Original Article

Using Breast Cancer Quality Indicators in a Vulnerable Population

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BACKGROUND: Adherence to quality indicators may be especially important to disease-specific outcomes for uninsured, vulnerable patients. The objective of this study was to measure adherence to National Initiative for Cancer Care Quality (NICCQ) breast cancer quality indicators in a public hospital and compare performance to published rates in a previously collected 5-city cohort. **METHODS:** One hundred five consecutive, newly diagnosed, stage I-III, breast cancer patients at a public hospital (from 2005 to 2007) were identified. Adherence rates to 31 quality indicators were measured by using medical record abstraction. Rates were calculated for individual indicators, aggregated domains, and components of care and were compared with the 5-city cohort results by using a 2-sided test of proportions. **RESULTS:** Overall adherence to the NICCQ indicators at the public hospital was 82%, versus 86% in the 5-city cohort. Public hospital adherence was better in 3 domains and components (Management of Treatment Toxicity 95% vs 73%, Referrals 76% vs 15%, and Documentation of Key Clinical Factors 72% vs 64%, $P < .05$ for all), but it was lower in others (Testing 82% vs 96%, Adjuvant Therapy 76% vs 83%, Surgery 72% vs 86%, Surveillance 63% vs 94%, and Respect for Patient Preferences 52% vs 72%, $P < .001$ for all). **CONCLUSIONS:** The results showed that it is possible to deliver breast cancer care to vulnerable patients comparable in quality to the care received by the broader population. Further study should identify the factors that lead to variation in adherence across domains of quality. *Cancer* **2011;117:3311–21.** *© 2011 American Cancer Society.*

KEYWORDS: breast cancer, quality of care, quality indicators, disparities.

Variations in the quality of breast cancer treatment exist throughout the continuum of care, from screening, diagnosis and active treatment to surveillance.[1] Receipt of recommended care varies by geographic region, institution, provider type, and patient characteristics.[2-3] Depending on the type of care, 10% to 70% of women with breast cancer do not receive the evidence-based treatments shown to improve rates of cure and survival.[4]

Vulnerable populations, such as the uninsured and underinsured, racial/ethnic minorities, and those with lower socioeconomic status are at increased risk for receiving suboptimal quality care.[5-6] These patients have lower rates of screening mammography,[7-8] are more likely to experience delays between abnormal screening mammogram and diagnostic resolution,[9] more likely to be diagnosed with advanced stage disease,[10-11] less likely to receive breast-conservation surgery and appropriate adjuvant therapy,[12-13] and to have worse outcomes such as higher rates of recurrence and shorter survival.[7] Patients who live in rural areas or areas with lower socioeconomic status are also at risk for inadequate care and poorer outcomes.[2,12-15] Public hospitals care for a disproportionate number of uninsured and underinsured patients, racial/ethnic minorities, and those with lower socioeconomic status; thus, public hospitals are an ideal setting in which to evaluate and improve the quality of care for these vulnerable populations.

Quality of care indicators can be used to evaluate whether patients receive recommended care. Unlike clinical practice guidelines, quality indicators usually define highly specific inclusion and exclusion criteria as well as measurement algorithms, and when well designed, they can be used to compare quality of care across providers.[16] A comprehensive set

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of 36 quality indicators for breast cancer was developed as part of the American Society of Clinical Oncology's (ASCO) National Initiative for Cancer Care Quality (NICCQ).[17-18] These indicators measure specific processes of care, spanning the treatment continuum from diagnostic staging, surgical treatment, and adjuvant therapy to post-treatment surveillance. By using these indicators in a study cohort from 5 metropolitan areas in the United States (referred to as the *5-city cohort* in the current study), Malin et al found that there was 86% adherence to the breast cancer indicators.

Before the ASCO study of the 5-city cohort, most evaluations of variation and disparities in breast cancer care focused on singular aspects of care or a small number of clinical processes, such as screening mammography. Although efforts are now being made to evaluate the quality of cancer care in community settings through programs such as the Quality Oncology Practice Initiative sponsored by ASCO, monitoring of the quality of care across the entire spectrum of breast cancer treatment is not routinely performed outside of large academic studies.[19] Comprehensive assessment of breast cancer treatment in vulnerable and at-risk populations has also been lacking.[20]

The goals of the current project were to measure adherence to the NICCQ breast cancer quality indicators in a public hospital setting and to identify which areas of care could be prioritized for quality improvement. As a reference standard, we compared adherence rates between patients receiving care at the public hospital and patients who were included in the 5-city, population-sampled, NICCQ cohort.

