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BACKGROUND: Patient navigation (PN) is being used increasingly to help patients complete screening colonoscopy (SC) to prevent colorectal cancer. At their large, urban academic medical center with an open-access endoscopy system, the authors previously demonstrated that PN programs produced a colonoscopy completion rate of 78.5% in a cohort of 503 patients (predominantly African Americans and Latinos with public health insurance). Very little is known about the direct costs of implementing PN programs. The objective of the current study was to perform a detailed cost analysis of PN programs at the authors’ institution from an institutional perspective. METHODS: In 2 randomized controlled trials, average-risk patients who were referred for SC by primary care providers were recruited for PN between May 2008 and May 2010. Patients were randomized to 1 of 4 PN groups. The cost of PN and net income to the institution were determined in a cost analysis. RESULTS: Among 395 patients who completed colonoscopy, 53.4% underwent SC alone, 30.1% underwent colonoscopy with biopsy, and 16.5% underwent snare polypectomy. Accounting for the average contribution margins of each procedure type, the total revenue was $95,266.00. The total cost of PN was $14,027.30. Net income was $81,238.70. In a model sample of 1000 patients, net incomes for the institutional completion rate (approximately 80%), the historic PN program (approximately 65%), and the national average (approximately 50%) were compared. The current PN program generated additional net incomes of $35,035.50 and $44,956.00, respectively. CONCLUSIONS: PN among minority patients with mostly public health insurance generated additional income to the institution, mainly because of increased colonoscopy completion rates. Cancer 2013;119:612-20. © 2012 American Cancer Society.

KEYWORDS: cost analysis, patient navigation, screening colonoscopy, racial disparities, colorectal cancer screening.

INTRODUCTION

Colorectal cancer (CRC) is 1 of the most prevalent, yet preventable, cancers in the United States,1 because screening effectively reduces its incidence and mortality.2-4 Colonoscopy is used increasingly as the primary screening modality in the United States; it has been recommended by the American Cancer Society,1 by other national authorities in cancer prevention,5,6 and by the New York City Department of Health and Mental Hygiene.7 It is publicized in the media and is used annually by 10 to 12 million individuals.5,8,9

CRC screening rates among minorities are lower than those among non-Hispanic whites.10-13 Disparities in screening contribute to disparities in CRC incidence and mortality.14-18 Interventions to increase screening colonoscopy (SC) rates among minority populations have become an important aspect of cancer prevention efforts from systems-based and psychological perspectives. In open-access endoscopy (OAE),19 primary care physicians (PCPs) refer average-risk patients directly for SC, avoiding the inconvenience, delay, and cost of an interim office consult with a gastroenterologist before the procedure, thereby eliminating logistical barriers to SC.7 Patient navigation (PN)20 interventions target logistic, personal, and sociocultural barriers to SC, such as lack of education or low health literacy, language barriers, medical mistrust, fatalism, and fear of the procedure.10,21-24 A patient navigator is a specially trained individual within the health care setting who helps a patient move through the system to obtain medical care.25

Originally used to increase poor diagnostic follow-up rates among minorities,26-29 PN has expanded to preventive screening,30-33 and our group was among the first in this trend. The structure of navigation programs depends on the needs of the target individuals and populations and the resources of the providers.34 For example, PN can include cultural targeting, which incorporates a discussion of barriers specific to a particular population subgroup.35 Culturally targeted PN interventions have increased health-promoting behaviors in a variety of settings,36-38 have been favored by patients over nontargeted interventions,39 and have resulted in greater retention of knowledge over time than nontargeted...
interventions. Cultural tailoring, which incorporates individualized intervention messages, also has been effective at increasing health-promoting behaviors. Thus, PN programs can be crafted from elements of standard, targeted, and tailored models.

We previously reported that implementing PN in the context of OAE at an urban academic hospital that served minority patients increased adherence to SC from 40% to 66.4%, with adherence defined as a patient completing a colonoscopy. Two other studies within OAE systems that targeted comparable populations in New York City reported that PN programs increased SC rates. To date, however, little is known about the costs and benefits associated with such programs, prompting some experts to call for an analysis of this issue.

