

# Patient-Centered Medical Home and Diabetes

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The current model of health care delivery is designed to address acute health problems and is based on episodic face-to-face interactions between health care provider and patient, which often do not address the needs of chronically ill individuals (1). Diabetes is a well-documented example of a high cost prevalent chronic illness where a significant quality chasm exists. It is one of the most expensive chronic illnesses affecting over 23 million Americans (2) at a cost of \$174 billion in 2007 (3). Despite the high expenditures for diabetes care, very few patients with diabetes are at goal for evidence based recommendations, with only 7% of patients at goal for A1C, blood pressure, and LDL cholesterol (4).

In the recent years, much discussion has taken place regarding future health policies and the need to strengthen primary care. It is believed that improvements in the mode of delivery of primary care will better serve the needs of the chronically ill (5). Health outcomes are better in regions in which there is an adequate supply of primary care physicians, and patients receiving care from primary care physicians are healthier (6) and have fewer inpatient hospitalizations (7), fewer emergent admissions (8), a lower length of stay (8), and lower costs of care (9–11).

The Patient-Centered Medical Home (PCMH) has been proposed as a practical solution to the primary care crisis and holds promise to deliver better chronic care. Diabetes lends itself well to the principles of the PCMH given its robust evidence-based guidelines, high cost, and well demonstrated quality gap. Although a common definition of the PCMH has

remained elusive (12), the basic elements of a PCMH are well described by the Joint Principles of the American Academy of Family Medicine, American Academy of Pediatrics, American College of Physicians and the American Osteopathic Association (13). Those are care coordination, quality and safety, whole person orientation, personal physician, physician leadership, enhanced access and payment (Table 1).

The PCMH can be regarded as a vehicle to adopt the Chronic Care Model, a widely accepted evidence-based guide to quality improvement efforts in the primary care setting (14). Diabetes care has long been aligned with the key principles of both the PCMH and the Chronic Care Model, with early recognition of the importance of patient-centered care, self-management, patient empowerment, and team-based care as keys to better diabetes care. One can easily imagine how these key elements described for the PCMH could be applied to improve diabetes care. In fact, many demonstration projects include a large focus on diabetes.

A critical component of a Medical Home practice is that members of a “well-tuned” health care team work together through effective coordination and communication to cultivate and promote a culture of teamwork (15,16). Information technology is an integral part in such a working environment (17), and when combined with a commitment to regular performance review, leads to improvements in patient-centered care including diabetes care (18,19). An electronic health record (EHR), which stores all pertinent patient health information, serves as a patient registry. It grants a practice the

ability to implement population-based management. Targeted data queries assist in identifying patients who are most in need of an intervention (20). A common tactic is identifying diabetes patients with an A1C >9.0% not seen in the last 6 months who are then contacted and reassessed for potential care barriers (20). Health care team meetings occur at regular intervals and include care performance measurement and improvement as an inseparable part of the agenda. The delivery of evidence-based care is safe, easily accessible, and affordable, with each patient having a personal physician or provider who leads a team to ensure that care is coordinated across specialties and providers. The team has a whole person orientation with attention to not only medical, but also psychological and social needs. Aspects of care that do not require in-depth medical training can be delegated to nonphysician members of the health care team through standing orders (15). They are characterized as operating at the “top of their license” or scope of practice (e.g., medication reconciliation, foot examinations, vaccines, ordering of routine laboratory tests, downloading glucometer data, and telephonic follow-up). Patients have easy access to their provider through a flexible scheduling system and are also able to communicate with members of the health care team as needed. These benefits of the PCMH are recognized in a reformed payment system that rewards care coordination and quality in addition to traditional fee-for-service reimbursements (21).

The PCMH envisions the planning of an office visit to take place well in advance of the actual visit during which information from all sources collated (e.g., consultations with other providers, laboratory results). This ensures a prepared proactive practice team that can interact with the patient in a “planned visit” during which comorbidities common in diabetes can be addressed systematically, in a timely manner, and consistently. A care coordinator/care manager can follow up with high-risk patients between visits to address potential barriers to adherence (15). Referral visits to subspecialty consultants, diabetes educators, or nutritionists, can be tracked to ensure appropriate

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See accompanying commentary, p. 1054.

