Defining and Measuring the Patient-Centered Medical Home

Kurt C. Stange, MD, PhD[1,2], Paul A. Nutting, MD, MSPH[3,4], William L. Miller, MD, MA[5,6], Carlos R. Jaén, MD, PhD[7,8], Benjamin F. Crabtree, PhD[9,10], Susan A. Flocke, PhD[11], and James M. Gill, MD, MPH[12,13]

[1]Family Medicine, Epidemiology & Biostatistics, Sociology and Oncology, Case Western Reserve University, Cleveland, OH, USA; [2]Case Comprehensive Cancer Center, Case Western Reserve University, Cleveland, OH, USA; [3]University of Colorado Health Sciences Center, Denver, CO, USA; [4]Center for Research Strategies, Denver, CO, USA; [5]Leonard Parker Pool Chair of Family Medicine, Allentown, PA, USA; [6]Lehigh Valley Health Network, Penn State College of Medicine, Allentown, PA, USA; [7]Family & Community Medicine, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA; [8]Epidemiology & Biostatistics, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA; [9]Department of Family Medicine, Robert Wood Johnson Medical School, Somerset, NJ, USA; [10]Program Leader in Population Sciences, Cancer Institute of New Jersey, Somerset, NJ, USA; [11]Department of Family Medicine, Epidemiology & Biostatistics and Oncology, Case Western Reserve University, Cleveland, OH, USA; [12]Delaware Valley Outcomes Research, Newark, DE, USA; [13]Department of Family and Community Medicine, Thomas Jefferson University, Philadelphia, PA, USA.

The patient-centered medical home (PCMH) is four things: 1) the fundamental tenets of primary care: first contact access, comprehensiveness, integration/coordination, and relationships involving sustained partnership; 2) new ways of organizing practice; 3) development of practices' internal capabilities, and 4) related health care system and reimbursement changes. All of these are focused on improving the health of whole people, families, communities and populations, and on increasing the value of healthcare.

The value of the fundamental tenets of primary care is well established. This value includes higher health care quality, better whole-person and population health, lower cost and reduced inequalities compared to healthcare systems not based on primary care.

The needed practice organizational and health care system change aspects of the PCMH are still evolving in highly related ways. The PCMH will continue to evolve as evidence comes in from hundreds of demonstrations and experiments ongoing around the country, and as the local and larger healthcare systems change.

Measuring the PCMH involves the following:

- Giving primacy to the core tenets of primary care
- Assessing practice and system changes that are hypothesized to provide added value
- Assessing development of practices' core processes and adaptive reserve
- Assessing integration with more functional healthcare system and community resources
- Evaluating the potential for unintended negative consequences from valuing the more easily measured instrumental features of the PCMH over the fundamental relationship and whole system aspects
- Recognizing that since a fundamental benefit of primary care is its adaptability to diverse people, populations and systems, functional PCMHs will look different in different settings.

Efforts to transform practice to patient-centered medical homes must recognize, assess and value the fundamental features of primary care that provide personalized, equitable health care and foster individual and population health.

KEY WORDS: primary care; patient-centered medical home; measurement; quality improvement.
J Gen Intern Med
DOI: 10.1007/s11606-010-1291-3

Electronic supplementary material *The online version of this article (doi:10.1007/s11606-010-1291-3) contains supplementary material, which is available to authorized users.*

The patient-centered medical home (PCMH) is emerging as a centerpiece of efforts to reform healthcare in the US and to establish a primary care basis for improving the value of healthcare.[1–4] In contrast to currently beleaguered US primary care,[5–9] what a PCMH looks like is not known outside of ongoing demonstration projects and a small number of practices that have sought to be recognized according to new standards set by the National Committee for Quality Assurance (NCQA).[10–14] In contrast, the benefits of primary care for people and societies are well-established.[15–19] Furthermore, the process and intended and unintended consequences[20–25] of transforming current practices into patient-centered medical homes are only beginning to be understood.[26]

Therefore, in this paper we carry out the following:

- Define the PCMH
- Compare this definition with the joint statement of PCMH principles by 4 physician organizations
- Propose principles for measuring the PCMH
- Overview current options for measuring the PCMH, including standards set by the NCQA for PCMH recognition and existing measures of primary care
- Propose relevant policy and research agendas

DEFINING THE PATIENT-CENTERED MEDICAL HOME

We define the PCMH as a team of people embedded in the community who seek to improve the health and healing of the people in that community. They work to optimize the fundamental attributes of primary care combined with evolving new ideas about organizing and developing practice and changing the larger health care and reimbursement systems. Unlike more narrowly focused ways of organizing the delivery of commodities of healthcare, the PCMH aims to personalize, prioritize and integrate care to improve the health of whole people, families, communities and populations.

Thus, the PCMH consists of the following:

1) The fundamental tenets of primary care: access, comprehensiveness, integration and relationship
2) New ways of organizing practice
3) Development of practices' internal capabilities
4) Health care system and reimbursement changes

The PCMH concept links new approaches to health care organization[1,27–34] with the well-established primary care function for improving the health of people and populations.[35] Below we overview each of these four aspects of the PCMH.

The Fundamental Attributes of Primary Care

Table 1 shows the core attributes of primary care are: first contact accessibility, comprehensiveness, integration & coordination, and relationships involving sustained partnerships over time.[15,36–38]

First contact access in the PCMH increasingly involves distance and asynchronous communication and self-care, in addition to face-to-face contact with practice members and partners.[39–41] Comprehensiveness includes provision of services that account for the majority of patient needs, including mental health[42–44] and care of often multimorbid[45–47] chronic illnesses.[48–53] Coordination involves guiding access to more narrowly focused care when needed;[38] integration of care involves optimizing and prioritizing delivery of needed services across acute and chronic illness, prevention, mental health and family care.[54] The PCMH emphasizes functional linkages with community organizations and with other healthcare entities such as hospitals, specialists, other service providers, urgent care, etc.[39,55–57] Sustained partnership involves developing relationships[58] that are patient-centered[59–62] and grounded in local knowledge of the family and community.[15]

Health care systems with a primary care focus have better quality,[63] lower cost,[63–65] less inequality in health care and health,[16,18,66–69] and better population health[16,65,70] when compared with systems based on other approaches to health care.

One of the critical and under-appreciated attributes of primary care is its flexibility in adapting to different sociopolitical climates, populations, communities, individual patients and available clinicians and practice workers.[71] Indeed, in international comparisons, Meads has identified a typology of 6 different manifestations of primary care,[72] all of which are manifested to some degree in different parts of the pluralistic US healthcare market.

Newer Aspects of the PCMH

New Ways of Organizing Practice. The PCMH moves beyond primary care as it is practiced now, to include new approaches to organizing practice to enhance its responsiveness to local patient needs. In various manifestations currently being tried,[14,31,40,73–75] these include diverse instrumental elements such as same-day appointment, electronic visits, group visits, disease registries and management, greater patient engagement, care coordination, new collaborative relationships, team-based care, quality and safety initiatives, electronic prescribing and medical records. Many of these changes grow out of the recommendations of the Institute of Medicine for reforming health care,[32,76] from learning collaboratives sponsored by the Institute for Healthcare Improvement[77,78] and others.[51,79,80]

Development of Practices' Internal Capability. Recent evidence shows that the large majority of primary care practices are not ready to become PCMHs.[11,12,81–83] Experience from the first PCMH National Demonstration Project[26] shows that even for highly motivated practices, the transformation to a PCMH represents a developmental process that necessitates practice work on internal capabilities.[84] These capabilities consist of core structures and processes, adaptive reserve, and attentive connections to the local environment the relationship infrastructure, an aligned management model, and leadership development.[85] In most practices the intense effort to incorporate multiple improvements and changes in core processes and relationships reveals deficits in the practice's adaptive reserve that must be addressed as the transformation process proceeds. Thus, the transformation of primary care into PCMHs is best understood as a developmental process, with stops, starts, backslides, leaps and challenges.[85] If the PCMH is to be sustainable and to evolve in an environment of continual change, primary care practices must enhance their robustness and resilience and foster connections in order to be locally responsive.[85]

Health Care System and Reimbursement Changes. Primary care does not operate in isolation, and one of its core functions is the effective and efficient integration of care both vertically (within disease categories) and horizontally (across the diverse needs of peoples, communities and populations).[86,87] In light

Table 1. Attributes of Primary Care

The value of primary care emerges from synergy among:[15,36–38]
• Accessibility as the first contact with the health care system
• Accountability for addressing a large majority of personal health care needs (comprehensiveness)
• Coordination of care across settings, and integration of care of acute and (often co-morbid) chronic illnesses, mental health and prevention, guiding access to more narrowly focused care when needed
• Sustained partnership and personal relationships over time with patients known in the context of family and community

of the co-evolving nature of the PCMH and the healthcare system within which it functions, the need for reform of the medical "neighborhood" increasingly is recognized,[55] in particular to help primary care to be more effective at integrating and prioritizing care.[54,88]

Primary care in the US in under-resourced compared to specialty care.[70,89,90] Blended payment[91,92] and other reimbursement reforms[29,93–96] have been proposed to redistribute resources toward the primary care function that provides the greatest value. Various minor reforms ranging from paying care management fees to reimbursing for specific components of the PCMH are included and are being evaluated in a number of the ongoing PCMH demonstrations and pilot projects.[14,74] Involving patients in practice and healthcare system governance represents a particularly promising innovation.[39,97,98]

Joint Principles of the PCMH

A 2007 joint statement[99] of four physician organizations whose members constitute the majority of primary care clinicians in the US identifies seven principles of the PCMH. These are summarized in Table 2.

