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PATIENT-CENTERED MEDICAL HOMES AND DIABETES OUTCOMES: AN  
INTEGRATED LITERATURE REVIEW

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By

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## ABSTRACT

Driven by the need to improve patient quality outcomes—while providing efficient and cost effective care—many healthcare systems have adopted the transformational model, patient centered medical home (PCMH), to managed patients with chronic diseases. This integrated literature review provides a critical appraisal of the evidence relating to diabetes care in PCMH settings, along with evidence syntheses. The review and syntheses are guided by the Agency for Healthcare Quality and Research (AHRQ) framework for PCMH. 96 studies were systematically retrieved from the relevant databases of the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Cochrane Review, Academic Premier (EBSCO), and PsychINFO. Only empirical studies published in English between 2003 and 2014 were included. 84 studies were eliminated for not meeting the criteria, leaving 12 studies for further analysis. The findings suggest that current evidence on the efficacy of the PCMH model in diabetes mellitus (DM) outcomes is equivocal. Only five studies reported improved quality outcomes, four studies showed improved process outcomes, and the remaining three studies showed no improvement in either measure for DM care in the PCMH setting. Where there were successful implementations of the PCMH model, they were supported by dedicated workflows, a consistent approach to care delivery, and teams that are well-managed. The limitations of the review included findings that were not generalizable, heterogeneous study designs, lack of comparison groups and non-

randomized comparison practices. Future studies need to consider longitudinal designs, in which the PCMH's effect on diabetes outcomes can be observed over time.

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## **BACKGROUND**

### **Problem Statement**

Over the last decade medical practices in the United States have embarked on a transformational process in their primary health delivery models to provide patient-centered, coordinated, and accessible care (Baxter & Nash, 2013; Berryman, Palmer, Kohl, & Parham, 2013; Jackson et al., 2013; Jaen et al., 2010). At the heart of this transformation is the ability to implement a team-based approach into primary care practices that shows promising results in both quality outcomes and cost effectiveness. The patient-centered medical home (PCMH) is a model of healthcare delivery that focuses on the patient's individual needs, has been introduced as an innovative model of delivering primary care. This model involves redesigning primary care visits from a face to face encounter with a provider, to a healthcare system where a primary care provider leads an interdisciplinary team to facilitate care and meet the diverse healthcare needs of the patient (Lee, Casalino, Fisher, & Wilensky, 2010). In other words, it provides patient-centered, comprehensive, and coordinated care, while offering superior access to care with a systems-based approach to quality and safety (Agency for Healthcare Research and Quality, 2010). Researchers have shown that early identification, self-management, patient empowerment, team-based care, and the use of electronic medical records to track care lead to better communication and/or quality outcomes and a higher level of care for the patients (Sia, Tonniges, Osterhus, & Taba, 2004).

In the four decades since the introduction of this model, a growing body of literature suggests that the model improves quality of healthcare, enhances patient and provider satisfaction, and reduces healthcare costs. The phrase “medical home” was

pioneered in 1967 by the American Academy of Pediatrics to demonstrate the concept of a single source of care and centralized medical records for children with chronic diseases and disabilities (Sia et al., 2004). In 1978, the World Health Organization redefined the concept of a medical home from that of a centralized health information system to one that recognizes the importance of channeling the numerous resources of the healthcare system through a continuous relationship with a primary care provider (Arend et al., 2012). The PCMH proposed to transform primary care into a provider-led, collaborative, team-based approach for healthcare delivery. The team may be comprised of a physician, non-physician providers, nurse, care coordinators, case managers, social workers and family members. The Institute of Medicine (IOM) reaffirmed the value of a medical home as a framework for providing a sustainable partnership between patients and their providers (IOM & Donaldson, 1996), recognizing that providers, through their relationships with patients, already have a unique understanding of the patients' healthcare needs and can coordinate resources, treatment, and preventive resources based on these individual needs.

The PCMH was developed as an extension to the Chronic Care Model (CCM). Initially, the CCM was pioneered by Wagner et al. (2001) as a concept to transform primary care delivery by improving the health outcomes of patients with chronic illnesses. Wagner introduced the CCM as a concept for transforming chronic disease management by placing an emphasis on team-based care, supporting patients with self-management, and using information technology (Arend et al., 2012). Specifically, the CCM model highlights the interactions between patients, communities, the health system, and the infrastructure that is required to deliver high quality and efficient care to patients

with chronic diseases (Wagner et al., 2001). In essence, the model postulates that quality chronic care is delivered through an integrated system that involves six essential elements: (1) offering leadership and support through the health system, (2) providing community resources, (3) supporting patients with self-management, (4) designing delivery systems, (5) supporting patients in making their decisions, and (6) establishing a clinical information system (Coleman, Austin, Brach, & Wagner, 2009; Wagner, Austin, & Korff, 1996). These components work collectively to create a productive collaboration between an informed, active patient and a prepared, proactive team. PCMH builds on the foundations of both medical home and chronic care conceptual models. In essence, interventions that are based on the CCM's focus on single chronic conditions, such as diabetes, have improved patient outcomes and quality of life (Cretin et al., 2004), while the PCMH model addresses the total healthcare needs of the patient.

According to the Agency for Healthcare Research and Quality (AHRQ), the care provided by a medical home is patient-centered, coordinated, comprehensive, and team-based. This model provides accessible care and offers a system-based approach to quality and safety (Agency for Healthcare Research and Quality, 2010). Care that is patient-centered strengthens the partnership between the patients, their families, and their providers ensuring that the patients' needs are met, their preferences are identified, and decisions about their health are made collaboratively (AHRQ, 2010; Institute of Medicine, 1996). Further, patients are educated about and supported in making decisions concerning the various treatment options available to them.

## **Diabetes Care in the United States**

Diabetes Mellitus is a chronic disease caused by the destruction of  $\beta$ - cells of the pancreas (American Diabetes Association, 2004). Thereby, resulting in the decreased availability of insulin to metabolize carbohydrate, fat and protein in target tissues in the body. Consequently, the impairment of insulin causes a rise of blood glucose (hyperglycemia).

Over the last 15 years, diabetes has become the most common chronic disease in the world, estimated to afflict nearly 194 million people (Esden & Nichols, 2013). In the United States, it has reached epidemic proportions with an estimated 26 million people affected. Consequently, with more people living sedentary lifestyles and obesity rising, the incidence of type 2 diabetes threatens to swell beyond 40 million in the next 15 years (Esden & Nichols, 2013; Moran, Burson, Critchett, & Olla, 2011). Long-term complications of diabetes often lead to heart disease, stroke, blindness, kidney failure, and amputation. Accordingly, stroke and heart disease are the leading causes of death among patients living with diabetes (Anderson et al., 2003; Bray et al., 2013; Esden & Nichols, 2013), making the disease the seventh leading cause of death in the United States (K. Lee, Palacio, Alexandraki, Stewart, & Mooradian, 2011).

Ironically, regardless of the high price tag of diabetic care, very few patients ever meet the goals of their evidence-based recommendations. Patients who have diabetes mellitus (DM) are especially likely to suffer from fragmented care (Bojadzievski & Gabbay, 2011; Tsai, Morton, Mangione, & Keeler, 2005) and can benefit enormously from the medical home model. Because of this, both research scholarship and health policy advocates argue that redesigning primary care practices could have a profoundly

positive effect on the healthcare and quality of life for patients living with diabetes. The recent signing of the Patient Protection and Affordable Care Act (ACA) has only strengthened this policy idea. In that, the ACA provides for the development of innovative models of primary care delivery within the Centers for Medicare and Medicaid Services for PCMHs and Accountable Care Organizations (ACO), an approach that will benefit patients who have diabetes (Ratner, 2011).

The healthcare system is burdened by a shortage of primary care physicians (PCP); even with the assistance of nurse practitioners and physicians' assistants, current wait times for seeing PCPs often average from three to four weeks (Everett et al., 2013). Hence, the focus has shifted to a more proactive and integrated model of care to help coordinate the management of patients with chronic diseases (Bojadzievski & Gabbay, 2011). The PCMH model, with its core principles of patient-centered care, patient empowerment, self-management, and team-based care, offers a foundation to enhance primary care delivery especially for patients living with diabetes. In recent years, several national demonstration projects have examined the effectiveness of PCMH as a vehicle to guide optimal care in diabetes. Many of these studies have focused on diabetic patients in diverse practice settings across the country (Grumbach & Grundy, 2010). In general, the growing interest in the PCMH approach to managing diabetes has led to increasing amounts of literature on the methods of developing, implementing, and evaluating this system of healthcare delivery. However, to date, there has been no exhaustive synthesis of this scholarship in the form of an integrative review.

### **Purpose Statement**

There are four aims to this integrative literature review: To critique and synthesize the current literature on the efficacy of diabetes care in a PCMH setting. In an effort to understand the significance of the PCMH in the care of diabetic patients. Explore how a PCMH model can be used as a theoretical framework to meaningfully guide clinical practice to redesign primary healthcare delivery and efficiently manage chronic diseases. Develop a deeper understanding of the PCMH model as an alternative to ending the current fragmentation and chaos that exist in primary care today. Finally, to encourage future research of the efficacy of the model in managing other chronic diseases.

### **Conceptual Framework**

This integrative review will critically appraise the evidence related to the PCMH model and the quality of clinical outcomes. Many healthcare organizations struggle to find effective strategies for coordinating care to manage patients who have complex chronic care needs (McDonald et al., 2007), an *organizational design framework* provides pertinent information about care coordination and a means of simplifying the complexities that impede or delay care delivery. This framework identifies concepts that are significant for care coordination. Indeed, the IOM stipulates that in order to improve care for all, parties should seek to redesign healthcare so that it is patient-centered, compassionate and empathetic, and responsive to the needs, values, and expressed preferences of the patients, who are all informed decision-makers in their own care (Institute of Medicine, 2001). A conceptual framework for care coordination will provide the overarching theory for this project.

By using an organizational design framework to understand and improve care, providers have the opportunity to identify structural solutions to fragmented care. According to Cretin et al. (2004), the organizational framework offers an integrated approach for delivering high quality and efficient care, eliminating the fragmentation that currently persists in some primary care practices. For organizations with an existing integrative model for delivering primary care, the framework offers an innovative guide to resolving care coordination problems.