In 2008, we began new PN programs. A cohort of African Americans received culturally targeted PN as part of a National Cancer Institute-funded randomized controlled trial (RCT) comparing the efficacy of professional navigators (trained health educators) versus community-based peer navigators (lay individuals aged >50 years from East Harlem who had undergone colonoscopy and who we trained to conduct PN). Other patients, predominantly of Latino background, received 1 of 2 types of nontargeted PN in a separate RCT funded by Mount Sinai School of Medicine that compared the efficacy of 2 navigation scripts. Overall, there were 4 types of PN.

Although the primary objective of both RCTs was to determine the effect of PN on SC adherence, a secondary aim was to assess the economic impact of PN from an institutional perspective. We hypothesized that PN would increase hospital net income, because the higher volume of SC would increase hospital revenue. We further hypothesized that the cost of PN would be small compared with the increase in income to the institution. Herein, we report the findings of a cost analysis of our PN programs.

MATERIALS AND METHODS

Study Setting and Recruitment

In 2 institutional review board-approved RCTs, primary care patients who were referred for SC by their PCPs were recruited during a scheduled, nonacute visit at Mount Sinai’s primary care clinic between May 2008 and May 2010. To avoid confusion, PCPs were educated about eligibility criteria for 1 “colonoscopy and patient navigation study” and ordered SC using an electronic medical record in which criteria for OAE were delineated. PCPs explained the study to potentially eligible patients. Research assistants were stationed in the clinic and worked directly with medical assistants. Interested patients were introduced to research assistants in the waiting room immediately after their physician visit to discuss the study further and to sign informed consent forms if they were interested in receiving navigation services.

Patients aged ≥50 years without active gastrointestinal symptoms, significant comorbidities, or a history of inflammatory bowel disease or CRC were eligible. Patients must not have undergone colonoscopy for at least 5 years or could not be up to date with other forms of CRC screening (eg, fecal occult blood testing, flexible sigmoidoscopy). After recruitment, nurses in the Division of Gastroenterology reviewed referrals by analyzing the electronic medical record to confirm medical eligibility and to evaluate for contraindications to colonoscopy or sedation.

Subsequently, the project coordinator randomized African American participants selected for the National Cancer Institute study to culturally targeted PN by either a professional health educator (Pro-PN) or a community-based peer navigator (Peer-PN). All other participants were assigned to a Pro-PN and were randomized in a separate RCT to receive nontargeted PN with or without discussions about personal barriers.

Intervention Protocols

The overall structure of all 4 interventions was identical. Participants received 3 scripted telephone calls: a scheduling call, a call 2 weeks before the colonoscopy, and a final call 3 days before the procedure. After the first call, written instructions for the bowel preparation and a reminder postcard with the colonoscopy date were mailed. The content of the scripts and the ethnic identity of patient navigators varied, as described below.

For the 2 culturally targeted PN groups (Peer-PN and Pro-PN), all navigators were African American to maintain ethnic concordance. Each call included information about how CRC impacts African Americans. During the scheduling call, patient navigators made SC appointments, asked patients about their concerns, and provided information about the preparation and the procedure. Patient navigators subsequently contacted participants 2 weeks and 3 days before the procedure to remind them of their appointments, confirm receipt of mailed information, review the bowel preparation instructions, assess transportation needs, and provide education and support. Peer-PNs also were able to discuss their own colonoscopy experience.

For the nontargeted PN groups, Pro-PNs were randomly assigned (language concordance was maintained). During the scheduling call, the patient navigators made an SC appointment and provided information about the preparation and the procedure. Two weeks and 3 days
before the colonoscopy, patient navigators called to
remind patients of their appointments, confirm receipt of
mailed information, review bowel preparation instructions,
and assess transportation needs. The only difference
between the groups was that 1 script also included a dis-
cussion about the importance of CRC screening and
asked about patients’ concerns. The different protocols in
navigation, which are not the focus of this report, were
designed to assess the efficacy of different formats for PN.
Because all of our PN programs have additional elements
beyond basic PN and share the key characteristics
described above, it was instructive to analyze all of the
data together.

