Palliative Chemotherapy or Radiation and Prognostic Understanding among Advanced Cancer Patients: The Role of Perceived Treatment Intent

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Abstract

Background: As patients' accurate understanding of their prognosis is essential for informed end-of-life planning, identifying associated factors is important.

Objective: We examine if receiving palliative chemotherapy or radiation, and the perception of those treatments as curative or noncurative, is associated with prognostic understanding.

Design: Cross-sectional analyses from a multisite, observational study.

Setting/Subjects: Patients with advanced cancers refractory to at least one chemotherapy regimen ($N=334$).

Measurements: In structured interviews, patients reported whether they were receiving chemotherapy or radiation, and whether its intent was curative or not. Their responses were categorized into three groups: patients not receiving chemotherapy/radiation (no cancer treatment group); patients receiving chemotherapy/radiation and misperceiving it as curative (treatment misperception group); and patients receiving chemotherapy/radiation and accurately perceiving it as noncurative (accurate treatment perception group). Patients also reported on various aspects of their prognostic understanding (e.g., life expectancy).

Results: Eighty-six percent of the sample was receiving chemotherapy or radiation; of those, 16.7% reported the purpose of treatment to be curative. The no-treatment group had higher prognostic understanding scores compared with the treatment misperception group (adjusted odds ratio [AOR] = 5.00, $p < 0.001$). However, the accurate treatment perception group had the highest prognostic understanding scores in comparison to the no-treatment group (AOR = 2.04, $p < 0.05$) and the treatment misperception group (AOR = 10.19, $p < 0.001$).

Conclusions: Depending on patient perceptions of curative intent, receipt of palliative chemotherapy or radiation is associated with better or worse prognostic understanding. Research should examine if enhancing patients' understanding of treatment intent can improve accurate prognostic expectations.

Keywords: goals of care; palliative chemotherapy; palliative radiation; prognostic awareness; prognostic understanding; treatment intent

Introduction

ADVANCED CANCER PATIENTS' accurate understanding of their prognosis is considered necessary for optimal, value-consistent, end-of-life planning and treatment decision

making.¹⁻³ However, a significant portion of dying cancer patients exhibit inaccurate understanding.⁴⁻⁷ Whether patients are receiving anticancer treatments such as palliative chemotherapy or radiation, and their perceptions of its curative potential, may be one set of factors associated with prognostic understanding.⁸⁻¹⁰

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Palliative chemotherapy and radiation (given with the intent to palliate symptoms and/or control, but not cure, the cancer) are often misperceived by patients as curative, which raises the concern that they may be associated with worse patient understanding and suboptimal end-of-life preparation and planning.^{10–13} In a national study of stage IV lung or colorectal cancer patients receiving chemotherapy, 81% of colorectal patients and 69% of lung cancer patients did not report accurate understanding that the chemotherapy was unlikely to cure their cancer.¹¹ In another study of cancer patients followed until death, patients receiving chemotherapy were found to have higher odds of receiving more aggressive care in the final week of life and late hospice referrals, and were less likely to die in their preferred place.¹² Similar results have been found with radiation therapy, with one study showing that 64% of incurable lung cancer patients did not have accurate beliefs about their treatment's curative potential.¹⁰

Some studies suggest that patients may rely on their chemotherapy or radiation treatment to maintain more optimistic expectations regarding their illness and their mortality.^{8,9,14} A qualitative study of small cell lung cancer patients and their communication with their doctors concluded that immediately after receiving the diagnosis, a focus on chemotherapy and its administration helped maintain optimism and avoid thinking about mortality.⁸ Another study examining the most influential factors on advanced breast cancer patients' decision to accept chemotherapy found preservation of hope as influencing their decisions.⁹

Taken together, these studies suggest that patients' receipt of palliative chemotherapy or radiation, and whether that treatment is perceived as curative or noncurative, may be associated with patients' prognostic understanding. To date, little research has examined such associations. To clarify how late-stage treatment relates to advanced cancer patients' prognostic understanding, we compared advanced cancer patients' prognostic understanding among three groups: (1) patients not receiving chemotherapy/radiation, (2) patients receiving chemotherapy/radiation and misperceiving it to be curative, and (3) patients receiving chemotherapy/radiation and correctly perceiving it to be noncurative.

