



## Role of Chemoradiotherapy in Elderly Patients With Limited-Stage Small-Cell Lung Cancer

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### A B S T R A C T

#### Purpose

To investigate outcomes for elderly patients treated with chemotherapy (CT) alone versus chemoradiotherapy (CRT) in the modern era by using a large national database.

#### Patients and Methods

Elderly patients (age  $\geq 70$  years) with limited-stage small-cell lung cancer clinical stage I to III who received CT or CRT were identified in the National Cancer Data Base between 2003 and 2011. Hierarchical mixed-effects logistic regression with clustering by reporting facility was performed to identify factors associated with treatment selection. Overall survival (OS) of patients receiving CT versus CRT was compared by using the log-rank test, Cox proportional hazards regression, and propensity score matching.

#### Results

A total of 8,637 patients were identified, among whom 3,775 (43.7%) received CT and 4,862 (56.3%) received CRT. The odds of receiving CRT decreased with increasing age, clinical stage III disease, female sex, and the presence of medical comorbidities (all  $P < .01$ ). Use of CRT was associated with increased OS compared with CT on univariable and multivariable analysis (median OS, 15.6 v 9.3 months; 3-year OS, 22.0% v 6.3%; log-rank  $P < .001$ ; Cox  $P < .001$ ). Propensity score matching identified a matched cohort of 6,856 patients and confirmed a survival benefit associated with CRT (hazard ratio, 0.52; 95% CI, 0.50 to 0.55;  $P < .001$ ). Subset analysis of CRT treatment sequence showed that patients alive 4 months after diagnosis derived a survival benefit with concurrent CRT over sequential CRT (median OS, 17.0 v 15.4 months; log-rank  $P = .01$ ).

#### Conclusion

In elderly patients with limited-stage small-cell lung cancer, modern CRT appears to confer an additional OS advantage beyond that achieved with CT alone in a large population-based cohort. Our findings suggest that CRT should be the preferred strategy in elderly patients who are expected to tolerate the toxicities of the combined approach.

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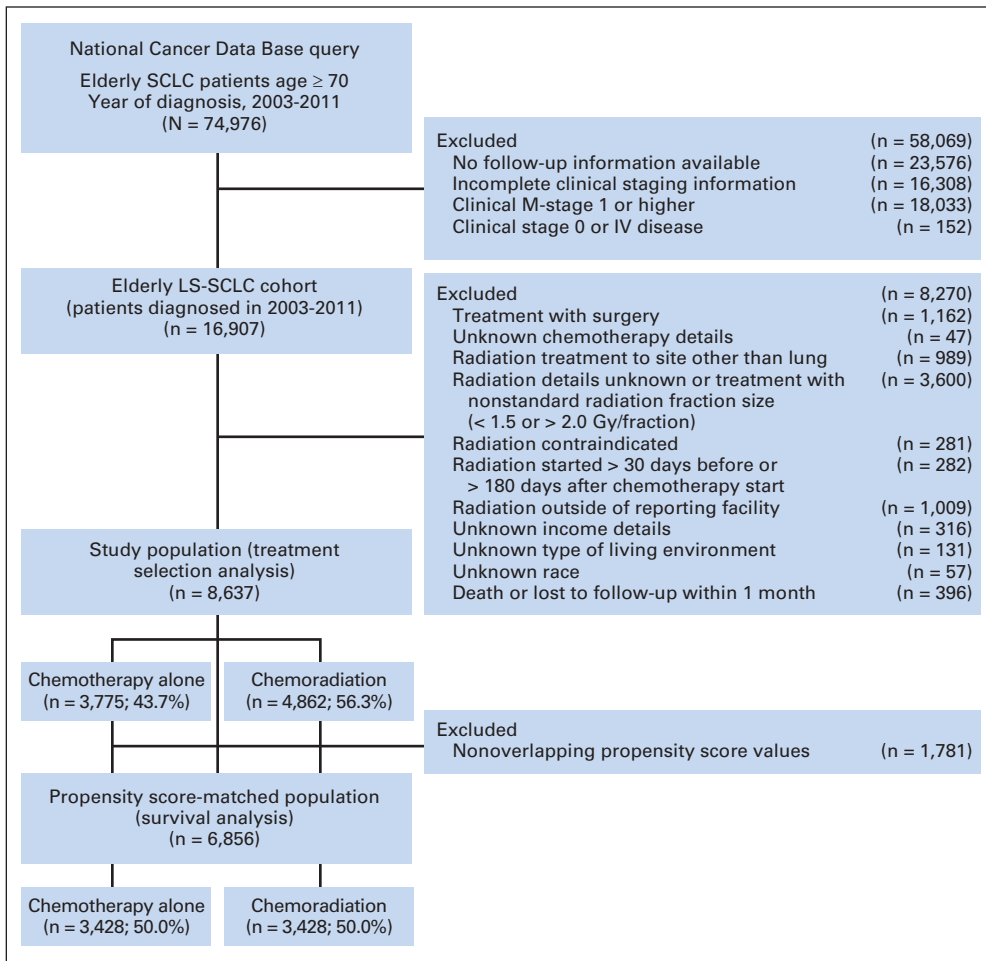
### INTRODUCTION

