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Associations Between Patient Perceptions of Communication, Cure, and Other Patient-Related Factors Regarding Patient-Reported Quality of Care Following Surgical Resection of Lung and Colorectal Cancer

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Abstract

Background—The objective of the current study was to analyze various patient-related factors related to patient-reported quality of overall and surgical care following surgical resection of lung or colorectal cancer.

Methods—Between 2003 and 2005, 3,954 patients who underwent cancer-directed surgery for newly diagnosed lung (30.3 %) or colorectal (69.7 %) cancer were identified from a population- and health system-based survey of participants from multiple US regions. Factors associated with patient-perceived quality of overall and surgical care were analyzed with multivariable logistic regression models.

Results—Overall, 56.7 % of patients reported excellent quality of overall care and 67.9 % of patients reported excellent quality of surgical care; there was no difference by cancer type ($P>0.05$). Factors associated with lower likelihood to report excellent quality of overall and surgical care included female sex, minority race, and the presence of multiple comorbidities (all odds ratio [OR] <1 , all $P<0.05$). Patients who had higher levels of education (overall quality: OR 1.62; surgical quality: OR 1.26), higher annual income (overall quality: OR 1.29; surgical quality:

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no competing interests.

OR 1.23), and good physical function (overall quality: OR 1.35; surgical quality: OR 1.24) were all more likely to report excellent quality of overall and surgical care (all $P<0.05$). Furthermore, patients who reported their physician as having excellent communication skills (overall quality: OR 6.49; surgical quality: OR 3.74) as well as patients who perceived their cancer as likely curable (overall quality: OR 1.17; surgical quality: OR 1.11) were more likely to report excellent quality of overall and surgical care (all $P<0.05$).

Conclusion—Patient-reported quality of care is associated with several factors including race, income, and educational status, as well as physician communication and patient perception of likelihood of cure. Future studies are needed to more closely examine patient–physician relationships and communication barriers, particularly among minority patients and those with lower income and educational status.

Keywords

Quality; Care; Surgery; Perception; Cure; Cancer

Introduction

In 2015, an estimated 1.6 million new patients will learn of a cancer diagnosis and over 589,000 will succumb to their disease.¹ In fact, the overall 5-year survival for all patients with invasive cancer is estimated to be 65 %.² Lung and colorectal cancer in particular represent a large burden of disease as these cancers constitute the two leading causes of cancer-related deaths in the USA.¹ Despite advances in diagnostic, surgical, and medical treatments, prognosis among lung and colorectal cancer patients can be varied, with 5-year overall survival ranging from 20 to 65% depending largely upon the stage of disease on presentation.^{1,3} Of note, 5-year relative survival is significantly lower among patients with lung cancer (18%) compared with patients who suffer from colorectal cancer (63%). For many patients with lung and colorectal malignancy, surgery offers the best hope for long-term survival—often in combination with various chemotherapy and radiation regimens. Even when curative surgical resection is not feasible, surgical intervention may help provide symptomatic palliation in a select group of patients.

Shared decision-making between patients and clinicians is critical when deliberating among various treatment options, especially among cancer patients. Communication about cancer treatments is often lacking. In fact, recent data have suggested that many cancer patients do not understand the intent of certain therapies utilized to treat their disease.^{4,5} Using the Cancer Care Outcomes Research and Surveillance (CanCORS) data, Weeks et al. reported that 69 % of patients with metastatic lung cancer and 81 % of patients with metastatic colorectal cancer did not report understanding that chemotherapy was not at all likely to cure their cancer.⁴ Somewhat surprisingly, patient-reported scores for physician communication were higher among those patients who had inaccurate expectations of cure.⁴ This apparent discordance could indicate either a shortcoming of patient understanding or a failure of the physician to help improve patients' understanding of their disease.

The study by Weeks et al. suggested that patients have a more optimistic and unrealistic view of the potential benefits of chemotherapy when being treated by physicians whom

patients report as having superior communication skills.⁴ Furthermore, Kehl et al. were able to show that physician-controlled decisions as opposed to patient-controlled decisions were associated with lower ratings of quality care. However, the association between patient perception of physician communication and ratings of quality of overall and surgical care among patients undergoing cancer-directed surgery has not been specifically investigated. As such, we sought to analyze patient-reported quality of overall and surgical care among patients who underwent surgical resection for lung or colorectal cancer from a national, prospective, observational cohort study. Though patients with lung and colorectal cancer face different obstacles inherent to their disease process, these cancers represent the two leading causes of cancer incidence and mortality in the USA. Previous studies have also shown that though these cancers are different from a clinical standpoint, there are similarities regarding patient perceptions of care and quality among these groups.^{6–8} Thus, we hypothesized that poor patient–physician communication would be associated with worse patient-reported quality of care.^{6,9} Furthermore, we sought to identify sociodemographic, clinical, and decision-making/communication factors that were associated with excellent patient-reported quality of overall and surgical care among patients with lung and colorectal cancer undergoing surgery.

Methods

Data Source

We analyzed patient baseline survey data from the CanCORS study, a national prospectively conducted cohort designed to evaluate care and outcomes among patients with lung and colorectal cancer. The CanCORS study enrolled approximately 5,000 patients diagnosed with lung cancer and 5,000 patients diagnosed with colorectal cancer from the Veterans Administration system, five geographically defined regions throughout the USA (Alabama, Iowa, Los Angeles County, Northern California, North Carolina), and five integrated delivery system sites associated with the NCI-funded Cancer Research Network (Seattle, Boston, Detroit, Portland, Hawaii).^{10,11} Participants in the CanCORS study were identified and contacted within 3 to 6 months of their cancer diagnosis from population-based cancer registries associated with each site. Patients (or surrogates for ill or deceased patients) underwent a computer-assisted telephone interview within an average of 6 months from diagnosis about beliefs, goals of care, treatment decision-making process, and quality of life.¹² Overall, 2.6 % ($n=102$) of the surveys were completed by patient surrogates. The majority of interviews were conducted in English; however, patients in certain locations (i.e., LA and Northern California) were able to complete the survey in Spanish or Mandarin.¹¹ Collaborative stage at diagnosis was collected from pathologic reports, radiology and the medical record, or from cancer registries if medical records were unavailable. The CanCORS study protocol was approved by institutional review boards (IRBs) at all participating sites and at the Statistical Coordinating Center at the Dana-Farber Cancer Institute.¹¹ The overall response rate was 49.1 % for lung cancer and 53.2 % for colorectal cancer in the baseline participant survey.¹¹

Cohort Selection and Data Collection

Patients eligible for enrollment in the CanCORS study were ≥ 21 years with a histologically or cytologically confirmed lung or colorectal cancer diagnosed between September 2003 and December 2005. For this study, we analyzed a subset of CanCORS participants who underwent cancer-directed surgery, as indicated by the participant or surrogate responding “yes” to having received surgery for lung or colon cancer. Patients were excluded due to failure to respond to questions about expected effects of surgery, surgery having not been completed at the time of survey, or missing information on cancer stage.

