

Non-small Cell Lung Cancer in Octogenarians: Treatment Practices and Preferences

Geoffrey R. Oxnard, MD,* Panos Fidiias, MD,† Alona Muzikansky, MA,‡
and Lecia V. Sequist, MD, MPH†

Introduction: Among patients with non-small cell lung cancer (NSCLC), patients aged 80 or older have inferior survival. Treatment practices in this patient population are poorly described. In this report, we describe the treatment of a population of very elderly patients with NSCLC at a large teaching hospital.

Methods: A retrospective chart review was performed of 111 outpatients with NSCLC aged 80 or older. Patient treatment regimens were evaluated for consistency with contemporaneous stage-specific guideline-recommended therapy (GRT). Attention was paid to how patient characteristics and attitudes influence therapy decisions.

Results: Patients characteristics included median age of 82.6 years (range, 80–92), 30% stage I–II, 39% stage IV, 59% performance status 0–1, 25% performance status ≥ 2 (performance status unavailable for 15%). Eighty-four percent of the patients received some form of antineoplastic therapy, and 11% were treated with best supportive care alone. Of 34 patients with localized disease, 53% underwent tumor resection and 38% received definitive radiation. Of 70 patients with stage III or IV disease, 36% received cytotoxic chemotherapy and 27% received oral targeted therapy alone. Thirty-two percent of patients received the stage-specific GRT. Of the patients who did not receive GRT, 26% electively refused the offered GRT and 74% were not offered GRT.

Conclusions: The vast majority of octogenarian patients with NSCLC receive antineoplastic therapy, but only one third of this population receives stage-specific GRT. Although many patients choose aggressive therapies, a small but clinically significant portion chose not to receive the offered GRT. More data are needed on appropriate therapy recommendations for this patient population.

Key Words: Non-small cell lung cancer, Octogenarian, Elderly, Patient preferences.

(*J Thorac Oncol.* 2007;2: 1029–1035)

*Department of Medicine, Massachusetts General Hospital, †Center for Thoracic Cancers, Massachusetts General Hospital Cancer Center, ‡Department of Biostatistics, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts.

Disclosure: The authors report no conflict of interest.

Address for correspondence: Lecia V. Sequist, MD, MPH, Massachusetts General Hospital Cancer Center, Yawkey Center for Outpatient Care, 32 Fruit Street, 7th Floor, Boston, MA 02114. E-mail: LVSequist@partners.org

Copyright © 2007 by the International Association for the Study of Lung Cancer

ISSN: 1556-0864/07/0211-1029

Lung cancer is the leading cause of cancer death in the United States, responsible for nearly one third of all cancer deaths^{1,2}; the majority of cases are non-small cell lung cancer (NSCLC). With a median age of incidence of 70 years, lung cancer is increasingly being recognized as a disease of the elderly.² Since a landmark article by Hutchins et al.³ describing the underrepresentation of elderly patients in cancer clinical trials, a number of studies have explored the treatment of lung cancer in patients aged 70 and older. Most of these have been subset analyses of the elderly population within a larger study, although some trials have been designed as elderly specific. From this literature, we know that selected elderly patients can tolerate surgery, radiation, and chemoradiation for local and locally advanced disease, as reviewed by Hurria and Kris.⁴ A large randomized trial demonstrated that elderly patients achieve a clear survival benefit from single-agent chemotherapy for advanced disease compared with best supportive care (BSC),⁵ and selected elderly patients can tolerate and benefit from more aggressive combination chemotherapy regimens.^{6–8}

However, the treatment of the very elderly with lung cancer, those age 80 or older, remains poorly described. A recent study of the national Surveillance, Epidemiology and End Results (SEER) database⁹ found that lung cancer patients older than the age of 80 had an inferior 5-year survival rate (8.3%) compared with younger patients (16.2%, $p < 0.0001$), controlling for stage, gender, and race. It also demonstrated that in practice, fewer of these very elderly NSCLC patients receive surgery or radiation treatments compared with younger patients. An earlier analysis of NSCLC patients in the SEER database found that the rate of receiving guideline-recommended therapy (GRT) was lower among patients aged 80 and older (33%) than among patients aged 50 to 59 (66%).¹⁰

There are only limited data available supporting specific therapies for NSCLC patients older than the age of 80. Recent surgical literature is optimistic about offering curative surgery to appropriately selected NSCLC patients aged 80 or older.^{11–13} In the sole published clinical trial of chemotherapy for advanced disease specifically performed in patients aged 80 and older,¹⁴ 20 treatment-naïve patients received vinorelbine plus gemcitabine and had a median survival of 10 months, comparable with results expected with chemotherapy in younger patients.

