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Barriers reported among patients with breast and cervical abnormalities in the patient navigation research program: impact on timely care

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Abstract

Background—Patient navigation (PN) is a system-level strategy to decrease cancer mortality rates by reducing barriers to cancer care. Barriers to resolution among participants in the PN intervention arm with a breast or cervical abnormality in the Patient Navigation Research Program (PNRP) and navigators' actions to address those barriers were examined.

Methods—Data were from seven institutions (2005 to 2010) included 1,995 breast and 1,194 cervical patients. A stratified Cox proportional hazards regression model was used to examine the effects of barriers on time to resolution of an abnormal screening test or clinical finding.

Findings—The range of unique barriers was 0 to 12 and 0 to 7 among participants with breast and cervical abnormalities, respectively. About two-thirds of breast and half of cervical participants had at least one barrier resulting in longer time to diagnostic resolution among breast (adjusted HR=0.744; p<0.001) and cervical (adjusted HR=0.792; p<0.001) participants. Patient-level and system-level barriers were most common. Frequent navigator actions were: making arrangements, scheduling appointments, referrals, and education.

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Dr. Katz has had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
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Conclusions—Having a barrier resulted in a delay in diagnostic resolution of an abnormal screening test or clinical finding. Health care systems can use these findings to improve existing PN programs or when developing new programs.

Keywords

patient navigation; patient navigators; patient-centered care; cancer

Introduction

Patient navigation (PN) was introduced by Dr. Harold Freeman in 1990 as a way to reduce cancer disparities by assisting patients from minority and low-income populations to improve access to cancer care (Freeman, Muth, & Kerner, 1995). PN is patient-centered with a goal of reducing barriers and coordinating timely care across various components of the health care system to improve patient outcomes.

A PN program may improve cancer screening rates, assist in the timely resolution of an abnormal screening test or clinical finding, reduce delays in initiation of treatment after a cancer diagnosis, improve treatment adherence, assist with survivorship issues, and provide support during end-of-life care (Carrillo et al., 2011; Dohan & Schrag, 2005; Freeman & Rodriguez, 2011; Paskett, Harrop, & Wells, 2011). PN programs achieve the goal of improved patient outcomes by addressing factors included in the Chronic Care Model such as providing information to patients in an understandable format so they have productive interactions with providers (reference chronic care model). In addition, patient navigators may arrange transportation services, connect patients with community resources to address their specific needs (e.g. child care), address a communication barrier by providing translation services, or provide emotional support by expressions of empathy and caring (Heaney C.A., 2008; Jean-Pierre et al., 2011).

To evaluate whether PN was an effective strategy to improve cancer care, the Patient Navigation Research Program (PNRP) was funded by the National Cancer Institute and the American Cancer Society. This cooperative effort funded nine grants to complete PN studies by 10 health care institutions in the United States (U.S.). Findings from most of the PNRP studies indicated that PN can reduce the time from receipt of abnormal findings to diagnostic resolution among patients with breast, cervical, colorectal, and prostate abnormalities (Battaglia et al., 2012; Dudley et al., 2012; Hoffman et al., 2012; Markossian, Darnell, & Calhoun, 2012; Paskett et al., 2012; Raich, Whitley, Thorland, Valverde, & Fairclough, 2012). Although PN programs have increased in popularity and are being widely adopted in the U.S., there is a lack of definitions of patient barriers, the prevalence of different barriers is not known, and there is limited information about the actions taken by patient navigators to address patient barriers.

The purpose of this report is to describe the barriers to care reported by women with breast and cervical abnormalities and to determine the effect of barriers on resolution of the abnormalities. This information is important to improving current PN programs and for developing effective PN programs in the future given that women were recruited into the PNRP at greater numbers than men and also due to the long-standing recognition that women utilize the health care system more frequently than men (Hibbard & Pope, 1986; Verbrugge, 1982).

