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Dispositional Hope as a Potential Outcome Parameter Among Patients w/ Advanced Malignancy: An Analysis of the ENABLE Database

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Abstract

Background: Hopefulness, whether inherently present ("dispositional hope") or augmented (by enhancement techniques) may impact outcomes. We set out to determine the association of dispositional hope with survival among patients diagnosed with advanced cancer.

Methods: Data from ENABLE, a palliative care intervention, were re-analyzed to determine the association of higher dispositional hope and patient survival. This is a secondary analysis of data combined from the ENABLE II and ENABLE III randomized controlled trials (RCTs) relative to dispositional hope and survival. A dispositional hope index was created from three "hope" items from two validated baseline questionnaires. Dispositional hope and survival data were collected during the two RCTs. In ENABLE II, participants were randomly assigned to the ENABLE intervention or to usual care. In ENABLE III, participants were randomly assigned to receive the intervention immediately or 12 weeks after enrollment.

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Dr. Corn is responsible for the overall content as a guarantor.

Conflicts of Interest: None.

Trial Registration: The trials were registered in clinicaltrials.gov (Identifier Study 1: NCT00253383; Identifier Study 2: NCT01245621).

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Results: 529 persons were included in Cox proportional-hazards regression analyses to model the effects of dispositional hope on survival. An initial analysis without covariates yielded a significant effect of hope, (Wald = 8.649, HR = 0.941, CI: 0.904–0.980, p = 0.003), such that higher dipositional hope was associated with longer survival. In a subsequent analysis that included all covariates, the effect of dispotional hope approached statistical significance (Wald = 2.96, HR = 0.933, CI: 0.863–1.010, p = 0.085).

Conclusion: Higher levels of dispositional hope was associated with longer survival in patients with advanced cancer. Prospective trials are needed to determine the effects of dispositional and augmented hope on outcomes of patients with advanced cancer.

Precis:

Within the ENABLE database, composed of information pooled from randomized trials, dispositional hope was associated with longer survival among patients with advanced cancer. Accordingly, hope may be an important stratification parameter in the design of clinical trials and workshops to augment hopefulness might be considered for such individuals.

Keywords

Hope; palliation; survival; ENABLE; advanced cancer

INTRODUCTION

In the 2020 update of cancer statistic (1), the American Cancer Society reported a decline in death rates of leading cancers including malignancies of breast, lung prostate and colon. Although the trend has been evident since 1991, Siegel et al emphasized that the drivers of this progress are difficult to decipher. While it is likely that these improvements are related to preventative measures (e.g., reductions in smoking) and novel therapies (e.g., combination treatments, checkpoint blockade immunotherapy and targeted therapies), the authors noted that additional factors may contribute to these results.

Recently, Corn, Feldman, and Wexler (2) have discussed dispositional hope (i.e., inherent hopefulness) and the ability to enhance hope (3) as one potential factor. Although the term hopefulness was previously associated with amorphous ideas and imprecise meanings, the concept has recently acquired a rigorous definition (4). Based on the work of Snyder et al (5) hopefulness is considered a measurable cognitive, goal-directed construct defined as “having goals” (hoped-for ends or objectives), “agency” (the energy or motivation to reach goals) and “pathways” (perceived routes and plans to approach goals) (6). Work by Feldman & Dreher (3) demonstrated that a single-session hope-enhancement intervention can increase dispositional hopefulness and raise healthy adults’ likelihood of goal accomplishment. In oncology, goals are not restricted to cure; but might also include a desire for symptom control or reaching a personal life goal.

Several investigators have suggested that interventions designed to enhance quality of life, by the very nature of the positive outlook created, may allow one to *directly* “will” a better outcome (7). Corn, Feldman, and Wexler (2) discuss possible biological mediators of a “direct” path, which are funneled through a psycho-neuro-immunological axis. *Conversely,*

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indirect mediators through the effects of hopefulness on behavior such as health-promoting behaviors (quitting smoking, adherence to exercise routines and dietary control), and pursuit of health-related knowledge (8–11) may have survival ramifications. Such salutary practices have demonstrated improved survival among patients with colorectal cancer who engaged in physical activity (12) and individuals diagnosed with cancers of the breast or bladder who experienced lower rates of mortality when smoking ceased (13, 14). Moreover, there could be an indirect benefit of hopefulness among patients who are demotivated to adhere to prescribed cancer therapeutics when such medications diminish quality of life (15, 16). In the latter scenario a hopeful person, or one who can be made more hopeful, might be able to persevere despite iatrogenic hardship and thereby adhere to toxic yet beneficial interventions. To date, the relationship between dispositional hope and survival among patients with cancer has not been extensively studied. The current analysis tested whether there is an association between dispositional hope and survival in studies of early palliative care designed to enhance quality of life.

