

Relationship Between Cancer Patients' Predictions of Prognosis and Their Treatment Preferences

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Context.—Previous studies have documented that cancer patients tend to overestimate the probability of long-term survival. If patient preferences about the trade-offs between the risks and benefits associated with alternative treatment strategies are based on inaccurate perceptions of prognosis, then treatment choices may not reflect each patient's true values.

Objective.—To test the hypothesis that among terminally ill cancer patients an accurate understanding of prognosis is associated with a preference for therapy that focuses on comfort over attempts at life extension.

Design.—Prospective cohort study.

Setting.—Five teaching hospitals in the United States.

Patients.—A total of 917 adults hospitalized with stage III or IV non-small cell lung cancer or colon cancer metastatic to liver in phases 1 and 2 of the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT).

Main Outcome Measures.—Proportion of patients favoring life-extending therapy over therapy focusing on relief of pain and discomfort, patient and physician estimates of the probability of 6-month survival, and actual 6-month survival.

Results.—Patients who thought they were going to live for at least 6 months were more likely (odds ratio [OR], 2.6; 95% confidence interval [CI], 1.8-3.7) to favor life-extending therapy over comfort care compared with patients who thought there was at least a 10% chance that they would not live 6 months. This OR was highest (8.5; 95% CI, 3.0-24.0) among patients who estimated their 6-month survival probability at greater than 90% but whose physicians estimated it at 10% or less. Patients overestimated their chances of surviving 6 months, while physicians estimated prognosis quite accurately. Patients who preferred life-extending therapy were more likely to undergo aggressive treatment, but controlling for known prognostic factors, their 6-month survival was no better.

Conclusions.—Patients with metastatic colon and lung cancer overestimate their survival probabilities and these estimates may influence their preferences about medical therapies.

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MOST METASTATIC solid tumors, including lung and colon cancer, are incurable and life expectancy is short. Cancer patients and their physicians are often faced with a fundamental choice between cancer-directed therapy and supportive care that emphasizes symptom management rather than control of the underlying disease. Even in incurable solid tumors, cancer-directed therapy may prolong average life expectancy by several months and palliate symptoms in some but is often associated with treatment-related toxic effects. There is substantial variability in the choices that are made about these alternatives. For example, among patients diagnosed as having metastatic colon cancer in 1990, 42% received chemotherapy as a component of their treatment, while 58% did not.¹

For editorial comment see p 1746.

We believe that patient preferences should drive choices between alternative therapies, especially when life expectancy varies little and quality-of-life considerations are prominent. Cancer patients' ability to participate in making decisions about their care may be limited by several factors, however. Some patients may be too ill or too overwhelmed emotionally to play a major role in establishing the goals of therapy. Among those who wish to participate, potential barriers include lack of physician support for patient decision making, insufficient patient knowledge of the likely outcomes of their disease, and lack of information concerning the effect of alternative strategies on outcomes. Several studies have documented that cancer patients' understanding of their prognosis is imperfect and that they tend to overestimate the probability of long-term survival.²⁻⁶ For example, in 1 survey of patients with metastatic cancer, 37 believed that treatment would cure them

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and 60% thought that it would control their metastatic disease.⁵

Patients' preferences for care reflect their values, their understanding of their illness, and their understanding of the risks and benefits associated with treatment choices.⁷⁻¹⁰ Studies of cancer patients' values regarding trade-offs between quality and quantity of life have shown substantial interpatient variability.¹¹⁻¹³ If patients do not understand their prognoses accurately, then their decisions about trade-offs between treatment choices may not reflect their true values.

We examined the relationship between cancer patients' estimates of their prognosis and their life-support and treatment preferences. The objectives of the analysis were to determine (1) whether patients' prognostic estimates were independent predictors of their treatment choice, (2) whether patients' prognostic estimates were concordant with their physicians' estimates, (3) whether patients' or physicians' estimates were more accurate, and (4) whether patients' treatment preferences influenced their medical outcomes.

