



Evaluation of the NCI's Community Cancer Centers' Program (NCCCP): Impact on Disparities in Quality of Cancer Care

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Michael T. Halpern , *RTI International*, mhalpern@rti.org

Pamela Spain , *RTI International*, pspain@rti.org

Debra J. Holden , *RTI International*, djholden@2mresearch.com

See next page for additional authors

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Abstract

This study examined the effects of the NCCCP pilot on breast or colon cancer quality of care for patients from underserved populations and those treated at disparities-focused hospitals (NCCCP sites having fewer oncology resources or in communities with greater proportions of underserved populations). Data on five quality of care measures were collected using the Commission on Cancer's Rapid Quality Reporting System. Following NCCCP initiation, we observed improvements in all five quality of care measures. There were similar quality of care improvements for Black vs. White patients, privately insured vs. Medicaid or uninsured patients, and men vs. women. Patients treated at disparities-focused hospitals showed quality of care improvements similar or significantly greater than improvements observed among patients treated at hospitals with more oncology care resources or smaller proportions of underserved populations. These findings indicate that the quality improvement processes, sharing of best practices, and other programs instituted as part of the NCCCP pilot had similar or greater benefits for individuals from underserved populations or those treated at disparities-focused hospitals than for patients in the corresponding non-disparate groups. Our results suggest that improvements in quality of care associated with the NCCCP are applicable to diverse populations of individuals with cancer.

Keywords

Cancer; Quality of Care; Health Care Disparities; Community Hospitals; Program Evaluation

Cover Page Footnote

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Authors

Michael T. Halpern, Pamela Spain, Debra J. Holden, Andrew K. Stewart, Erica J. McNamara, Greer Gay, Steven B. Clauser, and Irene Prabhu Das

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School of Community Health Sciences
University of Nevada, Las Vegas

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Michael T. Halpern, MD, PhD, RTI International, University of Arizona
Pamela Spain, PhD, RTI International
Debra J. Holden, PhD, RTI International
Andrew Stewart, MS, American Society of Clinical Oncology
Erica J. McNamara, MPH, American College of Surgeons
Greer Gay, PhD, American College of Surgeons,
Steven B. Clauser, PhD, Patient-Centered Outcomes Research Institute (PCORI)
Irene Prabhu Das, PhD, National Cancer Institute

ABSTRACT

This study examined the effects of the NCCCP pilot on breast or colon cancer quality of care for patients from underserved populations and those treated at disparities-focused hospitals (NCCCP sites having fewer oncology resources or in communities with greater proportions of underserved populations). Data on five quality of care measures were collected using the Commission on Cancer's Rapid Quality Reporting System. Following NCCCP initiation, we observed improvements in all five quality of care measures. There were similar quality of care improvements for Black vs. White patients, privately insured vs. Medicaid or uninsured patients, and men vs. women. Patients treated at disparities-focused hospitals showed quality of care improvements similar or significantly greater than improvements observed among patients treated at hospitals with more oncology care resources or smaller proportions of underserved populations. These findings indicate that the quality improvement processes, sharing of best practices, and other programs instituted as part of the NCCCP pilot had similar or greater benefits for individuals from underserved populations or those treated at disparities-focused hospitals than for patients in the corresponding non-disparate groups. Our results suggest that improvements in quality of care associated with the NCCCP are applicable to diverse populations of individuals with cancer.

Keywords: Cancer; Quality of Care; Health Care Disparities; Community Hospitals; Program Evaluation

INTRODUCTION

In 2007, the National Cancer Institute (NCI) funded the NCI Community Cancer Centers Program (NCCCP) pilot, an initiative designed to help build a community-based research platform supporting basic, clinical, and practice-based research on cancer prevention, screening, diagnosis, treatment, survivorship and palliative care at community hospitals (Clauser et al., 2009; NCCCP, 2011). Initially, 16 community hospitals participated in this pilot program. As the NCCCP sites developed over time, they began to function in certain respects as a network, collaborating to improve patient care, share best practices, and develop new tools to achieve program goals.

A major focus of the NCCCP was on addressing health disparities, defined by NCI as "differences in the incidence, prevalence, mortality, and burden of cancer and related adverse health conditions that exist among specific population groups in the United States" (<http://crchd.cancer.gov/disparities/defined.html>). For the NCCCP, the populations affected by health disparities were defined to include racial and ethnic minorities, and other underserved populations: residents of rural areas, women, the elderly, uninsured and underinsured individuals, and those who are socioeconomically disadvantaged. Forty percent of NCCCP funds were targeted to program initiatives to better serve these populations. The goal of the disparities component of the NCCCP was to "actively reach out to these communities, bringing more Americans into the system of care and helping NCI to better understand and address the underlying causes of cancer health disparities" (<http://ncccp-intra.nci.nih.gov/About/index.htm>).