Project ENABLE (Educate, Nurture, Advise, Before Life Ends), a nurse-led telehealth early palliative care intervention for patients with advanced cancer (17–19) demonstrated improved quality of life, mood, and survival benefits in two randomized controlled trials. Patient reported outcomes included items measuring hope. Therefore, we combined data from these trials to examine the relationship between baseline dispositional hope (as measured by a “hope index” created from single hope items), intervention status (if and when patients received the ENABLE intervention), and survival among patients with advanced cancer. Based on the theoretical linkage of hope with improved survival as mediated by a combination of biological and behavioral pathways (2), we hypothesized that baseline dispositional hope would be associated with longer survival.

METHODS

This study is a secondary analysis using a correlational design to test novel hypotheses about the association between dispositional hope and survival. The data were derived from two previously published randomized controlled trials. In ENABLE II (hereafter referred to as Study 1 in which enrollment took place between November 2003 and May 2007) (18) participants were randomly assigned to either the ENABLE intervention or (b) usual cancer care. In ENABLE III (hereafter referred to as Study 2, in which enrollment took place between October 2009 and March 2013) (19) using a wait-list control design, all participants received the ENABLE intervention but were randomly assigned to receive the intervention either early (upon enrollment) or after a delay of 12 weeks. Target sample sizes of 400 (Study 1) and 360 (Study 2) were chosen to provide 80% power to identify key differences in outcomes of interest in the original studies (quality of life, symptom intensity, mood) (18). Due to slower accrual than anticipated, the final enrollment totals were 322 (Study 1) and 207 (Study 2). The protocols, data, and safety monitoring board (DSMB) plans for both studies were approved by the Dartmouth College and the Veterans Affairs Medical Center (VAMC), White River Junction, Vermont institutional review boards (IRB). The trials were registered in clinicaltrials.gov (Identifier Study 1: NCT00253383; Identifier Study 2: NCT01245621).

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In both studies, the primary dependent variables were patient-reported quality of life, mood, symptom intensity, and resource use. In Study 1, participant survival was examined in a post-hoc analysis. In Study 2, survival was examined as an *a priori* primary outcome. In the current analyses, we focus on the intervention and hope effects on survival. Specifically, we examine the association between participants' baseline hope index and subsequent survival time as well as the moderating effect of receiving the ENABLE intervention on this association.

Participants

For both studies, participants were recruited from the Norris Cotton Cancer Center at Dartmouth-Hitchcock Medical Center or the WRJ VAMC within 60 days of a new diagnosis of advanced cancer. Eligibility criteria included diagnosis of a new advanced solid tumor or hematological malignancy (only ENABLE III), recurrence, or new disease progression following stable disease, and an oncologist-predicted prognosis of approximately 6–24 months. In addition, all participants had to be English-speaking and over age 18. Individuals were excluded if they had impaired cognition, or a severe psychiatric disease (e.g., schizophrenia, bipolar disorder) or active substance abuse disorder. As noted, pursuant to enrollment, patients were randomly assigned to receive the intervention vs. usual care (Study 1) or early vs. delayed intervention (Study 2). Full details of the respective studies are described elsewhere (18, 19).

The combined sample of this analysis included 529 patients, of whom 161 received usual care (Study 1 only), 265 received the early intervention (161 from Study 1; 104 from Study 2), and 103 received the delayed intervention (Study 2 only).