Table 1—Basic components of a PCMH (47)

Coordination and integration of care	Exchange of health-related information through electronic health records; use of patient registries; care coordinator services; the physician arranges care with subspecialists and consultants, guides the patient through the health system
Quality and safety	Decision support based on updated practice guidelines, e.g., incorporation of most current care guidelines in daily patient flow, use of checklists and worksheets to guarantee consistency; use of patient registries to review performance data
Whole person orientation	Comprehensive care including preventive care and end-of-life care
Personal physician	Each patient has a personal physician who is a first contact for all new health issues; the physician knows the important psychosocial factors that may influence the health of the patient, is culturally competent, and offers long-term comprehensive care.
Physician-directed medical practice	The physician oversees the health care team whose members communicate closely and is a key link in coordinating their work for the optimal benefit of the individual patient
Enhanced access	Flexible scheduling system; easy access to members of the health care team
Payment	Quality-based payment in addition to fee-for-service reimbursements of face-to-face visits; reimbursement for care coordination; recognition of complexity and severity of illness; sharing of savings achieved from reduced health care costs

care is received. Telephonic or secure e-mail follow-up and easy access of the health care team can assist patients and their family members when new problems arise (15) (e.g., adjusting insulin dosages, medication side effects, reminders for overdue complication screenings). Patients should have remote access from home to their own EHR (including laboratory results) (21). Educational content pertaining to diabetes can also be accessed via telephone or websites.

Although some traditional high-quality primary care practices may have many of the characteristics and tools of a Medical Home already in place, active support of patient self-management is an inseparable part of the activities of the PCMH (22). Teaching self-management such as healthy lifestyle modification, problem solving skills, motivation, and emotional support can be reinforced through regular follow-up by the provider. Even though formal diabetes education has been the standard of care for diabetes, ongoing self-management support (typically not by a physician or diabetes educator) can be incorporated into team-based care to ensure continued patient success in achieving self-management goals. Given the high incidence of depression in patients with diabetes, medical homes can develop standard screening procedures for screening and treating depression with integration of behavior health professionals into the Medical Home team.

The PCMH movement has accelerated in recent years, driven by professional

society endorsement, National Committee for Quality Assurance (NCQA) certification, and hope that the PCMH could empower primary care toward better quality care while reducing costs. Nationally, efforts have already reported improvements in quality and decreased acute care utilization and/or cost savings. These demonstrations differ from each other in their emphasis on Medical Home elements, organization of primary care delivery, care management, and provider reimbursement changes. Cost savings have already been reported in at least eight Medical Home demonstrations throughout the United States (23).

As PCMH demonstration projects are being conducted nationwide, they typically include reimbursement changes for primary care that are either through commercial carriers, Medicare, or Medicaid. Current demonstrations include over 14,000 providers caring for nearly 5 million patients (24). In this review we define key elements of the PCMH in relation to diabetes care and report demonstration pilots that include diabetes as a target disease.

## RESEARCH DESIGN AND METHODS

We collected information on Medical Home demonstrations that included quality of care data for diabetes by performing a PubMed search using the key words “Patient-Centered

Medical Home AND Diabetes Mellitus” in the timeframe between November 1993 and April 2010. We supplemented our collection by searching for additional demonstrations with Google, the Patient Centered Primary Care Collaborative nationwide Pilot Map (25), the American College of Physicians PCMH website (26), and the Commonwealth Fund online databases of Medical Home demonstrations (27). Our search focused on identifying Medical Home demonstrations that report process and outcome measures in diabetes—either in peer reviewed journals or formal websites. We identified 41 PCMH pilots nationwide, 11 of which were identified as reporting quality outcomes or trends in diabetes care. We excluded three studies because of their small size (fewer than 10 practices) and focused on identifying the interventions used to transform practices into a Medical Home.