Disparities in cancer care have been well documented. Racial and ethnic minority populations are less likely to receive cancer screening tests than whites, and are more likely to be diagnosed with late-stage cancer (AHRQ, 2014; Berry et al, 2009; Chornokur et al., 2011; Halpern et al., 2008). Individuals from racial and ethnic minorities also are more likely to experience delays in receiving diagnostic tests needed to confirm a cancer diagnosis (Allard & Maxwell, 2009; Battaglia et al., 2007) and to have disparities in cancer treatment and adjuvant therapy (AHRQ, 2014; Terplan et al., 2009). For example, African American Medicare patients are less likely than Whites to receive chemotherapy for colorectal cancer (Baldwin et al., 2005) and surgical treatment for early-stage lung cancer (Bach et al., 1999; Lathan et al., 2006). Disparities in cancer care have also been documented for underserved populations based on age, insurance, or socioeconomic status (AHRQ, 2014; Forrest et al., 2013; Halpern et al., 2008; Quaglia et al., 2013).

Disparities in quality of care for cancer treatment also exist based on the type of health care facility where treatment services are provided. In particular, some studies have reported that cancer patients treated at community hospitals experience decreased quality of care compared to patients treated at higher-volume cancer hospitals. For example, Spencer et al. (2008) reported that men treated for prostate cancer at community cancer centers had lower compliance with quality of care measures that did those treated at teaching/research hospitals. Similarly, Halpern et al. (2009) reported that women with early stage breast cancer receiving surgery at community hospitals were significantly less likely to receive any lymph node biopsy than were those treated at teaching hospitals.

Decreased quality of care may lead to worse outcomes for patients treated at community hospitals. Gutierrez et al. (2007) reported that rectal cancer patients had significantly worse survival rates following treatment at community hospitals compared with those treated at teaching hospitals; the same group also reported that breast cancer patients treated at community

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hospitals had worse survival rates than those treated at teaching hospitals (Gutierrez et al., 2008). Chen et al. (2010) reported that patients with advanced (stage III and IV) laryngeal cancer had decreased survival rates when treated at low-volume hospitals vs. high-volume teaching/research facilities. Lassig et al. (2012) similarly reported that patients with head and neck cancers had significantly lower 5-year survival when treated at community hospitals (32.8%) vs. at academic centers (53.2%).

A comprehensive, multi-method evaluation of the NCCCP has recently been completed (Holden et al., 2012). One component of the evaluation focused on how participation in the NCCCP changed the quality of cancer care provided at these hospitals over time (i.e., before vs. after NCCCP initiation) (Halpern et al., 2013). This study reports on the changes in the quality of cancer care for patients from disparate populations treated at NCCCP sites and for patients treated at NCCCP sites with limited medical resources or in markets serving higher proportions of underserved populations. We address the following research questions:

How did the quality of cancer care provided at NCCCP sites change from before vs. after initiation of NCCCP for:

1. Individuals from underserved (disparate) populations (vs. those from non-disparate populations)?
2. Individuals treated at NCCCP hospitals in markets with greater proportions of disparate populations (vs. those treated in NCCCP hospitals in markets with lower proportions of disparate populations)?
3. Individuals treated at NCCCP hospitals with limited oncology care resources, which may result in disparities in access (vs. those treated at NCCCP hospitals with greater levels of oncology care resources)?

METHODS

Sample. For this evaluation, the study population consisted of patients diagnosed with breast or colon cancer between January 1, 2006 and May 31, 2010 at NCCCP sites (Halpern et al., 2013). The 16 NCCCP sites, originally funded as part of the NCCCP in 2007, had oncology programs accredited by the Commission on Cancer (CoC) and participated as beta-test sites of the CoC's Rapid Quality Reporting System (RQRS), a near-real-time data collection system that provided quality of care information for this evaluation (Stewart et al., 2011). This study was found by the NIH Office of Human Subjects Research and the RTI International Institutional Review Board (IRB) to be exempt from human subjects review. *Data and Measures Rapid Quality Reporting System (RQRS).* The RQRS was developed by the Commission on Cancer to improve the timeliness and reporting of the National Quality Forum (NQF) endorsed quality indicators and to provide a platform for quality improvement based on those measures (<http://www.facs.org/cancer/ncdb/rqrs.html>). RQRS provides information on concordance with six quality measures: three measures for breast cancer, two for colon cancer, and one for rectal cancer. As the number of patients eligible for the rectal cancer quality of care measure was small and this measure had not been endorsed by the NQF at the time of data collection, this evaluation included results only from the breast and colon cancer measures:

- *Breast- BCS+Rad:* Radiation therapy administered within 1 year of diagnosis for women under age 70 receiving breast conserving surgery for breast cancer.

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- *Breast-MAC*: Combination (multi-agent) chemotherapy considered or administered within 4 months of diagnosis for women under 70 with AJCC T1cN0M0 or Stage II or III hormone receptor negative breast cancer.
- *Breast-HT*: Tamoxifen or third generation aromatase inhibitor considered or administered within one year of diagnosis for women with AJCC T1cN0M0, or Stage II or III hormone receptor positive breast cancer.
- *Colon-ACT*: Adjuvant chemotherapy considered or administered within 4 months of diagnosis for patients under age 80 with AJCC Stage III colon cancer.
- *Colon-12RLN*: At least 12 regional lymph nodes are removed and pathologically examined for resected colon cancer.