In this report, we describe the experience of NSCLC patients aged 80 or older at a major teaching hospital. In

particular, we compare treatments received with those therapies that are recommended according to current practice guidelines. Furthermore, we investigate the specific factors that influence treatment selection in this age group.

PATIENTS AND METHODS

A comprehensive database of patients evaluated between April 2001 and September 2005 at the Center for Thoracic Cancer at the Massachusetts General Hospital Cancer Center was queried to identify patients with lung cancer aged 80 or older, generating an initial sample of 144 patients. This sample was reviewed to exclude patients with non-NSCLC tumor histology (small-cell lung cancer, mesothelioma, nonbronchogenic primary, unknown primary), and age at presentation younger than 80. As our goal population was outpatient NSCLC patients, patients were excluded if they received inpatient consultation without outpatient follow-up. Our final sample of 111 patients consisted of outpatients with NSCLC presenting to our cancer center at the age of 80 or older. Patients presenting for second-opinion consultation only were included in the study, although complete data on their course of treatment were not always available.

Medical records were reviewed according to an institutional review board–approved protocol and a single physician collected all data. Data were collected on patient demographics and medical history, treatments administered, and tolerability of treatment. Tumor stage was determined as per the American Joint Committee on Cancer guidelines for lung cancer staging, 6th edition.¹⁵ When available, additional details were collected regarding the medical decision-making process, including which treatments were offered to each patient, reasons why physicians offered specific treatments, and reasons why patients chose specific treatments.

A standard, stage-specific GRT was determined from practice guidelines and medical literature.^{16,17} Table 1 details stage-specific GRT (shown in boldface type). For stage IA disease, anatomic resection with lobectomy or pneumonectomy was considered GRT. (Recent literature has suggested the equivalence of anatomic and limited resection in elderly patients¹⁸; however, this has not been incorporated into practice guidelines.) GRT for stage IB and II tumors depended on the time of patient presentation because the use of adjuvant platinum-based chemotherapy became standard at our institution after the presentation of the International Adjuvant Lung Cancer Trial data in mid-2003. For this reason, anatomic resection was considered GRT before mid-2003, at which point GRT changed to require adjuvant chemotherapy following resection.^{19,20} (Data suggesting that adjuvant chemotherapy is poorly tolerated by elderly patients was published after the completion of our study period.²¹) For locally advanced disease (stage III, excluding malignant pleural effusion), concurrent chemoradiation therapy, with or without surgical resection, was considered GRT. For advanced disease (stage IV or stage IIIB with malignant effusion), any cytotoxic chemotherapy regimen was considered GRT for these elderly patients.¹⁶ Each of our patients' treatment regimens over time, including treatments received immediately

TABLE 1. Most Aggressive Treatment Administered by Tumor Stage (*n* = 104)

Stage	Treatment	Patients, No. (%)
All stages		104
	Guideline recommended therapy	33 (31.7)
IA		17
	Lobectomy	3 (17.6)
	Limited resection	5 (29.4)
	Definitive radiation	9 (52.9)
	Best supportive care	0 (0.0)
IB and II		17
	Lobectomy with adjuvant chemotherapy	0 (0.0)
	Lobectomy alone (before IALT study)	4 (23.5)
	Lobectomy alone (after IALT study)	4 (23.5)
	Limited resection alone	2 (11.8)
	Definitive radiation alone	3 (17.6)
	Chemoradiation	1 (5.9)
	Palliative therapies only	2 (11.8)
	Best supportive care	1 (5.9)
IIIA and IIIB		20
	Neoadjuvant chemoradiation with resection	1 (5.0)
	Chemoradiation with platinum doublet	6 (30.0)
	Definitive radiation alone	6 (30.0)
	Palliative radiation only	3 (15.0)
	Best supportive care	4 (20.0)
IV (including IIIB with malignant effusion)		50
	Platinum doublet	3 (6.0)
	Single-agent chemotherapy	15 (30.0)
	Isolated cranial metastectomy	1 (2.0)
	Targeted therapy	19 (38.0)
	Palliative radiation only	6 (12.0)
	Best supportive care	6 (12.0)

Analysis excludes three patients for whom stage data were unavailable and four additional patients for whom treatment data were unavailable. Guideline-recommended therapies appear in bold. IALT, International Adjuvant Lung Cancer Trial.

before presentation at our cancer center, was evaluated for consistency with GRT.

