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Quality of Cancer Care among Foreign-Born and US-Born Patients with Lung or Colorectal Cancer

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Abstract

Background—Disparities in care have been documented for foreign-born cancer patients in the US. However, limited data are available on lung and colorectal cancer. We assessed whether patient-reported quality and receipt of recommended care differed between US-born and foreign-born cancer patients.

Methods—We collected surveys and medical records for a population-based cohort including white, Hispanic, and Asian adults (2,205 US-born and 890 foreign-born) with lung or colorectal cancer diagnosed in California during 2003–2005. We used logistic regression to assess the association of nativity with patient-reported quality of care and receipt of recommended treatments (adjuvant chemotherapy for stage III colon cancer, adjuvant chemotherapy and radiation for stage II/III rectal cancer, and curative surgery for stage I/II non-small cell lung cancer). We also assessed whether language explained any differences in care by nativity.

Results—Overall, 46% of patients reported excellent care, but foreign-born patients were less likely than US-born patients to report excellent quality of care (adjusted odds ratio (AOR)=0.80, 95% confidence interval [CI]=0.65–1.00), a difference partly explained by language of survey, an indicator of English proficiency. Rates of recommended therapies ranged from 64% to 85%; foreign-born patients were less likely to receive chemotherapy and radiation for stage II/III rectal cancer (AOR=0.35, 95% CI=0.12–0.99). Rates of other treatments did not differ significantly by nativity.

Conclusions—Foreign-born cancer patients reported lower quality of care and were less likely to receive some cancer therapies than US-born. Better coordination of care and communication about cancer treatments and expanded use of interpreters may lessen these disparities.

Keywords

lung cancer; colorectal cancer; recommended care; immigrants; satisfaction; quality; disparities; race/ethnicity; Hispanic; Asian

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Disparities in cancer diagnosis, treatment, and survival have been documented for immigrants in the United States (US). Foreign-born individuals are diagnosed with cancer at more advanced stages or with larger tumors(1–4), receive less definitive cancer treatments(1) and have worse survival once diagnosed with cancer(4–6) than individuals of similar race/ethnicity who were born in the US. Such disparities may be related to access to screening services(7;8) or care, which may be mediated in part by language differences and communication difficulties(9–11).

The extent of disparities in cancer outcomes by nativity remains poorly understood. Prior studies have focused on breast(1–4;6;12), colorectal(5), and gastric(13) cancer and have variably included Hispanic(1;2) or Asian(3–6;12;13) patients. Not all studies reported worse care for foreign-born patients; one reported earlier-stage diagnosis, more complete surgical treatment and improved survival of Asians and Pacific Islanders with gastric cancer, which was most pronounced among the foreign-born subgroup(13). Moreover, prior studies have typically used cancer registry data, which are limited by incomplete data on birthplace(14–18) and no information on factors related to acculturation. Few data are available on disparities by nativity in the treatment of lung and colorectal cancer, despite these cancers representing the two leading causes of cancer mortality in the US(13).

In 2007 approximately 38 million foreign-born individuals resided in the US, of whom 18 million were Hispanic and 9 million were Asian(19). To document whether US- and foreign-born patients with lung or colorectal cancer differ in their perceived quality of care and receipt of guideline-based treatments, we studied a large, population-based cohort of white, Hispanic, and Asian patients. Specifically, we assessed differences by nativity in patients' ratings of the quality of their care and in receipt of recommended treatments. In addition, we assessed whether such differences were influenced by English-language proficiency.

Material and Methods

Study Design and Study population

Patients were recruited as part of a large national study of cancer care and outcomes undertaken by the Cancer Care Outcomes Research and Surveillance (CanCORS) Consortium (20;21). The study was approved by the human subjects committees at all participating institutions. Patients aged 21 and older diagnosed with invasive lung or colorectal cancer during September 2003 through December 2005 were identified within approximately three months of diagnosis using rapid case ascertainment from population-based cancer registries or pathology and cytology records. Patients were living in Alabama, Iowa, Los Angeles County, Northern California, and central North Carolina, or received their care in one of 5 large health maintenance organizations or at one of 15 medical centers in the Veterans Affairs Health Care system.

The eligible study sample consisted of 11,629 patients with invasive lung cancer and 10,239 patients with colorectal cancer. After notifying the patient's physician, 8,340 lung and 7,841 colorectal patients were contacted, and 5,150 lung and 4,911 colorectal patients or their proxy were interviewed, for a response rate of 51.0% and cooperation rate among contacted participants of 59.9%(22). An additional 140 lung and 208 colorectal patients were excluded because their cancers were recurrent or they were later deemed to be ineligible, resulting in a total of 9,713 patients (5,010 lung and 4,703 colorectal).