All measures except the Colon-12RLN measure are endorsed by the NQF as *accountability measures*, meaning they can be used for purposes such as public reporting; payment incentive programs; and the selection of providers by consumers, health plans, or purchasers¹. The Colon-12RLN measure has been endorsed by the NQF as a *quality improvement measure*, meaning that it is intended to be used for internal monitoring of performance over time within an organization or group so that analyses and subsequent remedial actions can be taken. Four of the five quality measures (all except the Colon-12RLN measure) are multimodal as they involve multiple types of adjuvant therapy (chemotherapy, radiation therapy, and hormonal therapy). No single physician can assure concordance with these measures; concordance involves cooperation among physicians of multiple subspecialties as well as other health care providers. In addition, these quality measures are also multifaceted, in that they incorporate initial surgery and subsequent adjuvant therapy, administration of adjuvant therapy within a limited time window, and (for the Breast-MAC, Breast-HT, and Colon-Act measures) consideration of whether adjuvant therapy was considered but not administered due to patient refusal, co-morbidities, or other relevant clinical factors. Only patients whose age and clinical characteristics were appropriate for these quality of care measures were included in calculation of concordance rates.

The main outcome metric used to examine changes in quality of care was the absolute percentage change in each quality of care measure from the baseline period (2006-2007) to the post-NCCCP initiation period (2008-2010). All quality of care measures were assessed using patient-level data.

The last update for this analysis included cases reported to RQRS through May 31, 2011; in order to have at least 1 year following diagnosis for all patients in the study population to complete the time period for measure concordance, May 31, 2010 was used as the diagnosis cut-off date for eligible patients. Patients diagnosed in 2006 or 2007 are considered to have been diagnosed "pre-NCCCP" initiation, while those diagnosed in 2008 or later are classified as having been diagnosed "post-NCCCP" initiation.

Other patient characteristics were obtained from the RQRS data, including patient age (categorized as <50, 50-59, 60-69, and 70 and older); patient sex (male-for colon cancer only or female); patient race (White, Black, and other/unknown, which combined the small numbers of

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http://www.qualityforum.org/Publications/2009/05/National_Voluntary_Consensus_Standards_for_Quality_of_Cancer_Care.aspx

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patients neither White nor Black); patient insurance (Medicare, Medicaid, private/government, uninsured, other/unknown).

Other Data Sources. In addition to the RQRS, several other data sources were used to categorize available hospital resources and characteristics of the markets² for each NCCCP site. The CoC Survey Application Record (SAR) is completed once every 3 years by hospitals with CoC-accredited cancer programs and provides detailed information about hospital oncology services and infrastructure. For this study, we used the latest SAR data submitted from each hospital prior to 2009. That is, since the SAR is collected from each hospital only once every three years, SAR data submitted in 2006, 2007, or 2008 were used. We used the SAR to categorize the number of oncology nurses and oncology beds at each hospital in tertiles. Oncology nurses per hospital were categorized as low (0 to 10), medium (11 to 16), or high (17 or more). Similarly, oncology beds per hospital were categorized in tertile of 0 to 23, 24 to 41, or 42 or more.

The Area Resource file (ARF) is a database developed by the U.S. Health Resources and Services Administration (HRSA) that contains more than 6,000 variables for each county in the United States. The ARF contains information on health care supply (e.g., numbers of facilities and numbers of health professionals by type), economic activity (e.g., employment), and sociodemographic factors (e.g., population by age, race/ethnicity, income, education, and population size). We used the ARF to provide patient characteristics and medical resources in the markets of NCCCP hospitals. These variables were categorized into tertiles and included: percentage of population non-White in market (21.7% or less, 21.8% to 32.1%, 32.2% or more); and percentage of population in poverty³ in market (8.6% or less, 8.7% to 11.6%, 11.7% or more).

For analyses comparing quality of care measures, we identified four categories of NCCCP sites as being “disparities-focused”. We defined “disparities-focused” NCCCP sites as those in: the lowest tertiles (versus the highest tertiles) for (1) number of oncology beds and (2) number of oncology nurses; and those in the highest tertiles (versus the lowest tertile) for (3) percentage of non-White population in the hospital’s market population and (4) percentage of hospital’s market population in poverty.

Analyses. Bivariate descriptive analyses (Chi-square tests) were performed at the patient level to assess changes, from eligible patients diagnosed during the baseline period to eligible patients diagnosed in the post-NCCCP period) for each of the five quality of care measure. Analyses were performed separately for each of the three breast cancer quality of care measures and the two colon cancer quality of care measures. Analyses for each quality of care measure

² We defined the markets of the NCCCP hospitals as the “Core Based Statistical Area” (CBSA), based on the work of Carpenter and colleagues (2006). The concept of a CBSA, as defined by the U.S. Office of Management and Budget (OMB), is a core area containing a substantial population nucleus (metropolitan area), together with adjacent communities having a high degree of economic and social integration with that core (micropolitan area). Counties or equivalent entities form the geographic building blocks for Metropolitan and Micropolitan Statistical Areas throughout the United States, and counties therefore form the geographic building blocks for CBSAs. In turn, ZIP codes provide the building blocks for the counties that make up each CBSA.

