Patient Navigation for Breast and Colorectal Cancer in 3 Community Hospital Settings

An Economic Evaluation

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BACKGROUND: The Ralph Lauren Cancer Center implemented patient navigation programs in sites across the United States building on the model pioneered by Harold P. Freeman, MD. Patient navigation targets medically underserved with the objective of reducing the time interval between an abnormal cancer finding, diagnostic resolution, and treatment initiation. In this study, the authors assessed the incremental cost effectiveness of adding patient navigation to standard cancer care in 3 community hospitals in the United States.

METHODS: A decision-analytic model was used to assess the cost effectiveness of a colorectal and breast cancer patient navigation program over the period of 1 year compared with standard care. Data sources included published estimates in the literature and primary costs, aggregate patient demographics, and outcome data from 3 patient navigation programs.

RESULTS: After 1 year, compared with standard care alone, it was estimated that offering patient navigation with standard care would allow an additional 78 of 959 individuals with an abnormal breast cancer screening and an additional 21 of 411 individuals with abnormal colonoscopies to reach timely diagnostic resolution. Without including medical treatment costs saved, the cost-effectiveness ratio ranged from $511 to $2080 per breast cancer diagnostic resolution achieved and from $1192 to $9708 per colorectal cancer diagnostic resolution achieved.

CONCLUSIONS: The current results indicated that implementing breast or colorectal cancer patient navigation in community hospital settings in which low-income populations are served may be a cost-effective addition to standard cancer care in the United States.

KEYWORDS: patient navigation, breast cancer, colorectal cancer, cost-effectiveness disparities.

INTRODUCTION

Breast cancer is the second leading cause of cancer death among women and colorectal cancer is the third leading cause of cancer death for both men and women in the United States. Despite a decline in the overall cancer mortality in the United States of approximately 1% per year for the past 2 decades, disparities in cancer outcomes continue to present a significant challenge. African Americans experience higher mortality rates in all cancer sites, including breast and colorectal cancer, compared with non-Hispanic whites. Disparities in mortality for breast and colorectal cancer often are more pronounced with respect to socioeconomic status than race. Individuals between ages 25 and 64 years with less than a high school education have not experienced a significant decline in death from colorectal cancer.

A complex interplay of individual and community level factors contribute to excess cancer mortality among the socioeconomically disadvantaged. Individuals of low socioeconomic status and the uninsured often experience financial and nonfinancial barriers when seeking cancer diagnosis and treatment. Consequently, these individuals often do not seek or receive timely and appropriate care, and they present for diagnosis and treatment at with advanced-stage cancer. Therefore, early detection and timely treatment are important objectives for improving survival rates among medically underserved populations and reducing ongoing disparities.

In 1990, in response to the American Cancer Society’s (ACS) Report to the Nation: Cancer in the Poor, Harold P. Freeman, MD, with funding from ACS, created the nation’s first patient navigation (PN) program in Harlem, New York City. The original patient navigation program provided assistance to a breast cancer patient population of low-income, African American patients at Harlem Hospital Center. Approximately 50% of the patients did not have medical insurance. After providing free and low-cost breast cancer screening and patient navigation to ensure timely follow-up and treatment, a similar population at Harlem Hospital Center had an increase in the diagnoses of early stage breast cancer and a survival rate >5 years. It is estimated that, since Dr. Freeman’s first PN program in 1990, hundreds of programs

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DOI: 10.1002/cncr.27487, Received: September 12, 2011; Revised: January 18, 2012; Accepted: January 25, 2012, Published online in Wiley Online Library (wileyonlinelibrary.com)
have incorporated some aspect of the patient navigator concept into cancer care. Dr. Freeman’s model aims to save lives by improving access to screening, ensuring timely delivery of services, and eliminating barriers to care. PN programs focus on the movement of the patient into and through the continuum of care by ensuring that patients attain resolution in a timely manner after a suspicious finding. The navigator increases awareness of services, works through financial barriers, and facilitates access to care from outreach through detection and treatment resolution. The navigator works to overcome patient barriers, including clinical barriers, such as scheduling conflicts, social support barriers, and financial concerns, and ancillary barriers, such as legal and transportation issues.