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Methods

Patient Navigation Research Program Sites

The PNRP research sites each used a different research design, however, the PN intervention across all sites was guided by the care management model (Longest, 2000), the Chronic Care Model (Wagner et al., 2005), and social support theory (Heaney C.A., 2008). The PNRP was conducted from 2005 to 2010, and seven of the ten PNRP sites focused on women with a breast and/or cervical abnormality from the time of an abnormal screening test or clinical finding to diagnostic resolution. Each site obtained Institutional Review Board approval prior to the initiation of the study, and a brief description of each site follows.

Boston—The Boston PNRP used a non-randomized controlled design in six community health centers among women with breast or cervical abnormalities (Battaglia et al., 2012). Each health center was assigned PN for either breast or cervical patients and served as a control for the other condition. A total of 23 female navigators were used during the study period. The patient navigators had a high school education, were integrated into the health center team, and used telephone, mail, and in-person navigation.

Chicago—The Chicago PNRP used a non-randomized controlled design among minority women with a breast or cervical abnormality using a system of 20 primary care clinics that included 19 federally qualified health centers and one hospital-based ambulatory care center (Markossian et al., 2012). During the study period, the navigation team consisted of two master's-level licensed clinical social workers and two lay high school educated navigators. Patient navigation was conducted by telephone and in-person.

Denver—The Denver PNRP used a randomized controlled trial design. Individual patients diagnosed with a breast, colorectal, or prostate abnormality were randomized to PN or usual care and followed over time to assess the effect of PN on time to diagnostic resolution (Raich et al., 2012). Three patient navigators were used during the study period. Depending on patients' needs navigators used phone contact, in-person navigation, or communicated by email. Only patients with breast and cervical abnormalities are included in this analysis.

Ohio—The Ohio PNRP used a group-randomized trial design (Paskett et al., 2012). Medical clinics were randomized to PN or comparison, and patients with breast, cervical, or colorectal abnormalities were followed over time to assess the effect of PN on time to diagnostic resolution. During the study, three lay college-educated female patient navigators conducted navigation mainly by telephone from a central location. Only patients with breast and cervical abnormalities are included in this analysis.

San Antonio—The San Antonio PNRP used a quasi-experimental design comparing unmatched control and intervention participants (Dudley et al., 2012). Patients with breast and cervical abnormalities were followed over time to assess the effect of PN on time to diagnostic resolution. A two-member team approach (patient navigator and a promotora) was used for each patient. Four college-educated patient navigators used mainly in-person navigation during the study.

Tampa—The Tampa PNRP used a group randomized design where 12 primary care clinics were randomized to PN or usual care, and patients with breast or colorectal abnormalities were followed over time to assess the effect of PN on time to diagnostic resolution (Wells et al., 2012). Five lay patient navigators used telephone and in-person navigation. Only patients with breast abnormalities are included in this analysis.

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Washington, D.C.—The DC PNRP investigated the effect of PN by comparing the delay between initial identification of a patient (breast) and diagnostic resolution with proportionally matched (age, race, and ethnicity) records-based non-navigated patients who did not have access to PN (Hoffman et al., 2012). During the study, 26 female patient navigators were used to conduct in-person navigation at nine clinics/hospitals.

Patient Navigators

Patient navigators from all sites were paid employees and received initial training and continuing education at the national and local level during the PNRP study period. Nationally, continuing education was conducted in-person or by webinars to provide and standardize training across sites by the PNRP training committee. The initial PN training was a two-day session conducted by the PNRP training committee in collaboration with the American Cancer Society (Calhoun et al., 2010). National training focused on: cancer and cancer disparities; navigator roles and responsibilities (boundaries and self-disclosure); types of PN programs; sensitivity to culture and diversity; common patient barriers; cancer diagnostic and treatment experiences; communication issues with health care providers and patients including attention to limited literacy and translation services; medical terminology; financial issues and paperwork; hospice services; introduction to clinical research; and community asset mapping.

