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Effects of Patient-Centered Medical Home model on primary care

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EFFECTS OF PATIENT-CENTERED MEDICAL HOME MODEL ON PRIMARY CARE

by

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EFFECTS OF PATIENT-CENTERED MEDICAL HOME MODEL ON PRIMARY CARE

ALEC J. BERNARD

ABSTRACT

The Patient-Centered Medical Home (PCMH) model has been touted as one of the most promising reform efforts of the largely inefficient U.S. healthcare system. In comparison to the current primary care system, the PCMH is a care delivery model that is based on the principles of care-coordination, enhanced access, and team-based collaboration as a means of providing comprehensive, patient-centered medical care. The current literature contains a limited number of review articles synthesizing the data of numerous PCMH outcome studies. Even a smaller number draws definitive conclusions as to whether PCMH is a viable model upon which to reform the US healthcare system.

This literature review will examine the available results of PCMH studies in light of their ability to 1) decrease the overall cost of healthcare 2) increase the efficiency of the continuity of care and 3) to increase positive patient outcomes through proactive patient care. Additionally, these results will be examined in regard to their longevity as a viable model of reform and specifically as it compares to the current US healthcare system.

This review will determine whether there is statistical evidence that the Patient-Centered Medical Home is a successful model to decrease healthcare costs, increase healthcare efficiency as well as increasing positive patient outcomes. In addition, this
review hopes to point to ways in which the model could be improved in order to more completely achieve the goals listed above.
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LIST OF ABBREVIATIONS

AAFP ................................................................. American Academy of Family Physicians
AAMC ................................................................. Association of American Medical Colleges
ACEP ................................................................. American College of Emergency Physicians
AAMC ................................................................. Association of American Medical Colleges
ACP ................................................................. American College of Physicians
AOA ................................................................. American Osteopathic Association
GDP ................................................................. Gross Domestic Product
HIT ................................................................. Health Information Technology
NCQA ................................................................. National Committee for Quality Assurance
NDP ................................................................. National Demonstration Project
OECD .............................................................. Organization for Economic Co-operation and Development
PCMH ................................................................. Patient-Centered Medical Home
PCMN ................................................................. Patient-Centered Medical Neighborhood
PMPM ................................................................. Per-Member-Per-Month
RCT ................................................................. Randomized Control Trial
INTRODUCTION

The Patient-Centered Medical Home (PCMH) model has been touted as one of the most promising reform efforts of the largely inefficient U.S. healthcare system. Finding its origins in the early 1960s, the concept of PCMH was originally conceived by pediatricians looking to improve care for chronically-ill children (Carrier et al., 2009). Their primitive model included concepts such as central coordination of care among specialists as well as serving as a central source for a given patient’s medical records. This principle of “continuity of care” would continue to thrive among pediatricians, however, this model failed to carry into the larger practice of primary care (Varkey, 2010). A study conducted by Spiegel et al. in 1983 concluded that, at the time, only 36% of a patient’s medical visits were to their primary care physician (Spiegel et al., 1983). It was this trend that led to the development of the Wagner Chronic Care Model of the late 1990s (Carrier et al., 2009). Depicted in Figure 1, The Wagner Model sought to centralize medical care with a primary care office as well as to introduce the trend of proactively addressing the healthcare needs of patients in order to prevent more devastating and costly medical emergencies in the future (Enthoven et al., 2007). Despite these efforts, a study conducted seven years after the development of the Wagner Model demonstrated only minor improvement in the coordination of patient care (McGlynn et al., 2003). In light of this, the American Academy of Family Physicians (AAFP) developed the comprehensive model of a medical home in order to actively and efficiently provide acute, chronic and preventative medical care services in addition to
serving as a centralized repository for a patient’s medical information (Egger et al., 2012). Almost a decade later, the cost-efficiency and benefits of the PCMH model continued to be disputed among scholars.

![Image of the Chronic Care Model](image.png)

**Figure 1: Wagner Chronic Care Model.** Wagner’s Model demonstrating the coordination between active and proactive medical care leading to improved patient outcomes. (Adapted from Carrier et al., 2009)

In order to gain quantifiable information regarding the everyday practicality and effectiveness of the PCMH, the AAFP established the National Demonstration Project (NDP) in 2006 (Arend et al., 2012). Analysis of the project has led to a variety of opinions regarding the adoption of a nationwide PCMH model (Nutting et al., 2009). Currently, the literature remains divided on the issue. Numerous observational cohort studies favor implementation of PCMH. These pro-PCMH studies provide similar results,
often citing statistical evidence that the model results in less resource utilization, increased disease management and more effective preventative health (DeVries et al., 2012).

In addition to those who recognize the benefits of a PCMH, there have been a small number of cohort studies that have showed evidence of some of the benefits touted by the model, but a decrease or no change in others. For example, a study published in the American Journal of Managed Care found an overall increase in preventative care among patients belonging to a PCMH, but found no statistical evidence of a reduction in overall healthcare costs (Peikes et al., 2012). Other studies that sought to review the quantitative evidence on the PCMH claim the model to be incomplete and as such, not ready for widespread adoption. A tendency among researchers who arrive at this conclusion are, on-average, favorable toward the PCMH model as an archetype, but feel more “comprehensive analyses is needed in order to refine the model to meet stakeholder’s needs” (Peikes et al., 2012).

An equal portion of the literature claims a widespread PCMH system as a misstep in the search for a solution to the unsustainable costs and complexity that currently plagues the US healthcare system. A literature review on the subject published by Health Service Management Research suggest that the majority of publications regarding the overall effectiveness of PCMHs are heavily weighted towards positive patient-related outcomes (Arend et al., 2012). The review cites numerous methodological and measurement discrepancies that the researchers believe are associated with the large number of positive patient outcomes (Alexander & Bae, 2012).
Additionally, it is important to also take into consideration the effect of PCMH on other pillars of our current healthcare system. Most notable of such is the American College of Emergency Physicians (ACEP) who, in a publically released statement, criticize the PCMH model, noting that “shifting of financial and other resources to support the PCMH model could have adverse effects on sectors of the healthcare system (“The Patient-Centered Medical Home Model,” n.d.). Similar statements have been released by the American Optometric Association as well as the American Psychological Association. Both groups cite restriction to their respective medical services as a potential hazard of a PCMH model.

There is no definitive consensus among researchers as to if the Patient-Centered Medical Home model effectively alleviates the problems it claims to address; namely that of lowering healthcare costs, improving coordination of care and increasing positive patient outcomes. Several studies have shown an increase in all three of the aforementioned goals among practices who implement PCMH compared to those who do not (DeVries et al., 2012). Others have shown PCMH models to improve patient outcomes, but fail to reduce healthcare costs or improve coordination of care (Peikes et al., 2012). In addition, several studies argue against the PCMH model entirely, both calling into question the favorable results of other studies and also the ability of the model to alleviate the long-term financial strain placed on the US healthcare system (Alexander & Bae, 2012).
PUBLISHED STUDIES

Information regarding the current PCMH model began appearing in the literature in the early 2000s in reaction to the largely ineffective implementation of the Wagner model during the late ‘90s. However, it was most surprising to discover that the tenets of the current PCMH model date back to the 1960s when pediatric physicians came together to develop a model of continuing care for chronically ill children (Carrier et al., 2009). It was also interesting to learn about the wide variety of criticism the model is receiving from various specialty physicians who fear that the PCMH model would greatly diminish the number of patients they see.

Performing an initial search for information, a general internet search on Patient-Centered Medical Home was first conducted and immediately resulted in a wide breadth of relevant background material. Next, a search for relevant articles was conducted using Google scholar. Limiting the search query using the parameters “Full Text” and “Since 2008” proved useful in restricting the results to only pertinent journal articles. The majority of the top results were extremely relevant PubMed and PMC articles. After reading a handful of abstracts from the Google scholar search, it became apparent that the literature was quite divided regarding the efficiency and longevity of the PCMH model. Next, a search for scholarly articles and reviews was conducted using PubMed. The original search of “Patient-centered medical home” resulted in over 11,000 results. Using the MeSH terms “Patient-Centered Care” AND “Patient Care Management”, in addition to numerous applicable parameters, narrowed the search to 382 results. Utilizing both PubMed and Google scholar proved to be equally helpful, however, for contrasting
reasons. An original search using Google scholar resulted in a wide array of articles and ranging in date from 1954 to June 2014. Google scholar was useful as it affords the researcher the ability to limit results to a specific year. This was valuable when searching for articles pertaining to the results of a certain national study as limiting the results to the year of that study’s conclusion resulted in valuable review articles. With that said, PubMed was also incredibly useful as the search engine allows for a greater number of parameters on a search query and as a result, is able to locate highly specific journal articles and reviews. PubMed’s “Related Citations in PubMed” and “Cited by other articles in PMC” also served as invaluable tools when attempting to locate articles or reviews about a similar PCMH study.