The Ralph Lauren Center for Cancer Care and Prevention was founded in June 2003 and later included the Harold P. Freeman Patient Navigation Institute (PNI) to train and certify individuals in Dr. Freeman’s model of PN. In an effort to expand the model and assess its effectiveness in settings around the country, the PNI, with support from Pfizer Inc. and the Pfizer Foundation, funded 5 PN programs in 2007 focused throughout the continuum of cancer care and on various cancer sites in medically underserved populations. The 5 programs targeted geographic areas with excess cancer mortality, including community hospitals in regions with some of the highest age-adjusted breast and colorectal cancer death rates in the United States. Although the literature suggests that PN programs improve patient satisfaction as well as the timeliness of screening, follow-up, and early detection, few have evaluated the cost-effectiveness of PN.

In this study we determined the incremental cost-effectiveness of breast and colorectal cancer navigation compared with standard care in 3 community hospitals in the United States. Given the paucity of information on the cost of PN, this analysis is 1 of the first to explore whether the total cost of breast and colorectal cancer PN can be offset by the improved timeliness to diagnosis for patient populations at greater risk for delayed diagnosis and poor adherence. The 3 PN programs included in this study are described in Table 1.

MATERIALS AND METHODS

Analytic Framework

We used a decision-analytic model from the health care payer perspective to compare the cost-effectiveness of a colorectal and breast cancer PN program over the period of 1 year in a community hospital setting compared with standard cancer care. In the analysis, we considered the
costs of a PN program compared with the diagnostic resolution attained by the navigated patient. The results are presented as incremental cost-effectiveness ratios (ICERs) to compare PN with standard care. For the analysis of standard care for the patient populations served by the community hospitals, we obtained data on the incidence of the cancer sites, treatments, and prognoses from the literature. The primary outcome of this analysis was the incremental decrease in time between an abnormal screening and diagnostic resolution. In addition, we used a threshold analysis to explore the performance standard, or the number of cancer deaths that would have to be prevented for the cost of PN to be cost-saving based on the potential savings in breast and colorectal cancer-attributable costs. A 1-year analytic horizon was chosen because patients were navigated from abnormal screening to diagnostic resolution for an average of 1 month for breast cancer and 2.5 months for colorectal cancer. We assumed that patients would experience the most benefit from early diagnosis within a 1-year period.

**Framework Parameters**

Parameter estimates used in this analysis, including costs and outcome measures, are summarized in Table 2 and below.

**Effectiveness of patient navigation**

The 3 PN programs that we analyzed measured aggregate patient data, including the number of patients navigated, the time between abnormal screening and diagnostic resolution, and the stage distribution of confirmed cancer cases for the sites navigated over the 3-year project timeframe. The effectiveness of PN on long-term cancer outcomes, such as mortality, has not been established. The literature on the effectiveness of PN on intermediate outcomes suggests that PN increases adherence to breast cancer screening, diagnostic follow-up, and treatment as well as colorectal cancer screening compliance.

The 3 PN programs that were included in the current analysis relied on the average time between a suspicious finding during breast or colorectal cancer screening and diagnostic resolution. The sites used mammography and clinical breast examinations for breast cancer screening, and 1 site screened for colorectal cancer through colonoscopy. In addition, the sites recorded the number of patients navigated to the point of diagnostic resolution, which was defined as the date a pathologist signs a report indicating a biopsy-confirmed diagnosis of breast or colorectal cancer or a finding that cancer is not present through biopsy or diagnostic mammogram.

**Effectiveness of standard care**

The current analysis estimates that patients who receive standard care, on average, will reach diagnostic resolution of breast cancer within 60 days of abnormal screening based on the Centers for Disease Control and Prevention (CDC) clinical guidelines under the National Breast and Cervical Cancer Early Detection Program. The CDC’s Colorectal Cancer Control Program recommends that no greater than 10% of patients are lost to follow-up between abnormal screening and diagnostic resolution and that patients reach diagnostic resolution within 60 days of an abnormal screening.

The current analysis relied on the CDC-recommended time interval for cancer care. We estimated that patients who receive standard care without PN would receive standard care, on average, will reach diagnostic resolution within 60 days of an abnormal breast cancer screening and within 60 days after an abnormal colorectal screening. In addition, the current analysis estimated that 10% of patients who receive standard care would be lost to follow-up after an abnormal breast or colorectal cancer screening and would not reach diagnostic resolution within 60 days.

**Economic Parameters**

The cost of navigating patients with breast and colorectal cancer in 3 community hospital settings in the United States was estimated for 1 year. All costs were updated to 2010 US dollars. A summary of costs obtained from the literature and the results of the program site cost analysis is provided in Tables 2 and 3 and below.