Similar to our definition of the PCMH, the joint principles specifically include some of the fundamental tenets of primary care (access, coordination/integration), plus new ways of organizing practice (*enhanced* access, physician-directed team-oriented practice, focus on quality and safety), plus health care and reimbursement system changes (payment that recognizes added value). Other aspects of primary care are subsumed under other titles (such as relationship and comprehensiveness under personal physician and whole person orientation, which is similar to comprehensiveness).

The joint principles build on other operationalizations of the primary care and medical home concepts.[1–4,13,27,28,30,35,40,57,60,61,100–111] They assume the well-established primary care function[61] in the same way that the principles of primary care assume appropriate and adequate disease-specific quality of care and supportive systems and reimbursement.[112]

The principles are evolving in their on-the-ground operationalization in diverse contexts in hundreds of PCMH demonstrations ongoing around the US,[14,113] as new collaborators are brought to the partnership[114] and as ongoing evaluations bring forth new evidence of intended and unintended consequences.[4,12,26,39,71,73,75,83–85,97,105,115–129]

MEASURING THE PCMH

Principles

The rationale and goals for measuring the PCMH are diverse, and include evaluation of baseline status or changes, guiding development and improvement through a change process, certifing of practices as PCMHs, guiding reimbursement or investment, and generating new knowledge.

The goal, as well as the setting and available resources, guide many of the decisions for measuring PCMH. For example, in evaluating the first National Demonstration Project of the PCMH,[75,118,130] our goals were to provide a rigorous evaluation that generated transportable new knowledge about the process of practice change[73,84,85,116] and the outcome for practices[73,116] and patients.[119] We also sought to provide ongoing feedback to implementers to guide their change process and to inform policy and practice.[26,75,85,117,121] The diverse practice and system settings across the US provided challenges; measurement resources were limited but more substantial than available for individual practices or for most systems.

In this setting, we chose a multimethod approach[118,131–138] to foster understanding of meaning and context while also testing a priori and emerging hypotheses—that is, we measured and analyzed both numbers and narratives. We attempted to measure the instrumental aspects of the PCMH as envisioned by the implementation group,[40] and processes and outcomes from the perspectives of change facilitators, practice members, patients, and medical and financial records.

In other settings, goals and measurement are narrower. Many practices attempting to be recognized as PCMHs are only measuring NCQA criteria. Others attempting an iterative practice improvement process emphasize change processes and outcomes for the practice and patient.[115] Systems deciding on investment in PCMH conversions tend to emphasize

Table 2. Joint Principles of the PCMH

- **Personal Physician**: Each patient has an ongoing relationship with a personal physician trained to provide first contact, continuous and comprehensive care
- **Physician Directed Medical Practice**: The personal physician leads a team of individuals at the practice level who collectively take responsibility for the ongoing care of patients
- **Whole Person Orientation**: The personal physician is responsible for providing for the entire patient's healthcare needs and taking responsibility for appropriately arranging care with other qualified professionals
- **Care is Coordinated and/or Integrated:** across all elements of the complex healthcare system (e.g. subspecialty care, hospitals, home health agencies, nursing homes) and the patient's community (e.g. family, public and private community based services). Care is facilitated by registries, information technology, health information exchange and other means
- **Quality and Safety**: are hallmarks of medical home by incorporating a care planning process, evidence based medicine, accountability, performance measurement, mutual participation and decision making
- **Enhanced Access**: to care is available through systems such as open scheduling, expanded hours and new options for communication between patients, their personal physician, and practice staff
- **Payment**: appropriately recognizes the added value provided to patients who have a patient-centered medical home beyond the traditional fee-for-service encounter

Summarized from:[99] American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), American Osteopathic Association (AOA). Joint principles of the patient-centered medical home. 2007. Available at: www.medicalhomeinfo.org/Joint%20Statement.pdf, Accessed February 2, 2010

cost and utilization outcomes, but also sometimes measure quality and the experience of staff and patients.[39,56,97]

Despite the diversity of purposes, situations and resources, some principles for PCMH measurement can be specified:

- Emphasize the well-established tenets of primary care[15,36–38] that have been shown to result in better quality[63] and health,[16,65,70] and lower cost,[63–65] and inequality[16,66,139–142]
- Measure the changes in practice operations and the co-evolving healthcare and payment systems that are hypothesized to provide added value to the PCMH[143]
- Measure the quality and function of relationships with patients, and healthcare system and community partners
- Assess practices' internal capabilities[85] that are necessary for development as a PCMH
- Avoid unintended negative consequences from emphasizing more easily measured instrumental aspects of the PCMH[20–22,24,61,144,145] over the complexly interacting relationship aspects[19,87,146–158] that are likely to provide much of its value [88,147,149,158]
- Use both numbers and narratives (quantitative and qualitative methods)[118,119] to measure the many context-dependent aspects of the PCMH [72]
- Consider which perspective and level (e.g. patient, family, practice, system, community, population) is most relevant for assessing each domain and the whole
- Since the context for operationalizing the PCMH is still evolving based on what is being learned in many ongoing demonstrations,[14] and since the healthcare system context is co-evolving, it is premature to recommend a single measurement standard (Good options from which to choose are outlined below and discussed in the online Appendix.)
- Recognize that many of the costs of transformation to the PCMH occur at the level of the practice and the system. But like the benefits of primary care, the value of the PCMH is likely to accrue at the level of the patient's lived experience outside of health care, and at the levels of the healthcare system, community, workforce and population.[15,36] This is discussed in more detail in the paper by Rittenhouse et al[159] in this issue

Current NCQA Criteria

The National Committee for Quality Assurance's Physician Practice Connections®—Patient-Centered Medical Home™ tool[160] is a practice self-report measure and has become the de facto standard used by many demonstrations to judge "medical homeness." It is being used in most ongoing demonstrations.[14] The NCQA PPC®-PCMH™is based on considerable prior work[110,161–165] and attempts to emphasize measurement reliability and practicality.[160] It assesses nine standards: access and communication, patient tracking and registries, care management, patient self-management support, electronic prescribing, test tracking, referral tracking, performance reporting and improvement, and advanced electronic communications.[160] The three-level scoring implicitly acknowledges that, for most practices, meeting these reporting standards will be a staged process.

The PPC®-PCMH™ contains 166 items, of which 46% assess practice report of functions that require use of some type of electronic information technology, 14% assess care for three specific chronic diseases the practice identifies as important to their patient panel, 13% reflect systems for coordinating care, 9% assess accessibility, 5% relate to performance reporting, and 4% are about tools for organizing clinical data. Use of non-physician staff and collection of data on patient's experience of care are each reflected in 2% of items, and 1% of items represent each domain of preventive service delivery, continuity of care and patient communication preferences.[166]

Criticisms of the NCQA's measure[4,26,124,166,167] relate to the balance of items compared to the valued domains of primary care, the degree to which the items are measured by the most appropriate perspective, the degree to which the items distinguish between high and low quality primary care, the lack of a patient perspective, and the opportunity costs and potential unintended consequences of the PCMH measurement and recognition process.

On June 15, 2009 the NCQA articulated a "Planned Evolution of PPC-PCMH Requirements."[168] This document states an interest in "understanding better how to assess patient-centeredness and experience as well as quality and cost outcomes," and expresses an interest in assessing patient's experience of the PCMH. It identifies a need for "standards designed to realize quality and cost gains achieved through better coordination and integration *across* settings." The document also notes the need to capture "relationships to various types of community organizations," and to "recognize the role of providers other than physicians."

Other Measures of Primary Care Functions and PCMH Components

There are a number of measures that assess important aspects of primary care that can be a source of items for comprehensive measurement of the PCMH.[15,36,84,116,118,119] Many of these domains are assessed from the patient point of view by the Primary Care Assessment Survey (PCAS)[169] and the Ambulatory Care Experiences Survey (ACES)[170] by Safran, the Primary Care Assessment Tool (PCAT)[171,172] by Starfield, the Components of Primary Care Instrument (CPCI)[173–175] by Flocke, and the Clinician-Group Consumer Assessment of Healthcare Providers and Systems (CG-CAHPS)[176] by the Agency for Healthcare Research and Quality. The PCAT and the CAHPS include versions for adults and children. The Assessment of Chronic Illness Care (ACIC)[177] assesses system support relevant to the Chronic Care Model.[51,178,179] The Medical Home Index (MHI) was developed specifically to assess six domains of the pediatric PCMH (organizational capacity, chronic condition management, care coordination, community outreach, data management and quality improvement).[180] John Howie has created an important patient-level outcome measure of the effectiveness of care. The Patient Enablement Instrument (PEI) assesses the degree to which patients are better able to cope with life, understand and cope with their illness, and keep themselves healthy as a result of their healthcare.[181–183] In addition to further work in developing a Consultation And Relational Empathy (CARE) measure,[184] Howie's group has taken the interesting step of adding both relationship aspects and time to the PEI to create the Consultation Quality Index (CQI), based on empirical evidence that time is an essential for enablement, relationship development and patient-centered care.[185–187]

These different measures and others provide a wealth of possibilities for bringing the patient perspective and the core

feature of primary care into PCMH assessment and recognition. The patient perspective assesses different domains that quality measures often overlook.[188] While the self-report aspect of the NCQA measure has inherent biases, reliably gathering the patient perspective requires attention to selection factors and sample size as well as measurement reliability and validity. More than a research standard, practical considerations and an ability to understand local adaption are vital if measures are to be widely applied to judge the PCMH qualifications of practices.