METHODS

Study Population

Patients enrolled in phases 1 and 2 of the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT) were eligible for the study. Although the study included hospitalized patients with any of 9 different diagnoses, only data pertaining to patients with non-small cell lung cancer and colon cancer will be presented in this report. A full description of the SUPPORT project objectives and methods has been published previously.¹⁴

Phase 1 was a prospective observational study that described the process of decision making and patient outcomes. Phase 2 was a cluster-randomized, controlled clinical trial to test the effect of an intervention in which physicians were provided with information about both prognosis and patient preferences and in which a nurse attempted to facilitate communication to enhance decision making. Enrollment, data collection, and interviewing were virtually identical during the 2 phases.¹⁵ Phase 1 enrolled patients from June 1989 through June 1991, and phase 2 enrolled patients from January 1992 through January 1994. Patients were enrolled at the time of hospitalization at 1 of 5 medical centers (Beth Israel Hospital, Boston, Mass; Duke University Medical Center, Durham, NC; Metro-Health Medical Center, Cleveland, Ohio; St Joseph's Hospital/Marshfield Clinic, Marshfield, Wis; and University of California, Los Angeles, Medical Center. No

differences in any of 5 outcome measures (timing of do not resuscitate orders, patient and physician agreement on preferences regarding resuscitation, days spent in the intensive care unit while in coma or receiving mechanical ventilation, frequency and severity of pain, and hospital resource use) were found between phases 1 and 2.¹⁵ Therefore, in the analyses presented herein, patients from the 2 phases are pooled in a single sample.

To be eligible for the diagnostic category of non-small cell lung cancer, patients were required to be hospitalized with non-small cell lung cancer, stage III or IV. To be eligible for the diagnostic category of colon cancer, they were required to be hospitalized with colon cancer metastatic to the liver. Patients whose conditions had been newly diagnosed (within 1 month) and who were hospitalized for the first time since diagnosis, as well as patients who had been hospitalized for reasons unrelated to their cancer, were ineligible. Patients were excluded from enrollment in SUPPORT if they were non-English speaking, had a planned admission of less than 72 hours, were pregnant, or had died or been discharged from the hospital within 48 hours of study entry.

All study patients were asked to identify a surrogate decision maker, whom patients "would want to help [their] doctor[s] make a decision about [their] medical care if [they] were too ill to do so." For patients who were unable to designate a surrogate, the physician and/or next of kin was asked to name a surrogate. Physicians interviewed were those identified by admission records as the responsible physician and were confirmed by physician interview to be the individual having primary responsibility for that patient's care.

Data Collection

Data were gathered prospectively by chart review, patient interview, and surrogate interview. An attempt was always made to interview the surrogate even if patient data were complete. Chart reviews were performed by trained research nurses, while interviews were performed by trained interviewers. Data collected by chart review included in this analysis were insurance, disease type, disease stage, time from cancer diagnosis, number of readmissions to the study hospital, resuscitations attempted, and death while receiving ventilatory assistance.

Data collected by patient and/or surrogate interview included demographics (age, sex, race, education, income); global quality of life (rated on a single-item scale from 0-100); activities of daily living (ADL) using a modified Katz ADL scale^{16,17}; patient's estimates of the probability of

2- and 6-month survival; and patient's preference for receiving life-extending treatment. Regarding their prognoses, patients were specifically asked, "What are the chances that you will live for 2 months or more if the current plan of care stays the same?" and "How about 6 months or more?" Patients were asked to choose from the following responses: "90% or better," "about 75%," "about 50-50," "about 25%," "10% or less," or "don't know." Regarding treatment preferences, they were specifically asked, "If you had to make a choice at this time, would you prefer a course of treatment that focuses on extending life as much as possible, even if it means having more pain and discomfort, or would you want a plan of care that focuses on relieving pain and discomfort, even if that means not living as long?" Response options were "extend life as much as possible," "relieve pain or discomfort as much as possible," and "don't know."