Tolerance of the various treatment modalities among very elderly NSCLC patients was grossly assessed by examining the incidence of severe postoperative morbidity, the 30-day postoperative mortality, and the fraction of patients able to successfully complete their prescribed radiation course or the first two cycles of a systemic therapy course. The frequency of dose adjustments for toxicity was also recorded. Descriptive statistics regarding the distribution of observed treatments were prepared. We fit a multivariable logistic regression model to determine the independent association between age, performance status (PS), and receiving GRT.

RESULTS

The characteristics of the 111 patients studied are summarized in Table 2. The age at presentation ranged from 80 to 92 years, with a median age of 82.6. Fifty-nine percent of patients had an Eastern Cooperative Oncology Group PS

TABLE 2. Patient Characteristics (*n* = 111)

Characteristic	Patients, No. (%)
Gender	
Male	55 (49.5)
Female	56 (50.5)
Age at presentation, yr	
80–81	37 (33.3)
82–83	26 (24.4)
84–85	25 (22.5)
86–87	14 (12.6)
88–89	6 (5.4)
90–92	3 (2.7)
Median	82.6
Performance status	
0	27 (24.3)
1	39 (35.1)
2	22 (19.8)
3	6 (5.4)
Not recorded	17 (15.3)
Charlson comorbidity index	
0	29 (26.1)
1–2	47 (42.3)
≥3	35 (31.5)
Smoking history	
Any smoking history	102 (91.9)
Nonsmoker	9 (8.1)
Tumor histology	
Adenocarcinoma	61 (55.0)
Squamous cell carcinoma	21 (18.9)
Other	23 (20.7)
NSCLC NOS	6 (5.4)
Stage	
IA	17 (15.3)
IB	11 (9.9)
IIA	1 (0.9)
IIB	5 (4.5)
IIIA	13 (11.7)
IIIB, without malignant effusion	10 (9.0)
IIIB, with malignant effusion	8 (7.2)
IV	43 (38.7)
Not recorded	3 (2.7)

NSCLC NOS, non-small cell lung cancer not otherwise specified.

of 0 or 1 when initially evaluated, although 15% of patients had no PS recorded. 26% of patients had a Charlson comorbidity index score of 0, 42% had a Charlson index of 1–2, and 32% had a Charlson index of 3 or more. Thirty-one percent of patients had stage I or II disease at completion of staging, and 39% had metastatic disease.

Median duration of follow-up was 8.4 months (range, 0–90). The treatments administered during the study period are depicted in Table 3. Overall, 84% of patients received some form of antineoplastic therapy, whereas 11% received BSC only (treatment data unavailable for six of 111 patients). Nineteen (17%) patients underwent surgical resection of their primary tumor, with ages ranging from 80 to 86 years

TABLE 3. Treatments Administered during the Study Period by Modality (*n* = 111)

Treatment received	Patients, No. (%)
Any antineoplastic therapy	93 (83.8)
Best supportive care only	12 (10.8)
Unknown	6 (5.4)
Any resection of primary tumor	19 (17.1)
Lobectomy	11 (9.9)
Limited resection (wedge or segmental)	7 (6.3)
Resection after neoadjuvant chemoradiation	1 (0.9)
Any radiotherapy	52 (46.8)
Definitive radiotherapy	19 (17.1)
Palliative radiotherapy	27 (24.3)
Chemoradiation	9 (8.1)
Any cytotoxic chemotherapy	30 (27.0)
Carboplatin/paclitaxel	10 (9.0)
Carboplatin/docetaxel	1 (0.9)
Vinorelbine	16 (14.4)
Docetaxel	5 (4.5)
Paclitaxel	3 (2.7)
Gemcitabine	3 (2.7)
Pemetrexed	5 (4.5)
Other (experimental therapies)	2 (1.8)
Any targeted therapy	39 (35.1)
Erlotinib	8 (7.2)
Gefitinib	33 (29.7)

Note that some patients received multiple treatments.