Measures of Each Domain

Table 3 depicts the components of the PCMH as articulated by the Joint Principles of the PCMH,[99] and the related domains of the primary care function, based on definitions by the Institute of Medicine[15] and by Starfield.[36,189] The table highlights the component(s) of the NCQA measure that are relevant to each domain, identifies elements that are missing in current conceptualizations and measures, and provides examples of potential additional sources of items for measuring each domain. The fact that some instruments are listed for multiple domains is an indication that these measures have some common elements and assess some of the same domains, although often in different ways.

Comparative details about these measures are discussed in the online Appendix for readers who may be choosing measures for particular circumstances. In addition, a forthcoming supplemental issue of *Healthcare Policy* compares the psychometrics and performance of measures of primary care constructs,[190–198] and provides an excellent starting point for those seeking to measure critical aspects of primary care and the PCMH.

Table 3. Measures of the PCMH and Primary Care

Domain		Current NCQA Measure Component (NCQA PPC®-PCMH)™ [160]	Missing Elements in Current Conceptualizations or Measures	Example Sources for Additional Measures
PCMH Principle[a]	Primary Care Functions[b]			
Personal physician	Sustained partnership & relationship	1. Access & Communication (Written standard for scheduling appointments with a personal clinician)	Relationships/partnerships with other members of the care team Patient-centered care [200] (RPAD[201])	MHI [180] CPCI[173–175] PCAS[169] PCAT[171,172] ACES[170] CARE[184] CAHPS[176]
Physician-directed team practice		3. Care Management	Team function Adaptive reserve & capacity for change (PCC[202])	CCI[202] OA[203] ACIC[177]
			Enabling relationships, leadership & communication (MHI [180] ACES[170])	Integration of the team[204]
Whole-person orientation	Accountability for addressing a large majority of personal health care needs		Personalization of care based on knowing the person's medical and personal history & values	PCAS[169] PCAT[171,172] CPCI[173–175] >85% of problems managed in practice
Coordination / integration of care	Coordination / integration of care	3. Care Management 7. Referral Tracking	Integration and prioritization of care across multiple co-morbid chronic illnesses, [45,205–210] acute and chronic illness, mental health, prevention & family care.[38,211–213]	MHI [180] CPCI[173–175] PCAS[169] ACES[170] PCAT[171,172] ACIC[177]
Quality & Safety		2. Patient Tracking & Registry	Person-level quality of care:	Disease-specific quality & safety:
		3. Care Management	Patient Enablement (PEI[182,187,214])	ACQA Starter Set[219]
		4. Self-Management Support	Protection from overtreatment[215]	ACIC[177]
		5. Electronic Prescribing		MHI [180]
		6. Test Tracking	Personalization of care	
		7. Referral Tracking	Patient-centered care (Epstein[200] RPAD[201])	
		8. Performance Reporting & Improvement	Cultural competency (ECHO[216] CCA-PC[217,218])	
		9. Advanced Electronic Communications	Patient engagement in PCMH improvement	
Enhanced access	Accessibility as 1st contact with the healthcare system	1. Access & Communication 9. Advanced Electronic Communications	Defined population that represents community	PCAT[171,172] ACES[170] CAHPS[176]
Payment for added value		(In some pilot, practices are paid more for being recognized at higher levels)	Recognition of the value of a primary care PCMH at other levels of the system	Blended payment[91,92] for services, quality & enabling relationships
			Recognition of transition costs to PCMH[93]	
(Neighborhood)	Family & community (& system) context	8. Performance Reporting & Improvement	Family care[212,220]	PCAT[171,172] CPCI[173–175] ECHO[216] MHI [180] ACES[170] PCC[202] ACIC[177]
			Seamless transitions between places and levels of care	

[a] *Based on the Joint Principles of the PCMH*[99]
[b] *Based on definitions by the Institute of Medicine*[15] *and by Starfield*[36,189]

POLICY AND RESEARCH AGENDA RECOMMENDATIONS

This overview of the definition and measurement of the patient-centered medical home leads to a number of research and policy recommendations:

- The PCMH enhances the well-established benefits of the primary care function. This function cannot be realized outside of the context of continuous healing relationships between patients and clinicians. The PCMH also must be understood within the context of enabling relationships between primary care practice, other healthcare system components, payment systems and communities.
- Longstanding underinvestment in the primary care infrastructure and relationships that are the foundation for the PCMH mean that substantial development is needed to enable the PCMH to serve as a fundamental underpinning for a high value health care system.
- Investment is needed to enable functional relationships within the PCMH, between patients and their PCMH, and between the PCMH and its healthcare system and community partners.
- Primary care and the PCMH must be valued for their long-term ability to increase the quality, integration, personalization, and equity of healthcare and their beneficial effect on the functional health of people and populations. Valuing primary care and the PCMH only for the possibility of short-term cost-saving benefits risks setting up the PCMH experiment and the healthcare system for failure.
- Evaluation efforts should recognize that a long—perhaps 5–10 year—time horizon is needed to see the full health and economic effects of the PCMH.
- The value of primary care accrues at the level of the patient and the population, whereas the costs are at the level of the practice and the enabling systems. Reimbursement and evaluation should recognize the importance of assessing these multi-level effects, and of engaging multiple perspectives.
- New measures are needed that reflect the higher order primary care functions such as the integration, prioritization and personalization of care, and measures that assess the affect of the PCMH and primary care across multiple levels of health care, health and society.[54]
- As an intermediate step, consideration should be given to reducing reporting burden in over-represented areas of the NCQA PPC®-PCMH™ [160] measure, and adding the following domains:
    - Ongoing patient- and relationship-centered care (as assessed by the patient)
    - Patient enablement (ability to do valued functions as a result of the care)
    - Comprehensiveness of care
    - Integration of care across multiple co-morbid chronic illnesses, acute complaints, mental health, prevention and family care
    - Protection from over-treatment
    - Personalization of care
    - Patient engagement in practice improvement
    - Development of a system, community, family & population orientation to care organization
    - Degree to which information technology and systems enable the primary care functions and personalized, prioritized, integrated care
    - Practices' adaptive reserve & capacity for change
- An emerging PCMH research agenda includes answering the following small sample of large questions:
    - What is the comparative effectiveness of different approaches to measuring and incentivizing transformation to PCMHs, including:
        - Pay-for-measurement
        - Enhanced reimbursement for primary care
        - Enhanced reimbursement for primary care and PCMH-enhancing infrastructure
    - What are the trade-offs in over-optimizing individual components of healthcare?
    - What is the added value of the PCMH beyond usual primary care in different settings and among different populations?
    - At what level do the costs and benefits of primary care and the PCMH accrue?
    - What is the time frame for PCMH implementation from different starting points? What resources are needed?
    - What processes and outcomes get worse before getting better during the transformation process?
    - How can the components of health care be integrated to optimize the health of individuals and populations, and the value of health care?
    - What does "productivity" mean when production is defined as optimizing health rather than producing healthcare?
    - What are the intended and unintended consequences of measuring and incentivizing different components of healthcare?
    - How can care be optimized across the domains of acute illness, multiple co-morbid chronic illnesses that are the norm among the elderly and primary care patients, prevention, mental health and family care?
    - What kinds of evidence are needed beyond disease-specific knowledge to optimize the care of whole people and the value of health care for populations and societies?
    - What is the optimal problem density, time allotment and support for different types of primary care encounters?
    - How might different reimbursement models combine with different practice and personal transformations to optimize care?

CONCLUSION

The PCMH, like primary care, is worthy of support, evaluation and evolution as a fundamental building block for a high-value health care system. In these efforts, it will be important to recognize the complex interactions of the PCMH at multiple levels, so that a narrow and short-term focus does not scuttle the potentially transformative nature of the PCMH before it has had a chance to make good upon its promise.

Acknowledgements: *This work was presented on July 27–28, 2009 at the Washington, DC Conference: Patient-Centered Medical Home: Setting a Policy Agenda. The authors are grateful to the Agency for Healthcare Research and Quality, the Commonwealth*

Fund, and the American Board of Internal Medicine Foundation for sponsoring the PCMH Evaluator's Collaborative. We also are grateful to the Commonwealth Fund and the American Academy of Family Physicians for sponsoring our independent evaluation of the National Demonstration Project. Dr. Stange's time is supported in part by a Clinical Research Professorship from the American Cancer Society. Critiques by the editor and reviewers were very helpful in refining the message and presentation.