LITERATURE REVIEW

The Need for a New Method of Primary Care

The United States spends more money than any other industrialized nation on healthcare. However, it consistently falls behind its counterparts in numerous indicators of population health. According to the Organization for Economic Co-operation and Development (OECD), the United States continues to spend roughly 18% of gross domestic product (GDP) on healthcare-related costs alone (Organization, 2014). Such expenditure is approximately 9 percentage points higher than the OECD average of 9.3%, the mean percentage of GDP spent on healthcare by 38 of the world’s most industrialized nations. The nations that most closely follow the US are the Netherlands and France, both
of whom spend approximately 12% of their GDP on healthcare-related costs (Organization, 2014).

The OECD also found that the United States, despite such high healthcare expenditures, falls behind many other industrial nations in several key indicators. In 2011, there were 2.5 practicing physicians per 1000 population in the United States compared to the OCED average of 3.2 physicians. Similarly, the U.S. has 3.1 hospital beds per 1000 population compared to the OCED average of 4.8 beds. Between the years of 1960 and 2011, the life expectancy at the time of birth has increased 9 years within the United States, statistically lower than an increase of 15 years experienced in Japan and the 11 year increase indicated by the OECD average. Perhaps most notably, in 2011, the percentage of adult obesity cases within the United States was 36.5%. This is alarmingly greater than other industrialized nations with an OCED average of 15% (Organization, 2014). This statistic is especially alarming as the obesity of a given population serves as a preliminary predictor of future cardiovascular disease and diabetes, both of which parallel increased healthcare cost and overall GDP expenditure.
Figure 2: Commonwealth Fund’s Overall Ranking of the Healthcare Systems of Western Nations. The overall ranking of Western Nations in pivotal healthcare-related measures of quality. (Adapted from Davis, 2014)

The Commonwealth Fund publishes an annual report which outlines how the United States Healthcare System compares to various other western nations. Figure 2 summarizes the Fund’s overall ranking of Western Nations in regards to pivotal healthcare-related measures of quality. According to the Fund’s 2014 publication, the U.S. ranks at or very close to the bottom in important categories including quality, access, efficiency and equity of care, all of which the U.S. ranked last (Davis, 2014). The United States falls behind others like the UK and Switzerland, both of whom are consistently rated among the top in the aforementioned categories, despite the U.S. spending more on healthcare per capita than both nations combined. Perhaps most troubling, the report
indicates that patients in the U.S. are more likely to forgo needed healthcare due to cost than those in other countries (Davis, 2014).

In terms of access, the report indicates that U.S. patients rank high in regards to timely and uninhibited access to specialized care. However, the United States ranks much lower when comparing similar access to primary care among other western nations. The U.S. ranks last in terms of efficiency of healthcare largely due in part to administrative red-tape, avoidable emergency room use and often unnecessary duplicated medical tests. The U.S. ranks a clear last in the measure of equity as Americans are the least likely to visit a physician when ill, fill a prescription or receive appropriate follow-up care (Davis, 2014).

Delivery of primary care in America has failed to adapt to the changing needs of the U.S. population. Current and previous models have centered upon and become quite effective treating acute illnesses. However, it is inadequate at treating and managing long-term, chronic and age-related medical needs of patients. In addition to the mounting concerns mentioned above, an overwhelming reluctance of medical students to enter fields of primary care has also placed a large burden on the United States healthcare system. Students, emerging from graduate medical programs with nearly insurmountable debt, have cited the low reimbursement rate and heavy workloads of primary care physicians as reasons for choosing to specialize in more lucrative fields (Green, 2013). In 2008, the Association of American Medical Colleges (AAMC) projected a national shortage of over 46,000 primary care physicians by the year 2025 (Peterson, 2012). This impending shortage, compounded by the apparent short-comings highlighted by both the
reports published by OECD and The Commonwealth Fund, indicate an urgent need to re-evaluate the model and effectiveness of America’s primary care system. It is against this backdrop that many within the clinical medicine community are pushing for a more rapid and widespread adoption of the Patient-Centered Medical Home model. As will be discussed later in this review, the PCMH addresses numerous weaknesses in the US healthcare system, while simultaneously looking create a more effective, cost-reducing and sustainable approach to patient-centered primary care.

Pillars of a Patient-Centered Medical Home

In his 2012 literature review, Dr. Arend and his colleagues organize various tenets of a patient centered medical home model into seven board principles: (1) enhanced access, (2) continuity, (3) comprehensiveness, (4) team-based care, (5) care coordination, (6) systems-based approach, and (7) revised reimbursement structures (Arend et al., 2012). As mentioned in the introduction of this literature review, the PCMH finds its origins in the 1960’s when the phrase “Medical Home” was introduced by the American Academy of Pediatrics (AAP) as a model of caring for chronically-ill pediatric patients (Fisher, 2008). Originally envisioned as a central hub for medical records, the model was soon expanded to include tenets of accessibility, comprehensiveness and patient-centeredness. (Hadland & Long, 2014). In the mid-1990’s, the medical home was further enhanced by Dr. Ed Wagner. Dr. Wagner would gain recognition for developing what would come to be known as the “Wagner Chronic Care Model”. The chronic care model looked to expand the medical home beyond pediatric patients to chronically-ill adult
Patient populations (Carrier et al., 2009). Tenets of Dr. Wagner’s model include an emphasis on a multi-level, team-approach to patient care, notions of patient self-management and the use of technology as it pertains to patient experience and treatment (Arend et al., 2012).

In an effort to address the numerous problems facing primary care outlined and discussed in the previous section, the AAP, AAFP, American College of Physicians (ACP) and the American Osteopathic Association (AOA) began to refine the model for large scale adaptation following the turn of the century. A report published by the AAFP, and later affirmed by a publication by the ACP in 2006, recognized that reimbursement reform would be necessary if widespread adaptation of the model was to ever be adopted (Barr & Ginsberg, 2006).

It is apparent to see that the seven core principles outlined by Dr. Arend and his colleagues are deeply rooted in the history of the model. Enhanced access, continuity and comprehensiveness are core tenets of the medical home model first proposed by the AAP in 1967. Also, important tenets such as team-based approach, care coordination and systems-based quality measures are important principles of Dr. Wagner’s Critical Care Model published in 1996. The importance of reimbursement reform structures are a direct result of the studies conducted by both the AAFP and the ACP ten years later as previously mentioned. In other words, the PCMH model discussed in this literature review was not ardently created by a single individual with a definitive set of parameters by which to define it; but rather the modern PCMH is the summation of years of innovations in primary healthcare-delivery. Innovation that sought to improve
coordination of care, lower healthcare costs and increase positive patient outcomes. These attributes have evolved with time to meet the challenge of providing care for a modern patient population (Carrier et al., 2009).

**Methods Used to Measure Effectiveness of PCMHs**

Currently, the literature remains divided regarding the effectiveness of PCMHs despite their continued widespread adoption. When the National Committee for Quality Assurance (NCQA) first introduced its standards for recognition as a PCMH, only 28 primary care practices were officially recognized by year-end (Arend et al., 2012). Currently, 7,782 practices have earned official recognition by the NCQA (National Center, 2014). This is particularly interesting when considered against the backdrop of widely discordant literature. While a majority of studies suggest the PCMH is producing positive results, there are enough studies concluding the contrary to warrant continued discussion on the topic. The overwhelming and ongoing investment in the model, both public and private, highlight the continued importance investigators should continue to place on evaluating the sweeping and dynamic changes implemented by a PCMH transition. As of date, the majority of clinical research has been focused upon the effectiveness of the PCMH at delivering its core tenets (enhanced access, continuity, coordination etc.). The most significant of these studies utilize a randomized controlled trial (RCT) model of chronically-ill patients (Arend et al., 2012). It has only been in the last year or so that comprehensive studies examining the effectiveness of the PCMH model as a whole, have emerged in the literature.
Enhanced Access

In the modern PCMH model, enhanced access refers to, in general terms, an increase in availability of the medical home to the patient. This is primarily achieved by transitioning from traditional, appointment-based scheduling to an open-scheduling model. The purpose of this model is to allow the patient greater access to their primary care physician at shorter notice. Stated simply, an open scheduling model does not book out future appointments but rather relies on the patient to make the appointment the week or day that he or she wishes to be seen (Rose et al., 2011). This model allows a patient access to their primary care physician on extremely short notice if necessary.

Currently, most medical homes utilize partial or semi-open schedule practices (Rose et al., 2011). In the model of appointment booking, a physician will continue to schedule appointments weeks or months in advance at the convenience of the patient. However, each primary care physician will allocate blocks of time each day, specifically reserved for their own panel of patients, for both urgent and non-urgent cases.