³ **Poverty** is defined in the ARF as the census bureau definition: the % of households in the market that are below the federal poverty level. For more information see: <http://www.census.gov/hhes/www/poverty/about/overview/measure.html>

were performed for Black vs. White patients; those with private insurance vs. those uninsured or enrolled in Medicaid; patients in the oldest age group (70 and over) vs. the youngest age group (under aged 50) and men vs. women (for the colon cancer measures only).

We also performed stratified descriptive analyses of the changes in each of these measures based on hospital and market-level characteristics. Analyses compared quality of care measures for patients treated at disparities-focused NCCCP sites (as defined above, based on their tertile category for number of oncology beds, number of oncology nurses, percentage of population non-White, and percentage of population in poverty) vs. quality of care measures for patients treated at NCCCP sites of the complementary tertile. For example, changes in quality measures for patients treated at NCCCP sites in the lowest tertile for oncology nurses were compared with changes for those treated at NCCCP sites in the highest tertile for oncology nurses. Similarly, changes in quality measures for patients treated at NCCCP sites in the highest tertile for non-White population were compared with changes of those treated at NCCCP sites in the lowest tertile for non-White populations. Patients treated at NCCCP sites in the middle tertile were not included in these analyses. All comparisons between NCCCP subgroups were assessed using Chi-square analyses to determine whether the changes in concordance with each quality measure were significantly different ($p < .05$).

To compare changes in each of the quality of care measures among disparate subgroups of patients treated at NCCCP sites and changes between patients treated at disparities-focused NCCCP sites vs. NCCCP sites in complementary tertiles, we performed multivariate logistic regression analyses. Analyses were performed at the patient level, controlling for clustering by hospital. In each model, the dependent variable was the dichotomous indicator (0/1) of whether or not a patient's care was concordant with a quality measure for which he or she was eligible. Only patients who were eligible for a specified quality of care measure—based on their cancer type, age, and clinical characteristics—were included in the analyses for that measure.

Regressions included a dichotomous indicator variable for time period of diagnosis (i.e., baseline vs. post-NCCCP initiation), a dichotomous indicator variable for patient or hospital group (e.g., Black vs. White patients or hospitals in markets with high poverty vs. low poverty), and the interaction of these two indicators. The interaction term reflects the difference-in-difference parameter, which indicates the difference from baseline to post-NCCCP for a quality of care measure for one patient group or hospital group relative to the difference for a comparison group of patients or hospitals. All regressions also included independent variables of patient age group, race, and insurance status; regressions for the colon cancer quality of care measures also included sex. All regression analyses were performed in SAS, using PROC GENMOD, controlling for clustering by hospital. Statistical significance was assessed at $p < 0.05$.

RESULTS

Patient Population. **Table 1** presents the characteristics of the overall NCCCP study population. The proportion of study patients diagnosed in the baseline period (2006-2007) was slightly less than the proportion diagnosed during the post-NCCCP initiation period (2008-2010). Black individuals were 10% to 12% of the study population. Approximately 15% of the breast cancer population was age 70 or older, while more than half of the colorectal cancer population was 70 or older.

Table 1. Characteristics of the NCCCP Breast and Colon Cancer Study Populations.

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	Breast Cancer	Colon Cancer
Total Unique Patients	8,081	3,390
Diagnosed between Jan. 2006 and Dec. 2007	44.8%	49.4%
Diagnosed between Jan. 2008 and May 2010	55.2%	50.6%
Black race	10.2%	12.0%
< 50 years	27.7%	8.7%
50–59 years	29.6%	17.4%
60–69 years	27.1%	23.3%
70 years and older	15.5%	50.6%
Female	n/a	51.2%
Uninsured	2.0%	2.4%
Medicaid	23.7%	14.4%
Private/military insurance	47.8%	23.9%
Medicare	26.5%	59.3%

Change in Quality of Care among Patients from Disparate Populations at NCCCP Hospitals. **Figure 1** presents the change in concordance rates for each quality measure for Black vs. White patients diagnosed at NCCCP sites in 2006/07 (the pre-NCCCP period) vs. 2008/09/10 (post-NCCCP period). For all five quality measures, concordance increased significantly ($p < 0.01$) for both Black and White patients treated at NCCCP sites. For both patient populations, the greatest improvement in concordance was noted for the Breast-HT measure (33.5% for White patients and 29.5% for Black patients). Results for all five measures suggest an absence of racial disparities in quality improvement; that is, the quality of care improvements for Black vs. White patients were not significantly different. Similarly, there were no significant differences in the change in quality measure concordance by insurance status (private vs. Medicaid or uninsured) for all five measures, or in the change by sex for the colon cancer measures (data not shown). In addition, there were no significant differences in the increases in quality of care between the youngest and oldest age groups for four of the five measures; for hormonal therapy following breast cancer surgery, the increase among women younger than age 50 (37.2%) was significantly greater than that for women older than 70 (26.9%, different significant at $p < 0.05$), although both groups of women experienced significant increases in this measures from pre- vs. post-NCCCP initiation (data not shown).