Calculation of Costs
Appointment outcomes were categorized based on
whether or not participants eventually completed a colo-
moscopy. Each completed colonoscopy was categorized as
SC alone, colonoscopy with biopsy, or colonoscopy with
snare polypectomy. The average number of colonoscopy
appointments per patient and the average number of
minutes spent on navigation for each appointment were
calculated for completer and noncompleter groups. Navig-
ators recorded the number of minutes spent on each call
in a call log. Calls that were attempted but not completed
were assigned a value of 1 minute. Instances of inadequate
bowel preparation (defined by the endoscopist) were
recorded as additional appointment outcomes.

Direct costs of navigation (both personnel and sup-
plies) were calculated for all randomized participants. Per-
sonnel costs included the salaries of the Pro-PNs based on a
$50,000.00 per year full-time equivalency salary with bene-
fits or an hourly stipend for the Peer-PNs, including time
spent in training. These costs amounted to $26.00 per
hour for Pro-PNs and $15.00 per hour for Peer-PNs. Be-
cause Pro-PNs were full-time employees with other
responsibilities (eg, research assistants in the primary care
clinics), only the time spent performing navigation activ-
ities was included. Supply costs included printed materials
mailed to participants, paper, and postage costs. Other
costs funded by the study during the course of the naviga-
tion process were categorized as “add-on” costs. For
instance, in some cases, the bowel preparation was paid for
by the study, some participants required car service to and/or
from their colonoscopy appointments, some participants
required a Pro-PN escort, and some mailings were sent by
express courier. These costs were calculated based on aver-
age dollar amounts spent by the study for each add-on cost.

By using data from Mount Sinai’s business office, we
obtained the contribution margin from each colonoscopy
procedure completed by our study participants in 2010.
The contribution margin was determined by subtracting
the direct cost of each colonoscopy procedure from the re-
venue generated by that procedure. These included direct
patient costs (eg, allocations for nurse and endoscopy assist-
ant staffing, supplies, room time), program costs (eg, funds
to support faculty teaching and administrative efforts), and
support services (eg, housekeeping, laundry, medical
records). All colonoscopies were performed by full-time
attending gastroenterologists (without gastroenterology fel-
low involvement). Professional fees for these procedures
were not included in the current cost analysis, because they
were collected independently from the institution and thus
did not affect institutional revenue. The revenue generated
from each procedure was obtained according to each partic-
ient’s insurance carrier at the time of the procedure. The
contribution margins for each SC completed in 2010 were
organized according to procedure type and were averaged
to obtain average contribution margins (ACM) for SC,
colonoscopy with biopsy, and colonoscopy with snare
polypectomy.

The net income generated was calculated using an
algorithm that accounted for the cost of navigation, the
cost of “add-ons,” and the average procedure net income
for each type of colonoscopy procedure. This analysis was
performed using SPSS 19.0 software (SPSS Inc., Chicago,
Ill). To place our results into perspective, we modeled costs
and revenues based on incremental colonoscopy comple-
tion rates of 80%, 65%, and 50% in 3 samples of 1000
patients that closely approximated our current PN program
completion rate, our historic nontargeted PN program
completion rate,31 and the national screening colonoscopy
adherence rate, respectively. This equates to incremental
completion rates of 15% above our historic PN program,
and 30% above the national average, respectively. Because
we have conducted PN routinely at Mount Sinai since
2003, we were unable to compare our findings with an
internal non-navigated control group. Instead, we used
data from the 2008 National Health Interview Survey as
reported by Klabunde et al.13 Finally, we calculated the per-
centage effort required for a dedicated patient navigator
based on institutional data.