Methods

Study sample

The study sample for the present investigation is composed of advanced cancer patients ($N = 334$) who participated in Coping with Cancer-II (CwC-II), a multisite observational cohort study conducted between 2010 and 2015 to examine racial and ethnic disparities in end-of-life cancer care. Participating sites included: Weill Cornell Medicine Meyer Cancer Center (New York, NY); Memorial Sloan Kettering Cancer Center (New York, NY); Dana-Farber/Harvard Cancer Center (Brigham and Women's Hospital, Dana-Farber Cancer Institute, and Massachusetts General Hospital, Boston, MA); Yale Cancer Center (New Haven, CT); Virginia Commonwealth University Massey Cancer Center (Richmond, VA); Simmons Comprehensive Cancer Center (Dallas, TX); Parkland Hospital (Dallas, TX); University of New Mexico Cancer Center (Albuquerque, NM); and Pomona Valley Hospital Medical Center (Pomona, CA). Institutional Review Boards at all participating sites approved study procedures; all participants provided written informed consent.

Patients were eligible for CwC-II if they were of Black or White race; age 21 years or older; had a locally advanced and/or metastatic gastrointestinal, lung, or gynecologic cancer; and had disease progression after one or more chemotherapy regimens. Patients were ineligible if they had cognitive impairment, were too weak to participate in study interviews, or if they were receiving hospice or specialized palliative care. Patient surveys were administered by trained interviewers.

The sample ($N = 334$) for the present study consisted of CwC-II participants who provided responses to items assessing their cancer treatment and its intent, and their prognostic understanding, at the time of their baseline (study entry) interview. Among 479 eligible patients, 375 (78.3%) were enrolled and interviewed at baseline. Among those 375, 41 (10.9%) were excluded due to missing data for the present study's variables of interest: 32 (8.5%) were excluded due to missing data for the patient's treatment and/or its intent; 9 (2.4%) were excluded due to missing data for the patient's prognostic understanding. Patients excluded due to missing data for variables of interest did not differ significantly from those included in the present study sample with respect to patients' age, sex, race, ethnicity, education, or insurance status. There were no significant between-tumor-type-group differences in either perceived intent of treatment or prognostic understanding in the present study sample.

Measures

Patient sociodemographic characteristics. Patients provided personal sociodemographic information at their baseline interview, including their age, sex, race, ethnicity (Latino vs. non-Latino), education (years of formal schooling), health insurance status, and marital status. Whether the patient was recruited geographically in the Northeast as opposed to the South/Southwest, and at a cancer center as opposed to a community hospital, were documented based on the site of the patient's recruitment.

Patient group based on cancer treatment and its perceived intent. During their baseline interview, patients were asked "Are you currently getting chemotherapy or radiation for your cancer?" Response options included "yes," "no," "refuse to answer" and "don't know." Only patients who answered "yes" or "no" were included in the present analysis. This question was followed with "If yes, what is the main purpose of this treatment?" with response options, "to cure me of my cancer," "to control or slow down my cancer," "to treat my symptoms," "to help me live longer," "other," "refuse to answer," and "don't know." Patients receiving treatment who answered "other," "refuse to answer," or "don't know" to this question were excluded from the present analysis. Patients' responses to these two questions were used to place them in one of three groups: patients not receiving chemotherapy/radiation (no treatment group), those receiving chemotherapy/radiation and misperceiving its intent as curative (treatment misperception group; endorsed "to cure me of my cancer"), and patients receiving chemotherapy/radiation and accurately perceiving its intent as noncurative (accurate treatment perception group; endorsed "to control or slow down my cancer," "to treat my symptoms," or "to help me live longer").