**RESULTS**—These PCMH initiatives typically include some element of payment reform (either by a single or multiple payers) to cover infrastructure costs and care coordination. The payer types include commercial carriers (e.g., Blue Cross, Aetna) as well as public payers such as Medicaid. Initiatives in larger integrated health care delivery systems also involve payers from within their own systems (e.g., Group Health Cooperative). However, few initiatives are multi-payer, making it difficult for a specific practice to transform care for all patients because infrastructure payments are typically based on a subset of their total patient population. Other key approaches to a Medical Home implementation include care management, which has already been shown to be among the most effective quality improvement strategies for glycemic control (28). Most initiatives use patient registries to create reports of quality measures and guide quality improvement efforts. In some initiatives practices received assistance to upgrade already pre-existing EHRs to support registry functions while in others, practices were granted software and technical assistance from payers. Transforming practices may be guided by regular learning sessions during which experiences are exchanged and future steps planned. Some initiatives have also augmented this by practice coaching. Although many initiatives are at the early stages without published outcomes, reports of initial improvements in diabetes care are becoming available.

Eight demonstrations in particular are worthy of further note (Table 2).

The Community Care of North Carolina (29,30) is considered to be one of the first adult care PCMH initiatives. All regions of North Carolina are engaged in this Medicaid Managed Care program involving nearly 3,000 providers and 1,200 physician practices. Community Health Networks consisting of local practices, hospitals, and the local Department of Health have been established. Each network provides case managers who assist with the coordination of care for the sickest high-risk diabetic patients and are augmented by an engaged pharmacist. Several practices often share a local case manager with whom they have a long-term established relationship. Case managers also have access to claims data to identify high-risk patients. Providers receive payments in addition to the regular Medicaid fee schedule. It consists of a per-member-per-month fee that initially started at \$5.50: part paid to the provider (\$2.50) and part to the local Community Health Network to finance the case manager and pharmacist activities (\$3.00) (29). Participating practices are required to regularly submit diabetes quality indicator data to the state. These data are shared among practices and thought to encourage competition for quality improvements. Thanks to reductions in emergency room visits, pharmacy utilization, and both inpatient and outpatient care, annual savings of at least \$161 million have been estimated (29). Diabetes care quality measures in 2006 exceeded the NCQA set thresholds for A1C, blood pressure control, and LDL cholesterol (29). Performance measurement by the NCQA within the framework of the Diabetes Physicians Recognition Program (31,32) consists of a scoring system for current practice guideline-based performance measures in diabetes. The initiative has now expanded to include Medicare participation (30).

The Medical Home initiative of Geisinger Health System (33), a large integrated health delivery system in Pennsylvania, targets chronically ill Medicare individuals in need of complex care. A nurse care coordinator (Personal Health Navigator) communicates with the physician and other members of the health care team, "navigating" patients and their families through the health system. Patients have remote access to their laboratory results and EHR, and they can contact their provider via e-mail. Self-scheduling, prescription refills, reminders about due

preventive/screening interventions, and educational materials are also available. Nine quality indicators of diabetes care are tracked and all or none scoring is applied to identify patients receiving optimal care. Patient report cards are used to share these key outcome measures over time. Preliminary results for over 20,000 Medicare diabetic patients suggest improvements in quality performance 1 year after implementation (33). Patients with an A1C <7% increased from 32.2 to 34.8% ( $P < 0.001$ ) and those with blood pressure <130/80 mmHg also increased from 39.7 to 43.9% ( $P < 0.0001$ ) (19). The percentage of patients satisfying all nine quality indicators increased from 2.4 to 6.5% (19). Incentives consist of monthly payments of \$1,800 per physician and \$5,000 per 1,000 Medicare patients for infrastructure changes in each practice (33). Health plan savings are shared with physicians if predefined quality benchmarks are met (33).

The Pennsylvania Chronic Care Initiative is the largest statewide multipayer medical home initiative. It was initiated by the Pennsylvania Governor's Office for Health Care Reform (GOHCR) (34). The GOHCR convened 17 of the major payers in Pennsylvania, including Medicaid, to incentivize a statewide implementation of the PCMH in primary care practices with diabetes as an initial target disease. GOHCR used its authority to convene, facilitate, and lead the design of the Chronic Care Initiative, and by doing so, provided the participating insurers and providers with antitrust protection. The 3-year initiative started a phased regional implementation in May 2008 and involves 102 practices and 518 providers with a total diabetic patient population of over 56,000. This patient population is quite diverse, consisting of a mix of rural and urban patient populations with a high preponderance of small practices where the PCMH has traditionally not been implemented. Health care teams attend quarterly Breakthrough Series Learning Collaboratives in the 1st year and semiannually in the following 2 years. New steps in the PCMH transition are planned and discussed during these learning sessions. Practice coaches act as facilitators to practice change. Monthly quality data generated through a diabetes registry is submitted by practices to the GOHCR. Practices without a registry system were provided a free web-based registry. The reports contain diabetes care measures such as A1C, blood pressure,

