Value and the Medical Home: Effects of Transformed Primary Care

Richard J. Gilfillan, MD; Janet Tomcavage, RN, MSN; Meredith B. Rosenthal, PhD; Duane E. Davis, MD; Jove Graham, PhD; Jason A. Roy, PhD; Steven B. Pierdon, MD; Frederick J. Bloom Jr, MD, MMM; Thomas R. Graf, MD; Roy Goldman, PhD, FSA; Karena M. Weikel, BA; Bruce H. Hamory, MD; Ronald A. Paulus, MD, MBA; and Glenn D. Steele Jr, MD, PhD

Background: The primary care medical home has been promoted to integrate and improve patient care while reducing healthcare spending, but with little formal study of the model or evidence of its efficacy. ProvenHealth Navigator (PHN), an intensive multidimensional medical home model that addresses care delivery and financing, was introduced into 11 different primary care practices. The goals were to improve the quality, efficiency, and patient experience of care.

Objective: To evaluate the ability of a medical home model to improve the efficiency of care for Medicare beneficiaries.

Study Design: Observational study using regression modeling based on preintervention and postintervention data and a propensity-selected control cohort.

Methods: Four years of claims data for Medicare patients at 11 intervention sites and 75 control groups were analyzed to compute hospital admission and readmission rates, and the total cost of care. Regression modeling was used to establish predicted rates and costs in the absence of the intervention. Actual results were compared with predicted results to compute changes attributable to the PHN model.

Results: ProvenHealth Navigator was associated with an 18% (P <.01) cumulative reduction in inpatient admissions and a 36% (P = .02) cumulative reduction in readmissions across the total population over the study period.

Conclusions: Investing in the capabilities of primary care practices to serve as medical homes may increase healthcare value by improving the efficiency of care. This study demonstrates that the PHN model is capable of significantly reducing admissions and readmissions for Medicare Advantage members.

(Am J Manag Care. 2010;16(8):607-614)

For author information and disclosures, see end of text.

Both policy makers and private payers in the United States have begun to recognize that improving care coordination across the fragmented healthcare delivery system is essential to improve the quality and affordability of care. Related efforts include recent Medicare demonstrations examining the impact of external disease management programs and payment reforms that reward integrated care organizations.[1,2] An alternative approach—the patient-centered medical home—involves enhanced primary care practices as the locus of integration and coordination of care. A version of the medical home model was originally described by the American Academy of Pediatrics and has more recently been refined and delineated by a coalition of professional societies through a set of joint principles.[3,4]

Elements of and antecedents to the current concept of the medical home have been shown to be associated with higher quality of care and patient experience.[5-8] Closely related work on Wagner's Chronic Care Model suggests the potential of this approach to improve the quality of care for patients with chronic conditions and prevent costly acute care.[9-11] However, empirical evidence is scant about whether efforts to transform practices into medical homes will improve quality or yield healthcare cost savings. Two recent studies demonstrate both the challenges of practicing transformation in primary care and the potential benefits in terms of patient and provider experience as well as preventable acute care utilization.[12,13]

In this study, we evaluate the impact of a medical home model, ProvenHealth Navigator (PHN), introduced for Medicare Advantage enrollees in 11 practices owned by Geisinger Health System (GHS) in Pennsylvania. ProvenHealth Navigator is a new model of care designed to improve the quality, efficiency, and patient experience of care. It functions as a partnership between participating primary care practices and Geisinger Health Plan (GHP). Central to the model is the transfer of population management capabilities, including nurse case managers, from the health plan to the practice sites. This report focuses on the impact of the PHN on hospitalization and healthcare spending compared with a matched set of practices, using 2 years of preintervention and 2 years of postintervention data.

In this article
Take-Away Points / p608
www.ajmc.com
Full text and PDF
Web exclusive
eAppendix

METHODS

Study Population

We assembled medical claims data for services provided from January 1, 2005, through December 31, 2008,

Take-Away Points

ProvenHealth Navigator (PHN), a multidimensional medical home model, was introduced into 11 Geisinger Health System primary care practices with the goal of improving the quality, efficiency, and patient experience of care for Medicare Advantage patients.

