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The Veterans Affairs Patient Aligned Care Team (VA PACT), a New Benchmark for Patient-Centered Medical Home Models: A Review and Discussion

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Abstract

Objective: Conduct a literature review on existing patient-centered medical home (PCMH) models and outline the differences and contributions.

Data sources: Systematic PCMH review data from PubMed database, from January 2000 to March 2013.

Results: Forty-eight (48) papers on various PCMH were included in the analysis. The types of collaborative PCMH models were compared in accordance to the scope of current PCMH demonstration projects, patient types, implementation strategy, and cross-functional team recruiting. The performance measurement tools and methods for data collection/analysis were thoroughly explored. Finally, the outcomes from PCMH models were evaluated in regard to patient experience, staff experience, quality of care, and economic outcomes.

Limitations: This review excluded the collaborative models which are not patient centered or patient oriented.

Conclusions and implications: Healthcare systems and their primary care practices are redesigning to achieve goals identified in PCMH models. However, implementation of these models requires major transformation. The Department of Veterans Affairs (VA) PCMH model, Patient Aligned Care Teams (PACT) model, has improved patients' and staff experience and care processes. PACT also includes innovative resources and tools to help healthcare teams develop a systematic approach to data-driven decision-making in healthcare transformation and should be considered when benchmarking for future PCMH model planning.

Keywords: collaborative care, patient-centered medical home, healthcare business process, Veterans Affairs, PACT

1. Introduction

The healthcare industry is driven to provide every patient with the best health care possible [1]. To reach this goal, provider organizations and third-party payers in healthcare facilities are implementing a variety of innovative high-quality programs in areas such as primary care [2–4], mobile health [5], and family care [6]. Although these sophisticated services provide invaluable resources for patients, in many cases they operate as silos, therefore, sometimes creating a complicated web of separate services which patients have to decipher. The patient-centered medical home (PCMH) is intended as a systematic approach for organizing primary care to coordinate and integrate healthcare services to provide a seamless platform of high-quality care considering the full spectrum of a patients' healthcare needs, with the goal to enhance patients' experiences [7, 8]. The term "home" is meant to describe friendly, accessible, personal, and supportive health care which is provided by one healthcare team and through the coordination of care when needed [9].

Currently, a variety of healthcare facilities and organizations have implemented different types of PCMH models [10–12]. Although there are several review papers that summarize the current design of PCMH models, implementation strategies, and latest evaluation results from pilot PCMH models [7, 13, 14], some topics are not discussed, such as the design of measurement tools to track the performance of PCMH implementation and the composition of PCMH teams. It was found that the Department of Veterans Affairs (VA), Veterans Health Administration (VHA) PCMH model, called Patient Aligned Care Team (PACT) model [15–17], includes innovative resources and tools to contribute to healthcare teams planning to develop a systematic approach to data-driven decision-making in healthcare transformation for future PCMH model. Integral to the success of the PACT model was the PACT Collaborative, which aided implementation.

The goal of this chapter is to systematically review the existing designs of typical PCMH models, such as the scope of PCMH projects and implementation strategies, examine process monitoring and measurement tools, and outcomes from quality of care measures such as patient satisfaction and staff efficiency. In addition, the author will outline VHA's realistic transformation opportunities and challenges in implementing PACT into their integrated healthcare systems on a national scale using the PACT Collaborative. The author will give examples of lessons learned by researchers, clinical staff, and policy partners during the early stages of PACT implementation which will be informative to other managed care or Accountable Care Organizations (ACOs) engaged in implementing PCMH models and may serve as a guideline to develop suitable models and implementation strategies for different healthcare organizations.

2. Review methods

This review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards [18]. An electronic search was conducted through the PubMed database for papers relative to the PCMH model and collaborative healthcare models

published from January 2000 to March 2013. The search strategy used the text keywords for patient centered or medical home and related concepts for eligible study designs. The included studies were published in English and indexed from database inception. The exact search strings are listed in **Table 1**, and details of the number of articles in each category are listed in **Table 2**. This search found 1559 articles published during this time period.

The titles and abstracts obtained from the electronic search were screened by reviewers independently to eliminate duplicates and exclude articles not related to PCMH models and those that are not based on patient centered or medical home models. A full-text review was

Collaborative model design	<ul style="list-style-type: none"> Key components Customer population Disease type Improvement model Learning session Action period Sustainability Industrial engineer
Measurement tools/data analysis method	<ul style="list-style-type: none"> Change package Measurement tool Process mapping Voice of customer Information technology Electronic record
Outcomes	<ul style="list-style-type: none"> Care collaboration Access management Practice redesign Care integration Hospital utilization Patient satisfaction Quality of care Chronic disease Team communication Process efficiency Cost savings

Table 1. Search terms used for article search.

Search term	Number of articles	
	1/1/2000 to present	2010 to present
Patient-centered medical home model	1559	569
Measurement tool	8	3
Information technology	618	199
Improvement model	179	66
Learning session	15	1
Action period	11	0
Sustainability	48	14
Voice of customer	2	0
Care collaboration	172	71
Access management	108	54
Practice redesign	25	15
Team communication	94	37
Chronic disease	170	73
Model design	247	101
Electronic record	39	20
Hospital utilization	54	18
Patient satisfaction	270	85
Quality of care	587	248
Care integration	101	45
Industrial engineer	0	0
Change package	1	0
Process efficiency	25	5
Cost savings	26	12

Table 2. Number of articles in each category.

performed on the remaining articles, and abstracts were selected for inclusion in this review based on the following specified criteria: (1) All the articles should be peer-reviewed; (2) All interventions should meet the definition of PCMH defined by Agency for Healthcare Research and Quality (AHRQ) [19]; and (3) Outcome evaluations should be data-driven and generated from practical implementation of the PCMH model. Since it was found that there was a lack of consistent definitions and nomenclature for PCMH, a manual reference review of relevant review articles was conducted and an additional four papers were identified. Overall, the search process resulted in a total of 48 articles in the final systematic review. The article selection process is shown in **Figure 1**.

Based on the approach described in AHRQ's "Methods Guide for Effectiveness and Comparative Effectiveness Reviews" [20], each paper was evaluated independently by two