**Annual colorectal cancer-attributable costs**

Because the patient population that we analyzed included non-Medicare recipients, the cost of colorectal cancer treatment was obtained from a study of a large health maintenance organization in the northwestern United States. Treatment costs were identified by time period, including the initial 6 months of care, continuing care in 3-month intervals, and 6 months of terminal care. The baseline estimate in the current analysis relied on the sum of 3 months of continuing care and the 6-month cost of terminal colorectal cancer care. We assumed that diagnostic resolution would result in a 9-month savings of cancer treatment costs. Because the relation between diagnostic resolution and survival has not been established for the time interval of the current analysis, we assumed that the savings would result from receiving a cancer diagnosis at an earlier stage or through a reduction in subsequent treatment delays.

**Annual breast cancer-attributable costs**

Similar to the calculation used for the baseline cost of colorectal cancer care, the same study of a health maintenance organization was used to estimate the 1-year cost.
Table 2. Framework Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PN Baseline Value (Range)</th>
<th>Standard Care Baseline Value (Range)</th>
<th>PN Value (Range)</th>
<th>Standard Care Value (Range)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program-effectiveness parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average no. of patients navigated for breast cancer</td>
<td>959 (N/A)</td>
<td>N/A</td>
<td>PNPD*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average no. of patients navigated for colorectal cancer</td>
<td>411 (N/A)</td>
<td>N/A</td>
<td>PNPD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average time between abnormal finding and diagnostic resolution of breast cancer, d</td>
<td>20 (10-30)</td>
<td>60 (43-90)</td>
<td>PNPD (±50%)</td>
<td>NBCCEDP 2011, Henson 1996, Caplan 2000, Ferrante 2008</td>
<td></td>
</tr>
<tr>
<td>Average time between abnormal finding and diagnostic resolution of colorectal cancer, d</td>
<td>7 (4-11)</td>
<td>60 (30-90)</td>
<td>PNPD (±50%)</td>
<td>CRCSPD 2006</td>
<td></td>
</tr>
<tr>
<td>Percentage who will reach diagnostic resolution of breast cancer</td>
<td>98 (99-95)</td>
<td>90 (91-86)</td>
<td>PNPD (±50%)</td>
<td>NBCCEDP 2011, Henson 1996, Caplan 2000, estimate; Richards 1999</td>
<td></td>
</tr>
<tr>
<td>Percentage who will reach diagnostic resolution of colorectal cancer</td>
<td>95 (99-94)</td>
<td>90 (92-86)</td>
<td>PNPD (estimate)</td>
<td>CRCSPD 2006 (estimate)</td>
<td></td>
</tr>
<tr>
<td>Average loss to follow-up after abnormal finding for breast cancer, %</td>
<td>2 (1-10)</td>
<td>10 (9-14)</td>
<td>PNPD (±50%)</td>
<td>NBCCEDP 2011, Henson 1996, Caplan 2000, estimate; Richards 1999</td>
<td></td>
</tr>
<tr>
<td>Average loss to follow-up after abnormal finding for colorectal cancer, %</td>
<td>5 (1-6)</td>
<td>10 (9-14)</td>
<td>PNPD (estimate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Economic parameters, $b</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual colorectal cancer-attributable costs</td>
<td>20,870 (42,085-18,822)</td>
<td>Taplin 1996</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CRCSPD, Colorectal Cancer Screening Demonstration Program; d, days; N/A, not applicable; NBCCEDP, National Breast and Cervical Cancer Early Detection Program; PN, patient navigator; PNPD, Patient Navigation Program Data.

*PNPD represent the average for the 3 programs over 1 year.

*All prices and costs are presented in 2010 US dollars.
of breast cancer care in the baseline. In addition, the assumption regarding cost savings was maintained for patients who were navigated for breast cancer.

Patient navigation costs
The cost of operating a PN program in a community hospital setting for 1 year was determined by collecting retrospective cost data from site records. The cost analysis results are presented in Table 3. Program costs were collected through a survey that was completed by the PN supervisor at 1 point in time in December 2010. The costs included direct, nonmedical operating costs needed to implement the PN programs, such as personnel, training materials, supplies, facilities, and additional care provided. The costs of capital items and start-up costs, such as computer software and outreach to raise awareness of PN programs, were not included, because the PN programs incurred these costs before the time period of the current cost analysis.