Baseline patient characteristics collected by the CanCORS consortium included age at diagnosis, sex, race, marital status, education, income, insurance status, participation in an integrated healthcare network, comorbidities, physical function, and cancer stage. Race was divided among patients who were primarily English versus Spanish speaking (for Hispanic patients) or Chinese speaking (for Asian patients) as previously described.¹² Patients who reported being widowed, divorced, separated, and never married were categorized as unmarried. Patients were classified as having none, 1, 2, or ≥ 3 comorbid conditions based on self-reported health history such as heart attack, stroke, congestive heart failure, diabetes, peripheral vascular diseases, chronic lung disease, diabetes, and chronic kidney disease. Physical function was categorized using three CanCORS survey items derived from the European Quality of Life-5 Dimensions questionnaire (EQ-5D) that identified problems with mobility, self-care, and usual activities. A patient was considered to have either good physical function if he/she responded “No” to all three of these items or poor physical function if the individual responded “Yes” to one or more items.^{4,13} The TNM staging system was used to classify tumor stage at diagnosis based on pathologic reports, radiology, and physician notes. Cases were grouped as stage I/II (localized), stage III (locoregional), or stage IV (metastatic) disease. All patients including patients with metastatic disease (stage IV) were included in this study as previous studies have shown that patients with advanced disease often have unrealistic perceptions of cure.¹⁴ Patient-reported assessment of quality of care, role in decision-making, patient – physician communication, and perceptions about potential beneficial and adverse effects of surgical treatment were derived from CanCORS survey questions and categorized as previously described (Supplementary Table S1)^{4,6,15}. Assessment of physician communication skills was calculated from five survey items that were derived from the Consumer Assessment of Healthcare Providers and Systems (CAHPS), with an indication 0 as the worst possible communication and 100 as optimal communication.^{4,12} Consistent with previously published work,⁴ physician communication scores were categorized in three groups: poor (0 – 80), fair (81 – 99), and excellent (100).

Patients reported their perception of the overall quality of care and quality of care for each treatment modality they received; only overall perception of quality of overall surgical care was analyzed for the purposes of this study. For the purposes of this study, patient-reported perceptions of care are reported as “patient-reported quality of care” As previously described, responses were grouped into “excellent” versus all other responses (“very good,” “good,” “fair,” or “poor”), as most patients responded excellent. With regards to perception of likelihood of cure, patients responding “very likely” or “somewhat likely” were categorized as perceiving surgical cure to be “likely.” In contrast, individuals who

responded “a little likely,” “not at all likely,” or “I don’t know” were considered as perceiving surgery “unlikely” to be curative.^{4,16}

Statistical Analysis

Categorical variables were presented as frequencies and percentages and compared using the chi-squared test. Patient-reported quality of overall and surgical care was analyzed according to demographic, clinical, socioeconomic, and health system factors for each type of cancer. Factors associated with quality of care were analyzed using multivariable logistic regression and expressed as odds ratios (OR) and 95 % confidence intervals (95 % CI). Variables included in the multivariable analysis were those of clinical interest,¹⁷ as well as those found to be of statistical significance ($P<0.05$) on univariable analysis. Furthermore, all variables entered in the multivariable model were checked for collinearity through the analysis of variance inflation factors; all factors had variance inflation factors less than 10. Unimputed values were used for descriptive analysis, whereas imputed values were used for regression models. All analyses were performed using STATA version 12.1 (StataCorp LP, College Station, TX); a two-tailed P value <0.05 was considered statistically significant.

Results

Patients (3,954) who underwent cancer-directed surgery for either lung ($n=1,199$, 30.3 %) or colorectal ($n=2,755$, 69.7 %) cancer were identified in the CanCORS study cohort and met the inclusion criteria. Supplementary Table S2 summarizes the demographic and tumor characteristics of the study population. About one-half of patients were >65 years ($n=2,047$, 51.8 %) and most were White ($n=2,736$, 69.2 %). Most patients had early stage (I/II) ($n=2,435$, 61.6%) disease, while a subset of patients had either stage III ($n=1,023$, 25.9 %) or stage IV ($n=496$, 12.5 %) disease. Patients who underwent surgery for lung cancer more often presented with early stage disease (stage I/II, 72.1 %; stage III, 18.3 %; stage IV, 9.6 %) compared with patients who had colon cancer (stage I/II, 57.0 %; stage III, 29.2 %; stage IV, 13.8 %) ($P<0.001$).

Patient-Reported Quality of Overall Care

Overall, 56.7% of patients reported excellent quality of care and this measure did not differ by cancer type (lung: $n=649$, 54.5 % versus colorectal: $n=1,582$, 57.6 %; $P=0.08$) (Table 1). After stratifying by stage of disease, patients with both early and late stage disease reported equivalent rates of excellent quality of care (stage I/II, 56.7 % versus stage III/IV, 56.7 %; $P=0.83$). There were, however, significant differences in quality of care as reported by patients of different races (Fig. 1). For instance, White patients had the highest proportion of individuals reporting excellent overall quality of care ($n=1,623$, 59.6 %) compared with Asian/Chinese-speaking ($n=10$, 17.9 %) and Asian/English-speaking patients ($n=70$, 46.1 %) who had the lowest rates of excellent quality of care ($P<0.001$).

With regards to perception of likelihood of cure, 80 % ($n=959$) of patients with lung cancer and 90.5 % ($n=2,470$) of patients with colorectal cancer perceived that surgery was likely to cure their cancer. Among patients with stage IV metastatic disease, 59.5 % of patients with lung cancer ($n=66$) and 80.2 % of patients with colorectal cancer ($n=304$) perceived that

surgery was likely to cure their cancer. Overall quality of care ratings was higher among patients who perceived that surgery was likely to cure their disease. Specifically, 57.5 % ($n=1,965$) of patients who believed that surgery was likely to cure their disease reported excellent overall quality of care compared with 49.9 % ($n=1,450$) of patients who did not believe that surgery was likely to cure their disease ($P=0.002$). Of note, in a subset analysis of patients with metastatic disease, perception of likelihood of cure did not affect quality of care ratings ($P=0.52$).