LDL cholesterol, foot exam, and nephropathy. Practices receive initial payments for infrastructure support to cover costs of being away at the learning collaborative sessions and administrative expenses (e.g., NCQA-application fees), with further payments based on NCQA tier certification (total of 3 tiers). Practices may continue to receive payments from any other ongoing pay-for-performance program administered by individual payers. Preliminary diabetes results from the 1st year of the first regional rollout (Southeastern Pennsylvania) with 10,000 patients demonstrate significant improvements in A1C, blood pressure control, LDL cholesterol, complication screening, and appropriate medication use. More patients received statins (57 vs. 36% at baseline,  $P < 0.01$ ), ACE inhibitors, and angiotensin receptor blockers. The percentage of patients with established self-management goals increased 20% to nearly 70% ( $P < 0.01$ ) (35). A similar smaller multipayer initiative in Rhode Island, convened by the Rhode Island Office of the Health Insurance Commissioner, has begun to report early improvements as well (36).

Washington's Group Health Cooperative (37,38) is a large integrated health care and insurance system. It undertook transformation steps toward a Medical Home at one of its clinics serving 9,200 patients staffed by salaried physicians (39). A 22% patient panel reduction for each physician and the recruitment of additional primary care staff enabled practice changes such as previsit chart reviews, patient contact prior to scheduled appointments to address concerns, daily meetings of the care teams, and regular quality reviews. Secure e-mail and telephone encounters were encouraged, and the average patient visit increased from 20 to 30 min. Composite quality measures for the PCMH clinic and 19 matched control clinics were reported at baseline, 12, and 24 months later (38). A1C, LDL cholesterol, retinopathy, and nephropathy monitoring were an integral part of the composite score and were not reported separately. The PCMH patients' composite quality score improved by 7.6% within a 2-year period (from 51 to 58.6%) (38). The rate of staff burn-out in the Medical Home was also better after 1 year (10 vs. 30%,  $P < 0.02$ ) (37). There were also fewer emergency department visits ( $-29\%$ ,  $P < 0.001$ ) and fewer hospitalizations for conditions that are treatable in the outpatient setting ( $-11\%$ ,  $P < 0.001$ ) (37). Although outpatient care costs