For this study, we included only patients enrolled from the Northern California (Alameda, Contra Costa, Sacramento, San Francisco, San Joaquin, San Mateo, Santa Clara, and Solano

counties) and Los Angeles county study sites, which accounted for the vast majority foreign-born individuals in CanCORS. We excluded 425 persons who did not identify country of birth. We restricted the cohort to whites, Hispanics and Asians due to small numbers of foreign-born individuals of other races. The final study population consisted of 2,205 US-born and 890 foreign-born individuals of white, Hispanic, or Asian race/ethnicity. Asian patients were most often of Chinese (45%) or Filipino (24%) descent.

Data Collection

Patients or surrogates of patients who were deceased or too ill to participate were interviewed by telephone approximately 3–6 months after diagnosis. Recruitment materials and patient and surrogate surveys were translated (with back-translation) into Spanish and Chinese (Mandarin and Cantonese) and administered by bilingual interviewers for respondents who preferred these languages. The surveys (available at www.cancors.org/public) included questions about cancer treatments, ratings of care, health status, and sociodemographic characteristics.

Patients' medical records (available for 75% of US-born and 61% of foreign-born patients) and registry data were used to obtain information about cancer site, stage at diagnosis, and treatment.

Dependent Variables

Patient-Reported Quality of Care—Patients were asked, “Overall, how would you rate the quality of your health care since your diagnosis of [lung or colorectal] cancer?” Potential responses included ‘excellent,’ ‘very good,’ ‘good,’ ‘fair,’ ‘poor’. We dichotomized the responses as “excellent” versus other.

Receipt of Recommended Treatment—We assessed receipt of guideline-recommended cancer treatments(23–25) for which sample sizes were sufficient for statistical comparisons, including adjuvant chemotherapy for stage III colon cancer, adjuvant chemotherapy and radiation therapy for stage II/III rectal cancer, and curative surgery for stage I/II non-small cell lung cancer. We documented receipt of chemotherapy and radiation therapy if a comprehensive medical record review identified receipt within 6 months of diagnosis or if the patient or surrogate reported that they had received or were planning to receive chemotherapy or radiation therapy at the time of the baseline survey (studies suggest that patients' self-reports of these treatments are highly accurate(26–30)). Among patients with medical record data, we identified receipt of surgery for stage I/II non-small cell lung cancer if the medical records documented pneumonectomy, lobectomy, or wedge resection within 6 months of diagnosis (patients were not asked about these specific procedures in the interview).

Independent variables

The main independent variables were nativity and race/ethnicity, categorized as US-born or foreign-born white, US-born or foreign-born Hispanic, and US-born or foreign-born Asian. Control variables included age at diagnosis, sex, marital status, education, household income, number of self-reported comorbid illnesses, self-reported health status, survey type, cancer type, and cancer stage. Among foreign-born individuals, we also documented language of survey (English versus non-English) which reflects English language proficiency and may be more relevant for clinical care than language spoken at home. Only 73 patients (2.3%) lacked health insurance; therefore this variable was not included in analyses. Variables were categorized as depicted in Table 1.

Statistical Analysis

We compared unadjusted proportions of each dependent variable by nativity, stratified by race/ethnicity using the Cochran-Mantel-Haenszel test. Next, we used logistic regression models to examine the association of nativity and race/ethnicity with each dependent variable, adjusting for the independent variables listed above. In a second set of models, we included language to assess if this variable explained any associations between nativity and the dependent variables. Finally, we investigated interactions of nativity and race/ethnicity.

We conducted several sensitivity analyses. First, we repeated analyses of ratings of care combining “excellent” with “very good.” Second, because surrogates may rate care differently than patients and because they were surveyed when patients were deceased or very ill and these poorer outcomes could influence ratings, we repeated the analyses of ratings of care excluding surrogate interviews. Third, we repeated all analyses using a variable reflecting language spoken at home instead of language of the survey which may not accurately reflect language skills for patients whose surrogates completed the survey. Fourth, we assessed adjuvant chemotherapy and/or radiation therapy if the patient reported treatment was given but not if they reported it was planned. Finally, for assessing rectal cancer treatments, we ran models assessing receipt of chemotherapy or radiation versus neither treatment.

Item non-response was <2–3% for most variables. We used multiple imputation to impute missing survey data for items other than the dependent and independent variables of interest(31). Analyses were conducted using SAS statistical software, version 9.2.

Results

The distribution of the patient characteristics stratified by race/ethnicity and nativity is presented in Table 1. Foreign-born Hispanic and Asian patients were younger than foreign-born whites and US-born groups. Asian patients were more often college graduates and Hispanic patients were more often in the low-income group. More US-born individuals completed the interview themselves. Many foreign-born Hispanic and Asian patients completed the survey in a language other than English.