In 2011, physicians Katherine Rose, Joseph Ross and Leora Horwitz sought to examine the specific effect implementing an advanced access model has on patient-care related outcomes (Rose, et al., 2011). Their study yielded mixed results. Dr. Rose and colleagues were able to successfully conclude that the time to the third available appointment, an accurate measure of appointment availability, was significantly decreased. Troublingly however, they also noted that out of the 24 implementations of advanced access, only a small fraction were able to achieve same-day access (Rose, et al., 2011).
Table 1: Summary Table of Advanced Access Studies. Dr. Rose and her colleagues examined previous studies of advanced access (AA) and compared patient satisfaction between practices with established AA system against those who had not. (Adapted from Rose, et al., 2011)

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient satisfaction: overall</th>
<th>Satisfaction, practices without AA</th>
<th>Satisfaction, practices with AA</th>
<th>Absolute δ satisfaction</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bundy et al. 2005 29</td>
<td></td>
<td>45%</td>
<td>61%</td>
<td>16% (95% CI 0.2 to 30)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Lewandowski et al., 2006 56</td>
<td></td>
<td>84%</td>
<td>87%</td>
<td>3%</td>
<td>NS</td>
</tr>
<tr>
<td>Solberg et al., 2004 45</td>
<td></td>
<td>DM 30%</td>
<td>DM 55%</td>
<td>19%</td>
<td>NR</td>
</tr>
<tr>
<td>Parente et al., 2005 57</td>
<td></td>
<td>6.21f</td>
<td>6.08f</td>
<td>−.13 points</td>
<td>NS</td>
</tr>
<tr>
<td>Radel et al. 2001 40</td>
<td></td>
<td>72%5</td>
<td>95%</td>
<td>23%</td>
<td>NR</td>
</tr>
</tbody>
</table>

Patient satisfaction: appointment system

<table>
<thead>
<tr>
<th>Study</th>
<th>Satisfaction, practices without AA</th>
<th>Satisfaction, practices with AA</th>
<th>Absolute δ satisfaction</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salisbury et al. 2007 44, Sampson et al. 2008 45</td>
<td>52%</td>
<td>52%</td>
<td>Adjusted OR 0.93 (95% CI 0.67–1.28)</td>
<td>NS</td>
</tr>
<tr>
<td>Bundy et al. 2005 29</td>
<td>39%</td>
<td>47%</td>
<td>10% (95% CI ~9 to 20)</td>
<td>NS</td>
</tr>
<tr>
<td>Lukas et al., 2004 37</td>
<td>74%</td>
<td>84%</td>
<td>10%</td>
<td>0.09</td>
</tr>
<tr>
<td>Mehrotra et al. 2008 31</td>
<td>53%</td>
<td>51%</td>
<td>−2%</td>
<td>NR</td>
</tr>
</tbody>
</table>

The study noted a positive correlation between the time until the third available appointment and no-show rate. In other words, the less time between when appointment is made and the third available appointment, the least likely a patient was to not arrive for their scheduled appointment. This was again noted by the researchers as practices reporting a decreased third appointment time also saw an increase in visit volume, physician compensation and productivity outcomes (Rose, et al., 2011). Perhaps most important, shorter wait times were positively associated with overall patient satisfaction (Rose, et al., 2011). As seen in Table 1, numerous studies cite an increase in overall patient satisfaction for practices implementing advanced access scheduling compared to those who did not implement the scheduling model.
While the aforementioned results lend support for a PCMH model, Dr. Rose and her colleagues also concluded that advanced access scheduling, more times than not, lead to a decrease in continuity of care. Another major tenet of PCMH, care continuity is highly important to a patient-centered medical practice. Specifically, the researchers conclude that, in an advanced access system, patients may be more likely to be lost to follow-up (Rose, et al, 2011). Another study conducted by Newman et al. demonstrated a similar problem in specialty offices implementing advanced access scheduling practices (Newman et al., 2004). These negative result however, may be negated with properly implemented continuity protocols and procedures often necessary for both accurate reimbursement and modern PCMH recognition.

![Figure 3: Strategies for Enhancing Access to Care.](image)

A graph depicting numerous ways in which 18 PCMH pilot practices are enhancing access to care. (Adapted from Payne & Gray et al., 2011)
Enhanced access also refers to expanded hours of operation. In many medical homes, this means remaining open later during the week and scheduling appointments on the weekend. This is in direct contrast to traditional primary care hours, the majority of which are open 9-5 Monday through Friday (Zickafoose et al., 2013). Figure 3 depicts strategies that practices enrolled in a Maine PCMH pilot program are using to enhance access to care. Most popular of these include same-day scheduling, physician availability via phone after hours, and expanding evening office hours. Being able to adapt to a given patient population is what has helped make PCMH pilot programs so successful. In light of this, practices have also expanded access by utilizing a 24-hour on-call provider, who is able to give limited phone consults and retrieve a patient’s medical record at a moment’s notice.

Additionally, technology has shaped many facets of society and the delivery of primary does not remain unaffected. Patient Centered Medical Homes have implemented technology to further expand access to patients. Web-portals have become an integral part of a PCMH to increase access to patients in a way that is both convenient and familiar. Web-portals allow for secure messaging, email and communication about a patient’s health or medical record directly with their healthcare team (Arend, et al., 2012). Web portals have also become a convenient way for patients to schedule appointments, participate in medical education modules, request prescription refills and access general information about their provider and practice.
Numerous studies have been published regarding the effect of increased patient access on patient care and resource allocation. One such study was conducted by Dr. Zickafoose and his colleagues to determine if there was an association between enhanced access and emergency room visits (Zickafoose, et al., 2013). The experiment utilized an internet-based, national survey and multivariable negative binomial regression to determine the association between enhanced access and visits to the emergency room. Zickafoose and his colleagues concluded that extended office hours, particularly being open after 5:00 p.m., were statistically associated with lower ED use in the area even after adjusting for age, social and economic factors (Zickafoose, et al., 2013). This result provides further evidence that a PCMH, with increased access practices implemented, can help reduce the cost of care delivery. This is especially the case as the cost of an emergency room visit is exponentially higher than that of an office visit both in terms of cost to the facility and the payout of a given patients insurance provider.

The study also found that enhanced access policies lead to more favorable opinions of a given primary care practice (Zickafoose, et al., 2013). This conclusion further augments the effectiveness of a PCMH at increasing patient satisfaction at a lower cost. Of equal importance, the study also found that a statistically relevant number of patients were unaware as to whether or not their primary care office did in fact practice broader hours of access such as on-call services and expanded office hours. Zickafoose and his colleagues, while recognizing the benefit of a PCMH model, advise transitioning practices to find successful ways of informing their patients of the office’s multiple expanded access policies (Zickafoose, et al., 2013).
Expanded patient access has shown to increase patient satisfaction. Additionally it allows for a level of transparency that has previously rarely been associated with healthcare. As will be discussed later, the practice of increasing access, such as expanding operating hours and web portals, have a potential to lead to burnout of the clinicians and staff. This highlights the importance of a well-planned practice restructuring plan that takes into account both the monetary and temporal resources necessary to become a PCMH.

Team-Based Care

On a clinical level, the introduction of team-based care is perhaps one of the greatest innovations of the PCMH. This is in direct contrast to the common implementation of a physician-centered model of primary care (Arend et al., 2012). Working as a team is not a nuance idea in healthcare, however, implementing such a change in primary care has numerous implications across both practice operations as well as delivery of care.

It has become somewhat of a standard of PCMH practices to utilize once or twice-daily “Team Huddles”. Group Health’s initial PCMH pilot program defined these meetings as short, all-team, daily planning meetings (Reid, 2010). These meetings also serve as an open forum for staff members to express concerns with a given patient or a given patient population. Holding an open forum among providers also contributes to a PCMH’s quality control as it provides an opportunity for team members to express concerns regarding the policies and protocols. In addition, group meetings or huddles
allows for the team to make suggestions regarding ways in which to improve both patient care and delivery. A team-based approach contributes to the dynamic structure of a PCMH. By placing a heavy importance on the team as opposed to either just physicians or stake-holders, the practice is able to better adapt to its patient population and, as a result, provide a more tailored healthcare experience.

Transitioning to a PCMH also requires providers, other than physicians, to both work at the highest level of their license, and assume expanded duties and responsibilities. As explained by Dr. Hal Yee’s article in *Annals of Internal Medicine*, some PCMHs have utilized medical assistants to run brief, pre-visit huddles in an effort to anticipate the needs of a given patient (Yee, 2011). In addition, medical assistants have been used to manage post-visit care, such as follow-up calls and assuring patients adhere to prescribed medication or nutritional regimes (Yee, 2011).

Nurses often have greater responsibility when caring for both chronic and high-risk patients within a PCMH. In many practices, registered nurses of ample training and experience assume complete care-management control of chronically-ill patients (Arend et al., 2012). This expanded staffing model specifically requires greater RN and clinical pharmacist involvement in care management (Reid, 2010). These broadened roles and responsibilities do not end with providers. Often other integral parts of the PCMH model, such as registrars and social workers, also assume additional responsibilities. With others maintaining a greater role in patient care, physicians are able to spend more time with their own patients as well as participating in complex medical diagnosis, treatment and management.
A team-based model of care delivery is essential to any PCMH model. However, it requires a certain level of trust among both staff and providers. Only under this level of trust can the model truly begin to improve the delivery and quality of care to patients (Fisher et al., 2008). In a PCMH pilot program across the state of Maine, after 1 year, providers and staff reported positive changes and benefits having participated in the pilot. Of these positive changes, many cited a renewed focus of teamwork and communication as being most beneficial (Payne & Gray, 2011).