Conflicts of Interest: *Drs. Crabtree, Jaén, Miller, Nutting and Stange are members of an independent evaluation team for the patient-centered medical home National Demonstration Project conducted by the TransforMed subsidiary of the American Academy of Family Physicians. Dr. Gill performs research consulting for GE Health Care. The authors were offered an honorarium for preparing this manuscript, but in recognition that the importance of environmental and social determinants of health[199] in addition to the healthcare determinants highlighted in this paper, we asked the sponsors to donate the honorarium to: the Nature Conservancy (environment), the Rotary Foundation of Rotary International (education, poverty alleviation), and the Clinton Foundation (health security, economic empowerment, leadership development and citizen service, racial, ethnic and religious reconciliation).*

Corresponding Author: *Kurt C. Stange, MD, PhD; Family Medicine, Epidemiology Biostatistics, Sociology and Oncology, Case Western Reserve University, 10900 Euclid Ave, LC 7136, Cleveland, OH 44106, USA (e-mail: kcs@case.edu).*

REFERENCES

1. Patient-Centered Medical Home Collaborative. The Patient-Centered Medical Home Collaborative
2. **Rosenthal TC.** The medical home: growing evidence to support a new approach to primary care. J Am Board Fam Med. 2008;21(5):427–40.
3. **Rogers JC.** The patient-centered medical home movement–promise and peril for family medicine. J Am Board Fam Med. 2008;21(5):370–4.
4. **Rittenhouse DR, Shortell SM.** The patient-centered medical home: will it stand the test of health reform? Jama. 2009;301(19):2038–40.
5. **Bodenheimer T.** Primary care–will it survive? N Engl J Med. 2006;355 (9):861–4.
6. **Bodenheimer T.** The future of primary care: transforming practice. N Engl J Med. 2008;359(20):2086–9.
7. **Larson EB, Fihn SD, Kirk LM, et al.** The future of general internal medicine. Report and recommendations from the Society of General Internal Medicine (SGIM) Task Force on the Domain of General Internal Medicine. J Gen Intern Med. 2004;19(1):69–77.
8. **Sandy LG, Schroeder SA.** Primary care in a new era: disillusion and dissolution? Ann Intern Med. 2003;138(3):262–7.
9. **Sandy LG, Bodenheimer T, Pawlson LG, Starfield B.** The political economy of U.S. primary care. Health Aff (Millwood). 2009;28(4):1136–45.
10. National Committee for Quality Assurance. Physician Practice Connections®-Patient-Centered Medical HomeTM. http://www.ncqa.org/tabid/631/Default.aspx, accessed 2010.
11. **Rittenhouse DR, Casalino LP, Gillies RR, Shortell SM, Lau B.** Measuring the medical home infrastructure in large medical groups. Health Aff (Millwood). 2008;27(5):1246–58.
12. **Friedberg MW, Safran DG, Coltin KL, Dresser M, Schneider EC.** Readiness for the patient-centered medical home: structural capabilities of Massachusetts primary care practices. J Gen Intern Med. 2009;24(2):162–9.
13. **Barr MS.** The need to test the patient-centered medical home. Jama. 2008;300(7):834–5.
14. Patient Centered Primary Care Collaborative. 2009 PCPP Pilot Guide: Proof in Practice. A compilation of patient centered medical home pilot and demonstration projects. Washington, D.C.: National Committee for Quality Assurance; 2009:90.
15. **Donaldson MS, Yordy KD, Lohr KN, Vanselow NA**, eds. Primary care America's health in a new era. Washington D.C.: National Academy Press; 1996.
16. **Starfield B, Shi LY, Macinko J.** Contribution of primary care to health systems and health. Milbank Q. 2005;83(3):457–502.
17. **Chan M.** Return to Alma-Ata. Lancet. 2008;372(9642):865–6.
18. **Chan M.** Primary health care as a route to health security. Lancet. 2009;373(9675):1586–7.
19. **Ferrer RL, Hambidge SJ, Maly RC.** The essential role of generalists in health care systems. Ann Intern Med. 2005;142(8):691–9.
20. **Casalino LP.** The unintended consequences of measuring quality on the quality of medical care. N Engl J Med. 1999;341(15):1147–50.
21. **Weyer SM, Bobiak S, Stange KC.** Possible unintended consequences of a focus on performance: insights over time from the research association of practices network. Qual Manag Health Care. 2008;17 (1):47–52.
22. **Roland M.** Pay-for-performance: too much of a good thing? A conversation with Martin Roland. Interview by Robert Galvin. Health Aff (Millwood). 2006;25(5):w412–9.
23. **Werner RM, Asch DA.** The unintended consequences of publicly reporting quality information. Jama. 2005;293(10):1239–44.
24. **Campbell SM, McDonald R, Lester H.** The experience of pay for performance in english family practice: a qualitative study. Ann Fam Med. 2008;6(3):228–34.
25. **Werner RM, McNutt R.** A new strategy to improve quality: rewarding actions rather than measures. Jama. 2009;301(13):1375–77.
26. **Nutting PA, Miller WL, Crabtree BF, Jaén CR, Stewart EE, Stange KC**. Initial lessons from the first national demonstration project on practice transformation to a patient-centered medical home. Ann Fam Med. 2009;254–60.
27. The medical home. Pediatrics. 2003;110(1 Pt 1):184-186.
28. **Sia C, Tonniges TF, Osterhus E, Taba S.** History of the medical home concept. Pediatrics. 2004;113(5 Suppl):1473–8.
29. **Martin JC, Avant RF, Bowman MA, et al.** The future of family medicine: a collaborative project of the family medicine community. Ann Fam Med. 2004;2(Suppl 1):S3–32.
30. American College of Physicians (ACP). The Advanced Medical Home: A Patient-Centered, Physician-Guided Model of Health Care; 2006.
31. **Task Force 1 Writing Group, Green A, Graham R, et al.** Task Force 1. Report of the task force on patient expectations, core values, reintegration, and the new model of family medicine. Ann Fam Med. 2004;2 (Suppl 1):S33–50.
32. Institute of Medicine: Committee on Quality of Health Care in America. Crossing the Quality Chasm: A new health system for the 21st century. Washington DC: National Academy Press; 2001.
33. **Zweifler J.** The missing link: improving quality with a chronic disease management intervention for the primary care office. Ann Fam Med. 2007;5(5):453–6.
34. **Scherger JE.** Primary care needs a new model of office practice. BMJ. 2005;330(7504):E358–9.
35. **Robert Graham Center.** The Patient Centered Medical Home: History, seven core features, evidence and transformational change. Washington, DC; 2007.
36. **Starfield B.** Primary care: balancing health needs, services, and technology. New York: Oxford University Press; 1998.
37. **McWhinney IR, Freeman T.** Textbook of family medicine. 3rd ed. New York: Oxford University Press; 2009.
38. **Stange KC, Jaén CR, Flocke SA, Miller WL, Crabtree BF, Zyzanski SJ.** The value of a family physician. J Fam Pract. 1998;46(5):363–8.
39. **Reid RJ, Fishman PA, Yu O, et al.** Patient-centered medical home demonstration: a prospective, quasi-experimental, before and after evaluation. Am J Manag Care. 2009;15(9):e71–87.
40. TransforMED. The TransforMED Patient-Centered Model.
41. **Fortney JC, Pyne JM, Edlund MJ, et al.** A randomized trial of telemedicine-based collaborative care for depression. J Gen Intern Med. 2007;22(8):1086–93.
42. **Peek CJ.** Integrating care for persons, not only diseases. J Clin Psychol Med Settings. 2009;16(1):13–20.
43. **Harkness EF, Bower PJ.** On-site mental health workers delivering psychological therapy and psychosocial interventions to patients in primary care: effects on the professional practice of primary care providers. Cochrane Database Syst Rev. 2009;1:CD000532.
44. **Nutting PA, Gallagher K, Riley K, et al.** Care management for depression in primary care practice: findings from the RESPECT-