(median, 81.7). Radiation therapy was the most common therapy administered overall, with 52 (47%) patients treated. Approximately half of the radiation regimens were palliative therapy to the chest, central nervous system, or bones. Systemic anticancer therapies were administered to 55 (50%) patients overall, with 30 (27%) patients undergoing treatment with at least one cytotoxic chemotherapy regimen, and 39 (35%) patients treated with an oral small molecule epidermal growth factor receptor (EGFR) targeted agent. For 25 (23%) patients, oral targeted therapy was the only antineoplastic therapy they received during the study. Among the 30 chemotherapy-treated patients, 11 (37%) received a platinum-based combination regimen; 21 (70%) were treated with a solitary regimen or “line” of therapy, and four (13%), four (13%), and one (3%) patients received two, three, and four lines of chemotherapy each, respectively.

Examining the treatments given to patients by stage at presentation (Table 1), we found that among the 34 patients with localized disease (stages I–II), 18 (53%) underwent surgical resection, 12 (35%) were deemed medically inoperable, and another four (12%) patients refused resection. Of the patients offered resection, 86% underwent the surgery and 14% declined. Eleven (61%) of the 18 thoracic surgeries performed were anatomic resections, all of which were lobectomies, and the remaining seven procedures were limited resections. There were no pneumonectomies performed in this cohort. None of the surgical patients received adjuvant

TABLE 4. Reasons Why Guideline-Recommended Therapy Was Not Received (*n* = 69)

Reason	Stage				
	All Stages	IA Lobectomy	IB/II Lobectomy ± Adjuvant Chemo ^b	IIIA/IIIB Chemoradiation	IV ^a Cytotoxic Chemo
Therapy not offered	51 (73.9%)	12	9	10	20
PS/comorbidities	33 (47.8%)	7	5	8	13
Age	4 (5.8%)	0	2	1	1
Reason not specified	14 (20.3%)	5	2	1	6
Patient preference	18 (26.1%)	2	4	4	8
No surgery	3 (4.3%)	2	1	0	0
No chemo	13 (18.8%)	0	2	3	8
BSC	2 (2.9%)	0	1	1	0

Analysis excludes patient for whom data were unavailable. PS, performance status; BSC, best supportive care.

^a Includes stage IIIB with malignant pleural effusion.

^b For stages IB and II, resection and adjuvant chemotherapy were considered GRT only after the IALT data were presented in 2003.

chemotherapy. Of the four patients who underwent resection after presentation of the International Adjuvant Lung Cancer Trial results,¹⁹ two were offered adjuvant chemotherapy but chose not to receive it, and two were not offered it due to PS or age. Of the 16 nonsurgical patients with limited disease, 13 (81%) received definitive radiation therapy, one of these with concurrent chemotherapy.

Treatment data were available for 20 of 23 patients with locally advanced disease (stage III, excluding malignant pleural effusion). One patient underwent trimodality therapy consisting of neoadjuvant radiation and concurrent carboplatin and paclitaxel, followed by surgical resection. Twelve (60%) patients received definitive radiation, including six patients treated with concurrent chemotherapy (with carboplatin and paclitaxel) and six patients treated with radiation only. None of the patients were given chemoradiation in a sequential fashion or were given platinum-based chemotherapy alone. Three (15%) patients underwent radiation with palliative intent and four (20%) were treated with BSC only.

Treatment data were available for 50 of 51 patients who presented with advanced disease. Eighteen (36%) patients were treated with cytotoxic chemotherapy, including three (6%) with a platinum-based combination regimen and 15 (30%) with a monotherapy regimen. Three of the 18 chemotherapy patients received an oral EGFR inhibitor initially before later receiving cytotoxic chemotherapy. Nineteen patients with advanced disease (38%) were treated with oral EGFR-targeted agents as their only systemic therapy, with a large portion of these (47.3%) having not been offered chemotherapy due to PS, age, or unspecified reasons. One patient underwent an isolated cranial metastectomy and no chemotherapy. Six (12%) patients were treated with BSC alone. Of the patients who presented with stage III or IV disease who were offered cytotoxic chemotherapy, 68% underwent the treatment, and 32% refused it.