Intervention

The ENABLE intervention has been described in detail elsewhere (18, 19) and consists of a psychoeducational approach to encourage patient activation and enhanced quality of life. In brief, after an initial in-person palliative care consult, trained nurse coaches specializing in palliative care facilitated 4 (Study 1) or 6 (Study 2) semi-structured psychoeducational telephone coaching sessions with patients using an author-developed informational guidebook called *Charting Your Course©*, followed by monthly check-in calls until the patient died or the study ended. Topics discussed during sessions included problem-solving, coping, self-care, symptom management, building a support system, communication skills, decision-making, advanced care planning, and life review. Importantly, affecting the level of hope was *not* included as a specific intervention goal.

Data Collection and Instruments

The primary variables of interest in these analyses were self-reported dispositional hope and observed survival. A 3-item hope index was created by summing one item from the Center for Epidemiological Studies-Depression (CES-D) measure (during the past week "I felt hopeful about the future;" 0 = Rarely, 1 = Some or a little, 2 = Occasionally or Moderately, 3 = Most of the Time) and two items from the Functional Assessment of Chronic Illness Therapy-Palliative Care (FACIT-PAL), one from the Additional Concerns Subscale ("I feel hopeful;" 0 = Not at All, 1 = A little bit, 2 = Somewhat, 3 = Quite a bit, 4 = Very much)

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and one from the Emotional Well Being subscale ("I am losing hope in the fight against my illness" reverse scored such that 0 = Very Much, 1 = Quite a bit, 2 = Somewhat, 3 = A little bit, 4 = Not at All). This 3-item index showed acceptable reliability, Cronbach's alpha = .778. In a principal component's analysis, all three items loaded on a single factor above .80.

Survival time was calculated from the date of enrollment to the date of death; patients who were still alive at study closure (Study 1: May 1, 2008; Study 2: September 5, 2013) were censored on that date.

Given the correlational nature of the primary independent variables (individual differences in dispostional hope and an intervention that spanned two RCT), results were assessed in the context of a variety of statistical covariates. Specifically, self-reported demographics (e.g., age, gender, ethnicity/race, marital status, employment status, level of education and rural/urban residence) were collected at baseline. Cancer site was identified from the electronic health record. Furthemore, we collected variables representing illness severity characteristics (resource use 3 months prior to study enrollment (days spent in the hospital and intensive care unit [ICU] and emergency department [ED] visits), chart review variables pertaining to the use of chemotherapy or radiation, the presence of advance directives (AD) as well as do not resuscitate (DNR) orders. All analyses were conducted using SPSS software, Version 24 (SPSS Inc., Chicago, IL).

Analysis

The two study samples were compared on dispositional hope and all statistical covariates (described below) using independent-samples t-tests for continuous variables and chi-square tests for categorical variables. For all continuous variables (hope index, days in hospital, days in ICU, ED visits, and age), the mean and standard deviation were calculated. The remaining variables were categorical: AD (yes/no), DNR (yes/no), undergoing chemotherapy at enrollment (yes/no), undergoing radiotherapy at enrollment (yes/no), gender (male/female), residence (rural vs. urban), education (college graduate vs. not), married (yes/no), employment (employed full or part time vs. not currently employed), and race (white vs. other). Cancer site was dummy-coded and each diagnosis site (lung, gastrointestinal, genitourinary, breast, hematological, and other) treated as a separate variable. For all dichotomous variables a count and percentage of the total were calculated. Pearson's bivariate correlations between the baseline hope index and all other continuous covariates were calculated; point-biserial correlations were used for dichotomous covariates. Cox proportional-hazards regression analyses (20) were used to model the effects of dispositional hope on survival, with and without adjustment for baseline covariates.

RESULTS

Comparisons of Baseline Characteristics Between Study 1 and Study 2

Table 1 lists baseline characteristics for the total combined sample and for Study 1 and Study 2 separately for the hope index, demographics, cancer site, and illness severity-related variables. Participants had a mean age of 65, were 56% male, 68% married, 98% white race, 58% rural residence, and often had lung (39%) or gastrointestinal (35%) cancers. Of the 21

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baseline variables examined, 8 differed between studies: Study 1 compared to Study 2 had a lower proportion of college graduates, a greater number of ICU days and ED visits. Further, Study 1 was characterized by more patients receiving chemotherapy, a higher proportion of patients with gastrointestinal cancer, and more patients receiving radiation treatments. Of note, Study 1 had no patients with hematological malignancies or cancers classified as "other" because only patients with four solid tumor types were eligible.