MATERIALS AND METHODS

Patient Cohorts

The study was based at a Los Angeles public hospital that serves 2 million individuals. All newly diagnosed, consecutive, breast cancer cases were identified through a systematic search of the pathology database or samples submitted between August 15, 2005 and September 15, 2007 and included biopsies and surgical specimens. Terms to capture cases included *breast*, *cancer*, and *carcinoma*. Patients with newly diagnosed stage I to III cancers who were aged 21 years and older were included. Patients who transferred their care to other institutions (without undergoing surgery or chemotherapy at the public hospital), patients with in situ or metastatic disease, and men were excluded. Adherence to the NICCQ quality indicators was assessed for these patients through chart abstraction.

Findings from the public hospital were compared with the previously published ASCO study that sampled patients from 5 metropolitan areas (Atlanta, Georgia; Cleveland, Ohio; Houston, Texas; Kansas City, Kansas; Los Angeles, California) who were newly diagnosed in 1998 and registered in an American College of Surgeons-approved hospital cancer registry (5-city cohort). Eligible breast cancer participants had stage I to III cancers, were aged 21 to 80 years, were English-speaking, and were female. Adherence to the NICCQ quality indicators for the 5-city cohort was assessed through telephone survey of the patients and a medical record review conducted 4 years after diagnosis. In the current study, data were collected through medical record abstraction with 1-year follow-up; patient interviews and surveys were not used in this study.

Data Abstraction

A medical record review was conducted on the patients in the public hospital sample to determine adherence to the NICCQ breast cancer quality indicators. A Microsoft Access computerized data abstraction tool was used (Microsoft, Redmond, Washington). Two physicians completed the abstractions, and the senior researcher reabstracted data that required further assessment (ie, to confirm dates or pathology reports in question). The senior researcher sampled 10% of the cases for review. In addition, tumor stage was reconfirmed independently for all cases by the senior researcher (each patient's tumor size, lymph node status, histology, and presence of metastases) from the electronic medical records. Study approval was obtained from both the University of California at Los Angeles (UCLA) and the Olive View-UCLA Medical Center Institutional Review Boards.

Analyses

Adherence to 31 of the 36 NICCQ breast cancer indicators was determined for the public hospital patients. The 5 indicators that were not measured pertained to the total duration of hormone therapy, whether the chemotherapy dosage was consistent with recommended guidelines, the amount of radiation to the chest wall after mastectomy, completion of planned radiation therapy among ambulatory patients, occurrence of grade 4 toxicity, and appropriate workup of vaginal bleeding when the patient was being given tamoxifen. Reasons for not assessing these 5 indicators included short follow-up time, data not

Table 1. Assignment of the 31 Measured National Initiative on Cancer Care Quality Indicators into Quality of Care Domains and Components of Care

	Components of Care							
	Testing	Pathology	Documentation of Key Clinical Factors	Referrals	Timing	Receipt of Treatment	Technical Quality of Treatment	Respect for Patient Preferences
Quality of Care Domains								
Diagnostic Evaluation	3	6	3	—	—	—	—	1
Surgery	—	—	—	—	—	1	1	2
Adjuvant Therapy	—	—	2	2	1	4	2	1
Management of Treatment Toxicity	—	—	—	—	—	—	1	—
Surveillance	1	—	—	—	—	—	—	—

reported, and insufficient data for accurate measurement of adherence. For examples, we were unable to determine whether the patient had been hospitalized at an outside institution, and we did not have consistent access to a data source for informing us whether the patient had a grade 4 toxicity.

The denominator for each indicator, termed *eligible events*, was defined by the specific inclusion and exclusion criteria for each indicator. For example, 1 of the indicators states: "*If* a patient has an axillary lymph node dissection, *then* the patient should have at least 6 lymph nodes removed." The "*if*" portion of the indicator states inclusion and exclusion criteria that define the denominator for that indicator.

After the ASCO study of the 5-city cohort methodology,[18] each indicator was also assigned to 1 of 5 Quality of Care Domains: 1) Diagnostic Evaluation, 2) Surgery, 3) Adjuvant Therapy, 4) Management of Treatment Toxicity, and 5) Post-treatment Surveillance as well as 1 of 8 Components of Care: 1) Testing, 2) Pathology, 3) Documentation of Key Clinical Factors, 4) Referrals, 5) Timing, 6) Receipt of Treatment, 7) Technical Quality of Treatment, and 8) Respect for Patient Preferences (Table 1). Percentage adherence was calculated for each domain and component. Adherence rates for individual indicators and aggregated domains and components were compared with the adherence rates reported in the 5-city cohort by a 2-sided test of proportions. Sensitivity analysis was performed to ensure that the comparisons across domains and components between the 5-city cohort and the public hospital data were not impacted by the 5 indicators that were not assessed in this study. This was performed by comparing the 5-city cohort's aggregated domain and component adherence rates both with and without the unmeasured indicators to the public hospital rates. Consistent with accepted quality improvement standards, a cutoff of <85% adherence rate was used to identify indicators, domains, and components in need of improvement.[18] Analyses were performed using STATA statistical software version 9.0 (StataCorp, College Station, Texas).