When considering the stage-specific GRT as we defined it, 33 of 104 very elderly NSCLC patients (32%) received the appropriate GRT. Patients receiving GRT were aged 80 to 87 years (median, 82.1) and had a PS of 0 or 1 with the exception of one PS 2 patient. Multivariate analysis demonstrated that

independent predictors for failing to receive GRT included PS ≥ 2 (OR = 17.1; 95% confidence interval [CI]: 2.2–135) and age 85 or older (OR = 4.8; 95% CI: 1.0–23.4). Factors not associated with receiving GRT were Charlson index (OR = 1.3; 95% CI: 0.9–1.7), gender (OR = 0.8; 95% CI: 0.3–1.7), and tumor stage (OR = 0.9; 95% CI: 0.8–1.1). Of the patients not receiving GRT, 26% refused it, 48% were not offered it due to PS or comorbid conditions, and 26% were not offered it due to age or reasons not explicitly stated in the medical record. Table 4 provides additional details about therapy decision making.

The majority of very elderly NSCLC patients were able to tolerate their respective treatments well (Table 5). Of the 16 surgical patients for whom data were available, four (25%) suffered serious postoperative complications, including one (6%) who died within 30 days of cardiogenic shock. Radiotherapy was generally well tolerated with 84% of patients completing their prescribed course of therapy; 96% of definitive regimens and 72% of palliative regimens were completed. Of 45 cytotoxic chemotherapy regimens administered, 33 (73%) were tolerated for two complete cycles until planned restaging examinations, whereas 10 (22%) were aborted before the first planned restaging examination (data unavailable for two treatment regimens). Nineteen of the 33 (58%) completed chemotherapy regimens were dose or schedule adjusted for toxic adverse events. Of 41 targeted therapy regimens initiated, 31 (76%) were continued for at least 2 months.

DISCUSSION

This study examined the outpatient treatment patterns of NSCLC patients aged 80 years and older evaluated at an academic general hospital cancer center and found that the vast majority of patients (84%) receive some form of anti-neoplastic therapy. These data suggest that the historical notion that advanced age should automatically preclude consideration of cancer treatment is falling out of practice. However, only 32% of patients received the stage-specific GRT, which may offer insight into why very elderly patients

TABLE 5. Tolerability of Therapy Received

Therapy Modality and Tolerability/Toxicity	No. (%)
Surgical resections	16
Severe morbidity	4 (25.0)
Small bowel obstruction	1
Shock	3
30-day mortality	1 ^a (6.3)
Radiation therapy regimens	57
Completed course of radiation	48 (84.2)
Cytotoxic chemotherapy regimens	45
2 cycles completed	33 (73.3)
Did not complete 2 cycles of therapy	10 (22.2)
Data unavailable	2 (4.4)
Targeted therapy regimens	41
2 mo completed	31 (75.6)
Did not complete 2 mo of therapy	9 (22.0)
Data unavailable	1 (2.4)

Cases excluded from analysis if tolerability/toxicity data not available.

^a Secondary to postoperative myocardial infarction and cardiogenic shock.

with NSCLC have inferior survival compared with younger patients. Multiple factors influenced the treatment practices observed, including patient health, physician attitudes, and patient preferences.