Depression trial. Ann Fam Med. 2008;6(1):30–7.
45. **Fortin M, Bravo G, Hudon C, Vanasse A, Lapointe L.** Prevalence of multimorbidity among adults seen in family practice. Ann Fam Med. 2005;3(3):223–8.
46. **Noel PH, Parchman ML, Williams JW Jr, et al.** The challenges of multimorbidity from the patient perspective. J Gen Intern Med. 2007;22(Suppl 3):419–24.
47. **Valderas JM, Starfield B, Sibbald B, Salisbury C, Roland M.** Defining comorbidity: implications for understanding health and health services. Ann Fam Med. 2009;7(4):357–63.
48. **Domino ME, Humble C, Lawrence WW Jr, Wegner S.** Enhancing the medical homes model for children with asthma. Med Care. 2009;47 (11):1113–20.
49. **Nutting PA, Dickinson WP, Dickinson LM, et al.** Use of chronic care model elements is associated with higher-quality care for diabetes. Ann Fam Med. 2007;5(1):14–20.
50. **Dorr DA, Wilcox A, Burns L, Brunker CP, Narus SP, Clayton PD.** Implementing a multidisease chronic care model in primary care using people and technology. Dis Manag. 2006;9(1):1–15.
51. **Wagner EH, Glasgow RE, Davis C, et al.** Quality improvement in chronic illness care: a collaborative approach. Jt Comm J Qual Improv. 2001;27(2):63–80.
52. **Barr VJ, Robinson S, Marin-Link B, et al.** The expanded Chronic Care Model: an integration of concepts and strategies from population health promotion and the Chronic Care Model. Hosp Q. 2003;7(1):73–82.
53. **Wagner EH, Bennett SM, Austin BT, Greene SM, Schaefer JK, Vonkorff M.** Finding common ground: patient-centeredness and evidence-based chronic illness care. J Altern Complement Med. 2005;11(Suppl 1):S7–15.
54. **Stange KC.** A science of connectedness. Ann Fam Med. 2009;7(5):387–95.
55. **Fisher ES.** Building a medical neighborhood for the medical home. N Engl J Med. 2008;359(12):1202–5.
56. **Paulus RA, Davis K, Steele GD.** Continuous innovation in health care: implications of the Geisinger experience. Health Aff (Millwood). 2008;27 (5):1235–45.
57. **DuBard CA, Cockerham J.** Community Care of North Carolina and the medical home approach to chronic kidney disease. N C Med J. 2008;69 (3):229–32.
58. **Beach MC, Inui T.** Relationship-centered care. A constructive reframing. J Gen Intern Med. 2006;21(Suppl 1):S3–8.
59. **Cheraghi-Sohi S, Hole AR, Mead N, et al.** What patients want from primary care consultations: a discrete choice experiment to identify patients' priorities. Ann Fam Med. 2008;6(2):107–15.
60. **Berwick DM.** What 'Patient-Centered' Should Mean: Confessions Of An Extremist. Health Aff (Millwood). May 19 2009.
61. **Berenson RA, Hammons T, Gans DN, et al.** A house is not a home: keeping patients at the center of practice redesign. Health Aff (Millwood). 2008;27(5):1219–30.
62. **Solberg LI, Hroscikoski MC, Sperl-Hillen JM, Harper PG, Crabtree BF.** Transforming medical care: case study of an exemplary, small medical group. Ann Fam Med. 2006;4(2):109–16.
63. **Baicker K, Chandra A**. Medicare spending, the physician workforce, and beneficiaries' quality of care. Health Aff (Millwood). 2004;Suppl Web Exclusives:W184–97.
64. **Greenfield S, Nelson EC, Zubkoff M, et al.** Variations in resource utilization among medical specialties and systems of care. Results from the medical outcomes study. Jama. 1992;267(12):1624–30.
65. **Lewin S, Lavis JN, Oxman AD, et al.** Supporting the delivery of cost-effective interventions in primary health-care systems in low-income and middle-income countries: an overview of systematic reviews. Lancet. 2008;372(9642):928–39.
66. **Starfield B**. Primary care and equity in health: The importantce to effectiveness and equity of responsiveness to people's needs. Humanity and Society. 2009;(in press).
67. **Rohde J, Cousens S, Chopra M.** 30 years after Alma-Ata: has primary health care worked in countries? Lancet. 2008;372(9642):950–61.
68. **Ferrer RL.** Pursuing equity: contact with primary care and specialist clinicians by demographics, insurance, and health status. Ann Fam Med. 2007;5(6):492–502.
69. **Beal AC, Doty MM, Hernandez SE, Shea KK, Davis K**. Closing the Divide: How Medical Homes Promote Equity in Health Care: Results From The Commonwealth Fund 2006 Health Care Quality Survey. 2007;62.
70. **Starfield B, Shi L, Grover A, Macinko J**. The effects of specialist supply on populations' health: assessing the evidence. Health Aff (Millwood). 2005;Suppl Web Exclusives:W5-97-W95-107.
71. **Davidoff F.** Heterogeneity is not always noise: lessons from improvement. Jama. 2009;302(23):2580–6.
72. **Meads G.** Primary care in the twenty-first century. Seattle: Radcliffe; 2006.
73. **Stewart EE, Nutting PA, Crabtree BF, Stange KC, Miller WL, Jaén CR**. Implementing the Patient-Centered Medical Home: observation and description of the National Demonstration Project. Ann Fam Med. 2010;8.
74. **Friedberg MW, Lai DJ, Hussey PS, Schneider EC.** A guide to the medical home as a practice-level intervention. Am J Manag Care. 2009;15:S291–9.
75. **Stange KC, Miller WL, Nutting PA, Crabtree BF, Stewart EE, Jaén CR**. Context for understanding the first National Demonstration Project and the Patient-Centered Medical Home. Ann Fam Med. 2010;8.
76. Institute of Medicine. Unequal treatment: Confronting racial and ethnic disparities in healthcare. Washington: The National Academies Press; 2003.
77. **Berwick DM.** A user's manual for th IOM's 'Quality Chasm' report. Health Aff (Millwood). 2002;21(3):80–90.
78. Institute for Healthcare Improvement. Institute for Healthcare Improvement: Accelerating improvement worldwide. http://www.ihi.org/ihi. Accessed February 2, 1010.
79. **Schouten LM, Hulscher ME, van Everdingen JJ, Huijsman R, Grol RP.** Evidence for the impact of quality improvement collaboratives: systematic review. BMJ. 2008;336(7659):1491–4.
80. TransforMED. TransforMED - Transforming Medical Practices. http://www.transformed.com/. Accessed February 2, 2010.
81. **Mitka M.** Large group practices lag in adopting patient-centered "medical home" model. Jama. 2008;300(16):1875.
82. **Goldberg DG, Kuzel AJ.** Elements of the patient-centered medical home in family practices in virginia. Ann Fam Med. 2009;7(4):301–8.
83. **Mambu J.** Re: the patient-centered medical home movement–promise and peril for family medicine. J Am Board Fam Med. 2009;22(1):93–4. Author reply 94.
84. **Nutting PA, Crabtree BF, Miller WL, Stewart EE, Stange KC, Jaén CR**. The journey to the Patient-Centered Medical Home: a qualitative analysis of the experiences of practices in the National Demonstration Project. Ann Fam Med 2010;8 (supplement):(forthcoming).
85. **Miller WL, Crabtree BF, Nutting PA, Stange KC, Jaén CR**. Primary care practice development: A relationship-centered approach. Ann Fam Med. 2010;8 (supplement)(2):(forthcoming).
86. **De Maeseneer J, van Weel C, Egilman D, Mfenyana K, Kaufman A, Sewankambo N.** Strengthening primary care: addressing the disparity between vertical and horizontal investment. Br J Gen Pract. 2008;58 (546):3–4.
87. **Thomas P, Meads G, Moustafa A, Nazareth I, Stange KC.** Combined vertical and horizontal integration of health care - a goal of practice based commissioning. Quality Primary Care. 2008;16(6):425–32.
88. **Stange KC, Ferrer RL.** The paradox of primary care. Ann Fam Med. 2009;7(4):293–9.
89. **Davis K.** Slowing the growth of health care costs–learning from international experience. N Engl J Med. 2008;359(17):1751–5.
90. **Starfield B.** Is US health really the best in the world? Jama. 2000;284 (4):483–5.
91. **Davis K, Schoenbaum SC, Audet AM.** A 2020 vision of patient-centered primary care. J Gen Intern Med. 2005;20(10):953–7.
92. **Davis K.** Paying for care episodes and care coordination. N Engl J Med. 2007;356(11):1166–8.
93. **Spann SJ.** Report on financing the new model of family medicine. Ann Fam Med. 2004;2(Suppl 3):S1–21.
94. **Goroll AH, Berenson RA, Schoenbaum SC, Gardner LB.** Fundamental reform of payment for adult primary care: comprehensive payment for comprehensive care. J Gen Intern Med. 2007;22(3):410–5.
95. **Goroll AH.** The future of primary care: reforming physician payment. N Engl J Med. 2008;359(20):2087–90.
96. **Berenson RA, Rich EC**. How to buy a medical home: or Let a thousand options bloom? How about five? *Patient-Centered Medical Home: Setting a Policy Agenda*; 2009.
97. **Larson EB.** Group Health Cooperative–one coverage-and-delivery model for accountable care. N Engl J Med. 2009;361(17):1620–2.
98. Foundation S. Southcentral Foundation. http://www.southcentralfoundation.com/ Accessed February 2, 2010.
99. American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), American College of Physicians (ACP), American