Information obtained by physician interview included physician estimates for the patient's likelihood of survival at 6 months. This question was asked prior to providing any computer-based prognostic information to physicians in phase 2. Physicians were asked to respond with a number ranging from 0% to 100% to the question "What is the probability that this patient will live for 6 months or more?"

Statistical Methods

Bivariable analysis and a logistic regression model were used to test the relationship between patient-prognostic estimates and their treatment preferences. The fit of a logistic regression model was assessed by the Hosmer-Lemeshow goodness-of-fit test.¹⁸ A secondary analysis with stratification by the physician-prognostic estimates was performed. Physician-prognostic estimates were measured as a continuous variable. For purposes of comparison with patients, these estimates were grouped into 5 categories similar to those available to the patients ($\geq 90\%$, 61%-89%, 40%-60%, 11%-39%, and 10%). Correlation coefficients for patient estimate vs physician estimate of 6-month survival did not differ between categorized and continuous physician-prognostic variables, so only the results of the analyses using categorized estimates are reported herein.

The accuracy of patient and physician estimates of the probability of the patients' being alive at 6 months were compared using receiver operating characteristic (ROC) curves.¹⁹ In this technique, the discrimination of a test or prediction is assessed by plotting the sensitivity of the test (the true-positive rate) against 1 minus the specificity (the false-positive rate). The points on the ROC curve are generated by calculat-

ing the sensitivity and specificity of the test or prediction at various criteria of positivity. The greater the area under the curve (on a scale of 0.5-1), the better the discrimination of the test or prediction. The sensitivity of the patients' estimates at a criterion of positivity of 90%, for example, represented, among patients who lived 6 months or more, the ratio of the number who estimated their probability of being alive at 6 months at 90% or higher to the total number of patients in the subset. The specificity of the "test" at this criterion of positivity represented, among patients who lived less than 6 months, the ratio of the number of patients who estimated their probability of being alive at 6 months at less than 90% to the total number of patients in this subset.

The degree of correlation between patient and physician prognostic estimates was evaluated with a τ -b statistic.²⁰ Bivariable analysis and a logistic regression model were used to test the relationship between patients' treatment preferences and their 6-month survival. The relationship between treatment preference and occurrence of adverse events was evaluated with a τ^2 statistic.

When information on income, education, functional status, or quality of life was not available, we substituted surrogate reports, calibrated to patient response or imputed values using methods described previously.²¹

Only patients for whom patient or surrogate prognostic estimates were available were included in the analysis (n=917, 63% of otherwise eligible subjects). For some patients, data on perceived prognosis were not available because they were cognitively impaired, intubated, or otherwise too ill to participate in the interview. All analyses involving patient estimates of prognoses were performed on 2 data sets. The first data set included only those patients who provided an estimate of the probability of their being alive at 6 months (n=546). In the second data set (n=917), when patient estimates were missing but a surrogate estimate of the probability of being alive at 6 months was available, this value, adjusted in accordance with the observed relationship between surrogate and patient estimates in the group for whom both variables were present, was used to replace missing values (n=271). When a surrogate estimate of the probability of the patient's being alive at 6 months was not available, the patient's estimate of the probability of the patient's being alive at 2 months, cubed, was used in place of the missing value (n=33). (The 6-month probability of being alive would equal the cube of the 2-month probability of being alive if the hazard function were constant.) For the remaining patients used in this analysis,