### **Patient-Centered Medical Home Model**

The PCMH model is an adaption of the CCM, which has been widely accepted as an evidence-based guide to quality improvement (Coleman et al., 2009; Cretin et al., 2004). The interventions in the CCM focus on treating single conditions, such as diabetes, asthma, depression, and chronic obstructive pulmonary disease (COPD). The PCMH model builds on the CCM, directly recognizing the unique healthcare needs of each patient and treating the whole patient. To this end, PCMH is a promising model for the delivery of quality chronic care management.

For the purpose of this project, the definition of the PCMH (see fig. 1) model will be based on guidelines issued by the Agency for Healthcare Research and Quality (AHRQ). The AHRQ identifies five key concepts in the definition of a medical home: (1) patient-centered orientation, (2) superb access to care, (3) coordinated care, (4) comprehensive care, and (5) a systems-based approach to quality and safety (Agency for Healthcare Research and Quality, 2010).



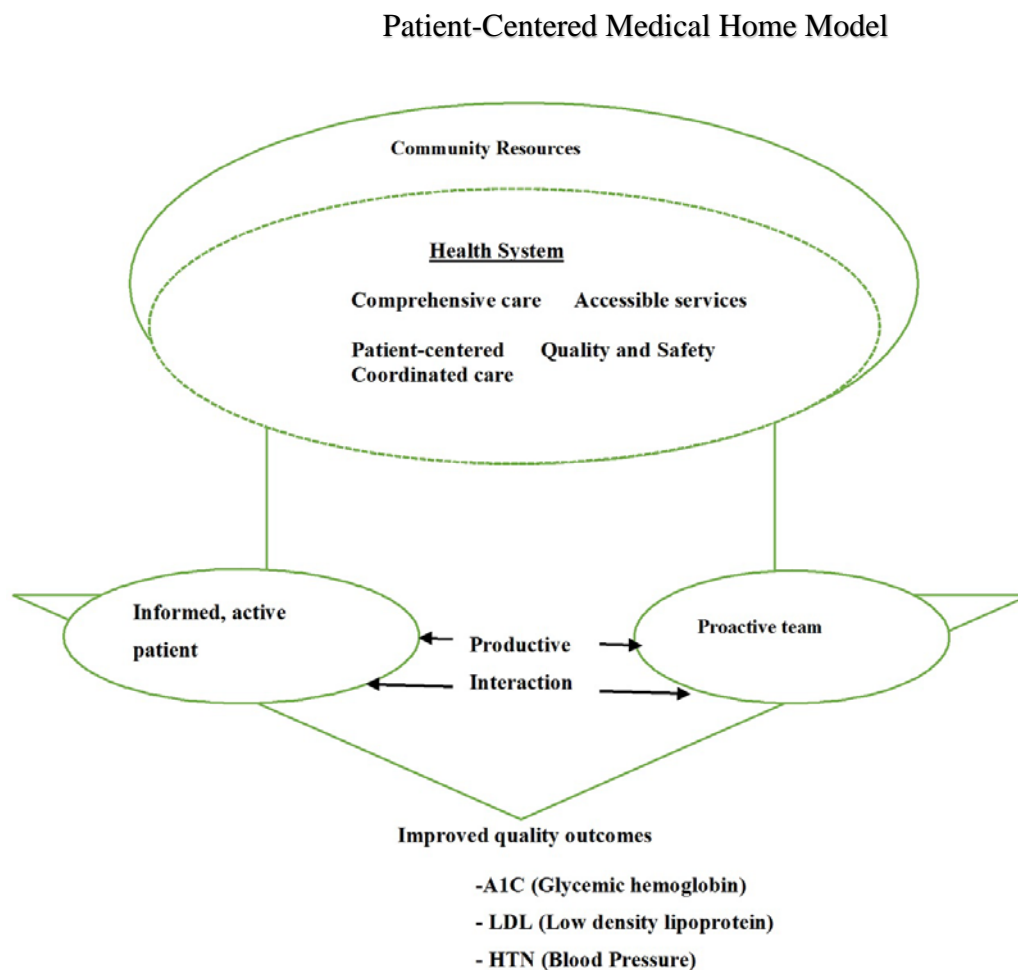


Fig. 1. Adapted and modified from "An Evaluation of Collaborative Interventions to Improve Chronic Illness Care," by S. Cretin, S.M. Shortell, and E.B. Keeler, 2004, *Evaluation Review*, 28, p. 30.

## Patient-Centered Orientation

Patient-centered orientation delivers primary healthcare that focuses on the whole person by recognizing unique needs, cultures, values, and preferences of patients.

Patients are actively supported in managing their self-care and taught to manage their care at their own pace. Patients and families are equal stakeholders in developing their care plans (Agency for Healthcare Research and Quality, 2010).

**Superb Access**

Superb access to care refers to access based on patients' preferences, with reduced waiting times for urgent and other needs, and team members available during and after hours. Patients also have alternative means of communication, such as emails and telephone care (Agency for Healthcare Research and Quality, 2010).

**Coordinated Care**

Coordinated care is care that is coordinated across the continuum of a complex healthcare system, including hospitals and specialty services. The team provides and coordinates a patient's transitions between these sites of service, while ensuring clear lines of communication are maintained between all parties involved in a patient's care (Agency for Healthcare Research and Quality, 2010).

**Comprehensive Care**

Comprehensive care involves taking responsibility for meeting the majority of the patient's physical and mental healthcare needs, including prevention and wellness, and acute and chronic care, through a cohesive team of providers (Agency for Healthcare Research and Quality, 2010).

**Quality and Safety**

A systems-based approach to quality and safety integrates evidence-based medicine and clinical-decision support tools to guide both the patients and their families in the shared decision-making process. This approach uses performance metrics to measure and improve patient experiences and patient satisfaction. Innovative systems, such as the electronic medical record (EHR), store all pertinent patient information and serve as a registry for health information to improve quality and safety. This gives

medical practices the ability to manage the health of their populations, share quality and safety data, and improve activities publicly (Agency for Healthcare Research and Quality, 2010).

### **Community Resources**

Community resources include a network of both medical (hospitals, nursing homes, home health agencies, etc.) and non-medical (social service counselors, American Diabetes Society, etc.) providers that are connected to the PCMH. This proactive team facilitates a broader set of services according to the complex needs of the patient (Pham, 2010; Rich, Lipson, Libertsy, & Parchman, 2012).

### **Proactive Team**

The proactive team consists of a provider and other skilled staff (nurses, educators, pharmacists, case managers, etc.) who will coordinate the services according to the patient's individual care plan. The staff generally ensures that preventative services, such as scheduling eye exams for patients with diabetes, are put into place. The team can also track the management of chronic conditions and facilitate follow-up referrals to specialists or schedule patients for team visits (Porter, Pabo, & Lee, 2013).

### **Informed Active Patient**

The PCMH model places patients at the center of the decision-making process for their care. Furthermore, the patients are actively engaged in the management of their health in four ways: (1) communication with the providers and their teams, (2) patient empowerment and support in self-care, (3) shared decision-making according to evidence-based guidelines and treatment options, and (4) patient access to medical records to ensure safety through detecting and preventing errors. For example, patients

can become informed about how to use their medications safely and about infection control initiatives, and they can also report complications or errors (Agency for Healthcare Research and Quality, 2010). An illustration of the model is shown in Figure 1.

### **Summary of the Literature of the PCMH**

The cornerstone of the PCMH model is a well-informed patient working collaboratively with a proactive and engaged team. The team coordinates the patient's care appropriately and enlists specialists or subspecialists as needed. At the same time, the team maintains responsibility for the coordination of care across the healthcare system. The primary care provider serves as the leader of the team. Each aspect of the PCMH model is designed to work interdependently to provide holistic care to the patient.

The PCMH model provides us with greater confidence that a collaborative and proactive approach undertaken by a healthcare system can, indeed, improve clinical outcomes (Cretin et al., 2004). In reality, many patients living with diabetes often receive fragmented care from a variety of providers who may have different attitudes toward adherence to clinical guidelines and patient outcomes (Larme & Pugh, 1998). Similarly, with recent changes in healthcare policies, PCPs are under increasing pressure to care for populations rather than individual patients (Longworth, 2013). A recent study finds that physicians recognize the need to care for patients individually and proactively, but lack the resources to do so (Zhang & Neidlinger, 2012). Therefore, the PCMH model with its core principles, including enhanced access and coordinated and comprehensive care, offers the best solution for the successful transformation from the current reactive model

of primary care delivery to one that is proactive and focused on preventative care and chronic disease management (Zhang et al., 2012).

## **REVIEW OF LITERATURE**

### **Diabetes Mellitus Type 2**

The management of diabetes is measured by the clinical outcomes of certain biomarkers (A1C, LDL-C, and BP), and lifestyle modification (diet, exercise, etc.). The most commonly used biophysical marker to measure the effectiveness of diabetes disease management is glycated hemoglobin (A1C) which predicts diabetes change over a lifetime. The optimal baseline value of A1C is less than 7%, blood pressure (BP) baseline values less than 130/80 mm Hg, and low-density lipoprotein (LDL) cholesterol concentration less than 100 mg/dl (Taliani, Bricker, Adelman, Cronholm, & Gabbay, 2013). Despite improvements in monitoring the disease in the last 10 years (i.e., laboratory testing as indicated per guidelines), the control of diabetes remains suboptimal. In fact, Anderson et al. (2003) cited that only 50% of diabetic patients are attaining the biomarker goals specified above. In addition, the findings are even more dismal in minority populations (Carrillo et al., 2011; Lee, Palacio, Alexandraki, Stewart, & Mooradian, 2011; Parker et al., 2012), where poor glycemic control can reach up to 75% in some ethnic populations (Parker et al., 2012). Hence, the persistent suboptimal results in diabetes control have created a major healthcare concern. On the other hand, in a quasi-experimental study, O'Toole et al. (2011) noted that patients aligned with care teams improve their chronic disease monitoring and management outcomes. Such care teams provide comprehensive, coordinated, accessible care and, where patients are empowered with self-management skills, help them attain and maintain treatment goals. Enhancing quality management of the disease helps reduce long-term complications,

improve quality of life, and efficiently use limited healthcare resources (O'Toole et al., 2011).

At the core of diabetic management in the last decade is the recognition that our current primary care delivery is not designed for the comprehensive care required by most diabetic patients (Solberg, Asche, Fontaine, Flottemesch, & Anderson, 2011). Instead, primary care delivery has resorted to episodic or reactive encounters between patients and their providers resulting in suboptimal care. It is important to realize that primary care plays an essential role in disease prevention, treatment, and monitoring, and needs to undergo a major transformation to stimulate sustainable improvement in diabetes care and improve patient quality outcomes. In response to the current episodic approach to diabetes care, the PCMH model has been proposed to improve patient outcomes. In that context, the purpose of this chapter is to review the literature on the efficacy of the Patient-Centered Medical Home (PCMH) model in improving patient outcomes in the primary care setting.

