
192. Postmus PE, Berendsen HH, van Zandwijk N, et al. Retreatment with the induction regimen in small cell lung cancer relapsing after an initial response to short term chemotherapy. Eur J Cancer Clin Oncol 1987; 23:1409–1411. [PubMed: 2824211]
193. Goto K, Ohe Y, Shibata T, et al. Combined chemotherapy with cisplatin, etoposide, and irinotecan versus topotecan alone as second-line treatment for patients with sensitive relapsed small-cell lung cancer (JCOG0605): a multicentre, open-label, randomised phase 3 trial. Lancet Oncol 2016;17:1147–1157. [PubMed: 27312053]
194. Asai N, Ohkuni Y, Matsunuma R, et al. Efficacy and safety of amurubicin for the elderly patients with refractory relapsed small cell lung cancer as third-line chemotherapy. J Cancer Res Ther 2012;8:266–271. [PubMed: 22842373]
195. Ettinger DS, Jotte R, Lorigan P, et al. Phase II study of amrubicin as second-line therapy in patients with platinum-refractory small-cell lung cancer. J Clin Oncol 2010;28:2598–2603. [PubMed: 20385980]

196. Inoue A, Sugawara S, Yamazaki K, et al. Randomized phase II trial comparing amrubicin with topotecan in patients with previously treated small-cell lung cancer: North Japan Lung Cancer Study Group Trial 0402. J Clin Oncol 2008;26:5401–5406. [PubMed: 18854562]

197. Onoda S, Masuda N, Seto T, et al. Phase II trial of amrubicin for treatment of refractory or relapsed small-cell lung cancer: Thoracic Oncology Research Group Study 0301. J Clin Oncol 2006;24:5448–5453. [PubMed: 17135647]

198. Shimokawa T, Shibuya M, Kitamura K, et al. Retrospective analysis of efficacy and safety of amrubicin in refractory and relapsed small-cell lung cancer. Int J Clin Oncol 2009;14:63–69. [PubMed: 19225927]

199. Jotte R, Conkling P, Reynolds C, et al. Randomized phase II trial of single-agent amrubicin or topotecan as second-line treatment in patients with small-cell lung cancer sensitive to first-line platinum-based chemotherapy. J Clin Oncol 2011;29:287–293. [PubMed: 21135284]

200. von Pawel J, Jotte R, Spigel DR, et al. Randomized phase III trial of amrubicin versus topotecan as second-line treatment for patients with small-cell lung cancer. J Clin Oncol 2014;32:4012–4019. [PubMed: 25385727]

201. Petrelli F, Ghidini A, Luciani A. Topotecan or other agents as second-line therapy for relapsed small-cell lung cancer: A meta-analysis of randomized studies. Mol Clin Oncol 2021;15:218. [PubMed: 34476102]

202. Giaccone G, Ferrati P, Donadio M, et al. Reinduction chemotherapy in small cell lung cancer. Eur J Cancer Clin Oncol 1987;23:1697–1699. [PubMed: 2828074]

203. Genestreti G, Tiseo M, Kenmotsu H, et al. Outcomes of platinum-sensitive small-cell lung cancer patients treated with platinum/etoposide rechallenge: a multi-institutional retrospective analysis. Clin Lung Cancer 2015;16:e223–e228. [PubMed: 25983005]

NCCN CATEGORIES OF EVIDENCE AND CONSENSUS

Category 1:

Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.

Category 2A:

Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.

Category 2B:

Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.

Category 3:

Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise noted.

Clinical trials:

NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

PLEASE NOTE

The NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) are a statement of evidence and consensus of the authors regarding their views of currently accepted approaches to treatment. Any clinician seeking to apply or consult the NCCN Guidelines is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment. The National Comprehensive Cancer Network® (NCCN®) makes no representations or warranties of any kind regarding their content, use, or application and disclaims any responsibility for their application or use in any way.

The complete NCCN Guidelines for Small Cell Lung Cancer are not printed in this issue of JNCCN but can be accessed online at NCCN.org.

Disclosures for the NCCN Small Cell Lung Cancer Panel

At the beginning of each NCCN Guidelines Panel meeting, panel members review all potential conflicts of interest. NCCN, in keeping with its commitment to public transparency, publishes these disclosures for panel members, staff, and NCCN itself.

Individual disclosures for the Small Cell Lung Cancer Panel members can be found on page 1464. (The most recent version of these guidelines and accompanying disclosures are available at NCCN.org.)

The complete and most recent version of these guidelines is available free of charge at NCCN.org.

J Natl Compr Canc Netw. Author manuscript; available in PMC 2023 May 23.