PN training at the local-level focused on study specific issues and local community and health care resources. Patient navigators obtained vital information by visiting local cancer-related organizations and by networking with staff from the different organizations. In addition, patient navigators visited local health care systems to become familiar with the referral clinics, diagnostic testing and treatment sites, and to develop relationships with local health care providers. The navigators focused on assisting patients by coordinating care among the patients and their families, providers, and community resources. Navigators were supervised locally and met on a regular basis to discuss cases, share information, and address any issue associated with the local PNRP.

Patient Barriers and Navigator Actions

A standard PN tracking form was developed and used by navigators from all sites. During each patient-navigator encounter, the patient navigator documented: (a) the date; (b) length of the encounter (time in direct contact with the patient); (c) type of encounter (in person visit, telephone call with patient, written message to patient by email or mail); (d) barrier(s) to health care from a defined list of barriers; and (e) action(s) taken by the navigator. Response values for the encounter times with patients were classified as: <15 minutes, 15 to <30 minutes, 30 to <45 minutes, 45 to <60 minutes, 60 to <90 minutes, and ≥ 90 minutes. The number of encounters for each participant varied depending on the individual, the barriers, and the type and timing of the follow-up care that was needed by the participant. Encounters the navigators had with individuals other than the participants (e.g. family member, medical or non-medical staff) were excluded since these encounters were not frequent and identification of additional unique barriers during these additional encounters would be minimal.

Definitions of types of patient barriers were agreed upon by the investigators at the different sites after much discussion and were included in the PNRP (Table 1) (Freund et al., 2008). To better understand how the different types of barriers may affect cancer care, identified barriers were grouped into three main categories: (a) patient-focused (e.g. financial problems, co-morbidities, beliefs and attitudes); (b) other-focused (e.g. transportation, demands from others); and (c) system-level barriers (e.g. logistical issues with the health care system, communication issues).

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We examined several barrier variables, including: 1) any barrier (yes or no); 2) barrier categories (yes or no for each barrier category); and 3) individual barriers (yes or no for each individual barrier). A patient was considered to have “any barrier” if at least one barrier was identified. A barrier was considered a “unique” barrier the first time it was associated with a patient. Thus, if a patient had transportation as a barrier during several encounters with a patient navigator, transportation in this analysis was considered a unique barrier only once for that patient. If a patient reported two barriers from different barrier categories, they would be classified as having a barrier in each category. For example, if insurance and communicating with a provider were barriers, that patient would be categorized as having one patient-focused barrier and one system-level barrier, respectively. In addition, if a patient had two different barriers from the same category then it would be counted as two barriers. For instance, if the lack of health insurance and fear were barriers for a patient, the patient would be categorized as having two patient-focused barriers. Patients could have no barriers, a single or multiple barriers identified during one encounter, and the patient navigator may have taken no action, a single or multiple actions to address the barrier(s) during one encounter.

Barriers coded as “other” were reclassified into one of the defined categories when possible. All system proactive navigation barriers (system issues that are barriers for many patients and not specific to one patient), participants (n=731; 630 breast and 101 cervical) who never had an encounter with a navigator, participants (n=423; 290 breast and 133 cervical) who did not have an encounter with a patient navigator prior to diagnostic resolution, and patients (n=181; 150 breast and 26 cervical) who were missing one of the demographic variables evaluated in this study were also eliminated from the analysis.

Actions taken by navigators to address patient barriers were also standardized in the PNRP (Freund et al., 2008). The following are the types of actions taken by the navigators in the PNRP: accompaniment (going with patients to appointments if needed); arrangements (e.g. arranging transportation, interpretation services, etc.); directly contacting the family; education (providing information in an understandable format); record keeping; referrals; scheduling appointments; and support.

Demographic Characteristics of the Participants

Demographic characteristics of the participants were obtained from surveys and medical records at the different sites including: age, race and ethnicity (Black, White, Asian, Hispanic), marital status (single, never married, married, separated, divorced, widow), household income (<$10,000, $10,000–$29,999, $30,000–$49,999, $50,000+), primary language spoken (English, Spanish, Other), and type of health insurance (none, public, private). Income was not collected by all sites, and thus was not included in the statistical modeling.

