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RESEARCH ARTICLE

Trust and Reflection in Primary Care Practice Redesign

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Objective. To test a conceptual model of relationships, reflection, sensemaking, and learning in primary care practices transitioning to patient-centered medical homes (PCMH).

Data Sources/Study Setting. Primary data were collected as part of the American Academy of Family Physicians' National Demonstration Project of the PCMH.

Study Design. We conducted a cross-sectional survey of clinicians and staff from 36 family medicine practices across the United States. Surveys measured seven characteristics of practice relationships (trust, diversity, mindfulness, heedful interrelation, respectful interaction, social/task relatedness, and rich and lean communication) and three organizational attributes (reflection, sensemaking, and learning) of practices.

Data Collection/Extraction Methods. We surveyed 396 clinicians and practice staff. We performed a multigroup path analysis of the data. Parameter estimates were calculated using a Bayesian estimation method.

Principal Findings. Trust and reflection were important in explaining the characteristics of practice relationships and their associations with sensemaking and learning. The strongest associations between relationships, sensemaking, and learning were found under conditions of high trust and reflection. The weakest associations were found under conditions of low trust and reflection.

Conclusions. Trust and reflection appear to play a key role in moderating relationships, sensemaking, and learning in practices undergoing practice redesign.

Key Words. Practice redesign, relationships, reflection, sensemaking, learning

There is increasing recognition that improving the current U.S. health care system will require achieving the triple aim of improving patient experiences, improving the health of populations, and lowering per capita expense (Berwick, Nolan, and Whittington 2008). The patient-centered medical home (PCMH) is a mechanism for meeting these objectives in primary care (Landon et al. 2010). Becoming a PCMH requires primary care practices to shift

approaches to care delivery from reactive, episodic, and clinician-directed to proactive, continuous, coordinated, and team-based (Wagner et al. 2012). Likewise, implementing the PCMH model introduces new economic, technical, and social challenges for practices, including how to best align external financial incentives with goals for practice innovation (Rittenhouse et al. 2014), how to leverage electronic health records systems to measure and track key processes of care outcomes (Tai-Seale et al. 2014), and how to keep patients at the center of practice redesign (Berenson et al. 2008). Recent reports from the nation's largest PCMH, the Veterans Health Administration's Patient Aligned Care Team model, depict similar challenges, with further emphasis on the need to engage leadership in meaningful PCMH change, facilitate team-based care with activated patients rather than clinician-directed care, and provide patients with access to their care teams (Reid and Wagner 2014).

One consistent theme emerging from such PCMH demonstration projects is the importance of the human infrastructure in practice redesign (Nutting et al. 2009, 2011; Homer and Baron 2010; Jaén et al. 2010). The need for practices to exhibit an *adaptive reserve* (the ability of practices to keep up with rapid developments and environmental changes) was perhaps the most significant finding from the National Demonstration Project (NDP) of the PCMH

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(Miller et al. 2010). Adaptive reserve in the NDP practices was significantly associated with a practice's ability to transition to a PCMH. Practices with adaptive reserve advanced along a change trajectory of slow, continuous improvement punctuated by occasional periods of rapid transformation toward a PCMH (Miller et al. 2010).

Relationships, reflection, sensemaking, and learning are pivotal dimensions of adaptive reserve (Miller et al. 2010). Practice *relationships* encompass the ways in which practice members interact and communicate with each other as they provide care for patients (Lanham et al. 2009). *Reflection* is the ongoing critical and developmental evaluation of action (Schön 1983). *Sense-making* is the process by which individuals assign meaning to experience (Weick 1995). *Learning* is the process by which the mental models and behaviors of individuals undergo change (Argyris and Schön 1978). Knowledge of how these variables are interrelated and work together in practices undergoing major change is limited. In this study, we examine how relationships, reflection, sensemaking, and learning are structured in practices undergoing PCMH practice redesign and develop empirically based suggestions for how these variables might be used to help primary care practices transition to PCMH.

Practice Relationships

The relationships among practice members are important influencers of a practice's capacity to deliver primary and preventive care services (Miller et al. 2001; Stroebel et al. 2005; Tallia et al. 2006; Geller et al. 2008). Several theory-building manuscripts on the role of relationships in primary care practices have argued the need for practices to improve practice relationships as a strategy for improving practice performance on both clinical and nonclinical outcomes (Lanham et al. 2009; Miller et al. 2010). In the evolving new chapter of primary care, where work tasks are highly interdependent, practice transformation is ubiquitous, and the systems and communities around practices are ever-changing, practice relationships are fundamentally important.

Reflection

Reflection is the ongoing critical and developmental evaluation of action (Schön 1983), as well as stepping back from action to gain perspective (Stange 2009). Reflection-in-action occurs in real-time—as people are performing a task, they are thinking about the task and changing their behavior in the

moment as needed to accomplish the task. For example, practice members reflect-in-action when coordinating care for a patient with an acute care need. Reflection-on-action occurs after a task has been completed or an event has occurred. In this type of reflection, people think about what happened and develop ideas for modifying future behavior. Reflection can be individual or social in nature and is enhanced, or inhibited, by the relationships among the individuals in a system (Schön 1983; Stroebel et al. 2005). As primary care practices move toward patient-centered models of care, reflection will likely be critical to help practices implement the changes and tie into core motivations.

Sensemaking

Sensemaking is “a diagnostic process directed at constructing plausible interpretations of ambiguous cues that are sufficient to sustain action” (Weick 2005). Effective sensemaking is associated with safe, high-quality care (Weick 2002; Manojlovich 2010). People act based on the sense they make of what has happened or is happening (Weick 1995). Effective sensemaking is more likely to lead to productive action than ineffective sensemaking (Weick 1993). As an example, Ghaferi, Birkmeyer, and Dimick (2009) examined differences in complication rates between hospitals with low and high mortality rates and expected to be able to explain the differences in mortality with differences in complication rates. Instead, they found no difference in complication rates—what differed was how quickly the complications at each hospital were recognized and treated. The authors termed the inability to recognize and treat complications “failure-to-rescue.” What Ghaferi, Birkmeyer, and Dimick (2009) call failure-to-rescue is analogous to ineffective sensemaking. Sensemaking is particularly important in work contexts characterized by high ambiguity, or where information can be interpreted in more than one way (Maitlis and Christianson 2014). Because sensemaking is a social activity, the relationships among practice members are important (Weick 1995).