Table 2—PCMH demonstrations reporting outcomes in diabetes care

PCMH demonstration	Start	Size	Improvements	Key transformation features
Community Care of North Carolina	1998	1,200 practices; 3,000 physicians	Improvements in A1C, blood pressure, and LDL cholesterol control (29); all three measures were above the NCQA target benchmarks. Reductions in emergency room and inpatient admissions; reductions in outpatient and pharmacy utilization (29)	Care coordination assisted by care managers; (Medicaid) – Single payer; PMPM fee; regular reporting of quality measures; community health networks
Geisinger Health System	2006	25 outpatient practice sites; 110 physicians	Improvements in the diabetic bundle (9 evidence-based quality indicators of diabetes care) (19). Reduction in inpatient admissions and total medical costs (33)	Care coordination assisted by care managers; single payer; monthly payments per physician; monthly infrastructure payments; performance-tied bonus payments; regular reporting of quality measures; patient registry; patient access to EHR
Pennsylvania Chronic Care Initiative	2008	102 practices; 518 physicians	Improvements in A1C, blood pressure, and LDL cholesterol control in the first year (35)	Care coordination assisted by care managers; multipayer; infrastructure payments based on NCQA certification; regular reporting of quality measures; patient registry; practice coaches; learning collaborative
Rhode Island Chronic Care Sustainability Initiative	2008	13 practices; 53 physicians	Improvements in A1C documentation, blood pressure control, and smoking advice documentation 6 months after begin of the initiative (36)	Care coordination assisted by care managers; multipayer; PMPM fee; care management reimbursement; regular reporting of quality measures; patient registry; practice coaches; learning collaborative
Group Health Cooperative Medical Home Pilot	2007	1 Seattle clinic serving 9,200 adult patients	Improvement in the composite quality score in the first and second year (38). Improved patient satisfaction; reductions in emergency room and inpatient admissions; return of \$1.5 for every dollar invested in the PCMH after 21 months (38)	Care coordination assisted by care managers; single payer; no reimbursement change; reduction of physician panel size; regular reporting of quality measures; patient registry; daily care team huddles to plan day, address problems and root cause analysis
Health Partners Medical Group, Minneapolis	2002	600 physicians; 50 clinics	Improvements in A1C, blood pressure, LDL cholesterol, aspirin use and tobacco cessation (40). Reductions in inpatient admissions and readmissions; clinic cost savings (40)	Care coordination assisted by care managers; single payer; change from salary to productivity based physician payments; regular reporting of quality measures; patient registry; learning collaborative
Colorado PCMH Pilot	2009	17 practices	Improvements in A1C, LDL cholesterol and blood pressure control (42); all measures above NCQA quality benchmarks including tobacco cessation and depression screening. Reductions in emergency room and inpatient admissions; improved patient satisfaction; improved healthcare worker satisfaction (42)	Care coordination assisted by care managers; multiple payer; PMPM fee; pay-for-performance payments; regular reporting of quality measures; patient registries; practice coaches; learning collaborative
The PCMH National Demonstration Project	2006	36 practices	Improvements in chronic illness care quality (44). No improvements in patient experience; practice coaches helpful in adopting more Medical Home features (44)	Care coordination; regular reporting of quality measures; patient registry; improved access; practice coaches; learning collaborative

PMPM, per-member-per-month.

were higher for Medical Home patients (+\$16 per patient per year,  $P < 0.05$ ), emergency medicine care costs were, however, significantly lower ( $-\$54$ ,  $P < 0.001$ ) (37). By the end of the first year, there was a full return on the health care work force and structural investment (about \$60,000 annually) (39) at the PCMH clinic site (37). By 21 months, for every \$1 invested in the PCMH, a return of \$1.5 was estimated (38).

Health Partners Medical Group of Minneapolis is another large integrated health system with 50 clinic locations (40). Some of the key practical steps in PCMH implementation included the adoption of the Chronic Care Model and organizing into “prepared clinical teams,” each consisting of a physician, nurse and receptionist. An all or none “bundle” of five diabetes quality measures (A1C, blood pressure, LDL cholesterol, aspirin use and tobacco cessation) was used to assess changes in quality of care. There were improvements between 2004 and 2008 from 4 to 25% of patients who met evidence based targets of all five quality measures (40). Reductions in inpatient admissions ( $-24\%$ ) and readmissions ( $-39\%$ ) were also evident (41). Clinic costs were 8% lower compared with average clinic costs in Minnesota, a state in which average costs of health care are already below the national average (41).

The Colorado PCMH Pilot (42) is led by a coalition of 7 major payers, 3 large employers, and 17 pilot practices. Practices receive in-office coaching to facilitate the transformation process and provide monthly registry quality reporting. Preliminary results toward meeting of NCQA's performance standards for A1C, LDL cholesterol, and blood pressure control are encouraging. This demonstration will be evaluated along with projects in New York, Pennsylvania, Massachusetts, Rhode Island, Idaho, and Oregon by teams supported by the Commonwealth Fund (27).

The National Demonstration Project (43), initiated by the American Academy of Family Physicians began in 2006 when 36 mainly independent and nonacademic family medicine practices were enrolled nationwide to transform toward a PCMH. The initiative randomized practices to those embracing transformation on their own vs. those transforming with the assistance of practice coaches. At the end of the 2-year study, practices adopted significantly more new components of the

PCMH when using practice coaches compared with self-directed practices (10.7 vs. 7.7 components,  $P = 0.005$ ) (44). Overall, a composite chronic illness score that included A1C, lipid levels, blood pressure, and retinal exams improved in both groups of practices, however, paradoxically even more so in noncoached practices (8.3 vs. 9.1%,  $P < 0.0001$ ) (44). There were no differences in patient reported experience.