- This transformed primary care model resulted in significantly fewer hospital admissions (18%) and readmissions (36%) when measured across the entire population.
- Total care costs for the entire PHN population decreased 7%, but this decrease did not achieve statistical significance.
- Medical home models seeking to change cost trends require a multidimensional transformation of primary care practice with intensive case management and a payer partnership.

and paid through June 30, 2009, and demographic information for 15,310 members of GHP's Medicare Advantage product. Using these data, we identified all claims for enrollees who were cared for by physician practices that implemented the PHN model and enrollees who were cared for by matched physician practices during the study period. Enrollees who switched physician practices during the study period were excluded from the analyses. Continuous enrollment was not required for inclusion in the study sample; analyses conducted on the continuously enrolled subpopulation yielded qualitatively similar results.

This analysis was approved by the GHS institutional review board.

Study Environment

Located in rural northeastern and central Pennsylvania, GHS is a not-for-profit, integrated healthcare organization comprised of the Geisinger Clinic, which has nearly 800 employed physicians; 2 acute tertiary/quaternary care hospitals; GHP, which serves 190,000 commercial and 38,000 Medicare Advantage members; and numerous other clinical programs and facilities. Geisinger Health Plan also utilizes a network of more than 18,000 non-GHS providers and 80 non-GHS hospitals.

Geisinger Health System has an electronic health record (EHR) implemented systemwide for all ambulatory and inpatient care. This EHR also is used by GHP case managers and patients. These EHR capabilities were operational in all participating practices for several years prior to the launch of the PHN. All Geisinger-owned primary care practices, including the PHN sites, participated in a preexisting, EHR-enabled quality initiative to improve preventive, diabetes, and coronary artery disease care.[14]

Implementation of ProvenHealth Navigator

The PHN model has 5 functional program components: (1) Patient-Centered Primary Care Team Practice, (2) Integrated Population Management, (3) Micro-delivery Systems, (4) Quality Outcomes Program, and (5) Value Reimbursement System (**Table 1**). A more detailed description of each component, with a comparison to the National Committee for Quality Assurance (NCQA) Physician Practice Connections and Patient-Centered Medical Home (PPC-PCMH) standards, can be found in the **eAppendix** at **www.ajmc.com**.

Many of the elements required under the PPC-PCMH standards are provided in the Patient-Centered Primary Care Team Practice component. Access criteria are met through close monitoring of performance on appointment standards (NCQA standard 1). Tracking and registry capabilities for several chronic diseases are embedded into the Primary Care Team Practice component's EHR (NCQA standard 2). Reminders for preventive and chronic disease care are part of the quality improvement initiative described above (NCQA standards 3 and 8). Self-management support has been a central theme in the team-based care approach the practices use; disease and case management were added as part of the PHN model (NCQA standard 4). Electronic prescribing as well as test and referral tracking also are available in the EHR (NCQA standards 5, 6, and 7). Advanced communication capabilities for patients and providers are available through the electronic portals portion of the EHR system (NCQA standard 9).

Although the PHN model was created prior to the publication of NCQA's PPC-PCMH standards, it does address all of the capabilities described in those standards. However, because our goal was to impact the quality, patient experience, and efficiency of care across the full continuum of care, not just in the office of the primary care physician (PCP), we believed that additional components and activities were necessary. The activities included in the 5 components are described further in Table 1. Several are worth noting. First, many of GHP's population management activities were moved to the practice site. Geisinger Health Plan provided case managers for each practice at a ratio of 1 nurse for every 800 Medicare patients to serve as the hub for population-based activities. Second, the model explicitly calls for the PCPs to develop systems of care for their patients when they are seen by other physicians or in other settings. Third, additional financial support was provided by GHP to pay for new services in the PCP office. An example is dedicated phone lines to allow high-risk patients to contact their case managers directly. Fourth, performance reports documenting the quality, utilization, and overall cost-of-care results were provided to the practice. Finally, we added a shared savings incentive model to the GHP reimbursement arrangement. Quality

outcomes were aligned with preexisting preventive and chronic disease care quality initiatives. Shared savings incentive payments then were based on improvement in bundled metrics for these services and other agreed-upon metrics.