Individual Disclosures for the NCCN Small Cell Lung Cancer Panel

Panel Member	Clinical Research Support/Data Safety Monitoring Board	Scientific Advisory Boards, Consultant, or Expert Witness	Promotional Advisory Boards, Consultant, or Speakers Bureau	Specialties
Michael Bassetti, MD	AstraZeneca Pharmaceuticals LP; EMD Serono, Inc.;and Merck & Co., Inc.	None	None	Radiotherapy/Radiation Oncology
Collin Blakely, MD, PhD	AstraZeneca Pharmaceuticals LP; Genentech, Inc.; MedImmune Inc.; Mirati Therapeutics, Inc.; Novartis Pharmaceuticals Corporation; Spectrum Pharmaceuticals, Inc.; and Takeda Pharmaceuticals North America, Inc.	Amgen Inc., and Blueprint Medicines Corporation	None	Medical Oncology
Anne Chiang, MD, PhD	AbbVie, Inc.; Amgen Inc.; AstraZeneca Pharmaceuticals LP; and Bristol-Myers Squibb Company	AstraZeneca Pharmaceuticals LP; Catalyst; Flatiron Health, Inc.; Genentech, Inc.; and Regeneron Pharmaceuticals, Inc.	None	Medical Oncology
Thomas A. D'Amico, MD	None	None	None	Surgery/Surgical Oncology
Christopher A. Dâvella, MD	None	None	None	Medical Oncology
Afshin Dowlati, MD	Amgen Inc.; AstraZeneca Pharmaceuticals LP; Bayer HealthCare; Eli Lilly and Company; GlaxoSmithKline; Immunomedics, Inc.; Ipsen; Merck & Co., Inc.; Pfizer Inc.; Regeneron Pharmaceuticals, Inc.; Seattle Genetics, Inc.; and TESARO, Inc.	Amgen Inc.; AstraZeneca Pharmaceuticals LP; Bayer HealthCare; Ipsen; Jazz Pharmaceuticals Inc.; and Merck & Co., Inc.	None	Medical Oncology
Robert J. Downey, MD	None	None	None	Surgery/Surgical Oncology
Martin Edelman, MD	Amgen Inc.; AstraZeneca Pharmaceuticals LP; GlaxoSmithKline; Mersana Therapeutics, Inc.; Nektar Therapeutics; Precision Therapeutics, Inc.; Revolutions Medicine; Seattle Genetics, Inc.; and Takeda Pharmaceuticals North America, Inc.	Flame; GlaxoSmithKline; Knaph; Precision Therapeutics, Inc.; Regeneron Pharmaceuticals, Inc.; sanofi-aventis U.S.; and Windmil	None	Medical Oncology
Charles Florsheim, JD[a]	None	None	None	Patient Advocacy
Apar Kishor P. Ganti, MD	None	AstraZeneca Pharmaceuticals LP; BeiGene; Blueprint Medicines Corporation; Cardinal Health; Flagship Biosciences; G1 Therapeutics; Genentech, Inc.; Jazz Pharmaceuticals Inc.; and Mirati Therapeutics	None	Medical Oncology
Kathryn A. Gold, MD	AbbVie, Inc.; BerGenBio; Daiichi- Sankyo Co.; ISA Pharmaceuticals; Pfizer Inc.; and Pharmacyclics, Inc.	AstraZeneca Pharmaceuticals LP; Rakuten; Takeda Pharmaceuticals North America, Inc.	None	Medical Oncology
Jonathan W. Goldman, MD	AbbVie, Inc.; Amgen Inc.; AstraZeneca Pharmaceuticals LP; Bristol- Myers Squibb Company; Eli Lilly and Company; Genentech, Inc.; GlaxoSmithKline; Janssen Pharmaceutica Products, LP; Kite Pharma, Inc.; Merck &	AbbVie, Inc.; AstraZeneca Pharmaceuticals LP; Bristol-Myers Squibb Company; Genentech, Inc.; Janssen Pharmaceutica Products, LP; Jazz Pharmaceuticals Inc.; and Pfizer Inc.	None	Medical Oncology; Hematology/Hematology Oncology; and Internal Medicine