Osteopathic Association (AOA). Joint principles of the patient-centered medical home. www.medicalhomeinfo.org/Joint%20Statement.pdf. Accessed February 2, 2010.
100. **Barr M, Ginsburg J**. The advanced medical home: a patient-centered, physician-guided model of health care. January 22, 2006; 1-21. Available at: www.acponline.org/hpp/statehc06_5.pdf. Accessed Accessed February 2, 2010.
101. **Starfield B.** The medical home index applies primarily to children with special health care needs. Ambul Pediatr. 2004;4(2):192. author reply 192-193.
102. **DeVoe JE, Wallace LS, Pandhi N, Solotaroff R, Fryer GE Jr.** Comprehending care in a medical home: a usual source of care and patient perceptions about healthcare communication. J Am Board Fam Med. 2008;21(5):441–50.
103. **Daaleman TP.** The medical home: locus of physician formation. J Am Board Fam Med. 2008;21(5):451–7.
104. **Schoen C, Osborn R, Doty MM, Bishop M, Peugh J, Murukutla N.** Toward higher-performance health systems: adults' health care experiences in seven countries. Health Aff (Millwood). 2007;26(6):w717–34.
105. **Landers SH.** The other Medical Home. Jama. 2009;301(1):97–9.
106. Medical home concept still fuzzy. Dis Manag Advis. 2008;14(2):5.
107. **Kirschner N, Barr MS**. Specialists/Subspecialists and the Patient-Centered Medical Home. Chest. 2009;8.
108. **Gottlieb LM.** Learning from Alma Ata: the medical home and comprehensive primary health care. J Am Board Fam Med. 2009; 22(3):242–6.
109. **Green L.** The patient-centered medical home: a discussion at NAPCRG 2008. Ann Fam Med. 2009;7(2):183–4.
110. **Pawlson LG, Bagley B, Barr M, Sevilla X, Torda P, Scholle S**. Patient-Centered Medical Home: From Vision to Reality; 2007.
111. Practitioners AAoN. Nurse practitioners: Promoting access to coordinated primary care.
112. **Stange KC, Ferrer RL**. The paradox of primary care. Ann Fam Med. 2009;7(4): 293–299.
113. **Sugarman J.** Medical home digest. New York: Commonwealth Fund; 2009.
114. Patient-centered primary care collaborative. The patient-centered primary care collaborative.
115. **Loxterkamp D, Kazal LA Jr.** Changing horses midstream: the promise and prudence of practice redesign. Ann Fam Med. 2008;6(2):167–70.
116. **Nutting PA, Crabtree BF, Stewart EE, et al**. Implementing the National Demonstration Project model of the Patient-Centered Medical Home. Ann Fam Med. 2010;8 (supplement): (forthcoming).
117. **Crabtree BF, Nutting PA, Miller WL, Stange KC, Stewart EE, Jaén CR**. After the National Demonstration Project: implications and recommendations. Ann Fam Med. 2010;8 (supplement):(forthcoming).
118. **Jaén CR, Crabtree BF, Palmer R, et al**. Methods for evaluating practice change towards a Patient-Centered Medical Home. Ann Fam Med. 2010;8 (supplement):(forthcoming).
119. **Jaén CR, Ferrer RL, Miller WL, et al**. Patient outcomes at 26 months in the patient-centered medical home national demonstration project. Ann Fam Med. 2010;8 (supplement):(forthcoming).
120. **Wensing M, Van den Hombergh P, Van Doremalen J, Grol R, Szecsenyi J.** General practitioners' workload associated to practice size rather than chronic care organisation. Health Policy. 2009;89 (1):124–9.
121. **Crabtree BF, Miller WL, McDaniel RR, Stange KC, Nutting PA, Jaén CR**. Thriving in an unhealthy environment: building adaptive capacity in primary care. J Fam Pract. 2009;(In press).
122. **Goroll AH, Simon SR, Tripathi M, Ascenzo C, Bates DW.** Community-wide implementation of health information technology: the Massachusetts eHealth Collaborative experience. J Am Med Inform Assoc. 2009;16(1):132–9.
123. **Scherger JE.** Future vision: is family medicine ready for patient-directed care? Fam Med. 2009;41(4):285–8.
124. **Kuzel AJ, Skoch EM.** Achieving a patient-centered medical home as determined by the NCQA–at what cost, and to what purpose? Ann Fam Med. 2009;7(1):85–6.
125. **Rittenhouse DR, Shortell SM, Fisher ES**. Primary Care and Accountable Care – Two Essential Elements of Delivery-System Reform. N Engl J Med. 2009.
126. **Loxterkamp D.** The dream of home ownership. Ann Fam Med. 2009;7 (3):264–6.
127. **Loxterkamp D.** A change will do you good. Ann Fam Med. 2009;7 (3):261–3.
128. **Loxterkamp D.** Benefits of continuity of care. Fam Med. 2009;41 (5):312.
129. **Chokshi DA.** Ensuring progress in primary care–what can health care reform realistically accomplish? N Engl J Med. 2009;361(20):e43.
130. TransforMED. National Demonstration Project www.transformed.com/ndp.cfm. Accessed February 2, 2010.
131. **Stange KC, Miller WL, Crabtree BF, O'Connor PJ, Zyzanski SJ.** Multimethod research: approaches for integrating qualitative and quantitative methods. J Gen Intern Med. 1994;9(5):278–82.
132. **Borkan JM.** Mixed methods studies: a foundation for primary care research. Ann Fam Med. 2004;2(1):4–6.
133. **Creswell JW, Fetters MD, Ivankova NV.** Designing a mixed methods study in primary care. Ann Fam Med. 2004;2(1):7–12.
134. **Tashakkori A, Teddlie C, eds.** Handbook of mixed methods in the behavioral and social sciences. Thousand Oaks: Sage Publications; 2003.
135. **Creswell JW.** Research design: Qualitative, quantitative, and mixed methods approaches. 2nd ed. Thousand Oaks: Sage Publications; 2003.
136. **Stange KC, Miller WL, McWhinney I.** Developing the knowledge base of family practice. Fam Med. 2001;33(4):286–97.
137. **Stange KC, Crabtree BF, Miller WL.** Publishing multimethod research. Ann Fam Med. 2006;4(4):292–4.
138. **Stange KC, Zyzanski SJ.** Integrating qualitative and quantitative research methods. Fam Med. 1989;21(6):448–51.
139. **Shi L, Macinko J, Starfield B, et al.** Primary care, infant mortality, and low birth weight in the states of the USA. J Epidemiol Community Health. 2004;58(5):374–80.
140. **Shi L, Macinko J, Starfield B, Politzer R, Wulu J, Xu J.** Primary care, social inequalities and all-cause, heart disease and cancer mortality in US counties: a comparison between urban and non-urban areas. Public Health. 2005;119(8):699–710.
141. **Shi L, Macinko J, Starfield B, Politzer R, Xu J.** Primary care, race, and mortality in US states. Soc Sci Med. 2005;61(1):65–75.
142. **Shi L, Macinko J, Starfield B, Politzer R, Wulu J, Xu J.** Primary care, social inequalities, and all-cause, heart disease, and cancer mortality in US counties, 1990. Am J Public Health. 2005;95(4):674–80.
143. **Nutting PA, Crabtree BF, Miller WL, Stange KC, Jaén CR, Stewart EE**. Primary care redesign: further lessons from the national demonstration project. Health Aff (Millwood). 2010:(in press)
144. **McGlynn EA.** Intended and unintended consequences: what should we really worry about? Med Care. 2007;45(1):3–5.
145. **Ganz DA, Wenger NS, Roth CP, et al.** The effect of a quality improvement initiative on the quality of other aspects of health care: the law of unintended consequences? Med Care. 2007;45(1):8–18.
146. **Thomas P.** Integrating primary health care: leading, managing, facilitating. Oxford: Radcliffe Publishing; 2006.
147. **Heath I, Rubenstein A, Stange KC, van Driel M.** Quality in primary health care: a multidimensional approach to complexity. BMJ. 2009;338:b1242.
148. **Sturmberg JP.** The foundations of primary care. Oxford: Radcliffe Publishing; 2007.
149. **Stange KC.** The paradox of the parts and the whole in understanding and improving general practice. Int J Qual Health Care. 2002;14(4):267–8.
150. **Miller WL, Crabtree BF, McDaniel R, Stange KC.** Understanding change in primary care practice using complexity theory. J Fam Pract. 1998;46(5):369–76.
151. **McDaniel R, Driebe DJ.** Complexity science and health care management. In: **Blair JD, Myron DG, Savage GT, eds.** Advances in health care management, vol. 2. Stamford: JAI Press; 2000:11–36.
152. **Miller WL, McDaniel RR Jr, Crabtree BF, Stange KC.** Practice jazz: Understanding variation in family practices using complexity science. J Fam Pract. 2001;50(10):872–8.
153. **Plsek PE, Greenhalgh T.** Complexity science: the challenge of complexity in health care. BMJ. 2001;323(7313):625–8.
154. **Crabtree BF.** Primary care practices are full of surprises. Health Care Manage Rev. 2003;28(3):279–83. Discussion 289-290.
155. **Litaker D, Tomolo A, Liberatore V, Stange KC, Aron DC.** Using complexity theory to build interventions that improve health care delivery in primary care. J Gen Intern Med. 2006;21(Suppl 2):S30–4.
156. **Sweeney K.** Complexity in primary care. Oxon: Radcliffe Publishing Ltd; 2006.
157. **Kernick D.** Complexity and Healthcare Organization: a view from the street. San Francisco: Radcliffe Medical Press; 2004.
158. **Stange KC.** The problem of fragmentation. Ann Fam Med. 2009;7 (2):100–3.