Lung cancer remains the leading cause of cancer-related mortality in the United States.<sup>1</sup> Small-cell lung cancer (SCLC) represents approximately 15% of new lung cancer diagnoses each year.<sup>2</sup> Of those, nearly 45% of patients are older than age 70 years and 10% are older than age 80 years, suggesting that a substantial portion of this patient population is elderly.<sup>3</sup>

In healthy patients with limited-stage SCLC (LS-SCLC), the standard treatment approach consists of combined chemoradiotherapy (CRT).<sup>4</sup> Two meta-analyses published in 1992 showed that the

addition of thoracic radiotherapy (RT) to chemotherapy (CT) improved survival in patients with LS-SCLC.<sup>5,6</sup> However, the Pignon et al<sup>5</sup> study suggested that the survival benefit from RT was limited to younger patients. In the subset of patients age 70 years or older, which represented a minority of patients in randomized trials, there was a trend toward a survival detriment for CRT versus CT alone.<sup>5</sup> Furthermore, it has been shown that intensive treatment is associated with significantly more toxicity in elderly patients without a survival benefit.<sup>7</sup>

No randomized phase III studies are available comparing CRT to CT alone in the elderly population with LS-SCLC. It is unclear whether modern



**Fig 1.** Study flow diagram. LS-SCLC, limited-stage small-cell lung cancer; SCLC, small-cell lung cancer.

CT and RT regimens may decrease the toxicity of combined CRT in elderly patients compared with historical data. In this study, we used a large national database to test the hypothesis that elderly patients benefit from modern CRT relative to CT alone. We also sought to examine the impact of RT timing on outcomes in elderly patients receiving CRT.

**PATIENTS AND METHODS**

**Data Source**

We conducted a population-based retrospective analysis using the National Cancer Data Base (NCDB), which is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The NCDB integrates cancer registry records from more than 1,500 accredited hospitals and captures approximately 70% of newly diagnosed cancers in the United States.<sup>8</sup> Variables recorded in the database include patient demographics, stage, and the first course of therapy, which is defined as all treatments administered to the patient before disease progression or recurrence. Details of anatomic treatment location, dose, number of fractions, and radiation technique are recorded, but details regarding CT drug names, dose, treatment duration, and performance status are not. The American College of Surgeons and the Commission on Cancer have not verified the data and are not responsible for either the analytic or statistical methodology used or the conclusions drawn from these data by investigators. This study was granted an exemption by the Yale Human Investigation Committee.

**Study Cohort**

Records for elderly patients (age ≥ 70 years) diagnosed with SCLC between 2003 and 2011 were obtained from the NCDB participant user file. Inclusion and exclusion criteria are summarized in Figure 1. We identified patients with LS-SCLC, which we defined as clinical stage I to III disease (cT0-T4, cN0-N3, cM0) to approximate the historical definition of LS-SCLC.<sup>9</sup> Patients with incomplete staging or treatment details were excluded. We included only patients receiving CT or CRT. Patients treated with surgery or those who began RT more than 30 days before or more than 180 days after the start of CT were excluded. No constraints were placed on total radiation dose in an effort to include patients who could not complete their course of radiation. However, patients receiving nonstandard dose fractionation regimens (< 1.5 Gy per fraction or > 2.0 Gy per fraction) were excluded to remove patients with miscoded radiation details as well as patients treated with palliative intent. We were unable to account for the use of prophylactic cranial irradiation in our study because the NCDB captures only the primary course of radiation. Patients with unknown sociodemographic factors were excluded to create a fully analyzable cohort of patients with complete data records for regression analysis because some of these factors were significant on univariable analysis. Finally, only patients with survival and follow-up greater than 30 days were included to limit the influence of mortality before treatment, as well as immortal time bias (ITB) in the CRT group.<sup>10</sup> Patients were stratified as receiving CT versus CRT. Those receiving CRT were further subdivided into concurrent versus sequential treatment. Concurrent CRT was defined as starting RT 30 days before to 60 days after CT began.

## Variables

Patient, tumor, and treatment information was dichotomized when possible. For example, patients were dichotomized as white or nonwhite or having an estimated median income greater than or less than \$48,000. Age was dichotomized as younger than 80 or  $\geq 80$  years. Insurance was dichotomized as private or nonprivate. Comorbidity information was derived from the Charlson-Deyo variation of the Charlson comorbidity index and dichotomized as 0 or  $\geq 1$  (representing any medical comorbidities).<sup>11</sup> The facility type was dichotomized as academic or nonacademic, which includes community cancer programs and comprehensive community cancer programs. Distance to the reporting facility was evaluated as a dichotomous variable split at the median cohort value.