Patients' Ratings of Quality of Care

Overall, 46% of patients rated their cancer care as excellent. In unadjusted analyses, the proportion rating quality of care as excellent varied between US-born and foreign-born patients within each race/ethnicity group ($P=0.01$). US-born patients more often reported excellent quality of care in all race/ethnicity groups compared with foreign-born patients (Table 1). In adjusted analyses, foreign-born patients were less likely than US-born patients to report excellent quality of care (adjusted odds ratio [OR]=0.80, 95% confidence interval [CI]=0.65–0.99, Table 2). Asian and Hispanic patients were also less likely than white patients to report excellent quality of care. When adjusting for language of survey (model II), the size of the effect of foreign birth on ratings decreased by about half ($OR=0.89$), and the association was no longer statistically significant. Language also explained some of the association of lower quality for Hispanic patients, but not for Asian patients. The interaction of nativity by race/ethnicity was not statistically significant ($P=0.46$ and 0.59 for Hispanic and Asian, respectively).

Adjuvant Chemotherapy for Stage III Colon Cancer

Overall, 77% of patients with stage III colon cancer received adjuvant chemotherapy. In unadjusted analyses, we found no differences in rates of adjuvant chemotherapy by nativity or race/ethnicity ($P=0.79$). Rates were highest among US-born Asian patients (92%) and

lowest among foreign-born Asian patients (76%)(Table 1), but the numbers in these groups were small and this difference was not statistically significant ($P=0.19$). After adjustment, there was no statistically significant association between nativity or race/ethnicity and adjuvant chemotherapy (Table 3). Adjusting for language of survey did not change the results. The interaction of nativity by race/ethnicity was not statistically significant ($P=0.71$ and $P=0.11$ for Hispanic and Asian patients, respectively).

Adjuvant Chemotherapy and Radiation Therapy for Stage II/III Rectal Cancer

Overall, 64% of patients with stage II/III rectal cancer received adjuvant chemotherapy and radiation therapy. In unadjusted analyses, we observed no differences in rates of both adjuvant chemotherapy and radiation by nativity, stratified by race/ethnicity ($P=0.61$) (Table 1). In adjusted analyses, foreign-born patients had lower rates of adjuvant chemotherapy and radiation therapy ($OR=0.35$, 95% $CI=0.12-0.99$, Table 3). Rates of adjuvant therapy did not differ by race/ethnicity. After adjusting for language, the association of nativity and treatment decreased somewhat ($OR=0.43$) and was no longer statistically significant. Language was not statistically associated with receipt of adjuvant therapy, although sample sizes were small. The interaction of nativity by race/ethnicity was not statistically significant ($P=0.24$ for Hispanic and $P=0.36$ for Asian patients).

Surgery for Stage I/II Non-Small Cell Lung Cancer

Overall, 85% of patients with stage I/II lung cancer underwent curative surgery. In unadjusted analyses, we observed no differences in rates of primary lung surgery by nativity or race/ethnicity ($P=0.64$, Table 1). After adjustment, we observed no association between nativity or race/ethnicity and receipt of surgery (Table 3). Similarly, adjusting for language of survey did not alter the results. The interaction of nativity by race/ethnicity was not statistically significant ($P=0.66$ for Hispanic and $P=0.97$ for Asian patients).

Sensitivity Analyses

In sensitivity analyses, when combining excellent with very good in patients' ratings of care, results were similar. In analyses of ratings of care excluding surrogate respondents; the beta coefficients were unchanged, but the effect of foreign-born status was no longer statistically significant due to the smaller sample size.

For all dependent variables, we repeated the second model including language spoken at home instead of the language of survey, and results were similar. We also conducted sensitivity analyses assessing adjuvant chemotherapy and/or radiation therapy where we did not consider the treatment to have been received if the patient reported the treatment was "planned" but not already given; results were similar. Finally, results of adjuvant therapy for stage II/III rectal cancer were similar when the dependent variable was dichotomized as either chemotherapy or radiation therapy versus none

Discussion

In this population-based cohort of patients in California with lung or colorectal cancer, we observed lower patient ratings of cancer care among foreign-born patients relative to U.S.-born patients as well as among Hispanic and Asian individuals. These differences were partially explained by English language proficiency. We also observed lower rates of adjuvant chemotherapy and radiation therapy for stage II/III rectal cancer among foreign-born patients compared with US-born patients. We did not observe differences in rates of adjuvant chemotherapy for stage III colon cancer or curative surgery for stage I/II lung cancer. However, moderate-sized differences may have been missed due to relatively small sample sizes in these groups.

The Institute of Medicine has emphasized the importance of patient-centered care, declaring patient-centeredness to be one of six key aims of high-performing health care organizations(32). Previous research has found that racial or ethnic minorities with cancer and other conditions rate their care less favorably than white patients(33;34); this difference is particularly pronounced among non-English speaking patients(33–35). Asian and Hispanic patients have more problems than whites with coordination of care, access to care, and access to health and treatment information(35). The complexity of cancer care and the need for timely information about the disease and treatment options, which often require substantial coordination of care among multiple specialists, may be particularly challenging for foreign-born patients if they have limited social support to help with navigating the health care system. These challenges can be compounded by communication difficulties between non-English speaking patients and their clinicians, particularly if trained interpreters are unavailable and the clinicians do not speak the patients' language.