Another example of the way in which the team-based approach of a PCMH can assist chronically-ill patients is through the development of a practice-based case manager. A pilot PCMH program run by UPMC utilized practice-based care managers to develop individually designed care-plans for chronically-ill patients with a specific focus on helping the patient manage symptoms and prescribed medication regimes (Rosenberg et al., 2012). The care manager works with families, health plan members, physicians and staff to support the patient’s management of their chronic condition. In the case of the UPMC program, the case manager was also responsible for reducing gaps in clinical care and eliminating unnecessary or repetitive care as a means of cost control (Rosenberg et al., 2012). There are many ways in which a PCMH can implement team-based care. Most important however, is that a patient-centered practice implements methods and procedures that are most effective for their respective patient populations.
Table 2: Number of Physicians, Nurse Practitioners and Physician Assistants in the Work Force in 2010 and that Projected in 2025. The percentage of physicians, nurse practitioners and physician assistants of the advanced provider workforce in 2010 and 2025. Numbers are rounded to the nearest thousand. (Adapted from Auerbach et al., 2013)

<table>
<thead>
<tr>
<th>Provider type</th>
<th>2010</th>
<th>Percent of total</th>
<th>2025</th>
<th>Percent of total</th>
<th>Percent change, 2010–25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>210,000</td>
<td>71</td>
<td>216,000</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>Nurse practitioners</td>
<td>56,000</td>
<td>19</td>
<td>103,000</td>
<td>29</td>
<td>85</td>
</tr>
<tr>
<td>Physician assistants</td>
<td>30,000</td>
<td>10</td>
<td>42,000</td>
<td>12</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>296,000</td>
<td>100</td>
<td>361,000</td>
<td>100</td>
<td>23</td>
</tr>
</tbody>
</table>

A team-based approach to primary care may be a pivotal means of mitigating the current and forecasted primary-care physician shortage. David Auerbach and his colleagues looked to examine projections of physicians and mid-levels in the workforce in the context of the PCMH. Table 2 depicts this impending physician shortage and highlights the projected rapid increase in mid-level providers. Most concerning is the meagerly forecasted 3 percent growth of physicians in the workforce by 2025. This is in direct contrast to the percent change of nurse practitioners and physician assistants which are projected to increase by 85 percent and 37 percent respectively. This is extremely troubling as of current, nurse practitioners and physician assistants are minority players in a non-PCMH approach to primary care (Auerbach et al., 2013). As projected by Table 2, if there is not a substantial shift in the delivery of primary care, the U.S. will face a considerable shortage of primary care physicians and a rather sizeable surplus of mid-level providers.
Utilizing the team-based approach necessitated by the PCMH model, in addition to expanded roles for mid-levels such as case managers and patient panel leads, the demand for physicians can be significantly minimized (Auerbach et al., 2013). With the support from providers of all levels, including registered nurses and medical assistants, physicians will be able to spend more time with patients. This increase in patient interaction can allow for an increase in patient panel size, affording primary care physicians to both see more patients, and for longer periods of time than under the current model of care. A growth in panel size may become unavoidable as there is expected to be an increased demand for primary care providers as a result of the Affordable Care Act (Auerbach et al., 2013). Regardless as to the reason of increased demand, a team-based approach to primary care delivery will become a necessity. The PCMH model not only utilizes this team-based care, but is built upon it. This is true for both providers within a practice as well as providers collaborating between various healthcare services.

**Care Coordination and Management**

Care coordination is important in any healthcare delivery model. In broad terms, it refers to open channels of communication between various medical providers. For example, if a patient is admitted to hospital through an emergency room, the PCMH would be notified and, with the patient’s permission, his/her medical history and notes shared for the purpose of diagnosis and treatment (Reid, 2010). A similar example arises in the case of a patient needing to see a specialist. This is often achieved through the
establishment of a “medical neighborhood” or collaborative relationship among healthcare providers within a given geographical area.

Care-management programs have also been utilized by PCMHs as a means of providing tailored care for those who are chronically-ill. The programs will require the regular use of resources for patients who are at risk for disease-related complications. In these programs, usually led by nursing staff as previously mentioned, patients are managed through outreach, clinic visits and coordination with other providers. In addition, these programs are conducted with frequent communication with a patient’s given PCP.

Utilizing pre-established goals for improvement and sustained management, these programs seek to eliminate the often convoluted and disorganized way chronically-ill patient populations are forced to manage their healthcare. These programs often utilize interviews with the patient and, with permission, family members and/or care givers. This affords the program the means to better care for and assist in managing the healthcare of the individual.

Perhaps on one of the most daunting barriers facing a truly integrated medical home model is the challenge of incorporating it within a much broader patient-centered medical neighborhood (PCMN) (Yee, 2011). The PCMN is broadly understood as effective cooperation between a patient’s PCMH and outside specialist and subspecialists who also take part in delivering quality healthcare to the patient.

In his 2008 NIH publication, Dr. Elliot Fisher cites the full implementation of a medical neighborhood as having numerous challenges to overcome in order to fully
integrate the PCMH into the U.S. primary care system (Fisher, 2008). These barriers are summarized in Table 3. As mentioned by Dr. Yee (Yee, 2011), the current system does not incentivize collaborative care between hospitals, specialists and PCMHs. Dr. Fisher believes this can be achieved by implementing various credentialing standards for each facility that would require channels and protocols to be developed specifically for communication between providers (Fisher, 2008). Additionally, collaboration could be rewarded through public and private payments to facilities participating in a medical neighborhood network. These financial incentives could come in the form of pay-for-performance or shared-savings payments, both of which will be discussed later in this review. Many oppose a medical neighborhood model as, in some cases, can be rather costly to implement (Fisher, 2008). For example, a monetary cost may come in the form of establishing secure methods of communication and shared health information technology (HIT) among members. A PCMN may also be costly as it reallocates resources for the betterment of chronically-ill patients who require visits to multiple labs, facilities and offices while shifting resources from managing acute/ short-term patients. Dr. Fisher hypothesizes that this can be averted if integrated care delivery systems are implemented that share savings from better quality of care and lessen costs for all patients (Fisher, 2008).

This will first require complete access to necessary clinical information across various healthcare sites including nursing homes, hospitals, specialists’ offices and the PCMH. This has already been implemented to a limited degree in most facilities through the use of electronic medical records (Fisher, 2008). However, the PCMN model will
require an even greater level of collaboration as all physicians, not just those in primary care, must show a willingness to participate in the decision making process regarding a shared patient’s care. This coordination, under the current system, is left to the PCP based on trusted referrals. This, unfortunately, often leads to numerous problems. For example, if a referred specialist is not within a patient’s insurance network, he/she is forced to visit a different provider, who may or may not collaborate with the patients PCP (Fisher, 2008).

**Table 3: Summary Table of Barriers and Potential Approaches to Full-Implementation of a Successful Medical Neighborhood.** The left column highlights some of the major challenges identified by Dr. Elliot Fisher. The right column indicates methods to overcoming said challenges. (Adapted from Fisher, 2011)

<table>
<thead>
<tr>
<th>Barrier to Success of Medical Neighborhood</th>
<th>Approaches to Overcoming Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resistance to Collaboration</strong></td>
<td><strong>Share Information Among Providers</strong></td>
</tr>
<tr>
<td>- Few incentives for hospitals and specialists to collaborate with primary care physicians</td>
<td>- Require medical homes to specify practice networks for performance measurement and information sharing</td>
</tr>
<tr>
<td></td>
<td>- Require providers to meet connectivity standards</td>
</tr>
<tr>
<td><strong>Lack or Uncertainty of Public and Political Support</strong></td>
<td><strong>Establish Performance Measurements and Rewards</strong></td>
</tr>
<tr>
<td>- Acceptability to patients is unknown; fear of gatekeeping could undermine</td>
<td>- Institute transparent performance measurement across continuum of care</td>
</tr>
<tr>
<td>- Specialist will probably oppose if their incomes are threatened</td>
<td>- Reward collaboration through payment updates, pay for performance or shared savings</td>
</tr>
<tr>
<td><strong>Difficulty Controlling Costs</strong></td>
<td><strong>Institute Broad Accountability for Population-Based Costs</strong></td>
</tr>
<tr>
<td>- There are outside influences on cost</td>
<td>- Foster integrated delivery systems that share savings from improved quality of care and lower costs for all patients</td>
</tr>
<tr>
<td>- Savings in a subpopulation are probably offset by increased spending in others</td>
<td></td>
</tr>
</tbody>
</table>
Individual physicians or facilities, under the current system, are not incentivized to share information or support the coordination of care of their patients. As Dr. Fisher highlights, this problem will need first to be solved before any sort of widespread PCMH implementation will be possible. He concludes by suggesting that continued or a step-wise increase in payments to those in a local practice network for shared electronic medical records and communication standards might help to foster the collaborative care the PCMN model looks to achieve. In an earlier article, Fisher and his colleagues allude to various standards that might be used to allocate an increase in funds. The first of which is a patient’s experience with their medical care, and should include assessments of both effectiveness and care coordination. In addition, the functional outcome of a patient’s health should be assessed as a standard of collaboration between providers. In other words, it will be important to understand whether or not a patient’s health improved as a result of care coordination. Lastly, the total cost of care for all patients in a practice network should be determined and evaluated in light of both effectiveness and the patient’s functional outcome. (Fisher et al., 2007).