Learning

Learning is often overlooked and/or misunderstood in primary care practice improvement. Rather than conceptualizing learning as occurring only at an individual level where, for instance, a nurse attends a conference or a physician completes online continuing education training, we conceptualize learning as a social process whereby the mental models and behaviors of

individuals undergo change (Argyris and Schön 1978; Huber 1991; Langer 1997; Edmondson 1999). For example, practice members may learn how to more effectively manage higher patient volumes during flu season, or how to communicate with patients between in-person visits. In practices where learning occurs, patients are more likely to receive safe, high-quality care (Langer 1997; Edmondson 2003). A recent study examining learning in primary care practices found that *reciprocal learning*, or learning that occurs through a shared, back and forth, iterative and building process, was associated with how well practices were organized to care for patients with chronic disease (Leykum et al. 2010). Conceptualizing learning as a practice-level attribute highlights the interdependencies between learning and relationships and suggests a key role for learning in practice redesign.

Knowledge about how relationships, reflection, sensemaking, and learning individually influence practice outcomes exists (Schön 1983; Miller et al. 2001; Weick 2002; Leykum et al. 2007, 2010; Lanham et al. 2009; Crabtree et al. 2010; Nutting et al. 2011). A gap, however, exists in knowledge of how these variables interact with each other in practice. Better understandings of the interdependencies among these variables will generate new knowledge about the role of the human infrastructure in primary care practices and contribute insights into managing primary care redesign.

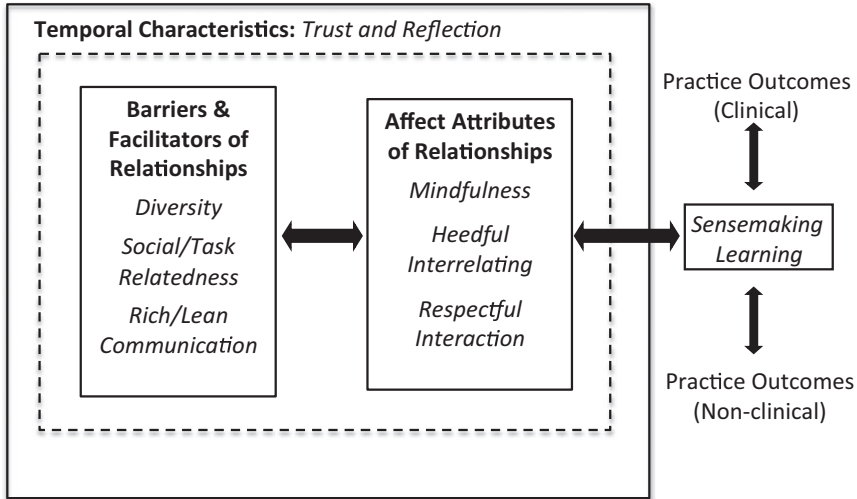
METHODS

We develop and test a revised conceptual model (see Figure 1) of practice relationships focusing on three new dimensions. As with the original model, we approached model refinement using complex adaptive systems as a guiding conceptual framework (Gell-Mann 1994; Anderson 1999). We use a path model, including a Bayesian estimation method to calculate parameter estimates, test the new model, and examine how seven relationship characteristics are structured and how they interact with reflection, sensemaking, and learning in practices transitioning to PCMH.

Model Development

Model development started with an existing model of practice relationships (Lanham et al. 2009). This model was the result of an integrative mixed-methods analysis synthesizing the main findings from four large national studies of primary care practice change (Crabtree et al. 2011). In this analysis, we identi-

Figure 1: A Priori Model of Relationships, Reflection, Sensemaking, and Learning



fied seven characteristics of relationships associated with practice performance in providing preventive care services to patients: *trust* (willingness to be vulnerable to others), *diversity* (our definition centered on cognitive diversity, or differences in individual perspectives of the world, as opposed to the more traditionally applied demographic-oriented diversity), *mindfulness* (openness to new ideas, new ways of doing things; fully engaged presence; rich discriminating awareness to detail; seeking novelty even in routine situations), *heedful interrelation* (interaction in which individuals pay attention to the task at hand [their job] and are sensitive to the way their actions affect the group), *respectful interaction* (honest, self-confident and appreciative interaction; “respect for my ideas and the ideas of others”), *rich and lean communication* (the effective use of multiple communication channels; for example, e-mail, face-to-face, phone), and *social/task relatedness* (mix of work- and nonwork-related conversations and activities). Detailed descriptions of these variables along with examples of how they appear in practice are provided in the original research (Lanham et al. 2009). All seven characteristics were simply conceptualized as interrelated and equally weighted in terms of importance in influencing practice-level outcomes.

As we continued to apply this model in our studies, we began to recognize the need to further categorize the seven characteristics. We subsequently

revised the model to include three dimensions: (1) temporal, (2) affective, and (3) barriers/facilitators.

For the first dimension, we classified trust and reflection as temporal in nature, perhaps serving as pre- and postconditions for effective practice relationships to develop. Based on previous observations from our own studies (Crabtree et al. 2011) and the literature, time appears to be an important component of these constructs. Trust is a relationally intricate and complex behavior, but it is also a precursor to effective group decision making and action (Meyerson, Weick, and Kramer 1996; Jarvenpaa and Leidner 1998; Jarvenpaa, Shaw, and Staples 2004; Paul and McDaniel 2004). When clinic members trust each other, they may be more likely to point out potential safety issues with current practices or make suggestions regarding practice improvement. Thus, we conceptualize trust as necessary to have in place, at some level, prior to practices having the capacity to efficiently establish and grow other components of practice relationships. Likewise, reflection is often discussed as an activity that is practiced, ongoing, and iterative over time (Schön 1983). Reflection is a multifaceted, disciplined, intellectual and emotional activity that takes time and attention to carry out successfully (Dewey 1933). Reflection happens during or after action, giving people the time and space needed to generate new meaning and shared understanding of events (Schön 1983; Dvora and Tsoukas 2009).