Our finding of lower rates of adjuvant chemotherapy and radiation therapy for stage II/III rectal cancer among foreign-born patients is particularly notable because receipt of adjuvant therapies for rectal cancer typically requires coordination of multi-modality therapy by different providers, and sometimes requires neoadjuvant treatment. The lower rates of effective adjuvant therapy for rectal cancer by nativity is consistent with the findings of lower rates of guideline-recommended treatment for breast cancer among foreign-born Hispanic(1) and Asian(36;37) patients. Another small study also demonstrated less combined modality therapy for foreign-born Asian patients with lung cancer compared with non-Asian patients(38). The lack of differences by nativity in receipt of other treatments we studied may be because single modality therapy is less complex. One study found higher rates of complete surgical treatment of gastric cancer among foreign-born Asian and Pacific Islander patients than non-Hispanic white patients(13).

Issues of language and acculturation are important considerations in understanding differences in patients' experiences with care. For newly diagnosed cancer patients who face a series of complex decisions regarding treatment, including trade-off between chances of cure, side effects and quality of life, good communication between the patient and the health care providers is crucial. Limited English proficiency may hamper communication as well as coordination and access to recommended care(33;39). Trained medical interpreters as well as patient navigator programs can improve care for patients with limited English proficiency(40), yet trained interpreters are available in person or by phone less than half of the times they are needed for patients with cancer, particularly in solo practices and single-specialty medical groups(41), and navigator programs are even less commonly available.

Language explained some of the lower ratings of care observed for Hispanic versus white patients, but not that for Asian versus white patients. Additional research is needed to understand what care beyond interpreter services is needed to improve experiences with care, particularly for Asian patients. While the observed findings point to language barriers as a prominent reason for disparities, the degree of adherence to native cultural beliefs and norms may also play a strong role, particularly in decisions about treatment options. In a prior study of providers who treat Asian patients with breast cancer, fear and cultural beliefs were among the most common reasons these patients chose mastectomy over breast-conserving surgery(42). Further research is needed to understand the role of acculturation, language, and cultural factors in treatment decision-making among foreign-born patients with cancer. Few patients in our study were recent immigrants, limiting our ability to assess the influence of years in the U.S. on treatment decisions.

Strengths of our study included a large population of foreign-born patients of different racial and ethnic groups surveyed in one of 3 languages and with survey data supplemented by

registry and medical record data. In addition, we assessed patients' ratings of quality of care as well as receipt of cancer treatment among patients with lung and colorectal cancer who were US-born and foreign-born.

Several limitations of our study should also be noted. First, despite the relatively large numbers of patients, we had limited power to detect differences of moderate size for some measures that still may be clinically important, as evidenced by the relatively wide confidence intervals for some treatments. For example, we had >80% power to detect an absolute difference of 12% in adjuvant chemotherapy for stage III colon cancer between US-born and foreign-born patients, and an absolute difference of 15% for curative surgery for stage I/II lung cancer between these groups. We had less statistical power to detect potential interactions of nativity by race/ethnicity. Thus, studies with larger sample sizes may be needed to detect smaller differences in receipt of recommended care by nativity. Second, patient-reported quality of care measured by a single item might be conceptually or psychometrically problematic if individuals in different race/ethnic groups or with different levels of acculturation do not ascribe the same meaning to the response categories. Some evidence from the Consumer Assessments of Healthcare Providers and Systems (CAHPS) survey suggest that Hispanic and Asian individuals report care experiences that are similar to or less positive than care for non-Hispanic whites, yet they have more positive ratings of care(43), and Hispanic patients are more likely to use the extremes of response scales(44). Our results were robust to alternative definitions of high-quality care, suggesting that differences in reporting the highest levels of quality are unlikely to explain our results; nevertheless, additional validation of single-item quality assessments in varied racial/ethnic groups is needed.

Third, we have no information about how non-respondent foreign-born patients may differ from respondents. Fourth, we studied patients in California, limiting the generalizability of the findings to immigrants in other parts of the US, where the characteristics of immigrant populations may differ (45). Moreover, we were unable to assess specific racial/ethnic subgroups that may differ in their culture, religion, beliefs, and practices concerning health; this may especially be true for Asians who constitute a heterogeneous group; however, nearly half of the Asians in our sample were of Chinese origin. Finally, foreign-born patients were less likely than others to consent to medical record abstraction. Nevertheless, we supplemented information from the medical records with self-reports of chemotherapy and radiation, which prior studies demonstrate are quite accurate (26–30). Since the analyses for lung cancer surgery required medical record data, foreign-born patients who did not consent to medical record abstraction were not included in this analysis.

