INCREMENTAL COST ESTIMATES FOR
THE PATIENT-CENTERED MEDICAL HOME

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ABSTRACT: Despite wide and growing interest in the medical home approach, little is known about the costs it entails. This analysis uses data from some three dozen practices to analyze the relationship, if any, between costs and medical home activities. The cost data are from the Medical Group Management Association Cost Survey and from the American College of Physicians Practice Management Check Up Tool for 2006; the medical home data are from the National Committee for Quality Assurance's Physician Practice Connections–Patient-Centered Medical Home recognition tool. We do not find evidence of additional costs associated with higher levels of "medical homeness," with the exception of information technology costs, which show a modest but statistically significant increase with medical home intensity. We acknowledge that the general lack of an association between costs and medical home intensity may be due to limitations of the data or to the definition of medical home.

CONTENTS

LIST OF EXHIBITS AND FIGURES

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EXECUTIVE SUMMARY

Over the past several years, there has been wide and growing interest in organizing primary care practices into "medical homes" (MHs), which provide care coordination, patient education, and related services in addition to primary medical care. Several prominent medical societies collaborated to articulate the "Joint Principles of the Patient-Centered Medical Home," core concepts that have been incorporated into the National Committee for Quality Assurance's (NCQA's) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool. But despite the attention being paid to the medical home approach, little is known about the costs associated with this practice model; the focus of most available studies is in establishing payment rates or value (by means of savings through reduced use of other services), not in providing clear cost estimates.

This project aimed to fill that gap by estimating the incremental costs of a practice that serves as an MH for its patients. It used data from some three-dozen practices to analyze the relationship, if any, between costs and medical home activities. The cost data came from the Medical Group Management Association (MGMA) Cost Survey and the American College of Physicians (ACP) Practice Management Check-up Tool for 2006; the medical home data were from NCQA's PPC-PCMH recognition tool. By collecting both cost and MH data from the same practices, we could measure any relationship as it actually occurred—in contrast with other studies, which have simply made assumptions about the inputs that practices would use to provide MH services.

Based on data from the 35 practices in the final analysis sample, we found no evidence of additional costs associated with higher levels of MH activity; our estimates suggested that there was less than a $1-per-month difference in patient costs between the third of study practices with the highest PPC-PCMH scores (which measure MH intensity) and those in the middle and lower thirds. The average total cost per full-time-equivalent (FTE) physician was $517,000 for all 35 practices. Although the mean total cost per FTE physician increased slightly across the three score categories, the Low and High means were within one standard error of one another, meaning that the differences were not statistically significant. Support staff costs exhibited a similar pattern.

The one exception was information technology (IT) costs, which showed a modest but statistically significant correlation with PPC-PCMH scores. The average practice spent about $8,000 per FTE physician on IT. However, practices scoring low

on the NCQA tool spent only $5,000 per FTE physician, while those scoring in the high category spent more than twice as much ($11,000).

This analysis has two potentially important implications. First, if one accepts the finding of a weak relationship between costs and PCMH levels, then becoming a PCMH may only require adjustments to how practice inputs are used, as opposed to incurring significant additional expenditures. Second, it may be that the PPC-PCMH recognition tool emphasizes certain dimensions of practice redesign (e.g., use of information technology) and, as a result, masks the relationship between costs and other elements of practice redesign that may be more important to improving patient-centeredness, such as expenditures of physician time.

Finally, what it costs—or does not cost—to be a medical home is distinctly different from how much payers may be willing to pay for MH-provided care. To the extent that the care model reduces spending on emergency room visits, hospital stays, or other types of services, payers may want to encourage physicians to adopt this practice model through payments that exceed any expenses associated with the model.

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INTRODUCTION

Growing interest in the "medical home" (MH) model for providing enhanced primary care has led providers and payers alike to seek a better understanding of its costs. With the rapid implementation of MH demonstrations, payers had to develop payment policies quickly, often without complete data on cost or its long-term effects on the model's adoption and evolution. Thus one of the primary goals of this project is to estimate the incremental costs of an MH practice so as to correct that omission.

What it costs to be a medical home is distinctly different from the amounts that payers are willing to pay for MH-provided care. Medical homes' measured costs could be quite modest, but if research finds that spending for other health services was significantly reduced as a result of MH activity, payers might be willing to pay more than costs in order to encourage adoption of this practice model. After all, many recent innovations in creating bonus payments for providers or hospital teams—when they achieve goals set by payers or managers—show that services can create value to the health care system that may not be reflected in their own costs.[1] Conversely, medical home costs could be high, and, in the absence of evidence of savings elsewhere (or extraordinary improvement in access or quality), payers might be unmoved to set payment rates accordingly. In any case, the analysis of MH costs is most appropriately done alone—outside the context of rate-setting or payment design—given that the costs are what they are, independent of whatever payment policies happen to apply.

In the absence of information from practices about the degree to which they have functioned as a medical home and the costs associated with their MH activities, available studies have typically tried to estimate costs by identifying inputs likely to be employed to provide MH activities. This micro-costing approach has generally attempted to estimate incremental physician time, other clinical and administrative staff time, IT requirements, and other expenses expected to be incurred in providing MH care. But the approach essentially assumes that there is a particular way to deliver MH services, when in reality there may be a *range* of ways for reorganizing current practice inputs, or adopting a different set of practice inputs, that could achieve similar results. Because labor resources typically come in lumpy increments (e.g., full-time versus half-time), practices may in fact make different decisions about who plays what role. In addition, there will be choices about how practice labor might be combined with information technology, contract labor, and alternative models for scheduling patients.

This study is the first to focus solely on estimating overall MH costs. And it does so with practice data that not only capture the costs but also the degree to which the practice meets the criteria of an MH, according to a widely used MH-assessment tool. By analyzing the relationship between reported costs (including physician compensation) and MH level, we do not have to make any assumptions about the ways in which practices use staff and other resources to provide MH care. Instead, the analysis can reflect whatever staffing and equipment decisions practices have made in order to achieve their measured level of MH.

A number of other issues must be addressed in considering costing approaches. First, how will the medical home be defined and what activities will MH-oriented practices or other organizations be required to undertake? We rely on the activities identified in the Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool developed by the National Committee for Quality Assurance (NCQA) to measure variation in the extent of "medical homeness" in a practice. There are a number of other ways to conceptualize and measure the medical home, but no other practical alternatives have emerged apart from the NCQA's consensus-building process. The PPC-PCMH tool does have some limitations. While its standards and elements appear logical, the entire package has never been subject to validation by demonstrating improved quality or cost outcomes, and some experts have raised concerns that the PPC-PCMH standards overemphasize practice infrastructure at the expense of patient-centered aspects of care and of chronic care in particular. But this NCQA tool is currently being used in a number of private and public MH studies and is widely viewed as the industry standard. Moreover, it is appropriate that the incremental costs of projects testing the PPC-PCMH version of the medical home be assessed according to various levels of PPC-PCMH performance.