Table 1.—Characteristics of Study Patients*

Characteristics	Patients, No. (%)	
	Included in Analysis (n = 917)	Excluded: No Prognostic Estimate Available (n = 542)
Mean age, y	62	63
Race		
White	771 (84)	451 (83)
Black	100 (11)	67 (12)
Hispanic	23 (3)	9 (2)
Other	23 (3)	10 (2)
Unavailable	0 (0)	5 (1)
Male	567 (62)	312 (58)
Insurance		
Private	420 (46)	242 (45)
Medicare	388 (42)	237 (44)
Medicaid/none	109 (12)	63 (12)
Annual income†		
<\$11 000	302 (33)	320 (59)
\$11 000-\$24 999	224 (24)	89 (16)
\$25 000-\$50 000	222 (24)	93 (17)
>\$50 000	169 (18)	40 (7)
Mean years of education†	12.4	11.9
Disease type		
Colon cancer metastatic to liver†	362 (39)	158 (29)
Non-small cell lung cancer†	555 (61)	384 (71)
Stage IIIA	38 (7)	24 (6)
Stage IIIB	59 (11)	47 (12)
Stage IV	397 (72)	278 (72)
Stage unavailable	61 (11)	35 (9)
Duration of cancer diagnosis, mo		
≤6 months	452 (49)	281 (52)
>6 months	415 (45)	233 (43)
Unavailable	50 (5)	28 (5)
Mean quality-of-life score*‡	3.35	3.78
Mean No. of activities of daily living impairments†	1.1	1.8
Alive at 6 mo†	417 (45)	207 (38)

*Data are presented as number (percent) of patients unless otherwise indicated.

† $P < .05$.

‡On a scale from 1 to 5, where 1 is excellent and 5 is poor.

only a surrogate estimate of the probability of being alive at 2 months was available, and this value cubed was used in place of the missing value (n=67). There were no meaningful differences between the 2 data sets in any of the analyses; therefore, only the results from the second data set are reported here.

RESULTS

Patient Characteristics

The characteristics of all eligible subjects are shown in Table 1. The average age of study patients was 62 years. Most (84%) were white, and 62% were male. Thirty-nine percent of the patients had metastatic colon cancer and 61% had lung cancer, most of which were stage IV. At 6 months of follow-up, 500 (55%) of the 917 patients had died. Characteristics of patients not included in the analysis because data on their 6-month survival estimates were not available proved to be similar to study patients except that a higher proportion had non-small cell lung cancer and their 6-month survival was poorer. These patients also

had slightly lower incomes, fewer years of education, and poorer scores on quality-of-life and ADL scales. Characteristics of patients for whom data on preferences for life-extending therapy were missing (34%) were similar to patients for whom this information was available, although they were also more likely to have non-small cell lung cancer, their mean age was 1 year higher, and they had slightly poorer 6-month survival, lower incomes, and poorer scores on quality-of-life and ADL scales.

Preferences

The distribution of patient 6-month survival estimates and their preferences for life-extending therapy and actual survival stratified by their prognostic estimates are shown in Table 2. Because there were relatively few patients in each category below 75%, patient-estimated prognosis at 6 months was treated as a dichotomous variable ($\geq 90\%$ vs $< 90\%$) in analyses of the relationship between survival estimates and preference for life-extending therapy

Table 2.—Patient Treatment Preferences and Survival by Their 6-Month Survival Estimates (n = 917)

Patient Estimate of Chances for 6-mo Survival, %	No. of Patients (% of Total)	Proportion of Patients Favoring Life-extending Therapy* (% of Row)	No. of Patients Alive at 6 mo (% of Row)
≥90	543 (59)	198/390 (51)	314/543 (58)
≈75	238 (26)	37/128 (29)	74/238 (31)
≈50	96 (11)	16/56 (29)	20/96 (21)
≈25	18 (2)	4/13 (31)	6/18 (33)
≤10	22 (2)	4/19 (21)	3/22 (14)

*Preference for life-extending therapy data were missing from 311 patients.