For the second dimension (affect attributes of relationships), we classified mindfulness, heedful interrelation, and respectful interaction as descriptors of relationships that form the affective core of practice relationships. Openness to new ideas and rich discriminating awareness of detail (mindfulness), understanding how individual's actions impact the group (heedful interrelation), and respecting one's own opinions and contributions while respecting the opinions and contributions of others (respectful interaction) are important in understanding the emotional tone of how individuals in work groups interact. Health care delivery systems are highly uncertain and ambiguous and the work in these systems involves intricate task coordination, mimicking many of the other complex systems where these constructs are typically studied (e.g., education systems, natural disasters, aviation systems).

For the third dimension (barriers/facilitators of relationships), we classified diversity, social/task relatedness, and rich and lean communication as mechanisms that enable or constrain practice relationships. Cognitive diversity in a practice (diversity), the degree to which interactions are socially or task oriented (social/task relatedness), and the ability of practices to effectively select communication channels to transfer information (rich/lean communica-

tion) are important in that they can either amplify or dampen the quality of the interactions in practices. These barriers and facilitators are important to understand in the context of practice redesign.

Data Collection and Analysis

We used clinician and staff surveys from 36 highly motivated family medicine practices across the United States to evaluate this new conceptual model (Figure 1). A technical advisory committee from a national pool of 337 practices selected the practices. Practices that appeared ready to implement the PCMH model, and that as a group were maximally diverse in geographic location, size, age, physician and staff makeup, ownership, and scope of practice were selected. Practices were located in 25 states, with 11 (31 percent) operating out of rural communities, 16 (44 percent) in suburban areas, and 9 (25 percent) in urban areas. Ten practices (28 percent) were solo physicians (some using a midlevel clinician), 8 practices (22 percent) were small (2–3 physicians), 10 practices (28 percent) were medium-sized (4–6 physicians), and 8 practices (22 percent) were large (≥ 7 physicians). Twenty-two practices (61 percent) were owned by physicians, 1 practice (3 percent) was owned by a governing board, and 13 practices (36 percent) were owned by larger hospital or medical systems. Please see Table 1 in Nutting et al. (2010) for more detail on the practices. According to published reports, this set of practices was similar in distribution of size and ownership status to practices in the United States at the time of data collection, and were on trend with respect to these dimensions with practices nationally between 2003 and 2013 (Hing and Burt 2007; Kane and Emmons 2013; Kirchhoff 2013).

Cross-sectional, self-administered surveys of practice personnel were performed as part of the American Academy of Family Physicians' NDP of the PCMH in 2006. The Clinician Staff Questionnaire (CSQ) was distributed in person to all clinical and nonclinical staff at each practice. CSQ measured seven characteristics of practice relationships (trust, diversity, mindfulness, heedful interrelation, respectful interaction, social/task relatedness, rich and lean communication) and three organizational attributes within practices (reflection, sensemaking, and learning). We collected 396 completed questionnaires (59 percent response rate). Clinicians and staff who agreed to participate returned the CSQ by mail directly to the study center. Table 1 lists these characteristics of practice relationships, reflection, sensemaking, and learning and provides the survey items for each. Additional details on data

Table 1: List of Key Variables and Corresponding Survey Items

<i>Variable</i>	<i>Survey Items</i>
Trust	I can rely on the other people in this practice to do their jobs well.
Reflection	After trying something new, we take time to think about how it worked. We regularly take time to reflect on how we do things.
Mindfulness	People in our practice actively seek new ways to improve how we do things. Our practice is able to easily adjust routines to deal with unusual situations. People at all levels of this office openly talk about what is and isn't working. People in this practice are thoughtful about how they do their jobs.
Heedful interrelation	People are aware of how their actions affect others in this practice.
Respectful interaction	People in this practice understand how their jobs fit into the rest of the practice. Most people in this practice are willing to change how they do things in response to feedback from others.
Diversity	I am comfortable telling people in my practice what I really think. People in this practice are able to disagree but still get along with each other. I am aware of my racial/ethnic/cultural stereotypes. This practice values people who have different points of view. This practice encourages everyone (front office staff, clinical staff, nurses, and clinicians) to share ideas. People in this practice actively seek out the opinions of others. Everybody in this practice tends to think the same about important issues. (negatively scored)
Social/task relatedness	Staff rarely get together to talk about their work. (negatively scored) People in this practice regularly talk about their personal lives.
Rich/lean communication	We regularly take time to consider ways to improve how we do things. Difficult problems are solved through face-to-face discussions in this practice. Everyday information is communicated in this practice through memos, post-it notes, or e-mails.
Sensemaking	People in this practice have the information that they need to do their jobs well. When we experience a problem in the practice, we make a serious effort to figure out what's really going on.
Learning	This practice learns from its mistakes. It is hard to get things to change in our practice. (negatively scored) Our practice likes to be on the cutting edge of new ideas.

collection, survey respondents, and a copy of the questionnaire were published previously (Jaén et al. 2010).

Statistical Methods

A multigroup path model was used to test the structural hypotheses in Figure 1 across three separate trust/reflection conditions (low, moderate, and high). The three conditions were derived from the two reflection items and the single trust item shown in Table 1. The response categories for these items where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and

5 = strongly disagree. These items were summed and divided by three to form a composite score (coefficient alpha = .74). Scores under 3 were considered low ($n = 56$), scores from 3 to less than 4 were considered moderate (133), and scores 4 and over were considered high ($n = 204$). All other variables in the path model were constructed from the items shown in Table 1 to form corresponding composite variables used in the path model. Latent variables were not used due to insufficient n in the all the trust/reflection strata to estimate all parameters efficiently.

When models are complex with relatively small sample sizes, maximum likelihood methods apply unnecessarily strict model assumptions to represent hypotheses derived from substantive theory (Asparouhov and Muthén 2010a,b). Overreliance on maximum likelihood methods often leads to inappropriate rejection of the model (Marsh et al. 2009). Therefore, parameter estimates were calculated using a Bayesian estimation method (Gelman et al. 2004; Muthén and Asparouhov 2010). The Bayesian approach is intended to produce an analysis that better reflects substantive theories by specifying informative priors for parameter estimates. Better small-sample performance is also obtained and large-sample theory is not necessary (Muthén and Asparouhov 2010).