Outcome Measures
The outcome measures for the PN programs included in this analysis were the number of patients navigated and the percentage lost to follow-up. The 3 community hospital sites recorded these outcomes using existing hospital databases or through a PN-specific database.

Sensitivity Analyses
We performed univariate sensitivity analyses to evaluate which parameters of the model were most influential to the results. In conducting this analysis, we constructed 3 scenarios that examined parameter values most favorable to the benefit of PN as well as values that were least favorable to the program. The range for each parameter was based on the available evidence and is presented in Table 2. In the case of parameters for which high and low estimates around the baseline value were not available, a standard convention of 50% more or less than the baseline was used.

RESULTS
The additional cost of PN programs resulted in moving breast cancer patients to the point of diagnostic resolution in an average of 20 days, an estimated 40 days earlier than the CDC recommends that patients reach resolution. In addition, PN allowed patients with colorectal cancer, on average, to reach diagnostic resolution in 7 days, an estimated 53 days earlier than the CDC recommends that individuals with an abnormal screening reach diagnostic resolution.

An average of 959 patients were navigated for breast cancer in 1 year across the 3 program site, and 98% (n = 941) reached diagnostic resolution. In addition, 95% (n = 390) reached diagnostic resolution for colorectal cancer of 411 patients who were navigated in 1 program site over the course of 1 year. In comparison, an estimated 90% (n = 863) of individuals with a suspicious finding during a clinical breast examination or screening mammography and 90% (n = 370) of individuals with an abnormal colonoscopy would reach diagnostic resolution at the end of 1 year if the same population had received standard care alone. The number of diagnostic resolutions was calculated using the number of patients navigated and the percentage lost to follow-up. On the basis of the decision-analytic model, PN was cost-saving compared with standard care. The results from the baseline case, along with the best and worst cases compiled in the sensitivity analyses, are presented in Tables 4 and 5 for breast cancer navigation and colorectal cancer navigation, respectively.

The ICERs presented in Tables 4 and 5 were calculated first by determining the net cost of the alternatives. The net cost was calculated by subtracting the medical treatment costs saved from the cost of implementing the program. The treatment costs saved were calculated by multiplying the number of patients who reached diagnostic resolution, regardless of diagnosis, by the cancer-attributable treatment costs. The ICERs also were calculated without accounting for medical treatment costs saved for the purposes of comparison. The results from PN scenarios for breast cancer and colorectal cancer indicate that PN probably is cost effective under each scenario in the

<table>
<thead>
<tr>
<th>Table 3. Patient Navigation Cost Analysis Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>Patient navigators</td>
</tr>
<tr>
<td>Other personnel (eg, outreach workers and project supervisor)</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td>Staff/personnel travel costs</td>
</tr>
<tr>
<td>General supplies (eg, printed supplies, mobile phone, postage)</td>
</tr>
<tr>
<td>Training</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
</tr>
<tr>
<td><strong>Cost analysis results</strong></td>
</tr>
<tr>
<td>Expressed per client</td>
</tr>
<tr>
<td>Average additional cost of patient navigation in a community hospital setting</td>
</tr>
</tbody>
</table>

*a All prices and costs are presented in 2010 US dollars and represent the average for the 3 programs over 1 year.
analyses presented in Tables 4 and 5 when considering the

Table 4. Costs and Outcomes of Breast Cancer Patient Navigation Compared With Standard Care in 3 Community Hospital

<table>
<thead>
<tr>
<th>Variable</th>
<th>Incremental Difference: PN vs Standard Care Baseline, $</th>
<th>Incremental Difference: Best Case, $</th>
<th>Incremental Difference: Worst Case, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross intervention costs (C)</td>
<td>73,291</td>
<td>63,699</td>
<td>79,804</td>
</tr>
<tr>
<td>Treatment costs saved (T)</td>
<td>2,286,096</td>
<td>5,522,071</td>
<td>1,054,432</td>
</tr>
<tr>
<td>Net costs (C – T)*</td>
<td>2,192,805</td>
<td>–5,456,372</td>
<td>–974,628</td>
</tr>
<tr>
<td>Cancer diagnostic resolution (A)</td>
<td>78</td>
<td>125</td>
<td>38</td>
</tr>
</tbody>
</table>

Incremental cost-effectiveness ratio
- Cost per diagnostic resolution (C – T)/A: Cost saving
- Cost per diagnostic resolution without medical treatment saved (C/A): 944