Patient prognostic understanding. Prognostic understanding was evaluated with four items used in prior

publications, assessing patient's: (1) terminal illness acknowledgment; (2) recognition of disease as incurable; (3) knowledge of advanced stage of disease; and (4) expectation to live months as opposed to years.¹⁵ Responses were coded 0 or 1, representing absence or presence of understanding, respectively, for each item. These four prognostic understanding item indicators were also summed (possible 0–4), with higher composite scores indicating greater prognostic understanding. The specific items and coding of response options were as follows. Terminal illness acknowledgment was assessed using the item, "How would you describe your current health status?," with participants responding, "relatively healthy" (0), "relatively healthy and terminally ill" (1), "seriously ill but not terminally ill" (0), "seriously ill and terminally ill" (1), and "don't know" (0). Recognition of disease as incurable was examined using the item, "Which of the following best represents what your oncology providers have told you about a cure for your cancer?," with participants responding, "my cancer will be cured" (0), "my cancer may be cured if treatments are successful" (0), "my cancer cannot be cured but we will try to control the cancer with treatment" (1), "my cancer cannot be cured and I am not able to have any further cancer treatment" (1), and "don't know" (0). Knowledge of advanced stage of disease was assessed by asking participants, "What stage is your cancer?." Response options included, "no evidence of cancer" (0), "early stage of cancer" (0), "middle stage of cancer" (0), "late stage of cancer" (1), "end stage of cancer" (1), and "don't know" (0). Life expectancy was assessed with the item, "Many patients have thoughts about how having cancer might affect their life expectancy, either based on what their doctors have told them, what they have read, or just their own sense about how long they might live with cancer. When you think about this, do you think in terms of (select response)?" Patients indicated if it was "months" (1), "years" (0), or don't know" (0).

Data analysis

Odds ratios (ORs) between patient characteristics and patient group (i.e., no treatment, treatment misperception, accurate treatment perception) were estimated using logistic regression. ORs between indicators of patient prognostic understanding and patient groups adjusted for potential patient sociodemographic confounds were estimated using multiple logistic regression. ORs between patient composite prognostic understanding score and patient groups adjusted for potential patient sociodemographic confounds were estimated using ordinal logistic regression. Median values were imputed for missing data for patient age ($n=6$) in the use of this variable as a covariate in these regression analyses. Statistical analyses were conducted in SAS version 9.4. p -Values below 0.05 were taken to be statistically significant.

Results

Table 1 presents sociodemographic characteristics of the patient sample ($N=334$) and their bivariate associations with patient group based on treatment and its perceived intent. Compared with the treatment misperception group, patients in the no-treatment group were more likely to be 65 years of age or older (34.0% vs. 10.9%; OR=4.23, $p=0.011$). Compared with the no-treatment group, patients in the accurate treatment perception group were more likely to be recruited

in the Northeast (74.1% vs. 31.9%; OR=6.09, $p<0.001$), and at a cancer center (78.2% vs. 57.4%; OR=2.66, $p=0.003$). Compared with the treatment misperception group, patients in the accurate treatment perception group were more likely to be 65 years of age or older (40.4% vs. 10.9%; OR=5.56, $p<0.001$), less likely to be Black (14.2% vs. 41.7%; OR=0.23, $p<0.001$), and more likely to be insured (81.5% vs. 59.6%; OR=2.99, $p=0.001$), married (63.4% vs. 41.3%; OR=2.46, $p=0.006$), and recruited in the Northeast (74.1% vs. 45.8%; OR=3.37, $p<0.001$) and at a cancer center (78.2% vs. 58.3%; OR=2.57, $p=0.005$).