Our data on guideline adherence are notably different from the findings of Potosky et al.,¹⁰ although our definitions of GRT are comparable. Compared with their study of the SEER database in 1996, we observed a similar overall percentage of octogenarians receiving GRT, but our cohort treated largely between 2001 and 2005 included fewer patients with localized disease receiving GRT and more patients with stage III or IV disease receiving GRT. Specifically, in our single-center cohort, 21% of very elderly patients with stage I and II NSCLC received strict GRT (a definition that included adjuvant chemotherapy), while 32% had anatomic lobectomies (the recommended therapy from the SEER study); in the SEER cohort, 55% of very elderly patients underwent lobectomy or pneumonectomy. In our cohort, 35% and 38% of stage III and IV patients, respectively, were treated with GRT compared with 21% and 16% of stage III and IV patients, respectively, in the SEER cohort. The trend toward a decrease in GRT for localized disease at our single-center cohort is somewhat surprising as we are an academic cancer center with a strong surgical tradition. This observed trend may be due to several factors including our nearly universal use of sensitive mediastinal staging modalities such as positron emission tomography and mediastinoscopy, which can shift patients from stage I–II diagnoses to stage III NSCLC, and our catchment population of medically complex patients, as evidenced by the 35% of patients with localized disease deemed medically inappropriate for surgery. The trend toward increased administration of GRT for very elderly NSCLC patients with stage III and IV disease in our cohort compared with the SEER study is consistent with comparing the practice of an academic referral center to a national database, but may also suggest that increased aware-

ness of the issues of caring for elderly cancer patients and improvement in the efficacy of systemic NSCLC treatments over the past decade are leading to changes in patient and physician attitudes toward making treatment decisions in this age group.

Our finding that 32% of patients aged 80 or older received GRT is inherently dependent on which therapy we consider “recommended” for this age population; these recommendations are largely inferred from data obtained in studies of younger patients. Defining GRT in patients aged 80 years and older is challenging given the scarcity of outcomes data in the very elderly population, in part due to the particular difficulty accruing very elderly patients in clinical trials.^{7,22} If our definition of GRT for very elderly patients were broadened somewhat to include limited resections or to include resections without adjuvant chemotherapy, both of which have been suggested by some data,^{18,23} then a greater portion of our patients would have received GRT. More investigation of survival and quality-of-life outcomes is needed to determine which therapies that we normally offer younger patients should be withheld from the very elderly.

Although both age and PS influenced whether a patient received GRT, PS was a much stronger predictor in our multivariable analysis (OR = 17.1 and 4.8 for PS and age, respectively). This is consistent with our finding that the most common documented reason for not receiving GRT was PS or comorbid disease. The Charlson comorbidity index was not found to correlate with receiving GRT in this cohort, although it has previously been found to correlate with outcomes in surgical lung cancer patients of all ages.²⁴ It is reassuring that PS is weighed heavily in patients of this age group because PS is one of the strongest known predictors of survival and therapy tolerance in NSCLC. Still, we found that 8% of the time that a patient was not offered GRT, the physician noted age as the primary reason. An additional 14 patients were not offered GRT due to unspecified reasons, and it is likely that age played a role in some of these decisions. These 14 cases consisted largely of limited resections being performed rather than anatomic (seven cases) and patients with advanced disease receiving targeted therapy rather than chemotherapy (five patients). We are optimistic that studies such as ours will influence a decrease in the frequency with which oncologists make treatment decisions based primarily on age.

Our data are consistent with previous findings that elderly patients desire aggressive therapy as often as younger patients.²⁵ Fifty-three percent of patients with localized disease underwent resection, and of 30 patients receiving chemotherapy, 30% went on to receive a second regimen and one patient received four different regimens (as well as receiving erlotinib). Compared with the historical experience from the University of Tsukuba in Japan, which found that 25 of 50 octogenarians with NSCLC received BSC alone,²⁶ we observed that only 11% of very elderly patients were treated with only BSC. This change suggests that offering aggressive palliative therapies to octogenarians has gained increased acceptance at academic centers over the past decade.

In addition, this study is the first to our knowledge that documents the clinically significant portion of octogenarian patients who elect to decline therapies that their doctor has recommended. Fourteen percent of patients who were offered curative surgery refused it, and 24% of patients with stage III or IV disease refused chemotherapy. One patient, an 81-year-old woman with stage II cancer, refused resection and radiotherapy, not wishing to undergo life-prolonging procedures; she did, however, wish improve her quality of life and underwent a total hip replacement, living another 11 months after the surgery. However, our findings were noted in patients presenting to an oncology clinic and may underestimate the amount of disinclination toward therapy in this age group, considering the additional population of patients with NSCLC who do not obtain an oncology consultation.

