Prevalence of Poor Performance Status in Lung Cancer Patients

Implications for Research

Rogerio C. Lilenbaum, MD, John Cashy, PhD,† Thomas A. Hensing, MD,†‡ Susan Young, PhD,†‡ and David Cella, PhD†‡*

Introduction: Performance status (PS) is a standard functional classification in oncology research and practice. However, despite its widespread use, little is known about the prevalence of poor PS in lung cancer patients, in relation to other cancers, based on the assessments of health care providers and patients.

Methods: Data from two quality of life studies were pooled for analysis. Analyses were performed on the subset of patients with lung cancer (n = 503) from the entire population of cancer patients (n = 2885). The prevalence of poor PS (defined as PS = 2–4 on a 0–4 scale) was determined for lung cancer patients.

Results: Prevalence of poor PS among lung cancer patients was 34% when estimated by providers and 48% when estimated by patients themselves. Agreement between providers and patients was only fair (weighted [*kappa*] = 0.41). For both advanced and early stage disease, lung cancer patients were at the highest risk for poor PS compared with other common cancers.

Conclusions: The prevalence of poor PS is quite high in lung cancer patients. Providers tend to underestimate poor PS. Specific clinical trials and treatment guidelines for this patient population are urgently needed.

Key Words: Poor performance status, Lung cancer.

(*J Thorac Oncol.* 2008;3: 125–129)

Assessment of performance status (PS) in cancer patients provides prognostic information and guides treatment intervention.[1–6] PS scores are based on a patient's ability to perform daily activities and are designed to provide a measure of impairment as a function of tumor burden. Two main PS scales are routinely used in oncology: Karnofsky (KPS) and Eastern Cooperative Oncology Group (ECOG PS). The KPS ranges from 0 to 100, in 10-point increments, to define 11 different PS levels from dead (0) to fully normal functioning (100). ECOG PS has six levels ranging from 0 (fully ambulatory without symptoms) to 5 (dead). Typically patients with an ECOG PS of 0 and 1 (or KPS 80, 90, and 100) are labeled as having "good" PS for clinical research purposes, whereas those patients with ECOG PS of 2, 3, and 4 are often ineligible for major clinical trials.

Several issues regarding PS in cancer patients need further clarification. First, the prevalence of poor PS in lung cancer patients remains unknown. Reporting of PS is not routinely included in patient records or required by cancer registries. Estimates from clinical trials consistently underestimate the prevalence of poor PS patients in clinical practice.[7–10] Second, studies have shown discordance between the PS assigned by oncologists compared with the PS provided by the patients themselves.[8,9,11,12] Assuming that patients are better judges of their own health status, this discrepancy further compounds the difficulties of using PS as a reliable prognostic indicator or as a selection factor for participation in clinical trials. Third, PS can be affected by cancer-related symptoms or by preexisting comorbid conditions.[13] Although it may be helpful to divide patients into those whose PS is compromised primarily by cancer from those whose PS is compromised by concomitant illnesses, this is not routinely performed in clinical practice or in research studies.

Based on this background, the current analysis was undertaken to: (1) determine the prevalence of poor PS in patients with lung cancer; and (2) evaluate the concordance between provider-rated and patient-rated PS.

PATIENTS AND METHODS

Two large databases were pooled for these analyses. Both studies were conducted after obtaining approval from institutional review boards. Both studies included survey results from outpatients and inpatients at the participating institutions. The first database, "BIOQOL" (Bilingual Intercultural Oncology Quality of Life) is from a study conducted between 1994 and 1996. Participating institutions included: Rush-Presbyterian Medical Center, Chicago, IL; Cook County Hospital, Chicago, IL; San Juan Oncology, San Juan, PR; San Juan VA, San Juan, PR; San Juan City Hospital, San Juan, PR; Grady Memorial Minority Community Clinical Oncology Pro-

*Thoracic Oncology Program, Mount Sinai Cancer Center, Miami Beach, Florida; †Evanston Northwestern Healthcare, Evanston, Illinois; and ‡Northwestern University Feinberg School of Medicine, Chicago, Illinois.

Disclosure: The authors declare no conflict of interest.

Address for correspondence: Rogerio Lilenbaum, MD, Mount Sinai Cancer Center, 4306 Alton Road, Miami Beach, FL 33140. E-mail: Rlilenba@msmc.com

ISSN: 1556-0864/08/0302-0125

gram, Atlanta, GA; and Emory University, Atlanta, GA. This study evaluated the impact of language, culture, and literacy upon QOL of patients with cancer and HIV disease.