159. **Rittenhouse DR, Thom DH, Schmittdiel JA**. Developing a policy-relevant research agenda for the PCMH: A focus on outcomes. *Patient-Centered Medical Home: Setting a Policy Agenda*. Washington, DC; 2009.
160. NCQA. Physician Practice Connections® - Patient-Centered Medical Home℠; 2008.
161. **Solberg LI, Scholle SH, Asche SE, et al.** Practice systems for chronic care: frequency and dependence on an electronic medical record. Am J Manag Care. 2005;11(12):789–96.
162. **Solberg LI, Asche SE, Pawlson LG, Scholle SH, Shih SC.** Practice systems are associated with high-quality care for diabetes. Am J Manag Care. 2008;14(2):85–92.
163. **Scholle SH, Pawlson LG, Solberg LI, et al.** Measuring practice systems for chronic illness care: accuracy of self-reports from clinical personnel. Jt Comm J Qual Patient Saf. 2008;34(7):407–16.
164. **Gilmer TP, O'Connor PJ, Rush WA, et al.** Impact of office systems and improvement strategies on costs of care for adults with diabetes. Diabetes Care. 2006;29(6):1242–8.
165. **Flopttemesch TJ, Scholle SH, O'Connor PJ, Solberg LI, Asche SE, Pawlson G**. Association between practice systems and healthcare utilization for diabetes. Diabetes Care. 2009;(in press).
166. **O'Malley AS, Peikes D, Ginsburg PB**. Qualifying a Physician Practice as a Medical Home Policy Perspective: Insights into Health Policy Issues; No. 1 December, 2008.
167. **Poplin C**. No direction home: a primary care physician questions the medical home model. Health Affairs Blog; 2009.
168. NCQA. Planned Evolution of PPC-PCMH Requirements; 2009.
169. **Safran DG, Kosinsk Mi, Tarlov AR, et al.** The primary care assessment survey: tests of data quality and measurement performance. Med Care. 1998;36(5):728–39.
170. **Safran DG, Karp M, Coltin K, et al.** Measuring patients' experiences with individual primary care physicians. Results of a statewide demonstration project. J Gen Intern Med. 2006;21(1):13–21.
171. **Cassady CE, Starfield B, Hurtado MP, Berk RA, Nanda JP, Friedenberg LA.** Measuring consumer experiences with primary care. Pediatrics. 2000;105(4 Pt 2):998–1003.
172. **Shi L, Starfield B, Xu J.** Validating the adult primary care assessment tool. J Fam Pract. 2001;50(2):161W–175W.
173. **Flocke SA.** Measuring attributes of primary care: development of a new instrument. J Fam Pract. 1997;45(1):64–74.
174. **Flocke SA.** Primary care instrument. J Fam Pract. 1998;46(1):12.
175. **Flocke SA, Miller WL, Crabtree BF.** Relationships between physician practice style, patient satisfaction, and attributes of primary care. J Fam Pract. 2002;51(10):835–40.
176. Agency for Healthcare Research and Quality. The Consumer Assessment of Healthcare Providers and Systems (CAHPS) program: Surveys and Tools to Advance Patient-Centered Care
177. **Bonomi AE, Wagner EH, Glasgow RE, VonKorff M.** Assessment of chronic illness care (ACIC): a practical tool to measure quality improvement. Health Serv Res. 2002;37(3):791–820.
178. **Von Korff M, Glasgow RE, Sharpe M.** Organising care for chronic illness. BMJ. 2002;325(7355):92–4.
179. **Wagner EH, Austin BT, Von Korff M.** Organizing care for patients with chronic illness. Milbank Q. 1996;74(4):511–44.
180. **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.
181. **Howie JG, Heaney DJ, Maxwell M, Walker JJ.** A comparison of a patient enablement instrument (PEI) against two established satisfaction scales as an outcome measure of primary care consultations. Fam Pract. 1998;15(2):165–71.
182. **Howie JG, Heaney DJ, Maxwell M, Walker JJ, Freeman GK, Rai H.** Quality at general practice consultations: cross sectional survey. BMJ. 1999;319(7212):738–43.
183. **Howie JG, Heaney DJ, Maxwell M.** Measuring quality in general practice. Pilot study of a needs, process and outcome measure. Occas Pap R Coll Gen Pract. 1997;75:i–xii. 1-32.
184. **Mercer SW, Maxwell M, Heaney D, Watt GC.** The development and preliminary validation of the consultation and relational empathy (CARE) measure: an empathy-based consultation process measure. Fam Pract. 2004;21(6):699–705.
185. **Heaney DJ, Walker JJ, Howie JG, et al.** The development of a routine NHS data-based index of performance in general practice (NHSPPI). Fam Pract. 2002;19(1):77–84.
186. **Mercer SW, Howie JG.** CQI-2–a new measure of holistic interpersonal care in primary care consultations. Br J Gen Pract. 2006;56(525):262–8.
187. **Howie JG, Heaney D, Maxwell M.** Quality, core values and the general practice consultation: issues of definition, measurement and delivery. Fam Pract. 2004;21(4):458–68.
188. **Sequist TD, Schneider EC, Anastario M, et al.** Quality monitoring of physicians: linking patients' experiences of care to clinical quality and outcomes. J Gen Intern Med. 2008;23(11):1784–90.
189. **Starfield B.** Primary care: concept, evaluation, and policy. New York, NY: Oxford University Press; 1992.
190. **Lévesque J-F, Haggerty J, Burge F, et al**. Canadian experts' views on the importance of attributes within different healthcare oganizational models. Healthcare Policy. 2010:special supplement, in press.
191. **Lévesque J-F, Haggerty J, Beninguisse G, et al**. Mapping the coverage of attributes in validated instruments that evaluate primary healthcare from the consumer perspective. Healthcare Policy. 2010:special supplement, in press.
192. **Haggerty J, Bouharaoui F, Santor D**. Differential item functioning in primary healthcare organizational evaluation instruments by French/English version, educational level and urban/rural location. Healthcare Policy. 2010:special supplement, in press.
193. **Haggerty J, Santor D, Lawson B, Beaulieu C, Fournier M, Burge F**. What patients tell us about primary healthcare evaluation instruments: response formats, bad questions and missing pieces. Healthcare Policy. 2010:special supplement, in press.
194. **Haggerty J, Lévesque J-F, Santor D, et al**. Measuring accessibility from the consumer perspective: comparison of primary healthcare evaluation instruments. *Healthcare Policy*. 2010:special supplement, in press.
195. **Haggerty J, Beaulieu M-D, Pineault R, et al**. Measuring comprehensiveness of care from the consumer perspective: comparison of primary healthcare evaluation instruments. Healthcare Policy. 2010:special supplement, in press.
196. **Burge F, Haggerty J, Beaulieu M-D, Lévesque J-F, Beaulieu C, Santor D**. Measuring relational continuity from the consumer perspective: comparison of primary healthcare evaluation instruments. Healthcare Policy. 2010:special supplement, in press.
197. **Haggerty J, Burge F, Pineault R, et al**. Measuring management continuity from the consumer perspective: comparison of primary healthcare evaluation instruments. *Healthcare Policy*. 2010:special supplement, in press.
198. **Beaulieu M-D, Haggerty J, Beaulieu C, et al**. Measuring interpersonal communication from the consumer perspective: comparison of primary healthcare evaluation instruments. Healthcare Policy. 2010:special supplement, in press.
199. World Health Organization. Commission on Social Determinants of Health - Final Report; 2008.
200. **Epstein RM, Franks P, Fiscella K, et al.** Measuring patient-centered communication in patient-physician consultations: theoretical and practical issues. Soc Sci Med. 2005;61(7):1516–28.
201. **Shields CG, Franks P, Fiscella K, Meldrum S, Epstein RM.** Rochester Participatory Decision-Making Scale (RPAD): reliability and validity. Ann Fam Med. Sep-Oct. 2005;3(5):436–42.
202. **Bobiak SN, Zyzanski SJ, Ruhe MC, et al**. Measuring practice capacity for change – A tool for guiding quality improvement in primary care settings. Quality Management in Health Care. 2009;in press.
203. **Ohman-Strickland PA, John Orzano A, Nutting PA, et al.** Measuring organizational attributes of primary care practices: development of a new instrument. Health Serv Res. 2007;42(3 Pt 1):1257–73.
204. **Tallia AF, Lanham HJ, McDaniel RR Jr, Crabtree BF.** 7 characteristics of successful work relationships. Fam Pract Manag. 2006;13 (1):47–50.
205. **Fortin M, Bravo G, Hudon C, Lapointe L, Dubois MF, Almirall J.** Psychological distress and multimorbidity in primary care. Ann Fam Med. 2006;4(5):417–22.
206. **Fortin M, Bravo G, Hudon C, et al.** Relationship between multimorbidity and health-related quality of life of patients in primary care. Qual Life Res. 2006;15(1):83–91.
207. **Fortin M, Dubois MF, Hudon C, Soubhi H, Almirall J.** Multimorbidity and quality of life: a closer look. Health Qual Life Outcomes. 2007;5(1):52.
208. **Fortin M, Soubhi H, Hudon C, Bayliss EA, van den Akker M.** Multimorbidity's many challenges. Time to focus on the needs of this vulnerable and growing population. BMJ. 2007;334(7602):1016–7.
209. **Starfield B, Lemke KW, Herbert R, Pavlovich WD, Anderson G.** Comorbidity and the use of primary care and specialist care in the elderly. Ann Fam Med. 2005;3(3):215–22.