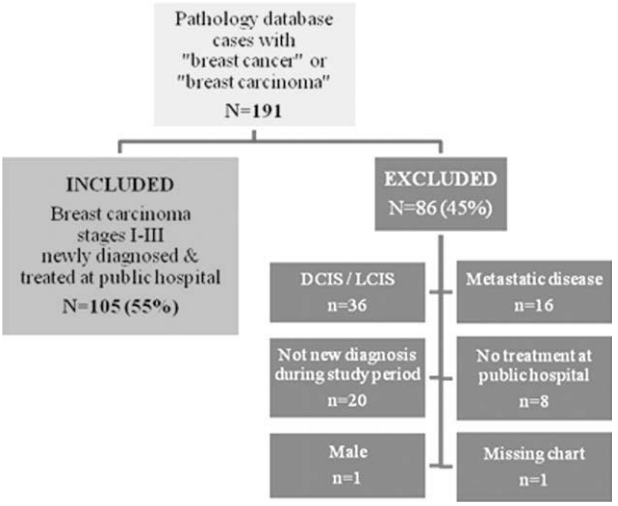

Figure 1. Inclusion and exclusion criteria from analytic public hospital cohort are shown.

RESULTS

Cohort and Patient Characteristics

One hundred ninety-one patients with breast carcinoma were identified through a search of the public hospital pathology database. Eight patients had a breast cancer diagnosis reported but elected to have treatment at another hospital. One hundred five (55.0%) patients met study eligibility requirements and were included in the analysis (see Fig. 1 for reasons for exclusion). The 5-city ASCO study cohort included 1287 patients with breast cancer.

Table 2. Comparison of Public Hospital Versus 5-City Cohort Breast Cancer Patient Characteristics

	Public Hospital	5-City Cohort	*P*
Total no. of patients	105	1287	
Age, y			
<55	50%	31%	<.001
≥55 to <65	34%	42%	.11
≥65	16%	27%	<.001
Race/ethnicity			
Hispanic	52%	4%	<.001
White	30%	85%	<.001
Asian	12%	4%	<.001
African American	5%	7%	.44
Insurance			
Uninsured/Public	100%	3%	<.001
Private	—	71%	
Medicare	—	21%	
Pathological stage			
Stage I	44%	54%	.05
Stage II	37%	39%	.69
Stage III	19%	5%	<.001

The mean age of the public hospital patients was 54 years (range, 30-82 years), with 50% younger than 55 years (Table 2). Compared with the 5-city cohort, the public hospital patients were significantly younger. Fifty-two percent of patients at the public hospital were Hispanic compared with 4% in the 5-city cohort. In addition, 57% of the breast cancer population at the public hospital (including in situ and metastatic cases) preferred Spanish as their primary language compared with the 5-city cohort, which was entirely English-speaking. Nineteen percent of the public hospital patients presented with stage III disease compared with 5% in the 5-city cohort. The most notable difference between the study populations was that 100% of the public hospital patients were either uninsured or publically insured versus 3% of the 5-city cohort patients.

Overall and Individual Indicator Adherence Rates in the Public Hospital Cohort

Overall adherence to the 31 measured NICCQ breast cancer quality indicators in the public hospital cohort (n = 105) was 82%, with a total of 1720 eligible events (sum of the denominators of the 31 measured indicators).

Adherence to the individual indicators ranged from 0% to 100% in the public hospital cohort, with a median of 86% (Table 3). The denominators or *eligible events* for the individual indicators ranged from 6 to 104. In 14 of the 31 indicators, adherence was below 85%. The quality of pathology reporting was generally good with the exception of consistent inking of margins and reporting of tumor histologic grade (80% and 58%, respectively). Complete documentation of cancer stage in patients seen only by surgeons was poor (17%). For patients who did not receive surgical lymph node sampling (sentinel lymph node biopsy [SLNB] or axillary lymph node dissection [ALND]), breast conservation surgery (BCS), or reconstruction after mastectomy, documentation that these patients had been informed of possible treatment options was inadequate much of the time (0%, 27%, and 43% for lymph node sampling, BCS, and reconstruction, respectively).

Quality indicators assessing adjuvant chemotherapy identified the following processes as needing improvement: discussion regarding possible treatment with chemotherapy (77%), receipt of chemotherapy (83%), starting chemotherapy within 8 weeks of last therapeutic surgery (75%), and documentation of planned chemotherapy dose (74%). Documentation of the radiation treatment plan (24%) and the total amount of radiation after BCS (77%) were also suboptimal. Only 54% of patients who did not receive radiation therapy after BCS had a consultation with a radiation oncologist. And, timely surveillance mammography was performed in only 63% of patients (of note, surveillance mammography is performed on site at the public hospital, and patients typically do not have another source of care option). These indicators identified specific clinical processes in need of improvement.