**Systems-Based Approach to Quality and Safety**

A PCMH must be able to point to specific protocols and mechanisms by which it is able to gauge both its performance and effectiveness. This is in part achieved by daily huddles and open forums as previously discussed. In addition, this also includes various computer software systems and models that are able to provide various measurements of performance based on specified quality indicators. Patient feedback is essential for any
quality assurance program in a healthcare setting. This is achieved through patient surveys among other various channels of feedback.

A study conducted by Forbat and colleagues showed that engaging patients in a variety of quality assurance initiatives not only helps to both increase communication between the patient and providers, but also leads to increased participation of patients in their own care (Forbat et al., 2008). The team followed a number of clinics for 6 months. In test clinics, various patient-engagement initiatives were enacted and compared against control clinics who did not change either their methodology or policies in regards to patient care.

**Figure 4: Patient Engagement Initiatives.** A schematic illustrating the various methods of patient-engagement used by Forbat and his colleagues. (Forbat et al., 2008)
As seen above in Figure 4, Forbat et al. implemented various engagement initiatives throughout a given patient’s course of treatment. Important to note is how a patient’s experiences are taken into account when defining a method of care. Patients who received care in control facilities reported dissatisfaction with what was commonly perceived as a power imbalance between patients/families and providers (Forbat et al., 2008). This is in direct comparison to patients in experimental facilities who were more positive about their care and optimistic of their outcome if they perceived their provider to value their input when developing a care plan. The researchers believe this disparity regularly arises when providers do not take into account a patient’s often long-term experience with their illness (Forbat et al., 2008). On the other hand, providers who utilized their clinical and medical knowledge in compliment with the patient’s experience were more positively favored by patients.

Engaging patients while developing care strategies is important. However, it is equally important to continue a similar level of patient-involvement throughout his/her care plan. As such, the researchers implemented numerous focus groups, opportunities for feedback and support policies. As outlined in Figure 3, support policies were defined as informative emails, before and after visit follow-up calls and numerous other methods for quality assessment. Forbat and his colleagues concluded that opportunities for patient feedback and supported patient engagement resulted in positive attitude shifts and actions of patients regarding their care (Forbat et al, 2008). This finding clearly demonstrates the benefit of a model of primary care that places a strong focus on patient involvement, input and quality improvement.
As of current, any practice that wishes to become recognized as a PCMH by the National Committee for Quality Assurance (NCQA) must demonstrate accountability by partaking in a recognition process (Arend et al., 2012). This process requires that the practice meets specific quality indicators that mirror the tenets of PCMH discussed above.

**PCMH and Provider Burnout**

Within the literature, physician burnout is widely accepted to occur more frequently in primary care physicians who work under the conditions of long work hours, unmanageable clinical workloads and a hectic or disorganized work environment (Helfrich et al., 2014). Using a cross-sectional online survey, Helfrich et al. looked to examine the PCMH model and its relationship to primary care employee burnout. It was uncovered that those who worked for institutions who valued a team-based approach, emphasized quality of care and increased levels of communication among both providers and patients were least likely to report burnout. Helfrich’s study proved an important addition to the literature as it was the first to examine a broad range of clinics, all of which are within the process of becoming a PCMH.

Additionally, Helfrich does not only examine the effects of transformation on physicians, but also other vital members of the PCMH model including mid-levels, support providers, and clinic staff. Respondents who reported being part of an adequately
staffed team were far less likely to experience burnout than their understaffed counterparts. (Helfrich et al. 2014).

One of the core tenets of the PCMH model, System-Based Approach to Quality and Safety as defined by Arend and colleagues, provides quantitative measures to monitor and improve the quality and efficiency of a clinic’s operation. Under this system, a determined provider-to-patient ratio would be maintained and staff added accordingly. Practices are held accountable by accreditation guidelines determined by numerous institutions such as Accreditation Association for Ambulatory Health Care, the Joint Commission and National Center for Quality Assurance (NCQA) (Arend et al., 2012). Providers who reported working in high-stress and fast-paced clinical environments had odds of burnout fourfold that of respondents who reported working in a well-managed, low-stress clinical environment (Helfrich et al., 2014).

The Group Health Cooperative PCMH pilot was examined against control facilities to directly study the relationship between PCMH and provider burnout. It was found that provider burnout decreased from 30% to 10% in less than a year (Reid et al., 2010). The study was continued for a second year and concluded a continued statistical decrease when compared to control clinics. The study, conducted by Robert J. Reid and colleagues, determined that this decrease in burnout could be directly attributed to greater time with patients, reduced panel sizes and a more supportive work environment, all of which are founding principles of any medical home model.

While the majority of the literature points to the PCMH model increasing provider job satisfaction and reducing burnout, numerous studies, including that conducted by
Lewis et al, highlight how a transition to a PCMH can actually lead to a higher likelihood of burnout. Often characterized as “change fatigue”, it may manifest as both burnout and passive/active conflict or resistance within the workplace according to a retrospective cross study conducted by Rittenhouse and colleagues (Rittenhouse et al., 2011).

Using a 3 question, web-based questionnaire, employees were asked to rate their institution within a 5-response range: (1) Rate staff morale in your clinic (Poor to excellent), (2) Overall I am satisfied with my current job (Strongly disagree to strongly agree), (3) Using your own definition of burnout, please check one (Having no symptoms to completely burned out). Using both univariate and multivariate equation models, Lewis and colleagues reported that the process of transforming a clinic toward a PCMH model is associated with increased staff morale and overall job satisfaction. Additionally, the researchers noted that the process was also associated with more frequent provider burnout.

The conclusions of Lewis and colleagues have received increased criticism since publication. The majority highlight the fact that Lewis’s study focuses on perceived characteristics of a given facility or clinic and fails to use non-objective standards or PCMH recognition criteria determined by various institutions such as the National Center for Quality Assurance (NCQA). It should also be noted that the study does not distinguish between burnout resulting from the transformation to a PCMH model specifically, or are the result of a facility undergoing any-sort of restructuring or period of change.
Reimbursement Reform

A primary challenge facing the PCMH model is the way in which insurance companies reimburse facilities for services rendered. The current system allows for practices and providers to input certain codes for procedures, medication, consults etc. which the insurance company reimburses for a pre-negotiated rate.

This poses a significant hurdle for medical homes as they are often allocating both time and resources to aspects of patient/ population healthcare that are not directly billable to a patient’s insurance. For example, as mentioned above, medical assistants are often asked to run huddles with the necessary providers as a means of anticipating the needs of a patient before he/she arrives. Similarly, the PCMH model places a heavy emphasis on post-visit follow-up and care. Other examples include the cost of enhanced access such as expanded office hours, the development of a web portal as well general population management (Fisher, 2008).

As Arend and his colleagues postulate, the solution to this problem will come in either the form of incentivizing the results of the PCMH model or the insurance company reimbursing for these new services directly (Arend et al., 2012). There are various models of reimbursement systems discussed in the literature that could be utilized to solve this problem. The most common of such is a Fee-for-Service system (Fisher, 2008). This would require insurance companies to negotiate new billable codes for the expanded services offered by a PCMH practice. A similar structure would be for insurance companies to offer reduced rates for practices that utilize pre/post-visit care management.
A Blended Model would utilize the fee-for-service program mentioned above, however, it would also include a per-member-per-month (PMPM) payout to the practice that would be utilized to cover to expanded costs associated with a PCMH (Arend et al., 2012). More recently derived methods of reimbursement are a variety of Shared Savings Models. Under this structure, a practice or healthcare system would be eligible for a 50/50 share of savings calculated by a formula that compared expected cost of the practice with anticipated expenditures. This would only be offered to practices or healthcare systems that meet a pre-determined list of quality standards (Fisher, 2008).

Grant-Based systems are currently one of the most popular forms of reimbursements for PCMHs. This payment system relies on government-based grants to support both the transition and sustainability of a practice into a medical home. An example includes federal grants for the widespread adoption of Health Information Technology. This funding became available following the 2009 Health Information Technology for Economic and Clinical Health Act (Arend et al., 2012). Government-backed demonstration programs have grown in both size and number and funding since the beginning of the Medicare Medical Home Demonstration project in 2007. This program gave qualified practices healthcare management grants to offset the cost of a PCMH transformation.