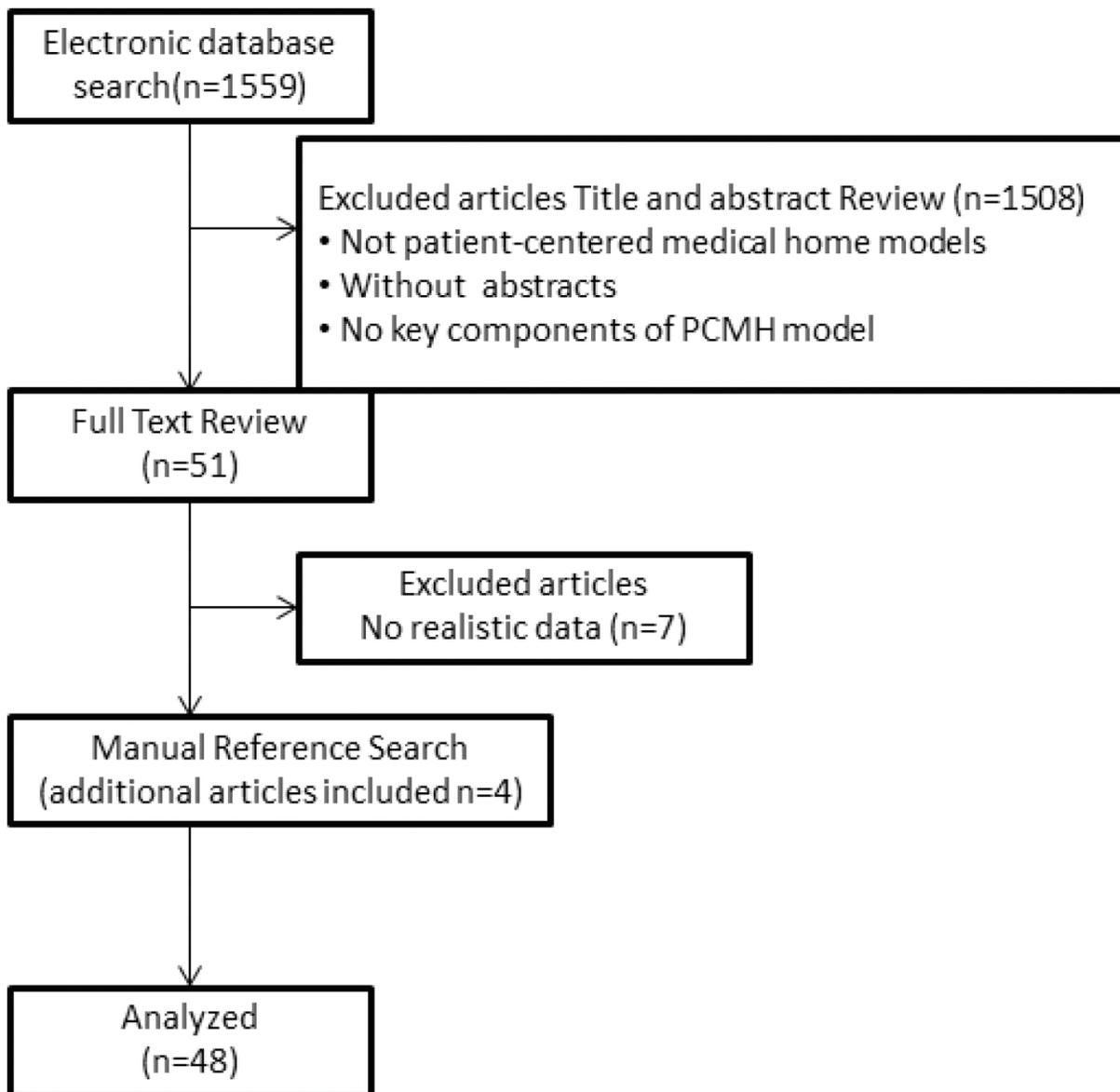


Figure 1. PCMH model article search results.

reviewers. Using the predefined criteria for methodological quality and adequacy of reporting for each study type, the quality of the study was judged in three levels: good, fair, or poor. Results of interest examined for PCMH effectiveness included key model components, data collection and analysis methods, performance measurement tools, quality improvement processes, care collaboration, and cost savings.

2.1. Review findings

2.1.1. PCMH scope and implementation strategies

As a new delivery model for primary care, the PCMH model provides comprehensive and coordinated care [21–23]. Systematic review results revealed various PCMH models are widely designed and verified by research institutes [17, 19], healthcare organizations [9, 24], clinical physicians [25–27], and other stakeholders [28–30]. Although most of the PCMH

models share a similar mission to provide patient centered, comprehensive, and accessible care [31], there is substantial diversity not only in the scope of PCMH demonstration projects and patient types, but also in the implementation strategy at pilot sites.

Most of the PCMH models are natural extensions of overall healthcare management or area-wide quality improvement initiatives. For example, the PACT model focuses on access, care coordination and management, and practice redesign for primary care, which covers patient access [32, 33], healthcare business process redesign, and care organization problems. However, some models only focus on specific types of diseases. For example, chronic care collaborative models require long-term cooperation among cross-functional members [34–38]. Typical diseases of interest for chronic care collaborative include diabetes [39, 40] and cardiovascular diseases [41]. Furthermore, the complexity level of each disease is a vital factor for PCMH model design in these cases [42]. For those PCMH models which are developed to improve complex diseases, such as cancer care [43], it is important to enhance seamless cooperation among specialists [44, 45], primary physicians, nurses [29], pharmacists [46], and social workers [47].

There are also considerations for implementing PCMH models to focus on other subsets of the population, such as women. For PACT model, this is certainly a worthy area of focus as women now represent the fastest growing segment of new VA users [48]. Women tend to also have complex healthcare needs, which may affect how VA care is organized, providers are trained, and how the VA can best deliver gender-sensitive primary care.

Implementation strategies vary widely across each healthcare system. Although each PCMH model has its unique objectives, a high-functioning interdisciplinary primary care teams are required as a critical component of the patient-centered medical home for them to collaborate. A core feature of PACT which showed huge promise for improving primary care at the VA was the creation of teamlets (small teams). A PACT teamlet required reorganization of primary care personnel into assumed new roles. It is a primary care team that generally consists of a primary care provider (MD, NP, PA), registered nurse care manager, clinical associate (LPN or medical assistant/health technician), an administrative associate (MA/MSA/health technician), and pharmacists, and they are integrated to provide on-site, in-office coordinated care [28, 30, 49]. The transformation into this team-based approach requires the following: (1) ensuring adequate staffing in all team roles, (2) devoting resources to in-depth training for all employees in communication and other skills needed to maximize team success, and (3) aligning the broader hospital system with PCMH decentralized, team-based approach [50, 51].

Team-based model is a fundamental shift in the roles and relationships among clinical personnel. Therefore, it creates a need for a more nuanced team-based audit, since currently the ownership of clinical performance still rests largely with the provider, despite the move to more team-based health care [52]. The team-based model can also create an opportunity to mitigate any discontinuity of care due to residency transitions [53].

During the beginning stages of strategic planning for implementing VA's PACT, top challenges faced by primary care directors were reviewed and included clinical informatics, chronic pain management, and care coordination [54]. In the early stages of implementation, several

challenges were identified to move to the team-based approach including: (1) short-staffing undermined development of team-based working relationships; (2) lack of co-location of PACT members in clinic and difficulty communicating with residents when they were off-site hampered communication and; (3) limited clinic hours of part-time primary care providers and residents prevented clinicians to get the training and reinforcement of PCMH principles which delayed the team formation [55].

Considering the many challenges to transitioning to a team-based approach, PACT's implementation strategy consists of various supportive initiatives including a national face-to-face kickoff conference, American College of Physicians (ACP) Medical Home Builder survey, the Centers of Excellence learning centers, national conference calls, common metrics, and the PACT Collaborative [17].

Some non-VA PCMH models use similar steps as the PACT, whereas others used the following: (1) emphasizing the role of nurses in educating patients [56], (2) PCMH principles based on complexity, care-coordination activities, and techniques to measure family satisfaction [57], (3) patient-centered care plan (PCCP) document to enhance care for complex patients and change the relationships with health team members [58], and (4) the adoption of PDSA cycles in PCMH implementation in large primary care and multi-specialty medical groups [27].