Because individuals were nested within clinics, estimates were derived using a multilevel statistical approach to adjust for potential bias of standard errors which may be artificially low using standard regression approaches (Bryk and Raudenbush 1992; Goldstein 1995). Mplus software was used to perform these analyses (Muthén and Muthén 2010). Following the methods of MacKinnon (1994, 1998) for mediation analysis, we tested if the association between the direct effect of diversity and mindfulness would be mediated by communication effectiveness and/or social/task relatedness. This is referred to as Model Segment 1 in Table 3. We used the aforementioned theoretical framework to inform our analysis of the pathways between these variables. Complex adaptive systems theory (Gell-Mann 1994; Zimmerman, Lindberg, and Plsek 1998; Anderson 1999; Plsek and Greenhalgh 2001) and organizational behavior theories (Weick 1993, 1995, 2005; Weick and Roberts 1993; Langer 1995; Jehn, Northcraft, and Neale 1999) were particularly salient in identifying diversity and mindfulness as a main pathway between the practice relationship variables. Likewise, we tested the hypothesis that the direct effect of mindfulness on sensemaking is mediated by heedful interrelation and/or respectful interaction (referred to as model segment 2 in Table 3 below); and that the direct effect of mindfulness on learning culture is also medi-

ated by heedful interrelation and/or respectful interaction (model segment 3). Model segments 2 and 3 were also informed by complex adaptive systems theory and organizational behavior literature focusing on the connections between mindfulness and sensemaking (Weick 1993, 1995, 2002) and on mindfulness and learning (Edmondson 2003).

RESULTS

Descriptive statistics and alpha coefficients of the study variables are shown in Table 2. Coefficient alpha ranged from .39 to .76 across the composite variables. Parameter estimates of the model are shown in Table 3. The labeled regression parameters b^1 – b^{13} in the table correspond to the accompanying paths shown in Figure 2, stratified by the three levels of trust/reflection.

Model Segment 1

Diversity among practice members was an equally significant predictor of mindfulness (b^1) across all levels of trust/reflection. However, communication effectiveness significantly mediated (b^2 and b^3) this association only in the two highest levels of trust/reflection, explaining 32 percent of the association between diversity and mindfulness in the highest levels of trust/reflection ($p < .001$) and 20 percent in the moderate level group ($p < .01$). While diversity predicted social/task relatedness in these two groups (b^5), social/task relatedness was not a mediator of the association between diversity and mindfulness.

Table 2: Descriptive Statistics of Study Variables

<i>Variables</i>	<i>Mean</i>	<i>SD</i>	<i>Range</i>	<i>Coefficient Alpha</i>
Diversity	3.62	0.61	1.83–4.80	.74
Communication	3.75	0.80	1.00–5.00	.71
Social/task relatedness	3.77	0.71	1.50–5.00	.39
Mindfulness	3.83	0.68	1.75–5.00	.73
Heedful interrelatedness	3.68	0.78	1.00–5.00	.65
Respectful interaction	3.59	0.76	1.00–5.00	.40
Sensemaking	3.78	0.80	1.50–5.00	.50
Learning culture	3.66	0.79	1.25–5.00	.76

Table 3: Regression Coefficients of the Direct and Indirect (Mediated) Paths

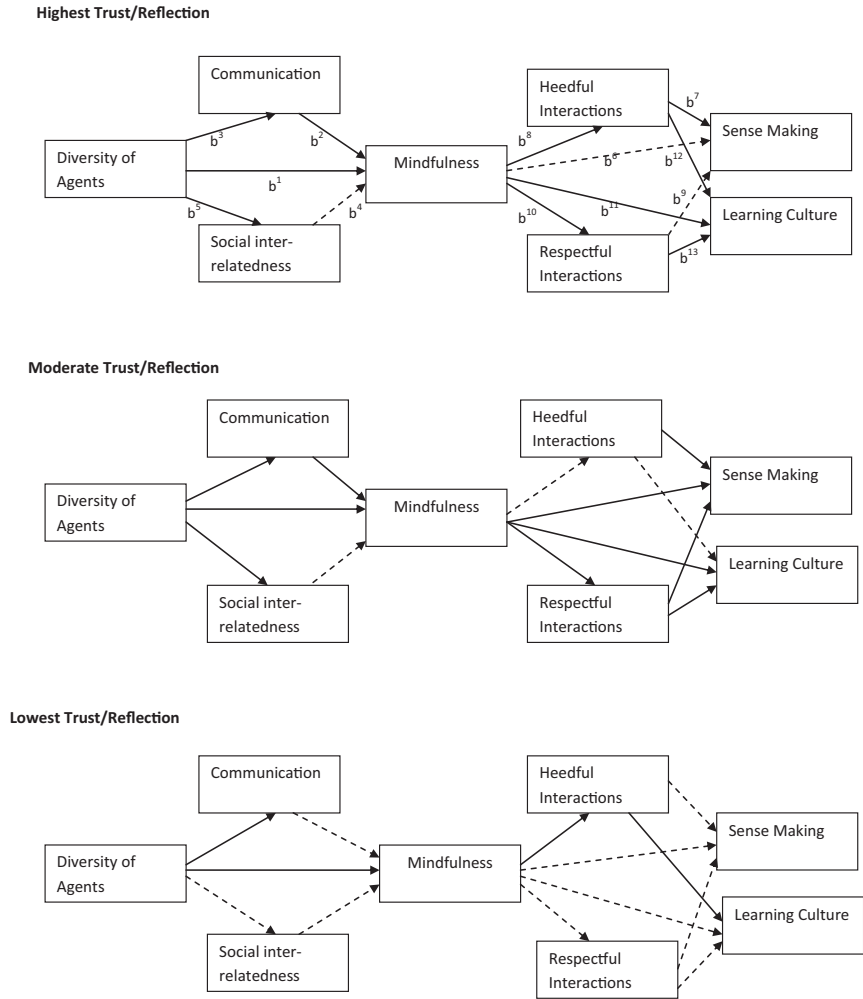
<i>High Trust/Reflection</i>				<i>Mid Trust/Reflection</i>				<i>Low Trust/Reflection</i>			
<i>b</i>	<i>se</i>	<i>t</i>	<i>r</i> ²	<i>b</i>	<i>se</i>	<i>t</i>	<i>r</i> ²	<i>B</i>	<i>se</i>	<i>t</i>	<i>r</i> ²
Direct effect: Diversity → Mindfulness											
0.60	0.05	12.0	.42	0.59	0.07	8.43	.34	0.54	0.14	3.86	.23
Model segment 1: b ¹ : Diversity → Mindfulness											
0.41	0.06	6.77	.49	0.45	0.08	6.05	.42	0.51	0.18	2.91	.23
b ² : Rich/lean communication → Mindfulness											
0.30	0.06	5.12	.49	0.24	0.07	3.41	.42	0.02	0.16	0.13	.23
b ³ : Diversity → Rich/lean communication											
0.58	0.06	9.57	.33	0.48	0.09	5.23	.18	0.55	0.14	3.87	.25
b ⁴ : Social/task relatedness → Mindfulness											
0.02	0.04	0.41	.49	0.09	0.05	1.65	.42	0.07	0.14	0.47	.23
b ⁵ : Diversity → Social/task relatedness											
0.52	0.09	5.76	.16	0.31	0.12	2.56	.05	0.31	0.19	1.67	.07
Direct effect: Mindfulness → Sensemaking											
0.31	0.08	3.88	.26	0.36	0.1	3.60	.30	0.14	0.13	1.08	.16
Model segment 2: b ⁶ : Mindfulness → Sensemaking											
0.04	0.10	0.43	.36	0.22	0.11	2.03	.41	0.03	0.14	0.18	.22
b ⁷ : Heedful interrelating → Sensemaking											
0.47	0.09	5.38	.36	0.40	0.11	3.64	.41	0.25	0.19	1.30	.22
b ⁸ : Mindfulness → Heedful interrelating											
0.41	0.07	5.60	.41	0.11	0.09	1.26	.11	0.39	0.12	3.13	.25
b ⁹ : Respectful interaction → Sensemaking											
0.07	0.06	1.31	.36	0.24	0.08	3.08	.41	0.13	0.13	0.95	.22
b ¹⁰ : Mindfulness → Respectful interaction											
0.39	0.10	3.78	.23	0.26	0.11	2.44	.20	0.17	0.17	1.03	.07
Direct effect: Mindfulness → Learning											
0.51	0.07	7.29	.44	0.46	0.09	5.11	.36	0.36	0.12	3.00	.34
Model segment 3: b ¹¹ : Mindfulness → Learning											
0.37	0.10	3.85	.46	0.39	0.10	3.70	.40	0.24	0.14	1.74	.41
b ¹² : Heedful interrelating → Learning											
0.19	0.08	2.25	.46	0.08	0.11	0.82	.40	.34	0.17	2.05	.41
b ¹³ : Respectful interaction → Learning											
0.13	0.06	2.40	.46	0.22	0.08	2.86	.40	0.11	0.12	0.92	.41

