Patient Navigation to Increase Mammography Screening Among Inner City Women

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BACKGROUND: Lower mammography screening rates among minority and low income women contribute to increased morbidity and mortality from breast cancer.

OBJECTIVE: To evaluate the effect of a patient navigation intervention on adherence rates to biennial screening mammography among women engaged in primary care at an inner-city academic medical center.

DESIGN: Quality improvement intervention with a concurrent control group, conducted from February to November of 2008.

STUDY SUBJECTS: All women in a hospital-based primary care practice aged 51–70 years. Subjects were randomized at the level of their primary care provider, such that half of the patients in the practice received the intervention, while the other half received usual care.

INTERVENTIONS: Intervention subjects whose last mammogram was >18 months prior received a combination of telephone calls and reminder letters from patient navigators trained to identify barriers to care. Navigators were integrated into primary care teams and interacted directly with patients, providers, and radiology to coordinate care. Navigators utilized an electronic report to track subjects. Adherence rates to biennial mammography were assessed in intervention and control groups at baseline and post-intervention.

KEY RESULTS: A total of 3,895 women were randomized to intervention (n=1,817) and control (n=2,078) groups. Mean age was 60, 71% were racial/ethnic minorities, 23% were non-English speaking, and 63% had public or no health insurance. At baseline, there was no difference in mammography adherence between the control and intervention groups (78%, respectively, $p=0.55$). After the 9-month intervention, mammogram adherence was higher in the intervention group compared with the control group (87% vs. 76%, respectively, $p<0.001$). Except among Hispanic women who demonstrated high rates

in both the intervention and control groups (85% and 83%, respectively), all racial/ethnic and insurance groups demonstrated higher adherence in the intervention group.

CONCLUSIONS: Patient navigation improves biennial mammography rates for inner city, low income, minority populations.

KEY WORDS: mammography screening; patient navigation; quality improvement; disparities; women's health.

J Gen Intern Med 26(2):123–9

DOI: 10.1007/s11606-010-1527-2

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INTRODUCTION

Breast cancer remains the second leading cause of cancer-related death in women; in 2009, breast cancer was responsible for an estimated 40,170 deaths in the United States¹. While advances in early diagnosis and treatment contribute to the overall decline in breast cancer mortality, certain vulnerable populations, including racial/ethnic minorities and the poor or uninsured, are burdened with a disproportionate share of this mortality². The etiology of these disparate outcomes is complex, yet delays in diagnosis and treatment have been demonstrated to play a role^{3–6}. Breast cancer screening rates among medically underserved populations, including the uninsured⁷ and non-Whites³, remain substantially lower than among insured white populations.

In an effort to reduce these cancer disparities, interventions to improve mammography utilization have been tested in diverse settings, with varying success. The most effective programs have incorporated multiple strategies that target individual and system barriers⁸. Patient navigation is emerging nationally as a culturally tailored, system-based intervention that targets individual barriers in an effort to reduce cancer health disparities⁹. A growing body of literature has documented the success of navigation after an abnormal screening test is identified^{10–14}, but the evidence for improving mammography utilization is limited to non-generalizable target populations^{15,16} or lack of rigorous control groups¹⁷. The purpose of this study was to examine whether a quality improvement patient navigation program could improve adherence to biennial mammography screening in a safety-net practice that

Electronic supplementary material The online version of this article (doi:10.1007/s11606-010-1527-2) contains supplementary material, which is available to authorized users.

Received April 28, 2010

Revised August 22, 2010

Accepted September 1, 2010

Published online October 8, 2010

serves a largely minority, inner-city, and underinsured patient population.