Implementation was focused on the GHP Medicare Advantage population because the high prevalence of chronic illnesses and the resource use of this population provide the best opportunity to demonstrate and evaluate the impact of the interventions. In October 2006 and January 2007, the PHN model was introduced into 2 pilot GHS practice sites selected because of their large GHP Medicare Advantage population and because their locations made them easily accessible for our PHN management team. During 2007 and January of 2008, the PHN model was expanded to include the Medicare Advantage members in 9 additional practices (Table 2). Prior to implementation at each site, all practice staff were trained on the core components of the model.

Table 1. ProvenHealth Navigator Model Description

Model Component	Component Description
Patient-Centered Primary Care Team Practice	*Patient-centered teams:* Teams composed of PCP, physician's assistant, nurses, administrative staff, and case manager. *Patient tracking and registries:* EHRs provide preventive and chronic care reminders based on patients' health conditions and status. *Expanded in-office treatments:* Expand the scope of in-office treatments to encourage office rather than ED utilization. *Improved access:* Same-day appointments, direct phone lines to case managers.
Integrated Population Management	*Population profiling:* Predictive modeling to risk-stratify the population. *Primary prevention:* Preventive services driven by patient and physician reminder systems. *Case management:* Case managers in each office provided by health plan create patient-centered intervention plans. *Disease management:* To address needs of moderate-risk patients with chronic illnesses. *Remote monitoring:* For high-risk or post–hospital discharge patients using home interactive voice response and in-home wireless devices. *Transitions of care management:* Case manager contacts and manages transitions for all patients leaving hospitals or other settings. *Pharmaceutical management:* Medication adherence and reconciliation by physicians and case managers. *Life planning:* Case managers facilitate advance directive discussions.
Micro-Delivery Systems	*Value-based referral system:* Referrals are made from predefined lists of aligned providers to develop closer relationships and improve communication between PCP and specialists. *360-Degree care systems:* Practices design care systems for patients in other care sites (ie, home health, acute hospitals, skilled nursing facilities, EDs).
Quality Outcomes Program	Ten quality metrics are tracked, including patient satisfaction, preventive and chronic disease care bundle metrics, encounters per patient, posthospital follow-up rate, and percentage of high-risk patients with current care plans.
Value Reimbursement System	*Fee-for-service:* Fee-for-service payments to reward practices for improving access to care. *Pay-for-performance:* Payments driven by achieving quality targets alone. *Physician and practice transformation stipends:* Support new PHN activities. *Incentive payments:* Shared savings model based on savings but paid based on the percentage of quality targets achieved.

ED indicates emergency department; EHR, electronic health record; PCP, primary care physician; PHN, ProvenHealth Navigator.

Initially, the PHN teams focused on improving the management of the highest risk patients. The GHP-embedded case managers were integrated as part of the practice care team. They were provided with utilization and predictive modeling reports derived from GHP claims data. For the first time, these reports gave the practice teams a systematic way to identify relative risk for their GHP patients. The case managers then met with the highest risk patients to design patient-specific care plans. They also provided close follow-up for patients transitioning from hospital to home. This activity focused on reaching out to the patient within 48 hours of discharge, medication reconciliation, appropriate resources and social supports in the home, and timely follow-up with the patient's PCP. Monthly team meetings that included PCPs, office staff, case managers, and GHP staff were held to evaluate results, discuss practice workflow and care access, and review hospital admissions for missed opportunities.

Table 2. ProvenHealth Navigator Site Start Dates and Average Membership

Clinic No.	Start Date	Average Membership
1	October 2006	647
2	January 2007	2107
3, 4, 5		
	November 2007	1573
6, 7, 8	December 2007	2099
9, 10, 11	January 2008	1819

The case managers also formed partnerships with preferred home health agencies and nursing homes. Outreach and education regarding the PHN strategy were provided to these agencies. Pharmacy management initiatives were developed to improve generic utilization, assist members approaching the Medicare Part D coverage gap, and provide members with acute care protocols for treating exacerbations of chronic conditions.

As progress was made, expanded strategies focused on members at moderate and low risk. Patients with gaps in preventive or chronic care were identified by EHR registries and health plan claims tools. Health plan nurses with training in disease management targeted moderate-risk members with hypertension, coronary artery disease, and diabetes for self-management education; worked with providers to ensure appropriate screenings; and assisted in optimizing medications. Site-based practice staff reached out to low-risk members to coordinate preventive care screenings such as mammograms, colorectal screening, and influenza vaccinations.