Association Between Baseline Hope Index and Covariates

Being employed (p=.004) and having a breast cancer diagnosis (p=.044) was associated with a higher hope index. Being diagnosed with lung cancer (p=.016), having completed an AD (p=.012), and having a DNR order on file (p=.009) was associated with lower hope index. No other associations achieved statistical significance (Table 2).

Association Between Baseline Hope Index and Survival

An initial Cox regression survival analysis with no covariates yielded a significant effect of dispositional hope such that a higher baseline hope index was associated with longer survival (Wald = 8.649, HR = 0.941, CI: 0.904–0.980, $p = 0.003$).

A subsequent analysis was used to model the effects of intervention status, hope index, and their interaction adjusting for all 19 baseline covariates. The design involved survival over time among a control group that never received the intervention (usual care), an experimental group that received the intervention upon enrollment (early intervention), and an experimental group that received the intervention 12 weeks after enrollment (delayed intervention). Because the intervention was the same for the latter two groups and simply involved implementation at different points in time, the data were handled using a Cox regression survival analysis with intervention as a time-varying covariate (Cox, 1972). Patients with missing covariate data were excluded as needed from each Cox model. As can be seen in Table 3, in this analysis the effect of dispositional hope did not achieve conventional levels of significance ($p = .085$). As is also evident in Table 3, neither the effect of the intervention ($p = 0.246$) nor the interaction between dispositional hope and the intervention (p = 0.778) achieved statistical significance. Five baseline covariates achieved significance: number of hospital days 3 months prior to enrollment ($p < 0.001$), DNR order on file ($p < 0.001$), lung cancer diagnosis ($p = 0.045$), gastrointestinal cancer diagnosis ($p = 0.041$), hematological cancer diagnosis ($p = 0.025$) and gender ($p = 0.033$).

The Cox analysis was repeated including only covariates that correlated significantly with the hope index (ADs, DNR order on file, lung cancer diagnosis, breast cancer diagnosis, and being employed) (see Table 2) as a test of whether these variables rather than the hope index, could be responsible for the relationships of interest. In this analysis, dispostional hope was once again associated with longer survival (Wald = 5.435, HR = 0.952, CI: 0.913–0.992, $p = 0.020$).

In order to provide a better understanding of these results, patients were divided into groups as a function of their categorization as having relatively high (Hope Index > 8.0) or low (Hope Index < 8.0) dispositional hope as determined by a median split. As can be seen in Figure 1, those high in hope survived longer than those low in hope. A Mantel-Cox

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Log Rank test applied to these data was significant, $c^2(1) = 9.258$, $p = .002$, with median survival time duration (in months) greater in the high hope (Mdn = 15.933, CI: 11.858–20.009) than in the low hope group (Mdn = 9.500, CI: 7.70–11.30). That said, hope is treated as a continuous variable using applicable covariate adjustments in our primary statistical hypothesis tests, and patients were categorized into these high and low hope groups primarily for illustrative purposes.

DISCUSSION

This is one of the first studies examining and finding a positive association between dispositional hope and overall survival among patients diagnosed with advanced cancer. However, other investigators have explored linkages between hopefulness and survival in chronic disease. Moskowitz et al (21), analyzed data from the National Health Epidemiologic Follow-up Study (NHEFS) and noted that among older patients (>65) with diabetes, hopefulness was associated with a lower mortality risk. Those authors speculated that contextual factors, including the likelihood of increased medication adherence among hopeful patients (22), may have an influence on the relationship of positive affect and survival.

The present analysis of the combined samples of the ENABLE II and III RCTs, although exploratory, was conducted among 529 patients who were diagnosed with advanced stages of relatively common cancers (e.g., lung, breast, colon, etc.). Although there are multiple limitations of a retrospective secondary analysis, the results reported herein are statistically significant, may be clinically meaningful, and are hypothesis-generating for future clinical trials.