Second, what activities should be performed by the medical home practice or by other community entities with which the practice collaborates? For example, the North Carolina Community Care Network model explicitly supports care coordination activity outside the small practices that receive additional payment as medical homes.[2] Clearly, if practices work in collaboration with other entities to achieve some of the elements envisioned for the medical home, the corresponding costs to the practice should be less than they would be if practices provided the elements directly.

Third, will a practice be expected to serve as a medical home for all of its patients or for only a subset of patients (e.g., those with chronic conditions or with a particular type of health insurance)? This question is related to the definitional issue described

above. The PPC-PCMH standards, for example, assume that virtually all elements of the medical home would apply to all patients, whereas some observers suggest that the medical home could be more efficiently deployed if targeted to patients with serious chronic conditions. Clearly the per-person costs differ in these two contexts, both with respect to average variable costs (because of differences in the intensity of services required) and average fixed costs (because of the size of the population over which they are spread). Under a medical home model in which all patients are served, there would appear to be a greater need to explicitly consider risk-adjustment in cost estimates or payment amounts than if the medical home were dedicated to a subset of patients, which effectively have already been selected based on risk.

Fourth, how do the costs of providing existing services relate to the costs of implementing a medical home? Some medical home activities are already assumed to occur in the context of, say, office visits and related services. For example, in the Medicare Fee Schedule, a share of the expected time for a mid-level office visit with an established patient includes follow-up—on lab results, referrals, or similar activities—that also are MH expectations. As a result, not all medical home activities and associated costs are new with the model, complicating the exercise of estimating costs. On the revenue side, payers may choose to lower existing payment rates to reflect such overlap with current practice.

Fifth, some of the activities of the medical home are performed directly by physicians and as a result may not be an explicit cost to the practice, at least as captured in standard accounting ledgers. Further, there are substitution opportunities—practices that rely on additional nonphysician staff *will* incur an explicit practice cost. Accounting for nonreimbursed physician time remains a challenge for costing the medical home, though the extent of the challenge depends on the specific analytical approach used.

Finally, it is important to differentiate initial investment costs for adopting elements of the medical home from the ongoing operating costs of being a medical home. There are some one-time transition costs related to redesigning office routines and retraining staff to changing roles, and there are ongoing costs associated with new equipment acquisition and maintenance. Although a piece of equipment may represent a one-time outlay from a transactional perspective, its purchase is typically considered an ongoing cost over its service life.

AVAILABLE ESTIMATES OF MEDICAL HOME COSTS

Before turning to our own efforts to estimate medical home costs, we review prior studies that have considered this issue. The methods used in these studies are not necessarily comparable, as they each had different objectives and took diverse routes in getting there. In fact, until now there have been very few available estimates of the *costs* associated with the medical home model. Many studies examined the *value* (captured, for example, as savings on other medical services) or describe *payment* approaches that have sustained physician participation in demonstrations or new programs. But while cost estimates may be incorporated within these studies, they are not always clearly described or presented. And as stated in the Introduction, there is no reason to believe that the value of the medical home to payers and the potential payments that they are willing to make to medical home practices should be driven only by the costs those practices incur.

The rest of this section briefly reviews some of the available medical home cost estimates. Specifically, we found two cost studies that provided detailed descriptions of their data and methods—one by the American Medical Association's Resource-Based Relative Value Scale Update Committee (RUC) at the request of the Centers for Medicare and Medicaid Services (CMS); and the other, regarding the New Model of Family Medicine, by the Lewin Group at the request of Future of Family Medicine Task Force Six. Their results suggest that the estimated medical home cost, whether explicit or implicit, seems to range widely from a few dollars to well over a hundred dollars per patient month.

RUC Estimates for Medicare Demonstration

Of particular interest to primary care physicians are the estimates created for use in the Medicare medical home demonstration, given that Medicare constitutes the largest single primary care payer nationwide. They also comprise the clearest effort at establishing service-level or patient-level costs of medical home care.

In preparation for its demonstration, CMS asked the RUC to establish relative values and practice-expense estimates to assist in setting payment amounts. The details of the demonstration had not been finalized at the time these estimates were produced, so the RUC made several assumptions to frame its estimates:[3]

- Primary care physicians have an average of 250 Medicare patients with chronic needs.

- A new G-code will be established for each of three medical home tiers, based on the levels in the PPC-PCMH model (subsequently, CMS decided to include only the two top tiers in the demonstration).[4]
- Payment for each G-code will be made on a per-beneficiary-per-month basis.

The RUC used the Medicare fee schedule structure, calculating 1) physician work relative value units (RVUs), 2) direct practice expenses, and 3) professional liability insurance (PLI) RVUs associated with the three new medical home codes.

To estimate work RVUs, the RUC combined information on the time it takes for activities similar to those required of medical homes, the current mix of office visits (to account for potential overlaps in activities), and work RVUs per unit of time. The practice expenses that the RUC took into account included clinical staff time, medical supplies, and medical equipment (in particular, equipment required to implement an electronic medical record). For the PLI RVUs, the RUC designated a set of services with comparable work RVUs that could be used as a source of PLI RVUs. The RUC estimated the amount of each component for each of the three medical home tiers to arrive at its final recommendations, which were submitted to CMS in April 2008. The recommendations did not include specific payment rates but rather the relative values and expense data for each of the three fee schedule elements corresponding to the three tiers.

Recently, CMS announced demonstration payment rates that differentiate the top two categories of medical homes (Exhibit 1).[5] The tiers reflect a set of specific characteristics that are similar to, but not exactly equivalent to, Levels 2 and 3 of the PPC-PCMH. Practices can receive medical home payments only for those patients with one or more chronic conditions who agree to participate in the demonstration. The list

Exhibit 1. Payment Rates for Medicare Medical Home Demonstration

Medical Home Tier	Average Per Member Per Month Payments	Patients with Low Risk	Patients with High Risk
Tier 1	$40.40	$27.12	$80.25
Tier 2	$51.70	$35.48	$100.35

Source: Centers for Medicare and Medicaid Services

of conditions is adapted from Hwang et al.[6] Estimates from claims data suggest that 86 percent of Medicare beneficiaries have claims for one or more of these conditions. Payments will be adjusted for two levels of patient severity, based on the Hierarchical Condition Categories (HCC) algorithm, the same risk adjuster that CMS uses to vary payments to Medicare Advantage plans for the underlying health status of their enrollees.