Table 3.—Relationship Between Patients' Estimates of Their 6-Month Survival and Their Preference for Life-Extending Therapy*

Physician Estimate of Chances for 6-mo Survival, %	Patient Estimate of Chances for 6-mo Survival, %	Proportion of Patients Favoring Life-Extending Therapy	Odds Ratio (95% CI)†
≥90	≥90	20/36	0.83 (0.12-5.6)
	<90	3/5	
61-89	≥90	34/66	2.6 (0.81-8.0)
	<90	5/17	
40-60	≥90	58/130	1.7 (0.90-3.2)
	<90	21/65	
11-39	≥90	31/54	3.5 (1.6-7.8)
	<90	15/54	
≤10	≥90	23/38	8.5 (3.0-24.0)
	<90	7/46	
Total	≥90	198/390	2.6 (1.8-3.7)
	<90	61/216	

*Of the 917 patients in the analytic sample, 311 had missing data on preference for life-extending therapy, and 95 additional patients had missing data for physician estimate of 6-month survival; therefore, these patients are not included in rows 1-5 and the "n" for these rows is 511 (917 - 311 - 95). Because the "Total" row is not stratified by physician estimate of survival, these 95 patients are included in that row, resulting in an "n" of 606 (511 + 95).

†The increase in odds ratio with decreasing physician estimate of 6-month survival is statistically significant ($P = .02$). CI indicates confidence interval.

(Table 3). In unadjusted analyses, the patients who estimated their probability of being alive at 6 months to be 90% or better were more likely to favor life-extending therapy (odds ratio [OR], 2.6; 95% confidence interval [CI], 1.8-3.7) (Table 3). The OR for this comparison was unchanged in logistic regression models that examined the need to adjust for age, sex, race, education, income, insurance, disease site and stage, time since diagnosis, functional status, and global quality of life (Hosmer-Lemeshow $P = .54$ for final model). A statistically significant relationship between patient-prognostic estimates and treatment preferences was observed in both phase 1 and phase 2. In addition, no significant difference in patient preference or in the relationship between patient-prognostic estimates and preference was observed between intervention and control patients in phase 2.

Stratification of patients by physician estimate of survival demonstrated that the relationship between perceived prognosis and desire for life-extending therapy was particularly strong among patients whose physicians believed them to have a poor prognosis. For example, among patients whose physicians estimated a less than 10% probability of 6-month survival, the odds of patients who thought they had a 90% probability of 6-month survival choosing life-extending therapy were 8.5 times higher than those

of patients in this category who thought they had less than 90% probability of surviving 6 months (Table 3). The progressive increase in the OR for the relationship of self-perceived prognosis to desire for life-extending therapy with declining physician estimates of the probability of 6-month survival was statistically significant ($P = .02$).

Comparison of Patient and Physician Estimates of Survival

Patients were substantially more optimistic about their prognoses than their physicians were ($\tau\text{-}b = 0.29$) (Table 4). In 82% of physician-patient pairs, the patients' estimate of their chance of living 6 months was higher than the physicians'; in 59%, the patient estimate exceeded the physician estimate by 2 prognostic categories or more.

Patient- and Physician-Prognostic Estimate Accuracy Comparison

The percentage of patients actually surviving 6 months or more within each physician- and patient-prognostic category is shown in Table 5. Although patients who believed they had at least a 90% probability of surviving 6 months lived longer than patients who were less optimistic about their prognoses (Table 5), physician estimates were better calibrated than those of patients. The discrimination of physician and patient es-

timates of the probability of surviving 6 months were compared with ROC curves. Using this technique, physician estimates of survival were significantly more accurate than patient estimates, with ROC curve areas of 0.78 and 0.66, respectively ($P < .0001$).

Life-Extending Therapy Preference and Outcomes

The relationship between patient treatment preference and the occurrence of adverse events is shown in Table 6. Patients who preferred life-extending therapy were 1.6 (95% CI, 1.04-2.39) times more likely to experience a readmission to the hospital, an attempted resuscitation, or death while receiving ventilatory assistance (42/146 [29%]) than patients who preferred therapy directed at pain relief (29/159 [18%]) ($P = .03$). In bivariable analysis, patients who preferred life-extending therapy were more likely to be alive at 6 months ($P = .005$). However, in a logistic regression model that controlled for age, race, sex, education, income, insurance status, site and stage of disease, functional status, overall quality of life, and physician-prognostic estimates, there was no statistically significant difference in 6-month survival between those who favored life-extending therapy and those who did not (Hosmer-Lemeshow $P = .17$ for final model).