Table 2 presents indicators and a composite measure of patients' prognostic understanding and their associations with patient group adjusting for patient age category, race, and geographic region, which were each highly significantly associated ($p<0.001$) with patient perceptions of treatment intent (Table 1). Compared with the treatment misperception group, patients in the no-treatment group were more likely to acknowledge that they were terminally ill (47.7% vs. 25.5%; adjusted odds ratio [AOR]=2.54, $p=0.045$) and incurable (72.7% vs. 8.7%; AOR=26.71, $p<0.001$), and more likely to have higher prognostic understanding composite scores (AOR=5.00, $p<0.001$). Compared with the no-treatment group, patients in the accurate treatment perception group were more likely to have higher prognostic understanding composite scores (AOR=2.04, $p=0.044$). Compared with the treatment misperception group, patients in the accurate treatment perception group were more likely to acknowledge that they were terminally ill (52.3% vs. 25.5%; AOR=4.09, $p<0.001$), incurable (76.4% vs. 8.7%; AOR=26.42, $p<0.001$), and at a late stage in their illness (45.9% vs. 23.9%; AOR=3.11, $p=0.003$), as well as more likely to have higher prognostic understanding composite scores (AOR=10.19, $p<0.001$).

Discussion

This study found that advanced cancer patients' receipt of palliative chemotherapy or radiation, and perception of this treatment as curative, was associated with their prognostic understanding. Data showed that patients receiving chemotherapy or radiation treatment had significantly different prognostic understanding than those not receiving such treatments. Specifically, patients' levels of prognostic understanding depended upon whether they perceived the treatment to be curative. Among the three groups examined, patients receiving chemotherapy or radiation and misperceiving it as curative had the lowest levels of prognostic understanding; their overall understanding was less accurate than both patients not receiving those treatments, and patients receiving those treatments and accurately perceiving them as noncurative. In contrast, patients accurately perceiving their chemotherapy or radiation as noncurative showed better understanding than both patients not receiving those treatments, and patients receiving those treatments and misperceiving it as curative. These results demonstrate that grasping the noncurative intent of palliative chemotherapy or radiation treatments appears to be key to advanced cancer patients' prognostic understanding.

Existing studies documenting that palliative chemotherapy and radiation are often misperceived as curative^{10,11} and are associated with worse end-of-life outcomes (e.g., late hospice referrals),^{12,16} raise the possibility that receiving these

TABLE 1. PATIENT VARIABLES AND THEIR ASSOCIATIONS WITH PATIENTS' TREATMENT AND PERCEIVED TREATMENT INTENT ($N=334$)

Characteristic	Treatment and its perceived intent													
	Full sample		Treat, not cure				Not treat				Treat, cure			
	334	100%	239	72%	47	14%	48	14%	OR	95% CI	p	OR	95% CI	p
	n	%	n	%	n	%	n	%						
Age, years														
≥65	116	35.4	95	40.4	16	34.0	5	10.9	1.31	0.68–2.54	0.415	5.56	2.12–14.60	0.000
<65	212	64.6	140	59.6	31	66.0	41	89.1	Ref.			Ref.		4.23
Sex														Ref.
Male	113	34.2	79	33.6	17	36.2	17	35.4	0.89	0.46–1.72	0.736	0.92	0.48–1.77	0.810
Female	217	65.8	156	66.4	30	63.8	31	64.6	Ref.			Ref.		1.03
Race														Ref.
Black	66	19.8	34	14.2	12	25.5	20	41.7	0.48	0.23–1.02	0.058	0.23	0.12–0.46	0.000
White	268	80.2	205	85.8	35	74.5	28	58.3	Ref.			Ref.		0.48
Ethnicity														Ref.
Latino	38	11.4	22	9.2	8	17.0	8	16.7	0.50	0.21–1.19	0.118	0.51	0.21–1.22	0.131
Non-Latino	295	88.6	216	90.8	39	83.0	40	83.3	Ref.			Ref.		1.03
Education, years														Ref.
>12	206	63.8	155	66.5	23	53.5	28	59.6	1.73	0.89–3.34	0.103	1.35	0.71–2.57	0.362
≤12	117	36.2	78	33.5	20	46.5	19	40.4	Ref.			Ref.		0.78
Insurance status														Ref.
Insured	254	76.7	194	81.5	32	69.6	28	59.6	1.93	0.95–3.92	0.069	2.99	1.53–5.84	0.001
Not insured	77	23.3	44	18.5	14	30.4	19	40.4	Ref.			Ref.		1.55
Marital status														Ref.
Married	191	58.4	149	63.4	23	50.0	19	41.3	1.73	0.92–3.27	0.090	2.46	1.29–4.69	0.006
Not married	136	41.6	86	36.6	23	50.0	27	58.7	Ref.			Ref.		1.42
Geographic region														Ref.
Northeast	214	64.1	177	74.1	15	31.9	22	45.8	6.09	3.09–12.0	0.000	3.37	1.78–6.38	0.000
South/Southwest	120	35.9	62	25.9	32	68.1	26	54.2	Ref.			Ref.		0.55
Cancer center														Ref.
Yes	242	72.5	187	78.2	27	57.4	28	58.3	2.66	1.38–5.13	0.003	2.57	1.34–4.92	0.005
No	92	27.5	52	21.8	20	42.6	20	41.7	Ref.			Ref.		0.96
														Ref.
														0.43–2.18
														0.930