METHODS

We implemented a quality improvement patient navigation intervention in 2008 to improve mammography utilization as defined by HEDIS (Healthcare Effectiveness and Data Information Set) criteria¹⁸ among patients served in the three internal medicine practices of an academic safety-net hospital in Boston. Due to limited resources of navigators' time and the need to address a large population, navigation could not be offered to all eligible patients at the time of program implementation. In order to equitably provide services and provide an equivalent comparison group for our evaluation, we randomized at the level of the provider to initially target half the population, since randomization at the practice level may be imbalanced because of system and provider characteristics. At the end of 9 months, the concurrent control group also received the navigation services. We report here findings from the initial 9-month intervention (February–November 2008) period. The Boston Medical Center Institutional Review Board approved this study.

Study Population

Eligibility was based on HEDIS criteria and included women aged 51 to 70 who were assigned a primary care provider and had a documented visit with that provider in the previous 2 years. Women were excluded if they had documentation of bilateral mastectomy. Prior to randomization, providers were stratified into high ($\geq 50\%$) versus low ($< 50\%$) HEDIS scores to balance the intervention and control groups. At baseline, provider HEDIS scores had a median value of 76% (interquartile range of 68%–82%). Half of each group of practicing providers was then randomly selected to have their eligible patients enrolled into navigation. Patients of four providers were excluded because they had five or fewer eligible patients indicating that they were not actively practicing primary care at the initiation of the study.

Patient Navigation Intervention

Navigation services targeted only women in the intervention group whose last documented mammogram was more than 18 months prior at any point during the intervention period. Three patient navigators were hired based on experience providing navigation services¹⁰ for diverse, inner-city patients and knowledge of existing local health systems. Each completed national¹⁹ and local navigation training programs²⁰ that emphasize barriers-focused culturally tailored services based upon the care management model²¹. Two were bilingual such that one spoke fluent Spanish and another fluent Portuguese and Cape Verdean Creole in addition to English.

The navigation protocol²¹ included four main activities: (1) use of an electronic medical record (EMR)-based tracking system to identify eligible women, (2) identifying and (3) helping overcome individual barriers to care, and (4) tracking

women through completion of mammograms. Navigators were incorporated into the primary care team in that they had regular contact and interaction with the provider about specific patient care issues. Prior to initiating navigation services, the navigator reviewed eligible patients with each provider to identify known barriers to care or recommendations from providers to not initiate navigation due to comorbidities that made screening undesirable (e.g., terminal illness from another condition). Navigators completed a series of at least three outreach telephone call attempts over a 2-week period (during daytime and early evening), followed by two letters if no contact was made, the last registered, to inform women of their need for a mammogram and the availability of the navigator to support them (see Appendix online for a detailed navigation protocol flow sheet). Upon contact, navigators inquired about individual barriers to accessing care—including but not limited to transportation issues, work scheduling conflicts, and fear—and then utilized available resources to address those barriers. The language line was available for interpreter support for non-English-speaking women if the navigator did not speak their native language. Navigators were granted scheduling access to radiology to schedule a mammogram directly.

An electronic system was developed for navigators to track patients over time. The tracking system organized women by time since the last mammogram, easily demonstrated how many telephone calls or letters had been completed as part of the protocol, and highlighted the next step needed for the protocol. When the navigator completed the entire protocol, the reason for non-adherence was documented, the provider was notified, and that subject was removed from the tracking list. Once a subject completed the mammogram, results were documented, and navigation was ended if the results were normal. Tracking of abnormal results was continued until a diagnosis was reached and the provider was aware of the results.

Data Collection

Socio-demographic data were collected directly from the electronic administrative database SDK® (Software Development Kit) and included age, race/ethnicity, health insurance coverage, primary language, marital status, and education level. Race/ethnicity was collected using a single question asked by registration clerks and has previously been shown to correlate with patient self-report in a similar population²². The database collapsed Portuguese Creole and Cape Verdean Creole into one category, and we report these two languages together with Portuguese in order to account for language concordance between the navigator and the patients. All commercial and employer-based insurance plans were coded as private insurance. Public insurance consisted of Medicaid, Medicare, or Commonwealth Care, the Massachusetts subsidized health insurance plan which began in November 2006²³. Uninsured patients were covered primarily through the Massachusetts uncompensated care pool or the Centers for Disease Control breast cancer screening program²⁴. We collapsed public insurance and uninsured into one category because both groups received coverage for screening mammography.