Diagnostic Resolution

In the PNRP study, diagnostic resolution was considered when a participant’s clinical abnormality or abnormal screening test was determined to be a benign condition or a cancer diagnosis. Follow-up time was truncated at 365 days. Participants who resolved or were censored after that time were considered censored at 365 days.

Statistical Analysis

Comparisons in the demographic characteristics between participants with and without barriers were conducted using chi-square tests of association. A stratified Cox proportional hazards regression model was used to model the time to resolution of the abnormal screening test or clinical finding with study site as the stratification factor. Separate models

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were fit for participants with breast and cervical abnormalities. The proportional hazards assumption in the baseline covariates was verified by examining the scaled Schoenfeld residuals (Grambsch, 1994; Schoenfeld, 1982) and diagnostic plots (negative log of the negative log of the survival probability). Violations were remedied by dividing the risk set as indicated by the diagnostics. The impact of each barrier or barrier group on time to resolution was estimated by adding an indicator variable for the barrier (present or absent) to the Cox regression model including the baseline covariates.

Results

A total of 2,004 participants with breast abnormalities and 1,209 participants with cervical abnormalities who had an encounter with a patient navigator prior to diagnostic resolution were entered into the study. Nine participants with breast abnormalities and 15 participants with cervical abnormalities, categorized as “other” race, were eliminated from the analysis resulting in 1,995 participants with breast and 1,194 participants with cervical abnormalities for this analysis. Demographic characteristics for participants with breast and cervical abnormalities are provided in Table 2.

Any Barrier(s)

Participants with breast abnormalities had from 0 to 12 unique barriers and participants with cervical abnormalities had from 0 to 7 unique barriers. About two-thirds (n=1,270; 63.7%) of participants with breast abnormalities and about half (n=556; 46.6%) of participants with cervical abnormalities had at least one barrier to care. Among participants with breast abnormalities, those with barriers compared to participants without barriers, were more likely to be Hispanic, Spanish speaking, married, less than 40 years old, and uninsured (all p-values <0.01). Among participants with cervical abnormalities, those with barriers compared to participants without barriers were more likely to be Hispanic, Spanish speaking, married or previously married, and uninsured (all p-values <0.01).

Barrier Categories

In total, participants with breast abnormalities had 3,717 unique barriers and participants with cervical abnormalities had 936 unique barriers. The most common barriers were categorized as patient-focused barriers (n=1,443; n=467), system-level barriers (n=1,254; n=287), and other-focused barriers (n=1,020; n=182) for patients with breast and cervical abnormalities, respectively. Among participants with breast abnormalities, almost half of those had 1 to 3 barriers (n=913; 45.8%) and fewer than one-fifth had 4 to 12 barriers (n=357; 17.9%). Similarly among participants with cervical cancer abnormalities, almost half of those had 1 to 3 barriers (n=504; 42.2%) and few had 4 to 7 barriers (n=52; 4.4%).

Barriers and Time to Diagnostic Resolution

Having at least one barrier significantly ($p<0.01$) impacted time to resolution (Table 3) for both participants with breast abnormalities (adjusted hazard ratio (aHR) = 0.74, 95% CI: 0.67–0.83) and participants with cervical abnormalities (aHR = 0.79, 95% CI: 0.70–0.90). Having either a patient-focused (aHR = 0.81, 95% CI:0.72–0.91) or a system-level barrier (aHR = 0.78, 95% CI: 0.70–0.87) significantly ($p<0.01$) impacted time to resolution for participants with breast abnormalities. Having any category (patient-focused, other-focused, or system-level) of barrier significantly (aHRs range: 0.78 to 0.82; p values ≤ 0.01) impacted time to resolution for participants with cervical abnormalities.