Note. Bold indicates statistically significant associations of at least $p < .05$.

Model Segment 2

The direct effect of mindfulness was significantly associated with sensemaking only in the top two levels of trust/reflection. Heedful interrelation completely mediated (e.g., explained) this association only in the highest level of trust/reflection. Respectful interaction did not mediate this association as it was not significantly associated with sensemaking in this group (b⁹).

Figure 2: Path Diagram of Organizational Attributes Primary Care



Note. Solid lines represent statistically significant relationships; dashed lines represent statistically nonsignificant relationships.

In the moderate trust/reflection group, heedful interrelation was not a mediator of the association between mindfulness and sensemaking as noted by a nonsignificant path between mindfulness and heedful interrelation (b^8). However, respectful interaction was a significant mediator of the association between mindfulness and sensemaking in this group ($p < .01$), explaining 20 percent of the association.

Model Segment 3

The direct effect of mindfulness and learning culture was significant across all levels of trust/reflection. In the highest trust/reflection group, both heedful interrelation and respectful interaction were significant mediators of the association between mindfulness and learning culture, independently explaining 18 percent and 11 percent of this association, respectively ($p < .05$).

In the moderate trust/reflection, heedful interrelation did not mediate the direct effect of the association between mindfulness and learning culture. While the key meditational paths for respectful interaction were significant (b^{10} and b^{13}), the statistical test of the mediation path was not significant ($p < .24$) according to the calculations used by McKinnon (Gelman et al. 2004; Muthén and Asparouhov 2010) and therefore cannot be considered a viable mediation effect. There were no statistically significant mediation effects in the lowest trust/reflection group.

Using a general linear ANOVA model or chi-square test, we found no differences between the following practice attributes and trust/reflection levels: percentage of Medicaid ($p = .21$) or Medicare patients ($p = .96$), practice age ($p = .22$), or ownership status ($p = .51$). However, significant differences were found for urbanicity ($p = .007$), with urban settings having higher levels of trust/reflection than rural settings; group size ($p = .006$), with smaller groups tending to have greater trust and reflection than larger groups; and uninsured patients ($p = .052$), with practices caring for more uninsured patients tending to have greater trust/reflection than practices caring for fewer uninsured patients.

DISCUSSION

Our analysis reveals new understandings of how relationships, reflection, sensemaking, and learning interrelate in the context of primary care practices undergoing major change and contributes new insights into the intersection of human infrastructure and primary care practice redesign.

The Role of Trust and Reflection

We found that trust and reflection, when considered together, serve as a single moderator variable influencing the strength of the relationships between six other characteristics of relationships and the organizational attributes sense-

making and learning. In practices where low trust and reflection were reported, the connections between the relationship characteristics and sense-making and learning were significantly weaker than in practices where moderate and high trust and reflection were reported. This finding is conceptually consistent with our a priori model where trust was hypothesized to be a necessary prior for practice relationships to be effective, and it suggests that for practice relationships to be mindful, heedful, respectful, etc., some minimum level of trust is required. Reflection was hypothesized as an activity that needs to occur on a continual basis. For the relationships in a practice to improve and for sensemaking and learning to be effective, people need time and space to think critically and developmentally about actions (both successful and unsuccessful) taken in a practice. Our analysis suggests that as trust and reflection increase, practices are more likely to exhibit diversity of thought, mindfulness, heedful interrelation, and respectful interaction, and practices are more likely to exhibit effective sensemaking and learning. Fostering trust among physicians and staff and providing ample time and space for people in practices to reflect and have conversations (Jordan et al. 2009), such as through daily huddles, could help primary care practices successfully move toward more patient-centered models of care.