The Q-score database contains data collected in 1995 and 1996 from Rush-Presbyterian Medical Center, Chicago, IL; Northwestern University Medical School, Chicago, IL; Johns Hopkins University Medical Center, Baltimore, MD; Fox Chase Cancer Center, Philadelphia, PA; and the Medical College of Ohio, Toledo, OH. These sites participated in a project to evaluate the comparability of four widely used cancer QOL questionnaires: The Cancer Rehabilitation and Evaluation System,[14] European Organization for Research and Treatment of Cancer QOL Questionnaire—Core 30,[15] The Functional Assessment of Cancer Therapy-General (FACT-G),[16] and Medical Outcomes Study Short Form 36.[17]

The combined sample size consisted of 3329 patients. Patients with HIV disease (n = 444) were excluded, leaving a pooled cancer sample of 2885 patients. A separate set of analyses was completed on the subset of patients with lung cancer (n = 503).

In both source studies, health care providers and patients independently completed identical versions of the ECOG PS scale (0 = "normal activity," 1 = "some symptoms, but no bed rest during daytime," 2 = "bed rest for less than 50% of daytime," 3 = "bed rest for more than 50% of daytime," 4 = "unable to get out of bed"). Concordance between providers and patients was determined based on the respective responses to the completed ECOG PS scale. Poor PS was defined as a rating of 2, 3, or 4.

TABLE 1. Baseline Characteristics of All Patients and Lung Cancer Patients in the Combined BIOQOL/Q

	All Patients (n = 2885)	Lung Cancer Patients (n = 503)
Gender (%)		
Male	46	58
Female	54	42
Age, yr (mean)	57.4	60.2
Diagnosis (%)		
Breast cancer	27.9	—
Colon cancer	15.2	—
Head and neck cancer	14.2	—
Lung cancer	17.4	100
Non-Hodgkin's lymphoma	5.5	—
Hodgkin's disease	0.6	—
Prostate cancer	7.1	—
Other	10.6	—
Unknown primary	<1	—
Race (%)		
White, non-Hispanic	57	53
Black	22	26
Hispanic	19	21
Other	2	<0.5
Inpatient (%)	17	20
Current treatments (%)		
Radiation	18	23
Chemotherapy	41	46
Hormone therapy	12	3

BIOQOL, bilingual intercultural oncology quality of life.

RESULTS

Demographic data are summarized in Table 1. There were a similar number of men and women in the cancer cohort, and the majority of patients (83%) were treated as outpatients. Just over half the patients were whites (57%), with the remainder being either African American (22%) or Hispanic (19%). Twenty-eight percent of patients had a diagnosis of breast cancer, followed in order by cancer of the colon, head and neck, lung, lymphatic system, and prostate. Baseline demographics of lung cancer patients were similar to the overall dataset, except for a slightly higher proportion of men and older patients. Nearly 20% of lung cancer patients were treated as inpatients and nearly half were receiving chemotherapy when the assessment was taken.

Prevalence of Poor PS

Among all patients with cancer, the majority was classified as having a good PS (0 of 1), whether assessed by the patient (61%) or the provider (78%). The second most prevalent group consisted of patients with PS2: 28% as assessed by patients and 15% by the provider, with the remainder of patients having PS3 and 4. In patients with lung cancer, a similar pattern was observed, but the prevalence of poor performance status was higher overall (Table 2). Nearly half of the lung cancer patients (48%) rated their PS as poor (versus 39% in the overall population). Based on providers, one-third (34%) of lung cancer patients had poor PS versus 22% in the overall population. The prevalence of PS3 was similar between patient and providers (10% and 14%, respectively). The prevalence of PS 4 was low in all groups, with the greater prevalence seen in lung cancer patients' self-assessments (3%).

We investigated the prevalence of poor PS in relationship to age and gender and found no significant correlation (data not shown). Data on other variables, such as stage and specific tumor type, were not always available and could not be correlated. Likewise, follow-up data on these patients was not uniformly available and an association with tolerance to treatment or overall survival could not be obtained.

Provider:Patient Concordance

Fewer than half of the PS ratings provided by patient and providers agreed with one another: 47% of overall sample and 43% of lung cancer sample. Adjusting for chance agreement, and weighting close disagreement more than distant disagreement, the weighted [*kappa*] coefficient ranged from 0.39 to 0.41, considered to be in the "fair" range (Table 3). When patients and providers disagreed about performance status, it was far more likely to be in the direction of provider underestimation of impairment (39% underestimation versus 14% overestimation).

