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Can a Patient-Centered Medical Home Lead to Better Patient Outcomes? The Quality Implications of Geisinger’s ProvenHealth Navigator

Daniel D. Maeng, PhD,1 Thomas R. Graf, MD,1 Duane E. Davis, MD,1 Janet Tomcavage, RN, MSN,1 and Frederick J. Bloom Jr, MD, MMM1

Abstract
One of the primary goals of the patient-centered medical home (PCMH) is to provide higher quality care that leads to better patient outcomes. Currently, there is only limited evidence regarding the ability of PCMHs to achieve this goal. This article demonstrates the effect of PCMHs in improving certain clinical outcomes, as shown by the ProvenHealth Navigator (PHN), an advanced PCMH model developed and implemented by Geisinger Health System. In this study, the authors examined the claims data from Geisinger Health Plan between 2005 and 2009 and estimated the effect of PHN on reducing amputation rates among patients with diabetes, end-stage renal disease, myocardial infarction, and stroke. The results show that, despite its relatively short period of existence, PHN has led to significant improvements in certain outcomes, further illustrating its potential as a care delivery model to be adopted on a wider scale.

Keywords
medical home, outcome, quality, primary care

There is mounting evidence regarding the effectiveness of patient-centered medical home (PCMH) models in delivering health care using primary care as the integrator of a patient-centered approach.1 Geisinger’s advanced medical home model, known as ProvenHealth Navigator (PHN), has shown reductions in all-cause hospitalization rates, in readmission rates, and in the total cost of care as well as increased patient and physician satisfaction.2 Some of these metrics have been duplicated in a growing number of medical home activities across the country.3-6

However, at this point published quality metrics and results are limited primarily to process measures such as the percentage of time an evidence-based guideline was followed or intermediate outcomes metrics such as hemoglobin A1c control or blood pressure control. Only 1 study thus far has focused on certain measures of patient outcome.7 To emerge as a sustainable model, PCMH must advance the “triple aim” of improving the experience of care, improving the health of populations, and reducing per capita costs of health care.7 Because of the current burden of chronic disease in the United States, a major part of the improved quality outcomes aspect of the triple aim must be achieved by improving primary prevention, preventing acute exacerbations of chronic disease, and preventing long-term complications of chronic disease. In turn, significant successes on these fronts will lead to substantial long-term reductions in total cost of care.8-10

This article provides evidence that long-term outcomes can be influenced by redesign of primary care. Despite its relatively short period of existence, Geisinger’s PHN has led to significant improvements in certain health outcomes for patients. In this analysis, we focus on the overall impact of PHN on all target patients, not just on those with

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a particular disease or disease type. This is to remain consistent with the goal of PHN, which is to provide higher quality care across the entire spectrum of patients via improved delivery and execution of primary care.

Background

In 2006, Geisinger Health System (GHS) acknowledged the need for health care redesign of both clinical care delivery and the supporting payment model. Several drivers influenced the redesign, including (a) the chronic disease burden and corresponding suspect quality, (b) fragmentation and lack of coordination in the current health care system, (c) rising health care costs, (d) the declining primary care base, and (e) a need to position GHS for future health care reform.

To this end, GHS has implemented its own version of advanced PCMH, referred to as PHN. Designing this unique program has required an integrated approach that included a cooperative partnership between Geisinger hospitals, its primary care network, and its health insurer, known as Geisinger Health Plan (GHP). PHN currently has 5 core program components: (a) patient-centered primary care, (b) integrated population management, (c) value-care systems, (d) quality outcomes, and (e) value-based reimbursement model. Table 1 summarizes the key elements of these 5 core program components.

Patient-Centered Primary Care

GHS has created an automation-enhanced, physician-directed, and team-oriented primary care model in which the members of the team work collaboratively at the top of their license. This includes the engaged patient and an electronic health record (EHR) as active team members. The goal is to focus the attention and work of each group in the areas of its unique value. For physicians, it is complex medical decision making and patient relationships; for nurses, it is education and support of patients and process management; for the EHR, it is consistent and active delivery of the best information—not just data—to other team members at the point of care; and for the patient, it is accurate and timely provision of information about his or her conditions and care preferences to the rest of the team as well as making the necessary lifestyle changes. Geisinger’s fully functional patient portal allows continuous access not only to medical records but also to the care team itself via secure Internet access.