Many physicians are hesitant to transition to a PCMH model as they fear diminishing their own income. Group Health Cooperative (discussed in detail below) is an integrated insurance and healthcare system that successfully implemented a PCMH pilot facility in 2006. The prototype program linked patients with primary care
professionals who worked in conjunction with a variety of different specialists and subspecialists. In order to shield physicians from any monetary loss they may accrue while implanting a PCMH, Group Health moved from the widespread volume-based incentives of fee-for-service medicine and toward a salary-based pay structure (Reid et al., 2010). While this may not be feasible for smaller practices, salary-based pay for primary care physicians may help to mitigate any monetary perversions they may have to transitioning to a PCMH model.

Many in the clinical community question whether a PCMH would actually lead to lower healthcare costs (Fisher, 2008). To those unfamiliar with the literature, it is easy to assume the more coordinated and effective primary care delivery becomes, more money will be saved from all involved. However, the literature continues to remain divided as to whether the money saved would become negligible when compared to the increased number of payouts needed to incentivize practices to transition into medical homes (Peikeset al., 2012). In recent years however, full-fledged pilot programs have provided evidence that the PCMH model is, in fact, extremely cost effective.

**PCMH Pilot Programs**

One of the earliest PCMH pilot programs was instituted in 2006 by Group Health Cooperative, a Seattle-based, integrated health insurance and care delivery system (Reid, 2010). Without PCMH standards yet defined by the NCQA, Group Health was one of the first to systematically categorize and institute practical care delivery changes necessary to achieve the goals of an idealized PCMH. These early changes are depicted in Table 4 and
clearly mirror the NCQA’s criteria for PCMH recognition that would be later published in May of 2008.

**Table 4: Care Delivery Changes of the Group Health Pilot Program.** A table outlining care delivery and practice management changes implemented at the Group Health Medical Home Prototype Clinic (Adapted from Reid et al., 2010).

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CARE DELIVERY CHANGES</strong></td>
<td></td>
</tr>
<tr>
<td>Virtual medicine</td>
<td>Secure e-mail messages and telephone encounters to enhance access and to prepare for, follow up from, or substitute for in-person visits. Promotion of EHR to promote patient engagement, including lab test results review, electronic health risk appraisal, and online Rx refills. Consistent use of &quot;after visit summaries&quot; made accessible to patients following their visits through the EHR.</td>
</tr>
<tr>
<td>Chronic care management</td>
<td>Use of electronic registries, health maintenance reminders, best-practice alerts. Use of motivational interviewing and brief negotiation skills by care team. Creation of collaborative care plans to guide patient and care-team activities. Promotion of self-management support resources, including group visits, behavior-change programs, and peer-led chronic illness workshops.</td>
</tr>
<tr>
<td>Visit preparation</td>
<td>Patients contacted in advance of visits to clarify concerns and visit expectations. Review record for follow-up tests, referral notes, and outside records. Review quality-deficiency reports for unmet care needs. Prepare the physician with education materials and other resources for visit.</td>
</tr>
<tr>
<td>Patient outreach</td>
<td>Outreach and follow-up for all discharges and emergency or urgent care visits. Quality outreach using quality-deficiency reports for unmet care needs. Outreach for medication monitoring and abnormal test results. New patient outreach.</td>
</tr>
<tr>
<td><strong>PRACTICE MANAGEMENT CHANGES</strong></td>
<td></td>
</tr>
<tr>
<td>Telephone call management</td>
<td>Redesign of telephone call intake system to bypass administrative options and connect patients directly with their care teams.</td>
</tr>
<tr>
<td>Care-team huddles</td>
<td>Short, all-team meetings to collectively plan day, balance supply and demand, distribute tasks, and troubleshoot problems.</td>
</tr>
<tr>
<td>Standard management practices</td>
<td>Use of visual display systems to track team performance, regular workplace rounds, root-cause analysis, and plan-do-check-act improvement cycles.</td>
</tr>
</tbody>
</table>

The prototype clinic was followed for over two years in order to determine the impact patient-centered changes would have on cost, quality and experience. This was conducted using predetermined measures that were defined prior to the start of the program. A two-group, quasi-experimental, before-and-after evaluation was used to
determine the progress of the pilot facility (Reid, 2007). These results were compared with 19 other Group Health facilities in the area.

**Table 5: Summary Table of Patient Experience at PCMH Clinical Pilot Compared with Two Control Clinics.** The table shows the subscale scores (transformed into 100-point summary scores) comparing numerous patient experience standards between the prototype clinic and controls clinics. NOTE: (QI): Quality of Doctor-Patient Interactions, (SDM): Shared Decision Making, (CC): Coordination of Care, (AC): Access to Care, (HO): Helpfulness of Office Staff, (PA): Patient Activation and Involvement and (GS): Goal-setting (Adapted from Reid et al., 2010).

<table>
<thead>
<tr>
<th>Interval</th>
<th>No. of survey respondents</th>
<th>Ambulatory care subscales¹</th>
<th>Chronic care subscales²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>QI</td>
<td>SDM</td>
</tr>
<tr>
<td>MEDICAL HOME PROTOTYPE CLINIC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>1,232</td>
<td>86.4</td>
<td>85</td>
</tr>
<tr>
<td>12 months</td>
<td>1,024</td>
<td>86.8</td>
<td>86.6</td>
</tr>
<tr>
<td>24 months</td>
<td>888</td>
<td>86.6</td>
<td>84.1</td>
</tr>
<tr>
<td>2 CONTROL CLINICS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>2,121</td>
<td>80.8</td>
<td>82.5</td>
</tr>
<tr>
<td>12 months</td>
<td>1,662</td>
<td>81.6</td>
<td>82.3</td>
</tr>
<tr>
<td>24 months</td>
<td>1,452</td>
<td>82.1</td>
<td>81.8</td>
</tr>
<tr>
<td>ADJUSTED DIFFERENCES</td>
<td></td>
<td>2.30***</td>
<td>2.93***</td>
</tr>
<tr>
<td>12 month vs. baseline³</td>
<td></td>
<td>1.63**</td>
<td>1.03</td>
</tr>
</tbody>
</table>

In terms of patient experience, the pilot program showed marked improvement over control facilities in a number of key performance indicators at the end of both 12 and 24 month evaluation periods. The results of these indicators can be found in Table 5 and were derived using a surveyed sample of 6,184 adults, between the ages of 21-85 (Reid, 2010). The study first compared standards of ambulatory care. After adjusting for variables such as age, health and education, patients receiving care at the prototype clinic reported having a better care experience in six scales of care after 12 months. This trend
largely continued during the 24 month evaluation with patients within the pilot program reporting better scores for care coordination, helpfulness of office staff and goal setting (Reid, 2010). On closer inspection of Table 4, it becomes apparent some improvements made between baseline and 12 months depreciated between 12 month and 24 month evaluations. However, subscores continue to show statistically significant improvement when compared to control clinics.

Table 6: Summary Table of Cost-Per-Patient at PCMH Clinical Pilot Facility Compared with that of Control Clinics in Regard to Primary Care, Specialty Care, Emergency Services and Hospital Admissions. Costs are defined as nominal costs for patient care, per patient, per month at Group Health facilities. 95 percent confidence intervals are reported in parenthesis next to each figure. (Adapted from Rosenberg et al., 2012)
The Group Health pilot program was also helpful in determining the overall cost of a PCMH compared to the standard model of care. Table 6 depicts data calculated by Reid et al. as a per-patient per-month expense. As expected, primary care continued to be more expensive at the PCMH pilot facility than that of other Group Health primary care facilities. After 21 months, it cost approximately $1.60 for each patient, per month at a primary care pilot facility. This cost disparity rose to almost $6.00 for each patient, per month, at PCMH specialty care offices compared to non-PCMH control offices after 21 months. While this may seem to support claims of a PCMH model being financially inefficient, Reid and his colleagues point to fewer emergency and urgent care visits and inpatient admissions constituting savings of $4.00 and $14.18, respectively (Reid et al., 2010). In other words, the expense difference between patient-centered primary and specialty pilot programs and control programs was recouped by less utilization of more expensive, emergency and inpatient care services. After adjusting for cross-cases and baseline costs of operation, Reid et al. calculated a total savings of approximately $10.30 per patient per month (Reid et al., 2010). This signifies a patient-centered approach to healthcare as having a positive return on investment and further supporting the model as being cost effective.

A similar pilot program was conducted by UPMC, an open, integrated delivery and finance system. This program sought to prove the feasibility of a PCMH when providers and payers work together, and that this collaboration can result in efficient, cost-effective, and high quality healthcare (Rosenberg et al., 2012). Table 6 indicates the
cost per month per member difference between pilot program facilities and non-patient-centered primary care facilities throughout the UPMC network.