### **Patient-Centered Medical Home**

The patient-centered medical home (PCMH), an innovative concept of delivering accessible, continuous, comprehensive, coordinated, patient-centered care, was jointly developed by the American College of Physicians, American Academy of Family Physicians, and the American Osteopathic Society in 2007 (Lee et al., 2011). Moran et al (2011) assert that patients in a PCMH model are engaged in their own self-care based on recommendations from their provider and have shown improvement in self-management skills and clinical outcomes. Another sub-theme of the Moran et al. (2011) study is the overall improvement in the Healthcare Effectiveness Data and Information Set (HEDIS)

in other quality measurements such as urine microalbumin, retinal eye exams and body mass index (BMI). There is further evidence suggesting that the PCMH offers a unique approach to primary care practice because it integrates traditional patient-provider contact, comprehensive and coordinated care, and promotes continuity of care into primary care (Moran et al., 2011; Solberg et al., 2011). Although the concept of the PCMH is in the formative years, the evidence now evolving from literature suggests that it may provide a solution to the current fragmentation in primary healthcare. The five core concepts that summarize the outcomes of the PCMH relating to diabetic care are highlighted below.

### **Patient-Centered**

The concept *patient-centered* is defined as care that is individualized and delivered based on patient's physiological and psychosocial needs (Esden & Nichols, 2013). Esden and Nichols (2013) in a quasi-experimental study utilizing a group approach for a patient-centered model of care, suggest that when patients received individualized care, their knowledge and understanding of diabetes and self-efficacy improved. However, a limitation to this study is they did not provide sufficient data on the actual outcome measures associated with diabetes care. Therefore, the reader is unable to effectively evaluate its true value. In another study, Moron et al. (2011) suggest that there were improvements in both monitoring (per clinical guidelines) of diabetes, and clinical outcomes (i.e., A1C, LDL, and blood pressure) when certified diabetic educators are added to PCMH team. However, the lack of a comparison group in the Moran et al study poses a threat to the internal validity of the findings under study.



**Comprehensive Care**

Calman et al. (2013) illustrated the benefits of the PCMH in developing relationships between health care professionals and the patient. In other words, a network of sub-specialists that makes up the medical home team who participate in the care of the patients as their condition warrants. Members of this medical home team may exist outside of the primary care setting, but use their expertise to deliver patient-centered care. In a descriptive study, the authors suggest that when additional services were available to diabetic patients, utilization of that service increased and visits to primary care providers decreased. The resulting outcome is a reduction in A1C for most patients (Calman et al., 2013). The most noted achievement of the PCMH is its flexibility in meeting the comprehensive needs of the patient.

**Coordinated Care**

Coordinated care refers to a central location which monitors the care received by all patients in the PCMH. Research by (Taliani et al., 2013) has shown that care provided by high-performing practices which utilize care managers and electronic medical record (EMR), results in improvements in diabetic quality outcomes. On the other hand, Taliani et al. (2013) suggests that care management in practices without an EMR system has less efficient communication and tracking tools. These low-performing practices are often bogged down with administrative tasks resulting in less productive and fragmented care delivery.

The PCMH establishes relationships with community resources and coordinates care with these entities to monitor the care received by these patients (Carrillo et al., 2011). In the New York-Presbyterian medical home model of utilizing community

resources to track care of patients on discharge (from hospital) and follow up ambulatory care visits, there was a 9.2% decrease in emergency room visits. In like manner, there was a slight, but not significant, decrease in hospital readmissions.

### **Quality and Safety**

Some studies support the theory that the medical home enhances quality and safety of care for diabetic patients (Anderson et al., 2003; Gabbay et al., 2013). Gabbay et al. (2013) further suggest that a well-structured practice with an electronic health record (EHR) system, trained staff to help with diabetic patients, a shared vision, and clarity of roles and responsibilities has positive results. In comparison, practices that lack similar infrastructure do not produce the same results. Anderson et al. (2003) further demonstrated that patients enhance their self-management skills when educated about the need for lifestyle modification, behavior change, and self-monitoring. Thereby, their quality of life is improved over the lifetime of their disease.

Despite the strengths of previous studies illustrating the benefits of the PCMH on diabetes care, an assessment of the Minnesota PCMH model (Solberg et al., 2011) implementation over a 10-year period and, Friedberg et al. (2014) illustrates that there were no improvements in diabetic and coronary artery disease (CAD) measures ( $p > .05$ ) during the years of their transformation period. However, Solberg et al. (2011) depicts overall improvements in patient satisfaction scores and on some access measures ( $p < .05$ ). Furthermore, the authors (Friedberg et al., 2014) revealed that utilization (emergency room visits, hospitalization, and ambulatory care visits) and cost of care did not improve in their cross-sectional study.

In light of this, indications are that the PCMH model can indeed offer mixed results, and may not hold true on every quality measures or need further interventions to improvement on outcome measures. Albeit, it is an illustration of any organization's ongoing commitment to ameliorate quality and safety in their patient population. Its activities are guided by evidence-based medicine, performance improvement, and clinical support and shared decision-making with patients and their families.

### **Accessible Service**

One of the key hallmarks of the PCMH is access to primary care providers or other specialists when patients need it (O'Toole et al., 2011). In a quasi-experimental study, O' Toole et al illustrate both the benefits and challenges with very high risk and vulnerable populations (homeless with chronic diseases). The benefits provide positive results in both preventative and chronic disease management, particularly with diabetic patients. In spite of this, the study did not translate into a decrease in urgent care and emergency room visits. Nonetheless, the findings proved that chronically ill patients benefit greatly from the PCMH model because they utilize a majority of the services. However, this highlights the complexity of delivering care to that population. Comparatively, a correlation study (Parker et al., 2012) showed there is a relationship between poor appointment keeping and poor outcome on diabetic measures in an ethnically diverse population in Northern California. However, all the participants had health insurance, and therefore the study could not be generalized beyond that population.

Unlike the studies mentioned earlier, Lee et al. (2011) conducted a correlational study in urban Jacksonville, Florida showing there is improved glycemic control when providers are available to deliver care in a PCMH model. Even though the study was

conducted predominately among minorities, the results showed overall improvement in glycemic control for all races. The study is limited, however, because there was no comparison with a similar group in a non- PCMH setting.

In addition to traditional appointment keeping, further access can be augmented by same day appointments (O'Toole et al., 2011; Parker et al., 2012) or even open access (O'Toole et al., 2011) where patients can walk in without scheduled appointments. In brief, literature supports that poor glycemic control is directly related to limited or inadequate access.

### **Conclusion**

This review of the literature related to the efficacy of diabetic care in a PCMH model clearly supports the overall benefit of redesigning the system for primary care delivery. This transformation requires a well-defined, team-based, coordinated system which pays special attention to establishing a long-term, collaborative relationship with the patient. To put it simply, patients must receive care that is tailored to their own needs, and they should be partners in the decision-making process that determines how that care is administered. On the other hand, the shortcomings of this review illustrate all of the selected studies lack true experiment design. Whereby, there are no control groups of non-PCMH studies and this could be an area for future research.

## **METHODS**

This section will discuss the methodology used for this integrative literature review. The study design, inclusion and exclusion criteria, and the systematic steps for collection of studies pertinent to the project will be presented.

### **Research Design**

The goal of this project is to conduct an integrative review of primary studies to evaluate the effectiveness and quality of care of diabetic patients in the PCMH model. An integrative review methodology was selected because it combines diverse methodologies (i.e., experimental and non-experimental studies), and provides a comprehensive understanding of the healthcare issue being studied (Whittemore & Knafl, 2005).

Whereas qualitative and quantitative research examines the experiences of participants through multiple approaches, the integrative literature review uses existing literature as its data source to synthesis knowledge about a given phenomenon of interest. Thus, the findings of the review have the potential to play a stronger role in evidence-based practice (Whittemore & Knafl, 2005). Reviewing a wide variety of studies gives a clear perspective of the complexity of the issue under study and allows the researcher to understand the topic from multiple vantage points (Torraco, 2005).

Noblit (1988) and Dixon-Woods (2006) identified two forms of systematic literature review: (1) the aggregative method which pools data and summarizes what is already known about the chosen topic (i.e., meta-analysis) and (2) interpretative synthesis studies which base their concepts on induction and interpretation of data (Dixon-Woods et al., 2006). Dixon-Woods et al. (2006) suggests that while interpretative synthesis are typically rooted in a qualitative paradigm, it is possible in both quantitative and

qualitative research. In light of this, given that the majority of the PCMH studies utilized quantitative methods to conduct their reviews, this integrative literature review will be presented in the philosophical tenets of an interpretive synthesis with quantitative sensibility. In short, the research design for this project is an integrative literature review that is an interpretative synthesis.

In a guideline written for integrative literature reviews, Torraco (2005) describes these types of reviews as a form of study that “reviews, critiques, and synthesizes representative literature on a topic in an integrative way such that new frameworks and perspectives are generated” (Torraco, 2005, p. 363). Similarly, this project will conduct a thorough and comprehensive review of existing literature on diabetes care in the PCMH model to summarize what is currently known, explore ongoing challenges, and determine whether such a practice can ameliorate quality care. Accordingly, a rigorous systematic approach was undertaken to review all relevant research studies on the phenomenon. The articles retrieved were appraised against an established criteria to identify a relevant and robust pool of primary research materials (Purling & King, 2012), and the outcome variables of the studies will be discussed in the findings.

### **Procedures**

The current integrative research project was conducted using the key stages of integration outlined by Whitemore and Knafl (2005): formulating the research problem (presented in the background section), conducting a literature search (presented in the methods section), evaluating, analyzing, and summarizing the data (presented in the findings and discussion sections).

### **Inclusion and Exclusion Criteria**

For the purpose of this review, only relevant literature in medicine, nursing, and psychology was sourced to address the concept of the PCMH and diabetes care. The literature from these disciplines was selected because these disciplines have provided the most relevant research to date on diabetes care in the PCMH. In order to ensure the quality of the search, only literature in peer-reviewed professional journals was sourced. Equally important, the studies include both theoretical and empirical primary sources, and no studies from secondary sources were included.