Communication among multiple stakeholders is regarded as one of the key factors to ensure high quality of care. PCMH projects normally involve cooperation of multiple stakeholders and some of the reported key communication barriers for clinicians when performing cross-discipline consultations include as follows: (1) lack of effective standardized communication processes, (2) practice style differences, and (3) inadequate PC training [59]. Sharing of real-time information on the status and results of PCMH projects and integrating the instant feedback into decision-making are two key factors that contributed to the final achievement of each PCMH-based project. Multiple supportive technologies and methods are deployed to facilitate communication, such as conference calls, electronic communication, and group e-mails [9, 17]. In addition to these tools, PACT utilizes the Microsoft SharePoint™ platform to share all real-time information which records all the updates with version tracking of supporting documentation [9]. In addition, the collaborative initiative within PACT adapted the Institute for Healthcare Improvement (IHI) Breakthrough Series Collaborative model [60], to deploy a web-based communication platform to train team members (similar to an e-learning system) and web-based storyboards for teams to review the results [61]. Within PACT, there is also a "toolkit" used at VA facilities nationwide to support teams to share, download, and adopt information in order to more effectively implement PCMH principles and improve local performance on VA metrics [62]. The toolkit is an online repository of ready-to-use tools created by VA staff (physicians, nurses, and other team members). PACT team member perspectives on the toolkit ranged from enthusiastic to not having time to review the contents of the toolkit.

2.1.2. Performance monitoring systems

While PACT Collaborative utilizes "PACT Compass" metrics [63] from VHA's information systems to organized broad domains, such as access, coordination of care, and continuity, most other PCMH implementation strategies dedicate considerable resources to direct practice support by helping the teams reorganize workflows and provide tools to enhance practice

capacity. A Physicians Practice Connection-PCMH (PPC-PCMH) model categorizes the principles into different levels based on their priorities and gives a numeric score of 0–24 points to the performance [64]. Some measurement tools are web-based with data automatically collected by Health Information Technology (HIT) systems [65], such as electronic medical records [66, 67]. The traditional ways of data collection, such as direct observation [68], patient interview, internal survey [58, 69], and audio recording [33], are used to collect information about patients' opinions.

Monthly and annual reports are utilized to track performance improvement and to compare the practice results of PCMH models. Some PCMH models invite clinical staff, such as physicians, to summarize the results of the medical treatment improvement by adopting the PCMH model [68]. In the PACT Collaborative, 250 medical teams from five regions were required to submit monthly performance reports to record a core set of metrics that assessed the program's impact on access, continuity of care, patient engagement and satisfaction, panel management, coordination of care, and clinical improvement [17].

Voice of customer (VOC) analysis is a useful tool to collect information about the current state of the healthcare business process, identify the potential problems, define the overall improvement goals, and test the acceptance rate of PCMH model by end users. Several projects use customer surveys to gather data from multiple stakeholders and analyzed the results by some statistical algorithms, such as regression modeling and standard ordinary least squares [70]. As of March 2012, Veterans Affairs include questions in the Survey of Healthcare Experience of Patients (SHEP) [71] to help understand the Veterans' satisfaction with VHA ambulatory care and to support assessment of VA's initiative to provide Veteran-centered primary care through the implementation of PACT.

While the use of relevant performance measures is an effective guide for quality improvement in PCMH models, there is little information in the literature on staff perceptions of performance metric implementation in these PCMH settings. Based on research conducted in PACT, it was found that primary care staff perceived performance metrics as time-consuming and not consistently aligned with PACT principles of care. Also, they found that metrics were as follows: (1) not reflecting Veteran's priorities, (2) represented an opportunity cost, (3) implemented with little communication or transparency, and (4) not well-adapted to team-based care. Based on this, it appears that there are gaps between the theory and reality of performance metric implementation, and these gaps should be considered when implementing a PCMH [72].

2.1.3. Outcomes from PCMH models

Quality of care is considered one of the most important indicators to judge the effects of new process improvement models. Christensen et al. [73] verified that the Walter Reed PCMH had reduced costs while at least maintaining, if not improving, access to and quality of care, and to determine whether access, quality, and cost impacts differed by chronic condition status. Henderson et al. [74] discussed the guiding principles of PCMH model to improve quality of care and demonstrated these principles with a case study from the experience of a care coordinator in a rural PCMH in Maine. Rosenberg et al. [75] reported on the experience of

University of Pennsylvania Medical Center Health Plan as part of a large, integrated delivery and financing system of PCMH to improve access to high-quality care for more Americans at a lower cost.

PCMH models have the goal of improving the patients' satisfaction and staff efficiency. Access management is one of the vital aspects that affected patient satisfaction. True et al. [22], identified successful strategies used by early adopters to overcome barriers to change the access management, which might increase patient satisfaction. Segel et al. [76] demonstrated that the patient-centered collaborative care model could improve discharge efficiency, staff communication, and patient satisfaction. However, the relative research to verify the performance improvement of medical staff members is lacking in comparison with the research that explored patient satisfaction. The patient satisfaction survey in the PACT model (SHEP) supported positive outcomes of patient access improvement [71]. Jaen et al. [32] evaluated patient relative outcomes, which included satisfaction with service relationship after implementing the PCMH model for more than 2 years.

2.1.4. Economics outcomes from PCMH models

PCMH models have the potential to reduce costs [77] and create optimal strategies for health-care utilization. Based on the selected articles, the cost reduction analysis mainly focuses on emergency department utilization, inpatient admissions, and total costs. Adoption of the PCMH model has been shown to reduce patient waiting time, improve access to care, and reduce inappropriate emergency room care [78, 79, 80], especially for the elder group of patients. Domino et al. [81] described a case study to show the decrease in emergency department utilization for children with chronic and serious diseases. It is the intention of the VA to evaluate the impact of the medical home on admissions and emergency department use, both of which may serve as proxies for cost [17]. Although the cost among PCMH patients was significant in the first few years and may be higher than non-PCMH patients considering the project cost [82], the expected projected reduction of cost of the PCMH model as the project is extended more long term is not discussed in detail within the articles.

3. Benchmarking VA PCMH model—PACT

In 2010, VHA (the largest integrated healthcare system in the United States, serving more than 8 million veterans) launched PACT (a national implementation of a PCMH model) to transform primary care delivery by improving the delivery of patient-centered care. PACT's aim to improve access, continuity, coordination, and comprehensiveness using team-based care that is patient driven and patient centered [83]. This national rollout of PCMH to all VA primary care practices in more than 150 medical centers and over 800 community-based outpatient clinics (in 900 primary care clinics nationwide, with 120 located in academically affiliated medical centers) aimed to offer accessible, comprehensive, and seamless care for meeting the customized needs and expectations of each Veteran [9, 84]. As a result, over 7000 primary care teams across the nation are in the process of transforming their operations.