We are not advocating that positive psychology be invoked as an oncologic strategy (e.g., that hopefulness should in any way substitute for proven clinical treatments.) Rather we consider that there are several direct and indirect theory-based explanations for why dispositional hope may favorably impact survival. First, there may be a direct effect of a “hope phenotype” in which a positive outlook, whether by sheer will or as an epigenetic phenomenon, could result in better survival (7). Indeed, in the context of patients with cervical cancer, Nelson et al suggested a mechanism that activates the psychoneuroimmunologic axis. Since cancer management is complex and heterogeneous, it may be prudent to measure and examine the impact of baseline dispositional hope within prospective trials assessing new therapeutic interventions for patients with advanced malignancies.

It is also arguable, however, that patients who can access hope might have *indirect* benefits via health-promoting behaviors such as exercising, consuming nutritionally-sound diets, or enhancing medication adherence. The influence of hope in these contexts is easily assessed by a prospective trial design in which patients are randomized to a therapy with or without hope-enhancement training. For example, endocrine therapy is known to be associated with a survival advantage among patients with breast cancer, yet non-adherence has been consistently described in approximately 45% of women for whom Level I evidence dictates prescription of such medications (23). Recently, the Southwest Oncology Group (SWOG)

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conducted a phase III trial to determine if text messaging increases adherence to such aromatase inhibitors. Although the idea had merit, twice-weekly reminders via smartphone did not improve adherence. The SWOG is now poised to study whether hope enhancement techniques based on Feldman and Dreher's (3) work could increase adherence to endocrine therapy. The premise of such an approach is that hope techniques may enable patients to see beyond the toxicity of aromatase inhibitors while pursuing the dual objectives of improving survival and minimizing recurrence. The latter can only be achieved if the admittedly toxic drugs are taken (Mark O'Rourke, personal communication, August 2020).

Another possible mechanism for the impact of hope on survival pertains to the role of pain. Several authors have speculated that there is an inverse relationship between pain levels and survival outcomes in patients diagnosed with pancreatic cancer (24, 25). Furthermore, in vivo models imply that animals with implanted tumors have accelerated tumor growth and increased mortality rates when subjected to pain (26, 27). Conversely, hope appears to be related to heightened pain tolerance and pain coping. In a laboratory study, Snyder and colleagues (28) found that healthy adults with high hope were able to tolerate the pain associated with having their hands submerged in freezing water better than low-hope participants. This connection between hope and pain perception appears to be mediated by "pain catastrophization," with research demonstrating that higher-hope individuals spend less time ruminating on their pain than lower-hope individuals (29).

Our results should be viewed in the context of other recent advances in the management of cancer. During the past two decades, oncologists have witnessed an unprecedented number of new drugs or pharmacologic combinations that have been recognized as standard therapy by regulatory bodies (30–34). Remarkably, this progress has not been restricted to rare malignancies but rather has changed practice for the most frequently encountered entities including tumors of the lung, breast, and gastrointestinal tract. In reviewing the divergence of the survival curves documented in these phase III studies, we noted that the benefits were, in several instances, of similar orders of magnitude to those associated with hopefulness in our report. While the data presented herein are derived from post-hoc analyses, this finding seems important to examine formally in prospective clinical trials. Moreover, the financial commitment to achieve the advances with the aforementioned medications has been enormous (35, 36). In contrast to the costs of contemporary cancer care, the dissemination of hope techniques requires a minimal investment of money and time. What's more, the benefits derived from hope enhancement techniques are realized immediately (3) and are likely to be tumor agnostic.

This study has several notable limitations. First the ENABLE investigators did not define dispositional hope as an *a priori* entity to be assessed vis-à-vis survival. This limitation is not simply an admission of the retrospective nature of our analysis but also an acknowledgment of the fact that established scales specifically designed for measuring hopefulness were not employed (5). Rather, within the instruments administered by ENABLE investigators (i.e., CES-D and FACIT-PAL) elements existed which allowed patients to declare whether they deem themselves to be hopeful. Future research must use validated tools of hopefulness to verify the purported association with survival. Notwithstanding, the simple metric of dispositional hope which we employed seems intuitive with internally-reassuring

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correlations (e.g., associations between hopefulness and employment; linkage between hopelessness and DNR orders). Second, the ENABLE sample was majority white race and these results should not be considered valid in a more racially diverse sample (19). As such, future research will be mandatory to test whether the present results can be generalized for more diverse populations.