The impact of individual barriers on time to resolution is listed in Table 4. Significant barriers ($p<0.05$) on time to resolution for participants with breast abnormalities were having a co-morbidity (aHR = 0.69, 95% CI: 0.55–0.86); health insurance (aHR = 0.85, 95% CI:

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0.74–0.97); other financial problems (aHR = 0.83, 95% CI: 0.70–0.98); housing issues (aHR = 0.59, 95% CI:0.36–0.98); being out of town (aHR = 0.60, 95% CI: 0.43–0.84); dealing with adult care (aHR = 0.67, 95% CI: 0.46–0.96); or having a system problem (aHR = 0.80, 95% CI: 0.71–0.91). Significant barriers ($p<0.05$) on time to resolution for participants with cervical abnormalities were: having a co-morbidity (aHR = 0.50, 95% CI: 0.33–0.75); health insurance issues (aHR = 0.68, 95% CI: 0.55–0.83); not being a priority (aHR = 0.38, 95% CI: 0.17–0.86); being out of town (aHR = 0.42, 95% CI: 0.24–0.75); employment demands (aHR = 0.68, 95% CI: 0.49–0.94); or having system problems (aHR = 0.57, 95% CI: 0.46–0.72).

Navigator Actions

The most frequent patient navigator actions taken to address the barriers of participants with breast and cervical abnormalities are listed in Table 5. The three most frequent actions taken by patient navigators for participants with breast abnormalities were making arrangements, scheduling appointments, and making referrals. The three most frequent actions for participants with cervical abnormalities were making arrangements, providing education, and scheduling appointments. For participants with breast and cervical abnormalities, encounter times were available for 99% (10,794/10,907) of the encounters. When time was available, navigators spent the following times during encounters with participants with breast and cervical abnormalities, respectively: <15 minutes (55%; 55%), 15 to <30 minutes (13%; 28%), 30 to <45 minutes (10%; 13%), 45 to <60 minutes (14%; 3%), 60 to <90 minutes (5%; <1%), and ≥ 90 minutes (4%; <1%).

Discussion and Conclusion

Patient navigation, a system-level strategy to assist patients through the complex health care system, focuses on reducing patient barriers to receiving cancer care. The current study focuses on the patient barriers and actions taken by the navigators to address those barriers among patients with breast and cervical abnormalities from the time of an abnormal screening test or clinical finding to diagnostic resolution in the PNRP. Defining the barriers and reporting the prevalence of barriers and actions taken by navigators provides critical information for health care systems seeking to improve existing PN programs or to develop new PN programs.

When patients with breast and cervical abnormalities are compared, the study findings provide valuable information about the differences and commonalities among these patients. First, patients with breast abnormalities had more barriers to care than patients with cervical abnormalities. This may be a reflection of several issues including the demographic characteristics of the patients or the difference in the clinical care of patients with breast vs. cervical abnormalities (Battaglia et al., 2010). Second, the time to diagnostic resolution for both groups of patients was affected by co-morbidities, health insurance issues, being out of town (e.g. business trip), and system-level barriers. It is important to note, that patient barriers were identified in about two-thirds of participants with breast abnormalities and about half of the participants with cervical abnormalities. Among participants having barriers, patient-focused barriers were identified most frequently followed by system-level barriers. Third, differences affecting time to diagnostic resolution included financial problems, housing issues, and adult care issues for patients with breast abnormalities. Employment demands and follow-up not being a priority affected time to diagnostic resolution for patients with cervical abnormalities. Finally, assisting patients with scheduling appointments, making arrangements and referrals, and providing educational materials and social support were the most frequent actions taken by the patient navigators to address patient barriers in the PNRP. However, navigators' actions varied by barrier type and this finding should be explored further to maximize the efficiency of future PN programs.