This finding may help in interpreting results from studies of team training in surgical care settings. Medical Team Training, a process through which surgical teams hold briefings before and debriefings after surgical cases, is associated with decreased surgical mortality (Neily et al. 2010). The briefings and debriefings provide time and space for surgical teams to reflect together both before and after surgeries and may enable trust among team members. These same dynamics could exist in Family Medicine primary care practices and may be particularly important in achieving successful practice change.

The Linkage between Diversity and Mindfulness

Diversity among practice members was found to be a significant predictor of mindfulness. Diversity in this study was conceptualized as diversity of thought (Harrison and Klein 2007), as opposed to demographic diversity. Mindfulness was defined as openness to new ideas (Langer 1995) and seeking novelty—even in routine situations (Weick 1993). Practices that exhibited diversity of thought also exhibited openness to new ideas and novelty-seeking behavior. The positive association between diversity and mindfulness is expected in conditions of moderate and high trust and reflection. The finding that diversity and mindfulness are linked in conditions of low trust and reflec-

tion is surprising, however, and may be an important finding for thinking about how to improve practice relationships, sensemaking, and learning when trust has not yet been established and/or allocating time and space for reflection is not yet feasible. In practices where increasing trust and reflection is particularly challenging, increasing diversity might be an alternative strategy for improving relationships (via mindfulness). We would then speculate that increased diversity, mindfulness, sensemaking, and learning could then feedback into the practice relationships, thereby increasing trust and reflection among practice members.

The mediating effect of rich and lean communication on the relationship between diversity and mindfulness was present in conditions of moderate and high trust and reflection. We found an increasing strength of this mediating effect as the level of trust and reflection in the practices increased. This finding suggests that the ability of practices to select and use communication channels that are appropriate for the message being conveyed seems to be dependent on the level of trust and the amount of reflection present in a practice.

Social/task relatedness was the least connected variable in the model. While diversity was linked to social/task relatedness in conditions of moderate and high trust and reflection, social/task relatedness was not a mediator of the relationship between diversity and mindfulness in any trust/reflection condition. This finding could be interpreted to mean that the amount of social- and task-related conversation in a practice might not play as important a role in practice relationships as once thought. Future research should examine this finding further.

The Linkage between Mindfulness and Sensemaking

Analysis revealed a significant direct effect of mindfulness on sensemaking under conditions of moderate and high trust and reflection. In practices where moderate trust and reflection were reported, respectful interaction mediated the association between mindfulness and sensemaking. In practices where high trust and reflection were reported, heedful interrelation mediated the association between mindfulness and sensemaking. These findings may indicate that respectful interaction (respect for one's own ideas and the ideas of others) is more important under conditions of moderate trust and reflection, and heedful interrelation (understanding how one's work fits into the work of the group) is more important under conditions of high trust and reflection.

The role of heedful interaction in sensemaking has been studied in the context of aircraft carriers and flight deck crews (Weick and Roberts 1993). The contribution this study makes is in examining the relationship between mindfulness, heedful interrelation, respectful interaction, and sensemaking under varying levels of trust and reflection. We find that heedful interrelation and respectful interaction mediate the relationship between mindfulness and sensemaking differently from each other depending on the level of trust and reflection present in a practice.

The Linkage between Mindfulness and Learning

Analysis revealed a significant direct effect of mindfulness on learning under all levels of trust and reflection. The role of mindfulness in learning has been addressed in previous research (Edmondson 2003); however, the examination of the relationship between these two variables under high, moderate, and low conditions of trust and reflection adds to our understanding of how these variables are interrelated.

We found that under conditions of high trust and reflection both heedful interrelation and respectful interaction were significant mediators for the linkage between mindfulness and learning. Under conditions of low and moderate trust and reflection, neither heedful interrelation nor respectful interaction was a significant mediator. This may be because in low trust/reflection conditions, heedful interrelation and respectful interaction were either not present or not sufficient to enable learning.

Our study contributes new understanding of how relationships, sensemaking, and learning interrelate and provides insight into their potential use during practice redesign efforts. The finding that trust and reflection are key in explaining the linkages among relationships, sensemaking, and learning speaks to the potential utility of trust and reflection as facilitators of practice redesign. This finding is consistent with practice facilitation research, where practices that participated in learning collaboratives or were taught how to work together to improve their practice using strategies based in work relationships (including trust) and reflection were able to make desired changes (Baskerville, Liddy, and Hogg 2012; Shaw et al. 2012; McMullen et al. 2013; Parchman et al. 2013).

Our analysis found that trust and reflection were higher in urban settings, smaller practices, and practices caring for uninsured patients. No significant differences in levels of trust and reflection were found for practice age, ownership status, and treatment of Medicare and Medicaid patients. While

not the primary aim of this study, these results provide a path forward for future research to further examine the relationship between this model and practice attributes such as size, urbanicity, and ownership status for deeper understanding of how practice attributes are associated with practice relationships, and ultimately how they are associated with PCMH recognition and patient outcomes.

Limitations

This study has several limitations. The data, while obtained in 2006, continue to be relevant for examining organizational attributes in primary care practices undergoing major change. The data were collected in practices that were on the leading edge of PCMH transformation. Practices today, large and small, urban and rural, high performing and low performing, continue to struggle with implementing these and other similar changes. Thus, insights generated from analyzing this diverse set of exemplar practices are applicable to other practices undergoing similar changes.

Our findings rely on self-reporting via survey rather than on direct observations or other methods that capture richer, more contextualized data. We believe, however, that practice member perceptions of relationships, reflection, sensemaking, and learning adequately represent these variables as practice members experienced them. Several of the constructs were represented by a small number of survey items. For example, reflection, heedful interrelation, respectful interaction, social/task relatedness, and sensemaking were represented by two items. A single item represented trust. Likewise, some of the composite constructs had moderate or low correlations between the variables, as evidenced by lower coefficient alphas. However, each item included in the analysis was selected based on having the highest level of conceptual fit with each construct's definition. The items representing our constructs acted consistently with our a priori hypotheses. For these reasons, we believe the findings from these analyses demonstrate a sufficient level of construct validity and are thus capable of informing future research and practice. On the other hand, the n of 56 in the low trust/reflection group may have contributed to lower variability in the items used to create the constructs and consequently may have artificially reduced the associations between the variables. Therefore, the reduced number of associations in the path model in the low group as compared to the other groups may be a statistical artifact and not due to the hypothesized theoretical mechanisms. For this reason, this

investigation should be considered preliminary. Furthermore, we did not utilize a latent variable measurement model approach due to insufficient *n* after stratification by trust/reflection groups. Future research should investigate these constructs using latent variables to reduce the effects of inherent measurement error.