Measures of Impact

Because we hypothesized that opportunities to reduce total healthcare spending through this model would relate to the ability of the practice to prevent hospitalizations and readmissions, we constructed monthly series of these events for each patient. Readmissions were defined as all medical–surgical patients admitted to acute care within 30 days from time of discharge for primary admission. Total healthcare spending (plan payment plus copayment) was computed for each member for each month by summing the allowed amount on medical claims. Pharmacy claims were not included in total spending because of variability in prescription drug coverage among members and over time because of the introduction of Medicare Part D in 2006. To protect the confidentiality of GHP payment information, we indexed spending so that the mean for patients in the nonintervention practices in January 2005 was set to $100.

Analytic Approach

We analyzed data at the patient-month level using multivariate linear mixed regression to measure the effect of the PHN intervention on hospital admissions per 1000 members, readmissions per 1000 members, and total nonprescription per member per month medical spending. Because we could access data from each clinic before and after PHN implementation along with concurrent data from non-PHN practices, our chosen approach was to model the expected incremental effect of PHN status on outcomes during the postintervention period, after adjusting for all covariates. The results reported in this article, therefore, represent the effect of PHN within a clinic and not simply a comparison of PHN clinics with non-PHN clinics. Following the approach of Berlin et al,[15] we decomposed PHN status into 2 components: the percentage of the study period during which each practice implemented PHN (ie, clinic-exposure association) and whether PHN was in effect during each observation (ie, a time-varying component). This 2-variable approach was necessary because, although our primary interest was the impact of a clinic switching from non-PHN to PHN status, there could be confounding due to the selection of PHN clinics and variability of different clinics' duration of exposure to PHN. The first variable was time invariant and thus could represent the incremental effect of the intervention itself. It could, however, absorb bias from clinic-exposure association as well as biases between clinics selected or not selected for PHN. By contrast, the second variable (ie, a binary indicator of current PHN status centered around the time-invariant component at each site) isolated the actual effect of the PHN intervention on a clinic population, which was the objective of the study. Other covariates in the model were Hierarchical Condition Category (HCC) risk score,[16] the year, and interactions between both PHN variables and year (to capture differences in trends within and among the PHN and non-PHN groups) and between PHN variables and HCC score. Age and sex were not included as separate regressors because they were captured in the HCC score. We also included a series of variables for calendar months to capture seasonal variation in utilization and spending.

Regression models were estimated using general estimating equations with exchangeable covariance. Consistent with the underlying nature of the data, we used a log-link function and quasi-Poisson distribution for monthly admissions and readmissions. To analyze monthly spending, we used a standard 2-part model modified to account for a small amount of capitation GHP pays uniformly for all members. The second part of the spending model was specified with a log-link function and normal distribution. These models allowed us to calcu-

Table 3. Characteristics of the Study Sample at Baseline (2005)

Characteristic	Intervention Cohort (n = 8634)	Matched Comparison Cohort (n = 6676)	*P* for Difference
Age, mean, y	73.5	74.1	<.001
65-74, %	51	48	
≥75, %	43	46	
Female, %	56	57	.75
Hierarchical Condition Category score, mean	1.02	1.01	.53
Admissions per 1000 members per year	288	278	.24
Readmissions per 1000 members per year	46	45	.74
Spending per member per month[a]	93	89	.04

[a]Total spending (plan payment plus member copayment), excluding prescription drugs, indexed to equal 100 for the intervention cohort at month 1 to protect confidentiality of spending figures.

late the difference between the observed outcomes for active PHN participants and their expected outcomes if the PHN had not been implemented.