## Statistical Analysis

Categorical variables were compared by using  $\chi^2$  tests, and continuous variables were compared by using independent sample *t* tests.

Treatment selection was evaluated by using a bootstrapped multivariable hierarchical mixed-effects logistic regression model that accounted for clustering of treatment patterns based on facility.<sup>12</sup> Variables were included in the regression analysis if they were found to be associated with treatment selection ( $P < .10$ ) on univariable analysis.

In the comparative survival analysis, the primary end point was overall survival (OS), which was defined as the time from diagnosis to death. The Kaplan-Meier method and log-rank test were used to determine OS, and a bootstrapped Cox proportional hazards model was used to determine significant contributors to differences in OS. The proportional hazards assumption was checked graphically by using log-log survival plots. Variables were included in the multivariable analysis only if found to be associated with survival ( $P < .10$ ) on univariable analysis. A sensitivity analysis was performed excluding patients who died within 3 months of diagnosis to address potential ITB.<sup>10</sup> Subset analyses were performed on the unmatched cohort. The first compared the entire CRT cohort to a subset of patients receiving CT in whom RT was recommended by the treating physician but was not delivered. This was performed to isolate a group of patients who were presumably well enough to undergo CRT but were unable or unwilling to be treated. Additional subset analyses examined outcomes in patients age  $\geq 80$  years and in patients with a Charlson-Deyo comorbidity score of 2.

Propensity score matching was performed with one-to-one nearest-neighbor matching without replacement to identify matched cohorts representing the two treatment modalities. Matching was performed by using variables found to be independent predictors of OS on multivariable analysis. Covariate balance was evaluated by using standardized differences of means.<sup>13</sup> Cox proportional hazards regression models were used to determine significant contributors to OS in the matched cohort, adjusting for propensity quintile.<sup>14</sup>

To assess whether radiation sequence had an impact on survival in the population receiving CRT, cohorts of patients receiving either concurrent or sequential treatment were compared. Patients with survival less than 4 months were excluded as part of a conditional survival analysis to address ITB associated with patients receiving sequential treatment. The Kaplan-Meier method was used to determine OS. We conducted a sensitivity analysis in which the survival cutoff was adjusted to 3, 6, and 12 months to evaluate the impact of its definition on the results. All analyses were performed by using STATA SE 13.1 (STATA, College Station, TX).

## RESULTS

### Study Cohort Characteristics

We identified 8,637 elderly patients with LS-SCLC who were treated with CT or CRT between 2003 and 2011. Median follow-up was 5.1 years. Clinical and demographic characteristics are provided in Table 1. Overall, 3,775 patients (43.7%) received CT and 4,862 patients (56.3%) received CRT. The median age was 75 years. Patients receiving CT were slightly older (median age, 76 v 75 years;  $P < .001$ ) and more likely to be female (55.4% v 52.2%;  $P = .003$ ). Patients

**Table 1.** Baseline Demographics and Clinical Characteristics for Patients Treated With CT or CRT

Characteristic	CT (n = 3,775)		CRT (n = 4,862)		P
	No.	%	No.	%	
Age at diagnosis, years					< .001
Median	76		75		
IQR	73-80		72-78		
$\geq 80$	1,057	28.0	872	18.0	< .001
Male	1,683	44.6	2,323	47.8	.003
White	3,489	92.4	4,451	91.6	.138
Charlson-Deyo score					< .001
0	1,950	51.7	2,975	61.2	
$\geq 1$	1,825	48.3	1,887	38.8	
Great circle distance, miles					.03
Median	7.6		7.5		
IQR	3.6-18.8		3.5-18.1		
Clinical stage					< .001
I	471	12.5	773	15.9	
II	359	9.5	550	11.3	
III	2,945	78.0	3,539	72.8	
Clinical T stage					< .001
0-2	1,879	49.8	3,160	65.0	
3-4	1,896	50.2	1,702	35.0	
Clinical N stage					.322
0	802	21.3	1,076	22.1	
1-3	2,973	78.8	3,786	77.9	
Income $\geq$ \$48,000	1,985	52.6	2,442	50.2	.030
Facility type					.294
Academic	800	21.2	1,076	22.1	
Nonacademic	2,975	78.8	3,786	77.9	
Insurance type					.402
Private	360	9.5	490	10.1	
Nonprivate	3,415	90.5	4,372	89.9	
Urban population	2,495	66.1	2,936	60.4	< .001
Chemotherapy type					
Undocumented	333	8.8	296	6.1	< .001
Single agent	179	4.5	130	2.7	
Multiagent	3,263	86.4	4,436	91.2	
Time between CT and RT, days					
Median			21		
IQR			0-56		
Radiation dose, Gy					
Median			59.4		
IQR			50.4-61.2		