In addition, this integrative review excluded literature about pediatric diabetic care and, delete studies based in inpatient settings. In order to ensure the quality of the review, unpublished manuscripts were also excluded. In general, the exclusion criteria narrowed the focus of the review to adult diabetic care in an outpatient, primary care PCMH settings. A complete list of criteria is shown in Table 1.

### **Data Collection**

Data collection was conducted using a three step process. In the first step, there is a broad sampling of studies on the PCMH model which explores the management of diabetes. The goal of this initial step was to identify all the studies available that provide a comprehensive view of the topic. In particular, an electronic search was conducted to identify studies written in the English language from 2003 to 2013 in the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Cochrane Review, Academic Premier (EBSCO), Sociological abstract, and PsychINFO. A combination of various keywords used in the search included: patient-centered medical home and diabetes, comprehensive care, care coordination or case

Table 1

*Inclusion and Exclusion Criteria*

Inclusion criteria	Exclusion criteria
Published between 2003-2013	Published prior to 2003
Published in English language	Published in language other than English
Primary research article or thesis	Articles other than primary research article or thesis
Related to primary care or ambulatory setting	Did not relate to primary care or ambulatory setting
Related to PCMH model and diabetes Related to actual PCMH experience	Did not relate to PCMH model and diabetes Simulated PCMH experience
Related to PCMH diabetes and care coordination	Did not relate to PCMH diabetes and care coordination
Related to PCMH diabetes and access	Did not relate to PCMH diabetes and access
Related to PCMH diabetes and comprehensive care	Did not relate to PCMH diabetes and comprehensive care
Related to PCMH diabetes and quality	Did not relate to PCMH diabetes and quality
Related to PCMH diabetes and community resources	Did not relate to PCMH diabetes and community resources

management, patient-centered care, access, quality and safety, and community resources.

Subsequent to the electronic search, reference mining or hand searching of relevant literature was also performed. Second, once the studies were identified, the next step was to remove all duplicate studies and categorize the remaining studies based on the six components that comprise of the medical home model (comprehensive care, patient-centered, accessible services, quality and safety, coordinated care, and community resources). The aim of the second step is to illustrate how each of the components making



up the PCMH model plays a role in diabetes care. The third step of the data collection was to organize the final studies in a table of evidence (TOE). It is important to note that only the most germane studies to be analyzed are illustrated on the TOE (Appendix C).

### **Proposed Project**

My aim is to critique and synthesize the current evidence on the efficacy of the PCMH model on diabetes type 2 quality outcomes. The product of my doctoral work will be a manuscript to be submitted to *The Diabetes Educator*. I will carefully review the author guidelines for the journal, and work with my committee to submit a publishable manuscript describing the evidence surrounding diabetes outcomes in Patient-centered medical homes settings involving multidisciplinary teams.

**PROJECT MANUSCRIPT**

**Patient-Centered Medical Homes and Diabetes Outcomes: An  
Integrated Literature Review**

**A manuscript prepared in partial fulfillment of  
the Doctor of Nursing Practice degree**

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## **Abstract**

### **Purpose**

This integrative review synthesizes the existing evidence on diabetes care provided within a Patient-Centered Medical Home (PCMH) model to evaluate the effectiveness of the model in terms of quality outcomes.

### **Methods**

Literature published in English between 2003 and 2014 was searched using the following keywords: patient-centered medical home and diabetes, comprehensive care, care coordination, patient-centered care, accessible care, quality and safety, and community resources. The following databases were searched: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Cochrane Review, Academic Premier (EBSCO), and PsychINFO. Of the 96 articles retrieved from the databases, 12 were selected for review.

### **Results**

The effects of the PCMH model on diabetes vary across practice settings. The heterogeneity of the research designs, practice settings, and quality outcomes limit the ability to generalize the findings beyond the programs reported in studies.

### **Conclusions**

The evidence related to diabetes type 2 quality outcomes in a PCMH model is equivocal. Most of the evidence relates to process measures rather than patient outcomes. Future studies should consider longitudinal designs, where the effect of the PCMH on diabetes outcomes can be observed over a period of time.

Over the past decade, the United States has embarked on a transformational process in primary care medical practices to improve outcomes for patients with chronic diseases.<sup>1-4</sup> various models of care involving team-based care coordination have been investigated. Many health delivery systems are considering the merits of the patient-centered medical home (PCMH) model to improve both quality and cost effectiveness for patients with complex needs. This is very important in a scenario where traditional medical delivery systems have failed to stabilize chronic diseases that require close surveillance, patient education, and patient adherence. According to the Agency for Healthcare Research and Quality (AHRQ),<sup>5</sup> the PCMH model redesigns primary care visits from a face-to-face encounter with a single provider to a process of care in which a team of professionals coordinates a patient's diverse healthcare needs.

Interdisciplinary team (IDT) collaboration and care coordination are common hallmarks of the PCMH model. The composition of the IDT varies across locations and may include physicians, non-physician providers, nurses, diabetes educators, pharmacists, case managers, social workers, and family members. In addition to IDT collaboration and coordination, research suggests that early identification and support of self-management behaviors, patient empowerment, and the use of electronic medical records enable better communication and better patient outcomes.<sup>6</sup> Although the PCMH may be operationalized differently depending on the specific mission and vision of an organization, the general tenets of patient-centered care, access, coordination, and comprehensive care remain constant.<sup>7</sup>

The phrase "medical home" was pioneered in 1967 by the American Academy of Pediatrics to describe a model based on a single source of care and centralized medical

records for children with chronic diseases and disabilities.<sup>6</sup> The Institute of Medicine (IOM) reaffirmed the value of a medical home as a framework for supporting a sustainable partnership between patients and their providers. Primary care providers have a distinctive understanding of patients' healthcare needs and are in a unique position to promote IDT collaboration to coordinate resources, treatment, and preventative resources.<sup>8</sup> In the United States, various healthcare delivery systems are investigating the efficacy of the PCMH model to provide comprehensive care to patients with diabetes.<sup>9</sup>

Diabetes mellitus (DM) affects 26 million people in the United States, with an annual estimated cost of \$119 billion.<sup>10</sup> Indeed, with more people living sedentary lifestyles and obesity on the rise, the incidence of type 2 diabetes threatens to grow beyond 40 million in the next 15 years.<sup>17, 18</sup> Long-term complications of DM often lead to heart disease, stroke, blindness, kidney failure, and amputation.<sup>11</sup> Not surprisingly, DM is the seventh leading cause of death in the United States.<sup>12</sup> Regardless of the high price tag for diabetes care, few patients meet the goals identified in the evidence-based practice (EBP) guidelines.<sup>13</sup> Patients with diabetes who lack compliance with EBP guidelines are particularly likely to suffer the consequences of fragmented care,<sup>14,15</sup> and early research suggests that a PCMH that incorporates EBP guidelines may lead to improved patient outcomes.<sup>14</sup>

The successful management of DM type 2 is evaluated predominately by specific clinical biophysical markers (i.e., A1C, low density lipoprotein cholesterol (LDL-C), blood pressure (BP), and body weight) and the patient's adherence to lifestyle modifications (i.e., diet, exercise, and DM self-management).<sup>11</sup> Other clinical guideline recommendations from the American Diabetes Association (ADA) include annual

comprehensive foot and eye examinations and an assessment of the comorbidities that can contribute to diabetes complications.<sup>11</sup>

Traditional medical delivery systems have failed to stabilize many chronic diseases, including diabetes type 2.<sup>14</sup> The evidence suggests that only 50% of all patients with diabetes attain national guideline goals.<sup>11</sup> Statistically, in minority populations, the outcomes are worse.<sup>16–19</sup> It is estimated that approximately 25% of minorities with diabetes achieve good glycemic control.<sup>18</sup> Although there is clear evidence regarding which DM biomarkers are associated with the development of diabetes comorbidities,<sup>11</sup> less is known about whether the PCMH model effectively improves quality outcomes for patients with diabetes type 2.<sup>3, 14</sup>

### **Purpose**

This integrative literature review aims to critique and synthesize the current research on the efficacy of the PCMH model on diabetes type 2 quality outcomes.

### **Search Strategy**

#### **Inclusion and Exclusion Criteria**

Only relevant literature in medicine, nursing, and psychology was searched to address the purpose of this review. These disciplines were selected because they provide the most relevant research thus far on the efficacy of the PCMH model on diabetes care. To ensure the quality of the search, only literature in professional peer-reviewed journals was searched. Equally importantly, the studies in this review included only empirical primary sources; no studies from secondary sources were included. In addition, the authors excluded literature on pediatric diabetes care and studies based in inpatient settings. To ensure the quality of the review, unpublished manuscripts were also

excluded. In general, the exclusion criteria narrowed the focus of the review to adults with a diagnosis of diabetes type 2 in outpatient, primary care settings (see table 5).

Patients with DM type 1, including both children and adults, are managed primarily in endocrinology settings. Therefore, type 1 DM was not included in the review.

### **Data Collection**

Data collection was conducted using a three-step process. The first step involved a broad sampling of studies on the PCMH model and diabetes care. The goal of this initial step was to identify all available studies and obtain a comprehensive understanding of the topic. In particular, an electronic search to identify studies written in the English language from 2003 to 2014 was conducted using the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Cochrane Review, Academic Premier (EBSCO), and PsychINFO. The following keywords were used in the search: *patient-centered medical home and diabetes; comprehensive care; care coordination or case management; patient-centered care; access, quality, and safety; and community resources*. Subsequent to the electronic search, reference mining or hand-searching of relevant literature was also performed. Once the studies were identified, the second step involved excluding all duplicate studies and categorizing the remaining studies based on the six components of the medical home model (comprehensive care, patient-centered, accessible services, quality and safety, coordinated care, and community resources). The aim of the second step was to illustrate how each of the components constituting the PCMH model plays a role in diabetes care. The third step of the data collection was to organize the final studies in a table of evidence (Appendix B). The final studies were reviewed and the quality was appraised by two investigators using the

evidence-based the guidelines published by the Johns Hopkins Nursing Evidence-Based Practice Appraisal (JHNEBP) tool.<sup>20</sup>

## Results

The initial search identified 96 studies for possible review; eight were excluded as duplicates after a review of the titles. Subsequently, abstracts were reviewed and 63 studies were discarded as not relevant, thereby leaving 25 studies for detailed review. Another 14 studies were discarded for not meeting the criteria of the appraisal, thereby leaving 10 studies to be included in the review. Two more studies were identified and selected through a thematic mining of the relevant references. A total of 12 studies were included in this integrative review (see fig. 2).