Table 7: Percent Change of Cost Per Member Per Month of UPMC PCMH Pilot Practices and Other Non-PCMH Practices Within the UPMC Network. A table outlining the difference in cost per member per month between pilot program sites and the rest of the UPMC network. These differences are calculated for both the 2008-09 and 2009-10 fiscal years. (Adapted from Rosenberg et al., 2012)

<table>
<thead>
<tr>
<th>Services</th>
<th>Program sites</th>
<th>Rest of network</th>
<th>Program sites</th>
<th>Rest of network</th>
<th>Program sites</th>
<th>Rest of network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3.0</td>
<td>7.5***</td>
<td>-2.6</td>
<td>-0.1</td>
<td>-15.8***</td>
<td>-4.73</td>
</tr>
<tr>
<td>Medical</td>
<td>-0.7</td>
<td>7.2***</td>
<td>1.2***</td>
<td>2.7***</td>
<td>-8.0***</td>
<td>-11.1***</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>-15.1***</td>
<td>-7.5***</td>
<td>1.34***</td>
<td>-12.8</td>
<td>-19.6</td>
<td>1.45***</td>
</tr>
<tr>
<td>High-tech radiology</td>
<td>12.3***</td>
<td>14.1***</td>
<td>0.08</td>
<td>3.2</td>
<td>12.3</td>
<td>-1.53***</td>
</tr>
<tr>
<td>Emergency department</td>
<td>7.3***</td>
<td>10.9***</td>
<td>0.41</td>
<td>1.8</td>
<td>3.6</td>
<td>-0.30</td>
</tr>
<tr>
<td>Inpatient medical/surgical</td>
<td>29.4***</td>
<td>4.6***</td>
<td>1.17</td>
<td>1.1</td>
<td>3.9</td>
<td>-2.43</td>
</tr>
<tr>
<td>Diagnostic labs</td>
<td>4.4</td>
<td>7.3***</td>
<td>0.34***</td>
<td>6.0</td>
<td>2.9</td>
<td>0.55***</td>
</tr>
<tr>
<td>Specialist</td>
<td>6.3</td>
<td>7.6***</td>
<td>0.74***</td>
<td>1.3</td>
<td>2.3</td>
<td>-0.53</td>
</tr>
<tr>
<td>Primary care provider</td>
<td>6.5</td>
<td>8.1***</td>
<td>0.46***</td>
<td>5.7</td>
<td>2.3</td>
<td>0.46***</td>
</tr>
<tr>
<td>Behavioral health outpatient</td>
<td>16.0</td>
<td>10.9***</td>
<td>0.60</td>
<td>2.0</td>
<td>4.8</td>
<td>-0.03</td>
</tr>
<tr>
<td>Behavioral health inpatient</td>
<td>10.1</td>
<td>7.3</td>
<td>0.43</td>
<td>12.2</td>
<td>13.0</td>
<td>0.26</td>
</tr>
<tr>
<td>Therapy</td>
<td>18.7***</td>
<td>10.5***</td>
<td>0.46</td>
<td>5.4</td>
<td>15.8</td>
<td>-0.63</td>
</tr>
</tbody>
</table>

Over the course of the 2008-09 fiscal year, total cost of medical care increased among both groups. However, the total cost increase was more than twice that for non-PCMH pilot practices (3.0 percent compared to 7.5 percent). Also show in Table 7 is how PCMH sites experienced a small decrease (-.07 percent) in pharmaceutical costs, compared to the 7.2 percent increase experienced by other primary care practices in the UPMC group. A similar trend continued between 2009 and 2010. Both groups saw a decrease in overall expenditure. However, those participating in the PCMH program saw a decrease of 2.6 percent while the rest of the network reported a minimal cost deduction.
of 0.1 percent. Both years lead to conclusions similar to that of the Group Health pilot program; namely that implementation of a PCMH model results in more cost-effective healthcare delivery.

Table 8: Percent Change of Member Receiving Appropriate Care at UPMC Pilot Practices and Non-PCMH Practices Within the UPMC Network. A table outlining the percent change of member receiving appropriate care as defined by the Healthcare Effectiveness Data and Information Set. Change is calculated as percent change from 2008 to 2010. HbA1c is an abbreviation of hemoglobin HbA1c. LDL is an abbreviation of low-density-lipoprotein. (Adapted from Rosenberg et al., 2012)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Program sites</th>
<th>Rest of network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>All four diabetes measures</td>
<td>77.8%</td>
<td>77.1% -0.7</td>
</tr>
<tr>
<td>HbA1c test</td>
<td>84.1</td>
<td>84.9</td>
</tr>
<tr>
<td>Eye exam</td>
<td>60.6</td>
<td>83.8</td>
</tr>
<tr>
<td>LDL screen</td>
<td>80.3</td>
<td>89.9</td>
</tr>
<tr>
<td>Nephropathy monitoring</td>
<td>82.6</td>
<td>89.5</td>
</tr>
<tr>
<td>Colon cancer screen</td>
<td>67.2</td>
<td>65.4</td>
</tr>
<tr>
<td>Breast cancer screen</td>
<td>73.7</td>
<td>76.1</td>
</tr>
<tr>
<td>Management of acute depression</td>
<td>65.8</td>
<td>71.9</td>
</tr>
</tbody>
</table>

As previously mentioned, the UMPC program sought to not only demonstrate that a PCMH model could be cost effective, but also that it leads to greater quality care. In order to examine this quality, the program compared measures of the Healthcare Effectiveness Data and Information Set between program sites and the rest of the UPMC network (Rosenberg et al., 2012). As shown in Table 8, program sites consistently outperformed their counterparts on almost all measures. Eye exams increased drastically in program sites from 60.6 percent in 2008 to 83.8 percent in 2010; a 23.3 percent increase compares to non-PCMH facilities increasing by only 7.1 percent in the same time frame. Similar increases were noted regarding diabetes and breast cancer screening.
methods. The measure of colon cancer screens show inverse changes with participating programs decreasing by 0.5 percent compared to a marked increase of 4.3 percent for non-program practices between 2008 and 2010. However, it is important to note that PCMH programs demonstrated a consistently higher percentage on the measure, averaging approximately 66 percent over the three years compared to the approximate 50 percent achieved by outside practices over the same period.
DISCUSSION

Since Dr. Wanger’s publication of the Chronic Care Model in 1996, the primary care community has been attempting to adapt its tenets and principles in a new method of care delivery (Carrier et al., 2002). The result of their efforts led to the development and implementation of the Patient-Centered Medical Home model. Based largely on principles such as enhanced access, team-based care and care coordination among others, the PCMH model represents a vast separation from traditional structures of primary care delivery (Arend et al., 2012).

This departure is perhaps needed more than ever as the United States Healthcare system faces numerous challenges regarding both cost effectiveness and long-term sustainability. The U.S. spends a larger percentage of GDP on healthcare related-costs than any other industrialized nation, yet pales in comparison when measured against other nations in standards of care such as quality, access and efficiency (Organization, 2014). Despite such high annual expenditures, the U.S. has a lower patient-to-provider ratio, less hospital beds per population and a slower increase in longevity than other developed nations (Davis, 2014). This, compounded by an aging population, an alarmingly high rate of obesity and a steady decline in primary care providers highlight the immediate need for change.

The Patient-Centered Medical Home model looks to solve these failures by increasing the quality and effectiveness of care while simultaneously decreasing its overall cost. Over the previous decade, much of the literature evaluating the PCMH has
focused on examining individual tenets of the model in light of their ability to achieve these goals.

Enhanced access is one of the largest departures of the PCMH when compared to traditional primary care delivery. Comprising practices designed to increase the availability of patients to primary care providers and access to medical records, these measures include expanded office hours, same-day scheduling and on-call availability among others (Payne et al., 2011 or Payne & Gray). A study conducted by Dr. Katherine Rose and her colleagues concluded that there is an inverse correlation between open access scheduling and no-show rate. The same study showed PCMHs implementing an open-schedule policy had an increase in patient volume, a decrease in wait times and positive increase in patient satisfaction (Rose et al., 2011).

A PCMH’s increased access also helps reduce overall healthcare costs and unnecessary or repetitive medical treatment. Dr. Zickafoose and his colleagues determined that there was a direct correlation between a PCMH’s enhanced access practices and emergency room visits. His study concluded that extended office hours, particularly being open after 5:00 p.m., were statistically associated with lower emergency room use within the area (Zickafoose et al., 2013). In other words, extended hours of operation in a PCMH help reduce the cost of care as the expense associated with an emergency room is exponentially higher than that of equal care in an out-patient office setting.

Team-based care is an essential tenet of a PCMH. This team approach is embodied in twice daily team meetings, pre-visit huddles and the use of teamlets to
maximize quality of care. When researchers asked providers of PCMH pilot practices what they enjoyed most about the program, many cited a renewed focus on teamwork and communication (Payne & Gray, 2011). A PCMH, based upon a team approach, is much better suited for the future landscape of primary care than the traditional, physician-hierarchy model currently implemented by the majority of practices in the U.S.. A study conducted by Auerbach and colleagues concluded that by the year 2025, there will be an extreme shortage of primary care physicians and a sizeable surplus of mid-level providers such as physician assistants and nurse practitioners (Auerbach et al., 2013). Through the use of various teams and provider collaborations, the PCMH is much better positioned to fully utilize the skills of mid-level providers through team and case lead roles. This will not only lead an increase in access and quality, but will also allow primary care physicians to both see more patients and for longer periods of time than under the current model of care delivery.