Integrated Population Management

By incorporating the resources, tools, and culture of a health plan into its primary care practices, Geisinger has provided another dimension of support for patient care. The ability to measure, understand, and influence the entire population of insured patients is an important advantage of PHN. The embedding of health plan–trained case management nurses within the primary care practices designated as PHN sites capitalizes on this advantage. Additionally, predictive modeling and utilization data tools bring comparative analytics and normative management data to the practice to improve care for the entire population. The ability to predict and plan for disease exacerbation and deliver health services in a proactive fashion is critical to PHN and is powered by the resources and tools provided by the health plan.

Value-Care Systems

By partnering with the most efficient and effective providers in each service segment—from specialty care to imaging, home care to nursing home—PHN seeks to improve value. Existing data from the health plan have been used to identify and recruit these high-value providers to be active participants of PHN. They are then linked as tightly as possible with the advanced medical home via enhanced communication. Continuous feedback, both to the primary care

<table>
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<th>Table 1. Five Core Components of PHN</th>
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<tr>
<td><strong>Patient-centered primary care</strong></td>
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<tr>
<td>Enhanced access and scope of services</td>
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<tr>
<td>Team-based care</td>
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<tr>
<td>Chronic disease and preventive care optimized with health information technology</td>
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<td><strong>Integrated population management</strong></td>
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<tr>
<td>Population segmentation and risk stratification</td>
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<tr>
<td>Preventive care</td>
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<td>GHP-employed, in-office case management</td>
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<tr>
<td>Disease management</td>
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<tr>
<td><strong>Value-care systems</strong></td>
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<tr>
<td>Micro-delivery referral systems</td>
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<tr>
<td>360° care delivery systems: skilled nursing, emergency department, hospitals, home health, and pharmacies</td>
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<tr>
<td><strong>Quality outcomes</strong></td>
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<tr>
<td>Patient satisfaction</td>
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<td>HEDIS and bundled chronic disease metrics</td>
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<td>Preventive services metrics</td>
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<td><strong>Value-based reimbursement</strong></td>
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<td>Fee-for-service with P4P payments for quality outcomes</td>
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<td>Physician and practice transformation stipends</td>
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<td>Quality-gated gainsharing</td>
</tr>
</tbody>
</table>

**Abbreviations:** PHN, ProvenHealth Navigator; GHP, Geisinger Health Plan; HEDIS, Healthcare Effectiveness Data and Information Set; P4P, pay for performance.
team and to the system participant, ensures performance. Additional value-care opportunities are identified by reviewing the data, and the care model continuously evolves in response.

**Quality Outcomes**

To ensure that PHN meets all elements of value in health care—quality, patient experience, and professional experience—a quality improvement program incorporating the nonfinancial aspects of care delivery has been created. This is used as a gate to ensure that the financial gains truly support the value proposition. Quality metrics with improvement targets are determined annually for each of the primary care practices designated as PHN. These metrics fall into several broad categories: chronic disease care, preventive care, care transition, patient experience, professional experience, and continuous improvement. Quality performance metrics are tied to reimbursement in order to incentivize the practices to improve and maintain quality.

**Value-Based Reimbursement**

It must be recognized that transforming an existing primary care practice into an advanced PCMH requires an extensive up-front investment and start-up cost. In addition to the tangible physical infrastructure, such as communication and information technology equipment, the practices must engage physicians in monthly management meetings and/or develop advanced office management strategies for various conditions, all of which require resources. As such, PHN practices have been furnished with the necessary resources in advance to offset the start-up cost associated with practice redesign.

Moreover, the practices participate in a quality-gated shared savings model. Total cost targets are set for the practices using the historical basis of the previous 2 years of experience. A regression-to-the-mean allowance is added to ensure that high-performing sites are rewarded for maintaining that performance. Additionally, the typical medical cost inflation factor is added to the base, and the entire target is risk adjusted. From this target the actual total cost of care is subtracted as well as the advances that have been made. The practices are then entitled to receive a portion of the savings based on the number of quality metrics attained.

**Conceptual Framework**

The main research question we sought to answer in this article may be stated as the follows: How did a GHP member’s likelihood of experiencing an adverse outcome in a given month change when that member’s primary care site was converted to a PHN site from a non-PHN site? Our postulate is that a system of care for chronic diseases that results in superior support and coordination generates a sustainable improvement in care and that this initially will affect microvascular complications (ie, amputation rates, end-stage renal disease [ESRD] status) and only later, with more time in better overall disease control, will affect macrovascular disease outcomes such as myocardial infarction (MI) or stroke. This is consistent with the findings of the UK Prospective Diabetes Study, which demonstrated differential impacts of tight blood pressure control, showing reduction in the microvascular but not in the macrovascular events.