To adjust for secular trends in the postintervention time period, we utilized data from a group of non-GHS practices that cared for GHP Medicare Advantage enrollees as a control cohort. We considered using either a GHS or non-GHS control cohort, but chose the non-GHS practices for 2 reasons: (1) the larger sample of non-GHS practices available for matching and (2) concerns about spillover effects of PHN on non-PHN practices within GHS. To ensure similarity between the intervention and nonintervention groups, we used propensity score matching to identify a subset of practices that were most similar to the intervention practices in terms of patient population and outcomes in 2005. Because the PHN model was implemented at the practice level, we sought to match the intervention and nonintervention cohorts at this level. We estimated propensity score models predating the adoption of the PHN model by using the following practice-level variables, all measured for 2005: mean patient age, percentage of male patients, mean HCC score, total per member spending, inpatient admissions, and readmissions. Each practice that adopted the PHN model was matched to 10 practices that did not adopt the PHN model based on the proximity of their estimated propensity score. Only those practices with estimated log odds from the propensity model that were within 0.60 standard deviation of an intervention site were counted as matches. A sensitivity analysis (not shown) with a GHS control cohort yielded results that were within the statistical confidence intervals (CIs) of the results presented here.

RESULTS

Because of overlap between sites, the propensity score model yielded a total of 75 distinct non-Geisinger practices within the common support region that could be matched with 1 or more of the 11 intervention sites (data not shown). Data from each of these sites were weighted to appropriately reflect the number of intervention sites with which they were matched. At baseline (2005), there were no statistically significant differences in sex or HCC scores of patients treated in the 11 PHN sites compared with the propensity score–matched non-GHS practices (Table 3). Patients treated in the intervention sites were approximately 6 months younger on average than those treated in comparison sites (P <.001), but because all results were regression adjusted, any potential bias associated with this age difference should have been eliminated. Average monthly admissions and readmissions per 1000 patients also were similar between the 2 groups (P = .24 and P =.74, respectively). Average spending per member per month was approximately 4% higher in the intervention cohort than in the comparison cohort (P = .04).

Table 4 and the Figure present the cumulative percent differences in actual admissions, readmissions, and total spending for PHN members versus the expected outcomes if PHN had not been implemented. As described previously, these expected outcomes were calculated by setting the time-dependent PHN indicator variable to zero in each multivariable regression model while keeping all other covariates constant. Outcomes were expressed as estimated effects with bootstrapped 95% CIs and as P values. The PHN model was associated with a total cumulative reduction of 56 admissions per 1000 members per year (18%; 95% CI, –30% to –5%; P <.01). The PHN model also was associated with a cumulative effect of 21 fewer readmissions per 1000 members per year (–36%; 95% CI, –55% to –3%; P = .02). Finally, the regression model estimated that the PHN model reduced cumulative total spending by 7%, but this difference did not reach significance (95% CI, –18% to 5%; P = .21). Results were qualitatively similar if all non-GHS clinic sites, rather

Table 4. Estimated Effect of ProvenHealth Navigator on Admissions, Readmissions, and Spending[a]

Variable	PHN Participants		Expected Difference Attributable to PHN	95% CI	*P*
	Active	Simulated			
Admissions per 1000 members per year	257	313	–56 (–18%)	–30% to –5%	<.01
Readmissions per 1000 members per year	38	59	–21 (–36%)	–55% to –3%	.02
Total costs PMPM, $	107	116	–9 (–7%)	–18% to +5%	.21

CI indicates confidence interval; PHN, ProvenHealth Navigator; PMPM, per member per month.
[a]Total spending (plan payment plus member copayment) values exclude prescription drugs and are indexed to equal $100 for non-PHN sites in January 2005 to protect confidentiality of spending figures. Results are reported for 2 groups: (1) PHN participants (active), representing only data from participants at PHN sites after implementation and (2) PHN participants without PHN (simulated), representing the expected outcomes from the previous group if the PHN had never been implemented.

than the propensity-matched comparison group, were used as a control cohort (data not shown).

DISCUSSION

Introduction of a medical home care delivery model was associated with a significant reduction in hospital admissions and readmissions for a population of Medicare Advantage enrollees. Our findings present a contrast to the recently published results of the Medicare Health Support demonstration, a set of parallel, randomized controlled trials of traditional disease management delivered by third parties to disease-specific populations.[2] Despite targeting sicker individuals, participating programs had little effect on healthcare utilization or spending. We hypothesize that the comparative success of the PHN model was partly due to its ability to leverage existing physician–patient and interprovider relationships to fundamentally change the way care is delivered rather than work outside the system to improve care.