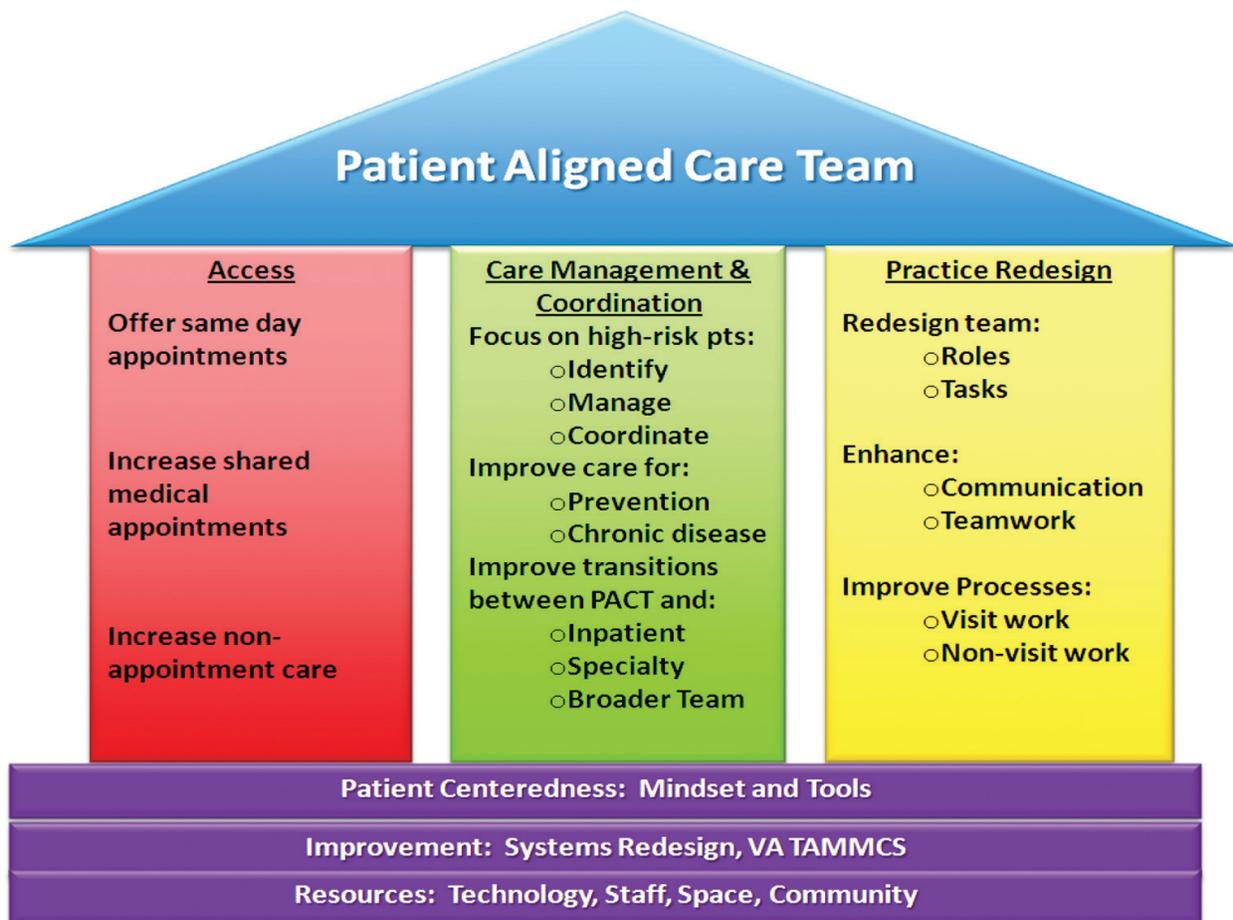


Figure 2. PACT three-pillar model. Reproduced with permission [85].

The PACT model (**Figure 2**) was designed to translate the PCMH model’s symbolic vision of a “home” into a tangible implementation plan where the roof and overarching goal are patient centeredness. The foundation of the home includes critical resources and the use of process improvement methodologies such as LEAN [85]. The three pillars of the PACT model are access, care management and coordination, and practice redesign. Each pillar represents a vital content area necessary to achieve a true patient-centered medical home and includes several primary and supporting measures to record the progress on each aim, summarized in Appendix 1.

VHA facilities that were most successful in implementation of the overarching goals have an internal capability for organizational learning and development [86], and deployable evidence-based quality improvement strategies that give teams the tools needed to adjust structures and processes to meet their goals [87]. In addition to the individual efforts being conducted at each facility, VHA used a collaborative learning model, PACT Collaborative [88], as a key approach to disseminate PACT concepts and changes, with the intention to successfully support the implementation goals of the PACT model in each facility.

The PACT Collaborative is a learning environment based on the IHI Breakthrough Series Collaborative model [89] (**Figure 3**). **Figure 4** illustrates the modifications, which are the addition of VHA national process improvement TAMMCS (vision, analysis, team, aim, map,

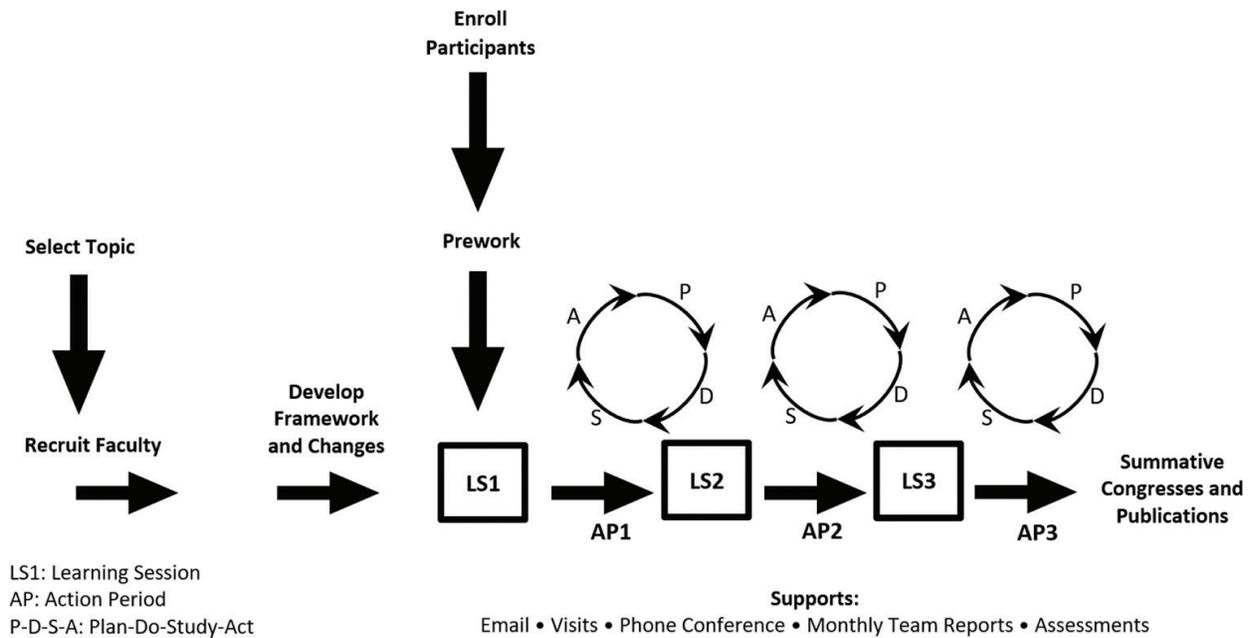


Figure 3. Institute for Healthcare Improvement (IHI) Breakthrough Series Collaborative Model.