The JHNEBP<sup>20</sup> practice model ( see table 3 and table 4) was used to organize, critically appraise, and synthesize the evidence for this integrative review. The strength of the evidence and quality was graded based on the scoring system of the JHNEBP tool. Further, the tool stipulates that research evidence (levels 1–3) has the highest strength, whereas non-research (levels 4–5) the lowest. All but one of the 12 studies used quantitative methodology exclusively. None of the studies meet all the criteria of the JHNEBP appraisal. Taliani et al. included grounded theory in their mixed-method study.<sup>21</sup> A majority of the 12 reviewed studies were conducted in the United States, although one study by O’Toole et al.<sup>22</sup> did not indicate a specific location. Most of the studies were non-experimental (see table 2) and given a level 3. However, one study<sup>22</sup> that used a quasi-experimental pre-post analysis was given a level 2 score. Parker et al.<sup>18</sup> used a very large sample size (n = 12,957), multiple outpatient settings, a non-experimental design, stratified random sampling, and a Horvitz-Thompson approach in



their analysis to address non-response bias; this resulted in a very rigorous study.<sup>18</sup> Their methodology enabled multivariate analyses that investigated the independent associations of ethnicity and adherence to keeping scheduled appointments with diabetes outcomes. The evidence revealed that there is an increased risk for A1C, LDL, and systolic BP elevation among certain ethnic groups.

Although many of the studies have large sample sizes, only Parker et al.<sup>18</sup> conducted a power analysis to determine the sample size for their study. However, a number of studies<sup>12,16,19,22–25</sup> had statistically significant findings ( $p < .05$ ), which suggests that their sample sizes were sufficiently large to avoid a type II error. All studies were given a quality rating B for meeting one or more of the criteria of the JHNEBP rating scale. The potential for bias was not evident in most of the studies, except for the study by Gabbay et al.,<sup>26</sup> that identified blinding of the participants and thus decreased the threat to internal validity. Overall, the findings provide inadequate evidence regarding the quality outcomes of diabetes type 2 care in a PCMH model.

### **Critique and Synthesis of the Current Research on the PCMH Model and Diabetes Care Outcomes**

A critique of the best available evidence is a cornerstone of EBP. These critiques provide a strong foundation for making informed decisions related to patient care<sup>27</sup> and are a foundation for practices of diabetes educators and other multidisciplinary team members. The PCMH model proposed by AHRQ involves five major strategies for primary care transformation and will provide a framework for the synthesis of this review. These five strategies are elaborated below:<sup>28</sup>

*Patient-centered care.* Patient-centered care is defined as care that is individualized and delivered based on a patient's physiological and psychosocial needs. In a pre- and post-test design utilizing a group approach in a PCMH setting, Esden and Nichols<sup>10</sup> found that when patients received individualized instructions, their knowledge and understanding of diabetes and self-efficacy improved. In other words, patient-centered care in a PCMH setting is not prescriptive, but it enables considerable flexibility based on the individual needs of the patient.

*Comprehensive care.* Comprehensive care is care delivered by an IDT that works to meet the diverse needs of the patient. Studies by Calman et al.<sup>29</sup> and O'Toole et al.<sup>22</sup> demonstrated that patients who were aligned with IDTs had improved chronic disease monitoring and management outcomes. Furthermore, IDTs may exist outside of the primary care setting but work collaboratively as experts to improve both process measures (i.e., annual eye exam or podiatry visits) and quality outcomes.<sup>22</sup> Interdisciplinary teams coordinate and provide comprehensive care and empower patients with self-management skills to help them attain and maintain their treatment goals.

*Coordinated care.* Coordinated care refers to a central location that monitors the care received by all patients in the PCMH setting. Research conducted by Taliani et al.<sup>21</sup> has shown that care provided by high-performing healthcare practices that utilize care managers and electronic medical records (EMRs) result in improved diabetes outcomes. The PCMH approach further strengthens relationships with community resources and coordinates with these entities to improve patient outcomes.<sup>16</sup> A study by Carrillo et al.<sup>16</sup> suggests that in high-risk and underserved communities, a PCMH model can utilize community resources to support the care patients receive after they have been discharged

from the hospital. This study reported a 9.2% decrease in emergency room visits ( $p = 0.001$ ) and a slight but not significant decrease in hospital readmissions ( $p = 0.25$ ).

*Quality and safety.* The use of evidence-based medicine and clinical decision tools together with a system-based approach to care ensures optimal quality and safe patient care delivery.<sup>28</sup> Several studies in the review support the premise that the PCMH model provides a framework to enhance the quality and safety of care for patients with diabetes.<sup>26,29,30</sup> Gabbay et al.<sup>26</sup> suggested that improved patient outcomes are supported by a well-structured practice with an EMR system, staff trained to help patients with diabetes, a shared vision, and clarity of roles and responsibilities. Furthermore, Calman et al.<sup>29</sup> reported a decrease in annual mean A1C (10.72% to 8.34%) when certified diabetes educators (CDEs) are added to the team.

*Accessible service.* One of the hallmarks of the PCMH model is access to primary care providers and members of an IDT, particularly for high-risk populations.<sup>22</sup> The benefits and challenges of providing accessible service for high-risk populations that typically lack access to care (homeless individuals and African Americans with diabetes) within a PCMH model is clearly presented in the reviewed literature.<sup>19,22</sup> In addition to traditional appointment-keeping, the literature on the PCMH suggests that access can be augmented by same-day appointments<sup>18,22</sup> and an open-access<sup>22</sup> system in which patients can walk in and consult providers without scheduled appointments. In general, the existing literature suggests that poor glycemic control is often directly related to limited or inadequate access.<sup>18</sup> In fact, a prospective cohort study by Lee et al. demonstrated that the PCMH model improved glycemic control by enhancing access to care ( $p < .005$ ).<sup>17</sup>

Although the evidence presented in some of the previously mentioned studies supports the efficacy of the PCMH model in the management of diabetes, not all the studies found a correlation between the PCMH model and improved patient outcomes. For example, a study that evaluated the Minnesota PCMH model over a 10-year period found no statistically significant improvement in diabetes metrics ( $p = .42$ ).<sup>24</sup> Further, in a cross-sectional study by Friedberg et al., utilization (emergency room visits, hospitalization, and ambulatory care visits) and cost of care did not improve with the use of a PCMH model.<sup>23</sup> Similarly, Simonetti et al.<sup>19</sup> indicated that even within a PCMH model, African American patients with diabetes did not have desired improvements in glycemic control, did not receive preventative eye screening exams, and had fewer endocrinology visits annually. Indeed, findings highlight the complexity of delivering care to some vulnerable minority populations, as health behaviors may be a predominant barrier to care.

## **Discussion**

This manuscript is the first integrative review to examine the effectiveness of the PCMH model in dealing with type 2 diabetes outcomes. Although a majority of the reviewed studies suggest that the PCMH model is associated with positive outcomes and process measures for patients with diabetes, the lack of methodological rigor, inadequate variety in both the level and strength of the evidence, and the heterogeneity of research designs limit the ability to generalize the findings across settings. Hence, there remains a gap in what is decisively known about the model's efficacy. To address this issue, more research that focuses on diverse settings and populations and employs more rigorous methodology is warranted—for example, randomized control studies that are the gold

standard for evaluating the efficacy of interventions. However, this may be difficult because of logistical or ethical challenges of randomizing populations to a PCMH setting. Therefore, longitudinal designs may be a more appropriate methodological approach to provide meaningful data on the efficacy of the PCMH on diabetes outcomes. Longitudinal designs can compare baseline data prior to enrolling in a PCMH and follow patients over time to produce clinically meaningful findings.<sup>27</sup> In essence, longitudinal studies would enhance our knowledge of the extent to which a PCMH model would cause an improvement in diabetes outcomes over time within a primary care setting.

Given the strengths and weaknesses of the studies included in the review, the evidence is equivocal in supporting that the PCMH model improves diabetes outcomes. Moreover, a recent systematic review examining PCMH effectiveness<sup>3</sup> revealed that two of the three studies found improvement in diabetes outcomes (i.e., A1C, LDL), whereas one-third showed no improvement in diabetes outcomes.

Further, the evidence is mixed regarding the efficacy of the PCMH on minorities with diabetes type 2. Two of the reviewed studies<sup>18,19</sup> found that the efficacy of the PCMH model may be challenging for managing minorities with diabetes. However, other studies<sup>13,17,22,25</sup> suggest that minorities achieve better diabetes care within the PCMH model possibly because of the availability of educational resources and a team-based support for self-management activities. In light of this, additional interventions may be necessary to address the social determinants that pose barriers for healthcare in certain minorities.

Critical to the discussion on the efficacy of the PCMH model on outcomes is the potential for traditional primary care practices to implement it. Mainly, the resources

needed to have genuine IDT collaborations may be a barrier for both large and solo practices.<sup>24</sup> Solo practices with limited resources may need to undergo a cultural shift from practiced independence to shared cooperation within a network to sustain the IDT collaboration endemic with the PCMH model. Furthermore, Carillo et al. demonstrated that forming collaborative networks into a “medical village” has a profound impact on addressing health disparities, particularly in vulnerable populations.<sup>16</sup> Unfortunately, some multi-payer systems do not incentivize team-based care. Instead, providers are only reimbursed for individual encounters based on a fee-for-service (FFS) scale.<sup>31</sup> In essence, unless payment reform occurs in the FFS payment system, solo practices could be discouraged from pursuing alternative practice models of care such as PCMH.

### **Limitations**

The results of this review must be considered cautiously; in other words, there are several limitations to be considered. The most obvious limitation of the review is the heterogeneity of research designs and settings that limit the ability of the authors to equivocally determine the efficacy of the PCMH model on diabetes outcomes. The existing studies tend to involve large medical groups and integrated practices, but the literature is almost silent on how the strategies endemic in the PCMH can be implemented in solo or smaller primary care practices. Further, a majority of the studies lack control groups, treatment randomization, or *a priori* power analysis to determine adequate sample sizes (and prevent type II errors).

Another limitation of this review is that it uses the AHRQ framework to describe the efficacy of the PCMH model on diabetes outcomes, which does not include a payment model. In fact, only two studies<sup>23,30</sup> included cost as one of their outcome

measures and the effects of PCMH were mixed in terms of cost savings. While it is critical for medical practices to seek innovative ways to improve quality of care, containing costs is essential to the viability of a healthcare system. Therefore, quantifying the cost of initiating and maintaining a PCMH is crucial and should be considered as a focus in future studies.