Change in Quality of Care among Patients Treated at Disparities-Focused NCCCP Sites. In addition to the comparisons of quality of care measures for disparate NCCCP patient populations discussed above, we also explored differences in quality of care for patients treated at disparities-focused NCCCP sites. As noted above, the greatest improvements in concordance for both Black and White patients was seen for the Breast-HT measures. Using the Breast-HT measure as an example, **Figure 2** presents the change in concordance rates for this measure, comparing rates for patients treated at disparities-focused NCCCP sites (i.e., those with limited oncology resources or in markets with greater proportions of underserved individuals, as

described in the Methods section) vs. rates for patients treated at NCCCP sites in the complementary medical resource or market tertiles (i.e., sites with more oncology resources or in markets with smaller proportions of underserved individuals). For the categories defined by tertiles of hospitals oncology beds and hospital oncology nurses, we did not observe disparities in changes in quality of care following NCCCP initiation; that is, patients treated at disparities-focused NCCCP sites (i.e., those in tertiles with the fewest oncology beds or oncology nurses) experienced increases in quality of care for the Breast-HT measure that were not significantly different than the increase experienced by patients at NCCCP hospitals in the complementary tertile. For the other two NCCCP sub-group categories (based on proportion of non-White individuals or proportion of individuals in poverty), the increase in concordance for the Breast-HT measure at disparities-focused NCCCP sites (i.e., sites in markets with the greatest proportion of non-White individuals and greater proportion of individuals in poverty) was significantly greater than the increase at NCCCP sites in the complementary tertile.

Table 2 presents concordance rates comparing disparities-focused NCCCP sites with NCCCP sites in the complementary tertile for the other four quality measures. Similar results as those presented in **Figure 2** are seen for the Breast-BCS + Rad and Colon-ACT measures; that is, the increase in concordance among patients treated at disparities-focused NCCCP sites defined based on the proportion of non-White individuals or proportion of individuals in poverty was significantly greater than the increase at NCCCP sites in the complementary tertile. For the disparities-focused NCCCP sites defined by the fewest oncology beds or oncology nurses, there were no significant differences in concordance for these two measures. In contrast, for the other two quality measures (Breast-MAC and Colon-12RLN), there were no significant difference in concordance for any of the disparities-focused hospital categories.

Multivariate Regression Analysis of Changes in Quality of Care among Disparate NCCCP Patients or NCCCP Patients Treated at Disparities-Focused Hospitals. To examine differences in quality of care measures among disparate patient groups and patients treated at disparities-focused NCCCP sites while also controlling for other patient characteristics, we performed multivariate difference-in-difference regression analyses. **Table 3** presents odds ratios for these regression analyses (as discussed in the Methods section). Controlling for other patient characteristics, there were no significant differences in the changes in concordance with each of the five quality measures for Black (vs. White), male (vs. female), uninsured/Medicaid covered (vs. privately insured), and older (vs. younger) patients except for uninsured/Medicaid vs. privately insured patients for the Breast-MAC measure ($p < 0.05$). These results indicate that, with this one exception, the improvement in quality of care among patients from disparate populations was equivalent to (i.e., not significantly different from) the improvement in quality of care among patients from the corresponding non-disparate populations.

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Figure 1. Changes in Quality of Care Measures (pre- vs. post-NCCCP initiation) for White and Black Patients Treated at NCCCP Sites.