In 17 quality indicators, performance was 85% or greater (Table 3). These indicators addressed aspects of pathology reporting, diagnostic evaluation, quality of surgical therapy, documentation, receipt of hormone and radiation therapy, management of treatment toxicity, and appropriate referrals to specialists. For example, adherence rate for diagnostic evaluation was 96% for performing surgical axillary lymph node sampling, 96% of patients received radiation after BCS, and 90% received consultation with a radiation oncologist after mastectomy when appropriate.

Quality of Care Domains and Components of Care Adherence Rates in the Public Hospital Cohort

In addition to evaluating specific processes, each NICCQ indicator was classified into a Quality of Care Domain

Table 3. National Initiative on Cancer Care Quality Breast Cancer Quality Indicators by Components of Care: Comparison Between Public Hospital and 5-City Cohort Adherence Rates

Indicator	Public Hospital Cohort 2005-2007			5-City Cohort 1998			
	No. Eligible	No. Meeting Criteria	Adherence Rate	No. Eligible	No. Meeting Criteria	Adherence Rate	*P*
Testing							
IF a patient with a stage I-III breast cancer meets all of the following criteria: age <70 y, tumor size >1 cm, no evidence of metastatic disease within 3 months of diagnosis, and no documentation in the medical record that axillary lymph node sampling would not change treatment, THEN the patient should have axillary lymph node sampling (sentinel lymph node biopsy or axillary dissection).	82	79	96%	782	777	99%	.02
IF a patient has a sentinel node biopsy that is positive, THEN the patient should undergo axillary lymph node dissection.	30	28	93%	47	47	100%	.07
IF a patient has an axillary lymph node dissection, THEN the patient should have at least 6 lymph nodes removed.	59	51	86%	919	876	95%	<.001
IF a patient with stage I-III breast cancer has not had bilateral mastectomies, THEN the patient should have a mammogram in the last 12 mo.	90	57	63%	1195	1121	94%	<.001
Pathology							
IF a patient has stage I-III breast cancer and had a breast tumor removed, THEN the pathology report should state the tumor size.	102	102	100%	1166	1043	89%	<.001
IF a patient has stage I-III breast cancer and had a breast tumor removed, THEN the pathology report should state that the margins were inked.	102	82	80%	1166	851	73%	.12
IF a patient has stage I-III breast cancer and had a breast tumor removed, THEN the pathology report should state the status of the margins.	102	101	99%	1166	1048	90%	<.001
IF a patient has stage I-III breast cancer and had a breast tumor removed, THEN a pathology report should state the histologic grade of the tumor.	102	59	58%	1180	969	82%	<.001
IF a patient has stage I-III breast cancer and had a breast tumor removed, THEN the hormone-receptor status of the tumor should be checked and reported.	102	99	97%	1280	1213	95%	.37
IF a patient with stage I-III breast cancer undergoes an axillary lymph node dissection, THEN the pathology report should state the number of lymph nodes evaluated and the number of positive lymph nodes.	95	95	100%	1087	1052	97%	.09
Documentation of Key Clinical Factors							
IF a patient with stage I-III breast cancer is not referred to another oncology specialist (eg, medical oncologist or radiation oncologist), THEN the medical record of the surgeon performing the last cancer surgery should document all of the following: tumor size and lymph node status (or AJCC stage or TNM category) and hormone-receptor status.	12	2	17%	68	17	25%	.53

(Continued)

Table 3. (Continued)