Third, we focused on the levels of hopefulness that were determind at baseline. The presence of hope is not a static entity. Rather, hope is dynamic as manifest by the changing degrees of hope that human beings experience on a daily basis. Unfortunatgely, missing data with regards to hopefulness at follow-up visits precludes a more sophisticated analysis which looks at hope as it varies with time.

Another limitation pertains to our dichotimization of the sampe in terms of “high” and “low” hope. In the ENABLE database, hope was measured as a continuous item using Likert scales. For ease of analysis we divided patients into low and high hope gropus by using a median split. The median split was based on the scores of our particular sample. Therefore, other samples would be expected to have a different median and a slightly different categorization of high and low hopefulness. This shortcoming highlights the value of replicating and extending these findings in other samples of patients with different stages of disease and illness trajectories.

Our report is observational and, by definition, cannot establish a direct causal relationship between increased hopefulness and improvements in overall survival. As such, we cannot conclude from the present study whether hopeful people are more likely to live longer, or whether individuals with a better prognosis are likely to be more hopeful. There are four reasons to believe the former rather than the latter argument. First, research shows that patients with cancer often do not know or correctly understand their prognosis (37–39) hence it is unlikely that progrostic understanding played a significant role in this sample. Second, in the present study hope was measured at baseline, and its relationship with mortality approached statistical significance ($p = .085$) even adjusting for all 19 covariates, including indicators of illness severity. When the analysis was repeated, adjusting only for the covariates that manifested statistically significant correlations with hope, the relationship between dispositional hope and survival retained statistical significance ($p = .02$). Third, it should be mentioned that past research on hope outside of the cancer domain has shown reciprocal relationships between hope and life outcomes (40, 41). As such, future research may be necessary to explore reciprocal relationships in the context of advanced cancers. For instance, hopefulness (or lack thereof) may predict later cancer progression which, in turn, predicts subsequent levels of hopefulness (whether increased or decreased). Finally, past research indicates that psychosocial interventiosn can potentially have causal impacts on surivival (42–46).

To determine a causal relationship between hopefulness and survival, future investigations should include randomized controlled trials of hope enhancement techniques to determine if hope might be susceptible to favorable intervention (3). At this juncture, such trials are being designed to gauge whether hope enhancement techniques can be adopted by physicians and patients as another component of the clinical armamentarium against cancer.

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We recognize that this view constitutes a departure from conventional trial design. However, hope enhancement offers a very low-cost intervention that might influence the duration and the quality of life of patients with cancer. The clinical impact of such measures may be considerable.