RESULTS
Participant Characteristics
Over a 24-month period, 749 patients were referred to
the study by their PCPs (Fig. 1). We successfully enrolled
700 participants (93.5% acceptance rate). Ultimately, 96
participants (13.7%) were not randomized for various rea-
sons; most were deemed medically ineligible for OAE and
were referred for further medical evaluation. The remaining 604 participants (86.3%) were randomized to receive PN. Among the randomized participants, 101 (16.7%) were not included in final navigation groups. Of these participants, 85 (14.1%) received some navigation services but did not schedule a colonoscopy because they refused colonoscopy (6.3%), were unreachable (4.0%), were reached once but subsequently were unreachable after multiple attempts (“passive refusers”; 3.6%), or were ineligible because of lack of insurance coverage (0.2%). An additional 15 participants (2.5%) were deemed ineligible because of medical illness. One participant (0.2%) died. The remaining 503 participants (83.3%) all received navigation services and were scheduled for SC. Of these, 342 participants (68%) were women, 233 (46.3%) were African American, 230 (45.7%) were Latino, 380 (75.5%) were ages 50 to 64 years, and 219 (43.5%) had an annual household income of ≤$10,000.00 (Table 1). The majority of participants were insured by Medicaid (52.7%) or Medicare (26.8%), and the remaining 20.5% were covered by private insurance or self-pay. Of the 503 patients in the navigation groups, 395 participants (78.5%) completed colonoscopy, whereas 108 participants (21.5%) did not (noncompleters).

Navigation Costs
The cost of navigation services for all 4 randomization groups was based on supply costs, training costs, and navigator salaries. The number of minutes spent with each participant was totaled. Among the 503 participants who received PN, 765 colonoscopy appointments were made. Of all appointments scheduled, completers accounted for 559 appointments (73.1%), and noncompleters accounted for 206 appointments (26.9%). The average navigation time was 38 minutes per appointment for completers versus 29 minutes for noncompleters ($P < .001). On average, noncompleters missed 4 times more reminder telephone calls than completers ($P < .001), thus
reducing the overall navigation time spent. The average cost of PN for a patient who completed colonoscopy was $23.90, and it was $20.26 for a patient who did not, as indicated in Table 2. Add-on costs were incurred relatively infrequently, and the averages were $4.93 per completer and $1.14 per noncompleter. The total cost of navigation for a completer was $28.83, and it was $21.40 for a noncompleter. The 395 completers incurred a total of $11,387.85 in navigation and add-on costs, whereas the 108 noncompleters incurred a total of $2311.20. The resulting weighted average cost of navigation per participant in the program (regardless of completion status) was $27.23. Each of the 101 participants who were randomized but did not complete navigation for the reasons listed above was assigned an average cost associated with 5 minutes of navigation ($3.25), resulting in a total cost of $328.25. The total cost of navigation for all randomized participants was $14,027.30.

**Average Contribution Margins From Colonoscopy**

All completers underwent colonoscopy. Some also required biopsies or snare polypectomies. Table 3 indicates that 211 completers (53.4%) received SC without biopsy. The ACM for an SC was $335.00, resulting in a total contribution margin of $70,685.00. One or more biopsies were taken from 119 completers (30.1%). At an ACM of $194.00, this resulted in a total contribution margin of $23,086.00. The remaining 65 completers (16.5%) underwent snare polypectomy. The ACM for a colonoscopy with snare polypectomy was $23.00, for a total contribution margin of $1495.00. Equipment costs resulted in a relatively low ACM for snare procedures. The 395 completers accounted for an overall total contribution margin of $95,266.00. After deducting the cost of navigation ($14,027.30 for all randomized participants), the total net income generated by the entire PN program was $81,238.70 for this 2-year period.