As such, we hypothesize that, in the short term, PHN is associated with lower incidences of amputation among patients with diabetes and of ESRD among the elderly population, who are more likely to suffer from chronic diseases than the general population. Moreover, we also expect that elderly patients treated in PHN are more likely to experience adverse outcomes at later stages in their lives as a result of better management of chronic conditions. At the same time, we do not necessarily expect to observe a significant impact of PHN in terms of MI and stroke, which likely will require longer term interventions and management.

Although the study population of this analysis is not limited strictly to diabetes patients, examples from diabetes research show that establishing a causal link between a redesigned system of care and patients’ likelihood of experiencing macrovascular events is difficult. For instance, the intensive blood glucose control arm of the Action to Control Cardiovascular Risk in Diabetes trial has been discontinued because of a higher incidence of macrovascular events among those patients. A subsequent analysis suggests that the greater incidences of macrovascular events occurred among the patients who were elderly or at a higher initial risk for cardiac diseases. This example illustrates that there are confounding factors (eg, comorbidity, preexisting health conditions) that must be accounted for carefully to accurately capture the effect of PHN.

**Data**

For this study, we used patient-level data originating from GHS. GHS is composed of 3 elements: Geisinger Clinic, which currently has some 850 physicians, including nearly 200 primary care physicians, working at nearly 40 sites across central and northeast Pennsylvania; GHP, which is a full-service regional health insurer with about a quarter million members, insuring approximately 30% of the Geisinger Clinic patients; and 2 Geisinger inpatient facilities as well as an inpatient drug and rehabilitation hospital. About 45% of GHP members are...
For the purposes of this article, we focused on the impact of the conversion of a primary care clinic into a PHN site on 2 microvascular events (amputation among patients with diabetes and ESRD) and 2 macrovascular events (MI and stroke). In our data set, these variables were available as binary indicators that equal 1 if the patient had a claim related to each of those outcomes during each month of our study period and 0 otherwise.

We used a set of multivariate logistic regression models to estimate the effect of the PHN conversion on these outcomes. Because the unit of observation was member month, each patient appeared multiple times in our data set for the duration of their enrollment in GHP’s Medicare Advantage plans (a maximum of 60 times for each month in the 5-year period). This data structure allowed us to use a panel data analysis method in which we exploited the over time variation within each member to estimate the unbiased effect of PHN. That is, we used a patient fixed-effects model.

Because of the nonrandomized, gradual rollout of PHN over the 4-year period, 2 potential confounders are likely to bias the results. First, it is possible that the primary care practices that were converted to PHN sites earlier were systematically different from those that were converted later in terms of their patient case mix. In other words, the clinics that were converted to PHN sites during the initial phases of the PHN rollout may have been the ones with a sicker patient population that is more prone to amputation, ESRD, MI, or stroke. If so, we would expect to find results that underestimate the true effect of PHN. This problem is not easily solved with our existing data set because we have no data that would accurately capture patients’ comorbidities and health status.

Second, it is also possible that those patients who were sicker and more prone to experience adverse outcomes had been systematically transferred from non-PHN sites to the PHN sites. Such an adverse selection of patients into PHN might have occurred because providers may transfer their sicker patients (eg, those with multiple chronic conditions and/or poor weight control) to the PHN sites, expecting that they would benefit from the services of the case managers embedded within the PHN sites. Thus, such an adverse patient selection into PHN would offset any positive effects.

To reduce the biases resulting from these potential confounders, we implemented the following: First, as mentioned, our sample was restricted to only those who never switched their primary care clinics during the study period. Therefore, our sample consisted only of those who remained in the same clinic regardless of whether the clinic was converted to PHN or not, thus reducing the patient selection bias. Second, to control for the unobserved patient case mix in our multivariate regression analysis, we used the patient fixed-effects model as

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**Table 2. Sample Distribution—Non-PHN Versus PHN From 2005 Through 2009**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Members</th>
<th>Total Number of Member Months</th>
<th>Percentage of Member Months in Non-PHN</th>
<th>Percentage of Member Months in PHN</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>28 590</td>
<td>313 916</td>
<td>100.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2006</td>
<td>28 262</td>
<td>316 063</td>
<td>99.63</td>
<td>0.37</td>
</tr>
<tr>
<td>2007</td>
<td>31 094</td>
<td>340 820</td>
<td>91.05</td>
<td>8.95</td>
</tr>
<tr>
<td>2008</td>
<td>30 140</td>
<td>335 829</td>
<td>70.45</td>
<td>29.55</td>
</tr>
<tr>
<td>2009</td>
<td>33 131</td>
<td>369 701</td>
<td>59.33</td>
<td>40.67</td>
</tr>
<tr>
<td>Overall</td>
<td>46 323</td>
<td>1 676 329</td>
<td>83.22</td>
<td>16.78</td>
</tr>
</tbody>
</table>

Abbreviation: PHN, ProvenHealth Navigator.
The main advantage of this approach was that we were able to strip away any time-invariant factors affecting our outcomes—whether observed or unobserved—that were unique to each member in our sample. To the extent that the unobserved comorbidities and underlying health conditions of each patient remain constant over the 5-year period, the patient fixed-effects model captures this bias.