Finally, the JHNEBP appraisal tool, which heavily favored grading qualitative studies for in-patient evidence-based practice settings, proved to be a challenge for the authors in this review. In fact, reviewing the evidence for this review incited vigorous debate amongst us, as we did not agree on the level of evidence in certain studies and had to rely on the expert opinion of other faculties.

## **Conclusion**

As the data continues to emerge from ongoing demonstration projects, the full impact of the efficacy of the PCMH model on chronic disease management will become clearer. However, it is crucial that future investigations consider more rigorous methodologies that can produce generalizable results across diverse practice settings. Clearly, for many primary care practices, the transformation to the PCMH model is a monumental task that requires a considerable amount of time and resources. Therefore, it may take time to realize substantive gains in patient outcomes after the model is fully implemented.

One of the advantages of an integrative literature review is that it provides for diverse views on a topic drawn from the strengths of current developments and recent advances in methods for interpretative synthesis of a practice issue. Therefore, it could be inferred that the integrative review methodology offers clarity and insight, and if

implemented, can guide the transformation of healthcare delivery systems. Within this context, despite the summative findings of the review, some evidence suggests that where the PCMH model is successfully implemented, it is supported by dedicated workflows, a consistent approach to delivery of care, and a well-managed team.

### **Implications for Practice**

In the final analysis, given the challenges associated with providing care for a growing population living with chronic diseases, primary care must continue to explore systematic transformations to improve both process measures and quality outcomes. This transformation will require a shift from the current models that focus on the healthcare provider or the health plan to a model that is patient-centered. In fact, there is an abundance of evidence that indicates that greater team-work,<sup>21,32,33</sup> effective communication,<sup>34,35</sup> and partnership with patients lead to a better patient care experience.<sup>36-38</sup> Therefore, based on the findings from this review, diabetes healthcare professionals, including diabetes educators, can adopt some strategies of the PCMH model in their own healthcare delivery systems to improve patient outcomes. Furthermore, given the current challenges facing many primary care systems, it is crucial that healthcare providers, including diabetes educators, continue to assume leadership roles to facilitate and adopt best practices that support the core functions of their care delivery models.

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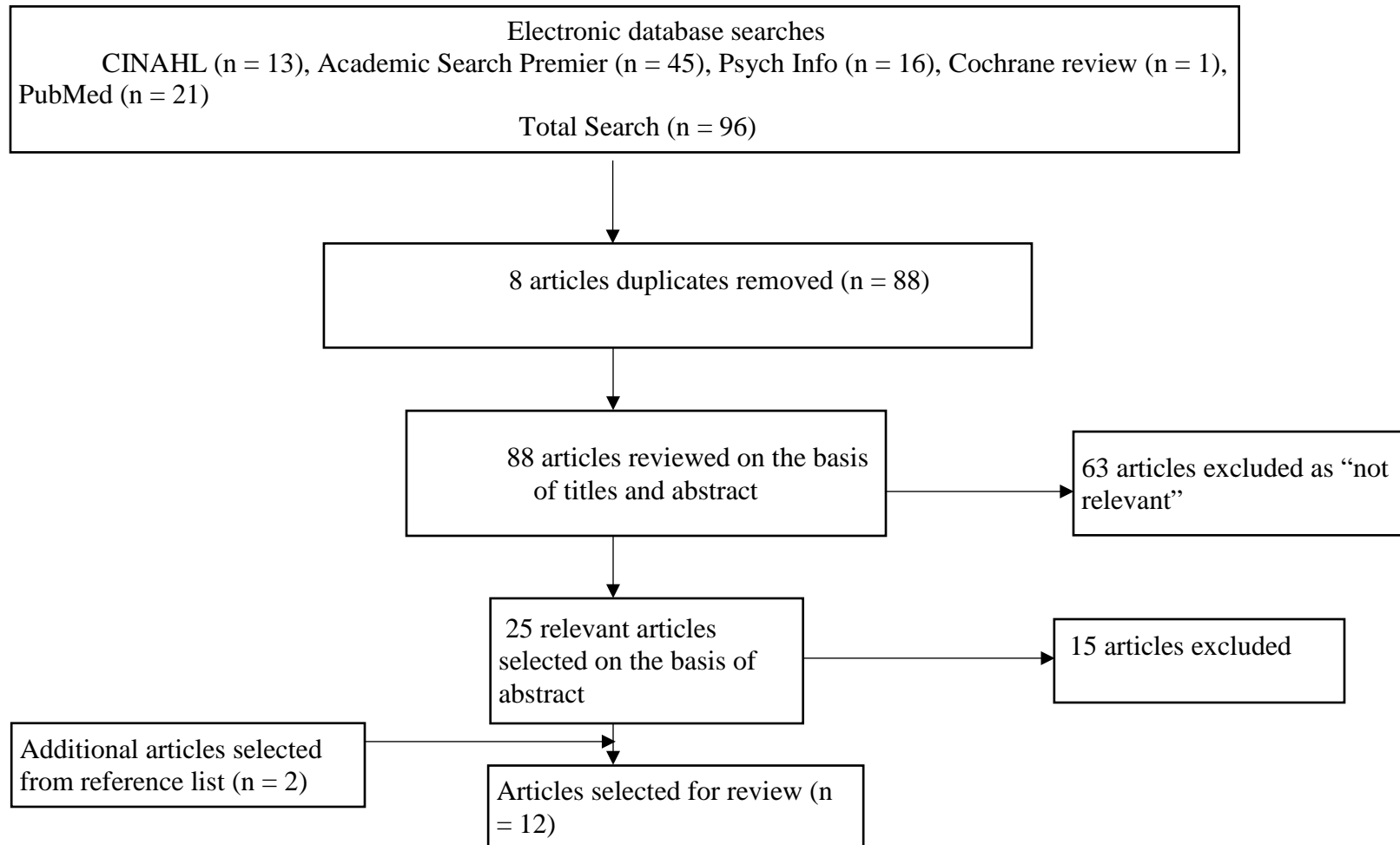
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**Figure 2. Flow chart summary of literature search**



**Table 2. Summary of Critical Appraisal**

	Q1. Sample	Q2. Randomization	Q3. Intervention	Q4. Control group	Q5. Treatment group	Q6. Data collection	Q7. results	Q8. Data analysis	Q9. Findings	Q10. Limitations	Strength of Evidence & Rating
Calman et al., 2013	X	X	X	X	X	√	√	√	√	√	3B
Carrillo et al., 2011	X	X	X	X	X	√	√	√	√	√	3B
Gabbay et al., 2013	X	X	X	X	X	√	√	√	√	√	3B
Lee et al., 2011	X	X	X	X	X	√	√	√	√	√	3B
Solberg et al., 2011	X	X	X	X	X	√	√	√	√	√	3B
Moran et al., 2011	X	X	√	X	√	√	√	√	√	√	3B
O' Toole et al., 2011	X	X	√	X	√	√	√	√	√	√	2B
Parker et al., 2012	√	X	X	X	X	√	√	√	√	√	3B
Taliani et al., 2013	X	X	X	X	X	√	√	√	√	√	3B
Stevens et al., 2014	X	X	X	X	X	√	√	√	√	√	3B
Simonetti et al., 2014	X	X	X	X	X	√	√	√	√	√	3B
Friedberg et al., 2014	X	X	√	√	X	√	√	√	√	√	3B

X = meet; √ = did not meet.

## JHNEBP Evidence Rating Scales

**Table 3. *Strength of the Evidence***

Strength of the Evidence	
<b>Level 1</b>	Experimental study/randomized control trial (RCT) or meta analysis of RCT
<b>Level 2</b>	Quasi-experimental study
<b>Level 3</b>	Non-experimental study, qualitative study, or meta-synthesis
<b>Level 4</b>	Opinion of nationally recognized experts based on research evidence or expert consensus panel (systematic review, clinical practice guidelines)
<b>Level 5</b>	Opinion of individual expert based on non-research evidence. (Includes case studies; literature review; organizational experience e.g., quality improvement and financial data; clinical expertise, or personal experience)

**Table 4. *Quality of the Evidence***

Quality of the Evidence		
<b>A High</b>	Research	Consistent results with sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence.
	Summative reviews	Well-defined, reproducible search strategies; consistent results with sufficient number of studies; criteria-based evaluation of overall scientific strength and quality of included studies; definitive conclusions.
	Organizational	Well-defined methods using a rigorous approach; consistent results with sufficient sample size; use of reliable <b>and</b> valid measures well-defined methods using a rigorous approach; consistent results with sufficient sample size
	Expert Opinion	Expertise is clearly evident
<b>B Good</b>	Research	Research reasonably consistent results, sufficient sample size, some control, fairly definitive conclusions; reasonably consistent recommendations based on comprehensive literature review that includes some reference to scientific evidence
	Summative reviews	Reasonably thorough and appropriate search; reasonably consistent results with sufficient numbers of defined studies; evaluation of strengths and limitations of included studies; fairly definitive conclusions
	Organizational	Well-defined methods; reasonably consistent results; use of reliable and valid measures; consistent recommendations
	Expert Opinion	Expertise appears to be credible
<b>C Low quality or major flaws</b>	Research	Little evidence with inconsistent results, insufficient sample size, conclusions cannot be drawn
	Summative reviews	Undefined, poorly defined, or limited search strategies; insufficient evidence with inconsistent results; conclusions cannot be drawn.
	Organizational	Undefined, <b>or</b> poorly defined methods; insufficient sample size; inconsistent results; undefined, poorly defined or measures that lack adequate reliability or validity
	Expert Opinion	Expertise is not discernable or is dubious

*Note.* Adapted with permission from John Hopkins Nursing Evidence-Based Practice Model and Guidelines, JHN EBP - Resources and Consultations. [http://www.hopkinsmedicine.org/institute\\_nursing/continuing\\_education/ebp/ebp\\_books\\_consultations.html](http://www.hopkinsmedicine.org/institute_nursing/continuing_education/ebp/ebp_books_consultations.html). Accessed December 1, 2014.



**Table 5. *Literature Review Inclusion***

Inclusion Criteria
Published between 2003–2014
Published in the English language
Primary research article or thesis
Related to primary care or ambulatory setting
Related to the PCMH model and diabetes
Related to an actual PCMH experience
Related to PCMH diabetes and care coordination
Related to PCMH diabetes and access
Related to PCMH diabetes and comprehensive care
Related to PCMH diabetes and quality
Related to PCMH diabetes and community resources

## **DISCUSSION**

SEE MANUSCRIPT

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## APPENDIX A

### AUTHOR GUIDELINES FOR THE DIABETES EDUCATOR

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Manuscripts must be submitted electronically at <http://mc.manuscriptcentral.com/tde>, where authors will be required to set up an online account in the SAGETRACK system powered by ScholarOne.