Abbreviations: CRT, chemoradiotherapy; CT, chemotherapy; IQR, interquartile range; RT, radiotherapy.

receiving CT also had higher overall clinical stage (78.0% v 72.8% stage III;  $P < .001$ ), were more likely to have medical comorbidities (48.3% v 38.8%;  $P < .001$ ), had higher estimated median household income (52.6% v 50.2% income  $\geq$  \$48,000;  $P = .03$ ), and were more likely to live in an urban setting (66.1% v 60.4%;  $P < .001$ ) compared with those receiving CRT. There was no difference between the two groups in race, facility type, insurance status, or the percentage of patients living farther than 7.6 miles (cohort median) from the treating facility.

The majority of patients in both treatment groups received multiagent CT, although the proportion was higher in patients receiving CRT (91.2% v 86.4%;  $P < .001$ ). The median dose of radiation in the CRT cohort was 59.4 Gy (interquartile range [IQR], 50.4 to 61.2 Gy). The median delay from the start of CT to the start of RT treatments

**Table 2.** Multivariable Analysis of Predictors of Treatment With CRT

Variable	Multivariable Analysis		
	OR	95% CI	P
Age (≥ 80 v < 80 years)	0.52	0.45 to 0.59	< .001
Sex (female v male)	0.88	0.79 to 0.97	.015
Charlson-Deyo score (≥ 1 v 0)	0.60	0.54 to 0.67	< .001
Clinical stage			
II v I	NS		
III v I	0.68	0.59 to 0.80	< .001
Income (≥ \$48,000 v < \$48,000)	NS		
Urban population	NS		
Random effect variance			
Treatment facility	1.16	1.08 to 1.25	

NOTE. Odds ratios (ORs) are reported on multivariable analysis only if they remained significant.  
Abbreviations: CRT, chemoradiotherapy; NS, not significant.

was 21 days (IQR, 0 to 56 days). No information was available regarding the frequency of radiation treatments per day, but only 6.8% of CRT patients received a dose of 45 Gy in 1.5 Gy fractions, whereas 75.9% received more than 45 Gy in 1.8 to 2 Gy fractions.

**Factors Affecting Treatment Selection**

Treatment selection was associated with both clinical and socioeconomic factors (Table 2). The odds of receiving CRT decreased with increasing age, clinical stage III disease, female sex, and the presence of comorbidities on multivariable mixed-effects logistic regression. Income and urban population, which were significant on univariable analysis, did not remain independently associated with treatment selection on multivariable analysis. A significant random effect related to treatment patterns at individual facilities was also evident (intraclass correlation, 26.1%; 95% CI, 24.8% to 27.5%).

**Survival Outcomes**

Factors associated with improved OS on univariable analysis included receipt of CRT, age younger than 80 years, female sex,

Charlson-Deyo score 0, clinical stage I disease, and receipt of non-single-agent CT. All factors significant on univariable analysis remained independently associated with improved OS on multivariable analysis (Table 3). Receipt of CRT had the strongest association with OS on multivariable analysis (hazard ratio, 0.52; 95% CI, 0.49 to 0.54; P < .001). The results were not changed when clustering by facility type was included in the regression analysis or when shared frailty was incorporated.

In the entire cohort, median OS was estimated to be 15.6 months (95% CI, 15.2 to 16.2 months) for patients receiving CRT and 9.3 months (95% CI, 9.0 to 9.6 months) for patients receiving CT (log-rank P < .001; Fig 2A). Three-year OS was 22.0% (95% CI, 20.8% to 23.3%) for patients receiving CRT and 6.3% (95% CI, 5.5% to 7.1%) for patients receiving CT. A sensitivity analysis excluding patients who died within 3 months of diagnosis confirmed a survival benefit with CRT (log-rank P < .001; (Appendix Fig A1, online only). In addition, we found no change in the result when the inclusion criteria for RT timing was adjusted from 30 days before the start of CT to 14 days on sensitivity analysis.