COMMENT

In a large cohort of terminally ill cancer patients, we found that how patients estimated their prognoses influenced their treatment preferences. Specifically, patients who believed that they would survive for at least 6 months favored life-extending therapy over comfort care at more than double the rate of those who believed that there was at least a small chance (as little as 10%) that they would not live 6 months. This association was most marked in patients who were optimistic about their probability of surviving 6 months despite physician estimates to the contrary. In addition, we found that patients greatly overestimated their chances of surviving 6 months, while physician-prognostic estimates were more accurate. Finally, we found that patients who expressed a preference for life-extending therapy were more likely to undergo aggressive treatment, but controlling for known prognostic factors, their 6-month survival was no better.

This study confirms the findings of a number of smaller case series showing that cancer patients tend to overestimate their prognoses.²⁻⁶ But it is the first to demonstrate that patients' beliefs about their prognoses are associated with their

Table 4.—Comparison of Patient and Physician Estimates of 6-month Survival (N = 776)*

Physician Estimate of Chances for 6-mo Survival, %	Patient Estimate of Chances for 6-mo Survival, %					Total
	≥90	75	50	25	≤10	
≥90	49	5	1	2	1	58
61-89	94	25	1	1	1	122
40-60	178	60	25	6	3	272
11-39	78	55	23	5	5	166
≤10	55	62	31	3	7	158
Total	454	207	81	17	17	776

*Of the 917 patients in the analytic sample, 141 had missing data on physician estimate of 6-month survival, resulting in an "n" for this table of 776 (917-141).

overall treatment preferences. One of the justifications that has been offered for withholding prognostic information from patients with a terminal disease is that, while promoting quality of life by maintaining hope, it will have little effect on medical choices.²² Our findings suggest that the most fundamental medical choice patients with incurable cancer face—the decision between life-extending therapy and comfort care—may be highly influenced by their understanding of their prognoses. These results are consistent with the empiric data demonstrating that patient preferences about resuscitation depend on the nature of the expected outcomes.^{23,28} Our findings take this work one step further by showing that a patient's preference about overall therapy goals is also associated with his or her perceived prognosis.

What are the implications of this study for patient care? One possible interpretation of the findings is that enhanced communication from physician to patient about prognosis could help patients make better-informed treatment decisions that are more consonant with their values. The observed relationship between patient preferences for life-extending therapy and their likelihood of experiencing aggressive therapy and adverse events suggests that this communication might also diminish patient suffering at the end of life. Our data suggest that these efforts might be particularly helpful in patients with poorer prognoses. Most importantly, we found that it is not necessary for patients to have a precise understanding of their prognoses to alter their treatment preferences. Study patients who simply understood that there was at least a 10% probability that they might not survive 6 months expressed substantially different treatment preferences from those who did not. This suggests that it may be quite possible both to maintain patient hope and to provide sufficient prognostic information so that patients would be able to make treatment decisions consistent with their underlying values.^{29,30}

One important lesson from phase 2 of SUPPORT is that an understanding of the sources of patients' beliefs, and pref-

erences, and of the processes by which they arrive at decisions about their care may be critical to designing interventions that are effective in changing end-of-life patterns of care and communication. Although our data provide compelling evidence that the cancer patients participating in this study did not have an accurate understanding of their prognoses, data were not collected that would allow us to identify what was driving these estimates. In particular, we do not know what sources of prognostic information patients used, how and whether physicians provided accurate prognostic estimates to patients, and why patients did not understand them or chose not to believe them. Analysis of the accuracy of patient-prognostic estimates in the SUPPORT cohort as a whole showed no association with study site, disease category, or whether patients were in the intensive care unit.³¹ This suggests that there may be pervasive and fundamental barriers to effective communication about prognosis among seriously ill patients that should be more fully investigated if effective interventions to address them are to be designed. Our findings with respect to influence of patient-prognostic estimates on their treatment preferences, and, in turn, of those preferences on actual patterns of care, highlight the critical importance of gaining a better understanding of the sources of these estimates.