Because the PHN model is a complex intervention, it is difficult to ascertain which elements are responsible for specific improvements in care. Our findings, coupled with qualitative observations, however, highlight the importance of placing nurse case managers directly into the practices and arming them with data and analytical capabilities. With timely information on emergency department (ED) and inpatient use, case managers are able to manage transitions of care to ensure early postdischarge follow-up and medication reconciliation. In addition, proactive identification of at-risk individuals provides an opportunity to use patient-specific action plans to implement timely interventions for acute exacerbations of chronic illnesses.

Our lack of findings on per member per month spending likely was due at least in part to the sample size and duration of the study, coupled with the skewed distribution of the healthcare spending data. We note that based on its own actuarial analysis, GHP found that the PHN practices did generate savings and triggered incentive payments under the quality-based shared savings incentive system.

Based on our understanding of the initial focus of PHN practices and the policy importance of understanding the impact on resource use, we focused the analyses on hospital utilization and total costs. In future work, it will be important to examine a broader scope of process and outcome measures, including ED visits, clinical quality measures, physician and nurse professional satisfaction, and patient experience. Tracking this larger set of outcomes will not only allow us to better answer questions of sustainability but also permit refinement of the model.

These conclusions are tempered by several study limitations. First, our measure of medical spending excluded the cost of prescription drugs. There are concerns that improved care coordination may increase the cost of prescription drugs, thereby decreasing or eliminating medical services savings.[17] However, a separate analysis of the changes in drug expense over time for both groups of practices demonstrated no differential impact or erosion of savings in the PHN sites. Second, the PHN model is situated in an integrated payer–provider environment (ie, the payer and provider are part of the same corporate entity) with long-standing use of an ambulatory EHR, in a Medicare population with high baseline spending and relatively little patient turnover. These factors almost surely contributed to PHN's success and may therefore limit generalizability to other settings. The PHN model, however, has subsequently been introduced into non-GHS practices. Moreover, implementation experience to date suggests that the key components of the PHN model are on-site case management, the use of population data, and the shared savings incentives, all of which could be implemented outside of an integrated delivery model. Third, as described above, while the PHN model is aligned with the NCQA PPC-PCMH standards, it also includes other components. In particular, PHN

implementation likely differs from many other medical home efforts that may not include robust case management programs, attention to care delivered outside of the PCP office, shared savings reimbursement, or direct health plan support. Although advocates of the medical home will see these findings as general support for that model, attention should be paid to the specific elements of the intervention and the limits to generalizability noted above. Finally, although every effort was made to account for secular trends and confounding factors, our study was observational in nature and the usual caveats with regard to causal inference apply.