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Although many of the common patient-focused barriers (e.g. health insurance, financial problems) documented in this multi-center study have been previously reported (Battaglia, Roloff, Posner, & Freund, 2007; Dohan & Schrag, 2005; Freeman, 2012; Hendren et al., 2011), it is worthy to note that several patient-focused barriers (e.g. fear, attitudes toward providers, perceptions about tests and treatments) and system-level barriers (e.g. communication with providers, literacy and language) did not significantly impact time to diagnostic resolution among patients with breast and cervical abnormalities participating in the PNRP (Armstrong, Ravenell, McMurphy, & Putt, 2007; Battaglia et al., 2007; Dohan & Schrag, 2005; Dovidio et al., 2008; Freeman, 2012; Hendren et al., 2011; Natale-Pereira, Enard, Nevarez, & Jones, 2011; Ponce et al., 2006). Additionally, the number of patient barriers varied by the different institutions and may be a reflection of the resources available at the locations.

In general, this study suggests that patient navigators are able to address many of the barriers reported by a diverse population of patients. The system-level barriers, however, are more difficult to address by patient navigators and the effects of patient navigation on providers and organizations needs to be evaluated in future studies (Taplin, Yabroff, & Zapka, 2012). It is also interesting that about a third of breast and half of cervical patients had no barriers to care, suggesting that the identification of patients who may need assistance of a patient navigator is a critical first step in the navigation process.

Our study has several limitations. First, PN programs and study designs differed across institutions and the barriers reported may differ depending on the type of PN used (e.g. in-person vs. telephone). In addition, some barriers were reported more frequently by the different institutions. Reasons for differences in the types of barriers reported by the different institutions may be due to the various types of patient navigation models, the diverse populations being served, or differences among the patient navigators. Another limitation of the study is that one institution did not record income data on the patients enrolled in the PNRP. Lack of income data on approximately one third of the patients with breast abnormalities and half of the patients with cervical abnormalities made it impossible to include this variable in statistical modeling. Finally, this report is focused on patients with breast and cervical abnormalities since there were a limited number of patients with colorectal and prostate abnormalities within the PNRP. Thus, the findings may not be generalizable to patients with other abnormal cancer screening tests or clinical findings.

In spite of limitations, this study has several strengths. First, the study included a large and diverse population of patients with breast and cervical abnormalities from different clinical sites across the U.S. In addition, patient navigators from all sites attended initial and ongoing national training using a standardized curriculum that supplied the navigators with important cancer-related information, gave them the opportunity to develop communication skills, and provided a chance for consistency of study methods. Furthermore, standardized definitions for patient barriers and actions taken by the patient navigators were developed for the PNRP. This enabled navigators from each site to use a common patient encounter tracking form so that data could be evaluated across sites.

Results of this study provide valuable insight into the common barriers of patients with breast and cervical abnormalities and the most frequent actions taken by navigators to address those barriers. These findings may reduce the complexity of the health care system that many patients face by providing information to develop or improve system level strategies.

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Implications for Practice and/or Policy

Health care systems can use the findings from this study to improve existing PN programs or when developing new PN programs that include patients with breast and/or cervical abnormalities. The first step in the patient navigation process is the identification of patients with barriers to care. By focusing only on patients with reported barriers, patient navigation programs can streamline and be more cost effective. The development of educational materials and making resources available to address the most common patient barriers may reduce modifiable system-level barriers and may improve patient satisfaction with care.

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Table 1

Definition of patient barriers

Barriers		**Definitions**
Patient-Focused		
Co-morbidity	Disability	Disability that makes getting health care difficult
	Co-morbidity	Medical or mental health problems that make getting health care difficult
Financial	Insurance	Paying for direct aspects of health care is a problem
	Financial problems	Dealing with financial problems (not directly related to health care) is interfering with receiving health care (e.g. not being able to pay food bills)
	Housing	Worrying about housing during health care
Attitudinal	Attitudes toward providers	Perceptions and beliefs about the health care providers that impact receiving health care
	Perceptions/Beliefs about test or treatment	Personal or cultural beliefs that effect receiving health care
	Not a priority	Other issues take priority over health care
	Fear	Fear about any aspect of health or health-related care
Other-Focused		
Transportation	Transportation	Difficulty getting from home to health care site
	Out of town/country	Out of area during health care
	Location of facility	Distance from health care facility even if transportation is available
Interpersonal	Social support	Lacks a person/community for assistance during health care
	Child care	Not having child care when needed during health care
	Adult care	Difficulty finding support for other family members during health care
	Employment demands	Work demands make getting health care difficult
System		
	Communication concerns with providers	Lacks understanding of the information provided by health care personnel
	Literacy	Difficulty understanding written communication from the health care system
	Language/Interpreters	Not sharing a common language for communication
	System problems	Care provided is not convenient/efficient to patient needs (e.g. waiting too long on the phone or in the office, days and hours of operation)