210. **Starfield B.** Threads and yarns: weaving the tapestry of comorbidity. Ann Fam Med. 2006;4(2):101–3.
211. **Beasley JW, Hankey TH, Erickson R, et al.** How many problems do family physicians manage at each encounter? A WReN study. Ann Fam Med. 2004;2(5):405–10.
212. **Flocke SA, Goodwin MA, Stange KC.** The effect of a secondary patient on the family practice visit. J Fam Pract. 1998;46(5):429–34.
213. **Flocke SA, Frank SH, Wenger DA.** Addressing multiple problems in the family medicine office visit. J Fam Pract. 2001;50(3):211–6.
214. **Howie JG, Heaney DJ, Maxwell M.** Care of patients with selected health problems in fundholding practices in Scotland in 1990 and 1992: needs, process and outcome. Br J Gen Pract. 1995;45(392): 121–6.
215. **Franks P, Clancy CM, Nutting PA.** Gatekeeping revisited–protecting patients from overtreatment. N Engl J Med. 1992;327(6):424–9.
216. ECHO™Development Team. Experience of Care and Health Outcomes Survey (ECHO™). http://www.hcp.med.harvard.edu/echo/home.html. Accessed January 31, 2010.
217. Bright Futures Tools for Professionals. Cultural Competence Assessment—Primary Care.
218. **Carrillo JE, Green AR, Betancourt JR.** Cross-cultural primary care: a patient-based approach. Ann Intern Med. 1999;130(10):829–34.
219. The Ambulatory Care Quality Alliance Recommended Starter Set: Clinical Performance Measures for Ambulatory Care. May 2005; http://www.ahrq.gov/qual/aqastart.htm. Accessed February 2, 2010.
220. **Orzano AJ, Gregory PM, Nutting PA, Werner JJ, Flocke SA, Stange KC.** Care of the secondary patient in family practice. A report from the Ambulatory Sentinel Practice Network. J Fam Pract. 2001;50 (2):113–8.
221. **Egnew TR.** The meaning of healing: transcending suffering. Ann Fam Med. 2005;3(3):255–62.
222. **Egnew TR.** Suffering, meaning, and healing: challenges of contemporary medicine. Ann Fam Med. 2009;7(2):170–5.
223. **Scott JG, Cohen D, DiCicco-Bloom B, Miller WL, Stange KC, Crabtree BF.** Understanding healing relationships in primary care. Ann Fam Med. 2008;6(4):315–22.
224. **Hsu C, Phillips WR, Sherman KJ, Hawkes R, Cherkin DC.** Healing in primary care: a vision shared by patients, physicians, nurses, and clinical staff. Ann Fam Med. 2008;6(4):307–14.
225. **Haggerty JL, Reid RJ, Freeman GK, Starfield BH, Adair CE, McKendry R.** Continuity of care: a multidisciplinary review. BMJ. 2003;327(7425):1219–21.
226. **Saultz JW, Albedaiwi W.** Interpersonal continuity of care and patient satisfaction: a critical review. Ann Fam Med. 2004;2(5):445–51.
227. **Saultz JW, Lochner J.** Interpersonal continuity of care and care outcomes: a critical review. Ann Fam Med. 2005;3(2):159–66.
228. **Mainous AG 3rd, Goodwin MA, Stange KC.** Patient-physician shared experiences and value patients place on continuity of care. Ann Fam Med. 2004;2(5):452–4.
229. **Nutting PA, Goodwin MA, Flocke SA, Zyzanski SJ, Stange KC.** Continuity of primary care: to whom does it matter and when? Ann Fam Med. 2003;1(3):149–55.
230. **Epstein RM, Fiscella K, Lesser C, Stange KC**. Defining and Achieving Patient-Centered Care: The Role of Clinicians, Patients and Healthcare Systems. Health Aff (Millwood). 2009;(in press).
231. **Scott T, Mannion R, Davies H, Marshall M.** The quantitative measurement of organizational culture in health care: a review of the available instruments. Health Serv Res. 2003;38(3):923–45.
232. **Rivo ML, Saultz JW, Wartman SA, DeWitt TG.** Defining the generalist physician's training. Jama. 1994;271(19):1499–504.
233. **Haight RO, Marsland DW, Mitchell GS Jr.** Clinical and educational implications of a longitudinal audit for asthma. J Fam Pract. 1976;3 (5):481–5.
234. **Marsland DW, Wood M, Mayo F.** Content of family practice. Part I. Rank order of diagnoses by frequency. Part II. Diagnoses by disease category and age/sex distribution. J Fam Pract. 1976;3(1):37–68.
235. **Marsland DW, Wood M, Mayo F.** A data bank for patient care, curriculum, and research in family practice: 526, 196 patient problems. J Fam Pract. 1976;3(1):25–8.
236. **Stange KC, Zyzanski SJ, Jaén CR, et al.** Illuminating the 'black box'. A description of 4454 patient visits to 138 family physicians. J Fam Pract. 1998;46(5):377–89.
237. **DesRoches CM, Campbell EG, Rao SR, et al.** Electronic health records in ambulatory care–a national survey of physicians. N Engl J Med. 2008;359(1):50–60.
238. **McGlynn EA, Asch SM, Adams J, et al.** The quality of health care delivered to adults in the United States. N Engl J Med. 2003;348 (26):2635–45.
239. **Kohn LT, Corrigan JM, Donaldson MS**, eds. To err is human. Building a safer health system. Washington: National Academy Press; 2000.
240. **Fortin M, Dionne J, Pinho G, Gignac J, Almirall J, Lapointe L.** Randomized controlled trials: do they have external validity for patients with multiple comorbidities? Ann Fam Med. 2006;4(2):104–8.
241. **Callahan EJ, Jaén CR, Crabtree BF, Zyzanski SJ, Goodwin MA, Stange KC.** The impact of recent emotional distress and diagnosis of depression or anxiety on the physician-patient encounter in family practice. J Fam Pract. 1998;46(5):410–8.
242. **Medalie JH, Zyzanski SJ, Langa D, Stange KC.** The family in family practice: is it a reality? J Fam Pract. 1998;46(5):390–6.
243. **Mold JW, Blake GH, Becker LA.** Goal-oriented medical care. Fam Med. 1991;23(1):46–51.
244. **Seifert MH.** Patient advisory council cuts malpractice costs. Patient Educ Newsl. 1984;7(5):1–2.
245. **Schoen C, Osborn R, Huynh PT, Doty M, Peugh J, Zapert K.** On the front lines of care: primary care doctors' office systems, experiences, and views in seven countries. Health Aff (Millwood). 2006;25 (6):w555–71.
246. **Scheffler R, Bodenheimer T, Lombardo P, et al.** The future of primary care–the community responds. N Engl J Med. 2008;359(25):2636–9.
247. **Lee TH, Bodenheimer T, Goroll AH, Starfield B, Treadway K.** Perspective roundtable: redesigning primary care. N Engl J Med. 2008;359(20):e24.
248. **Morrison I, Smith R.** Hamster health care. BMJ. 2000;321 (7276):1541–2.
249. **Macinko J, Starfield B, Shi L.** Quantifying the health benefits of primary care physician supply in the United States. Int J Health Serv. 2007;37(1):111–26.
250. **Geyman J.** The corporate transformation of health care: can the public interest still be served? New York: Springer Publishing Company; 2004.
251. **Geyman JP.** Health care in America: can our ailing system be healed? Boston: Butterworth-Heinemann; 2002.
252. **Bobrow RS.** The unintended consequences of measuring quality on the quality of medical care. N Engl J Med. 2000;342(7):519. author reply 520.
253. **Acheson LS, Stange KC, Zyzanski S.** Clinical genetics issues encountered by family physicians. Genet Med. 2005;7(7):501–8.
254. **O'Neill SM, Rubinstein WS, Wang C, et al.** Familial risk for common diseases in primary care: the Family Healthware Impact Trial. Am J Prev Med. 2009;36(6):506–14.
255. **Rhyne R, Bogue R, Kukulka G, Fulmer H, eds.** Community-oriented primary care: health care for the 21st century. Washington: American Public Health Association; 1998.
256. **Stange KC, Gjeltema K, Woolf SH.** One minute for prevention: the power of leveraging to fulfill the promise of health behavior counseling. Am J Prev Med. 2002;22(4):320–3.
257. **Stange KC, Woolf SH.** Policy options to enable high-value preventive care: an analysis commissioned by the partnership for prevention. Washington: Partnership for Prevention; 2008.
258. **Woolf SH, Stange KC.** A sense of priorities for the health care commons. Am J Prev Med. 2006;31(1):99–102.
259. **Etz RS, Cohen DJ, Woolf SH, et al.** Bridging primary care practices and communities to promote healthy behaviors. Am J Prev Med. 2008;35:S390–7.
260. **Green LW, Cifuentes M, Glasgow RE, Stange KC.** Redesigning primary care practice to incorporate health behavior change: prescription for health round 2 results. Am J Prev Med. 2008;35:S347–9.
261. **Nutting P.** Community-oriented primary care: From principle to practice. Washington, DC: U.S. Government Printing Office; 1987. DHHS Publication No. HRS-A-PE 86-1 (Now available from the University of New Mexico Press)
262. Task Force on Community Preventive Services. The Community Guide: What Works to Promote Health: Community Guide Branch National Center for Health Marketing (NCHM) Centers for Disease Control and Prevention 2009.
263. **Willis J.** Friends in low places. Abingdon, Oxon: Radcliffe Medical Press; 2001.
264. **Sox HC.** Medical professionalism in the new millennium: a physician charter. Ann Intern Med. 2002;136(3):243–6.
265. **Willis J.** The paradox of progress. Abingdon, Oxon: Radcliff Medical Press, Ltd; 2002.

266. **Doran T, Fullwood C, Gravelle H, et al.** Pay-for-performance programs in family practices in the United Kingdom. N Engl J Med. 2006;355(4):375–84.
267. **Grant S, Huby G, Watkins F, et al.** The impact of pay-for-performance on professional boundaries in UK general practice: an ethnographic study. Sociol Health Illn. 2009;31(2):229–45.
268. **Robinson JC, Casalino LP, Gillies RR, Rittenhouse DR, Shortell SS, Fernandes-Taylor S.** Financial incentives, quality improvement programs, and the adoption of clinical information technology. Med Care. 2009;47(4):411–7.
269. **Geyman J.** Shredding the social contract: the privatization of medicare. Monroe: Common Courage Press; 2006.
270. **Geyman J.** The corrosion of medicine: can the profession reclaim its moral legacy? Monroe: Common Courage Press; 2008.
271. **Brody H.** Hooked: ethics, the medical profession, and the pharmaceutical industry. Lanham: Rowman & Littlefield Publishers, Inc.; 2007.
272. TransforMED. The TransforMED Model; 2009. http://www.transformed.com/transformed.cfm, Accessed February 2, 2010.