With regard to the key questions posed at the end of the Introduction, the CMS approach is based largely on a version of the PPC-PCMH medical home definition that differs slightly from the one used in this study. The estimates apply to the very large subgroup of Medicare beneficiaries who have chronic conditions; the heterogeneity within this group has led to a two-level severity adjustment for payment. There is explicit recognition of the overlap between MH services and existing evaluation and management (EM) services. Like all Medicare payments, rates have been set in a way that implies a set relationship between physician and other inputs—physicians can choose to produce MH services with a different mix of inputs but payment rates would be unaffected. Finally, consistent with other Medicare physician payment policies, investment in equipment (IT or other) for MH services is treated on an amortized per-service basis—capital outlays are discounted over the expected life of the equipment and then divided by expected service volume to develop a service-level equipment cost. There is no mechanism for compensating physicians for startup costs associated with office or staffing redesign or for financing equipment outlays.

A major difference between the RUC approach and the analysis presented in this report is that in our approach all patients in a practice are included in the MH while the RUC/CMS approach is limited to Medicare patients with chronic needs. As a result, we expect our cost estimates to be much lower. The studies also differ with regard to data and analytic strategy. We are using cost and MH data collected uniformly from a set of practices while the RUC constructed cost estimates from a variety of sources, while relying heavily on data from a single large integrated system. Other key factors—medical home definition, overlap with other services, accounting for physicians' costs as reported for other services, and treatment of capital outlays—are comparable between the two studies.

The New Model of Family Medicine

In 2004, the American Academy of Family Physicians introduced the New Model of Family Medicine (NMFM)—which includes selected elements of the medical home—and the Academy also commissioned an analysis of the cost associated with the new model. This practice-level analysis identified aspects of the model that are likely to have direct cost effects, whether to increase or decrease costs.[7] The analysis was based on the expected relationship between features of the model and practice outcomes (i.e., indicators of practice performance), as summarized in Exhibit 2. For example, the team approach to care envisioned by the NMFM is expected to permit physicians to spend less time per service while increasing staff training costs and clinical staff time per service.

Koenig and Shiels used data from a number of sources, including the Medical Group Management Association (MGMA), the American Medical Association (AMA), the Centers for Medicare and Medicaid Services (CMS), and Relative Value Studies, Inc. (RVSI). The key CMS data came from the Medicare Physician Fee Schedule and the Clinical Practice Expert Panels (CPEP). With service-mix data from MGMA and service-level costs primarily from the CMS and RVSI data, the researchers developed detailed estimates of the costs associated with Exhibit 2's various MH features, along with the magnitude of their likely effect on each of the practice outcomes listed.

But there is no straightforward calculation of overall or incremental costs of the new practice model. Instead, the resulting model estimates the net effect of MH costs on physician compensation, explicitly considering likely impacts on practice revenues and outcomes, such as those listed in Exhibit 2. The aspects of the NMFM expected to free up physician time are the introduction of electronic medical records and medical protocol software, a team approach to patient care, group visits, and e-mail consultations with patients. The Koenig and Sheils model was designed to calculate the net effect of the MH attributes on practice productivity (visits), physician net income, and physician time. Based on their estimates of the costs of each MH attribute and its effect on outcomes, they concluded that under current payment policies an MD in a five-physician family practice could earn the same net income under the NMFM by working 12 percent fewer hours or could earn 26 percent more income by working the same hours.

Exhibit 2. Hypothesized Effect of New Model of Family Medicine on Practice Outcomes

| | **Practice Outcome** | | | | | | | |
| New Model Feature | Training Costs | Service Volume | Per-Service Inputs | | | Office Expense | Admin Staff | Malpractice Premiums |
			RVUs	**MD Time**	**Clinical Staff Time**			
Open Access Scheduling	x	–	+	x	x	x	x	x
Online Appointments	+	x	x	x	x	+	–	x
Electronic Medical Records	+	x	+	–	–	+	–	–
Group Visits	+	x	x	–	–	+	x	x
E-Consults	x	x	x	–	–	+	x	x
Care Management	x	x	x	x	+	x	x	x
Web-Based Information	+	x	x	x	x	+	+	x
Team Approach	+	x	x	–	+	x	x	x
Medical Protocol Software	+	x	x	–	+	+	x	x
Outcomes Analysis	+	x	x	+	+	+	x	x

Note: The expected effect of the feature on the outcome is represented by a plus sign if the outcome is expected to increase, a minus sign if it is expected to decrease, and an x if there is no clear effect. Source: Financial Model for Sustaining Family Medicine and Primary Care Practices, The Lewin Group, July 2004.

Although no specific cost estimate is presented, the result that a family medicine physician could maintain current income levels and work fewer hours implies that current payments are adequate to cover the costs associated with the model. The analysis also extends into the effects of payment changes that explicitly reward MH practices under a variety of alternative approaches.

The lack of a specific cost estimate means that we cannot make a direct comparison with our estimates below. However, the fact that whatever incremental costs are incurred appear to be recoverable in the current payment system suggests they are low. This analysis, based on an MH definition that distills a broad range of MH activities into 10 specific functions, is different from the definition used in our analysis below. Otherwise, this study is similar in that it includes all patients in the MH practice, reflects the overlap between new MH and existing services, and explicitly accounts for the cost of equipment required for practice transformation.

Other Financial Estimates

North Carolina's Medicaid program has embraced a medical home construct and now makes a monthly payment of $2.50 per patient to the designated primary care provider.[8] Moreover, the state has added another $2.50 per patient per month to support nurses and other professionals in a Community Care Network, usually based in local hospitals and health departments, to provide the chronic care management support to complement activities in physician practices. The population included in North Carolina consists for the most part of relatively healthy pediatric patients and mothers covered by Medicaid. The payment rates do not seem to be derived from cost estimates or from any prediction about expected systemic savings. Instead, they appear to carry over from an earlier primary care case management system that the state implemented in the 1990s.

Preliminary comparisons between actual health care spending and a historical benchmark—which reflects what spending might have been without the medical home— show savings across hospital (inpatient, outpatient, and emergency room) services and physician services for all recent years.[9] Savings related to prescription drugs are not evident. Again, these projections emphasize health care spending, not the incremental cost to the practice of adopting the medical home.