Indicator	Public Hospital Cohort 2005-2007			5-City Cohort 1998			
	No. Eligible	No. Meeting Criteria	Adherence Rate	No. Eligible	No. Meeting Criteria	Adherence Rate	*P*
IF a patient with stage I-III breast cancer is seen in consultation by a medical oncologist after last breast surgery, THEN the medical record of the medical oncologist should document all of the following: tumor size and lymph node status (or AJCC stage or TNM category) and hormone receptor status.	51	46	90%	704	574	82%	.15
IF a patient with stage I-III breast cancer is seen in consultation by a radiation oncologist after completion of the staging evaluation, THEN the medical record of the radiation oncologist should document at least one of the following: tumor size and lymph node status (or AJCC stage or TNM category).	47	43	91%	282	202	72%	.01
IF a patient is treated with chemotherapy, THEN body-surface area should be documented.	50	47	94%	313	88	28%	<.001
IF a patient with stage I-III breast cancer is treated with radiation therapy THEN the radiation therapy medical record should document all of the following: total radiation dose, dose per fraction or number of fractions given, and the site.	46	11	24%	341	213	62%	<.001
Referrals							
IF a patient with stage I-III breast cancer undergoes breast-conserving surgery and did not receive radiation therapy, THEN the patient should have a consultation with a radiation oncologist.	13	7	54%	62	11	18%	.01
IF a patient with invasive breast cancer undergoes a mastectomy and has any of the following: positive margins, tumor size >5 cm, 4 or more involved lymph nodes or a T4 lesion, THEN the patient should have a consultation with a radiation oncologist.	21	19	90%	20	1	5%	<.001
Timing							
IF a patient newly diagnosed with stage II-III breast cancer is aged <50 y and the tumor is >2 cm or the tumor involves the lymph nodes, THEN the patient should start adjuvant chemotherapy within 8 wk of the last therapeutic surgery.	20	15	75%	173	136	79%	.68
Receipt of Treatment							
IF a patient has stage I-III breast cancer, THEN the patient should receive 1 of the following surgical treatments: breast-conserving surgery or mastectomy.	104	104	100%	1287	1286	100%	1.00
IF a patient with stage I-III breast cancer meets all of the following criteria: ER+ or PR+ breast cancer, tumor size 1 cm or involved axillary lymph nodes, and not taking tamoxifen within 6 mo before diagnosis, THEN the patient should be started on tamoxifen.	61	52	85%	772	699	91%	.12
IF a patient with stage II-III breast cancer is aged <50 y and the tumor is >2 cm or involves the lymph nodes, THEN the patient should receive chemotherapy.	24	20	83%	173	163	94%	.06

(Continued)

Table 3. (Continued)

Indicator	Public Hospital Cohort 2005-2007			5-City Cohort 1998			
	No. Eligible	No. Meeting Criteria	Adherence Rate	No. Eligible	No. Meeting Criteria	Adherence Rate	*P*
IF a patient with stage I-III breast cancer has breast-conserving surgery, THEN the patient should receive local radiation therapy.	27	26	96%	683	669	98%	.54
IF a patient with invasive breast cancer who undergoes a mastectomy has any of the following: positive margins, tumor size >5 cm, 4 or more involved lymph nodes or a T4 lesion, THEN the patient should receive radiotherapy.	16	15	94%	121	98	81%	.21
Technical Quality Of Treatment							
IF a patient with stage I-III breast cancer undergoes surgical treatment with breast-conserving surgery, THEN the pathology report for the last cancer surgery should state that the surgical margins are clear or only focally involved with breast cancer.	48	42	88%	681	674	99%	<.001
IF a patient is treated with chemotherapy, THEN the planned dose (dose per cycle x number of cycles) should be documented in the medical record.	50	37	74%	296	188	64%	.17
IF a patient with stage I-III breast cancer has breast-conserving surgery and the patient received radiation therapy and did not receive brachytherapy, THEN the patient should receive local radiation therapy 45Gy to 50.4 Gy to the whole breast.	22	17	77%	465	446	96%	<.001
IF a patient ever receives highly emetogenic chemotherapy, THEN the patient should receive potent antiemetic therapy.	56	53	95%	267	178	67%	<.001
Respect for Patient Preferences							
IF a patient with stage I-III breast cancer has a 1 cm tumor or lymph node involvement, THEN a physician should have a discussion with the patient on possible treatment with chemotherapy.	78	60	77%	1044	939	90%	<.001
IF a patient has stage I-III breast cancer and does not undergo axillary lymph node sampling, THEN the patient should be informed about the option of a surgical check or removal of lymph nodes under the arm (ie, sentinel-node biopsy or axillary dissection).	6	0	0%	40	22	55%	.01
IF a patient with stage I-III breast cancer undergoes mastectomy as first therapeutic procedure, THEN before undergoing mastectomy, the patient should be informed about the option to have either breast-conserving surgery followed by radiation therapy or mastectomy.	48	13	27%	107	31	29%	.80
IF a patient with stage I-III breast cancer undergoes mastectomy, THEN before undergoing mastectomy, the patient should be informed about the option of breast reconstruction after mastectomy.	54	23	43%	598	298	50%	.32