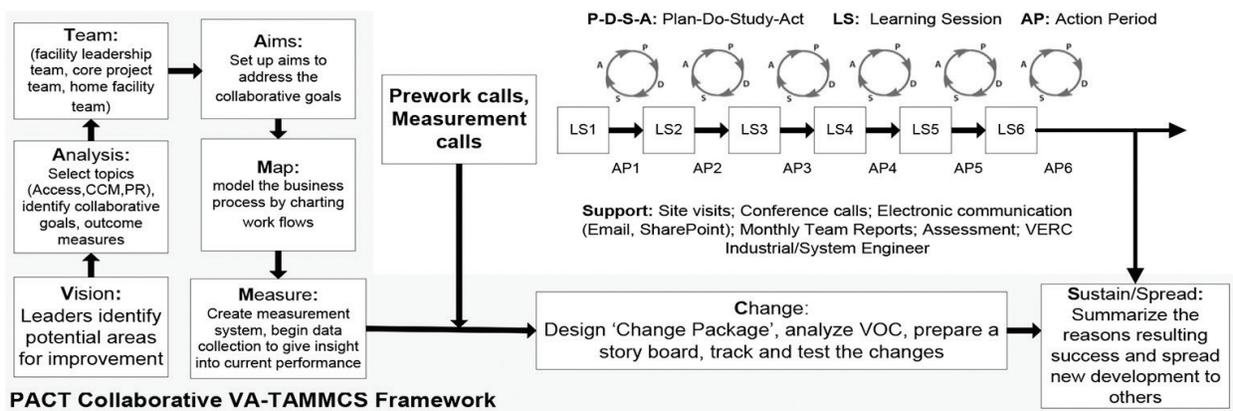


Figure 4. PACT three-pillar model. Reproduced with permission [85]

measure, change, and sustain) along with the inclusion of 3 additional learning sessions [90] (Figure 4).

The PACT Collaborative model was made up of five regional PACT Collaborative and approximately 250–350 individuals from 141 teams participated in six face-to-face learning sessions across 21 months, where learning sessions were adopted for exchanging ideas through peer-to-peer meetings and audio conferences, and training a sample of patients or caregivers from patients’ families with basic and necessary medical information. In each of the regions, there were industrial engineers (IEs) and coordinators from the Veterans Engineering Resource Centers to serve as coaching, teaching, and process improvement experts to collect data, track improvement progress, and make process improvement decisions [88]. This novel addition to the program brought an unparalleled level of quality improvement expertise. Their work

involved problem analysis, aim definition, team creation, principle and measurement tool design, performance improvement with the combination of learning sessions and action periods, and Plan-Do-Study-Act (PDSA) [91] cycles.

Within the PACT Collaborative, Excel-based measurement tools, PACT Compass (a consolidated combination of care quality measures) was used to track the overall PACT PCMH model from the national level to provide system-wide sharing of data and allowing performance improvement to be monitored at the team level [92]. The performance measures in the collaborative were as follows: (1) PACT Collaborative participant surveys; (2) Coach Assessment Scores and Plan-Do-Study-Act (PDSA) data; and (3) PACT Compass (national measures to assess PACT implementation within VA healthcare system). At the end of the collaborative, most participants reported the PACT Collaborative was needed to implement PACT. Team members reported that involvement of the industrial engineers, use of the measurement tools, the change packages, and monthly reports improved teams' performance from all perspectives related to access, care coordination, and knowledge gains by the teams [88]. Over 80% of the teams were successful in process improvement initiatives that increased the number of same-day appointments, increasing non-face-to-face care, and improving team communication [87].

4. Discussion

Based on the results of the review, there is a significant opportunity to document the progress of PCMH projects and identify standard performance measurement indicators for PCMH models. If more standard performance measurement indicators are identified and used, future meta-analyses could be performed to distinguish the effects of the PCMH models in comparison with non-PCMH models or current practices. The PACT model, utilizing the PACT Collaborative, can serve as a guideline to develop suitable models and implementation strategies that include evaluation tools inherent to a successful PCMH model for healthcare organizations.

The PACT model and a few other models from the review mentioned monthly reports and documentation to track the status of PCMH projects; however, there was no standard format for reports and many evaluations are not documented well enough to demonstrate the results of models, and often those that are documented can only identify non-generalizable outcomes [93]. The PACT model is unique in that the PACT Collaborative heavily utilized industrial engineers in partnership with clinicians as part of the core planning and project team to review monthly reports, analyze the results, and assist the faculty for further improvement suggestions. By employing such strategies as process mapping, VOC analysis, PDSA cycles, and a variety of communication techniques, the PACT model was able to document their progress and improve outcomes. Other PCMH models have had difficulty in implementation due to a lack of staff trained in the implementation methods and the burden of data collection [94].

Although the articles in this review did not uncover cost reductions associated with PCMH, recent research has discovered the actual cost savings occur once full implementation, versus partial implementation, of the model has been actualized [95]. To ensure the implementation

results and improvement of quality care and collaboration efficiency, all stakeholders should have assessment methods to evaluate the performance and a road map to guide them to implement customized PCMH models into their facilities successfully. Data collection and analysis are important elements to summarize the achievements from previous steps, identify the valuable stories to share with other groups, and sustain the results to broader adoption fields. However, there is a need for a comprehensive theory to select key indicators which could evaluate the PCMH model. In addition, more efficient technologies to share and integrate real-time information about collaborative procedures are needed.

While PACT primary care personnel viewed PACT positively as a model, they reported insufficient staffing and low-functioning team members as barriers to achieve highly functioning teamlets [96]. In response to this, the PACT Collaborative could resolve these barriers with evaluation tools and team member training, as one study confirmed the Collaborative enabled care teams to achieve over 80% of their aims, increased the number of PDSAs through implementation to 93%, and was deemed necessary to implement PACT [88]. Additionally, team process and effectiveness measures had stronger associations with perceived improvements in teams' abilities to deliver patient-centered care [97].

The collaborative learning model may also be an effective way to leverage a small number of staff and personnel across a large patient population [88]. As such, specialty-care clinics could be converted to function as a PCMH as these clinics often continue to operate as silos within a large, integrated healthcare system and are still functioning with a wide variation in patients' receipt of care [98]. Overall, the VA's PACT model, and particularly the PACT Collaborative within this model, addresses many of the obstacles PCMH models face from implementation to evaluation and may serve as a benchmark for future PCMH planning in order to enhance future models.

5. Conclusions

A limitation of this review is that it excluded the collaborative models which are not patient centered or patient oriented. In the future, it could be an interesting area of research to compare similarities between models which are patient centered and those which are not patient centered.

More research should also focus on the added patient values and return-on-investment of the PCMH models, particularly over a longer course of time. Another possible area for future research would be to build upon health information technology (HIT), such as electronic health record and electronic identification which could streamline the process of information exchange, and increase the patient's access to health services. Although the current HIT can support many of the core principles of PCMH, it does not have all the functionalities to facilitate the model directly, which might be a potential research focus for healthcare-IT specialists.

In summary, the PCMH model has been recognized as a promising solution to supply patients with advanced primary care service. There is a large variety in the scope of current PCMH

projects, as well as in the design, implementation, and evaluation of these projects. The PACT model is a large, successful example of a national PCMH project, and along with the PACT Collaborative, could serve as a standard for future PCMH models to reference when determining their designs, implementation strategies, and evaluation techniques.