Another study of, in effect, the *value* of the MH was conducted by the Deloitte Center for Health Solutions. In their analysis, the researchers focused on two types of patients in the medical home: those with chronic diseases that have been targeted for

disease management (heart failure, COPD, asthma, hypertension, and diabetes), and patients with complex conditions amenable to case management.[10]

The key costs expected under the medical home result from additional staff (health coaches and data/IT managers), electronic medical records, and patient education materials and equipment. Based on assumptions about the ranges of the incremental costs of setting up a medical home, Deloitte concluded that expected savings in reduced hospital readmissions, emergency department use, and other service use would be about $150 per patient per month, which is expected to outweigh any new MH practice expenses; the study did not detail the practice costs part of the analysis.

Between them, the North Carolina and Deloitte studies in effect establish a very broad range—from $5 to $150 per patient per month—of the value of the MH. It is not possible to determine how much of this range is due to the differences in included population (pediatric/maternal versus chronic/complex conditions), type of estimate (payment versus value), MH definition, or other factors, nor is it clear how to expect our *cost* estimate to fit into this range. Meanwhile, the CMS payment rates, based on a different MH definition and population (chronic elderly patients) and developed from costs constructed from input costs, cover a wide range: $27 (low-risk patient, low-tier MH) to $100 (high-risk patient, high-tier MH) (Exhibit 1). These estimates are based on the same MH definition we use below, but they are higher than our cost estimates, given the differences in population.

ESTIMATING THE INCREMENTAL COST OF THE MEDICAL HOME: EVIDENCE FROM PRACTICES

Unlike the studies described above, the present study aims to analyze costs and medical home activities as they occur in actual practices. In this approach we do not impose a specific model of how medical home activities are produced; rather, we reflect whatever mix of staff, supplies, and equipment the practices actually employ.

Data

The analysis required two key types of data from practices—costs, and a measure of the degree to which the practices function as medical homes. In order to make the data collection process more efficient and to reduce the burden on study participants, we recruited them from among practices that had already completed either the MGMA Cost Survey or the American College of Physicians (ACP) Practice Management Checkup Tool for 2006. Participating practices were asked to allow the study team to access their previously provided cost data, undertake an MH self-assessment, and provide some

additional data on practice costs and attributes not available from MGMA or ACP. The recruitment process, as well as the data collection and management plan, was approved by the Urban Institute's Institutional Review Board.

The aim of the self-assessment, carried out with NCQA's PPC-PCMH online tool, was to gauge each participating practice's level of medical homeness. Use of the PPC-PCMH—an industry standard designed to reflect the features of the medical home as described by joint principles issued in 2007 by several prominent medical societies—provided a practical way to assess the extent to which a practice had adopted elements of the medical home.[11] The process was doable within the time and resource constraints of this study and provided a ready comparison with other studies, given the broad use of the PCMH framework. After practices completed the online self-assessment and provided us with the results, they became eligible for continuing with the NCQA recognition process, which in later stages would have involved auditing of reported measures.[12]

We also needed to augment the cost data already available from MGMA and ACP. In particular, we asked practices to provide data on IT expenses, services provided, and patient volume and mix. We asked them to estimate various aspects of their IT costs and to enumerate service volume by Current Procedural Terminology (CPT) code or groups of CPT codes. In addition, we asked practices to report the size of their patient panel by estimating how many patients they had seen at least once a year during the past two years. Although the focus of some of the MH literature is on chronic care patients, we did not ask practices to estimate the fraction of their patient panel that had one or more chronic conditions (e.g., hypertension, diabetes, coronary disease) because that criterion is not a focus of the NCQA recognition tool. Based on site visits conducted earlier in this project, we concluded that many practices would not be able to provide these estimates without the additional burden of chart review.

We invited to participate in this study about 80 practices that had responded to the 2006 MGMA Cost Survey and 20 that had responded to the 2006 ACP Practice Management Checkup Tool. We tried to target practices with between 1 and 15 physicians that were either physician-owned or owned by a hospital, HMO, or other entity. Slightly more than 50 percent of the invited practices agreed to participate; we ended up with an initial sample of 44 practices with complete data—33 from MGMA and 11 from ACP (Exhibit 3).

Exhibit 3. Characteristics of Study Participants and Analysis Population

	All Study Participants	Final Analysis Population
All	**44**	**35**
Ownership		
IDS, Hospital, MSO, Other	5	0
Physicians	39	35
Practice Recruited to Study by:		
MGMA	33	25
ACP	11	10
Total Cost per FTE Physician		
Under $350k	7	7
$350k–450k	6	6
$450k–550k	10	7
$550k–650k	10	7
$650k or more	11	8
IT Cost per FTE Physician		
Under $5k	14	14
$5k–10k	11	9
$10k–20k	9	7
$20k–30k	5	4
$30k or more	2	0
Total Physician FTE		
2 or less	8	6
2–5	8	8
5–10	19	17
10–20	5	4
Over 20	4	0

Sources: Medical Group Management Association (MGMA) Cost Survey and the American College of Physicians (ACP) Practice Management Check-up Tool for 2006.

In the course of developing files for analysis and reviewing key variables, we excluded several practices from the final analysis for one or more analytic or data-integrity reasons:

- *Analytic concerns.* Seven practices had characteristics that could have been used to define useful analytic subgroups but were not common enough to form a subgroup with sufficient sample size:

  - Four practices were much larger than our target practice-size range.
  - Five practices were owned by hospitals, HMOs, or other entities (two of these were also the larger practices referenced in the preceding bullet).

- *Data integrity.* Two practices had reported IT cost-per-physician figures that greatly exceeded those for other practices, raising concerns that acquisition costs in fields related to annual IT costs had been included.[13]

As a result, the analysis was conducted on 35 practices, which reported somewhat lower costs per physician—consistent with the nature of the exclusions (ownership status and apparently anomalous IT costs) (Exhibit 3). The analysis group had total costs fairly evenly distributed from under $350,000 per MD through over $650,000 per MD, while IT costs per MD were clustered below $10,000. Six of the 35 practices had two or fewer FTE physicians while four practices had between 10 and 20 FTEs. Although there is always a risk that differences in accounting practices lead to systematic differences in reported practice costs, this did not appear to be the case in our sample.