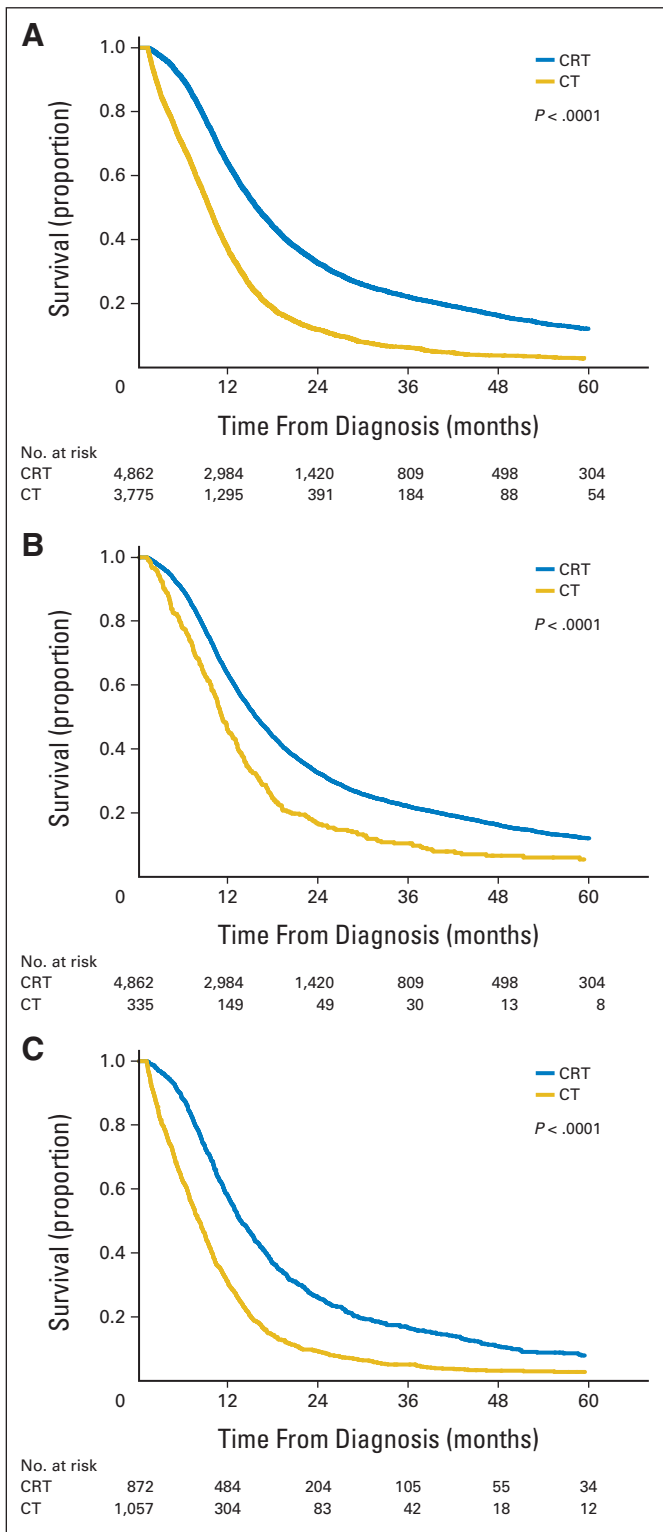
We performed a subset analysis restricting the CT cohort to patients for whom RT was explicitly recommended but not delivered in an effort to reduce selection bias. This reduced the cohort from 3,775 patients to 335 (8.9% of the original cohort). The patients who were excluded lacked useful information about why RT was not delivered. A survival benefit for CRT persisted on log-rank analysis (P < .001; Fig 2B). Median OS and 3-year OS were 15.6 months and 22.0% (unchanged) for patients receiving CRT. Median OS was 11.0 months (95% CI, 10.4 to 12.3 months) for patients receiving CT and 3-year OS was 10.6% (95% CI, 7.4% to 14.3%).

When the cohort was limited to patients older than 80 years, we identified 1,057 patients who received CT and 872 patients who received CRT. On log-rank analysis, the survival benefit with CRT persisted (P < .001). Median OS was 13.6 months (95% CI, 12.8 to 14.8 months) for patients receiving CRT and 8.1 months (95% CI, 7.5 to 8.6 months) for patients receiving CT. The 3-year OS rate among this subset was 16.4% (95% CI, 13.9% to 19.1%) for patients receiving