Clinical data were obtained electronically from the medical records in the Centricity® EMR. Using ICD-9 billing codes in the past 24 months, we calculated the Charlson comorbidity score²⁵ using the Deyo method²⁶. Completion of screening mammography was determined by electronic query of the EMRs that search patient charts for evidence of an internal radiology report or outside films received. The HEDIS criterion¹⁸ for mammography adherence was defined as completion of a bilateral screening mammogram in the past 24 months.

Navigators documented all activities in an electronic template within the EMR. These logs included the number of encounters and type of patient contacts and reason for non-adherence for those with outstanding mammograms (i.e., unable to contact, moved or transferred care, declined services, comorbidities that made screening undesirable, insurance issues, and did not keep appointment on two or more occasions).

Data Analysis

Descriptive statistics on patient socio-demographics were performed for all eligible subjects in the intervention and control arm. Statistical differences were identified using the chi-square test or t-test.

Unadjusted rates of adherence to biennial screening mammography were compared for the intervention and control groups at baseline and post intervention time periods. Unadjusted logistic regressions were performed for each demographic subgroup for the post intervention groups, while adjusted logistic regressions were performed for both time period groups. Regressions modeled adherence to biennial screening mammography (bivariate), and to control for the influence (clustering effect) of each provider on the association between the outcome and intervention group, models were performed using GEE (generalized estimation equation) logistic regression controlling for clustering on the provider level. Adjusted models controlled for all socio-demographic variables.

Adherence rates for intervention and control groups by the interval from their last mammogram at study initiation were computed along with adjusted models for each interval and group, also controlling for clustering on the provider level.

All tests were two-tailed, with a statistical significance level set at $p=0.05$. Individual regressions were performed for each socio-demographic variable in order to assess the benefit of the intervention for specific subgroups of the sample. All data were analyzed using Statistical Analysis System version 9.1 (SAS Institute, Cary, NC).

RESULTS

A total of 3,895 women were included in the study (1,817 intervention, 2,078 control). Table 1 shows baseline characteristics by control and intervention groups. The average age in the total population was 60 years (SD 5 years). Most women were from racial/ethnic minority groups (47% African American, 11% Hispanic). Primary language was English for most

(77%), while 9% spoke a non-English language also spoken by the navigator (Spanish, Portuguese, and Cape Verdean Creole) and 14% required a interpreter services support. The majority had a public form of insurance and low educational attainment, with 7% never attending school and 34% not completing high school. Most (64%) were not married, and 34% had a Charlson comorbidity score²⁵ of one or greater. There was a greater percentage of Hispanic and Spanish-speaking women in the control group compared with the intervention group, reflecting that Hispanics are clustered with specific provider panels and not randomly distributed in the practice. There were two Spanish-speaking providers, one randomized to the intervention and the one to the control group.

Table 2 shows the unadjusted adherence rates and the adjusted odds ratios for mammography adherence between intervention and control patients at baseline and post intervention. At baseline, adherence rates were the same for the intervention and control groups, 78% respectively. By the end of the 9-month intervention, 87% of patients in the intervention group demonstrated biennial mammography adherence compared to 76% in the control group. After adjusting for all socio-demographic variables and using cluster analysis to adjust for provider, the odds of adherence in the intervention group was 2.5 (95% CI, 1.9–3.2) compared with the control group. Table 3 shows the odds ratios, across each demographic subgroup, for mammography adherence between intervention and control patients while clustering on the provider level, demonstrating that the intervention had a positive impact in all subgroups categorized by age, education level, marital status, insurance type, and level of comorbidity. The same was true for each racial/ethnic and language group with the exception of Hispanic women who demonstrated high baseline adherence rates in the intervention and control groups (85% and 83%, respectively).