In conclusion, foreign-born individuals with lung or colorectal cancer reported lower quality of care than US-born patients and were less likely to receive some complex cancer treatments that are recommended by clinical guidelines. These differences were at least partly explained by English language proficiency. Cancer experiences and outcomes may be improved with a greater emphasis on coordination of care and improving communication with foreign-born patients, including providing additional services for these patients, such as interpreters and patient navigators.

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References

1. Kouri EM, He Y, Winer EP, Keating NL. Influence of birthplace on breast cancer diagnosis and treatment for Hispanic women. *Breast Cancer Res Treat.* 2009; 121:743–751. [PubMed: 19949856]
2. Hedeon AN, White E. Breast cancer size and stage in Hispanic American women, by birthplace: 1992–1995. *Am J Public Health.* 2001; 91:122–125. [PubMed: 11189803]
3. Hedeon AN, White E, Taylor V. Ethnicity and birthplace in relation to tumor size and stage in Asian American women with breast cancer. *Am J Public Health.* 1999; 89:1248–1252. [PubMed: 10432917]
4. Gomez SL, Clarke CA, Shema S, Chang ET, Keegan THM, Glaser SL. Disparities in breast cancer survival among Asian women by ethnicity and immigrant status: a population-based study. *Am J Public Health.* 2010 in press.
5. Choe JH, Koepsell TD, Heagerty PJ, Taylor VM. Colorectal cancer among Asians and Pacific Islanders in the U.S.: survival disadvantage for the foreign-born. *Cancer Detect.Prev.* 2005; 29:361–368. [PubMed: 16081223]
6. Chuang SC, Chen W, Hashibe M, Li G, Zhang ZF. Survival rates of invasive breast cancer among ethnic Chinese women born in East Asia and the United States. *Asian Pac.J Cancer Prev.* 2006; 7:221–226. [PubMed: 16839213]
7. Shih YC, Elting LS, Levin B. Disparities in colorectal screening between US-born and foreign-born populations: evidence from the 2000 National Health Interview Survey. *J Cancer Educ.* 2008; 23:18–25. [PubMed: 18444042]
8. Tsui J, Saraiya M, Thompson T, Dey A, Richardson L. Cervical cancer screening among foreign-born women by birthplace and duration in the United States. *J Womens Health (Larchmt.).* 2007; 16:1447–1457. [PubMed: 18062760]
9. Kandula NR, Wen M, Jacobs EA, Lauderdale DS. Low rates of colorectal, cervical, and breast cancer screening in Asian Americans compared with non-Hispanic whites: Cultural influences or access to care? *Cancer.* 2006; 107:184–192. [PubMed: 16721803]
10. Jacobs EA, Lauderdale DS, Meltzer D, Shorey JM, Levinson W, Thisted RA. Impact of interpreter services on delivery of health care to limited-English-proficient patients. *J Gen.Intern.Med.* 2001; 16:468–474. [PubMed: 11520385]
11. Fiscella K, Franks P, Doescher MP, Saver BG. Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. *Med Care.* 2002; 40:52–59. [PubMed: 11748426]
12. Pineda MD, White E, Kristal AR, Taylor V. Asian breast cancer survival in the US: a comparison between Asian immigrants, US-born Asian Americans and Caucasians. *Int J Epidemiol.* 2001; 30:976–982. [PubMed: 11689507]
13. Byfield SA, Earle CC, Ayanian JZ, McCarthy EP. Treatment and outcomes of gastric cancer among United States-born and foreign-born Asians and Pacific Islanders. *Cancer.* 2009; 115:4595–4605. [PubMed: 19626648]
14. Lin SS, O'Malley CD, Clarke CA, Le GM. Birthplace and survival among Asian women diagnosed with breast cancer in cancer registry data: the impact of selection bias. *Int J Epidemiol.* 2002; 31:511–513. [PubMed: 11980831]
15. Lin SS, Clarke CA, O'Malley CD, Le GM. Studying cancer incidence and outcomes in immigrants: methodological concerns. *Am J Public Health.* 2002; 92:1757–1759. [PubMed: 12406802]
16. Gomez SL, Glaser SL. Quality of birthplace information obtained from death certificates for Hispanics, Asians, and Pacific Islanders. *Ethn.Dis.* 2004; 14:292–295. [PubMed: 15132217]