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Appendix

Aim	Primary measure	Supporting measure
Access	<ul style="list-style-type: none"> • Third next available appointment OR • Difference between desired date and actual appointment date • Percent of care provided outside of single provider appointment venues • Continuity • Percent of calls answered within 30 s • Percent of patient-generated e-mails responded within 24 h • Percent of care provided in group visits 	<ul style="list-style-type: none"> • Panel size • Demand, supply and activity • No-show rate • Cancel and reschedule rate • Phone abandonment rate • First call problem resolution • Others as desired and needed • Group clinic stops • Average visit frequency
Practice Redesign	<ul style="list-style-type: none"> • Cycle time (and subsets) • Minutes behind • Ratio of red zone to total cycle time • Percent increase in teamlet huddles/week • Percent increase in team meetings/month • Pre- and post-team communication assessment 	<ul style="list-style-type: none"> • % patients notified of test results within 7 days of test • % appointments started on time • % decrease in interruptions during the appointment • % refills done within 24 h • % forms completed/returned to patient within 72 hours
Care Coordination and Management	<ul style="list-style-type: none"> • Percent of high-risk patients being actively managed • Percent of patients with contact or visit within 48 hours/7 days of transition from ED or hospital • Percent adherence to PC portion of service agreement (right patient with correct work-up) • Percent increase in 2-way pre-discharge patient handoff communication 	<ul style="list-style-type: none"> • Medication reconciliation rates on transitions (sample) • Laboratory reconciliation rates on transitions (sample) • Percent patients offered age appropriate preventative strategies and screening • Percent of patients by chronic disease active on a registry

Additional relevant measures

- Panel turnover rate
- Length of primary care in dept
- Panel DCG
- Octane (Specialty)
- MHV-SM data
- My HealtheVet enrollment
- Patient complaint data
- RN/LPN/Clerk mix
- Panel average age
- Specialty referral rate

Appendix 1. Summary of the primary and supporting measures.

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References

- [1] Healthcare Industry. [Online] Available from: http://en.wikipedia.org/wiki/Health_care_industry [Accessed: 2013-02-04].
- [2] Michael M, Schaffer SD, Egan PL, Little BB, Pritchard PS. Improving wait times and patient satisfaction in primary care. *J Healthc Qual.* 2013; 35(2): 50–60.
- [3] Coma E, Ferran M, Méndez L, Iglesias B, Fina F, et al. Creation of a synthetic indicator of quality of care as a clinical management standard in primary care. *Springerplus.* 2013; 2(1): 51.
- [4] Brennan SE, Bosch M, Buchan H, Green SE. Measuring team factors thought to influence the success of quality improvement in primary care: a systematic review of instruments. *Implement Sci.* 2013; 8(1): 20.
- [5] Källander K, Tibenderana JK, Akpogheneta OJ, Strachan DL, Hill Z, et al. Mobile health (mHealth) approaches and lessons for increased performance and retention of community health workers in low- and middle-income countries: a review. *J Med Internet Res.* 2013; 15(1): 17.
- [6] Kuo DZ, Houtrow AJ, Arango P, Kuhlthau KA, Simmons JM, et al. Family-centered care: current applications and future directions in pediatric health care. *Matern Child Health J.* 2012; 16: 297–305.
- [7] Jackson GL, Powers BJ, Chatterjee R, Bettger JP. The patient-centered medical home a systematic review. *Ann Intern Med.* 2012; 158(3): 169–97.

- [8] Alexander JA, Cohen GR, Wise CG, Green LA. The policy context of patient centered medical homes: perspectives of primary care providers. *J Gen Intern Med.* 2013; 28(1): 147–53.
- [9] VHA Systems Redesign Program Office, Patient Centered Medical Home Collaborative Prewrite Guide. 2010.
- [10] Harbrecht MG, Latts LM. Colorado's patient-centered medical home pilot met numerous obstacles, yet saw results such as reduced hospital admissions. *Health Affairs.* 2012; 31(9): 2010–7.
- [11] Maeng DD, Davis DE, Tomcavage J, Graf TR, Procopio KM. Improving patient experience by transforming primary care: evidence from Geisinger's patient-centered medical homes. *Popul Health Manag.* 2013;16(3): 157–63. Available from: <http://online.liebert-pub.com/doi/pdfplus/10.1089/pop.2012.0048> [Accessed 2013-02-26].
- [12] Hudak RP, Julian R, Kugler J, Dorrance K, Lynch S, et al. The patient-centered medical home: a case study in transforming the military health system. *Mil Med.* 2013; 178(2): 146–52.
- [13] Peikes D, Zutshi A, Genevro JL, Parchman ML, Meyers DS. Early evaluations of the medical home: building on a promising start. *Am J Manag Care.* 2012; 18(2): 105–22.
- [14] Hoff T, Weller W, DePuccio M. The patient-centered medical home: a review of recent research. *Med Care Res Rev.* 2012; 69(6): 619–44.
- [15] VHA Primary Care Program Office. Patient Aligned Care Team (PACT). Available from <http://www.va.gov/primarycare/pact/> [Accessed 2013-02-06].
- [16] Rosland A, Nelson K, Sun H, Dolan ED, Maynard C, Bryson C, Stark R, Shear JM, Kerr E, Fihn SD, Schectman G. The patient-centered medical home in Veterans Health Administration. *Am J Manag Care.* 2013; 19(7): 263–72.
- [17] Klein S. The Veterans Health Administration: Implementing patient-centered medical homes in the nation's largest integrated delivery system. *Commonwealth Fund.* 2011; 16: 1537–60.
- [18] Preferred Reporting Items for Systematic Reviews and Meta-Analyses. PRISMA statement. Available from: <http://www.prisma-statement.org/> [Accessed 2013-02-08].
- [19] Agency for Healthcare Research and Quality. What is the PCMH? AHRQ's definition of the medical home. Available from: http://pcmh.ahrq.gov/portal/server.pt/community/pcmhhome/1483/PCMHDefining%20the%20PCMH_v2 [Accessed 2013-03-11].
- [20] Agency for Healthcare Research and Quality. Methods guide for effectiveness and comparative effectiveness review. Available at <http://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=318> [Accessed 2013-02-14].

- [21] Rittenhouse DR, Casalino LP, Gillies RR, Shortell SM, Lau B. Measuring the medical home infrastructure in large medical groups. *Health Affairs*. 2008; 27(5): 1246–58.
- [22] True G, Butler AE, Lamparska BG, Lempa ML, Shea JA, et al. Open access in the patient-centered medical home: lessons from the veterans health administration. *J Gen Intern Med*. 2013; 28(4): 539–45.
- [23] Takach M. About half of the states are implementing patient-centered medical homes for their Medicaid populations. *Health Aff (Millwood)*. 2012; 31(11): 2432–40.
- [24] Takane AK, Hunt SB. Transforming primary care practices in a Hawai'i Island clinic: obtaining patient perceptions on patient centered medical home. *Hawaii J Med Public Health*. 2012; 71(9): 253–8.
- [25] Baxter L, Nash DB. Implementing the patient-centered medical home model for chronic disease care in small medical practices: practice group characteristics and physician understanding. *Am J Med Qual*. 2013; 28(2): 113–9.
- [26] Rich EC, Lipson D, Libersky J, Peikes DN, Parchman ML. Organizing care for complex patients in the patient-centered medical home. *Ann Fam Med*. 2012; 10: 60–2.
- [27] Rittenhouse DR, Casalino LP, Shortell SM, McClellan SR, Gillies RR, et al. Small and medium-size physician practices use few patient-centered medical home processes. *Health Aff (Millwood)*. 2011; 30(8): 1575–84.
- [28] Berdine HJ, Skomo ML. Development and integration of pharmacist clinical services into the patient-centered medical home. *J Am Pharm Assoc*. 2012; 52(5): 661–7.
- [29] Tomcavage J, Littlewood D, Salek D, Sciandra J. Advancing the role of nursing in the medical home model. *Nurs Adm Q*. 2012; 36(3): 194–202.
- [30] Haines SL, DeHart RM, Flynn AA, Hess KM, Marciniak MW, et al. Academic pharmacy and patient-centered health care: a model to prepare the next generation of pharmacists. *J Am Pharm Assoc*. 2011; 51(2): 194–202.
- [31] Reid RJ, Fishman PA, Yu O, Ross TR, Tufano JT, et al. Patient-centered medical home demonstration: a prospective, quasi-experimental, before and after evaluation. *Am J Manag Care*. 2009; 15: 71–87.
- [32] Jaén CR, Ferrer RL, Miller WL, Palmer RF, Wood R, et al. Patient outcomes at 26 months in the patient-centered medical home national demonstration project. *Ann Fam Med*. 2010; 8(1): 557–67.
- [33] Bichel A, Erfle S, Wiebe V, Axelrod D, Conly J. Improving patient access to medical services: preventing the patient from being lost in translation. *Healthc Q*. 2009; 13: 61–8.
- [34] Sidorov JE. The patient-centered medical home for chronic illness: is it ready for prime time? *Health Aff*. 2008; 27(5): 1231–4.