In an attempt to investigate factors that can lead to discordance in PS assessments, we divided patients into three groups based on agreement between patients and providers, worse PS by patients, and worse PS by providers. All three

TABLE 2. Patient-Rated and Provider-Rated ECOG PS, Lung Cancer Patients (n = 503)[a]

Patient-Reported ECOG PS	Provider-Reported ECOG PS						
	0	1	2	3	4	Total	
0	59	38	6	4	0	107	(22.0)
1	43	77	21	2	0	146	(30.0)
2	16	69	53	20	2	163	(33.5)
3	2	19	25	22	1	70	(14.4)
4	0	3	1	7	3	15	(3.1)
Total	121	207	106	55	6		
	(24.4)	(41.8)	(21.4)	(11.1)	(1.2)		

All values inside parentheses indicate percentages.
[a] Eight patients were missing patient-rated PS, two patients were missing provider rated PS.
ECOG PS, Eastern Cooperative Oncology Group Performance Status.

TABLE 3. Provider:Patient Concordance on Performance Status Rating[a]

	All Patients (n = 2837)	Lung Cancer Patients (n = 493)
Agreement	47%	43%
Provider underestimate	39%	38%
Provider overestimate	14%	19%
Test of symmetry	S(10) = 39.7[b]	S(10) = 53.3[b]
Kappa	0.26	0.24
Weighted kappa	0.41	0.39

[a] Because of missing data on 48 patients, total sample for these comparisons was 2837.
[b] $p < 0.0001$.

groups were similar with respect to age and gender. When analyzed by FACT scores, as a surrogate for baseline disease characteristics, we found no significant correlation with respect to discordance.

Relative Risk of Poor PS

The relative risk of having poor PS by tumor type and stage was also determined. Both provider and patient ratings were evaluated. Because they had the lowest risk of poor PS, patients with localized breast cancer were set as the reference group for these analyses. Using this cohort as the benchmark, the risk of having poor PS was calculated for other tumor types using both patient and provider ratings of PS. We required at least 100 per patient cohort to include it in the analysis (this excluded 12 patients with localized lymphoma). All studied groups had a higher risk of poor PS compared with patients with localized breast cancer. That risk was about five-fold in advanced lung cancer patients and almost three-fold in localized lung cancer using patient-rated PS (Figure 1). When considering provider-rated PS, the risk of poor PS in advanced lung cancer was almost 12 times that of localized breast cancer; whereas for localized lung cancer it was about was about six times that of localized breast cancer.

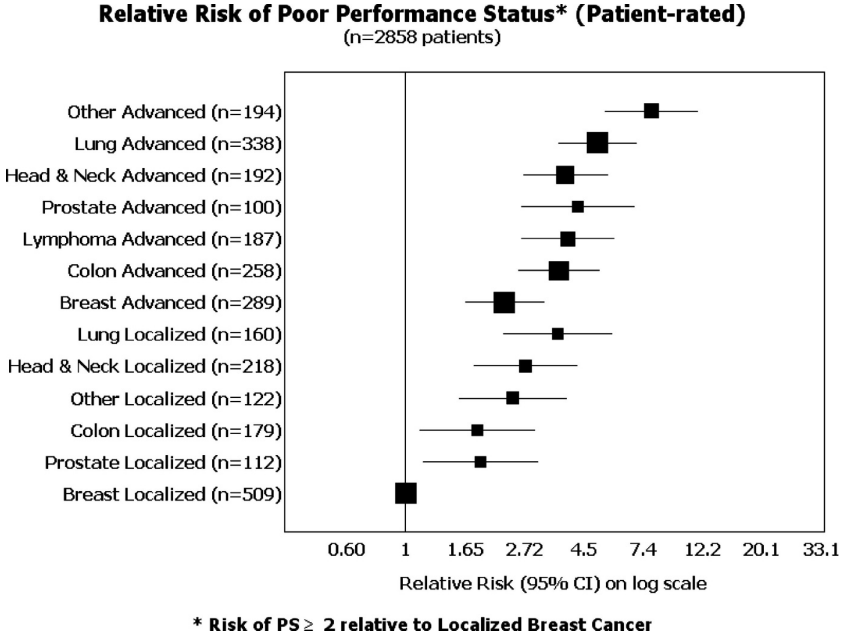

FIGURE 1. Comparison of relative risk of poor performance status (patient rated) by tumor type and stage.