Care coordination, or lack thereof, leads to perhaps the greatest care costs and inefficiencies under the traditional system. The PCMH model looks to eliminate these through the ambitious implementation of a Patient-Centered Medical Neighborhood (PCMN) (Yee, 2011). Despite the numerous challenges facing the full realization of a PCMN, researchers such as Dr. Fisher believe that such a large-scale model can be realized with the development of network-wide incentives to foster collaboration. Fisher believes that this, coupled with the support of insurance payers, could help eliminate unnecessary costs and duplicated tests that plague the current system.
In order to be recognized as PCMH by the NCQA, a practice must demonstrate a systems-based approach to quality and safety. This is achieved primarily through patient feedback and engagement initiatives. Dr. Forbat and colleagues looked to establish whether this aspect of a PCMH has a positive effect on patient care. The study concluded that engaging patients in a variety of engagement initiatives not only helps to foster increased communication between patients and providers, but also leads to greater participation of patients in their own care (Forbat et al., 2008). This increased engagement also resulted in positive attitude shifts of patients in regards to their care, further supporting the effectiveness of a PCMH to increase positive patient outcomes.

Many opponents of a PCMH model cite an increase in the likelihood of provider burnout as a reason to avoid implementation (Rittenhouse et al., 2011). This however, has been shown by various studies to not be the case. The Group Health pilot program specifically examined the relationship between PCMH and provider burnout. The study concluded that provider burnout decreased from 30% to 10% in the year following PCMH implementation (Reid et al., 2010). A similar drop in fatigue was noted the following year. Studies that present data positively correlating a PCMH and provider burnout have received criticism within the literature. Much of this criticism surrounds a failure to distinguish between burnout resulting from the transformation to a PCMH model specifically, or if it is a result of a facility undergoing any-sort of restructuring or period of change.

Reimbursement reform continues to remain one of the major challenges facing widespread PCMH adoption. As of current, there are a variety of payment models that
try and account for the non-direct billable services that a PCMH provides such as pre/post visit follow up, care coordination management, health IT and patient engagement initiatives. These payments methods include a Fee-for-Service system, a blended model and integrated payer-health systems such as the Group Health Cooperative (Arend et al., 2012). Currently however, most PCMH programs have used government-based grants to offset both the cost of transition and expanded services (Fisher, 2008). Specific grants include the Health Information Technology for Economic and Clinical Health Act of 2009 that made funding available for health IT specific needs. Similar grants exist explicitly to help offset the transition of a practice to a PCMH. Despite the availability of government-base funding, it is imperative that insurance payers and healthcare providers form a consensus on how to best bill for a PCMH’s services. Only once this has been established, will widespread adoption of PCMHs begin.

Perhaps the greatest evidence in support of PCMHs can be found in the literature examining the results of pilot programs. Two of the largest and most successful, the Group Health Cooperative and the UPMC PCMH pilots provide real-world evidence of an increase in efficiency, quality of care, and cost savings compared to control practices (Rosenberg et al., 2012). Both programs explicitly demonstrate clear savings. In the Group Health program, it was determined that for every dollar spent on the pilot PCMH practices, Group Health received $1.50 in return (Reid, 2007). Similar returns were derived from the UPMC program and standard of care quality were found to improve in pilot PCMH practices when compared to non-pilot practices (Rosenberg et al., 2012).
CONCLUSION

The transformation of primary care delivery in the United States is no longer a lofty ideal but rather a necessity. Patient-Centered Medical Homes provide a promising means of decreasing costs, increasing efficiency and continuity of care and increasing positive patient outcomes. Studies examining the effectiveness of individual aspects of the PCMH model have provided positive results; specifically, that of open-access, team-based care and care coordination. In addition, full-scale, multi-year pilot programs have provided evidence to support the improvement in patient care and reduction of cost promised by PCMH models are possible.

There are, however, various aspects of the model that will continue to be modified based on future academic study. Most prominently, effective ways will need to be designed in which practices adopting a PCMH model can educate their patients regarding what the model is and how it will benefit their care. Additionally, the model will no-doubt continue to expand in light of the future workforce. More studies will need to be conducted in order to determine how to most effectively assimilate the growing number of physician assistants and nurse practitioners into the PCMH model.

The most daunting challenge facing PCMHs however, are the current reimbursement structures and unwillingness of providers to accept change and adopt collaborative relationships with one another. These obstacles, until overcome, will continue to stand in the way of widespread adoption and limit the sustainable potential of a nation-wide PCMH model. Ultimately the success of any PCMH is dependent on the
leadership of the physicians adopting its practices and principles. Without this, the true benefits of the PCMH will never reach patient populations.
REFERENCES


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Education

Boston University School of Medicine, Boston, MA 2014 (Present)
Candidate, Master of Arts in Medical Sciences
Saint Anselm College, Manchester NH 03102 (2012)
Bachelor of Arts in Biochemistry, G.P.A. 3.6, Magna cum Laude

Work Experience

Emergency Room Registrar - Parkland Medical Center, 2011-Present
- Interview Patients to obtain all Necessary Account Information
- Insure Medical Charts are Complete and Accurate
- Welcome Patient and Family Members in a Professional Manner

Resident Assistant - Saint Anselm College, 2009-2012
- Community Facilitator
- Program Organizer
- Administrator
- Resource/ Referral Provider
- University Representative

Physical Therapist Aide - Derry Sports and Rehab, 2007-2008
- Responsible for Assisting Physical Therapists with Patient Care
- Skills Include: Ultra Sound
- Massage Therapy
- Electro-Stimulation
- Assist with Office Work and Patient Check-In
- Responsible for Cleanliness of Clinic

Volunteer Experience

Service & Solidarity Mission to New Orleans, Louisiana
St. Joan of Arc Elementary, February 2012
- Serve as a Teacher’s Assistant in an Underprivileged School
- Worked Directly with Elementary Age Children whose Families have been Affected by Hurricane Katrina
Active Member of Saint Anselm College Emergency Medical Services (SACEMS)
Saint Anselm College, 2010-2011
- Offer Immediate, On-call, Pre-Hospital Care
- Stand-by Coverage of Major College Events
- Assist with Blood/Bone Marrow Drives and Flu Shot Clinics

EMS Detail for Saint Anselm Rugby, Hockey and Football Games
Saint Anselm College 2010-2011
- Provide On-Scene Medical Care of Injured Athletes
- Provide On-Scene Medical Care of Sport Spectators

Elliot Hospital Emergency Room Ambassador
Elliot Hospital, Manchester NH, 2007-2011
- Address Patient Concerns in Waiting Room
- Ensure Comfort of Patient Family and Friends
- Assist Triage Staff and Floor Nurses
- Observe Interesting Trauma/Medical Cases Under a Physician

Research Experience

Examination of Increased Heat Shock Protein Expression in Aneuploid Yeast and its Role in Human Cancers - Saint Anselm College, Fall 2011-Spring 2012
  - Worked under the direction of Dr. Robert Vallari Ph.D.
- Example Techniques Include:
  SDS PAGE
  Western Blotting
  Polyclonal Antibody Precipitation

Extracurricular Involvement

Elected Student Government Senator for the Class of 2012
Saint Anselm College, 2011-2012
- Advocate and Voice for the Student Body
- Consider and Vote on Key Legislation
- Approve All Student Government Spending

Chair of the Student Government Welfare Committee
Saint Anselm College, 2011-2012
- Promote Overall Welfare of Student Body
- Establish and Promote Initiatives to Better the Wellbeing of the Student Body
- Communicate with Administration and Students

Appointed Member of the Saint Anselm College Safety Committee
Saint Anselm College, 2010-2012
- Serve as Communicating Body between Administration, Physical Plant and Campus Safety
- Call Attention and Address all matters of Health and Safety of Campus Community
Active Member of Saint Anselm College Emergency Medical Services (SACEMS)
Saint Anselm College, 2010-2011
- Licensed in the State of NH
- Offer Immediate, On-call, Pre-Hospital Care
- Stand-by Coverage of Major College Events
- University Representative

Treasurer of Saint Anselm College Emergency Medical Services
Saint Anselm College, 2010-2011
- Detailed Knowledge of Multiple Organization Accounts
- Accurate Book-Keeping utilizing Excel Spreadsheets
- Developing and Maintaining SACEMS Yearly Budget

Awards

Annual Achievement Award in Biochemistry - Saint Anselm College, 2012
- Highest Major G.P.A.
- Leadership within the Major

Tri Beta National Biological Honor Society – Saint Anselm College, 2011-2012
- Must have Cumulative G.P.A. above 3.0
- Must have a 3.0 G.P.A. Average in Upper Level Biology Courses

Delta Epsilon Sigma National Scholastic Honor Society in the Catholic Tradition
Saint Anselm College, 2011-2012
- Must have a Record of Outstanding Academic Accomplishment
- Must Rank in the Top 20 Percent of their Class in Scholarship

Dean’s List of Scholars - Saint Anselm College, 2008-2012
- Requirements Include:
  Maintain a Semester G.P.A. of 3.0
  Must Complete a Total of 5 Courses during the Semester

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