- [35] Gabbay RA, Bailit MH, Mauger DT, Wagner EH, Siminerio L. Multipayer patient-centered medical home implementation guided by the chronic care model. *Jt Comm J Qual Patient Saf.* 2011; 37(6): 265–73.
- [36] Ortiz G, Fromer L. Patient-centered medical home in chronic obstructive pulmonary disease. *J Multidiscip Healthc.* 2011; 4: 357–65.
- [37] Gulley SP, Rasch EK, Chan L. If we build it, who will come? Working-age adults with chronic health care needs and the medical home. *Med Care.* 2011; 49(2): 149–55.
- [38] Hennessey B, Suter P, Harrison G. The home-based chronic care model: a platform for partnership for the provision of a patient-centered medical home. *Caring.* 2010; 29(2): 18–24.
- [39] Jortberg BT, Miller BF, Gabbay RA, Sparling K, Dickinson WP. Patient-centered medical home: how it affects psychosocial outcomes for diabetes. *Curr Diab Rep.* 2012; 12(6): 721–8.
- [40] Johnson JA, Al Sayah F, Wozniak L, Rees S, Soprovich A, et al. Controlled trial of a collaborative primary care team model for patients with diabetes and depression: rationale and design for a comprehensive evaluation. *BMC Health Serv Res.* 2012; 12: 258–69.
- [41] Hatzichristou D, Tsimtsiou Z. Prevention and management of cardiovascular disease and erectile dysfunction: toward a common patient-centered care model. *Am J Cardiol.* 2005; 96(12B): 80–4.
- [42] Shippee ND, Shah ND, May CR, Mair FS, Montori VM. Cumulative complexity: a functional, patient-centered model of patient complexity can improve research and practice. *J Clin Epidemiol.* 2012; 65(10): 1041–51.
- [43] Sarfaty M, Wender R, Smith R. Promoting cancer screening within the Patient Centered Medical Home. *CA Cancer J Clin.* 2011; 61(6): 397–408.
- [44] Kirschner N, Barr MS. Specialists/subspecialists and the patient-centered medical home. *Chest.* 2010; 137(1): 200–4.
- [45] O'Neill JL, Cunningham TL, Wiitala WL, and Bartley EP. Collaborative hypertension case management by Registered Nurses and Clinical Pharmacy Specialists within the Patient Aligned Care Teams (PACT) Model. *J Gen Intern Med.* 2014. 29(Suppl 2): S675–81.
- [46] Choe HM, Farris KB, Stevenson JG, Townsend K, Diez HL, et al. Patient-centered medical home: developing, expanding, and sustaining a role for pharmacists. *Am J Health Syst Pharm.* 2012; 69(12): 1063–71.
- [47] Zimmerman J, Dabelko HI. Collaborative models of patient care: new opportunities for hospital social workers. *Soc Work Health Care.* 2007; 44(4): 33–47.
- [48] Yano EM, Haskell S, Hayes P. Delivery of Gender-Sensitive Comprehensive Primary Care to Women Veterans: Implications for VA Patient Aligned Care Teams. *J Gen Intern Med.* 2013; 29(Suppl 2): S703–7.
- [49] Dolovich L. Ontario pharmacists practicing in family health teams and the patient-centered medical home. *Ann Pharmacother.* 2012; 46(4): 33–9.

- [50] Tuepker A, Kansagara D, Skaperdas E, Nicolaidis C, Joos C, Alperin M, Hickam D. "We've Not Gotten Even Close to What We Want to Do": a Qualitative Study of Early Patient-Centered Medical Home Implementation. *J Gen Intern Med.* 2014; 29(Suppl 2): S614–22.
- [51] True G, Stewart GL, Lampman M, Pelak M, Solimeo SL. Teamwork and delegation in medical homes: primary care staff perspectives in the Veteran Health Administration. *J Gen Intern Med.* 2014; 29(Suppl 2): S632–9.
- [52] Hysong S, Knox M, Haidet P. Examining Clinical Performance Feedback in Patient Aligned Care Teams. *J Gen Intern Med.* 2014; 29(Suppl 2): 667–74.
- [53] Wang ES, Conde MV, Simon B, Leykum LK. Exploring End-of-Residency Transitions in a VA Patient Aligned Care Team. *J Gen Intern Med.* 2014; 29(Suppl 2): 649–58.
- [54] Farmer MM, Rose DE, Rubenstein LV, Canelo IA, Schectman G, Stark R, Yano E. Challenges facing primary care practices aiming to implement patient-centered medical homes. *J Gen Intern Med.* 2014; 29(Suppl 2): S555–62.
- [55] Forman J, Harrod M, Robinson C, Annis-Emeott A, Ott J, Saffar D, Krein S, Greenstone C. First things first: foundational requirements for a medical home in an academic medical center. *J Gen Intern Med.* 2014; 29(Suppl 2): 640–648.
- [56] Wood MR, Bolyard D. Making education count: the nurse's role in asthma education using a medical home model of care. *J Pediatr Nurs.* 2011; 26(6): 552–8.
- [57] Cooley WC, McAllister JW. Building medical homes: improvement strategies in primary care for children with special health care needs. *Pediatrics.* 2004; 113(5):1499–506.
- [58] Council LS, Geffken D, Valeras AB, Orzano AJ, Rechisky A, et al. A medical home: changing the way patients and teams relate through patient-centered care plans. *Fam Syst Health.* 2012; 30(3): 190–8.
- [59] Chang ET, Wells KB, Young AS, Stockdale S, Johnson MD. The anatomy of primary care and mental health clinician communication: a quality improvement case study. *J Gen Intern Med.* 2013; 29(Suppl 2):S598–606.
- [60] Institute for Healthcare Improvement. The Breakthrough Series: IHI's Assessment Scale for Collaborative. 2004.
- [61] Boushon B, Provost L, Gagnon J, Carver P. Using a virtual breakthrough series collaborative to improve access in primary care. *Jt Comm J Qual Patient Saf.* 2006; 32(10): 573–84.
- [62] Luck J, Bowman C, York L, Midboe A, Taylor T, et al. Multimethod evaluation of the VA's Peer-to-Peer Toolkit for patient-centered medical home implementation. *J Gen Intern Med.* 2014; 29(Suppl 2): S572–8.
- [63] Medical Home Builder Survey VISN Detail. Available from: <https://secure-reports2.vssc.med.va.gov/ReportServer/Pages/ReportViewer.aspx?%2fPC%2fPC+Medical+Home%2fMainMenu&rs%3a-Command=Render> [Accessed 2014-01-03].