Missing observations—age (6), sex (4), ethnicity (1), education (11), insurance status (3), and marital status (7).
CI, confidence interval; OR, odds ratio.

TABLE 2. PATIENTS' PROGNOSTIC UNDERSTANDING AND ITS ASSOCIATIONS WITH PATIENTS' TREATMENT AND PERCEIVED TREATMENT INTENT (N=334)

<i>Treatment and its perceived intent</i>																																																																																																							
<i>Full sample</i>			<i>Treat, not cure</i>				<i>Not treat</i>				<i>Treat, cure</i>																																																																																												
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PU item																																																																																																							
Acknowledge that illness is terminal																																																																																																							
Yes	157	47.9	124	52.3	21	47.7	12	25.5																																																																																															
No	171	52.1	113	47.7	23	52.3	35	74.5																																																																																															
Understand that disease is incurable																																																																																																							
Yes	217	66.4	181	76.4	32	72.7	4	8.7																																																																																															
No	110	33.6	56	23.6	12	27.3	42	91.3																																																																																															
Know that disease is at a late stage																																																																																																							
Yes	133	41.2	107	45.9	15	34.1	11	23.9																																																																																															
No	190	58.8	126	54.1	29	65.9	35	76.1																																																																																															
Expect to live months, not years																																																																																																							
Yes	24	8.2	19	9.0	5	13.2	0	0.0																																																																																															
No	270	91.8	193	91.0	33	86.8	44	100.0																																																																																															
PU composite																																																																																																							
Number of "Yes" PU items																																																																																																							
0	58	20.6	27	13.2	7	20.6	24	55.8																																																																																															
1	76	27.0	52	25.4	11	32.4	13	30.2																																																																																															
2	79	28.0	63	30.7	10	29.4	6	14.0																																																																																															
3	55	19.5	51	24.9	4	11.8	0	0.0																																																																																															
4	14	5.0	12	5.9	2	5.9	0	0.0																																																																																															
<table> <tr> <th colspan="3"></th><th colspan="4"><i>Treat, not cure vs. not treat</i></th><th colspan="4"><i>Treat, not cure vs. treat, cure</i></th><th colspan="2"><i>Not treat vs. treat, cure</i></th></tr> <tr> <th colspan="3"></th><th>AOR</th><th>95% CI</th><th>p</th><th>AOR</th><th>95% CI</th><th>p</th><th>AOR</th><th>95% CI</th><th>p</th><th>p</th></tr> <tr> <td colspan="3">Acknowledge that illness is terminal</td><td>1.61</td><td>0.81–3.22</td><td>0.176</td><td>4.09</td><td>1.92–8.71</td><td>0.000</td><td>2.54</td><td>1.02–6.30</td><td>0.045</td><td></td></tr> <tr> <td colspan="3">Understand that disease is incurable</td><td>0.99</td><td>0.46–2.14</td><td>0.978</td><td>26.42</td><td>8.96–77.89</td><td>0.000</td><td>Ref.