By design, only women whose last mammogram had occurred more than 18 months ago received navigation services. Table 4 describes adherence rates for intervention and control patients by the interval from their last mammogram at study initiation in an effort to demonstrate the effect of navigation on the targeted population. This breakdown shows that the greatest improvement occurred in the two groups (18–24 months; >24 months) with the longest gaps since their previous mammography. Of those with mammograms more than 24 months before the start of the intervention, navigation adherence was 50% compared with only 17% in the control group. Navigated patients whose last mammogram had been performed more than 18 months but less than 24 months prior to the beginning of the intervention had an adherence rate of 74% compared with 37% of those in the control group. Women in the 12 to 18 month group are included here because a subset of them became eligible for navigation at some point during the study period, and indeed the intervention group showed a greater rate of adherence (97%) compared with the control group (93%).

Of the 1,817 women in the intervention group, 661 received navigation services with a mean of two telephone calls and one letter per subject. This resulted in 271 scheduled and 251 completed mammograms. Of these mammograms, 6% were abnormal [Breast Imaging Reporting and Data System (BIR-ADS) 0, 3, 4, or 5]. No cancers were identified during the 9-month study period. Of the patients randomized to the navigation group who remained non-adherent at the conclu-

Table 1. Baseline Characteristics of Patient Navigation Control and Intervention Subjects

Characteristic		Total (N=3,895)	Control (N=2,078)	Intervention (N=1,817)	P-value*
Age, mean (SD) [†] , years		60 (5)	60 (5)	60 (5)	0.05
Race	White	1,123 (29)	618 (30)	505 (28)	<0.001
	African-American	1,848 (47)	926 (45)	922 (51)	
	Hispanic	430 (11)	295 (14)	135 (7)	
	Other	494 (13)	239 (12)	255 (14)	
Insurance	Private insurance	1,432 (37)	758 (36)	674 (37)	0.69
	Public insurance	2,463 (63)	1,320 (64)	1,143 (63)	
Language	English	3,005 (77)	1,546 (74)	1,459 (80)	<0.001
	Spanish	281 (7)	204 (10)	77 (4)	
	Portuguese/Cape Verdean Creole	60 (2)	29 (1)	31 (2)	
	Other	549 (14)	299 (14)	250 (14)	
Education level	Did not attend school	286 (7)	160 (8)	126 (7)	0.003
	Did not graduate high school	1,340 (34)	688 (33)	652 (36)	
	Graduated high school or GED [‡]	840 (22)	469 (23)	371 (20)	
	Some college/voc/tech program	684 (18)	396 (19)	288 (16)	
	Graduated college/post grad	580 (15)	282 (14)	298 (16)	
Marital status	Married	1,409 (36)	738 (36)	671 (37)	0.31
Level of comorbidities [§]	Score 0	2,569 (66)	1,395 (67)	1,174 (65)	0.18
	Score 1	997 (26)	517 (25)	480 (26)	
	Score 2+	317 (8)	162 (8)	155 (9)	

*P-value is based on chi-square test, with a statistical significance level set at $p=0.05$

[†]SD denotes standard deviation

[‡]GED denotes General Education Diploma

[§]Comorbidity assessed using the Charlson Index²⁵, using the Deyo methodology

sion of the study, 61% could not be contacted despite multiple telephone calls and letters, 14% moved or transferred care to another facility, and 14% declined mammography.

DISCUSSION

Using a comparable continuous control group, our study demonstrates the impact of a patient navigation program in primary care at achieving expected mammography screening rates in a diverse inner-city underserved population. With the exception of Spanish speakers and the Hispanic population, who at baseline had high rates, the navigation intervention increased adherence across all ages, insurance groups, education levels and all other languages and races. Our study design, evaluating a quality improvement navigation program

in an entire practice of vulnerable patients, demonstrates the feasibility of adopting this method of care to a clinical setting that mirrors urban safety net settings throughout the country.