**Table 3.** Univariable and Multivariable Analyses of Predictors of OS

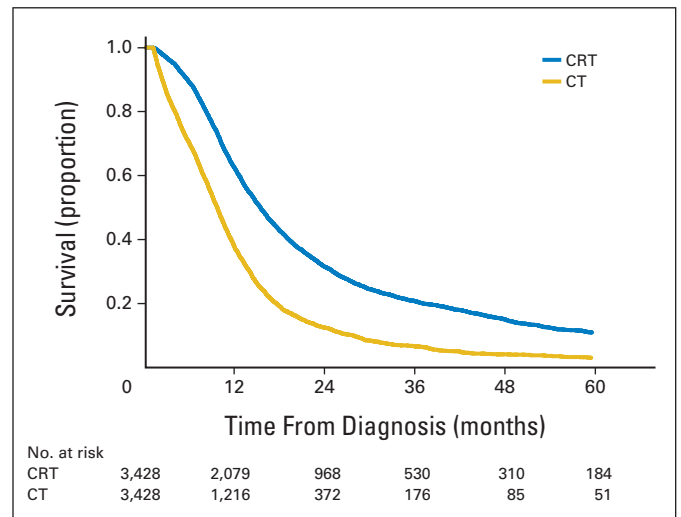
Variable	Univariable Analysis			Multivariable Analysis		
	HR	95% CI	P	HR	95% CI	P
CRT v CT	0.50	0.47 to 0.52	< .001	0.52	0.49 to 0.54	< .001
Age (≥ 80 v < 80 years)	1.34	1.27 to 1.41	< .001	1.25	1.18 to 1.33	< .001
Sex (female v male)	0.86	0.82 to 0.90	< .001	0.83	0.79 to 0.87	< .001
Race/ethnicity (white v nonwhite)	0.93	0.86 to 1.01	.09			
Charlson-Deyo score (≥ 1 v 0)	1.26	1.21 to 1.32	< .001	1.23	1.17 to 1.29	< .001
Distance ≥ 7.6 miles	0.99	0.95 to 1.03	.63			
Clinical stage						
II v I	1.22	1.11 to 1.34	< .001	1.21	1.11 to 1.32	< .001
III v I	1.61	1.50 to 1.72	< .001	1.60	1.50 to 1.71	< .001
Income (≥ \$48,000 v < \$48,000)	0.97	0.93 to 1.02	.22			
Facility type (nonacademic v academic)	0.99	0.94 to 1.05	.83			
Insurance type (nonprivate v private)	1.01	0.94 to 1.09	.76			
Urban population	1.03	0.99 to 1.08	.18			
CT type						
Single agent v undocumented	1.28	1.11 to 1.47	.001	1.25	1.07 to 1.46	.006
Multiagent v undocumented	0.96	0.88 to 1.05	.43	0.99	0.90 to 1.09	.89

Abbreviations: CRT, chemoradiotherapy; CT, chemotherapy; HR, hazard ratio.



**Fig 2.** Kaplan-Meier curves comparing overall survival by chemotherapy (CT) versus chemoradiotherapy (CRT) treatment regimens in the unmatched (A) overall cohort, (B) limited subset of CT patients for whom radiation was recommended but not delivered, and (C) subset of patients age  $\geq$  80 years.

CRT and 5.2% (95% CI, 3.9% to 6.8%) for patients receiving CT (Fig 2C). We similarly found an OS benefit with CRT in the subset of patients with multiple medical comorbidities (Charlson-Deyo score



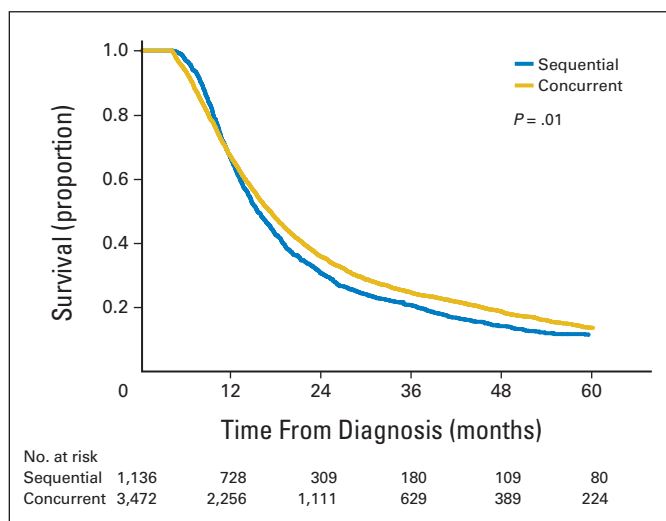
**Fig 3.** Kaplan-Meier overall survival stratified by treatment regimen for propensity score-matched cohort. CRT, chemoradiotherapy; CT, chemotherapy.

of 2) with an improvement in both median and 3-year OS (log-rank  $P < .001$ ; Appendix Fig A2, online only). An OS benefit was observed in patients with cN0 disease and in those with cN1-3 disease (log-rank  $P < .001$  for both). There was no difference in OS in patients treated with RT to a dose of 45 Gy in 1.5 Gy fractions when compared with patients treated in 1.8 to 2.0 Gy fractions to a dose  $\geq$  60 Gy (log-rank  $P = .20$ ). Both regimens improved survival when compared with CT (log-rank  $P < .001$ ).

Propensity score matching produced a cohort of 6,856 patients, which was well-matched on all factors found to be significantly associated with OS on multivariable Cox proportional hazards regression (Appendix Table A1, online only). Propensity score matching confirmed a survival benefit of CRT over CT (hazard ratio, 0.52; 95% CI, 0.50 to 0.55;  $P < .001$ ). Three-year OS was 20.6% (95% CI, 19.2% to 22.1%) for the matched CRT group and 6.6% (95% CI, 5.7% to 7.5%) for the CT group (Fig 3).