Our response rate (59 percent), while adequate, may reflect some selection bias. Practices that participated in the study were highly motivated, and those responding to the survey may not reflect a representative sample. Therefore, the generalizability of these results may be questionable—necessitating the need for replicated in other studies (Halbesleben and Whitman 2013).

The finding that diversity and mindfulness are linked even in conditions of low trust and reflection was unexpected, and our interpretation of this result could be incorrect. For example, it is possible that diversity and mindfulness are endogenous with respect to each other.

Finally, this study was cross-sectional and does not establish an association or causal link between this model and PCMH recognition. Additionally, no association or causal link was established between this model and improved quality or reduced cost. Rather, this study focuses several steps back from these outcomes, examining whether certain characteristics of relationships (trust, diversity, mindfulness, heedful interrelation, respectful interaction, social/task relatedness, and rich and lean communication) are associated with three organizational attributes (reflection, sensemaking, and learning) that are believed to facilitate practice redesign first, and ultimately key quality and cost outcomes.

Implications

Findings from this study can be used to better understand the social dynamics and human infrastructure of primary care practices undergoing change. Facilitating trust and reflection can help practices bring together the diverse skills, values, and expertise needed to deliver high-quality health care to patients and improve practice function. Our work suggests a new model of practice relationships that describes a more prominent role for trust and reflection than previously identified, a role that appears to be foundational for a practice's ability to engage in a successful change process. Creating opportunities for reflection could improve the relationships among practice members as well as provide a forum focused on practice improvement activities. These opportunities might take the form

of regular team meetings, all-staff lunches, impromptu meetings or conversations (Jordan et al. 2009), or huddles (Fogarty and Schultz 2010; Provost et al. 2015). All of these formats allow space for individuals to speak openly with each other about practice matters and take an active role in practice redesign activities that can set the stage for consistent involvement in practice improvement.

Future directions for research includes testing the association and causal link among this model and quality and cost outcomes of PCMH and non-PCMH recognized practices to examine whether the changes and redesigns taking place in primary care practices are achieving the anticipated improvements in quality and cost reductions. Future research should also examine the relationship between this model and practice attributes such as practice size, ownership status and age. Designing and evaluating interventions to increase trust and facilitate reflection in practices implementing a major change (e.g., implementing a new electronic health records system or merging with another practice) could be a next step in this line of research.

CONCLUSION

Using a Bayesian-inspired structural path modeling approach, we analyzed survey responses from 396 primary care clinicians and staff to test a conceptual model of primary care practice relationships. We examined how relationships, reflection, sensemaking, and learning were interrelated in practices transitioning to PCMH. Our findings suggest a new model of practice relationships that gives primacy to the roles of trust and reflection in moderating practice relationships, sensemaking, and learning in primary care practices undergoing major change. We believe this new model provides practices with much needed information about where to initiate efforts to improve practice relationships in the midst of uncertainties associated with practice redesign. This study is a preliminary step in understanding the much larger challenge of how to improve important PCMH outcomes such as cost and quality of care. Our study is deliberately situated several steps back from these outcomes and contributes knowledge of how relationships and organizational attributes are believed to be interrelated in practices undergoing redesign. Future research is needed to examine the associations and causal linkages between this model and PCMH recognition and quality and cost outcomes.

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REFERENCES

- Anderson, P. 1999. "Complexity Theory and Organization Science." *Organization Science* 10: 216–32.
- Argyris, C., and D. Schön. 1978. *Organizational Learning: A Theory of Action Perspective*. Reading, MA: Addison-Wesley.
- Asparouhov, T., and B. Muthen. 2010a. *Bayesian Analysis Using Mplus: Technical Implementation*. Technical Appendix. Los Angeles: Muthen & Muthen. www.statmodel.com.
- . 2010b. *Bayesian Analysis of Latent Variable Models Using Mplus*. Technical Report. Los Angeles: Muthen & Muthen. www.statmodel.com.
- Baskerville, N. B., C. Liddy, and W. Hogg. 2012. "Systematic Review and Meta-Analysis of Practice Facilitation within Primary Care Settings." *The Annals of Family Medicine* 10 (1): 63–74.

- Berenson, R. A., T. Hammons, D. N. Gans, S. Zuckerman, K. Merrell, W. S. Underwood, and A. F. Williams. 2008. "A House Is Not a Home: Keeping Patients at the Center of Practice Redesign." *Health Affairs* 27 (5): 1219–30.
- Berwick, D. M., T. W. Nolan, and J. Whittington. 2008. "The Triple Aim: Care, Health and Cost." *Health Affairs* 27: 759–69.
- Bryk, A. S., and S. W. Raudenbush. 1992. *Hierarchical Linear Models*. Newbury Park, CA: Sage.
- Crabtree, B. F., P. A. Nutting, W. L. Miller, K. C. Stange, E. E. Stewart, and C. R. Jaen. 2010. "Summary of the National Demonstration Project and Recommendations for the Patient-Centered Medical Home." *Annals of Family Medicine* 8 (Suppl 1): S80–90.
- Crabtree, B. F., P. A. Nutting, W. L. Miller, R. R., McDaniel, Jr., K. C., Stange, C. R., Jaen, and E. E. Stewart. 2011. "Primary Care Practice Transformation is Hard Work: Insights from a 15-year Developmental Program of Research." *Medical Care* 49 (Suppl): S28–35.
- Dewey, J. 1933. *How We Think*. Buffalo, NY: Prometheus Books.
- Dvora, Y., and H. Tsoukas. 2009. "What Is Reflection-in-Action? A Phenomenological Account." *Journal of Management Studies* 46 (8): 1339–64.
- Edmondson, A. C. 1999. "Psychological Safety and Learning Behavior in Work Teams." *Administrative Science Quarterly* 44: 350–83.
- . 2003. "Speaking Up in the Operating Room: How Team Leaders Promote Learning in Interdisciplinary Action Teams." *Journal of Management Studies* 40: 1419–52.
- Fogarty, C. T., and S. Schultz. 2010. "Team Huddles: The Role of the Primary Care Educator." *The Clinical Teacher* 7: 157–60.
- Geller, B. M., J. M. Skell, A. L. Dorwaldt, K. D. Howe, G. S. Dana, and B. S. Flynn. 2008. "Increasing Patient/Physician Communications about Colorectal Cancer Screening in Rural Primary Care Practices." *Medical Care* 49 (Suppl): S36–43.
- Gell-Mann, M. 1994. "Complex Adaptive Systems." In *Complexity: Metaphors, Models and Reality*, edited by G. Cowan, D. Pines, and D. Meltzer, pp. 17–45. New York: Addison-Wesley.
- Gelman, A., J. B. Carlin, H. S. Stern, and D. B. Rubin. 2004. *Bayesian Data Analysis*, 2nd Edition. Boca Raton, FL: Chapman & Hall.
- Ghaferi, A. A., J. D. Birkmeyer, and J. B. Dimick. 2009. "Complications, Failure to Rescue, and Mortality with Major Inpatient Surgery in Medicare Patients." *Annals of Surgery* 250 (6): 1029–34.
- Goldstein, H. 1995. *Multilevel Statistical Models*. New York: Halsted Press.
- Halbesleben, J. R. B., and M. V. Whitman. 2013. "Evaluating Survey Quality in Health Services Research: A Decision Framework for Assessing Nonresponse Bias." *Health Services Research* 48: 913–30.
- Harrison, D. A., and K. J. Klein. 2007. "What's the Difference? Diversity Constructs as Separation, Variety, or Disparity in Organizations." *Academy of Management Review* 32: 1199–228.
- Hing, E., and C. W. Burt. 2007. "Characteristics of Office-Based Physicians and Their Practices: United States, 2003-04." *Vital Health Statistics* 13: 1–34.