Several limitations of this study design should be noted. First, because data on patient- or surrogate-perceived prognosis were available for only 63% of otherwise eligible study subjects, the results may not be generalizable to all patients with these incurable solid tumors. And although the patients for whom data on perceived prognosis or treatment preference were missing resembled those with complete data with respect to most sociodemographic and clinical variables, these patients did have slightly lower incomes, quality-of-life scores and ADL, and a higher proportion had lung cancer and died within 6 months of study enrollment. Questions asked of the terminally ill patients in this study are difficult ones and, despite considerable investment in

Table 5.—Percentage of Patients Surviving 6 Months or More by Patients' and Physicians' Estimates of 6-Month Survival Probabilities (N = 776)*

Estimated Probability of 6-mo Survival, %	Proportion (%) of Patients Surviving at 6 mo
Patients	
≥90	260/454 (57)
≈75	65/207 (31)
≈50	16/81 (20)
≈25	5/17 (30)
≤10	1/17 (6)
Physicians	
≥90	41/58 (71)
61-89	103/122 (84)
40-60	146/272 (54)
11-39	40/166 (24)
≤10	17/158 (11)

*Of the 917 patients in the analytic sample, 141 had missing data on physician estimate of 6-month survival, resulting in an "n" for this table of 776 (917 - 141).

Table 6.—Relationship Between Patient Treatment Preference and the Occurrence of Adverse Events (Phase 2 Patients Only)*

	No. (Row %)		Total
	No Adverse Event†	Adverse Event†	
Extend life	104 (71)	42 (29)	146 (48)
Relieve pain	130 (82)	29 (18)	159 (52)
Total	234 (77)	71 (23)	305 (100)

*There were 169 patients with missing data on treatment preference.

†Adverse events are defined as a readmission to the study hospital of at least 72 hours, 1 or more resuscitation attempts, or death while receiving ventilator assistance.

study procedures designed to minimize missing data, response rates were not ideal. We attempted to address this problem by including subjects for whom only surrogates' estimates of prognoses were available, and it was reassuring to find that this did not alter any of the findings of the study. But it is important to recognize that our results describe the beliefs and preferences of only those patients who were willing to share their views with the study team and should not be generalized to the entire population.

Generalizability is also limited by the fact that all patients participating in this study were hospitalized for treatment of their disease or disease-related complications at an academic medical center. The characteristics of hospitalized patients may differ in systematic ways from those of ambulatory patients. Furthermore, patients opting for care in an academic setting may be especially interested in obtaining state-of-the-art or aggressive therapy. Future studies in different settings would be valuable in elucidating the influence of these factors on the relationship between patient perception of prognosis and treatment preferences.

Finally, and most importantly, demonstration of an association between self-perceived prognosis and treatment preference does not prove a causal rela-

tionship. It is possible that the same personality traits or coping strategies that lead certain patients to cling to overly optimistic views of their prognoses may also lead those patients to opt for life-extending therapy. Although our multivariable analysis suggests that the association between self-perceived prognosis and treatment preference is not explained by sociodemographic, clinical, or quality-of-life variables, this does not prove causation.

The real value of this observational study is not that it provides definitive proof that improving cancer patients' understanding of their prognoses would enable them to make better decisions about their treatment. Rather, it is important preliminary evidence that could be used to justify an intervention study

to examine the issue. The potential costs of effectively educating incurable cancer patients about their prognoses might include the loss of hope and associated deleterious effect on quality of life. However, our data suggest that there may be real benefits as well, including treatment choices that are more consonant with patient preferences, which could lead to a diminished demand for aggressive, toxic interventions driven by unrealistic expectations. Furthermore, our findings indicate that physicians may be able to provide prognostic data that are sufficiently accurate to achieve these benefits.