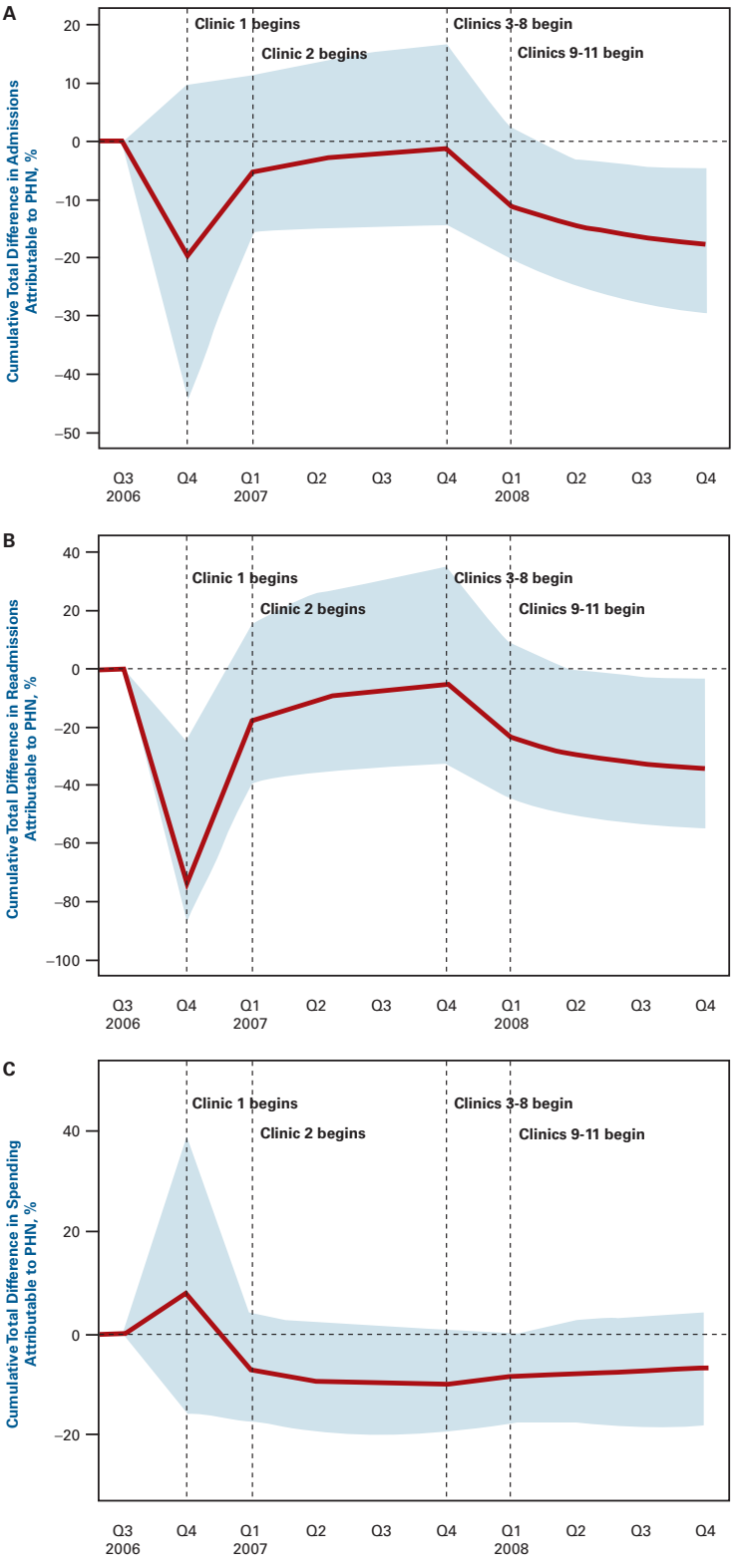
The strengths of the study design also are significant and include the fact that we were able to analyze healthcare spending and utilization for an entire population before and after the intervention alongside a well-matched comparison group. This approach allowed for relatively robust causal inference while minimizing the potential confounding effects of regression to the mean and survivorship biases.[18]

Cost control in the US healthcare system has long been an elusive goal. In the current economic downturn, the need for evidence-based policies to meet this objective is more urgent than ever. To the extent that these results can be generalized, PHN offers an appealing model to improve value through prevention of hospital admissions and readmissions by transforming the delivery of primary care. Continued experimentation with models based on these principles in a range of practice settings and patient populations will be critical for policy development.

Acknowledgments

Dr Rosenthal acknowledges financial support from the Commonwealth Fund. Data were provided through the Actuarial Services Department of Geisinger Health Plan. The authors thank Richard Bitting, BBA, and Albert Wolstein, MBA. Analysis was provided by staff at the Henry Hood Center for Health Research.

Figure. Actual Versus Expected Cumulative Differences in Outcomes for Admissions (A), Readmissions (B), and Total Spending (C)[a]



PHN indicates ProvenHealth Navigator.
[a]Outcomes for active PHN participants versus the expected outcomes for those participants if PHN had not been implemented. Shaded areas indicate 95% confidence intervals.

Author Affiliations: From Geisinger Health System (RJG, JT, DED, JG, SBP, FJB, TRG, KMW, BHH, RAP, GDS), Danville, PA; Harvard School of Public Health (MBR), Boston, MA; University of Pennsylvania (JAR), Philadelphia, PA; Humana, Inc (RG); Louisville, KY.

Funding Source: There was no external funding for this report.