**Net Income in Perspective**

Because PN has become standard practice in Mount Sinai’s primary care clinic, we can no longer compare our findings with findings from an internal control group. Therefore, to put the net income received from PN in context, we compared our findings with a similar patient population at our own institution that received PN31 (‘‘historic PN’’) but without additional elements (such as cultural targeting). We also compared our findings with the screening rate in the general population, assuming that the vast majority of this group had never received PN.13 Table 4 represents our model of the net costs and income received from 3 samples of 1000 patients receiving navigation services with completion rates of 80%, 65%, and 50% (representing the current study, historic PN, and the national average, respectively). We used a weighted ACM of $241.00 per colonoscopy based on the number of participants in the current study who completed each type of colonoscopy procedure. Navigation cost values for the historic PN group were assumed to be

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**Table 1. Patient Navigation Participant Demographics**

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Sample Size (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>503 (100)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>161 (32)</td>
</tr>
<tr>
<td>Women</td>
<td>342 (68)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>233 (46.3)</td>
</tr>
<tr>
<td>Latino</td>
<td>230 (45.7)</td>
</tr>
<tr>
<td>Other</td>
<td>40 (8)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>≤64</td>
<td>380 (75.5)</td>
</tr>
<tr>
<td>≥65</td>
<td>123 (24.5)</td>
</tr>
<tr>
<td>Household income</td>
<td></td>
</tr>
<tr>
<td>≤$10,000.00</td>
<td>219 (43.5)</td>
</tr>
<tr>
<td>&gt;$10,000.00</td>
<td>236 (46.9)</td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>265 (52.7)</td>
</tr>
<tr>
<td>Medicare</td>
<td>135 (26.8)</td>
</tr>
<tr>
<td>Private</td>
<td>99 (19.7)</td>
</tr>
<tr>
<td>Self-pay</td>
<td>4 (0.8)</td>
</tr>
<tr>
<td>Final colonoscopy status</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>395 (78.5)</td>
</tr>
<tr>
<td>Incomplete</td>
<td>108 (21.5)</td>
</tr>
<tr>
<td>Average no. of appointments per patient</td>
<td>1.48</td>
</tr>
<tr>
<td>Average no. of calls per appointment</td>
<td>7.28</td>
</tr>
<tr>
<td>Average min per appointment</td>
<td>35.45</td>
</tr>
</tbody>
</table>

**Table 2. Cost of Patient Navigation**

<table>
<thead>
<tr>
<th>Expense</th>
<th>Completer, n = 395</th>
<th>Noncompleter, n = 108</th>
<th>No PN, n = 101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation per participant</td>
<td>23.90</td>
<td>20.26</td>
<td>3.25</td>
</tr>
<tr>
<td>Add-ons per participant</td>
<td>4.93</td>
<td>1.14</td>
<td>—</td>
</tr>
<tr>
<td>Total per participant</td>
<td>28.83</td>
<td>21.40</td>
<td>3.25</td>
</tr>
<tr>
<td>Total per sample size</td>
<td>11,387.85</td>
<td>2311.20</td>
<td>328.25</td>
</tr>
<tr>
<td>Grand total, n = 604</td>
<td>14,027.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3. Average Contribution Margins From Colonoscopy**

<table>
<thead>
<tr>
<th>Cost, $US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expens</td>
</tr>
<tr>
<td>Completer, n = 395</td>
</tr>
<tr>
<td>Navigation per participant</td>
</tr>
<tr>
<td>Add-ons per participant</td>
</tr>
<tr>
<td>Total per participant</td>
</tr>
<tr>
<td>Total per sample size</td>
</tr>
<tr>
<td>Grand total, n = 604</td>
</tr>
</tbody>
</table>

Abbreviations: PN, patient navigation.
the same as those for the current PN groups. The net incomes were $165,456.00 at the 80% completion level, $130,420.50 at the 65% completion level, and $120,500.00 at the 50% completion level. Thus, our current PN model was $35,035.50 more profitable than our historic PN model and $44,956.00 more profitable than the national average.