Methods

The core analytic approach used in this study aimed to determine whether, in a cross-section of practices, costs varied systematically with overall NCQA PCMH score or with the score for any of the individual standards. The strength of this approach, relative to extant micro-costing studies, was that we did not need to make assumptions about the specific inputs associated with the various medical activities. Instead, within the analytic structure described in this section, we were able to identify relationships between various types of costs that practices were actually incurring, along with their rankings on the PCMH scale.[14]

The PCMH instrument assigns points for each of nine MH domains, such as "Access and Communication" and "ePrescribing." Details of the PCMH Content and Scoring, derived from NCQA materials, are shown in Exhibits 4 and 5. Responses to a series of practice-specific questions are combined to create a PCMH score between 0 and 100. NCQA recognizes three levels of medical homes, based both on this ordinal

score and the practice's responses to tool items that must be passed in order to attain each level. For example, a practice that has a PCMH score exceeding the Level 2 requirement (50–74 points) but not all 10 of the "must pass" elements required for Level 2 recognition would be recognized only as a Level 1 medical home. Although the detailed elements contained in the NCQA recognition tool resulted from extensive consideration of desired practice attributes and some practical field testing, the basis for the specific score cutoffs and the "must pass" elements were essentially policy decisions and therefore were neither intrinsically part of the recognition tool nor tested prior to adoption.

Exhibit 4. PPC-PCMH Content and Scoring

Standard 1: Access and Communication	Pts
A. Has written standards for patient access and patient communication**	**4**
B. Uses data to show it meets its standards for patient access and communication**	**5**
	9

Standard 2: Patient Tracking and Registry Functions	Pts
A. Uses data system for basic patient information (mostly non-clinical data)	2
B. Has clinical data system with clinical data in searchable data fields	3
C. Uses the clinical data system	3
D. Uses paper or electronic-based charting tools to organize clinical information**	**6**
E. Uses data to identify important diagnoses and conditions in practice**	**4**
F. Generates lists of patients and reminds patients and clinicians of services needed (population management)	3
	21

Standard 3: Care Management	Pts
A. Adopts and implements evidence-based guidelines for three conditions **	**3**
B. Generates reminders about preventive services for clinicians	4
C. Uses non-physician staff to manage patient care	3
D. Conducts care management, including care plans, assessing progress, addressing barriers	5
E. Coordinates care//follow-up for patients who receive care in inpatient and outpatient facilities	5
	20

Standard 4: Patient Self-Management Support	Pts
A. Assesses language preference and other communication barriers	2
B. Actively supports patient self-management**	**4**
	6

Standard 5: Electronic Prescribing	Pts
A. Uses electronic system to write prescriptions	3
B. Has electronic prescription writer with safety checks	3
C. Has electronic prescription writer with cost checks	2
	8

Standard 6: Test Tracking	Pts
A. Tracks tests and identifies abnormal results systematically**	**7**
B. Uses electronic systems to order and retrieve tests and flag duplicate tests	6
	13

Standard 7: Referral Tracking	PT
A. Tracks referrals using paper-based or electronic system**	**4**
	4

Standard 8: Performance Reporting and Improvement	Pts
A. Measures clinical and/or service performance by physician or across the practice**	**3**
B. Survey of patients' care experience	3
C. Reports performance across the practice or by physician **	**3**
D. Sets goals and takes action to improve performance	3
E. Produces reports using standardized measures	2
F. Transmits reports with standardized measures electronically to external entities	1
	15

Standard 9: Advanced Electronic Communications	Pts
A. Availability of Interactive Website	1
B. Electronic Patient Identification	2
C. Electronic Care Management Support	1
	4

****Must Pass Elements**

NCQA
Measuring quality.
Improving health care

Source: National Committee for Quality Assurance (NCQA) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool (2008).

Exhibit 5. PPC-PCMH Scoring

Level of Qualifying	Points	Must Pass Elements at 50% Performance Level
Level 3	75 - 100	10 of 10
Level 2	50 – 74	10 of 10
Level 1	25 – 49	5 of 10
Not Recognized	0 – 24	< 5

Levels: If there is a difference in Level achieved between the number of points and "Must Pass", the practice will be awarded the lesser level; for example, if a practice has 65 points but passes only 7 "Must Pass" Elements, the practice will achieve at Level 1.

Practices with a numeric score of 0 to 24 points or less than 5 "Must Pass" Elements are not Recognized.

NCQA
Measuring quality.
Improving health care.

In our analysis group, 29 practices would have achieved Level 1 NCQA recognition, with four failing to achieve any recognition and two achieving the highest level (Exhibit 6). The cluster of 29 practices at Level 1 NCQA recognition did not all score exactly within that level's criteria (between 25 and 49 points) and have five of 10 "must pass" elements (Exhibit 5). Instead, the range of NCQA scores within these 29 practices was 32 to 78. Six of these practices had scores within the Level 1 prescribed range of 25 to 49 points. The remaining 23 Level 1 practices had NCQA scores in the Level 2 or 3 ranges but none had the requisite number of 10 "must pass" elements.

This lack of variation across NCQA levels, resulting from too few practices performing well on enough "must pass" elements, preempted any analysis of how costs varied across the formal NCQA recognition levels. We considered ignoring the "must pass" requirements and just using the NCQA score cutoffs, but that was not a feasible analytic solution because 19 of the 29 had NCQA Level 2 scores, leaving six with Level

1 scores and four with Level 3 scores. The unbalanced distribution of practices across the preset NCQA score categories would have greatly reduced the statistical power of any analysis of the correlation of costs with medical home level. As a result, the probability of detecting any such correlation using these categories would have been quite low, unless the correlation was very strong.

For purposes of this study, therefore, we created analytic PCMH score categories that conformed closely to the NCQA score cutoffs and did not reflect the must-pass elements: Low (comparable to NCQA's Level 1), Middle (Level 2), and High (Level 3).[15] The cutoffs were selected to match the NCQA point cutoffs as closely as possible while recognizing natural gaps in the distribution of the participating practices' scores and creating three roughly similar-sized groups. As a result, the PCMH score category "Low" used in this analysis included the four practices that would have received no recognition, along with the nine lowest-scoring practices that received NCQA Level 1 recognition.[16] The High category included the two NCQA Level 3 practices along with the nine highest-scoring practices in NCQA Level 1. The middle group included the remaining 11 practices that had scores in the NCQA Level 2 range but would have received NCQA Level 1 recognition because they did not pass all 10 must-pass elements.