17. Gomez SL, Glaser SL, Kelsey JL, Lee MM. Bias in completeness of birthplace data for Asian groups in a population-based cancer registry (United States). *Cancer Causes Control*. 2004; 15:243–253. [PubMed: 15090719]
18. Gomez SL, Glaser SL. Quality of cancer registry birthplace data for Hispanics living in the United States. *Cancer Causes Control*. 2005; 16:713–723. [PubMed: 16049810]
19. Grieco, EM. Race and Hispanic origin of the foreign-born population in the United States: 2007. U.S. Department of Commerce, Economics and Statistics Administration; 2010.
20. 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. *J Clin Oncol*. 2004; 22:2992–2996. [PubMed: 15284250]
21. National Cancer Institute. Cancer Care Outcomes Research & Surveillance Consortium. 2009. www.outcomes.cancer.gov/cancors/.
22. American Association for Public Opinion Research. Standard Definitions – Final Dispositions of Case Codes and Outcome Rates for Surveys, 2008. 2008. www.aapor.org/Resources_for_Researchers.htm.
23. National Comprehensive Cancer Network. Clinical practice guidelines in oncology: non-small cell lung cancer. Version 1. 2004.
24. National Comprehensive Cancer Network. Clinical practice guidelines in oncology: colon cancer. Version 1. 2004.
25. National Comprehensive Cancer Network. Clinical practice guidelines in oncology: rectal cancer. Version 1. 2004.
26. Clegg LX, Potosky AL, Harlan LC, Hankey BF, Hoffman RM, Stanford JL, et al. Comparison of self-reported initial treatment with medical records: results from the prostate cancer outcomes study. *Am J Epidemiol*. 2001; 154:582–587. [PubMed: 11549564]
27. Oberst K, Bradley CJ, Schenk M. Breast and prostate cancer patient's reliability of treatment reporting. *J Registry.Manag*. 2009; 36:12–15. [PubMed: 19670693]
28. Schootman M, Jeffe DB, West MM, Aft R. Self-report by elderly breast cancer patients was an acceptable alternative to surveillance, epidemiology, and end results (SEER) abstract data. *J Clin Epidemiol*. 2005; 58:1316–1319. [PubMed: 16291477]
29. Phillips KA, Milne RL, Buys S, Friedlander ML, Ward JH, McCredie MR, et al. Agreement between self-reported breast cancer treatment and medical records in a population-based Breast Cancer Family Registry. *J Clin Oncol*. 2005; 23:4679–4686. [PubMed: 15851764]
30. Maunsell E, Drolet M, Ouhoumane N, Robert J. Breast cancer survivors accurately reported key treatment and prognostic characteristics. *J Clin Epidemiol*. 2005; 58:364–369. [PubMed: 15862722]
31. He Y, Zaslavsky A, Harrington DP, Catalano PJ, Landrum MB. Multiple imputation in a large-scale: a practical guide. *Stat Methods Med Res*. 2009 Epub ahead of print.
32. Institute of Medicine. Crossing the Quality Chasm: A New Health Care System for the 21st Century. Washington, D.C: National Academy Press; 2001.
33. 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. *J Clin Oncol*. 2005; 23:6576–6586. [PubMed: 16116149]
34. Pitkin DK, Bahnney BW, Lurie N, Escarce JJ. Review: immigrants and health care access, quality, and cost. *Med Care Res Rev*. 2009; 66:355–408. [PubMed: 19179539]
35. 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 (CanCORS) Consortium. 2010 *under review*.
36. Gomez SL, France AM, Lee MM. Socioeconomic status, immigration/acculturation, and ethnic variations in breast conserving surgery, San Francisco Bay area. *Ethn.Dis*. 2004; 14:134–140. [PubMed: 15002933]
37. Goel MS, Burns RB, Phillips RS, Davis RB, Ngo-Metzger Q, McCarthy EP. Trends in breast conserving surgery among Asian Americans and Pacific Islanders, 1992–2000. *J Gen.Intern.Med*. 2005; 20:604–611. [PubMed: 16050854]

38. Finlay GA, Joseph B, Rodrigues CR, Griffith J, White AC. Advanced presentation of lung cancer in Asian immigrants: a case-control study. *Chest*. 2002; 122:1938–1943. [PubMed: 12475830]
39. Fable-Munsuz A, Liang SY, Ponce NA, Walsh JM. Acculturation and colorectal cancer screening among older Latino adults: differential associations by national origin. *J Gen.Intern.Med*. 2009; 24:963–970. [PubMed: 19472016]
40. Karliner LS, Jacobs EA, Chen AH, Mutha S. Do professional interpreters improve clinical care for patients with limited English proficiency? A systematic review of the literature. *Health Serv.Res*. 2007; 42:727–754. [PubMed: 17362215]
41. Rose DE, Tisnado DM, Malin JL, Tao ML, Maggard MA, Adams J, et al. Use of Interpreters by Physicians Treating Limited English Proficient Women with Breast Cancer: Results from the Provider Survey of the Los Angeles Women's Health Study. *Health Serv.Res*. 2009
42. Pham JT, Allen LJ, Gomez SL. Why do Asian-American women have lower rates of breast conserving surgery: results of a survey regarding physician perceptions. *BMC Public Health*. 2009; 9:246. [PubMed: 19615070]
43. Lurie N, Zhan C, Sangl J, Bierman AS, Sekscenski ES. Variation in racial and ethnic differences in consumer assessments of health care. *Am J Manag.Care*. 2003; 9:502–509. [PubMed: 12866629]
44. Weech-Maldonado R, Elliott MN, Oluwole A, Cameron Schiller K, Hays RD. Survey response style and differential use of CAHPS rating scales by Hispanics. *Med Care*. 2008; 46:963–968. [PubMed: 18725851]
45. Pew Hispanic Center. Demographic Profile of Hispanics in California, 2007. 2009. www.pewhispanic.org/states/?stateid=CA.