### Radiation Sequence Analysis

We identified 4,362 patients receiving CRT with survival of at least 4 months after diagnosis who were included in this analysis. Of those, 3,472 (79.4%) received concurrent treatment and 1,136 (25.7%) received sequential treatment. The median delay from the start of CT to the start of RT treatments was 9 days (IQR, 0 to 27 days) in the concurrent group and 106 days (IQR, 82 to 138 days) in the sequential group. Comparison of OS between concurrent and sequential CRT revealed a modest survival benefit for concurrent treatment (median OS, 17.0 months; 95% CI, 16.3 to 17.6 months) over sequential treatment (median OS, 15.4 months; 95% CI, 14.6 to 16.3 months; log-rank  $P = .01$ ). The 3-year OS rate was 24.2% (95% CI, 22.7% to 25.7%) for concurrent treatment and 20.3% (95% CI, 17.9% to 22.8%) for sequential treatment (Fig 4). The curves cross at 12 months, which violates the proportional hazards assumption; therefore, Cox regression could not be performed. Sensitivity analysis found a significant benefit to concurrent treatment when the survival threshold was set at 3, 6, or 12 months ( $P < .05$ ).



**Fig 4.** Kaplan-Meier overall survival analysis stratified by sequential or concurrent chemoradiotherapy.

## DISCUSSION

This analysis is the largest of its kind to examine outcomes associated with the use of CRT and CT in elderly patients with LS-SCLC. Our results demonstrate a significant improvement in OS with CRT compared with CT alone (15.7% absolute 3-year OS benefit) in elderly patients with SCLC, an effect that persists in the subset of patients older than age 80 years and in those with medical comorbidities. This is a sizable difference, considering that in the subset of patients younger than age 55 years in the Pignon et al<sup>5</sup> meta-analysis, the 3-year OS benefit was 8.2%. In the absence of randomized clinical evidence, these data provide confirmation that CRT should be considered standard therapy for appropriately selected elderly patients. In addition, we found a modest, but significant, long-term benefit (3.9% 3-year OS benefit) for patients receiving concurrent treatment when compared with sequential treatment. The curves cross approximately 1 year after diagnosis, suggesting that patients who are able to tolerate the acute effects of concurrent treatment are most likely to benefit from more intensive therapy.

The question of how to approach treatment of elderly patients with LS-SCLC has long been a topic of investigation. In the Pignon et al<sup>5</sup> meta-analysis, the absolute survival benefit was confined to patients younger than age 55 years. This observation is derived from trials that were included in the meta-analysis, most of which concluded enrollment before 1990, predating modern conformal RT techniques and improvements in supportive care.<sup>5,15-22</sup> The elderly cohort was a relatively small population (199 patients of 2,103), in part because more than half the studies excluded patients older than age 70 to 80 years. In addition, nearly all of the studies used three or more CRT agents, which are generally considered to be more toxic than the standard platin doublet regimens used today.

Considering the lack of OS benefit observed in the meta-analysis for elderly patients receiving CRT, there has been concern over increased toxicity with combined-modality therapy in this population. More recent studies have examined treatment-related toxicity in el-

derly patients with LS-SCLC receiving CRT and have generally shown equivalent survival rates when compared with those in younger patients, despite slightly higher rates of toxicity.<sup>23,24</sup> Other investigators have achieved some success in decreasing toxicity while maintaining favorable outcomes in elderly patients by reducing treatment intensity.<sup>25-27</sup>

Our study, which includes data on more than 8,500 patients, demonstrates that CRT appears to provide superior OS compared with CT alone in appropriately selected elderly patients. The large survival benefit is likely a result of decreased toxicity associated with modern RT and CT regimens as well as advancements in supportive care. Current treatment guidelines for patients with LS-SCLC in the United States recommend that patients with a good performance score (0 to 2) should undergo four to six cycles of multiagent CT plus local thoracic RT initiated early (with cycle 1 or 2) and additional prophylactic cranial irradiation in patients who respond to treatment.<sup>4</sup> Our findings support the notion that all elderly patients should be considered for concurrent CRT as the primary intervention, with deviation from this regimen based on patient-specific factors such as poor performance status or significant medical comorbidity.

A limitation of this study lies in the selection bias inherent in retrospective studies. Although our methods incorporated propensity score matching and adjustment for multiple sources of bias including age and comorbidity, it has been previously demonstrated that there is little correlation between comorbidity and functional assessment in elderly patients.<sup>28</sup> It is likely that unmeasured covariates played a large role in the selection of patients for CT or CRT. We attempted to diminish the impact of this bias by performing multiple subset analyses including one in which the CT group was confined to those for whom RT was recommended but not delivered, which showed similar results. It is important to acknowledge that this study supports that clinical judgment regarding the suitability of elderly patients for CRT should continue to play a role in the selection of appropriate therapy.