Because costs vary with the size of a practice, we needed to express them on a "per unit of volume" basis. Data were not available about services provided, RVU volume, or physician hours, so we were unable to use RVUs or physician patient-care hours as our unit of volume. The most completely reported measure available to scale costs to practice size was the number of FTE physicians in the practice; thus the analysis was conducted on a "per FTE physician" basis. Auxiliary analysis of the average patient panel per FTE physician indicated that this measure of physician productivity was not related to practice size, suggesting that scaling by FTE physicians, as opposed to the size of the practice's patient panel, was a reasonable approach.

The data from MGMA and ACP allowed us to examine total annual costs per FTE physician as well as some key cost components: support staff costs per FTE physician, general operating costs per FTE physician, and reported physician costs (for both employees and owners) per FTE physician. Within general operating costs, we were able to focus on IT costs per FTE physician. This particular category could be quite important, given that many of the PCMH standards in the NCQA recognition tool may reflect incorporation of electronic health records as part of practice management systems.

**Exhibit 6. NCQA and Analytic PCMH Score Category
by NCQA Recognition Level**

	Number of Practices	PCMH Score Range		NCQA Recognition Level			
		Min	Max	0	1	2	3
Number of Practices	35			4	29	0	2
PCMH Score Range (Min–Max)		**22**	**96**	**22–41**	**32–78**	**–**	**89–96**
NCQA Score Category							
Under 25	2	22	23	2	–	–	–
25–50	8	29	48	2	6	–	–
50–75	19	51	74	–	19	–	–
75 and over	6	75	96	–	4	–	2
Analytic PCMH Score Category							
Low	13	22	53	4	9	–	–
Mid	11	56	68	–	11	–	–
High	11	72	96	–	9	–	2

Source: National Committee for Quality Assurance (NCQA) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool (2008).

To examine the relationship between practice cost per FTE physician and PCMH scores, we started with a simple descriptive analysis. We tabulated the mean for each cost variable by PCMH score category and explored differences across the categories. In addition, we split the PCMH score categories into small (one to three physicians) and medium (four to 20 physicians) to explore the role of practice size in the cost– PCMH relationship. Although medium-sized practices had higher costs per physician than did small practices, there were no differences in the patterns across the PCMH score categories.[17] Therefore we present only the results from the more aggregated comparisons.

We also tried to assess score variation resulting from each of the PCMH standards' influence on costs, using linear multiple-regression methods with the cost measures as dependent variables. We were able to derive estimates of average costs from these models for each PCMH score category, but the coefficients of the individual PCMH standards were rarely significant.

Results

Practice scores on the nine standards of the PCMH tool (PPC1 to PPC9) tended to increase monotonically with score category (Exhibit 7). In some cases, the differences between Low and Mid and the differences between Mid and High were fairly comparable—for example, for PPC3: Care Management. For others, the pattern was not as smooth. For example, PPC4: Self-Management Support had essentially the same mean for the Low and Mid groups (2.54 and 2.55, respectively), compared to 4.55 among the High practices, suggesting that the two lower groups were quite similar to one another and different from the high group. Conversely, PPC6: Test Tracking had a mean of 6.12 among the Low practices, compared to 10.64 and 11.82 for Mid and High, respectively. In this case, the two higher categories were similar to one another and different from the low group.

The average total cost per FTE physician was $517,000 for all 35 practices in this study (Exhibit 8). Although the mean total cost per FTE physician increased slightly across the three score categories, the Low and High means were within one standard error of one another, meaning that the differences were not statistically significant. Support Staff costs exhibited a similar pattern, while General Operating costs were highest for the Mid group and Physician costs were lowest for the Mid group.

The only category of costs that showed a consistent, significant, and increasing relationship with PCMH score category was annual IT costs, with the average practice in this study spending about $8,000 per FTE physician. However, practices scoring low on the NCQA tool spent only $5,000 per FTE physician, while those scoring in the high category spent more than twice as much ($11,000); despite the small sample sizes, this difference was statistically significant. The middle PCMH score category was also in the middle on annual IT costs, but the difference between Mid and Low, as well as between Mid and High, was not statistically significant. The importance of IT in the PCMH scores can also be seen from the distribution of practices that use electronic health records (EHRs) exclusively, as opposed to a combination of paper health records and EHRs: no practices in Low, four practices in Mid, and eight practices in High (data not shown).

With such a small sample, these simple means could be strongly influenced by a few extreme values. Thus in an effort to discern a systematic relationship that may have been obscured by anomalous cases, we conducted two different statistical analyses. In the first, we estimated linear regression models for each measure of costs per physician as a function of an intercept and the nine PCMH standards scores. We then predicted costs per physician using the coefficient estimates and the mean standard scores within each

18

Exhibit 7. Mean PCMH Component Scores,
Overall and by PCMH Score Category

			PCMH Score Category		
		Overall	Low	Mid	High
	N	35	13	11	11
PPC1 **Access and Communication**	Mean	6.11	4.96	6.5	7.07
	Standard Error	0.36	0.69	0.51	0.45
PPC2 **Tracking and Registry**	Mean	12.91	8.62	12.86	18.05
	Standard Error	0.86	1.07	1.01	0.77
PPC3 **Care Management**	Mean	14.09	10.81	14.57	17.49
	Standard Error	0.76	0.99	1.22	0.93
PPC4 **Self-Management Support**	Mean	3.17	2.54	2.55	4.55
	Standard Error	0.35	0.51	0.65	0.49
PPC5 **ePrescribing**	Mean	3.62	1.17	4.39	5.75
	Standard Error	0.51	0.53	0.9	0.65
PPC6 **Test Tracking**	Mean	9.33	6.12	10.64	11.82
	Standard Error	0.75	1.38	1.01	0.6
PPC7 **Referral Tracking**	Mean	2.06	1.69	1.91	2.64
	Standard Error	0.3	0.46	0.56	0.53
PPC8 **Performance Reporting**	Mean	6.95	3.94	8.34	9.11
	Standard Error	0.78	1.12	1.4	1.03
PPC9 **Advanced eCommunication**	Mean	0.55	0.12	0.45	1.16
	Standard Error	0.14	0.08	0.14	0.35
Total NCQA Score	Mean	58.79	39.96	62.2	77.62
	Standard Error	3.02	2.93	1.48	2.34

Source: National Committee for Quality Assurance (NCQA) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool (2008).