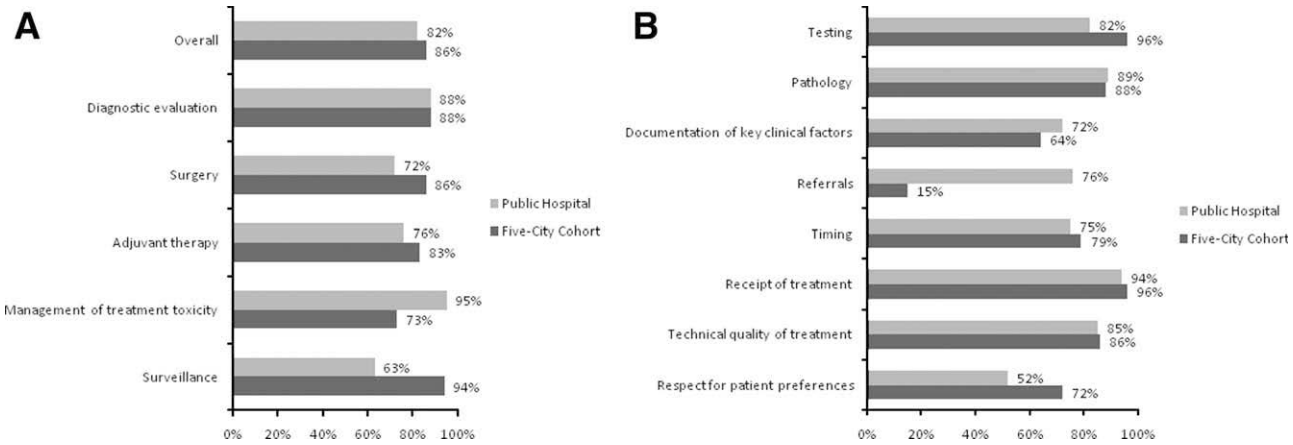

Figure 2. Illustrated are (A) comparison of public hospital to 5-city cohort adherence rates across aggregated quality of care domains and (B) comparison of public hospital to 5-city cohort adherence rates across aggregated components of care.

Table 4. Comparison of Public Hospital Versus 5-City Cohort Adherence to NICCQ Breast Cancer Quality Indicators by Aggregated Quality of Care Domains and Components of Care

	No. of Measures		Eligible Events		Adhered Events		% Adherence		*P*[a]
	Public Hospital Cohort	5-City Cohort	Public Hospital Cohort	5-City Cohort	Public Hospital	5-City Cohort	Public Hospital	5-City Cohort	
Overall	31	36	1720	20,281	1405	17,455	82%	86%	<.001
Quality of care domains									
Diagnostic evaluation	13	13	892	9887	787	8691	88%	88%	1.00
Surgery	4	4	254	2673	182	2289	72%	86%	<.001
Adjuvant therapy	12	16	428	6148	326	5077	76%	83%	<.001
Management of treatment toxicity	1	2	56	378	53	277	95%	73%	<.001
Surveillance	1	1	90	1195	57	1121	63%	94%	<.001
Components of care									
Testing	4	4	261	2943	215	2821	82%	96%	<.001
Pathology	6	6	605	7045	538	6176	89%	88%	.47
Documentation key clinical factors	5	5	206	1708	149	1094	72%	64%	.02
Referrals	2	2	34	82	26	12	76%	15%	<.001
Timing	1	1	20	173	15	136	75%	79%	.68
Receipt of treatment	5	5	232	3036	217	2915	94%	96%	.14
Technical quality of treatment	4	9	176	3505	149	3011	85%	86%	.71
Respect for patient preferences	4	4	186	1789	96	1290	52%	72%	<.001

[a] *P* for comparison of percentage adherence to domains and components of care scores for patients receiving care in public hospital compared with the 5-city cohort using a 2-sided test of proportions.

and a Component of Care (Table 1). Examining performance in these domains and components can help identify more global or systems-level deficiencies in quality of care within an organization or healthcare system.

For the public hospital, adherence was ≥85% in Diagnostic Evaluation and Management of Treatment Toxicity domains (Fig. 2, Table 4). Conversely, less than 85% adherence in the domains of Surgery, Adjuvant Therapy, and Surveillance identified systems-level elements in need of quality improvement.

Among the Components of Care, adherence was ≥85% in Pathology, Receipt of Treatment, and Technical Quality of Treatment. The components of Testing, Documentation of Key Clinical Factors, Referrals, Timing, and Respect for Patient Preferences all had lower scores.

Comparison of Adherence Rates for the Public Hospital and 5-City ASCO Cohorts

Overall performance across all the NICCQ indicators was slightly lower at the public hospital than in the 5-city cohort (82% vs 86%, $P < .001$), but the discrepancy was small.

Adherence rates in the public hospital cohort and 5-city cohort differed in 16 of the 31quality indicators (Table 3). Performance at the public hospital was better for 7 of the 16, which included for example, pathology reporting of tumor size and margin status, documentation of staging, and appropriate referral to radiation oncologists. In 9 indicators, performance at the public hospital was lower compared with the 5-city cohort, for example, informing patients who did not receive lymph node sampling that it was an option, discussing the option for chemotherapy, and performing timely surveillance mammography.