Table 3 shows the unadjusted descriptive statistics of the variables used in this analysis. It suggests that, even after restricting our sample to those who never switched their primary care clinics, there appears to be confounding of the observed relationship between PHN and patient outcomes because of the unobserved patient case mix as expected. Although the differences in age distribution between PHN patients and non-PHN patients are quite small, the patients in PHN appear to have been slightly more likely to experience adverse outcomes than the non-PHN patients, with the exception of the amputation rates among the patients with diabetes.

Other potential confounders include disease management programs and other quality improvement initiatives implemented outside of PHN. In particular, diabetes disease management programs have been implemented by Geisinger Clinic since 2006, and these may have independently influenced the outcomes for the subset of the GHP members over the study period. Sex and race were not included because they are time-invariant patient characteristics perfectly captured by the patient fixed-effects model.

Table 4 shows the estimated odds ratios associated with the PHN conversion along with the number of member month observations used for each regression model. The estimated odds ratios suggest that when a primary care site was converted to a PHN site, the odds of its patients experiencing 1 of the 2 microvascular events—diabetic amputation or ESRD—in a given month significantly decreased. At the same time, the results also suggest that there were no significant impacts of PHN conversion on the 2 macrovascular events: MI and stroke.

**Discussion**

PHN, which is Geisinger’s version of an advanced PCMH model, has previously been shown to enhance value for patients by improving the process of care and potentially reducing cost. Although commonly available quality metrics such as readmission rates and patient satisfaction (eg, Consumer Assessment of Healthcare Providers and Systems) are clearly important, one may argue that what ultimately matters is the quality of care as reflected by the longer term “hard” outcomes—such as the ones considered in this article—experienced by patients.

This study of the GHP members whose primary care sites have been reengineered as PHN sites has shown reduced incidences of amputations and ESRD related to PHN over the study period. It is important to note that these improvements were found even after a rather short follow-up period, with the majority of the PHN member month observations occurring in 2008 and 2009, which were the last 2 years of our study period. Because the interventions in a PHN site are complex, as described in the Table 1, the specific causes of such improvements in these outcomes are likely to be multifactorial.

More specifically, the improvements in these microvascular events may result from earlier detection, improvement in risk factor management, pharmaceutical intervention, or procedural intervention, all of which were included as the key components of the PHN innovation.
Future work is need to identify which of these specific interventions and strategies had the greatest impact and/or whether there was a synergic impact of the interventions as a whole whereby the PHN components worked in tandem to produce greater results than what each component would have yielded independently on its own.

On the other hand, this study has not shown any significant reductions in claims related to MI and stroke as a result of the PHN implementation. As hypothesized, it is possible that it simply takes longer for the interventions necessary to affect these macrovascular events to yield any detectable results. Although some interventions, such as smoking cessation, potentially could have an impact within months, other interventions (eg, aspirin therapy for primary prevention) may affect patient outcomes only for longer term measures such as 10-year cardiovascular risk.13-15

The strengths of this study include a large sample of elderly patients, the stability of the population studied, and the relatively large number of primary care practices that were included in the analysis. The potential limitations of the study include the use of claims data (not clinical data), nonrandom PHN participation, and a sample restriction to only the health plan enrollees who had never switched their primary care clinics. Such a restriction may limit the external validity of our findings. Furthermore, this study may not be generalized outside this population of rural Pennsylvania residents older than age 65 years.

Efforts to improve value in health care often are viewed with skepticism to be mere cost reduction strategies.16 Therefore, demonstrating increased quality is critical to evaluating new models of health care reform in a transparent and accountable fashion.17,18 There is currently a growing interest in showing which models of health care reengineering—with PHN being only one of them—result in measurable improvements in hard outcomes, such as the ones considered in this study. Further work is necessary to measure the impact of PHN on other hard outcomes and, in particular, to determine if a longer intervention period will show any significant impact on macrovascular events.

Declaration of Conflicting Interests
The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: All authors are employees of Geisinger Health System. There are no other current or foreseeable conflicts of interest.

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References