</td><td>7.70–92.72</td><td>0.000</td><td></td></tr> <tr> <td colspan="3">Know that disease is at a late stage</td><td>1.67</td><td>0.82–3.40</td><td>0.157</td><td>3.11</td><td>1.46–6.62</td><td>0.003</td><td>1.86</td><td>0.73–4.76</td><td>0.196</td><td></td></tr> <tr> <td colspan="3">Expect to live months, not years</td><td>0.49</td><td>0.16–1.54</td><td>0.224</td><td>Ref.</td><td></td><td></td><td>Ref.</td><td></td><td></td><td></td></tr> <tr> <td colspan="3">PU composite</td><td>2.04</td><td>1.02–4.07</td><td>0.044</td><td>10.19</td><td>5.11–20.34</td><td>0.000</td><td>5.00</td><td>2.12–11.79</td><td>0.000</td><td></td></tr> </table>																<i>Treat, not cure vs. not treat</i>				<i>Treat, not cure vs. treat, cure</i>				<i>Not treat vs. treat, cure</i>					AOR	95% CI	p	AOR	95% CI	p	AOR	95% CI	p	p	Acknowledge that illness is terminal			1.61	0.81–3.22	0.176	4.09	1.92–8.71	0.000	2.54	1.02–6.30	0.045		Understand that disease is incurable			0.99	0.46–2.14	0.978	26.42	8.96–77.89	0.000	Ref.	7.70–92.72	0.000		Know that disease is at a late stage			1.67	0.82–3.40	0.157	3.11	1.46–6.62	0.003	1.86	0.73–4.76	0.196		Expect to live months, not years			0.49	0.16–1.54	0.224	Ref.			Ref.				PU composite			2.04	1.02–4.07	0.044	10.19	5.11–20.34	0.000	5.00	2.12–11.79	0.000	
			<i>Treat, not cure vs. not treat</i>				<i>Treat, not cure vs. treat, cure</i>				<i>Not treat vs. treat, cure</i>																																																																																												
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Missing observations—Terminal (6), incurable (7), late stage (11), live months (40), PU composite (52).
AOR, odds ratio adjusted for patient age category, race, and geographic region; PU, prognostic understanding.

treatments may undermine prognostic understanding and end-of-life planning. However, the present results reveal a more nuanced understanding. Our results suggest that it is not receipt of chemotherapy or radiation *per se* that is problematic, rather it may be patients' perceptions of treatment intent that is critical. Misperceptions about treatment intent may be driving some of the associations seen between chemotherapy and poor outcomes.¹² Indeed, the present findings indicate that patients receiving palliative chemotherapy or radiation therapy who accurately grasp the intent of those treatments have better, and not worse, prognostic understanding than patients not receiving such treatments.

These results suggest potential patient cognitive processes by which perceptions regarding chemotherapy and radiation relate to expectations regarding prognosis.^{8,9,14} As suggested in previous literature, patients may rely on these treatments to avoid thinking of mortality and to foster more favorable, but inaccurate, expectations regarding the future.^{8,9} However, the present finding that those receiving chemotherapy or radiation and accurately perceiving it had better understanding than those not receiving those treatments, suggests that there may also exist cognitive processes around cancer treatments that foster prognostic understanding. It may be that the repeated occurrences associated with receiving chemotherapy or radiation (e.g., planning schedules around the timing of each dose, administration of each dose, discussions with family members or oncologist about treatment), evoke more frequent and realistic thoughts regarding the illness and its course, which may consolidate prognostic understanding and bring about a deeper level of awareness of what lies ahead.^{17,18}

Given the cross-sectional nature of the study, it is possible that the causal explanation for the results is in the opposite direction: accurate prognostic understanding may reduce the likelihood of receiving palliative chemotherapy and radiation and misperceiving it as curative. This explanation would be consistent with the finding that patients not receiving treatments had higher likelihood of accurate understanding relative to those receiving treatments and misperceiving it. However, this explanation does not account for why patients in the accurate treatment understanding group had better prognostic understanding scores than those not receiving treatments.