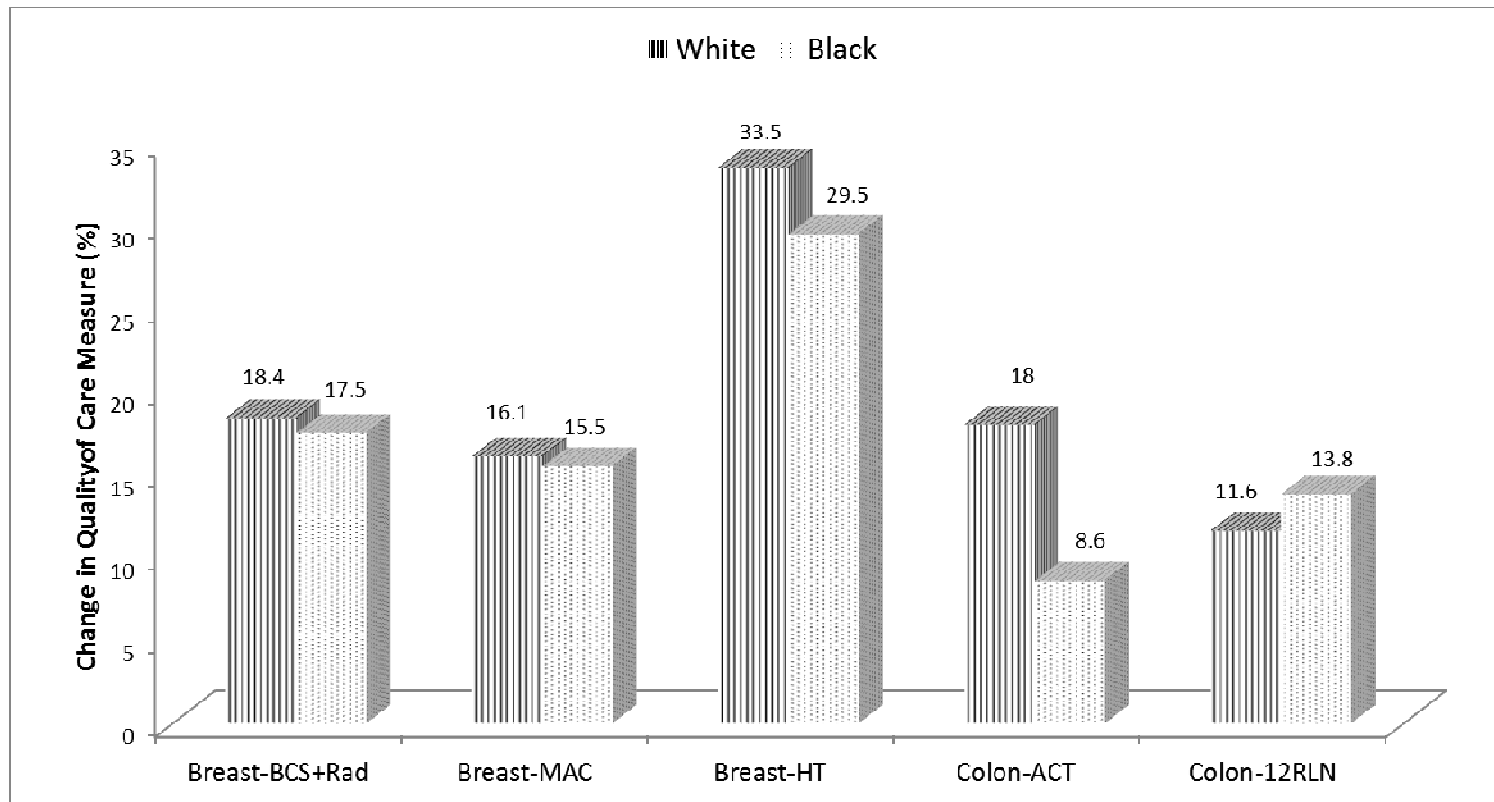
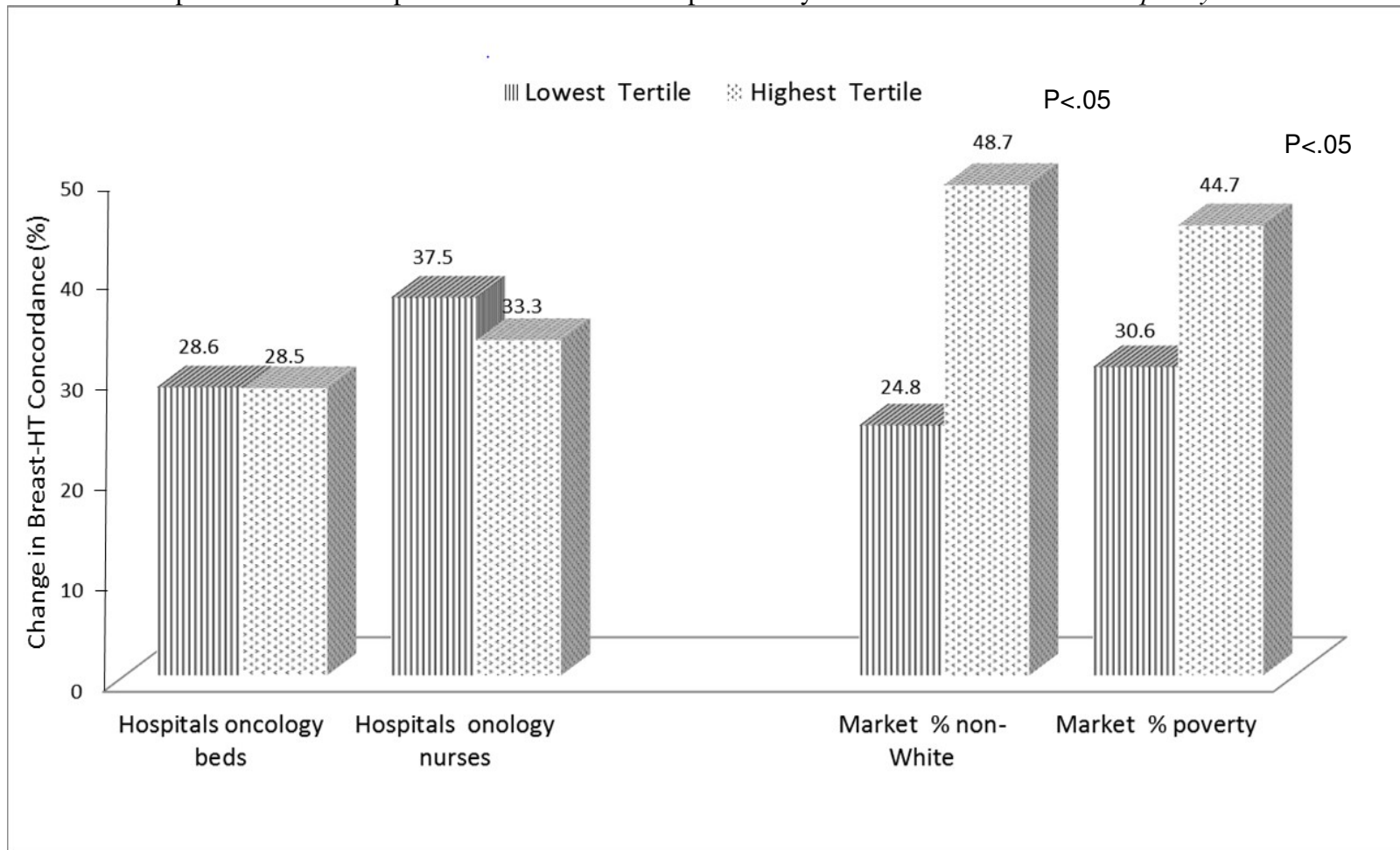