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#### ARTICLE CATEGORIES

##### Features

Feature articles provide a detailed presentation of a subject from one of the following categories: original research, literature reviews, or perspectives in practice. All feature articles must include a structured abstract of 150 to 200 words.

##### Original Research

This type of feature reports original clinical investigations that are relevant to the education and care of people with diabetes. Research papers should be 12 to 14 double-spaced pages, excluding tables, figures, and references. The following elements should be included in reports of original research: (1) structured abstract; (2) introduction with statement of the purpose of the study; (3) complete description of the methods (eg, design, sample, evaluation instruments, procedures, statistical analyses); (4) clear report of the results; (5) conclusions/discussion of the findings; and (6) implications and/or recommendations that summarize how the findings can be applied to the practice of diabetes education.

##### Literature Reviews, Perspectives in Practice

Papers in this category should be 8 to 10 double-spaced pages, excluding tables, figures, and references. Literature reviews should provide a comprehensive summary and critique of information on a relevant topic from a representative collection of resources. The most current findings should be presented along with a history of the literature on the given topic.

Controversies, issues, and questions should be addressed as well as standard practices and opinions. Perspectives in practice may take the form of a detailed case study in which clinical situations illustrate distinguishing, unique, or atypical features that provide a lesson to be learned.

## Departments

Articles concerning the application of principles and concepts in nutrition, pharmacy, psychosocial aspects of diabetes, research methodology, professional growth and development, and healthcare policy, as well as letters to the editor are published in specific departments. Papers may be submitted to the individual departments within *The Diabetes Educator* and should be 4 to 8 double-spaced pages, excluding tables, figures, and references.

### Nutrition Update

These articles provide essential information about diabetes and nutrition for clinical practice.

Papers might review the current literature on a timely topic and/or make specific recommendations for practice.

### Pharmacy Update

These articles address information regarding any pharmaceutical used in diabetes care. Papers might review information on new products, pharmacokinetics, preparations, dosages, interactions, precautions, or side effects.

### Professional Development

These articles provide a forum for sharing ideas, insights, and individual expertise on a broad range of topics related to professional growth as a diabetes educator. Papers might address specific strategies and/or practical approaches concerning the responsibilities of the diabetes healthcare professional.

### Research Update

These articles provide readers with information about aspects of the research process and/or grant writing as it relates to diabetes care and patient education. Papers might focus on assisting the clinician or educator in planning, designing, implementing, or evaluating research proposals or grants for clinical application.

### Tool Chest

These articles provide a format for sharing innovative educational strategies or tools that are relevant for use in patient and professional education. Papers might describe a particular teaching technique or tool and its application in practice.

### Letters to the Editor

These letters provide a forum for commenting on articles published in *The Diabetes Educator* and topics of general interest in diabetes care and education. The length should not exceed 800 words of text with a minimal number of references. One table or figure may be included, if necessary. Any comments regarding a specific article must include the title, author(s), and date of publication. Letters that contain questions or criticisms in response to a previously published paper will be forwarded to the author(s) of that article for a reply. The sharing of ideas, experiences, opinions, and alternative views is encouraged. The editor-in-chief reserves the right to accept, reject, or excerpt letters for clarity and appropriateness of content, and to accommodate space requirements.



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Manuscripts are considered for publication with the understanding that all persons listed as authors have participated sufficiently in the research and writing to take public responsibility for the content (refer to Contributorship policy).

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Manuscripts must be typed double-spaced throughout (including references). Use margins of at least 1 inch on the top, bottom, and sides of each page. Nothing should be typed in all caps. Number pages consecutively in the upper right-hand corner, beginning with the title page, and provide a running head (not exceeding 50 characters) at the top of each page.

The manuscript should be organized in the following manner:

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2. Structured abstract
3. Introduction (no heading)
4. Research design, methodology, results, conclusions (for features)
5. Text divided into logical headings and subheadings as appropriate
6. Implications/relevance for diabetes educators
7. Acknowledgments
8. References

## 9. Tables, figures, legends, and illustrations/photos on separate pages

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The title page should include (1) title of the manuscript; (2) suggested running head; (3) full name and academic degree(s) for each author; (4) institutional affiliation, including department name and city/state; (5) complete mailing address, with daytime telephone and fax numbers, and email address for corresponding author; and (6) acknowledgment of financial and/or other support. The title page is the only place in the manuscript where the author(s) should be identified by name. The title should be written in a brief, concise manner that accurately reflects the main idea of the paper. The running head is a shortened version of the title that should not contain the names or initials of any authors. Funding sources must be cited on the title page for manuscripts that have resulted from sponsored research and/or educational scholarships for theses or dissertations prepared by the author. Any financial interest in the products mentioned in the article must be disclosed by the author(s) on the title page as well as any compensation for preparing the manuscript.

### Structured Abstract

All feature articles must include a structured abstract of no more than 250 words using the following headings:

- a. Purpose (Begin this section with the sentence: The purpose of this study is to \_\_\_\_\_. Include the rationale for the study, hypotheses, objectives) Methods (study design, setting, characteristics of the sample, intervention, data collection procedures, evaluation measures)
- b. Results (key findings only, no details or statistics)
- c. Conclusions (information supported by the data, implications)

In general, the abstract should be written in a brief, concise style that provides an overview of the information in the article and allows the reader to survey the contents. Use simple, concrete words and short sentences that provide factual information rather than describing what information will appear in the article. Abstracts may be published on the AADE Web site at [www.diabeteseducator.org](http://www.diabeteseducator.org).

All non-feature articles must include a structured abstract of no more than 250 words using the following headings:

- a. Purpose
- b. Conclusions

### Text Style

Manuscripts should be prepared in accordance with the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" (Ann Intern Med. 1997; 126:36-47 or *American Medical Association Manual of Style: A Guide for Authors and Editors*, 10th edition (New York, NY: Oxford University Press, 2007). and/or at the following Web address for the American College of Physicians: <http://www.acponline.org/journals/resource/unifreq.htm>). All accepted manuscripts will

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For spelling of medical terms, use the most recent print or electronic version of either *Dorland's Illustrated Medical Dictionary* (Philadelphia: WB Saunders) or *Stedman's Medical Dictionary* (Baltimore, Md: Williams & Wilkins). For spelling and hyphenation of nonmedical terms, use *Merriam Webster's Collegiate Dictionary*, 11th edition (Springfield, Mass: Merriam-Webster; 2003).

## Guidelines

- Throughout the manuscript, avoid using the personal pronouns I or we.
- Employ nonsexist language.
- Spell out abbreviations and acronyms on first mention followed by the abbreviation in parentheses. Limit the overall use of abbreviations in the text.
- Avoid jargon. For example, instead of *the patient was on insulin* use the patient was taking insulin.
- In general, authors should use the active voice. If the subject is mentioned in the sentence, the active voice is preferred over the passive voice. For example, *Passive voice*: The definition of target blood glucose range used in the survey was taken from previous studies. *Active voice*: The authors used previous definitions of the target blood glucose range in the survey.
- Throughout the text, use generic, nonproprietary names for medications and devices. At the first mention, state the generic name followed in parentheses by the trade name with the register® or trademark™ symbol and the manufacturer's name and city/state: generic name (trade manufacturer name, city, state).
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## Terminology

- Avoid the use of the term diabetic. Use patient/individual with diabetes or complications of diabetes.
- Use type 1 (Arabic numeral) diabetes and type 2 diabetes, not IDDM or NIDDM.
- Use blood glucose monitoring (not blood sugar monitoring), blood glucose check not test and blood glucose not blood sugar.
- A1C (not A1c) should be used
- Unless describing research subjects, avoid the use of the term non-compliant.

## Laboratory Data

All clinical laboratory data should be given in traditional units followed in parentheses by units in the metric system according to the *Système International d'Unités* (SI units). For example, a blood glucose level should be stated in the following manner: 80 mg/dL (4.44 mmol/L).

Abbreviate units of measure in the text only when accompanied by numbers; units of measure should be abbreviated in tables and figures.

## References

Authors are responsible for the accuracy and completeness of all reference citations. Format the reference list according to the style shown in the *American Medical Association Manual of Style*. Reference numbers should be typed in arabic superscript numerals in the text, outside periods and commas and inside colons and semicolons. A hyphen should be used to join a series of references.

As supported by previous research,<sup>1,5-8,23</sup>

The data were analyzed in the following manner<sup>9-11</sup>:

The reference list should be typed double-spaced and start on a separate sheet immediately following the end of the text. Number references consecutively in the order they appear in the text, including references cited in tables, figures, and other graphics. All references included on the reference list must be cited at least once in the text. Abbreviate journal names and italicize according to US National Library of Medicine's (NLM) current Fact Sheet

(<http://www.nlm.nih.gov/pubs/factsheets/constructitle.html>). Search [www.ncbi.nlm.nih.gov/nlmcatalog/journals](http://www.ncbi.nlm.nih.gov/nlmcatalog/journals) for journal title abbreviations. Inclusive page numbers must be provided (eg, 88-104) for all print references.

References to personal communication (including e-mail) may be cited parenthetically in the text but not in the reference list; include the name of the person, the e-mail address, and the date of the communication. Material that has been accepted for publication but not yet published may be cited in the reference list with the journal name followed by "In press." Unpublished material may not be cited. Electronic forms of documents may be included in the reference list and should be cited according to the style for each type of electronic source. Following are some examples of correct forms of references:

### Journal Article

List all authors if six or less; for more than six, list only first three authors followed by "et al." Lustman PJ, Clouse RE, Alrakawi A, et al. Treatment of depression in adults with diabetes: a primary care perspective. *Clin Diabetes*. 1997; 15: 122-126.

### Entire Book

Rubin RR, Biermann J, Toohey B. *Psyching Out Diabetes: A Positive Approach to Your Negative Emotions*. Los Angeles, Calif: Lowell House; 1992.

### Book With Editor(s)

Mensing C, Cypres M, Halstenson C, McLaughlin S, Walker EA, eds.. *The Art and Science of Diabetes Self-Management Education*.. Chicago, IL: American Association of Diabetes Educators; 2006.