The results of the phase 2 SUPPORT intervention trial demonstrated that providing prognostic information to physicians was not effective in changing the

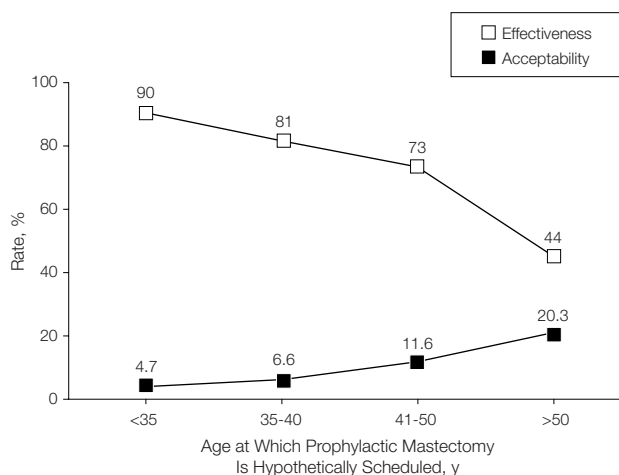
patterns of care of the seriously ill.¹⁵ The results of this analysis suggest that to achieve the goals of making care at the end of life consistent with patient values and minimizing futile therapy, we may need to change what physicians tell patients about their prognoses and be sure that patients hear and understand what their physicians have said. Meticulous care would be required to design an ethical and informative study of the impact educating cancer patients about prognosis has on a variety of outcomes. The potential benefit of such findings to patients, their families, and society could be substantial.

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Figure. Acceptability Reported by Patients and Computed Effectiveness of Prophylactic Mastectomy by Age at Surgery



The acceptability of prophylactic mastectomy to women potentially at risk was assessed prior to the first cancer genetic consultation. We plotted the rate at which women and physicians said surgery would be acceptable according to age at which the intervention is hypothetically scheduled. Effectiveness (Ef) of the strategy was computed using the following formula: $Ef = C (Dfw)$, where Dfw is the proportion of cancer-prone women still disease free who accept prophylactic mastectomy at a given age based on Breast Cancer Linkage Consortium penetrance data,³ and C is the efficacy of the intervention (90%) as given by Hartmann et al.²

phylactic mastectomy should be performed (FIGURE). Respondents' answers were not correlated with women's age at the time of the survey, their disease status, or their genetic risk. In contrast, the age at which surgery hypothetically would be scheduled was strongly associated with the acceptability of prophylactic mastectomy. Only 4.7% (22) of patients and 10.9% (76) of physicians found the surgical intervention acceptable in women younger than age 35 years.

Comment. Although prophylactic mastectomy may prolong life in women with a *BRCA1* or *BRCA2* mutation who accept the intervention, if the intervention is unacceptable to most women, particularly when suggested to women younger than 35 years, the age at which the benefit is expected to be the highest, prophylactic mastectomy is unlikely to have a substantial impact. The convergence of patient aversion, physician reluctance, and cautious institutional guidelines⁴ will likely make prophylactic mastectomy a rarely

performed procedure in France, even if other populations may find this strategy more acceptable.^{4,6}

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CORRECTION

Incorrect Wording: In the Original Contribution entitled "Relationship Between Cancer Patients' Predictions of Prognosis and Their Treatment Preferences," published in the June 3, 1998, issue of THE JOURNAL (1998;279:1709-1714), there was incorrect wording in a table. On page 1712, in Table 2, in the first row under the column "Proportion of Patients Favoring Life-Extending Therapy" the numbers that read "148/390" should have read "198/390." In the third row, under the column "Proportion of Patients Favoring Life-Extending Therapy" "16/50" should have read "16/56."