Figure 2: Change in concordance with quality of care measures for NCCCP patients treated at disparities-focused hospitals vs. hospitals in the complementary tertile: *Breast-HT* quality measure



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Table 2: Change in concordance with quality of care measures for NCCCP patients treated at disparities-focused hospitals vs. hospitals in the complementary tertile: *Breast-BCS+Rad*, *Breast-MAC*, *Colon-ACT*, and *Colon-12RLN* quality measures.

	CHANGE IN CONCORDANCE (BASELINE VS. POST-NCCCP INITIATION)											
	Breast- BCS+Rad			Breast-MAC			Colon-ACT			Colon-12RLN		
Disparities-Focused Hospital Category	Lowest Tertile	Highest Tertile	Diff-erence (p-value)	Lowest Tertile	Highest Tertile	Diff-erence (p-value)	Lowest Tertile	Highest Tertile	Diff-erence (p-value)	Lowest Tertile	Highest Tertile	Diff-erence (p-value)
Oncology Beds in Hospital	18.3	17.0	NS	10.9	9.7	NS	1.1	9.0	NS	14.1	9.2	NS
Oncology Nurses in Hospital	27.7	19.5	NS	15.3	11.0	NS	23.8	13.9	NS	15.4	11.0	NS
Proportion non-White in Hospital Market	18.7	30.0	p<0.05	8.0	22.6	NS	4.3	30.9	p<0.05	13.3	12.0	NS
Proportion living in poverty in Hospital Market	17.7	26.4	p<0.01	19.8	19.6	NS	4.7	27.2	p<0.05	14.2	13.7	NS

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Table 3: Difference-in-difference multivariate regression odd ratios for the change in concordance for quality of care measures for NCCCP patients from disparate populations or treated at disparities-focused hospitals.*

	Breast-BCS+Rad		Breast-MAC		Breast-HT		Colon-ACT		Colon-12RLN	
	OR	Diff. vs. reference	OR	Diff. vs. reference	OR	Diff. vs. reference	OR	Diff. vs. reference	OR	Diff. vs. reference
Disparate Patient Populations										
Black (vs. White)	0.81	NS	0.87	NS	0.71	NS	0.64	NS	1.15	NS
Medicaid/Uninsured (vs. private insurance)	1.63	NS	0.38	p<0.05	1.14	NS	0.61	NS	0.86	NS
Male (vs. female)	----- -	-----	----- -	-----	----- -	-----	0.63	NS	0.98	NS
Oldest age group (vs. youngest age group)	0.79	NS	0.92	NS	0.71	NS	0.47	NS	1.68	NS
Disparities-Focused Hospitals										
Lowest Number of Oncology Beds in Hospital (vs. highest number)	2.29	p<0.01	1.99	p<0.05	1.54	NS	0.58	NS	1.41	NS
Lowest Number of Oncology Nurses in Hospital (vs. highest number)	3.60	p<0.005	1.36	NS	1.96	p<0.05	2.34	NS	1.62	NS
Highest Proportion non-White in Hospital Market (vs. lowest proportion)	2.23	p<0.05	1.34	NS	1.30	NS	0.40	NS	1.15	NS
Highest Proportion living in poverty in Hospital Market (vs. lowest proportion)	1.90	NS	0.81	NS	0.55	NS	0.40	NS	1.20	NS

* Multivariate logistic regressions controlled for patient age, insurance status, sex (colon cancer measures), and age group. Due to potential confounding, regressions with comparisons across market proportion of non-White individuals did not control for patient race, and regressions with comparisons across market proportion in poverty did not control for insurance status.

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Examining the quality of care for patients treated at disparities-focused hospitals with fewer medical resources, those treated at hospitals with fewer oncology beds had significantly greater increases in concordance for the Breast-BCS+Rad and Breast-MAC measure, while those treated at hospitals with fewer oncology nurses had significantly greater increases in concordance for the Breast-BCS+Rad and Breast-HT measures. Changes in concordance for patients treated at hospitals in markets with more underserved individuals were generally not significantly different from changes for patients treated at hospitals in markets with fewer underserved individuals. However, patients treated at hospitals in markets with more individuals living in poverty had significant greater increases for the Breast-BCS+Rad measure compared with changes for patient treated at NCCCP sites with the smallest proportion of individuals living in poverty.