Patient–physician communication ratings also were associated with overall quality of care ratings (Fig. 2). Roughly one-half of patients ($n=2,209$, 55.9 %) reported excellent communication with their physician. Among these patients, 70.6 % of patients reported excellent quality of care versus only 27.2 % of patients who reported poor patient–physician communication ($P<0.001$).

To account for measurable sociodemographic, clinical, and communication-level factors believed to be associated with patient-reported overall quality of care, a multivariable logistic regression analysis was performed (Table 2). In adjusted analyses, female sex (OR 0.84, 95 % CI 0.79–0.89; $P<0.001$), Asian/English-speaking (OR 0.53, 95 % CI 0.46–0.62; $P<0.001$), Asian/Chinese-speaking (OR 0.25, 95 % CI 0.18–0.34; $P<0.001$), and Black (OR 0.67, 95 % CI 0.61–0.74; $P<0.001$) patients, as well as patients with multiple co-morbidities (≥ 3 comorbid conditions: OR 0.84, 95% CI 0.76–0.93; $P=0.001$), were associated with a lower likelihood of reporting excellent quality of overall care. Patients with late stage disease (stage III: OR 1.09, 95% CI 1.02–1.17 and stage IV: OR 1.12, 95 % CI 1.02–1.23; both $P=0.02$), those who had higher levels of education (high school diploma: OR 1.47, 95 % CI 1.35–1.60 versus college degree or higher: OR 1.62, 95 % CI 1.46–1.79; $P<0.001$), an annual income $> \$60,000/\text{year}$ (OR 1.29, 95 % CI 1.16–1.42; $P<0.001$), good physical function (OR 1.34, 95 % CI 1.16–1.56; $P<0.001$), and patients who reported good (OR 2.83, 95 % CI 2.59–3.08; $P<0.001$) or excellent (OR 6.49, 95 % CI 6.01–7.01; $P<0.001$) physician communication were more likely to report excellent quality of overall care. Furthermore, patients who perceived their cancer was likely curable also were more likely to report excellent quality of overall care (OR 1.17, 95 % CI 1.07–1.28; $P=0.001$).

Patient-Reported Quality of Surgical Care

Overall, 67.9 % of patients reported excellent quality of surgical care and this did not differ by cancer type (lung: $n=809$, 67.9 % versus colorectal: $n=1,864$, 67.8 %; $P=0.95$) or stage of disease (stage I/II, 68.7 % versus stage III/IV, 66.6 %; $P=0.07$) (Table 3). There were marked differences in quality of surgical care reported by patients of different races, with a higher proportion of White patients reporting excellent quality of surgical care ($n=1,926$, 70.6 %) compared with Hispanic/Spanish-speaking ($n=45$, 55.6 %) and Asian/Chinese-speaking patients ($n=16$, 28.6 %; $P<0.001$) (Fig. 3). Patient-reported quality of surgical care was also higher among patients who perceived that surgery was likely to cure their disease. For example, 68.5% ($n=2,344$) of patients who believed that surgery was likely to cure their disease reported excellent quality of surgical care versus 62.3% ($n=301$) of patients who did not believe that surgery was likely to cure their disease ($P=0.002$). In the subset of patients with metastatic disease, however, perception of likelihood of cure was not associated with

patient-reported quality of surgical care ($P=0.72$). Furthermore, physician communication was also associated with patient-reported rates of excellent surgical care as 77.2 % of patients who reported excellent physician communication also reported excellent quality of surgical care versus only 46.0 % of patients who reported poor patient–physician communication ($P<0.001$) (Fig. 4).

The influence of sociodemographic, clinical, and communication-level factors on perception of patient-reported quality of surgical care was then examined using multivariable logistic regression analyses (Table 4). In adjusted analyses, patients who were female (OR 0.74, 95 % CI 0.69–0.78; $P<0.001$), older (>75 years: OR 0.79, 95 % CI 0.72–0.87; $P<0.001$), patients with metastatic stage IV disease (OR 0.81, 95 % CI 0.74–0.89; $P<0.001$), minorities (Hispanic/English: OR 0.85, 95 % CI 0.74–0.98; Hispanic/Spanish: OR 0.69, 95 % CI 0.56–0.86; Black: OR 0.74, 95 % CI 0.68–0.82; Asian/English: OR 0.47, 95 % CI 0.41–0.55; Asian/Chinese: OR 0.21, 95 % CI 0.16–0.28; all $P<0.005$), and unmarried patients (OR 0.67, 95 % CI 0.81–0.93; $P<0.001$) were less likely to report excellent quality of surgical care. In contrast, patients with good physical function (OR 1.24, 95 % CI 1.17–1.33; $P<0.001$) and higher education (high school degree: OR 1.22, 95 % CI 1.13–1.34; college degree: OR 1.26, 95 % CI 1.14–1.40; both $P<0.001$) and those who reported good (OR 2.18, 95 % CI 2.00–2.37; $P<0.001$) or excellent (OR 3.74, 95 % CI 3.47–4.02; $P<0.001$) physician communication were more likely to report excellent quality of surgical care. Perception of likelihood of cure was also associated with higher reported quality of surgical care after adjusting for all measurable factors (OR 1.11, 95 % CI 1.01–1.22; $P=0.03$).

Discussion

Several patient-related factors have previously been shown to have an impact on overall quality of care.^{12,17–19} Furthermore, patients' perception of their prognosis has been previously shown to have an impact on their decisions about medical care.^{5,20–26} As with every medical decision, it is imperative to hold a thorough discussion of the risks and benefits of all available treatment plans in order to provide optimal individualized medical management. To our knowledge, no previous study has comprehensively examined the association between patient factors (i.e., race, income, education, etc.), patients' understanding of their disease (i.e., physician communication, perception of likelihood of cure), and patient-reported quality of overall and surgical care among patients undergoing cancer-directed surgery. Our study is important as we utilized a national cohort of patients who underwent surgery for lung or colorectal cancer in determining the factors most associated with excellent patient-reported quality of care. Consistent with previous work, we found that race, income level, education status, and physician communication were the factors most strongly associated with varying rates of patient-reported quality of care. Perhaps equally as important, patients who perceived their cancer to be likely curable were also more likely to report excellent quality of overall and surgical care.