Table 5. Costs and Outcomes of Colorectal Cancer Patient Navigation Compared With Standard Care in 3 Community Hospital

<table>
<thead>
<tr>
<th>Variable</th>
<th>Incremental Difference: PN vs Standard Care Baseline, $</th>
<th>Incremental Difference: Best Case, $</th>
<th>Incremental Difference: Worst Case, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross intervention costs (C)</td>
<td>73,291</td>
<td>63,699</td>
<td>79,804</td>
</tr>
<tr>
<td>Treatment costs saved (T)</td>
<td>428,878</td>
<td>2,248,599</td>
<td>154,713</td>
</tr>
<tr>
<td>Net costs (C – T)*</td>
<td>–355,587</td>
<td>–2,184,900</td>
<td>–74,909</td>
</tr>
<tr>
<td>Cancer diagnostic resolution (A)</td>
<td>21</td>
<td>53</td>
<td>8</td>
</tr>
</tbody>
</table>

Incremental cost-effectiveness ratio
- Cost per diagnostic resolution (C – T)/A: Cost saving
- Cost per diagnostic resolution without medical treatment saved (C/A): 3567

Abbreviations: PN, patient navigation.

*The net cost was calculated by subtracting the medical treatment costs saved from the gross cost of the intervention.

analyses presented in Tables 4 and 5 when considering the cost per diagnostic resolution achieved. Furthermore, when accounting for medical treatment costs saved over the course of 1 year by reaching diagnostic resolution, all 3 scenarios are potentially cost-saving to the health care payer. If medical treatment costs are not taken into account, then the cost per diagnostic resolution achieved in the base case, best case, and worst case scenarios ranges from a cost of $511 to $2080 per breast cancer diagnostic resolution achieved and $1192 to $9708 per colorectal cancer diagnostic resolution achieved.

**Sensitivity Analysis**

On the basis of univariate sensitivity analysis, the parameters that influenced the model results the most were personnel costs, including the navigator’s salary, and the effectiveness of standard care. A threshold analysis was conducted to assess the point at which PN is cost-saving and to compare the ICERs with the annual breast and colorectal cancer-attributable costs. The threshold analysis results are presented in Table 6. The PN program would need to prevent at least 3 breast cancer deaths or 4 colorectal cancer deaths for the intervention to be cost-saving to the health care payer.

**DISCUSSION**

Implementing breast cancer or colorectal cancer PN programs in community hospital settings could be a cost-effective addition to standard practice for cancer care in the United States. The current study demonstrates that PN programs operating over the course of 1 year reduce the time between abnormal screening and diagnostic resolution in a low-income patient population.

The PN programs that were included in this analysis allowed patients with an abnormal screening to reach a timely diagnosis. On average, low-income individuals in the United States are less likely to receive breast or
colorectal cancer diagnosis and treatment in a timely manner and, thus, are at greater risk for cancer mortality. In addition, standards of care for breast and colorectal cancer care are less likely to be followed for uninsured individuals who reside in low-income areas. Therefore, the predominately uninsured patients who were navigated by these 3 programs may have received delayed and incomplete follow-up after an abnormal screening result, or may have been lost to follow-up after screening.

A delay in breast cancer diagnosis after an abnormal screening test is associated with increased anxiety and emotional distress, larger tumor size, advanced cancer stage, and increased risk of cancer death. Similarly, a diagnosis of colorectal cancer at an advanced stage is associated with a lower 5-year survival rate. Therefore, these PN programs illustrate a potential benefit for low-income and historically medically underserved communities in urban and rural settings. Furthermore, receiving timely diagnostic and treatment services can lead to a reduction in the risk of cancer mortality. Therefore, the increase in timely care and adherence to diagnostic services accomplished by these programs has the potential to impact cancer outcomes.

A previously published analysis from a mathematical model suggests that PN leads to an increase in life expectancy of 0.219 years and savings in lifetime breast cancer-attributable costs. Although this is the first analysis to our knowledge that explores the cost-effectiveness of colorectal cancer PN, models developed by Frazier et al and Saini et al estimate that colorectal cancer screening tests are cost-effective for high-risk patients. Tangka et al examined the cost of starting a colorectal screening program and observed that costs ranged from $65,549 to $365,282 (in 2010 US dollars), and labor accounted for 67% of the total costs. In addition, breast cancer PN costs of the Chicago Cancer Navigation Project, on average, were $1258 per program participant. The Chicago Cancer Navigation Project baseline ICER was $95,625 per life-year saved; in the current study, we observed that a similar intervention was potentially cost-effective.