Our findings of improved mammogram utilization with a patient navigation intervention are consistent with existing literature^{15–17}. Dignan and colleagues¹⁵ showed improved adherence to mammogram screening over an 18-month period in a randomized controlled trial (RCT) of 157 Native American women utilizing direct patient contact or telephone calls versus a control group. Paskett and colleagues' RCT¹⁶ of 851 subjects also showed improved adherence of mammogram screening in a rural, low income population of white, African American and Native American subjects. Han and colleagues' study¹⁷ utilized patient navigation to improve mammogram adherence of 102 Korean American women after 6 months, but lacked a control group for comparison. Our study findings, designed as a practice improvement within an urban safety-net setting, included a more diverse, yet vulnerable population and thus provide further evidence for the generalizability of navigation as a means to reduce cancer health disparities.

At baseline, more Hispanic and Spanish-speaking women were present in the group allocated to the control group, reflecting that patients are not randomly distributed throughout the practice, but rather are more likely to be seen by Spanish-speaking providers. Prior research has shown both lower^{27,28} and higher^{29,30} mammography screening rates among Hispanic as compared with white women and may reflect a variety of local factors, including the community's overall acculturation and education levels, as well as access to insurance and to bilingual health care providers.

Our study was developed to improve HEDIS rates as a quality improvement project within primary care and thus

Table 2. Adjusted Patient Navigation Intervention Effects on Mammography Adherence Controlling for Baseline Characteristics

	Control (N=2,078)	Intervention (N=1,817)	Adjusted OR (95% CI) [†]
Adherent (n%) [*]			
Baseline	1,631 (78)	1,412 (78)	1.1 (0.8–1.4)
Post Intervention	1,589 (76)	1,575 (87)	2.5 (1.9–3.2)

*Unadjusted mammography adherence frequencies

[†]Odds ratios from a logistic regression analysis, adjusted for baseline characteristics variables and clustering on the provider level

Table 3. Unadjusted Patient Navigation Intervention Affects on Mammography Adherence Stratified by Baseline Characteristics

		Control (N=2,078)	Intervention (N=1,817)	
		Adherent (n%) [*]		Stratified OR (95% CI) [†]
Post intervention by characteristic				
Age	50–59 years	743 (74)	835 (86)	2.2 (1.6–2.9)
	60–70 years	846 (79)	740 (87)	1.9 (1.3–2.6)
Race	White	433 (70)	429 (85)	2.4 (1.5–4.0)
	African American	724 (78)	806 (87)	1.9 (1.4–2.6)
	Hispanic	245 (83)	115 (85)	1.2 (0.8–1.8)
	Other	187 (78)	225 (88)	2.1 (1.3–3.3)
Insurance	Public	1,002 (76)	986 (86)	2.0 (1.6–2.6)
	Private	587 (77)	589 (87)	2.0 (1.3–3.2)
Language	English	1,172 (76)	1,285 (88)	2.4 (1.7–3.3)
	Spanish	167 (82)	64 (83)	1.1 (0.6–1.9)
	Portuguese/Cape Verdean Creole	21 (72)	28 (90)	3.6 (1.2–10.3)
	Other	229 (77)	198 (79)	1.2 (0.8–1.7)
Education level	Did not attend school	115 (72)	113 (90)	3.4 (1.7–6.8)
	Did not graduate high school	536 (78)	568 (87)	1.9 (1.3–2.8)
	Graduated high school or GED	401 (86)	344 (93)	2.2 (1.3–3.7)
	Some college/voc/tech program	299 (76)	258 (90)	2.8 (1.9–4.1)
	Graduated college/post grad	183 (65)	226 (76)	1.7 (1.1–2.5)
Marital status	Married	570 (77)	596 (89)	2.1 (1.6–2.9)
	Not married	1,019 (76)	979 (87)	2.3 (1.5–3.6)
Level of comorbidities	Score 0	1,052 (75)	1,019 (87)	2.1 (1.5–3.0)
	Score 1	408 (79)	417 (87)	1.8 (1.3–2.4)
	Score 2+	125 (77)	132 (85)	1.9 (1.1–3.3)