In trying to determine whether it would be realistic to hire a dedicated navigator, we observed that it would be feasible to hire a dedicated navigator on a part-time basis. By using our institution’s data based on a 37.5-hour work week, a $50,000 per year full-time equivalency salary with benefits, an average 51.5 minutes spent per patient (equivalent to 0.858 hours per patient; unpublished results), and a hypothetical volume of 1000 patients per year, we observed that a navigator would only need to be hired at 44% effort (0.44 full-time equivalency; 858 navigation hours per 1950 full-time hours per year) to complete the navigation volume at a cost of $21,999.12 per year (equivalent to $25.64 per hour). With a few thousand dollars of add-ins, the hypothetical cost for the institution could increase to approximately $25,000.00 total. The PN position, at $25,000.00 per year, if implemented in an environment with a 50% screening adherence rate and using an ACM of $241.00 for a colonoscopy (as modeled in Table 4), still would generate a profit of $95,500.00. At an 80% adherence rate, the profit would increase to $167,800.00. The cost of employing a part-time navigator would be more than covered by the increased profit to the institution.

**DISCUSSION**

Unlike other cancer screening tests, such as Papanicolaou smears, mammograms, and prostate-specific antigen tests, colonoscopy is a complex, invasive test that is associated with a variety of administrative and personal barriers. PN is an increasingly popular strategy to enhance colonoscopy completion rates. We and others have

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**Table 3. Net Income from Colonoscopy**

<table>
<thead>
<tr>
<th>Income Variable</th>
<th>Screening Colonoscopy</th>
<th>Colonoscopy with Biopsy</th>
<th>Colonoscopy with Snare</th>
<th>Noncompleters</th>
<th>No PN</th>
<th>Row Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>211</td>
<td>119</td>
<td>65</td>
<td>108</td>
<td>101</td>
<td>604</td>
</tr>
<tr>
<td>ACM, $US</td>
<td>335.00</td>
<td>194.00</td>
<td>23.00</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total contribution margin: ACM × sample size, $US</td>
<td>70,685.00</td>
<td>23,086.00</td>
<td>1495.00</td>
<td>—</td>
<td>—</td>
<td>95,266.00</td>
</tr>
<tr>
<td>PN for sample size, $US</td>
<td>−6083.13</td>
<td>−3430.77</td>
<td>−1873.95</td>
<td>−2311.20</td>
<td>−328.25</td>
<td>−14,027.30</td>
</tr>
<tr>
<td>Net income, $US</td>
<td>64,601.87</td>
<td>19,655.23</td>
<td>−378.95</td>
<td>−2311.20</td>
<td>−328.25</td>
<td>81,238.70</td>
</tr>
</tbody>
</table>

Abbreviations: ACM, average contribution margin; PN, patient navigation.

* PN cost values were taken from Table 2, the row headed “Total per participant.”

**Table 4. Incremental Effects of Patient Navigation on Net Income Modeled on a Theoretical Cohort of 1000 Patients**

<table>
<thead>
<tr>
<th>Variable</th>
<th>PN: Current Study</th>
<th>Historic PN: Mount Sinai School of Medicine</th>
<th>National Average: Assumed no PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonoscopy completion rate, %</td>
<td>≈80</td>
<td>≈65</td>
<td>≈50</td>
</tr>
<tr>
<td>Theoretical no. completers per 1000</td>
<td>800</td>
<td>650</td>
<td>500</td>
</tr>
<tr>
<td>ACM, $US</td>
<td>241.00</td>
<td>241.00</td>
<td>241.00</td>
</tr>
<tr>
<td>Total contribution margin: ACM × no. of completers, $US</td>
<td>192,800.00</td>
<td>156,650.00</td>
<td>120,500.00</td>
</tr>
<tr>
<td>PN for completers: $28.83 × no. of completers, $US</td>
<td>−23,064.00</td>
<td>−18,739.50</td>
<td>—</td>
</tr>
<tr>
<td>PN for noncompleters: $21.40 × no. of noncompleters, $US</td>
<td>−4280.00</td>
<td>−7490.00</td>
<td>—</td>
</tr>
<tr>
<td>Net income, $US</td>
<td>165,456.00</td>
<td>130,420.50</td>
<td>120,500.00</td>
</tr>
<tr>
<td>Additional net income of current PN sample relative to other samples, $US</td>
<td>+35,035.50</td>
<td>+44,956.00</td>
<td>—</td>
</tr>
</tbody>
</table>

Abbreviations: ACM, average contribution margin; PN, patient navigation.