Along with these key PCMH initiatives that have reported data on diabetes outcomes, there are numerous other initiatives that include diabetes as a focus suggesting early improvements (25–27). Many are in the process of formally reporting on their results but the majority do not have well-developed evaluation plans (24).

**CONCLUSIONS**—Medical Home demonstrations that track quality measures in diabetes care are being widely adopted nationally. Although randomized trials have yet to be performed, the eight Medical Home initiatives reported provide encouraging “before and after” results to support the PCMH as a viable mechanism to improve the quality and costs of diabetes care. The transformation toward a PCMH and its implementation, however, varies among the different demonstration projects. All typically include reimbursement enhancement with most using care management.

Fundamental to the successful implementation of the elements of the PCMH model is payment reform (45) because the current payment model only incentivizes face-to-face visits. Time for care coordination must be recognized and a payment reform is necessary to offset costs generated in the implementation and transformation process (46). Current trends in payment methodologies for PCMH vary (24) but include standard fee for service payments augmented by a per-member-per-month fee. This can also be further enhanced by bonus payments tied to achieving predefined performance and/or shared savings models (as used by Geisinger and Blue Cross of Northeastern Pennsylvania). Other initiatives have focused on infrastructure payments early in the initiative to offset increased costs of PCMH implementation (e.g., Pennsylvania Chronic Care Initiative). These reimbursement changes are likely to be critical for small practices, which are more likely to lack the resources and infrastructure needed (47).

Practice transformation often requires some facilitation and coaching. A practice coach shared by multiple practices can serve different roles including technical assistance (e.g., NCQA certification application, EHR adoption), facilitation/coordination of processes (e.g., guide quality improvement meetings), and/or humanistic/cheerleading aspects to encourage practices through the stressful phases of transformation. The majority of current ongoing demonstrations nationwide are assisted by practice coaches (24). Learning collaboratives are another key strategy used in 69% of PCMH nationwide (24) (e.g., Pennsylvania Chronic Care Initiative). During these sessions practice members explore and exchange ideas about the unique pathways of implementing changes. Registry and EHR upgrade software can also be provided to individual practices by participating payers or government stakeholders.

The NCQA has established a program for Medical Homes that certifies practices at three tiers on the basis of the fulfillment of specific Medical Home criteria. This program is used by the majority of current ongoing Medical Home demonstrations nationwide (24). Practices are evaluated for the fulfillment of nine standards in 1) patient access and communication, 2) patient-tracking and registry functions, 3) care management, 4) patient self-management and support, 5) electronic prescribing, 6) test tracking, 7) referral tracking, 8) dedication to regular quality review through performance reporting and improvement, and 9) advanced electronic communication. Practices must meet minimum criteria within these categories, five of which are required for level 1 certification. Level 2 and 3 certification is dependent on fulfilling and scoring in all 10 “must-pass” elements (48).

While the PCMH is gaining attention and popularity, transforming practices have also been observed to encounter challenges. The transformation toward a PCMH should not be viewed as a simple prescheduled set of steps in practice redesign or a fulfillment of certification requirements in stages. Instead, it represents a long lasting commitment to transformation and adaptability to patient needs. Observations from the National Demonstration Project found that although many practices began the demonstration with a preexisting EHR, it has been a challenge to establish registry and patient portal functions (49). Nationally, EHR adoption has been slower than expected (50). To

facilitate further adoption and enable communication among different providers, policy makers have focused efforts on incentivizing and standardizing EHRs (51). Physicians' attempting to redirect efforts toward treating and maintaining the health of larger population groups in addition to treating individual patients is a task requiring a change in mindset (39,49,52). Learning sessions have proven very important in regards to reenergizing participants for practice redesign although it seems that some have reported difficulties transferring the motivation and enthusiasm for change to team members who did not participate in these sessions (49). Finally, good leadership and personal transformation on the part of a physician is needed to facilitate team work.

Only 3 years ago, pursuit of a medical home pilot required a well-informed leap of faith. The size of that leap has grown significantly smaller based on recent reports which have found at minimum cost neutrality and in most cases cost savings. As the business case builds, more PCMH demonstrations are likely to blossom across the country with many including diabetes as one of the focus illnesses. Early results for diabetes care quality are encouraging and individual PCMH demonstrations will continue to attract attention in the near future as they report further results.

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