Using the CanCORS cohort of patients who received chemotherapy, Weeks et al. demonstrated that 69 % of patients with incurable lung cancer and 81 % of patients with incurable colorectal cancer believed that chemotherapy was likely to cure their disease.⁴ Among patients who underwent cancer-directed surgery for lung or colorectal cancer, we

not only found that 80 % ($n=959$) of patients with lung cancer and 89.6% ($n=2,470$) of patients with colorectal cancer perceived that surgery was likely to cure their cancer, but that this perception of cure also had a significant impact on patient-reported quality of care. Furthermore, patients who reported excellent physician communication were nearly six and a half more times more likely to report excellent quality of overall care and nearly four times more likely to rate the quality of surgical care as excellent. Previous studies have demonstrated the importance of quality patient–physician communication to help patients and family members make informed decisions, manage cancer effectively, and improve psychosocial health outcomes.^{5,20–26} As such, there appears to be significant unmet communication needs among patients undergoing surgery for lung or colorectal cancer. Several reports, including one from our own group, have demonstrated that patients often have unrealistic expectations of cure for terminal illnesses.^{4,22,27} To this point, our group has shown using the same cohort of patients that 57.4 % with metastatic lung cancer and 79.8 % of patients with metastatic colon cancer believed surgery to be curative.¹⁴ Given this, it appears that patient misconceptions about cure with regards to cancer, and in particular advanced metastatic cancer, may either be due in part to patient misunderstanding or a failure of the physician to effectively communicate and help patients understand their true prognosis. In fact, our results regarding the association of excellent physician communication and excellent quality of care support findings from Roberts et al. who reported that empathy from surgeons was the most important factor to cancer patients as opposed to information-giving.²⁸ Taken together, it appears that inspiring an overly optimistic perception of prognosis may in fact increase patient-reported quality of care. Though data are mixed regarding the attempt to improve physician communication skills,^{29,30} patient–physician relationships should focus not only on providing up-front, accurate medical information and expectations but also taking the time necessary to provide patients and their family members with the emotional support needed to cope with these demanding diseases.

In the current study, we were able to demonstrate a variety of patient-related factors that were associated with patient-reported ratings of overall and surgical quality care. In particular, race appeared to play a significant role in how patients perceived their quality of overall and surgical care among patients undergoing cancer-directed surgery. Ayanian et al. had previously shown significant disparities in cancer patients' perception of quality of care by race, ethnicity, and language.¹² Similarly, results of the current study focusing on patients who underwent cancer-directed surgery indicated that patients of minority race (Black, Hispanic, Asian) had significantly lower reported rates of patient-reported quality of overall and surgical care. Furthermore, after stratifying patients by language (i.e., English speaking versus Spanish or Chinese speaking), patients who were minority and non-English speaking generally had lower rates of patient-reported quality of overall and surgical care. Though it is difficult to elucidate the factors behind such an association, it is reasonable to conclude that both cultural and language barriers between physicians and patients play a role in this perceived lack of patient-reported quality of care. Ayanian and colleagues also suggested that issues with access and coordination of care, particular in the cancer patient, may be factors related to these findings.^{10,31} It is also plausible that the race of the surgeon may have affected these patient-reported ratings of quality of care. Previous studies have

indeed shown that race concordance between physicians and patients to be associated with higher ratings of patient-reported quality of care.^{32,33} Our study also found that lower income status and lower educational status were associated with worse quality of overall care and demonstrated a similar pattern in the context of surgical care. The associations found in this study should promote studies to further evaluate factors associated with patient-perceived quality of care among a cohort of primarily minority or uninsured patients. Furthermore, these data should prompt further research not only to identify the reasons for these disparate perceptions about quality of care but also to determine how to identify, target, and improve patient experiences in these high-risk populations.

The current study has several limitations that should be considered when interpreting the data. Perceived quality of care measures was based on patient-reported responses an average of 6 months following the diagnosis of their disease. As such, treatment decisions and the effect that patient–physician interactions had on patient-perceived quality of care may have been affected by recall bias. In addition, surveys completed by surrogates could also be influenced by recall bias and may not accurately reflect the patients’ true perceptions. However, the use of surrogates in our cohort was limited (2.6 %) and therefore was not likely to have had a significant impact on the overall findings. In addition, though our response rate was acceptable for survey-based data (49.1 % for lung cancer and 53.2 % for colorectal cancer), bias between responders and nonresponders was a possibility. Furthermore, patient-reported overall quality of care was likely most influenced by the provider who played the central role in a given patient’s care. As the survey focused primarily on patient-centered responses, the data is limited by the lack of availability of provider or hospital characteristics. Our data, however, do demonstrate a relatively consistent correlation between factors impacting both overall and surgical quality of care. Finally, data on patients who experienced a complication related to their cancer care were unavailable. These data may have been pertinent as the incidence of surgical complications has been previously shown to impact patient-reported quality of care.³⁴