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Table 2

Demographic characteristics of participants with breast and cervical abnormalities

		Participants with breast abnormalities (N=1995)		Participants with cervical abnormalities (N=1194)	
Variable	**Level**	**n**	**%**	**n**	**%**
Site	Boston	584	29.3	643	53.9
	Chicago	112	5.6	130	10.9
	Denver	287	14.4	--	--
	Ohio	253	12.7	103	8.6
	San Antonio	111	5.6	318	26.6
	Tampa	402	20.2	--	--
	Washington	246	12.3	--	--
Age (years)	<30	486	24.4	703	58.9
	30–39			280	23.5
	40–49	741	37.1	211	17.7
	50–59	464	23.3		
	60+	304	15.2		
Race and ethnicity	Black	357	17.9	360	30.2
	White	599	30.0	212	17.8
	Hispanic	896	44.9	622	52.1
	Asian	143	7.2	--	--
Marital status	Single/Never married	730	36.6	797	66.8
	Married	877	44.0	271	22.7
	Separated/Divorced/Widow	388	19.4	126	10.6
Household income*	<$10,000	405	32.5	241	52.3
	$10,000–$29,999	503	40.4	144	31.2
	$30,000–$49,999	129	10.4	34	7.4
	$50,000+	209	16.8	42	9.1
Language	English	1141	57.2	735	61.6

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		Participants with breast abnormalities (N=1995)		**Participants with cervical abnormalities (N=1194)**	
Variable	**Level**	**n**	**%**	**n**	**%**
	Spanish	683	34.2	400	33.5
	Other	171	8.6	59	4.9
Insurance	None	834	41.8	458	38.4
	Public	674	33.8	489	41.0
	Private	487	24.4	247	20.7

[*] Significant missing data including one site (Boston) that did not collect household income

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Table 3

Frequencies of unique barriers by barrier category and their impact on time to resolution among participants with barriers compared to participants without barriers[†]

	Participants with breast abnormalities (n=1995)		**Participants with cervical abnormalities (n=1194)**	
Barrier Group	**Frequency n (%)**	**Hazard Ratio (95% CI)**	**Frequency n (%)**	**Hazard Ratio (95% CI)**
Any Barrier	**1,270 (63.7)**	**0.74[**] (0.67–0.83)**	**556 (46.6)**	**0.79[**] (0.70–0.90)**
Patient-Focused	**827 (41.5)**	**0.81[**] (0.72–0.91)**	**352 (29.5)**	**0.78[**] (0.68–0.90)**
Other-Focused	616 (30.9)	0.98 (0.87–1.09)	**157 (13.1)**	**0.78[**] (0.65–0.94)**
System	**856 (42.9)**	**0.78[**] (0.70–0.87)**	**260 (21.8)**	**0.82[*] (0.70–0.95)**

[*] $p<0.05$;

[**] $p<0.01$ (significant findings in bold font)

[†] Adjusted HRs estimated from multivariable Cox model stratified by study site with covariates age, race/ethnicity, marital status, and health insurance.