Exhibit 8. Mean Annual Spending by PCMH Score Category

		Overall	PCMH Score Category		
			Low	Med	High
Number of Practices		**35**	**13**	**11**	**11**
Type of Spending per MD per year ($1,000s)					
Support Staff	**Mean**	154	145	153	165
	Standard Error	10.4	13.2	19.15	23.11
General Operating	**Mean**	125	106	150	123
	Standard Error	13.57	20.19	18.18	31.23
IT	**Mean**	8	5	8	11
	Standard Error	1.09	1.06	2.49	1.95
Physician	**Mean**	197	200	183	207
	Standard Error	8.69	17.78	14.35	12.34
Total	**Mean**	517	495	518	543
	Standard Error	27.76	49.36	45.34	51.99

Sources: National Committee for Quality Assurance (NCQA) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool (2008) and Medical Group Management Association (MGMA) Cost Survey or the American College of Physicians (ACP) Practice Management Checkup Tool for 2006.

PCMH score category. These predicted costs (Exhibit 9) better reflect any underlying (linear) relationship between costs and the PCMH standards than the simple means in Exhibit 8, which could have been influenced by extreme values. For example, the simple means in Exhibit 8 show that total costs per physician ranged from $495,000 to $543,000 across the three PCMH Score Categories. This might suggest that total costs increased by almost 10 percent across the PCMH score groups. However, as shown in the top panel of Exhibit 9, predicted total costs per physician only ranged from $513,000 for the Low group to $525,000 for the High group. This result reinforces the fact that the means were influenced by extreme values and that these data did not reveal a strong relationship between costs and medical home scores.

Because many medical home demonstrations envision paying doctors for MH-related activities on a "per patient per month" basis, we transformed the means reported above as costs per FTE physician into a measure of costs per patient per month (lower panel of Exhibit 9). However, because we did not always have data on the size of a practice's patient panel, it was not possible to develop these measures at the practice level and then average across practices. Instead, we estimated the average patient-panel size per physician for those practices that reported total patients. The result, 2,640 patients per physician, was used to calculate the costs per patient-month. These numbers, which reflect the same pattern discussed above (as all of the results from the top panel were

Exhibit 9. Estimated Spending by PCMH Score Category

Type of Spending per MD ($1,000s)	PCMH Score Category		
	Low	Mid	High
Support Staff	152	157	154
General Operating	120	122	134
IT	5	8	11
Physician	206	193	195
Total	513	514	525
Per Patient-Month:			
Support Staff	$4.80	$4.96	$4.86
General Operating	$3.79	$3.85	$4.23
IT	$0.16	$0.25	$0.35
Physician	$6.50	$6.09	$6.16
Total	$16.19	$16.22	$16.57

transformed with the same number of patient-months), suggest that there is less than a 40-cents-per-month difference in per-patient costs between practices in the High and Mid PCMH score categories.

The second statistical analysis involved the calculation of simple correlation coefficients between the continuous PCMH score and each cost measure. Consistent with the lack of statistical significance among the means by score category (as described above) for all but the IT cost measure, the correlation coefficients were all small and insignificant—again with the exception of IT costs (Exhibit 10). For these costs, the correlation coefficient was 0.36 with a p-value of 0.04, suggesting a statistically significant correlation of modest magnitude.

IMPLICATIONS AND LIMITATIONS

Within the range of practice sizes represented in our data, the evidence suggested quite modest, if any, costs associated with higher levels of performance on the NCQA PPC-PCMH recognition tool. There were no significant incremental costs, other than those associated with IT costs, for practices with higher PCMH scores. Costs analyzed here included those related to physician time, nonphysician providers, support staff, and general operations. There was an apparent relationship between IT costs and MH scores, presumably due to specific characteristics of the PCMH dimensions and scoring.

Exhibit 10. Correlation of Spending with PCMH Score

	Correlation Coefficient	p-Value
Support Staff	0.01	0.93
General Operating	0.11	0.53
IT	0.36	0.04
Physician	−0.07	0.63
Total	0.05	0.76

Sources: National Committee for Quality Assurance (NCQA) Physician Practice Connections–Patient-Centered Medical Homes (PPC-PCMH) recognition tool (2008) and Medical Group Management Association (MGMA) Cost Survey or the American College of Physicians (ACP) Practice Management Check-up Tool for 2006.

The insufficient number of practices in the "Not Recognized" range of PCMH scores limited our ability to examine the incremental costs required for recognition as a PCMH Level 1 medical home. It is possible that this insufficiency arose because the practices in our sample had previously reported cost data on surveys; these practices may have capabilities to engage in MH activities that are not representative of all practices. However, it is also possible that the NCQA recognition tool produces very few scores below 25. This may have to do with the weighting of the various elements, or with the fact that not being recognized may result from failing to achieve high enough scores on the must-pass elements (as opposed to a practice's aggregate score).

It is possible that use of cost data from 2006 and PCMH scores from a later year (2008) led to an important source of bias in this study. If, for example, several study practices had engaged in practice redesign *after* costs were reported in 2006, then we would be analyzing PCMH scores in 2008 that were higher because of uncaptured costs. To examine the chance that this source of bias affected our results, we conducted a sensitivity analysis. In particular, we tried to identify the degree to which the costs analyzed here would have to be understated to mask a significant relationship between costs and PCMH score. If we discovered, for example, that if the costs were 10 percent higher in just a few practices we could have observed a significant relationship between costs and PCMH score, then we would conclude that this mismatch between the timing of the cost data and the PCMH scores may have had important implications for our analysis.

Based on some simple sensitivity analyses, however, this did not seem to be an important problem. For example, the total costs for all of the practices in the High category would have to be nearly 30 percent higher than measured for the correlation between total costs in 2006 and PCMH score in 2008 to be statistically significant at the $p = .10$ level.[18] But if there were indeed some important unreported costs due to the

timing mismatch, it seems unlikely that they would be clustered exclusively among the third of the sample with the highest PCMH scores and be of this magnitude for all affected practices. If any unreported costs occurred among lower-scoring practices, then there would have to be even more unreported costs among high-scoring practices to create this modest level of correlation.

The analysis had other potential data limitations. We recognize that: (1) the sample was chosen in a way that may have made it unrepresentative; (2) limited information was available on services provided, physician hours, and other productivity measures; (3) the sample size was inadequate for detailed analyses by, for example, practice characteristics, physician characteristics, or geographic location; and (4) data reporting on costs may have differed among practices and between MGMA and ACP, despite their apparent comparability. These shortcomings in the study could possibly have been overcome by a larger and more scientifically structured data-collection approach. For example, a larger data set drawn from a truly random sample of practices might have generated a different distribution of practices across NCQA recognition levels (including the must-pass elements), which could have allowed for more direct estimates of the relationship between practice costs and the PCMH levels defined by NCQA.