Panel Member	Clinical Research Support/Data Safety Monitoring Board	Scientific Advisory Boards, Consultant, or Expert Witness	Promotional Advisory Boards, Consultant, or Speakers Bureau	Specialties
	Co., Inc.; Nektar Therapeutics; Novartis Pharmaceuticals Corporation; and Pfizer Inc.			
John C. Grecula, MD	Intraop Medical Inc.	None	None	Radiotherapy/Radiation Oncology
Christine Hann, MD, PhD	AbbVie, Inc.; Amgen Inc.; AstraZeneca Pharmaceuticals LP; Bristol-Myers Squibb Company; and Genentech, Inc.	Amgen Inc.; Ascentage Pharma; AstraZeneca Pharmaceuticals LP; and Janssen Pharmaceutica Products, LP	None	Medical Oncology
Wade Iams, MD	None	Chardan Consulting; Clinical Care Options; Curio Science; Defined Health; G1 Therapeutics; Genentech, Inc.; Jazz Pharmaceuticals Inc.; Mirati Therapeutics; and Outcomes Insights	Amgen Inc.	Medical Oncology
Puneeth Iyengar, MD, PhD	AstraZeneca Pharmaceuticals LP; National Cancer Institute; and Varian Medical Systems, Inc.	AstraZeneca Pharmaceuticals LP	None	Radiotherapy/Radiation Oncology
Karen Kelly, MD[a]	AstraZeneca Pharmaceuticals LP; Novartis Pharmaceuticals Corporation; Roche Laboratories, Inc.	AbbVie, Inc.; Amgen Inc.; AstraZeneca Pharmaceuticals LP; Daiichi-Sankyo Co.; EMD Serono; Genentech, Inc.; Janssen Pharmaceutica Products, LP; DebioPharm; GenMab; Sanofi-Genzyme; Regeneron Pharmaceuticals, Inc.		Medical Oncology
Maya Khalil, MD	Amgen Inc.; Bristol-Myers Squibb Company; Johnson & Johnson; Lucence; National Cancer Institute; Numab Therapeutics; and Seattle Genetics, Inc.	None	None	Medical Oncology, and Internal Medicine
Marianna Koczywas, MD	None	None	None	Medical Oncology; Hematology/Hematology Oncology; and Internal Medicine
Billy W. Loo, Jr., MD, PhD[a]	None	None	None	Radiotherapy/Radiation Oncology
Robert E. Merritt, MD	None	None	Intuitive Surgical, Inc.	Surgery/Surgical Oncology
Nisha Mohindra, MD	Pfizer Inc.	G1 Therapeutics	None	Medical Oncology
Julian Molina, MD, PhD	None	None	None	Hematology/Hematology Oncology, and Internal Medicine
Cesar Moran, MD	None	None	None	Pathology
Saraswati Pokharel, MD	None	None	None	Pathology
Sonam Puri, MD	None	AstraZeneca Pharmaceuticals LP, and G1 Therapeutics	AstraZeneca Pharmaceuticals LP, and G1 Therapeutics	Medical Oncology; Hematology/Hematology

J Natl Compr Canc Netw. Author manuscript; available in PMC 2023 May 23.

Panel Member	Clinical Research Support/Data Safety Monitoring Board	Scientific Advisory Boards, Consultant, or Expert Witness	Promotional Advisory Boards, Consultant, or Speakers Bureau	Specialties
				Oncology; and Internal Medicine
Angel Qin, MD	None	None	None	Medical Oncology
Chad Rusthoven, MD	Merck & Co., Inc., and Takeda Pharmaceuticals North America, Inc.	None	None	Radiotherapy/Radiation Oncology
Jacob Sands, MD	AbbVie, Inc.; Ascentage Pharma; Daiichi- Sankyo Co.; Genentech, Inc.; and Merck & Co., Inc.	AstraZeneca Pharmaceuticals LP; Blueprint Medicines Corporation; Boehringer Ingelheim GmbH; Daiichi- Sankyo Co.; Eli Lilly and Company; Jazz Pharmaceuticals Inc.; Medtronic, Inc.; PharmaMar; and Takeda Pharmaceuticals North America, Inc.	None	Medical Oncology
Rafael Santana-Davila, MD	Alexo Therapeutics, Inc.; ALX Oncology; Astellas Pharma US, Inc.; AstraZeneca Pharmaceuticals LP; Beyond Spring Pharmaceuticals; Bristol-Myers Squibb Company; Cullinan Oncology; Genentech, Inc.; ISA Pharmaceuticals; Merck & Co., Inc.; and Pfizer Inc.	AstraZeneca Pharmaceuticals LP; EMD Serono; Jazz Pharmaceuticals Inc.; Mirati Oncology; and Takeda Pharmaceuticals North America, Inc.	None	Medical Oncology
Michael Shafique, MD	Amphivena Therapeutics; Daiichi- Sankyo Co.; EMD Serono; Nektar Therapeutics; Pfizer Inc.; and Vaccinex Inc.	Jazz Pharmaceuticals, Inc.	None	Medical Oncology
Saiama N. Waqar, MBBS, MSCI	Hoosier Cancer Research Network, and Washington University School of Medicine	None	None	Medical Oncology

The NCCN Guidelines Staff have no conflicts to disclose.

[a]The following individuals have disclosed that they have an employment/governing board, patent, equity, or royalty:

Charles Florsheim, JD: GO2 Foundation for Lung Cancer

Karen Kelly: UpToDate®

Billy W. Loo, Jr., MD, PhD: Tibaray, Inc.

J Natl Compr Canc Netw. Author manuscript; available in PMC 2023 May 23.