DISCUSSION

To our knowledge, this is the first attempt to prospectively determine the prevalence of poor PS in lung cancer patients in the United States. Because these patients are not routinely enrolled in clinical trials, and information about PS is missing from cancer evaluation forms, the magnitude of this issue in the management of lung cancer patients has been underestimated. We have found that poor PS is rather prevalent among patients with cancer. Nearly 2 of every 5 cancer patients (39%) in this study of 2885 patients rated their PS as poor (i.e., ECOG 2, 3, or 4). The risk of poor PS was greatest for patients with advanced disease, particularly those with advanced lung cancer. Half the patients with lung cancer, regardless of stage, rated their PS as poor (49%), whereas 34% of their providers did the same. These estimates are similar to other published data on the prevalence of poor PS in lung cancer patients. In a longitudinal study of 536 lung cancer patients, Buccheri and colleagues found that 50% were rated ECOG PS 2, 3, or 4 by their providers at diagnosis.[12] Radzikowska and colleagues evaluated PS in patients with lung cancer using a large (n = 20,561) population-based registry in Poland.[18] They found that approximately 30% of patients had an ECOG PS rating of 2, and another 12% had a rating of 3 or 4, making the prevalence of poor PS 42% in their patient population.

Our data show that the concordance between patient PS assessments and provider assessments is only fair. Using the patient data, the incidence of poor PS across all tumor types may be as high as 39%; however, using the provider data, the rate is only 22%. Patient and provider ratings matched in less than half the cases; when there was not agreement, it was usually that patients reported their PS as poorer than did their providers. For the subset of lung cancer patients, the rate of over and underestimation by providers compared with patients was similarly high. We were not able to identify specific factors that lead to under- or overestimation of the PS based on our data. Several reasons have been proposed to explain this discrepancy, including underreporting of symptoms by patients to enable more aggressive treatment; failure on the part of the physician to be more specific about PS; or dismissal of non–cancer-related causes of PS impairment. Ando and colleagues compared interobserver agreement on PS ratings as assessed by 206 patients with NSCLC, their nurses, and their oncologists in a prospective study.[11] Oncologists assessed 71% of the patients as having a good PS, but only 59% of patients assessed their PS as good (p = 0.007). Nurses were also more optimistic in their assessments than were patients, and there were no significant differences in the assessments between nurses and oncologists. On the other hand, survival in this cohort was better correlated with the oncologist-assessed PS rather than the patient's self-assessment. This observation suggests that oncologists may take into consideration other factors besides the patient's PS on their assessment of overall prognosis. In addition, an inherent selection bias may be present. Insofar as treatment decisions are based on the oncologist-assessed PS, a patient with a self-assessed PS2 may receive more aggressive treatment if assessed as PS1 by the oncologist, which may, in turn, lead to improved survival.

A study by Blagden and colleagues compared PS assessments between oncologists and patients with cancer before confirmation of the cancer diagnosis.[9] Patients with a suspected diagnosis of lung cancer (n = 101) assessed their own PS at the first clinic visit while waiting to be seen by the oncologist. Oncologists performed a blinded assessment of PS, and a research nurse collected the data and monitored outcomes. Although agreement on PS was observed in only 50% of the cases, both patient-assessed and oncologist-assessed PS correlated with survival in Cox regression models.

Our data have limitations. Approximately 20% of lung cancer patients were hospitalized and nearly 50% were undergoing chemotherapy at the time their PS was assessed. Although this most likely contributed to lower the PS of the group as a whole, our figures are in conformity with the other studies referenced above. Furthermore, this reflects a less selected and arguably a more realistic pool of lung cancer patients seen in clinical practice rather than outpatients who are not receiving active treatment. Second, we do not have survival data and therefore cannot correlate PS with outcome, as other studies have done. An analysis of disease-related symptoms and PS, based on the same database, has been recently published and showed a direct correlation between symptoms and worsening PS.[19] Last, we did not have access to comorbidity data. Recent reports indicate that a high comorbidity index may contribute to a poor PS and may have an independent impact on overall outcome.[20,21] This is the subject of ongoing investigations.

In summary, a significant percentage of patients in oncology practice presents with a poor PS. The risk of poor PS is greatest for lung cancer patients, particularly those with advanced disease. Determining PS is subjective and varies between the patient and provider. The implications of these findings for clinical research and clinical practice are manifold. First, we propose that PS ratings be incorporated into the initial patients' assessments, and recorded in the patient's standard staging form, as currently mandated by tumor registries. Like stage, PS is strongly correlated with prognosis, and access to this information would be invaluable for clinical and research purposes. Second, patients should also provide a measure of their performance status. This would allow physicians and nurses to gain more insight into their patients' sense of well-being, which may have implications for management. Third, a more standardized PS scale, perhaps less variable and less subjective, and above all more reproducible, would be an important contribution. Last, a substantial percentage of patients with lung cancer are currently not being captured into research studies and dedicated clinical trials in patients with poor PS are urgently needed.