- [64] Mina L. Harkins. Introduction and overview: NCQA's PPC-PCMH recognition program. Available from http://www.cthealthpolicy.org/webinars/20100202_mharkins_ppc_pcmh.pdf [Accessed 2013-02-20].
- [65] Miller C. Patient-centered medical home care model: IT considerations. *MD Advis* 2011; 4(4): 23–6.
- [66] O'Malley AS, Cohen GR, Grossman JM. Electronic medical records and communication with patients and other clinicians: are we talking less? *Issue Brief Cent Stud Health Syst Change*. 2010 Apr; (131): 1–4.
- [67] Frenzel JE. Using electronic medical records to teach patient-centered care. *Am J Pharm Educ*. 2010; 74(4): 71.
- [68] Tralongo P, Ferrà F, Borsellino N, Verderame F, Caruso M, et al. Cancer patient-centered home care: a new model for health care in oncology. *Ther Clin Risk Manag*. 2011; 7: 387–92.
- [69] Cooley WC, McAllister JW, Sherrieb K, Clark RE. The medical home index: development and validation of a new practice-level measure of implementation of the medical home model. *Ambul Pediatr*. 2003; 3(4): 173–80.
- [70] Rathert C, Williams ES, McCaughey D, Ishqaidif G. Patient perceptions of patient-centered care: empirical test of a theoretical model. *Health Expect*. 2012 Available from: <http://onlinelibrary.wiley.com/doi/10.1111/hex.12020/pdf>. [Accessed 2013-02-28].
- [71] VHA Office of Quality and Performance. Survey of Healthcare Experiences of Patients: Methods over view and technical summary. 2009.
- [72] Kansagara D, Tuepker A, Joos S, Nicolaidis C, Skaperdas E, Hickman D. Getting performance metrics right: a qualitative study of staff experiences implementing and measuring practice transformation. *J Gen Intern Med*. 2014; 29(Suppl 2): S607–13.
- [73] Christensen EW, Dorrance KA, Ramchandani S, Lynch S, Whitmore CC, et al. Impact of a patient-centered medical home on access, quality, and cost. *Mil Med*. 2013; 178(2): 135–41.
- [74] Henderson S, Princell CO, Martin SD. The patient-centered medical home. *Am J Nurs*. 2012; 112(12): 54–9.
- [75] Rosenberg CN, Peele P, Keyser D, McAnallen S, Holder D. Results from a patient-centered medical home pilot at UPMC health plan hold lessons for broader adoption of the model. *Health Aff (Millwood)*. 2012; 31(11): 2423–31.
- [76] Segel S, Hashima J, Gregory WT, Edelman A, Li H, et al. A new approach to postpartum rounds: patient-centered collaborative care improves efficiency. *J Grad Med Educ*. 2010; 2(1): 67–72.
- [77] Nutting PA, Crabtree BF, Stewart EE, Miller WL, Palmer RF, et al. Effect of facilitation on practice outcomes in the national demonstration project model of the patient-centered medical home. *Ann Fam Med*. 2010; 8(1): 33–4.

- [78] Roby DH, Pourat N, Pirritano MJ, Vrungos SM, Dajee H, et al. Impact of patient-centered medical home assignment on emergency room visits among uninsured patients in a county health system. *Med Care Res Rev.* 2010; 67(4): 412–430.
- [79] Steele GD, Haynes JA, Davis DE, Tomcavage J, Stewart WF, et al. How Geisinger's advanced medical home model argues the case for rapid-cycle innovation. *Health Aff (Millwood).* 2010; 29(11): 2047–53.
- [80] Werner RM, Canamucio A, Marcus SC, Terwiesch C. Primary care access and emergency room use among older veterans. *J Gen Intern Med.* 2014; 29(Suppl 2): 689–94.
- [81] Domino ME, Humble C, Lawrence WW Jr, Wegner S. Enhancing the medical homes model for children with asthma. *Med Care.* 2009; 47: 1113–20.
- [82] Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *JAMA.* 2009; 301(6): 603–18.
- [83] Katz DA, McCoy K, and Sarrazin MV (2014) Does Improved Continuity of Primary Care Affect Clinician–Patient Communication in VA? *J Gen Intern Med* 29(Suppl 2): S682–8.
- [84] Yano EM, Bair MJ, Carrasquillo O, Krein SL, Rubenstein LV. Patient Aligned Care Teams (PACT): VA's journey to implement patient-centered medical homes. *J Gen Intern Med.* 2014; 29(Suppl 2): S547–9.
- [85] Woodward-Hagg H, Workman-Germann J, Flanagan M, Suskovich D, Schachitti S, Corum C, et al. Implementation of Systems Redesign: approaches to spread and sustain adoption. In: Henriksen K, Battles JB, Keyes MA, Grady ML, editors. *Advances in patient safety: new directions and alternative approaches (Vol. 2: Culture and Redesign).* AGRH (US): 2008.
- [86] Rubenstein LV, Stockdale SE, Sapir N, Altman L, Dresselhaus T, et al. A patient-centered primary care practice approach using evidence-based quality improvement: Rationale, methods, and early assessment of implementation. *J Gen Intern Med.* 2014; 29(Suppl 2): 589–597.
- [87] Reid RJ, Wagner EH. The Veterans Health Administration Patient Aligned Care Teams: Lessons in primary care transformation. *J Gen Intern Med.* 2014; 29(Suppl 2): S552–4.
- [88] Bidassie B, Davies ML, Stark R, Boushon B. VA experience in implementing patient-centered medical home using a breakthrough series collaborative. *J Gen Intern Med.* 2014; 29(Suppl 2): S563–S571.
- [89] Institute for Healthcare Improvement. *The Breakthrough Series: IHI's collaborative model for achieving breakthrough improvement.* 2003.
- [90] Davies ML. *Systems Redesign Framework for Improvement (TAMMCS).* 2009.

- [91] Langley GL, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance* (2nd Edition). Jossey Bass: San Francisco; 2009.
- [92] Schectman G, Stark R. Orchestrating large organizational change in primary care: The Veterans' Health Administration experience implementing a patient-centered medical home. *J Gen Intern Med.* 2014; 29(Suppl 2): S550–1.
- [93] Huerta TR, Sieck CJ, Hefner J, Johansen M, Wexler R, et al. Patient centered care plus medical home does not equal patient centered medical home: Why layering models of care may not lead to better outcomes. *OA Fam Med.* 2013; 1(1): 5.
- [94] Goldman RE, Parker DR, Brown J, Walker W, Eaton CB, et al. Recommendations for a mixed methods approach to evaluation the patient-centered medical home. *Ann Fam Med.* 2015; 13(2): 168–175.
- [95] Paustain ML, Alexander JA, El Reda DK, Wise CG, Green LA, et al. Partial and incremental PCMH practice transformation: Implications for quality and costs. *Health Serv Res.* 2014; 49(1): 52–74.
- [96] Ladebue AC, Helfrich CD, Gerdes ZT, Fihn SD, Nelson KM, et al. The experience of Patient Aligned Care Team (PACT) members. *Health Care Manage Rev.* 2016; 41(1): 2–10.
- [97] Helfrich CD, Dolan ED, Simonetti J, Reid RJ, Joos S, et al. Elements of team-based care in a patient-centered medical home are associated with lower burnout among VA primary care employees. *J Gen Intern Med.* 2014; 29(Suppl 2): S659–66.
- [98] Fix GM, Asch SM, Saifu HN, Fletcher MD, Gifford AL, et al. Delivering PACT-principled care: Are specialty care patients being left behind? *J Gen Intern Med.* 2014; 29(Suppl 2): S695–702.