* The weighted ACM was based on the number of participants who completed each type of colonoscopy procedure.

* PN cost values were taken from Table 2, the row headed “Total per participant.”
demonstrated that colonoscopy rates can increase considerably when a programmatic effort is implemented to make scheduling of procedures (eg, OAE) and patient understanding and adherence to the procedures (eg, PN) available.

Building on our previous work with a single patient navigator, we have been studying whether using peers as navigators and creating a more focused, culturally targeted approach would further enhance SC rates among our predominantly minority patient population. The expansion of our program raised the question, “Is PN a sound financial investment?”

Herein, we report that implementing PN programs at our institution led to an SC adherence rate of 78.5%. The 395 completed colonoscopies brought in a total contribution margin of $95,266.00 over a 2-year period. The resulting net income after deducting $14,027.30 (the cost of PN) was $81,238.70. We conclude, therefore, that, among a predominantly minority population of low socioeconomic status, most of whom were covered by public health insurance, PN programs still generate a profit for the institution. By using models, we also demonstrated that our current PN program compared favorably with our institution’s first PN program and with the general population. Finally, we demonstrated that the cost of hiring a part-time dedicated navigator would likely be covered by the increase in profit to the institution.

Our study has several limitations. First, our increase in screening adherence cannot be attributed solely to the PN programs. Data from the National Health Interview Survey demonstrate that SC rates have been increasing over time. In New York City, the percentage of adults aged >50 years who have had a colonoscopy in the last 10 years increased from 61.7% in 2007 to 67.5% in 2010. In East Harlem (the current study setting), 62.3% of residents were adherent to SC. Nevertheless, our completion rate of 78.5% represents a substantial increase in adherence even beyond this upward trend. Second, it is likely that some participants would have completed screening regardless of navigation, but it was not possible to determine the size of that group. Because of this, we calculated costs and profits based on all colonoscopies completed. Third, we analyzed SC adherence from 4 types of PN at our institution as part of 1 data set. We conducted our analyses based on the assumption that any effects of variations between the 4 PN protocols were small and that the cost analysis would not be significantly impacted by these differences. Fourth, because PN has become standard practice at our institution, it was not possible to have a non-navigated control group (for a retrospective review of a vulnerable non-navigated population in an OAE system, see Kazarian et al). Thus, data from the comparison groups were collected in different years and differed along some demographic parameters. For instance, the general population has a higher percentage of non-Latino whites than our patient population. Because screening rates generally are higher in this group than among minorities, the national average may overestimate adherence to SC. Fifth, we made the supposition that PN programs are not widely implemented on a national level. It is possible that they are more common than we assume. Sixth, the current analysis is based on ACMs from SC at an urban academic center in which the majority of patients (79.5%) are covered by public insurance. Therefore, our results may not be generalizable to other settings in which the insurance mix differs. If anything, we would expect the financial balance sheet to be more favorable in environments with more private insurance. Moreover, because our increase in hospital net income was based on improving adherence rates, we would propose that any institution performing SC would likely derive financial benefit from implementing a PN program with a part-time dedicated navigator. Finally, the current analysis is not a cost-effectiveness analysis. It does not take into consideration the costs involved in rescheduling “no-shows” and patients who had inadequate bowel preparations or the costs of pathology. We previously reported that PN substantially reduces the no-show and poor-preparation rates. These issues, along with the cost value of the colonoscopy findings and the cost related to professional fees, will be the subject of a future cost-effectiveness analysis.

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