Table 1
Distribution of Patient Characteristics and Treatments by Nativity and Racial/Ethnic Group

	Racial/Ethnic Group by Nativity							
	White		Hispanic		Asian			
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
Totals	1,870 (100)	219 (100)	267 (100)	323 (100)	69 (100)	348 (100)		
Age								
21–54	251 (13)	33 (15)	63 (23)	93 (29)	14 (20)	100 (29)		
55–64	397 (21)	39 (18)	51 (19)	58 (18)	14 (20)	68 (20)		
65–74	551 (29)	48 (22)	77 (29)	80 (25)	11 (16)	106 (30)		
≥75	671 (36)	99 (45)	76 (28)	92 (28)	30 (43)	74 (21)		
Gender								
Male	930 (50)	114 (52)	124 (46)	177 (55)	40 (58)	194 (56)		
Female	940 (50)	105 (48)	143 (54)	146 (45)	29 (42)	154 (44)		
Marital status								
Married or living with a partner	1099 (59)	123 (56)	166 (62)	203 (63)	44 (64)	269 (77)		
Not married	771 (41)	96 (44)	101 (38)	120 (37)	25 (36)	79 (23)		
Education								
Non-high school graduate	197 (11)	24 (11)	96 (36)	180 (56)	4 (6)	73 (21)		
High school diploma	515 (27)	61 (28)	81 (30)	60 (19)	14 (20)	62 (18)		
Some college	532 (28)	42 (19)	56 (21)	28 (9)	17 (25)	61 (17)		
College graduate	627 (34)	92 (42)	34 (13)	55 (17)	34 (49)	152 (44)		
Income								
Less than \$20,000	365 (20)	65 (30)	84 (32)	142 (44)	12 (18)	131 (38)		
\$20,000 to \$39,999	559 (30)	57 (26)	87 (33)	105 (33)	22 (32)	88 (25)		
\$40,000 to \$59,999	381 (20)	40 (18)	50 (19)	48 (15)	16 (24)	60 (17)		
≥\$60,000	565 (30)	57 (26)	46 (17)	27 (8)	18 (26)	69 (20)		
Health insurance								
Yes	1847 (99)	215 (98)	260 (96)	299 (92)	69 (100)	336 (97)		
No	23 (1)	4 (2)	7 (4)	24 (8)	0 (0)	22 (3)		

Study site	Racial/Ethnic Group by Nativity							
	White		Hispanic		Asian			
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
Cancer type								
Northern California	960 (51)	89 (41)	129 (48)	99 (31)	38 (55)	229 (66)		
Los Angeles County	910 (49)	130 (59)	138 (52)	224 (69)	31 (45)	119 (34)		
Cancer type								
Colorectal cancer	849 (45)	126 (58)	153 (57)	195 (60)	36 (52)	202 (58)		
Lung cancer	1,021 (55)	93 (42)	114 (43)	128 (40)	33 (48)	146 (42)		
Stage								
I	428 (23)	57 (26)	58 (22)	58 (18)	14 (20)	79 (23)		
II	327 (17)	42 (19)	49 (18)	51 (16)	5 (7)	56 (16)		
III	484 (26)	51 (23)	75 (28)	100 (31)	22 (32)	92 (27)		
IV	569 (30)	59 (27)	75 (28)	92 (28)	25 (36)	104 (30)		
Unknown	62 (3)	10 (5)	10 (4)	22 (7)	3 (4)	17 (5)		
Number of co-morbid illnesses*								
0	673 (36)	87 (38)	105 (39)	144 (45)	35 (51)	186 (53)		
1	619 (33)	71 (33)	84 (32)	100 (31)	25 (36)	116 (33)		
2	356 (19)	36 (17)	46 (17)	55 (17)	6 (9)	32 (9)		
3+	222 (12)	24 (11)	31 (11)	24 (8)	3 (4)	15 (4)		
Overall health status								
Excellent	228 (12)	30 (14)	25 (9)	34 (10)	12 (17)	33 (9)		
Very good	537 (29)	67 (31)	68 (26)	66 (21)	17 (24)	96 (28)		
Good	602 (32)	68 (31)	91 (34)	117 (35)	24 (34)	126 (36)		
Fair	372 (20)	42 (19)	62 (23)	85 (26)	12 (18)	81 (23)		
Poor	131 (7)	12 (5)	21 (8)	21 (7)	5 (7)	12 (4)		
Survey respondent								
Patient	1,346 (72)	135 (62)	185 (69)	197 (61)	46 (67)	213 (61)		
Surrogate of deceased patient	389 (21)	48 (22)	40 (15)	59 (18)	13 (19)	54 (16)		
Surrogate of living patient	135 (7)	35 (16)	42 (16)	67 (21)	10 (14)	81 (23)		
Language of survey								