In conclusion, patient-reported quality of care is affected by several patient- and physician-related factors. Patient factors such as race, income, and educational status, as well as physician communication, appear to have the strongest association with patient-reported quality of care. Perception of likelihood of cure was also associated with quality of care after controlling for other factors. Physicians should promote honest discussions about prognosis with cancer patients in order to eliminate misconceptions about the effectiveness of various treatment plans. Future studies should focus more closely on examining patient–physician relationships and communication barriers, particularly among minority patients and those with lower income and educational status.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2015. *CA: a cancer journal for clinicians*. 2015; 65(1):5–29. [PubMed: 25559415]
2. Henley SJ, Singh SD, King J, Wilson R, O'Neil ME, Ryerson AB, et al. Invasive cancer incidence and survival—United States, 2011. *MMWR Morbidity and mortality weekly report*. 2015; 64(9): 237–242. [PubMed: 25763875]
3. Siegel R, Desantis C, Jemal A. Colorectal cancer statistics, 2014. *CA: a cancer journal for clinicians*. 2014; 64(2):104–117. [PubMed: 24639052]
4. Weeks JC, Catalano PJ, Cronin A, Finkelman MD, Mack JW, Keating NL, et al. Patients' expectations about effects of chemotherapy for advanced cancer. *The New England journal of medicine*. 2012; 367(17):1616–1625. [PubMed: 23094723]
5. Hack TF, Degner LF, Parker PA, Team SC. The communication goals and needs of cancer patients: a review. *Psycho-oncology*. 2005; 14(10):831–845. discussion 46–7. [PubMed: 16200519]
6. Kehl KL, Landrum MB, Arora NK, Ganz PA, Ryn MV, Mack JW, et al. Association of actual and preferred decision roles with patient-reported quality of care: Shared decision making in cancer care. *JAMA Oncology*. 2015
7. Kenzik KM, Ganz PA, Martin MY, Petersen L, Hays RD, Arora N, et al. How much do cancer-related symptoms contribute to health-related quality of life in lung and colorectal cancer patients? A report from the Cancer Care Outcomes Research and Surveillance (CanCORS) Consortium. *Cancer*. 2015
8. Malin JL, Ko C, Ayanian JZ, Harrington D, Nerenz DR, Kahn KL, et al. Understanding cancer patients' experience and outcomes: development and pilot study of the Cancer Care Outcomes Research and Surveillance patient survey. *Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer*. 2006; 14(8):837–848. [PubMed: 16482448]
9. Tanco K, Rhondali W, Perez-Cruz P, Tanzi S, Chisholm GB, Baile W, et al. Patient Perception of Physician Compassion After a More Optimistic vs a Less Optimistic Message: A Randomized Clinical Trial. *JAMA Oncol*. 2015; 1(2):176–183. [PubMed: 26181019]
10. Ayanian JZ, Chrischilles EA, Fletcher RH, Fouad MN, Harrington DP, Kahn KL, et al. Understanding cancer treatment and outcomes: the Cancer Care Outcomes Research and Surveillance Consortium. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2004; 22(15):2992–2996. [PubMed: 15284250]
11. Catalano PJ, Ayanian JZ, Weeks JC, Kahn KL, Landrum MB, Zaslavsky AM, et al. Representativeness of participants in the cancer care outcomes research and surveillance consortium relative to the surveillance, epidemiology, and end results program. *Medical care*. 2013; 51(2):e9–e15. [PubMed: 22406968]
12. Ayanian JZ, Zaslavsky AM, Arora NK, Kahn KL, Malin JL, Ganz PA, et al. Patients' experiences with care for lung cancer and colorectal cancer: findings from the Cancer Care Outcomes Research and Surveillance Consortium. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2010; 28(27):4154–4161. [PubMed: 20713876]
13. Shaw JW, Johnson JA, Coons SJ. US valuation of the EQ-5D health states: development and testing of the D1 valuation model. *Medical care*. 2005; 43(3):203–220. [PubMed: 15725977]
14. Kim Y, Winner M, Page A, Tisnado DM, Martinez KA, Buettner S, et al. Patient perceptions regarding the likelihood of cure after surgical resection of lung and colorectal cancer. *Cancer*. 2015
15. Keating NL, Beth Landrum M, Arora NK, Malin JL, Ganz PA, van Ryn M, et al. Cancer patients' roles in treatment decisions: do characteristics of the decision influence roles? *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2010; 28(28):4364–4370. [PubMed: 20713872]

16. Chen AB, Cronin A, Weeks JC, Chrischilles EA, Malin J, Hayman JA, et al. Expectations about the effectiveness of radiation therapy among patients with incurable lung cancer. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2013; 31(21): 2730–2735. [PubMed: 23775958]
17. Sofaer S, Firminger K. Patient perceptions of the quality of health services. *Annual review of public health*. 2005; 26:513–559.
18. Cooper-Patrick L, Gallo JJ, Gonzales JJ, Vu HT, Powe NR, Nelson C, et al. Race, gender, and partnership in the patient-physician relationship. *JAMA : the journal of the American Medical Association*. 1999; 282(6):583–589. [PubMed: 10450723]
19. van Ryn M, Burke J. The effect of patient race and socio-economic status on physicians' perceptions of patients. *Social science & medicine*. 2000; 50(6):813–828. [PubMed: 10695979]
20. Mazor KM, Gaglio B, Nekhlyudov L, Alexander GL, Stark A, Hornbrook MC, et al. Assessing patient-centered communication in cancer care: stakeholder perspectives. *Journal of oncology practice / American Society of Clinical Oncology*. 2013; 9(5):e186–e193. [PubMed: 23943884]
21. Robinson JD, Hoover DR, Venetis MK, Kearney TJ, Street RL Jr. Consultations between patients with breast cancer and surgeons: a pathway from patient-centered communication to reduced hopelessness. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2013; 31(3):351–358. [PubMed: 23233706]
22. Weeks JC, Cook EF, O'Day SJ, Peterson LM, Wenger N, Reding D, et al. Relationship between cancer patients' predictions of prognosis and their treatment preferences. *JAMA*. 1998; 279(21): 1709–1714. [PubMed: 9624023]
23. Bennett M, Alison D. Discussing the diagnosis and prognosis with cancer patients. *Postgraduate medical journal*. 1996; 72(843):25–29. [PubMed: 8746281]
24. Mazor KM, Beard RL, Alexander GL, Arora NK, Firreno C, Gaglio B, et al. Patients' and family members' views on patient-centered communication during cancer care. *Psycho-oncology*. 2013; 22(11):2487–2495. [PubMed: 23780672]
25. Maguire P. Improving communication with cancer patients. *Eur J Cancer*. 1999; 35(14):2058–2065. [PubMed: 10711246]
26. Nelson JE, Gay EB, Berman AR, Powell CA, Salazar-Schicchi J, Wisnivesky JP. Patients rate physician communication about lung cancer. *Cancer*. 2011; 117(22):5212–5220. [PubMed: 21495028]
27. El-Jawahri A, Traeger L, Park ER, Greer JA, Pirl WF, Lennes IT, et al. Associations among prognostic understanding, quality of life, and mood in patients with advanced cancer. *Cancer*. 2014; 120(2):278–285. [PubMed: 24122784]
28. Roberts CS, Cox CE, Reintgen DS, Baile WF, Gibertini M. Influence of physician communication on newly diagnosed breast patients' psychologic adjustment and decision-making. *Cancer*. 1994; 74(1 Suppl):336–341. [PubMed: 8004605]
29. Tulskey JA, Arnold RM, Alexander SC, Olsen MK, Jeffreys AS, Rodriguez KL, et al. Enhancing communication between oncologists and patients with a computer-based training program: a randomized trial. *Annals of internal medicine*. 2011; 155(9):593–601. [PubMed: 22041948]
30. Curtis JR, Back AL, Ford DW, Downey L, Shannon SE, Doorenbos AZ, et al. Effect of communication skills training for residents and nurse practitioners on quality of communication with patients with serious illness: a randomized trial. *JAMA : the journal of the American Medical Association*. 2013; 310(21):2271–2281. [PubMed: 24302090]
31. Ayanian JZ, Zaslavsky AM, Guadagnoli E, Fuchs CS, Yost KJ, Creech CM, et al. Patients' perceptions of quality of care for colorectal cancer by race, ethnicity, and language. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*. 2005; 23(27): 6576–6586. [PubMed: 16116149]
32. Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR. Patient-centered communication, ratings of care, and concordance of patient and physician race. *Annals of internal medicine*. 2003; 139(11):907–915. [PubMed: 14644893]
33. Saha S, Komaromy M, Koepsell TD, Bindman AB. Patient-physician racial concordance and the perceived quality and use of health care. *Archives of internal medicine*. 1999; 159(9):997–1004. [PubMed: 10326942]