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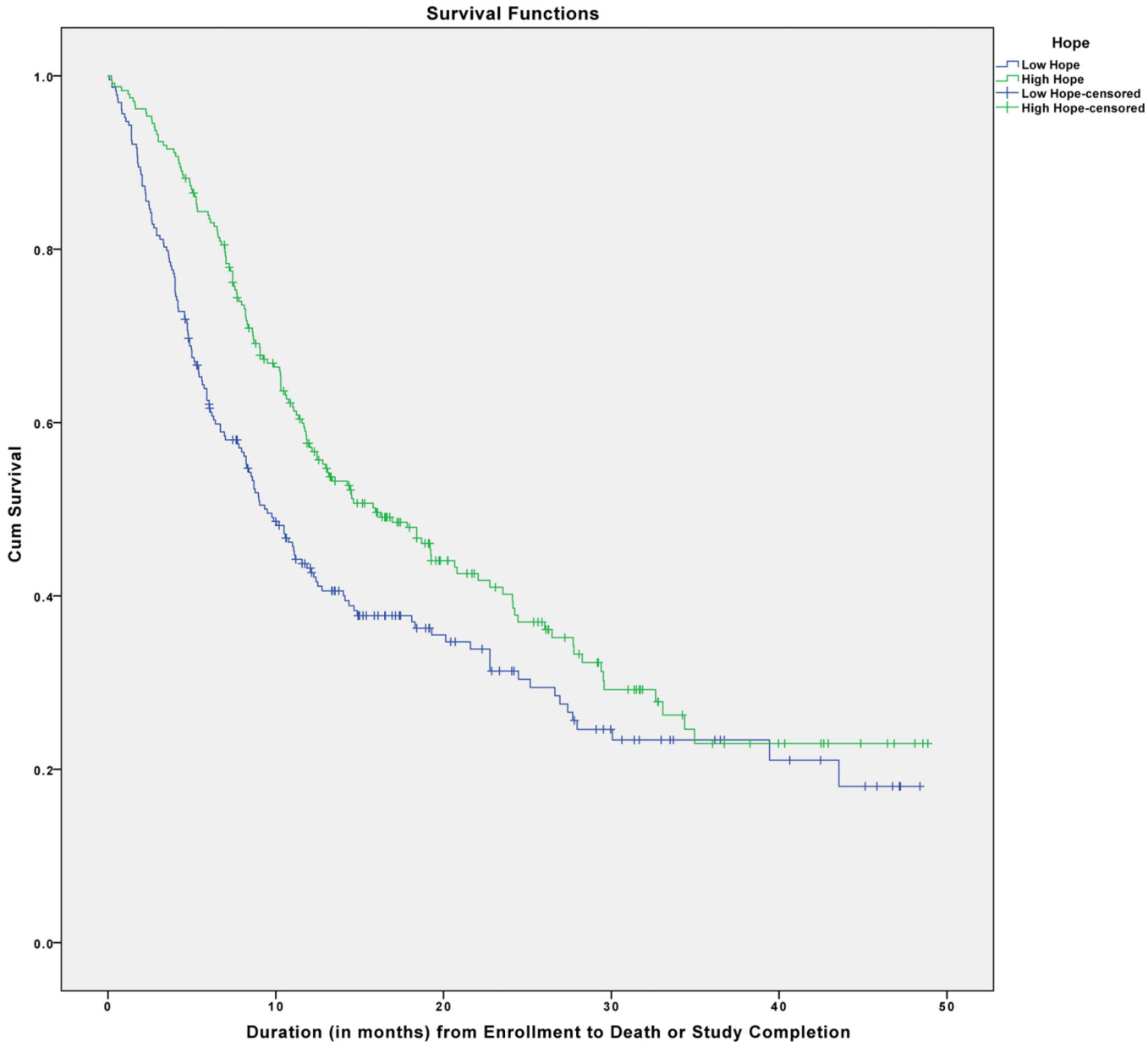

Figure 1.

Kaplan-Meier survival curves for patients with relatively high versus low hope (determined by a median split on the entire patient sample). Cross-hatch lines indicate censored data. Not corrected for covariates

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Table 1.

Baseline characteristics of combined sample & comparisons between Study 1 and Study 2

	Combined Sample		Comparison between study groups				
			Study 1 (N = 322)		Study 2 (N = 207)		
	N	Mean (SD) or No. (%)	N	Mean (SD) or No. (%)	N	Mean (SD) or No. (%)	p *
Demographic variables							
Age	529	64.7 (10.7)	322	65.0 (11.2)	207	64.3 (9.9)	.453
Gender (male)	529	296 (56%)	322	187 (58.1%)	207	109 (52.7%)	.221
Rural residence	529	306 (57.8%)	322	181 (56.2%)	207	125 (60.4%)	.343
College graduate	482	166 (34.4%)	275	81 (29.5%)	207	85 (41.1%)	**.008**
Married	526	356 (67.7%)	319	221 (69.3%)	207	135 (65.2%)	.331
Employed	525	112 (21.3%)	318	63 (19.8%)	207	49 (23.7%)	.291
White	485	475 (97.9%)	279	275 (98.6%)	206	200 (97.1%)	.257
Cancer site							
Lung (NSCLC)	529	205 (38.8%)	322	117 (36.3%)	207	88 (42.5%)	.155
Gastrointestinal	529	183 (34.6%)	322	133 (41.3%)	207	50 (24.2%)	**.000**
Genitourinary	529	55 (10.4%)	322	39 (12.1%)	207	16 (7.7%)	.107
Breast	529	56 (10.6%)	322	33 (10.2%)	207	23 (11.1%)	.753
Hematological	529	10 (1.9%)	322	0 (0%)	207	10 (4.8%)	**.000**
Other cancer	529	20 (3.8%)	322	0 (0%)	207	20 (9.7%)	**.000**
x Days in hospital	528	2.79 (5.2)	322	2.95 (5.2)	206	2.54 (5.2)	.381
Days in ICU	404	.18 (.92)	322	.03 (.25)	82	.74 (1.9)	**.001**
ED visits	529	.43 (.84)	322	.34 (.78)	207	.57 (.90)	**.003**
Advanced directives	527	238 (45.2%)	322	149 (46.3%)	205	89 (43.4%)	.520
Do not resuscitate	515	43 (8.3%)	322	23 (7.1%)	193	20 (10.4%)	.201
Chemotherapy	529	427 (80.7%)	322	271 (84.2%)	207	156 (75.4%)	**.012**
Radiation	529	81 (15.3%)	322	41 (12.7%)	207	40 (19.3%)	**.040**
Hope							
Baseline HOPE	465	8.1 (2.7)	264	8.1 (2.6)	201	8.1 (2.8)	.958