ACKNOWLEDGMENTS

Supported, in part, by grants from the National Cancer Institute (CA; CA61679 and CA 60068) and an unrestricted grant from Cell Therapeutics, Inc.

REFERENCES

1. Blazeby JM, Brookes ST, Alderson D. Prognostic value of quality of life scores in patients with oesophageal cancer. *Br J Surg* 2000;87:362–373.

2. Butow PN, Coates AS, Dunn SM. Psychosocial predictors of survival in metastatic melanoma. *J Clin Oncol* 1999;17:2256–2263.
3. Ganz PA, Lee JJ, Siau J. Quality of life assessment. An independent prognostic variable for survival in lung cancer. *Cancer* 1991;67:3131–3135.
4. Llobera J, Esteva M, Rifa J, et al. Terminal cancer: duration and prediction of survival time. *Eur J Cancer* 2000;36:2036–2043.
5. Ruckdeschel J, Piantadosi S. Quality of life in lung cancer surgical adjuvant trials. *Chest* 1994;106:324S–328S.
6. Stanley K. Prognostic factors for survival in patients with inoperable lung cancer. *J Natl Cancer Inst* 1980;65:25–32.
7. Kramer JA, Curran D, Piccart M, et al. Identification and interpretation of clinical and quality of life prognostic factors for survival and response to treatment in first-line chemotherapy in advanced breast cancer. *Eur J Cancer* 2000;36:1498–1506.
8. Loprinzi CL, Laurie JA, Wieand HS, et al. Prospective evaluation of prognostic variables from patient-completed questionnaires. North Central Cancer Treatment Group. *J Clin Oncol* 1994;12:601–607.
9. Blagden SP, Charman SC, Sharples LD, et al. Performance status score: do patients and their oncologists agree? *Br J Cancer* 2003;89:1022–1027.
10. Webster K, Cella D, Chang C-H, et al. Unique contributions of patient and provider performance status ratings (PSR) in oncology (Abstract 1592). *Qual Lif Res* 2002;9:293.
11. Ando M, Ando Y, Hasegawa Y, et al. Prognostic value of performance status assessed by patients themselves, nurses, and oncologists in advanced non-small cell lung cancer. *Br J Cancer* 2001;85:1634–1639.
12. Buccheri G, Ferrigno D, Tamburini M. Karnofsky and ECOG performance status scoring in lung cancer: a prospective, longitudinal study of 536 patients from a single institution. *Eur J Cancer* 1996;32A:1135–1141.
13. Chang VT, Hwang SS, Feuerman M, et al. Symptom and quality of life survey of medical oncology patients at a veterans affairs medical center: a role for symptom assessment. *Cancer* 2000;88:1175–1183.
14. Schag C, Ganz P, Wing D, et al. Quality of life in adult survivors of lung, colon, and prostate cancer. *Qual Lif Res* 1994;3:127–141.
15. Aaronson NK, Ahmedzai S, Bergman B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;85:365–376.
16. Cella DF, Tulsky DS, Gray G, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *J Clin Oncol* 1993;11:570–579.
17. Ware J, Kosinski M, Keller S. SF-36 Physical and Mental Health Summary Scales: A User's Manual. Boston: The Health Institute, New England Medical Center, 1994.
18. Radzikowska E, Glaz P, Roszkowski K. Lung cancer in women: age, smoking, histology, performance status, stage, initial treatment and survival. Population-based study of 20 561 cases. *Ann Oncol* 2002;13:1087–1093.
19. Cella D, Wagner L, Cashy J, et al. Should health-related quality of life be measured in cancer symptom management clinical trials? Lessons learned using the Functional Assessment of Cancer Therapy (FACT). *JNCI. Monographs* 2007(37):53–60; doi: 10.1093/jncimonographs/lgm009.
20. Asmis TR, Ding K, Whitehead M, et al. Are age and comorbidity independent prognostic factors in the treatment of metastatic NSCLC? A review of prospectively randomized National Cancer Institute of Canada Clinical Trials Group (NCI CTG) trials. *Lung Cancer* 2005;49(suppl 2):S85.
21. Wymenga M, Biesma B, Vincent A, et al. Can baseline geriatric assessment (CGA) predict toxicity in elderly non-small cell lung cancer (NSCLC) patients receiving combination chemotherapy? Results from the first 100 pts in the prospective multicenter NVALT-3 study. *J Clin Oncol* 2007;25(18S):7537.