Because evidence of the impact of PN on cancer mortality is limited to simulated estimates based on secondary data, the potential long-term impact of PN in the community hospital setting in the United States remains unclear. Our analysis demonstrated that, if a PN program in a community hospital is effective at preventing 3 or 4 cancer deaths over the course of 1 year, then it would be cost-saving.

The current analysis has some limitations. We assumed that, once a patient reaches diagnostic resolution for breast or colorectal cancer, the patient would receive timely treatment within the 1-year analytic horizon and would avoid incurring some medical treatment costs. Previous research suggests that PN is associated with timely treatment initiation; however, the impact of PN on the quality of treatment and averting cancer mortality is unknown. Several studies have illustrated the disparities in breast and colorectal cancer treatment among rural, minority, and uninsured patients and the impact of the treatment disparities on patient survival. Therefore, although this assumption of equal treatment would impact the ICER, our threshold analysis indicated that the program would have to avert only 4 cancer deaths to be cost-saving.

The cost of medical treatment for breast and colorectal cancer in the baseline was obtained from a large study of a health maintenance organization in a geographically location different from the 3 program sites. The patients who were served by the 3 programs primarily had public insurance or no insurance and, thus, may have had reduced medical costs compared with privately insured individuals. Overall, the analysis maintains a conservative estimate of medical savings, because we did not account for indirect or societal costs. These costs could be considerable and would result in a more favorable ICER. In addition, we did not account for potential cost savings,

Table 6. Baseline Threshold Analysis Results: Program Funder Perspective

<table>
<thead>
<tr>
<th>Total Program Costsa</th>
<th>Annual Cost of Cancer Carea, b</th>
<th>Cost-Saving Threshold (No. of Additional Breast Cancer Deaths That Would Need to be Averted)</th>
<th>Cost-Saving Threshold (No. of Additional Colorectal Cancer Deaths That Would Need to be Averted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$73,291</td>
<td>Breast cancer, $29,173; colorectal cancer, $20,870</td>
<td>2.51</td>
<td>3.51</td>
</tr>
</tbody>
</table>

a Costs are in 2010 US dollars.

b See Taplin 1996.
from the reduction of no-shows, improved patient flow, and increased reimbursement from the enrollment of uninsured patients into public insurance programs.

The current analysis does not explore the impact of PN on breast or colorectal cancer screening rates or on any potential shift in disease stage. Previous studies have illustrated an association between PN and increased screening compliance.7,24,29,30 Because uninsured, low-income women often do not have access to early cancer detection,41,42 an increase in the number of individuals screened could lead to a more favorable ICER if PN were used to facilitate access to screening for individuals who would have presented with a late-stage diagnosis. However, the additional costs of screening individuals without a cancer diagnosis may decrease the cost-effectiveness of PN.

The current analysis relied on the cost to operate PN programs, as opposed to considering all costs at initial scale up, including capital equipment. The retrospective cost analysis was completed after the 3 programs had been operating for at least 2 years. The cost of initial PN implementation has been analyzed in the Chicago Patient Navigation Program,25 and the results indicated that additional costs ranging from $1200 to $20,000 would be expected based on the scale up of a similar program.25 Even after accounting for these additional costs, PN still would be cost-effective in all scenarios in the current analysis.

Despite these limitations, the findings of this study are informative for improving cancer care for medically underserved communities. The strength of this analysis is that it maintains a conservative estimate, and all scenarios illustrate that operating PN programs is likely to be beneficial. The current findings are in line with a previous clinical study and simulation modeling.21,25 Furthermore, data soon will be available from the 9-site Patient Navigation Research Program that will contribute effectiveness data on outcomes and costs related to implementing and operating a standardized program in communities across the United States.54

The current study illustrates that operating PN programs in community hospital settings can result in timely cancer care and has the potential to produce health and economic benefits. Given the excess breast and colorectal cancer mortality in the geographic regions and populations that were included in this analysis, expanding access to PN programs in community hospital settings has the potential to reduce continuing disparities in cancer outcomes.

**FUNDING SOURCES**

Funding for this article was provided by the Pfizer Foundation to the Johns Hopkins Bloomberg School of Public Health through their Global Health Partnerships Program.

**CONFLICT OF INTEREST DISCLOSURES**

The authors made no disclosures.

**REFERENCES**