### Chapter in a Book

White JR, Campbell RK, Yarborough PC. Pharmacologic therapies. In: Funnell MM, Hunt C, Kulkarni K, Rubin RR, Yarborough PC, eds. *A Core Curriculum for Diabetes Education*. 3rd ed. Chicago: American Association of Diabetes Educators; 1998: 197-360. Camp KK. Being Active, In: Mensing C, Cypres M, Halstenson C, McLaughlin S, Walker EA, eds. *The Art and Science of Diabetes Self-Management Education*. Chicago, IL: American Association of Diabetes Educators; 2006: 669-688.

## Government Publications

Centers for Disease Control and Prevention. National Diabetes Fact Sheet. Atlanta: US Dept of Health and Human Services, Centers for Disease Control and Prevention, Division of Diabetes Translation; 1997. US Department of Health and Human Services, Public Health Service. Healthy People 2000. National Health Promotion and Disease Prevention Objectives. Summary Report. Boston: Jones & Bartlett Publishers; 1992. DHHS publication 91-50213.

## Electronic Citations

### Software

*SPSS/PC+* [computer program]. Version 6.1.1. Chicago: SPSS Inc; 1995. Online Journals

Friedman SA. Preeclampsia: a review of the role of prostaglandins. *Obstet Gynecol* [serial online]. January 1988;71(1):22-37. Available from: BRS Information Technologies, McLean, Va. Accessed December 15, 1990.

### World Wide Web

White paper: criteria for assessing the quality of health information on the Internet. Available at: <http://www.mitrotek.org/hiti/showcase/documents/criteria.html>. Accessed September 30, 1997. CD-ROMs

*The American Heritage Dictionary: Reference Tool for Windows* [book on CD-ROM]. Cambridge, Mass: SoftKey International Inc; 1995. Based on: American Heritage Dictionary of the English Language, Third Edition. Boston, Mass: Houghton Mifflin Co; 1992.

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All graphic elements should be prepared one per page on separate pages following the references. They should be referred to in the text but be self-explanatory and not duplicate the text. Art must be included with the original manuscript. Figures and illustrations should be professionally drawn and submitted as camera-ready copy. Photographs are welcome if they complement the text. They must be clear black-and-white glossy prints. Photos of identifiable persons must be accompanied by each person's written permission to use her or his likeness for publication. Illustrations and photos should be labeled on the back with the orientation (eg, arrow pointing up, if applicable) and the name of the first author. Captions should be provided.

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## APPENDIX B

### TABLE OF EVIDENCE FOR PROPOSAL

#### *Summary of Evidence for Integrative Literature Review*

Author(s)	Design	JHNEBP and Quality Rating	Sample and Setting	Measurements	Results	Limitations
Calman et al., 2013	Retrospective Design Variables: HbA1c	3B	N=545 pts  New York	Pts w/initial values HbA1c > 9% and pts w/initial values HbA1C < 9%  Pts w/at least one documented HbA1c baseline (2003–2004), midpoint (2005–2007), and PCMH period (2008–2011)	↓ annual mean HbA1c average 10.72% to 8.34% for pts w/baseline HbA1c > 9%; Slight ↑ trend in pts. < 9% at baseline	Data obtained from EHR; Multiple PCMH components implemented initially. Cannot evaluate impact of specific interventions; No control group to compared with.
Carrillo et al., 2011	Retrospective Chart Review Variables: ED, hospitalization utilization	3B	N=7,731 pts  New York	Pts w/ED visits six months before PCMH and six months after implementation	ED visits ↓from 33.1% to 30.7% (p=0.001); Hospitalization ↓from 16.4% to 15.5% (p=0.25)	Model requires large resources to implement.
Friedberg et al., 2014	Comparative Design Variables: HbA1c, LDL, utilization (hospitalization, ED, ambulatory visits), and cost of care	3B	N=32 Pilot practices  N=29 Control practices  Pennsylvania	Pts. w/HbA1c and LDL levels according to NCQA and HEDIS specifications; ED visits, hospitalization, and ambulatory visits were calculated for control and pilot studies. Cost of care- standardized prices were calculated for	No differences in A1c and LDL levels between control and pilot sites (p=0.97). No significant difference in hospitalizations (p=0.36); ED visits (p=0.47); ambulatory (p=0.33); and total cost	Potential for heterogeneity between control and pilot; Low survey response from comparison group; self-selection in a pilot group could



Author(s)	Design	JHNEBP and Quality Rating	Sample and Setting	Measurements cost of care	Results of care (p=0.23)	Limitations have resulted in a ceiling effect; Insufficient power may have lead to type II error
Gabbay et al., 2013	Cross-sectional Design Variables: HbA1c, blood pressure, and LDL	3B	N=25 practices  Pennsylvania	HbA1c < 7%, blood pressure < 130/80 mmHg, LDL < 100 mg/dL	Higher performing practices = improved DM quality measure performance (+14.9%); Lower-performing practices = low DM performance (-11.1%)	Evaluation conducted midway through the pilot design; small sample size precluded inferential statistics. Only descriptive statistics were reported
Lee et al., 2011	Prospective Cohort Design Variables: HbA1c, race, and gender	3B	N=457 practices  Florida	From the Physician Quality Reporting Initiative (PQRI) registry  % of pts with HbA1c > 8%	Average HbA1c ↓by 0.5% (p<0.005) across races and genders; the proportion of pts with HbA1c > 8% decreased in all races and genders (p<0.005, respectively)	No non-PCMH control group; Design population primarily African Americans and Caucasians, therefore, cannot be generalized to other ethnic minorities
Moran et al., 2011	Pre- and Post-test Design Variables: HbA1c, fasting glucose, LDL, urine microalbumin, BP, BMI, and cost	3B	N=34 practices  Michigan	Data obtained from pts' medical records: HbA1c, LDL, urine microalbumin, BP, fasting glucose, and BMI  Cost analysis based on the	RN-CDE integration post-test improvement HbA1c:-5.29 (p=0.000); fasting blood glucose:-3.70 (p=0.002); No significant	No comparison group; Homogeneous sample limits generalizability

Author(s)	Design	JHNEBP and Quality Rating	Sample and Setting	Measurements	Results	Limitations
				Stanford Patient Education Research Center Health Care Utilization Scale	improvement in LDL:- 0.64 (p=0.53); BMI: - 1.15 (p= 0.26); urine microalbumin: 0.34 (p=0.74); BP: 0.18 (p=0.86); Overall screening improved HbA1c by 93%; LDL by 56%; urine microalbumin by 94%, BP by 100%; RN-CDE resulted in potential cost savings of \$6,480/practice over four months	
O'Toole et al., 2011	Quasi-experimental Pre- post Analysis Variables: HbA1c, LDL, BP, and care use	2B	N=457 pts  VA	Data from VA electronic medical records; Care use: F2F and telephone contacts w/providers, ED visits, and hospitalizations	Improved HbA1c: 6.9% (p<0.001); LDL: 42.4% (p=0.50); and BP control: 81.7% (p<0.001). Care use improved across populations (P=0.05–0.001)	Design methodology does not allow for causality to be inferred; Study involved 1 VA medical center
Parker et al., 2012	Cohort Design HbA1c, LDL, SBP, and PAK	3B	N=12,957 pts  California	Data from KPHC medical records. PAK: Missed appointments > 1 in 3	PAK associated w/↑ risk of elevated HbA1C (>7%); LDL (>100 mg/dL); SBP (>130 mmHg); PAK (p<0.05) in differences between ethnicities	Potential for selection bias; Cannot explain why ethnicity and PAK would be different. Design limited to an insured population
Simonetti et al., 2014	Retrospective Cohort Design Variables: HbA1c, LDL,	3B	N=1,457 pts  Pennsylvania	Clinical, laboratory, and health maintenance data from EHR to assess DM	Compared w/non- Hispanic white pts, black pts less likely to	Single PCMH practice and highly educated sample

Author(s)	Design	JHNEBP and Quality Rating	Sample and Setting	Measurements	Results	Limitations
	BP, and care utilization			process of care, and foot and retinal eye exam. LDL < 100mg/ dL BP < 140/90 HbA1c < 7% HbA1c > 9%	achieve DM care measures across the board but the results were not statistically significant	may not represent the general population
Solberg et al., 2011	Comparative Design Variables: HbA1c, BP, and LDL (optimal DM care)	3B	N=21 PCMH practices  N=34 Non- PCMH practices  Minnesota	Data from EHR HbA1c (< 7%), BP (<130/80 mmHg), LDL (<100 mg/dL)	No differences in biomarkers (p=0.42) in PCMH practice vs. Non-PCMH practice	Nonrandomized comparison of practices; Low response rate
Stevens et al., 2014	Cross-sectional Design Variables: HbA1c, eye exam, and patients' perceptions of PCMH quality	3B	N=540 pts  California	PCAT (Likert scale of 1–4, w/ 4= best of care); Last HbA1c test w/in six months; Last eye exam w/in one year	Pt's' perception of QUO is significantly associated with all quality and process outcomes (p<0.05); 83% of pts report having HbA1C w/in six months and 58% recalled an eye exam w/in one year (p<0.05)	No RCT to compare before and after data to validate improvements; Medicaid population limits the generalizability; all the outcome QOC measures were self-reported
Taliani et al., 2013	Mixed Method Design (Grounded Theory and Descriptive) positive deviance approach Variables: HbA1c, BP, LDL, and CM	3B	N=21 practices  N=136 employees  Pennsylvania	DM quality measures: HbA1c < 7%, BP < 130/70, LDL < 100 mg/dL); Semi-structured interviews	Improvement scores not reported. Only baseline scores were reported.  The identified themes were: care managers' duties; use of EMR;	Lack of data on Improvement score limits the interpretation of the study; Practices received money to participate

Author(s)	Design	JHNEBP and Quality Rating	Sample and Setting	Measurements	Results  integration and information sharing	Limitations

*Note.* PCMH = patient-centered medical home; LDL = low-density lipids; HbA1c = glycated hemoglobin; BP= blood pressure; N = sample; BMI = body mass index; CDE = certified diabetes educator; HEDIS = healthcare effectiveness data and information set; PAK = patient appointment keeping; SBP = systolic blood pressure; PCAT = patient care assessment tool; ↓ = decrease ; ↑ = increase ; CM = care management ; IDT = interdisciplinary team ; DM = diabetes mellitus ; SD = standard deviation; pts = patients ; MDRTC= Michigan Diabetes Research and Training Center; VA = Veterans Affairs; QOC = Quality of Care ; KPHC= Kaiser Permanente health connect.