Oral targeted therapy was notably more popular than cytotoxic chemotherapy in this patient population. More than one fifth of patients (23%) received targeted therapy as their only antineoplastic therapy, due to either poor PS or a desire for “a minimalistic approach to . . . therapy” or a desire to “return to [a] normal schedule.” Our academic cancer center has a particular research focus on EGFR inhibitor therapy, which may have increased the popularity of these therapies in our study. However, it should be noted that only three of 39 patients receiving oral EGFR therapy were participating in clinical trials. Although more patients in this study received gefitinib, we anticipate that erlotinib will increase in popularity given recent data.^{27,28} More recently, a phase II trial of first-line erlotinib in elderly patients showed a median overall survival of 11 months,²⁹ suggesting that comparison of erlotinib to chemotherapy for elderly patients will need to be pursued further in a randomized fashion.

Chemotherapy was slightly less well tolerated in our patients than in published elderly chemotherapy trials. Although 22% of our patients stopped chemotherapy before initial restaging, single-agent studies have shown that 9%⁵ and 11%³⁰ of patients aborted therapy before initial restaging. Of the patients who did receive two full cycles of therapy, a significant proportion (58%) required dose interruption or adjustment. These findings are not surprising for very elderly patients and demonstrate the flexibility required when delivering cytotoxic chemotherapy to this age group.

In summary, we found that our population of patients with NSCLC aged 80 years or older received antineoplastic therapy 84% of the time, however, received GRT only 32% of the time. Very elderly patients have diverse attitudes toward cancer treatment. Although some desire aggressive treatment modalities, a significant portion decline therapies offered by their oncologist; thus, treatment decisions must be individualized to their life expectancies and life goals. Due to the heterogeneous nature of our study population's baseline health and treatment regimens, we were not able to evaluate patient survival or tumor response. It is hoped that our data will encourage increased study of both the appropriate treatment algorithms for very elderly NSCLC patients and the attitudes toward treatment by both physicians and patients,

leading to the development of improved care for this growing patient population.

ACKNOWLEDGMENTS

The authors thank Dr. John Wain for reviewing the manuscript.

REFERENCES

1. Edwards BK, Brown ML, Wingo PA, et al. Annual report to the nation on the status of cancer, 1975–2002, featuring population-based trends in cancer treatment. *J Natl Cancer Inst* 2005;97:1407–1427.
2. Edwards BK, Howe HL, Ries LA, et al. Annual report to the nation on the status of cancer, 1973–1999, featuring implications of age and aging on U.S. cancer burden. *Cancer*. 2002;94:2766–2792.
3. Hutchins LF, Unger JM, Crowley JJ, et al. Underrepresentation of patients 65 years of age or older in cancer-treatment trials. *N Engl J Med* 1999;341:2061–2067.
4. Hurria A, Kris MG. Management of lung cancer in older adults. *CA Cancer J Clin* 2003;53:325–341.
5. The Elderly Lung Cancer Vinorelbine Italian Study Group. Effects of vinorelbine on quality of life and survival of elderly patients with advanced non-small-cell lung cancer. *J Natl Cancer Inst* 1999;91:66–72.
6. Costa GJ, Fernandes AL, Pereira JR, et al. Survival rates and tolerability of platinum-based chemotherapy regimens for elderly patients with non-small-cell lung cancer (NSCLC). *Lung Cancer* 2006;53:171–176.
7. Rocha Lima CM, Herndon JE 2nd, Kosty M, et al. Therapy choices among older patients with lung carcinoma: an evaluation of two trials of the Cancer and Leukemia Group B. *Cancer* 2002;94:181–187.
8. Langer CJ, Manola J, Bernardo P, et al. Cisplatin-based therapy for elderly patients with advanced non-small-cell lung cancer: implications of Eastern Cooperative Oncology Group 5592, a randomized trial. *J Natl Cancer Inst* 2002;94:173–181.
9. Owonikoko TK, Belani C, Cai C, et al. Lung cancer in patients >80 years of age: analysis of the national surveillance, epidemiology and end results (SEER) database. *J Clin Oncol* 2006;24(Suppl):7156.
10. Potosky AL, Saxman S, Wallace RB, Lynch CF. Population variations in the initial treatment of non-small-cell lung cancer. *J Clin Oncol* 2004;22:3261–3268.
11. Hope WW, Bolton WD, Kalbaugh CA, et al. Lung cancer resection in octogenarians: a reasonable approach for our aging population. *Am Surg* 2007;73:22–24.
12. Port JL, Kent M, Korst RJ, et al. Surgical resection for lung cancer in the octogenarian. *Chest* 2004;126:733–738.
13. Brock MV, Kim MP, Hooker CM, et al. Pulmonary resection in octogenarians with stage I nonsmall cell lung cancer: a 22-year experience. *Ann Thorac Surg* 2004;77:271–277.
14. Chen YM, Perng RP, Chen MC, et al. A phase II trial of vinorelbine plus gemcitabine in previously untreated inoperable (stage IIb/IV) non-small-cell lung cancer patients aged 80 or older. *Lung Cancer* 2003;40:221–226.
15. Greene FL, Fritz AG, Balch CM, et al. *AJCC Cancer Staging Manual*, 6th ed. New York: Springer-Verlag, 2002.
16. Pfister DG, Johnson DH, Azzoli CG, et al. American Society of Clinical Oncology treatment of unresectable non-small-cell lung cancer guideline: update 2003. *J Clin Oncol* 2004;22:330–353.
17. ACCP. Diagnosis and management of lung cancer: ACCP evidence-based guidelines. *Chest* 2003;123:1S–337S.
18. Mery CM, Pappas AN, Bueno R, et al. Similar long-term survival of elderly patients with non-small cell lung cancer treated with lobectomy or wedge resection within the surveillance, epidemiology, and end results database. *Chest* 2005;128:237–245.
19. Le Chevalier T for the IALT Investigators. Results of the randomized International Adjuvant Lung Cancer Trial (IALT): cisplatin-based chemotherapy (CT) vs no CT in 1867 patients (pts) with resected non-small cell lung cancer (NSCLC). *Proc Am Soc Clin Oncol* 2003;22:2.
20. Arriagada R, Bergman B, Dunant A, et al. Cisplatin-based adjuvant chemotherapy in patients with completely resected non-small-cell lung cancer. *N Engl J Med*. 2004;350:351–360.
21. Pepe C, Hasan B, Winton TL, et al. Adjuvant vinorelbine and cisplatin