34. Gurland BH, Merlino J, Sobol T, Ferreira P, Hull T, Zutshi M, et al. Surgical complications impact patient perception of hospital care. *Journal of the American College of Surgeons*. 2013; 217(5): 843–849. [PubMed: 24035448]

Fig. 1.

Association between race and patient-reported overall quality of care

Fig. 2. Association between physician communication scores and patient-reported overall quality of care

Fig. 3.
Association between race and patient-reported quality of surgical care

Fig. 4.
Association between physician communication scores and patient-reported quality of surgical care

Table 1

Proportion of patients who reported excellent overall quality of care stratified by cancer type

Characteristic	Lung cancer (n=1,199)	Colorectal cancer (n=2,755)	Total (n=3,954)
Age			
21–54	66 (40.0)	422 (59.5)	488 (55.8)
55–64	194 (58.3)	411 (59.2)	605 (58.9)
65–74	245 (58.5)	410 (57.2)	654 (57.7)
75+	144 (52.8)	339 (54.1)	483 (53.7)
Sex			
Male	340 (55.3)	897 (60.3)	1,237 (58.9)
Female	309 (53.7)	683 (54.4)	993 (54.2)
Race			
White	510 (56.1)	1,113 (61.3)	1,623 (59.5)
Hispanic/English speaking	26 (63.4)	76 (47.8)	102 (51.0)
Hispanic/Spanish speaking	9 (62.3)	36 (52.9)	45 (55.6)
African-American	56 (47.1)	214 (53.4)	270 (52.0)
Asian/English speaking	13 (46.4)	57 (46.0)	70 (46.1)
Asian/Chinese speaking	4 (30.8)	6 (14.0)	10 (17.9)
Other	32 (47.1)	81 (57.5)	113 (54.1)
Tumor stage			
Stage I or II	467 (54.4)	908 (57.9)	1,374 (56.6)
Stage III	118 (54.4)	464 (58.0)	582 (57.3)
Stage IV	64 (55.7)	210 (55.6)	274 (55.6)
Marital status (n=3,950)			
Married or living with a partner	403 (54.8)	1,048 (60.1)	1,540 (58.5)
Unmarried	246 (54.3)	533 (53.2)	779 (53.6)
Education (n=3,947)			
Less than high school diploma	98 (50.0)	201 (46.4)	299 (47.5)
High school degree or some college	389 (54.0)	894 (58.7)	1,283 (57.3)
College degree or higher	160 (59.7)	486 (61.4)	645 (61.0)
Income			
<\$20,000	169 (51.2)	352 (50.9)	521 (51.0)
\$20,000-\$40,000	174 (55.2)	433 (56.2)	607 (55.9)
\$40,000-\$60,000	110 (56.7)	286 (56.3)	396 (56.4)
\$60,000	149 (60.1)	491 (66.4)	640 (64.8)
Integrated healthcare network			
No	472 (53.6)	1,217 (57.8)	1,689 (56.6)
Yes	177 (57.1)	364 (56.9)	541 (57.0)
Good physical function (n=3,935)			
No	373 (50.4)	731 (52.3)	1,104 (51.7)
Yes	271 (61.0)	848 (63.2)	1,118 (62.6)
Self-reported comorbid conditions			

Characteristic	Lung cancer (n=1,199)	Colorectal cancer (n=2,755)	Total (n=3,954)
0	193 (56.4)	721 (60.6)	914 (59.7)
1	230 (56.7)	480 (55.9)	710 (56.2)
2	119 (53.6)	232 (55.2)	351 (54.7)
3	107 (48.6)	148 (53.2)	255 (51.2)
Insurance			
No	5 (50.0)	36 (45.6)	41 (46.1)
Yes	639 (54.6)	1,544 (58.0)	2,183 (56.9)
Patient–physician role in decision-making (n=3,931)			
Patient-controlled	292 (57.5)	616 (57.5)	907 (57.4)
Shared control	294 (54.3)	750 (58.7)	1,044 (57.5)
Physician-controlled	56 (44.1)	213 (54.3)	269 (51.8)
Patient–family role in decision-making (n=3,884)			
Patient-controlled	323 (54.3)	797 (58.1)	1,120 (57.0)
Shared control	312 (56.2)	741 (57.7)	1,053 (57.3)
Family-controlled	5 (26.3)	26 (55.3)	31 (47.0)
Physician communication score (n=3,947)			
Poor	66 (23.4)	180 (28.9)	246 (27.2)
Fair	124 (49.0)	306 (53.2)	430 (51.9)
Excellent	459 (70.1)	1,096 (70.8)	1,554 (70.5)
Perception of cure			
Unlikely	111 (49.6)	130 (50.2)	241 (49.9)
Likely	528 (55.4)	1,437 (58.4)	1,964 (57.5)

Table 2

Odds ratios for the association between various demographic, tumor, and socioeconomic factors and a response to excellent quality of overall care