Across the aggregated Quality of Care Domains and Components of Care, performance was better in the public hospital in the Management of Treatment Toxicity, Referrals, and Documentation of Key Clinical Factors (Fig. 2, Table 4). Domains and components in which the public hospital had lower performance included Adjuvant Therapy, Surgery, Surveillance, Testing, and Respect for Patient Preferences.

DISCUSSION

When we used the NICCQ breast cancer quality indicators, we found that the quality of breast cancer treatment at the public hospital was good with 82% overall adherence, and 17 of the 31 individual indicators had scores of $\geq$85%. From an institutional standpoint, analysis of these indicators identified areas of good and lower quality in the continuum of breast cancer care. Indicators with <85% performance identified specific clinical processes in most need for quality improvement. By analyzing performance in the aggregated Quality of Care Domains and Components of Care, we were able to identify more global and systems-level elements that can be addressed to achieve more widespread impact with our quality-improvement efforts.

Comparison of indicator adherence to the previously published 5-city NICCQ cohort allowed us to assess quality of care at the public hospital relative to a study cohort that was more likely to be representative of breast cancer patients in the United States. The public hospital and 5-city patient cohorts were significantly different in terms of age, race/ethnicity, language spoken, and insurance status. As expected, the public hospital cohort had sociodemographic characteristics that suggested this was a more vulnerable population and, therefore, at-risk for decreased access to care and/or suboptimal quality of care. By comparison, the 5-city cohort was more similar to the national breast cancer population than to the public hospital cohort. Although overall performance at the public hospital was lower compared with the ASCO study, the magnitude of the difference was small. Of course, public hospitals can vary significantly in terms of size, organizational structure, patient demographics, and services provided. Some features of the study site which may have led to higher performance include a multidisciplinary tumor board that is attended by physicians in all treating disciplines, including surgery, medicine, and radiation oncology. All patients receiving breast cancer treatment are discussed by the tumor board. Also, medical oncology treatment takes place on site at the hospital, which allows close communication between the surgical and oncologic services. Although radiation oncology is off-site, there is also close communication between the on-site and off-site providers. In comparison, patients treated in private hospitals often receive care in a more fragmented manner through different institutions and unaffiliated providers. Areas in which the public hospital performed better, such as in Referrals and Documentation of Key Clinical Factors, may have benefited from the limited options for uninsured patients to choose other providers and the paradoxically higher degree of continuity of care between surgical and oncologic disciplines that this may create. Although our study findings do not indicate which features of the public hospital resulted in higher quality care, they do suggest that such care is possible, at least in selected settings. Also, many other public hospitals have close affiliations with academic centers, and this may be of benefit on some of the indicators.

Nevertheless, our analysis identified areas of deficiencies in the quality of care provided at the public hospital that are consistent with known disparities in quality of care across socioeconomic strata. Overall the quality of care was good, with 82% adherence to the indicators. However, adherence was lower in the public hospital compared with the 5-city cohort in several indicators that could have a significant impact on patient outcomes in terms of recurrence and survival. For example, clear margins were achieved in 88% of patients who underwent BCS at the public hospital compared with 99% in the 5-city cohort, receipt of appropriate chemotherapy in

patients with stage II-III cancer was 83% versus 94%, and receipt of appropriate hormone therapy was 85% versus 91%. These results were presented to our multidisciplinary staff, and targeted approaches to improve care were subsequently implemented, specifically, receipt of hormone treatment, surveillance mammography, and better patient education. A patient registry for tracking receipt of care was also initiated.

This study had several limitations. First, unlike the 5-city ASCO study, there was no patient survey conducted for the public hospital cohort because of resource constraints. Therefore, we had to rely on information limited to the medical records. Specifically, for the 3 indicators assessing Respect for Patient Preferences, we measured whether a relevant discussion was documented in the medical record instead of asking patients whether they were informed of their possible treatment options,. This might have introduced measurement bias into these indicators and resulted in lower adherence rates. For indicators that assessed receipt of treatment, it is possible that patients received some aspects of their treatment at other facilities. This, too, might have introduced measurement bias and resulted in lower adherence rates. However, this is not likely to be a significant factor in our study cohort given their limited options for access to care.

There were additional differences between the public hospital and the 5-city cohort in terms of patient selection and timeframe, and variations in performance were more challenging to interpret. For example, temporal changes in care between 1998 and 2005 might have contributed to some of the measured differences in performance. Documentation within the medical record was often incomplete. Finally, this was a single-institution study and it may lack generalizability. Our study, thus, suggests that high-quality care can be provided to traditionally underserved patients at a public hospital but cannot prove that it is routinely provided at all municipal hospitals.