^{*}Unadjusted mammography adherence frequencies

[†]Unadjusted odds ratios from a logistic regression analysis clustering on the provider level

performed as a population-level analysis. The study design responded to a growing emphasis on HEDIS rates as a quality performance measure of individual providers. Interventions like this patient navigation program are becoming increasingly important in order to ensure that practices serving populations with historically lower screening rates achieve benchmarks, both for patient care and for practice reimbursement under pay-for-performance plans. One strength of our study is that it was integrated into the practice with provider “buy-in,” and was designed to evaluate the benefit and effectiveness of integration of this type of program into a busy primary care practice. As such, this model of care fits the Medical Home Model, which is increasingly recognized as a standard way to transform care delivery in primary care settings^{31–34}.

We designed our intervention to improve our practice HEDIS measures of biennial screening for all women 51–70 years of age, at a time when the providers were recommending annual screening. Best practice guidelines for

patient navigation and timing of the intervention have yet to be defined as reflected by the different intervention protocols implemented in prior studies. Paskett and colleagues¹⁶ navigated those ≥ 12 months overdue for a mammogram and followed them for an additional 12–14 months, while Han and colleagues¹⁷ navigated women 2 years overdue and followed up at 6 months. Dignan and colleagues¹⁵ navigated for patients 18 months overdue. We chose to initiate navigation after an 18-month screening interval and found this to be an effective strategy in the rational use of the navigator resources, as evidenced by the fact that our greatest effect of the intervention was seen among the groups with the longest time interval since their last mammogram. Even with changes in recent guidelines, our protocol is consistent with recommended mammography frequency in this age group^{27,35–37}. There is still a subset of women who remain non-adherent to mammography screening using this protocol; the majority of these women were not reachable by phone or mail based on available contact information. This reflects

Table 4. Mammography Adherence by Time Since Last Mammogram for Control and Intervention Subjects with Adjusted Patient Navigation Intervention Odds Ratios

Time since last mammogram at baseline	Control		Intervention		Adjusted OR (95% CI) [*]
	N	Subjects adherent post intervention	N	Subjects adherent post intervention	
>24	447	78 (17)	405	202 (50)	5.6(3.9–8.2)
18–24	126	47 (37)	89	66 (74)	6.0(2.8–12.7)
12–18	626	585 (93)	547	531 (97)	3.5 (1.8–6.5)

^{*}Odds ratios from a logistic regression analysis, adjusted for baseline characteristics variables, and clustering on the provider level

communication challenges in caring for an inner city, at-risk population and suggests a different approach is necessary for this group.

Our study is somewhat limited in its generalizability because it was conducted in only three practices at a single academic safety net institution and required the use of an EMR and information technology support. However, our system reflects standard EMR support and practice systems that have become federal mandates^{38,39}. Due to limited resources, we were unable to assess costs of the program or patient or provider satisfaction, all of which are crucial to sustainability of such programs.

Our findings support the benefit of patient navigation programs in the primary care setting as one approach to reduce cancer health disparities. While financial support is necessary for primary care providers to develop and maintain such programs, the Medical Home Model³¹⁻³⁴ could be one venue to provide the infrastructure and personnel necessary for sustainable navigation implementation. Health care policy-makers should continue to explore advocacy efforts in order to determine how to sustain these programs.

Acknowledgements: Funded by the Avon Foundation Safety Net Grant. The study would like to acknowledge the contributions of Faber Alvis, Mariuca Tuxbury, and Arlene Ash, PhD. This study was presented as an oral presentation at the 32nd annual meeting of the Society of General Internal Medicine conference in Miami in May 2009.

Conflicts of Interest: None disclosed.

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