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Table 4

Frequency of unique barriers and their impact on time to resolution among participants with barriers compared to participants without barriers[†]

Barriers		**Participants with breast abnormalities (n=1995)**		**Participants with cervical abnormalities (n=1194)**	
		Frequency n (%)	**Hazard Ratio (95% CI)**	**Frequency n (%)**	**Hazard Ratio (95% CI)**
Patient-Focused					
Co-morbidity	Disability	16 (0.8)	0.98 (0.58–1.63)	6 (0.5)	0.42 (0.16–1.15)
	Co-morbidity	**107 (5.4)**	**0.69** (0.55–0.86)**	**36 (3.0)**	**0.50** (0.33–0.75)**
Financial	Insurance	**487 (24.4)**	**0.85* (0.74–0.97)**	**172 (14.4)**	**0.68** (0.55–0.83)**
	Financial problems	**203 (10.2)**	**0.83* (0.70–0.98)**	19 (1.6)	0.80 (0.50–1.30)
	Housing	**23 (1.2)**	**0.59* (0.36–0.98)**	8 (0.7)	0.43 (0.18–1.05)
Attitudinal	Attitudes toward providers	35 (1.8)	0.87 (0.61–1.26)	11 (0.9)	1.12 (0.59–2.12)
	Perceptions/Beliefs about test/treatment	225 (11.3)	0.90 (0.76–1.06)	61 (5.1)	1.15 (0.87–1.52)
	Not a priority	9 (0.5)	0.51 (0.23–1.15)	**9 (0.8)**	**0.38* (0.17–0.86)**
	Fear	338 (16.9)	1.15 (0.99–1.33)	145 (12.1)	1.10 (0.91–1.33)
Other-Focused					
Transportation	Transportation	263 (13.2)	0.91 (0.79–1.06)	44 (3.7)	0.87 (0.63–1.22)
	Out of town/country	**45 (2.3)**	**0.60** (0.43–0.84)**	**20 (1.7)**	**0.42** (0.24–0.75)**
	Location of facility	252 (12.6)	1.08 (0.92–1.27)	16 (1.3)	0.79 (0.47–1.35)
Interpersonal	Social support	219 (11.0)	1.07 (0.91–1.26)	47 (3.9)	1.24 (0.91–1.69)
	Child care	55 (2.8)	1.02 (0.77–1.37)	7 (0.6)	1.75 (0.77–3.95)
	Adult care	**34 (1.7)**	**0.67* (0.46–0.96)**	1 (0.1)	0.74 (0.10–5.26)
	Employment demands	152 (7.6)	1.08 (0.90–1.29)	**47 (3.9)**	**0.68* (0.49–0.94)**
System					
	Communication concerns: providers	267 (13.4)	0.91 (0.78–1.06)	55 (4.6)	1.11 (0.82–1.51)
	Literacy	137 (6.9)	0.87 (0.71–1.06)	17 (1.4)	1.03 (0.62–1.73)
	Language/Interpreters	416 (20.9)	0.89 (0.77–1.02)	95 (8.0)	1.26 (1.00–1.59)
	System problems	**434 (21.8)**	0.80** (0.71–0.91)	**120 (10.1)**	**0.57** (0.46–0.72)**

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[*] $p<0.05$;

[**] $p<0.01$ (significant findings in bold font)

[†] Adjusted HRs estimated from multivariable Cox model stratified by study site with covariates age, race/ethnicity, marital status, and health insurance

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Table 5

Patient navigator actions by barrier categories among participants with breast and cervical abnormalities[*]

Action	Patient-Focused (n)	Other-Focused (n)	System (n)	Total (n)
Participants with breast abnormalities				
Education	499	123	160	782
Support	447	230	156	833
Referrals	386	185	355	926
Arrangements	366	345	474	1185
Record keeping	190	102	234	526
Scheduling Appointments	183	235	546	964
Accompaniment	160	116	269	545
Directly contacting family	34	35	75	144
Other	8	5	6	19
Participants with cervical abnormalities				
Education	192	57	63	312
Support	173	23	29	225
Referrals	54	21	65	140
Arrangements	177	69	137	383
Record keeping	94	32	54	180
Scheduling Appointments	105	57	138	300
Accompaniment	5	1	5	11
Directly contacting family	30	12	27	69
Other	5	3	4	12

[*] Each unique encounter-barrier-action combination is represented.