- in elderly patients: National Cancer Institute of Canada and Intergroup Study JBR. 10. *J Clin Oncol* 2007;25:1553–1561.
22. Murthy VH, Krumholz HM, Gross CP. Participation in cancer clinical trials: race-, sex-, and age-based disparities. *JAMA* 2004;291:2720–2726.
 23. Pepe C, Hasan B, Winton T, et al. Adjuvant vinorelbine and cisplatin in elderly patients: National Cancer Institute of Canada and Intergroup Study JBR.10. *J Clin Oncol* 2007;25:1553–1561.
 24. Birim O, Kappetein AP, Bogers AJ. Charlson comorbidity index as a predictor of long-term outcome after surgery for nonsmall cell lung cancer. *Eur J Cardiothorac Surg* 2005;28:759–762.
 25. Yellen SB, Cella DF, Leslie WT. Age and clinical decision making in oncology patients. *J Natl Cancer Inst* 1994;86:1766–1770.
 26. Kurishima K, Satoh H, Ishikawa H, et al. Lung cancer in the octogenarian. *Gerontology* 2001;47:158–160.
 27. Thatcher N, Chang A, Parikh P, et al. Gefitinib plus best supportive care in previously treated patients with refractory advanced non-small-cell lung cancer: results from a randomised, placebo-controlled, multicentre study (Iressa Survival Evaluation in Lung Cancer). *Lancet* 2005;366:1527–1537.
 28. Shepherd FA, Rodrigues Pereira J, Ciuleanu T, et al. Erlotinib in previously treated non-small-cell lung cancer. *N Engl J Med* 2005;353:123–132.
 29. Jackman DM, Yeap BY, Lindeman NI, et al. Phase II clinical trial of chemotherapy-naive patients \geq 70 years of age treated with erlotinib for advanced non-small-cell lung cancer. *J Clin Oncol* 2007;25:760–766.
 30. Ricci S, Antonuzzo A, Galli L, et al. Gemcitabine monotherapy in elderly patients with advanced non-small cell lung cancer: a multicenter phase II study. *Lung Cancer* 2000;27:75–80.