On the basis of the findings of this study, several interventions have been implemented to improve performance and quality of care in areas identified as deficient. For example, post-treatment surveillance will be automatically initiated through the radiology department, which already had a system in place to follow abnormal screening mammograms; that system will be extended to ensure that patients receive timely surveillance mammograms after curative treatment. Importantly, many cultural and language barriers in this vulnerable patient population were likely responsible for some of the lower rates of receipt of care. Recently, a patient navigator program (bilingual and bicultural) has addressed some of these barriers, but future assessments are warranted. Furthermore, a prospective patient registry was instituted to track all components of patient treatment to ensure receipt of appropriate care. Our findings show that not only can high-quality care be provided to an underserved population but also that evaluations of performance can identify additional areas that are ripe for quality improvement.

CONFLICT OF INTEREST DISCLOSURES

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REFERENCES

1. Landercasper J, Dietrich LL, Johnson JM. A breast center review of compliance with National Comprehensive Cancer Network Breast Cancer guidelines. *Am J Surg*. 2006;192: 525-527.
2. Sariego J. Patterns of breast cancer presentation in the United States: does geography matter? *Am Surg*. 2009;75:545-549; discussion 549-550.
3. Hiotis K, Ye W, Sposto R, Skinner KA. Predictors of breast conservation therapy: size is not all that matters. *Cancer*. 2005;103:892-899.
4. Malin JL, Schuster MA, Kahn KA, Brook RH. Quality of breast cancer care: what do we know? *J Clin Oncol*. 2002; 20:4381-4393.
5. Bickell NA, Shastri K, Fei K, et al. A tracking and feedback registry to reduce racial disparities in breast cancer care. *J Natl Cancer Inst*. 2008;100:1717-1723.
6. Harper S, Lynch J, Meersman SC, Breen N, Davis WW, Reichman MC. Trends in area-socioeconomic and race-ethnic disparities in breast cancer incidence, stage at diagnosis, screening, mortality, and survival among women ages 50 years and over (1987-2005). *Cancer Epidemiol Biomarkers Prev*. 2009;18:121-131.
7. Ward E, Halpern M, Schrag N, et al. Association of insurance with cancer care utilization and outcomes. *CA Cancer J Clin*. 2008;58:9-31.
8. Kim J, Jang SN. Socioeconomic disparities in breast cancer screening among US women: trends from 2000 to 2005. *J Prev Med Public Health*. 2008;41:186-194.
9. Wujcik D, Fair AM. Barriers to diagnostic resolution after abnormal mammography: a review of the literature. *Cancer Nurs*. 2008;31:E16-E30.
10. Naik AM, Joseph K, Harris M, Davis C, Shapiro R, Hiotis KL. Indigent breast cancer patients among all racial and ethnic groups present with more advanced disease compared with nationally reported data. *Am J Surg*. 2003;186:400-403.

11. Halpern MT, Bian J, Ward EM, Schrag NM, Chen AY. Insurance status and stage of cancer at diagnosis among women with breast cancer. *Cancer*. 2007;110:403-411.
12. Bickell NA, Wang JJ, Oluwole S, et al. Missed opportunities: racial disparities in adjuvant breast cancer treatment. *J Clin Oncol*. 2006;24:1357-1362.
13. Carcaise-Edinboro P, Bradley CJ, Dahman B. Surveillance mammography for Medicaid/Medicare breast cancer patients. *J Cancer Surviv*. 2010;4:59-66.
14. Sprague BL, Trentham-Dietz A, Burnside ES. Socioeconomic disparities in the decline in invasive breast cancer incidence. *Breast Cancer Res Treat*. 2010;122:873-878.
15. Wujcik D, Shyr Y, Li M, et al. Delay in diagnostic testing after abnormal mammography in low-income women. *Oncol Nurs Forum*. 2009;36:709-715.
16. Walter LC, Davidowitz NP, Heineken PA, Covinsky KE. Pitfalls of converting practice guidelines into quality measures: lessons learned from a VA performance measure. *JAMA*. 2004;291:2466-2470.
17. Schneider EC, Malin JL, Kahn KL, Emanuel EJ, Epstein AM. Developing a system to assess the quality of cancer care: ASCO's national initiative on cancer care quality. *J Clin Oncol*. 2004;22:2985-2991.
18. Malin JL, Schneider EC, Epstein AM, Adams J, Emanuel EJ, Kahn KL. Results of the National Initiative for Cancer Care Quality: how can we improve the quality of cancer care in the United States? *J Clin Oncol*. 2006;24:626-634.
19. Neuss MN, Desch CE, McNiff KK, et al. A process for measuring the quality of cancer care: the Quality Oncology Practice Initiative. *J Clin Oncol*. 2005;23:6233-6239.
20. Malin JL, Diamant AL, Leake B, et al. Quality of care for breast cancer for uninsured women in California under the breast and cervical cancer prevention treatment act. *J Clin Oncol*. 2010;28:3479-3484.