	Racial/Ethnic Group by Nativity					
	White		Hispanic		Asian	
	US-born	Foreign-born	US-born	Foreign-born	US-born	Foreign-born
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
English	1,866 (100)	219 (100)	255 (96)	123 (38)	63 (91)	221 (64)
Other language	4 (0)	0 (0)	12 (4)	200 (62)	6 (9)	127 (36)
Quality of Care						
N(%) rating quality of care excellent	963 (52)	98 (45)	114 (43)	125 (39)	26 (38)	91 (27)
Adjuvant Chemotherapy for Stage III Colon Cancer (N=447)						
Total N	236	34	48	62	13	54
N(%) receiving adjuvant chemotherapy	176 (75)	25 (74)	39 (81)	53 (85)	12 (92)	41 (76)
Adjuvant Chemotherapy and Radiation for Stage II/III Rectal Cancer (N=161)						
Total N	82	11	22	20	5	21
N(%) receiving adjuvant chemotherapy and radiation	53 (65)	7 (64)	15 (68)	11 (55)	3 (60)	14 (67)
Surgery for Stage I/II Non-Small Lung Cancer (N=294)						
Total N	224	23	11	14	3	19
N(%) receiving surgery	188 (84)	20 (87)	9 (82)	13 (93)	3 (100)	16 (84)

* Based on self report of myocardial infarction, congestive heart failure, stroke, chronic lung disease, diabetes, kidney problems, depression.

Table 2

Adjusted Odds Ratios (95% CI) for Excellent Rating of Care by Patients' Nativity and Race/Ethnicity (N=3,080)

	Model I*		Model II** (adjusting for language of survey)	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Nativity				
US-born	Ref.		Ref.	
Foreign-born	0.80 (0.65–0.997)	0.047	0.89 (0.70–1.11)	0.30
Race/ethnicity				
White	Ref.		Ref.	
Hispanic	0.77 (0.61–0.98)	0.03	0.83 (0.65–1.07)	0.15
Asian	0.40 (0.30–0.55)	<0.001	0.42 (0.31–0.57)	<0.001
Language of survey				
English	-		Ref.	
Other	-		0.66 (0.48–0.91)	0.01

* Using logistic regression to adjust for nativity, race/ethnicity, age, gender, marital status, education, income, site, cancer type, cancer stage, co-morbidity, health status, survey type.

** Also adjusted for language of survey.

Statistically significant variables (P<0.05) are depicted in bold type.

Table 3

Adjusted Odds Ratios (95% CI) for different curative treatments by US-born versus Foreign-born and Race/Ethnic group among Patients with Colon, Rectal or Lung Cancer

	Model I*		Model II** (adjusting for language of survey)	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Adjuvant Chemotherapy among Patients with Stage III Colon Cancer (N=447)				
Nativity				
US-born	Ref.		Ref.	
Foreign-born	1.04 (0.51–2.12)	0.91	0.87 (0.42–1.81)	0.71
Race/ethnicity				
White	Ref.		Ref.	
Hispanic	1.72 (0.76–3.88)	0.19	1.50 (0.66–3.41)	0.34
Asian	1.08 (0.44–2.70)	0.86	0.98 (0.40–2.45)	0.97
Language of survey				
English	-		Ref.	
Other	-		2.26 (0.75–6.80)	0.15
Received Both Adjuvant Chemotherapy and Radiation among Patients with Stage II and III Rectal Cancer (N=161)				
Nativity				
US-born	Ref.		Ref.	
Foreign-born	0.35 (0.12–0.99)	0.048	0.43 (0.14–1.30)	0.14
Race/ethnicity				
White	Ref.		Ref.	
Hispanic	0.61 (0.20–1.82)	0.38	0.67 (0.22–2.04)	0.48
Asian	0.95 (0.15–1.30)	0.94	1.05 (0.52–5.79)	0.95
Language of survey				
English	-		Ref.	
Other	-		0.41 (0.10–1.68)	0.22
Primary Lung Surgery among Patients with Stage I and II NSC Lung Cancer (N=294)				
Nativity				
US-born	Ref.		Ref.	
Foreign-born	0.95 (0.24–3.77)	0.96	0.95 (0.24–3.77)	0.94
Race/ethnicity				
White	Ref.		Ref.	
Hispanic	0.97 (0.19–4.99)	0.92	0.97 (0.19–4.99)	0.97
Asian	0.79 (0.17–11.34)	0.91	0.79 (0.11–5.65)	0.82
Language of survey				
English	-		Ref.	
Other	-		1.62 (0.13–20.17)	0.71

* Using logistic regression to adjust for nativity, race/ethnicity, age, gender, marital status, education, income, site, cancer stage (except among colon cancer patients), co-morbidity, health status, survey type.

** Also adjusted for language of survey.