Abbreviations: SD = Standard Deviation; % = Percent of total patients; ICU = Intensive Care Unit; ED = Emergency Medicine Department.

* Independent samples t-tests were used for continuous variables (Age, Days in hospital, Days in ICU, ER visits, and Baseline HOPE); Chi-Squared analyses were used for categorical variables.

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Table 2.

Correlation of baseline Hope with control covariates

	N	r	p
Demographic variables			
Age	465	−.004	.938
Gender (male)	465	.001	.986
Rural residence	465	−.024	.610
College graduate	461	−.028	.545
Married	462	.057	.220
Employed	461	.135	**.004**
White	464	.077	.097
Cancer site			
Lung	465	−.111	**.016**
Gastrointestinal	465	−.022	.633
Genitourinary	465	.028	.548
Breast	465	.093	**.044**
Hematological	465	.088	.058
Other cancer	465	.072	.120
Illness-related variables			
Days in hospital	464	.008	.869
Days in ICU	344	.029	.590
ED visits	465	−.008	.864
Advanced directives	463	−.117	**.012**
Do not resuscitate	452	−.122	**.009**
Chemotherapy	465	.020	.672
Radiation	465	.034	.471

ICU = Intensive Care Unit; ER = Emergency Medicine Department. Analyses used pairwise deletion and significance values are not corrected for multiple comparisons.

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Table 3.

Results of Cox Proportional Hazards Regression Analysis including all statistical covariates

				95% CI for HR	
Variables in the Equation	**Wald**	**HR**	**p**	**Lower**	**Upper**
Intervention	1.24	0.601	.265	0.246	1.471
HOPE (at baseline)	2.96	0.933	.085	0.863	1.010
Intervention x HOPE	0.08	1.015	.778	0.915	1.127
Demographic variables					
Age	0.11	0.998	.737	0.984	1.012
Gender (male)	4.53	0.701	**.033**	0.506	0.972
Rural	0.04	0.973	.849	0.732	1.294
College graduate	2.60	0.778	.107	0.574	1.056
Married	3.68	0.727	.055	0.524	1.007
Employed	0.00	1.001	.996	0.690	1.453
White	1.36	0.427	.244	0.102	1.786
Cancer site					
Lung	4.05	0.297	**.044**	0.091	0.969
Gastrointestinal	4.19	0.289	**.041**	0.088	0.948
Genitourinary	1.53	0.458	.216	0.133	1.578
Breast	1.40	0.455	.236	0.124	1.675
Hematological	5.03	0.198	**.025**	0.048	0.816
Illness-related variables					
Days in hospital	17.98	1.060	**< .001**	1.032	1.088
Days in ICU	1.02	0.922	.313	0.789	1.079
ED visits	0.10	0.973	.753	0.822	1.153
Advanced directives	0.17	1.065	.677	0.793	1.430
Do not resuscitate	22.49	0.293	**< .001**	0.177	0.487
Chemotherapy	1.71	0.771	.190	0.522	1.138
Radiation	0.85	0.820	.358	0.538	1.251

CI = Confidence Interval; HR = Hazard Ratio (risk of death); Wald = Wald statistic; Intervention = having the palliative care intervention (vs. not having it) entered as a time-varying covariate; ICU = Intensive Care Unit; ER = Emergency Medicine Department. All variables were entered into a Cox proportional hazards regression model simultaneously.