Another potential limitation is that we used the NCQA PCMH tool and self-assessment without auditing, making it possible that practice-generated scores might not withstand external review. But because the Medicare demonstration will require that scores be audited, it might provide some insight into how accurately practices' self-scoring of the NCQA tool reflect PCMH capabilities. In addition, the NCQA assessment tool requires that practices have capabilities in a broad range of very specific activities that can be measured. There may be so much variation in how practices could efficiently produce each of these activities, however, that there need not be a strong relationship between PCMH scores and actual practice costs. Moreover, the effects of the activities, as specified and weighted in the NCQA tool, on patient outcomes and spending are still not well understood.

Although our methodology did capture the costs that practices incur for physician salaries or draws on practice earnings, it may not have captured the additional physician time needed to carry out components of the PCMH such as communication by phone or e-mail and after-hours involvement with emergencies. To the extent that some practices rely on physicians themselves to perform such activities, the additional time usually is not reflected as specific practice costs; thus the implications of lower effective hourly compensation could not be considered. However, in our appraisal of the NCQA tool, it

appeared that the potential for unrecognized physician time would show up primarily in the domains of Access and Communication and of Patient Self-Management Support; most of the other activities are generally performed by nonphysicians or involve application of practice systems, including enhanced IT. Because these two physician-specific domains account for only about 15 percent of the maximum NCQA PCMH score, unrecognized physician time was probably not a significant confounder in the context of the NCQA tool.

Finally, we were not able to attempt case-mix adjustment, but we do not think that this was a serious problem. First, we studied general primary care practices with presumably broad mixes of patients, as opposed to practices with healthier or less healthy populations—e.g., pediatric or geriatric practices, respectively—which might have biased the findings. In addition, many of the capabilities in the NCQA standards are infrastructural or work-process enhancements that apply to all patients. As mentioned earlier in this report, however, some MH applications focus on particular subgroups of patients, whose associated costs may differ from those of the general population we studied.

CONCLUSIONS

Our analysis reflects a basic approach that could guide future studies of medical home costs. Relating actual practice costs to a practice's PCMH level represents a promising approach because it does not require assumptions about the exact set of inputs that practices may use to function as a PCMH.

Despite the data-imposed limitations (discussed above) that could require our findings to be viewed cautiously, this analysis has two potentially important implications. First, if one accepts the finding of a weak relationship between costs and PCMH levels, then becoming a PCMH may only require adjustments to how practice inputs are used, as opposed to incurring significant additional expenditures. Second, it may be that the NCQA recognition tool emphasizes certain dimensions of practice redesign (e.g., use of information technology) and, as a result, masks the relationship between costs and other elements of practice redesign that may be more important to improving patient-centeredness (e.g., expenditures of physician time).

Finally, not finding evidence that there are significant costs associated with attaining higher levels of MH is not equivalent to concluding that payers should not pay for higher levels of recognition. There may be other benefits to meeting the PPC-PCMH standards, such as achieving lower expenditures on other health care services or reorienting a network's delivery system more toward primary care in anticipation of new organizational and payment models of care.

NOTES

1   At the same time, it is possible that reaching the outcome required to receive the bonus may incur costs that exceed its value.

2   S. Wilhide and T. Henderson, "Community Care of North Carolina: A Provider-Led Strategy for Delivering Cost-Effective Primary Care to Medicaid Beneficiaries," American Academy of Family Physicians, June 2006.

3   AMA/Specialty Society, RVS Update Committee (RUC), "Medicare Medical Home Demonstration Project," April 25, 2008.

4   Centers for Medicare and Medicaid Services, "Medical Home Demonstration Fact Sheet," November 2008. Available at www.acponline.org/running_practice/pcmh/demonstrations/fact_sheet.pdf (accessed Sept. 3, 2009).

5   Ibid.

6   W. Hwang, W. Weller, H. Ireys, and G. Anderson, "Out-Of-Pocket Medical Spending for Care of Chronic Conditions," Health Affairs, Nov./Dec. 2001 20(6):267–78.

7   L. Koenig and J. Sheils, "Financial Model for Sustaining Family Medicine and Primary Care Practices: Final Report," submitted to Future of Family Medicine Task Force Six by the Lewin Group, July 15, 2004.

8   S. Wilhide and T. Henderson, "Community Care of North Carolina," June 2006.

9   Mercer Group, "External Evaluations Requested by Community Care of North Carolina," 2007.

10 Deloitte Center for Health Solutions, The Medical Home: Disruptive Innovation for a New Primary Care Model," 2008. Available at www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_chs_MedicalHome_w.pdf (accessed Sept. 3, 2009).

11 AAFP, AAP, ACP, AOA (American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, and American Osteopathic Association), "Joint Principles of the Patient-Centered Medical Home," March 2007. Available at www.medicalhomeinfo.org/joint%20Statement.pdf (accessed Sept. 3, 2009).

12 Some practices felt it was easier to respond to the questions in hard copy, so we provided them with a printed version that was identical in content to the online tool.

13 Annual IT costs include the costs of maintaining and upgrading the IT system (hardware and software) as well as the costs of depreciation or amortized acquisition.

[14] The basic question we addressed was "Do practices that score higher on the NCQA PCMH scale also have higher practice expenses?" If the analysis of the study data suggested that the answer is "no," this would indicate that improving PCMH scores does not add to expenses in the long run. The reason may be twofold. First, as suggested in the Introduction, it may be possible for practices to produce MH activities with inputs that cost no more than those that they had already been employing. Second, the practices that score well on the PCMH scale may be inherently more efficient (i.e., would produce any services at the same quality but lower cost). However, assessing how costs might change when a practice of a given efficiency adds MH would require very different data than we had available and, as such, was beyond the scope of this study.

[15] Based on the actual data, the PCMH score cutoffs used to create the analytic score categories were 22 to 55 (comparable to NCQA's Level 1 range), 55 to 70 (comparable to Level 2), and greater than 70 (comparable to Level 3).

[16] Of the four practices that would not have achieved NCQA Level 1 recognition, two failed to make the NCQA score cutoff of 25 but had scores over 20, while two had sufficient points (i.e., greater than 25) but failed to pass five of the 10 must-pass elements.

[17] Expenses for support staff, providers, and general operating costs per FTE physician were higher in medium than in small practices. Interestingly, IT costs per FTE physician were not higher in medium practices, presumably because these relatively fixed costs could be spread across more individuals.

[18] Costs would have to be over 35 percent higher among the High practices to achieve a correlation significant at $p = .05$.