Author Disclosures: Drs Gilfillan, Davis, Graham, Pierdon, Bloom, Graf, Hamory, Paulus, and Steele and Ms Tomcavage and Ms Weikel are employees of the Geisinger Health System, and to the extent the ProvenHealth Navigator intervention exerted a positive effect on the total cost of care for this population, Geisinger's financial performance may have been improved. The intervention also may have contributed to improvement in Geisinger's quality metrics. As employees, these authors have an incentive compensation arrangement that is impacted by Geisinger's financial and quality results. Dr Bloom also reports serving on Merck's Speaker's Bureau on the Patient-Centered Medical Home. Dr Goldman reports having worked for Geisinger during the implementation of the ProvenHealth Navigator. Drs Rosenthal and Roy report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (RJG, JT, MBR, DED, JG, SBP, RG, KMW, GDS); acquisition of data (RJG, JT, DED, FJB, KMW); analysis and interpretation of data (RJG, JT, MBR, JG, JAR, TRG, RG, KMW, RAP, GDS); drafting of the manuscript (RJG, JT, MBR, DED, JG, JAR, FJB, BHH, RAP, GDS); critical revision of the manuscript for important intellectual content (RJG, MBR, JG, JAR, SBP, FJB, TRG, RG, BHH, RAP, GDS); statistical analysis (MBR, JG, JAR, RG); provision of study materials or patients (JT, TRG), administrative, technical, or logistic support (RJG, JT, SBP, FJB, TRG); and supervision (RJG, SBP, RG, RAP, GDS).

Address correspondence to: Richard J. Gilfillan, MD, 2811 N St NW, Washington, DC 20007. E-mail: rjgilfil@ptd.net.

REFERENCES

1. Government Accountability Office. *Medicare Physician Payment: Care Coordination Programs Used in Demonstration Show Promise, but Wider Use of Payment Approach May Be Limited.* Washington, DC: GAO; February 2008. GAO-08-65.

2. Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *JAMA.* 2009;301(6): 603-618.

3. Medical Home Initiatives for Children With Special Needs Project Advisory Committee. American Academy of Pediatrics. The medical home. *Pediatrics.* 2002;110(1 pt 1):184-186.

4. Patient Centered Primary Care Collaborative. Joint principles of the patient centered medical home. February 2007. http://www.pcpcc.net/joint-principles. Accessed July 17, 2010.

5. Grumbach K, Selby JV, Damberg C, et al. Resolving the gatekeeper conundrum: what patients value in primary care and referrals to specialists. *JAMA.* 1999;282(3):261-266.

6. Schoen C, Osborn R, Doty MM, Bishop M, Peugh J, Murukutla N. Toward higher-performance health systems: adults' health care experiences in seven countries. *Health Aff (Millwood).* 2007;26(6):w717-w734.

7. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q.* 2005;83(3):457-502.

8. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. *JAMA.* 1995;274(4):305-311.

9. Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Aff (Millwood).* 2001;20(6):64-78.

10. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, part 2. *JAMA.* 2002;288(15):1909-1914.

11. Tsai AC, Morton SC, Mangione CM, Keeler EB. A meta-analysis of interventions to improve care for chronic illnesses. *Am J Manag Care.* 2005;11(8):478-488.

12. Nutting PA, Miller WL, Crabtree BF, Jaen CR, Stewart EE, Stange KC. Initial lessons from the first national demonstration project on practice transformation to a patient-centered medical home. *Ann Fam Med.* 2009;7(3):254-260.

13. Reid RJ, Fishman PA, Yu O, et al. Patient-centered medical home demonstration: a prospective, quasi-experimental, before and after evaluation. *Am J Manag Care.* 2009;15(9):e71-e87.

14. Weber V, Bloom F, Pierdon S, Wood C. Employing the electronic health record to improve diabetes care: a multifaceted intervention in an integrated delivery system. *J Gen Intern Med.* 2008;23(4):379-382.

15. Berlin JA, Kimmel SE, Ten Have TR, Sammel MD. An empirical comparison of several clustered data approaches under confounding due to cluster effects in the analysis of complications of coronary angioplasty. *Biometrics.* 1999;55(2):470-476.

16. Pope GC, Kautter J, Ellis RP, et al. Risk adjustment of Medicare capitation payments using the CMS-HCC model. *Health Care Financ Rev.* 2004;25(4):119-141.

17. Fireman B, Bartlett J, Selby J. Can disease management reduce health care costs by improving quality? *Health Aff (Millwood).* 2004;23(6):63-75.

18. Duncan I. An actuarial method for evaluating disease management outcomes. In: *Managing and Evaluating Healthcare Intervention Programs.* Winsted, CT: Actex Publications; 2008:135-147. ■