	Univariable		Multivariable	
	OR (95 % CI)	P value	OR (95 % CI)	P value
Cancer type				
Lung	Ref		Ref	
Colorectal	1.13 (0.98–1.30)	0.08	1.06 (0.99–1.13)	0.11
Tumor stage				
Stage I or II	Ref		Ref	
Stage III	1.02 (0.88–1.19)	0.76	1.09 (1.02–1.17)	0.02
Stage IV	0.96 (0.79–1.16)	0.66	1.12 (1.02–1.23)	0.02
Age				
21–54	Ref		Ref	
55–64	1.13 (0.94–1.36)	0.18	1.06 (0.97–1.15)	0.23
65–74	1.08 (0.90–1.29)	0.41	0.99 (0.91–1.08)	0.83
75+	0.92 (0.76–1.10)	0.36	0.93 (0.84–1.02)	0.12
Sex				
Male	Ref		Ref	
Female	0.82 (0.73–0.94)	0.003	0.84 (0.79–0.89)	<0.001
Race				
White	Ref		Ref	
Hispanic/English speaking	0.71 (0.63–0.79)	<0.001	0.77 (0.68–0.88)	<0.001
Hispanic/Spanish speaking	0.85 (0.71–1.02)	0.07	1.53 (1.22–1.93)	<0.001
African-American	0.73 (0.68–0.79)	<0.001	0.67 (0.61–0.74)	<0.001
Asian/English speaking	0.58 (0.51–0.66)	<0.001	0.53 (0.46–0.62)	<0.001
Asian/Chinese speaking	0.15 (0.11–0.20)	<0.001	0.25 (0.18–0.34)	<0.001
Marital status				
Married or living with a partner	Ref		Ref	
Unmarried	0.82 (0.72–0.93)	0.002	0.93 (0.87–1.00)	0.05
Education				
Less than high school diploma	Ref		Ref	
High school degree or some college	1.48 (1.24–1.76)	<0.001	1.47 (1.35–1.60)	<0.001
College degree or higher	1.73 (1.41–2.11)	<0.001	1.62 (1.46–1.79)	<0.001
Income				
<\$20,000	Ref		Ref	
\$20,000–\$40,000	1.22 (1.02–1.44)	0.03	0.98 (0.90–1.06)	0.57
\$40,000–\$60,000	1.24 (1.02–1.51)	0.03	0.92 (0.84–1.02)	0.11
\$60,000	1.77 (1.48–2.12)	<0.001	1.29 (1.16–1.42)	<0.001
Good physical function				
Yes	Ref		Ref	
No	1.57 (1.38–1.78)	<0.001	1.35 (1.27–1.43)	<0.001

	Univariable		Multivariable	
	OR (95 % CI)	P value	OR (95 % CI)	P value
Self-reported comorbid conditions				
0	Ref		Ref	
1	0.87 (0.74–1.01)	0.06	0.94 (0.88–1.01)	0.10
2	0.81 (0.68–0.98)	0.03	0.93 (0.85–1.01)	0.10
3	0.71 (0.58–0.87)	0.001	0.84 (0.76–0.93)	0.001
Insurance				
No	Ref		Ref	
Yes	1.55 (1.01–2.36)	0.04	1.36 (1.12–1.66)	0.002
Integrated healthcare network				
No	Ref		Ref	
Yes	1.02 (0.88–1.18)	0.84	0.93 (0.87–1.00)	0.05
Patient–physician role in decision-making				
Patient-controlled	Ref		Ref	
Shared control	1.00 (0.87–1.14)	0.98	0.99 (0.93–1.05)	0.06
Physician-controlled	0.80 (0.65–0.97)	0.03	1.22 (1.11–1.34)	<0.001
Patient–family role in decision-making				
Patient-controlled	Ref		Ref	
Shared control	1.01 (0.89–1.15)	0.86	0.94 (0.89–1.00)	0.06
Family-controlled	0.67 (0.41–1.09)	0.11	1.09 (0.86–1.38)	0.50
Perception of cure				
No	Ref		Ref	
Yes	1.36 (1.12–1.65)	0.002	1.17 (1.07–1.28)	0.001
Physician communication score				
0–80	Ref		Ref	
80–100	2.89 (2.37–3.54)	<0.001	2.83 (2.59–3.08)	<0.001
100	6.42 (5.40–7.63)	<0.001	6.49 (6.01–7.01)	<0.001

Table 3

Proportion of patients who reported excellent quality of surgical care stratified by cancer type

Characteristic	Lung cancer (n=1,199)	Colorectal cancer (n=2,755)	Total (n=3,954)
Age			
21–54	110 (66.7)	481 (68.0)	591 (67.8)
55–64	235 (71.0)	470 (67.7)	705 (68.8)
65–74	284 (67.8)	506 (70.8)	790 (69.7)
75+	180 (65.2)	407 (64.6)	587 (64.8)
Sex			
Male	432 (70.5)	1,062 (71.4)	1,494 (71.1)
Female	377 (65.2)	802 (63.7)	1,179 (64.2)
Race			
White	629 (69.2)	1,297 (71.3)	1,926 (70.6)
Hispanic/English speaking	32 (76.2)	100 (63.3)	132 (66.0)
Hispanic/Spanish speaking	8 (61.5)	37 (54.4)	45 (55.6)
African-American	78 (65.6)	259 (64.9)	337 (65.1)
Asian/English speaking	17 (60.7)	68 (54.8)	85 (55.9)
Asian/Chinese speaking	5 (38.5)	11 (25.6)	16 (28.6)
Other	41 (60.3)	94 (66.7)	135 (64.6)
Tumor stage			
Stage I or II	593 (68.9)	1,073 (68.6)	1,666 (68.7)
Stage III	140 (64.8)	554 (69.1)	694 (68.2)
Stage IV	76 (66.7)	237 (62.4)	313 (63.4)
Marital status (n=3,950)			
Married or living with a partner	506 (68.8)	1,235 (71.0)	1,741 (70.3)
Unmarried	302 (66.5)	627 (62.5)	929 (63.7)
Education (n=3,947)			
Less than high school diploma	125 (63.8)	271 (62.3)	396 (62.8)
High school degree or some college	493 (68.5)	1,035 (68.1)	1,528 (68.2)
College degree or higher	189 (70.3)	557 (70.5)	746 (70.4)
Income			
<\$20,000	214 (65.1)	419 (60.8)	633 (62.2)
\$20,000-\$40,000	218 (69.2)	535 (69.5)	753 (69.4)
\$40,000-\$60,000	131 (67.5)	340 (67.1)	471 (67.2)
\$60,000	183 (74.4)	543 (73.1)	726 (73.4)
Integrated healthcare network			
No	586 (66.7)	1,425 (67.7)	2,011 (67.4)
Yes	223 (71.5)	439 (63.4)	662 (69.4)
Good physical function (n=3,935)			
No	482 (65.1)	892 (64.1)	1,374 (64.5)
Yes	321 (72.1)	963 (71.6)	1,284 (71.8)
Self-reported comorbid conditions			