In conclusion, our findings suggest that elderly patients who are candidates to receive CT should be strongly considered for CRT, which appears to confer a large additional OS advantage beyond that achieved with CT alone. Treatment decisions in elderly patients with LS-SCLC should be based on patient-specific criteria, and elderly age alone should not be a contraindication for multimodality treatment.

## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Disclosures provided by the authors are available with this article at [www.jco.org](http://www.jco.org).

## AUTHOR CONTRIBUTIONS

**Conception and design:** Christopher D. Corso, Roy H. Decker

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**Data analysis and interpretation:** Christopher D. Corso, Charles E. Rutter, Henry S. Park, Nataniel H. Lester-Coll, Anthony W. Kim, Lynn D. Wilson, Zain A. Husain, Rogerio C. Lilienbaum, James B. Yu, Roy H. Decker

**Manuscript writing:** All authors

**Final approval of manuscript:** All authors

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### Role of Chemoradiotherapy in Elderly Patients With Limited-Stage Small-Cell Lung Cancer

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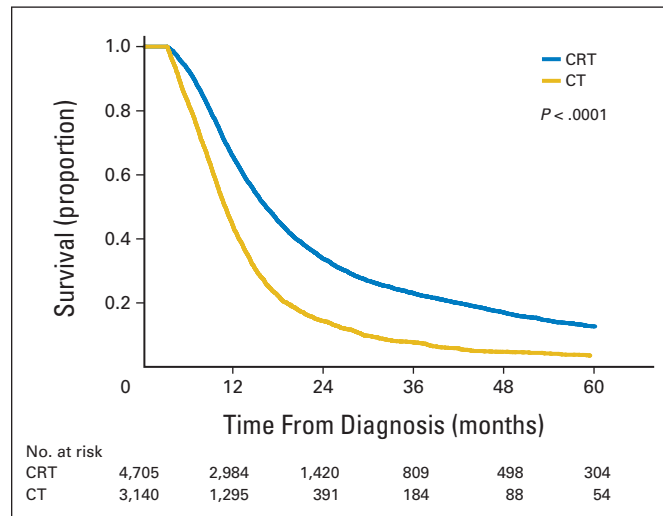
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**Appendix**

**Table A1.** Propensity Score–Matched Characteristics for Patients Treated With CT Alone or CRT

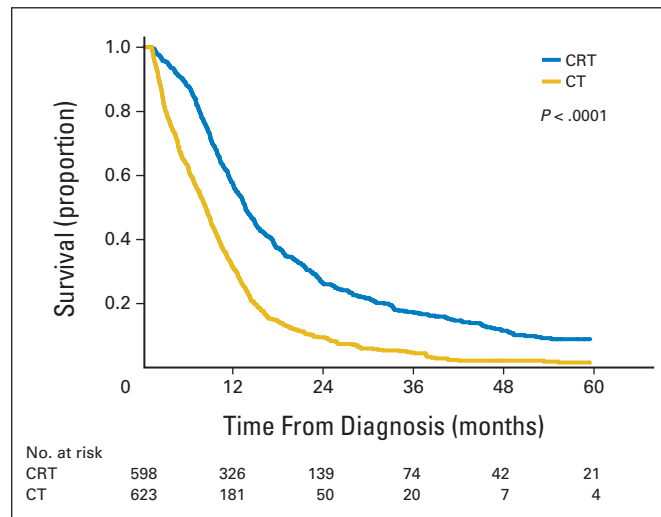
Characteristic	CT Alone (n = 3,428)		CRT (n = 3,428)		Absolute Standardized % Bias Across Covariates	P*
	No.	%	No.	%		
Age ≥ 80 years	772	22.5	771	22.5	0.1	.98
Male	1,451	42.3	1,482	43.2	1.8	.45
Charlson-Deyo score					1.9	.44
0	1,891	55.2	1,859	54.2		
≥ 1	1,537	44.8	1,569	45.8		
Clinical stage					1.3	.57
I	457	13.3	460	13.4		
II	325	9.5	352	10.3		
III	2,646	77.2	2,616	76.3		
CT type					3.9	.10
Undocumented	237	6.9	265	7.7		
Single agent	99	2.9	117	3.4		
Multiagent	3,092	90.2	3,046	88.9		

Abbreviations: CRT, chemoradiotherapy; CT, chemotherapy.  
\*t test.



**Fig A1.** Kaplan-Meier overall survival stratified by treatment regimen with 3-month conditional survival analysis. CRT, chemoradiotherapy; CT, chemotherapy.

### CRT in Elderly Patients With LS-SCLC



**Fig A2.** Kaplan-Meier curves comparing overall survival by chemotherapy (CT) versus chemoradiotherapy (CRT) treatment regimen in patients with Charlson-Deyo comorbidity score of 2 (multiple comorbidities).