DISCUSSION

This is the first study reporting the impacts of the NCCCP pilot on cancer treatment among individuals from underserved populations or those treated at disparities-focused hospitals. As described earlier, the NCCCP focused on reducing health care disparities through a number of initiatives, including enhancing outreach and patient navigation services to better serve them in the program. Other factors potentially enhancing provision of services to individuals from disparate populations by NCCCP sites included co-investment by the sites in disparities initiatives; hospital leadership involvement in this program; and access to the disparities expertise of both NCI personnel and the network of other NCCCP sites for sharing best practices (O'Brien & Kaluzny, 2014). The analyses presented in this study indicate that individuals from underserved populations generally experienced similar increases in quality of care as did those from non-disparate populations. These findings suggest that the quality improvement processes, sharing of best practices, and other programs instituted as part of the NCCCP pilot had similar benefits for all population groups. Furthermore, for certain disparate patient groups (e.g., those treated at NCCCP sites in markets with the highest proportion of non-White individuals or individuals living in poverty), the increase in quality of care was significantly greater than that for the corresponding non-disparate groups.

NCCCP sites employed a range of strategies to improve quality of care for disparate populations with cancer during the pilot (Holden et al., 2012). There was a greater focus on collecting information on minority participation in cancer screening and treatment programs using standardized Office of Management and Budget (OMB) categories. NCCCP sites also increased community partnerships, particularly partnerships with organizations assisting underserved populations. The number of sites having partnerships with organizations targeting minority or underserved populations increased from 3 sites in 2008 to 14 sites in 2010. Previous studies have suggested that community partnerships and outreach programs can be effective in improving access to care for underserved populations. Vicini et al. (2011) reported that a minority outreach

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program at William Beaumont Hospital in Detroit doubled minority enrollment in cancer clinical trials. Other partnerships have increased breast and cervical cancer screening among African American and Hispanic populations (Mayo et al., 2004) and colorectal cancer screening among low-income individuals (Redwood et al., 2011). Yung et al. (2012), examining receipt of adjuvant hormone therapy among women with breast cancer, suggested that partnerships may facilitate identification of at-risk women and implementation of quality improvement strategies.

Previous studies of cancer-related quality improvement programs have generally indicated positive results with respect to underserved patient populations. For example, Parsons et al. (2012) found that non-White patients who underwent thoracic, abdominal, or pelvic cancer surgery at hospitals participating in the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) experienced similar short-term outcomes to White patients, but had longer hospitalizations. These authors suggested that improved access to quality-driven hospital programs could reduce disparities in cancer care outcomes. Similarly, in a study of five community-based radiation oncology centers participating in an NCI quality assurance/quality improvement initiative, the overwhelming majority of patients regardless of minority status received treatment similar to that of patients at American College of Radiology accredited facilities (de Andrade et al., 2008).

Our findings also indicate that patients treated at "disparities-focused" NCCCP sites (i.e., those sites in markets with greater proportions of individuals from underserved populations or with fewer oncology resources that could lead to access to care disparities) generally saw improvements in quality of care that were similar to or greater than the improvements observed for patients treated at hospitals with more medical resources or in markets with smaller proportions of underserved individuals. This further suggests that the NCCCP was at least as effective, and was potentially more effective, at increasing quality of care for hospitals facing additional financial or programmatic challenges. While a number of studies have reported that community-level or environmental factors are significantly associated with differences in cancer treatment patterns and outcomes (e.g., Erhunmwunsee et al., 2012; Sprague et al., 2011; Tseng et al., 2010), the mechanisms by which surrounding markets affect treatment patterns and outcomes needs further research.

Several important limitations exist with this study. First, while all NCCCP sites included disparities as a set of common area of focus, there was substantial variation among the sites in the baseline quality of care at NCCCP initiation and in the specific quality improvement initiatives undertaken during the pilot. In addition, this analysis aggregates results from all NCCCP sites. These factors limit our ability to identify which specific aspects of the NCCCP were most effective in improving quality of care for underserved populations. In addition, while the NCCCP was implemented in 2007, the beta-test of the RQRS was not implemented until 2009 at NCCCP sites. This potentially limited the opportunity for the RQRS to affect concordance with quality of care measures, in particular, the number of lymph nodes removed at the time of colon cancer resection, among NCCCP sites. Additional information on the impacts of the NCCCP pilot, including qualitative and quantitative information from patients, is available in the overall NCCCP evaluation (Holden et al., 2012)

Despite these limitations, these analyses provide important information on the overall effects of the NCCCP in improving the quality of breast and colorectal cancer care for disparate patient populations treated at community hospitals. Our results indicated that patients from underserved populations experienced similar improvements to individuals who were not from

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underserved groups. While this does not provide evidence that the NCCCP can eliminate disparities in cancer care, it suggests that the improvements in quality of care associated with the NCCCP are not limited to a subset of patients, but are applicable to diverse populations of individuals with cancer. In addition, the NCCCP differs from many other previously-evaluated programs in that it is focused on both reducing disparities and improving overall cancer quality of care.

CONCLUSION

As multiple studies have reported substantial disparities in cancer care for underserved populations, initiatives that improve care for diverse groups will be important for addressing barriers to care. For example, with the Medicaid expansion initiated in several states as part of the Affordable Care Act, improving quality of care for Medicaid beneficiaries diagnosed with cancer is crucial. Further research is needed to identify the hospital programs, initiatives, and policy changes associated with the significant quality of cancer care improvements for disparate population groups served in the NCCCP and similar community-based cancer programs.

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