Characteristic	Lung cancer (n=1,199)	Colorectal cancer (n=2,755)	Total (n=3,954)
0	239 (70.0)	825 (69.3)	1,064 (69.4)
1	280 (69.1)	577 (67.2)	857 (67.8)
2	138 (62.2)	272 (64.5)	410 (64.0)
3	152 (68.9)	190 (68.4)	342 (68.5)
Insurance			
No	6 (60.0)	50 (64.1)	56 (63.6)
Yes	796 (67.9)	1,811 (68.0)	2,607 (67.9)
Patient–physician role in decision-making (n=3,931)			
Patient-controlled	358 (70.3)	734 (68.4)	1,092 (69.0)
Shared control	377 (69.6)	882 (69.1)	1,259 (69.3)
Physician-controlled	65 (51.2)	246 (62.6)	311 (59.8)
Patient–family role in decision-making (n=3,884)			
Patient-controlled	397 (66.5)	922 (67.3)	1,319 (67.1)
Shared control	388 (70.0)	893 (69.6)	1,281 (69.7)
Family-controlled	11 (57.9)	23 (48.9)	34 (51.5)
Physician communication score (n=3,947)			
Poor	128 (45.4)	290 (46.3)	418 (46.0)
Fair	161 (63.6)	394 (68.4)	555 (67.0)
Excellent	520 (79.3)	1,180 (76.4)	1,700 (77.3)
Perception of cure			
Unlikely	143 (63.8)	158 (61.0)	301 (62.3)
Likely	656 (68.7)	1,688 (68.5)	2,344 (68.6)

Table 4

Odds ratios for the association between various demographic, tumor, and socioeconomic factors and a response to excellent quality of surgical care

	Univariable		Multivariable	
	OR (95 % CI)	P value	OR (95 % CI)	P value
Cancer type				
Lung	Ref		Ref	
Colorectal	1.00 (0.86–1.15)	0.95	0.95 (0.89–1.02)	0.19
Tumor stage				
Stage I or II	Ref		Ref	
Stage III	0.97 (0.83–1.14)	0.74	1.02 (0.94–1.09)	0.67
Stage IV	0.79 (0.64–0.97)	0.02	0.81 (0.74–0.89)	<0.001
Age				
21–54	Ref		Ref	
55–64	1.05 (0.86–1.27)	0.64	0.90 (0.83–0.99)	0.02
65–74	1.09 (0.90–1.31)	0.40	0.95 (0.87–1.04)	0.30
75+	0.87 (0.72–1.07)	0.18	0.79 (0.72–0.87)	<0.001
Sex				
Male	Ref		Ref	
Female	0.73 (0.64–0.83)	<0.001	0.74 (0.69–0.78)	<0.001
Race				
White	Ref		Ref	
Hispanic/English speaking	0.81 (0.71–0.91)	0.001	0.85 (0.74–0.98)	0.02
Hispanic/Spanish speaking	0.52 (0.43–0.62)	<0.001	0.69 (0.56–0.86)	0.001
African-American	0.77 (0.71–0.84)	<0.001	0.74 (0.68–0.82)	<0.001
Asian/English speaking	0.76 (0.68–0.87)	<0.001	0.47 (0.41–0.55)	<0.001
Asian/Chinese speaking	0.17 (0.13–0.21)	<0.001	0.21 (0.16–0.28)	<0.001
Marital status				
Married or living with a partner	Ref		Ref	
Unmarried	0.74 (0.65–0.85)	<0.001	0.67 (0.81–0.93)	<0.001
Education				
Less than high school diploma	Ref		Ref	
High school degree or some college	1.27 (1.06–1.53)	0.01	1.22 (1.13–1.34)	<0.001
College degree or higher	1.41 (1.14–1.74)	0.001	1.26 (1.14–1.40)	<0.001
Income				
<\$20,000	Ref		Ref	
\$20,000–\$40,000	1.38 (1.15–1.65)	<0.001	1.16 (1.07–1.26)	<0.001
\$40,000–\$60,000	1.25 (1.02–1.52)	0.03	0.97 (0.88–1.07)	0.51
\$60,000	1.68 (1.39–2.03)	<0.001	1.23 (1.11–1.37)	<0.001
Good physical function				
Yes	Ref		Ref	
No	1.40 (1.22–1.61)	<0.001	1.24 (1.17–1.33)	<0.001

	Univariable		Multivariable	
	OR (95 % CI)	P value	OR (95 % CI)	P value
Self-reported comorbid conditions				
0	Ref		Ref	
1	0.93 (0.79–1.09)	0.39	0.97 (0.91–1.05)	0.49
2	0.79 (0.65–0.95)	0.02	0.85 (0.77–0.93)	<0.001
3	0.96 (0.78–1.20)	0.74	1.08 (0.98–1.20)	0.13
Insurance				
No	Ref		Ref	
Yes	1.21 (0.78–1.88)	0.39	1.11 (0.91–1.35)	0.32
Integrated healthcare network				
No	Ref		Ref	
Yes	1.10 (0.94–1.29)	0.24	0.96 (0.89–1.03)	0.24
Patient–physician role in decision-making				
Patient-controlled	Ref		Ref	
Shared control	1.13 (0.98–1.29)	0.09	0.92 (0.86–0.98)	0.02
Physician-controlled	0.52 (0.32–0.85)	0.01	0.87 (0.79–0.96)	0.004
Patient–family role in decision-making				
Patient-controlled	Ref		Ref	
Shared control	1.32 (1.08–1.61)	0.006	1.09 (1.02–1.16)	0.008
Family-controlled	1.65 (1.38–1.99)	<0.001	0.74 (0.59–0.93)	0.009
Perception of cure				
No	Ref		Ref	
Yes	1.32 (1.08–1.61)	0.006	1.11 (1.01–1.22)	0.03
Physician communication score				
0–80	Ref		Ref	
80–100	2.38 (1.96–2.89)	<0.001	2.18 (2.00–2.37)	<0.001
100	3.99 (3.38–4.70)	<0.001	3.74 (3.47–4.02)	<0.001