Several demographic factors were found to be associated with misperceiving chemotherapy/radiation intent. Black patients were more likely to misperceive treatment intent relative to white patients, a finding consistent with other reported racial disparities in end-of-life care and planning.^{19,20} Patients who were younger than 65, not married, not insured, not recruited at a cancer center, and recruited from the south/southwest, were also more likely to misperceive treatment intent, relative to those who were older, married, insured, recruited at a cancer center, and recruited in the northeast, respectively. These findings suggest possible differences based on demographic factors that shape perceptions of treatment intent.²¹ The differences by geographic region also suggest possible regional variation in clinical practice or patient characteristics, or differences in institutional characteristics (e.g., academic nature of institution) that influence perceptions of treatment intent. Relevant demographic variables were included as controls in the primary findings, suggesting that the associations seen between the primary variables are not merely confounding relationships stemming from demographic differences.

The percent of patients found in this study to be misperceiving the intent of their palliative chemotherapy and radiation (16.7%) was notably lower than other studies, where between 60% and 80% of patients had inadequate understanding of treatment intent.^{10,11} The differences in rates may be due to the assessment method and the response options used. In this study, patients chose between several response options regarding treatment intent, one of which was "to cure me of my cancer." In the other studies, patients rated the likelihood of treatments curing their cancer on a scale ranging from "very likely" to "not at all likely," and all patients who did not endorse "not at all likely" were identified as having inadequate understanding. Future research comparing different assessment methods of treatment intent may therefore be warranted. Differences in sample characteristics may also explain the lower rate of inaccurate understanding in our study compared with other studies. Most notably, the present sample included patients refractory to at least one chemotherapy regimen. Such patients have already experienced chemotherapy failure, and may have had more discussions with their physicians regarding treatment intent and its limitations in curing the cancer.

Limitations of the present study include the sample size and its cross-sectional observational study design. There are possible alternative explanations for the findings, including unexamined physician and patient factors. Examples include therapeutic alliance, patients' level of optimism or denial, clinician prognostic disclosure, and the content of previous prognostic discussions.² A longitudinal study spanning treatment initiation and discontinuation, in which discussions regarding chemotherapy/radiation are also assessed, would provide more insight into the underlying processes.

The present findings suggest potential opportunities for clinical interventions. Helping patients to understand the intent of chemotherapy or radiation treatment may foster better prognostic understanding.²² Discussions of prognosis often do not occur between clinicians and patients, as it is difficult to know when to have them and clinicians fear that patients may not be receptive to them.¹ A discussion of chemotherapy and radiation intent, on the other hand, may be easier to have at treatment initiation, as the discussion may feel more natural (although still not easy), because risks and benefits of treatment must be communicated as per legal and ethical mandates, and patients may be expecting such a discussion.¹³ Oncologists may therefore capitalize on treatment risk/benefit discussions at the initiation of chemotherapy and radiation to foster patients' prognostic understanding.

The present study adds to the literature showing that receipt of palliative chemotherapy or radiation is associated with both better and worse prognostic understanding, depending on whether patients perceive it as curative or not. It further shows that perceptions of curative intent may drive some of the associations found in the literature between receipt of chemotherapy and radiation and unfavorable outcomes.^{12,16} Future research should identify if the associations found in this study are causal in nature, such that receipt of chemotherapy or radiation, and perceptions of its curative potential, can lead to more accurate or inaccurate patient expectations of their prognosis. Helping patients accurately understand chemotherapy and radiation intent may be important not only for informed receipt of such treatments, but also to foster terminally ill patients' expectations and understanding of what is to come in their disease course.^{13,22}

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