- Homer, C. J., and R. J. Baron. 2010. "How to Scale Up Primary Care Transformation: What We Know and What We Need to Know?" *Journal of General Internal Medicine* 25: 625–9.
- Huber, G. P. 1991. "Organizational Learning: The Contributing Processes and the Literatures." *Organization Science* 2: 88–115.
- Jaén, C. R., B. F. Crabtree, R. F. Palmer, R. L. Ferrer, P. A. Nutting, W. L. Miller, E. E. Stewart, R. Wood, M. Davila, and K. C. Stange. 2010. "Methods for Evaluating Practice Transformation towards a Patient-Centered Medical Home, in the National Demonstration Project." *Annals of Family Medicine* 8 (Suppl 1): S9–20.
- Jarvenpaa, S. L., and D. E. Leidner. 1998. "Communication and Trust in Global Virtual Teams." *Journal of Computer Mediated Communication* 3 (4): 1–36.
- Jarvenpaa, S. L., T. R. Shaw, and D. Staples. 2004. "Toward Contextualized Theories of Trust: The Role of Trust in Global Virtual Teams." *Information Systems Research* 15 (3): 250–64.
- Jehn, K. A., G. B. Northcraft, and M. A. Neale. 1999. "Why Differences Make a Difference: A Field Study of Diversity, Conflict, and Performance in Workgroups." *Administrative Science Quarterly* 44: 741–63.
- Jordan, M. E., H. J. Lanham, B. F. Crabtree, P. A. Nutting, W. L. Miller, K. C. Stange, and R. R. McDaniel, Jr. 2009. "The Role of Conversation in Health Care Interventions: Enabling Sensemaking and Learning." *Implementation Science* 4: 1–13.
- Kane, C. K., and D. W. Emmons. 2013. "New Data on Physician Practice Arrangements: Private Practice Remains Strong Despite Shifts Toward Hospital Employment." *American Medical Association* 4 (6): 1–16.
- Kirchhoff, S. M. 2013. *Physician Practices: Background, Organization, and Market Consolidation*. Washington, DC: Congressional Research Service. [accessed November 10, 2015]. Available at: http://digitalcommons.ilr.cornell.edu/key_workplace/1002/
- Landon, B. E., J. M. Gill, R. C. Antonelli, and E. C. Rich. 2010. "Prospects for Rebuilding Primary Care Using the Patient-Centered Medical Home." *Health Affairs* 29 (5): 827–34.
- Langer, E. J. 1995. "Mindfulness/Mindlessness." In *The Blackwell Encyclopedia of Social Psychology*, edited by T. Manstead, and M. Hewstone, pp. 388–90. Oxford, England: Blackwell.
- . 1997. *The Power of Mindful Learning*. Cambridge, England: Perseus Books.
- Lanham, H. J., R. R. McDaniel, B. F. Crabtree, W. L. Miller, K. C. Stange, A. F. Tallia, and P. A. Nutting. 2009. "How Improving Practice Relationships among Clinicians and Nonclinicians Can Improve Quality in Primary Care." *Joint Commission Journal on Quality and Patient Safety* 35: 457–66.
- Leykum, L. K., J. A. Pugh, V. Lawrence, M. L. Parchman, P. H. Noel, J. Cornell, and R. R. McDaniel, Jr. 2007. "Organizational Interventions Employing Principles of Complexity Science Have Improved Outcomes for Patients with Type II Diabetes." *Implementation Science* 2: 28.
- Leykum, L. K., R. F. Palmer, H. J. Lanham, M. E. Jordan, P. H. Noel, and M. L. Parchman. 2010. "Reciprocal Learning and Chronic Care Model Implementation:

- Results from a New Scale of Learning in Primary Care Settings.” *BMC Health Services Research* 11: 44.
- MacKinnon, D. P. 1994. “Analysis of Mediating Variables in Prevention and Intervention Research.” *Research Monograph* 139: 127–53.
- . 1998. *Introduction to Statistical Mediation Analysis*. New York: Lawrence Erlbaum.
- Maitlis, S., and M. Christianson. 2014. “Sensemaking in Organizations: Taking Stock and Moving Forward.” *The Academy of Management Annals* 8 (1): 57–125.
- Manojlovich, M. 2010. “Nurse/Physician Communication through a Sensemaking Lens: Shifting the Paradigm to Improve Patient Safety.” *Medical Care* 48: 941–6.
- Marsh, H. W., B. Muthén, A. Asparouhov, O. Ludtke, A. Robitzsch, A. J. S. Morin, and U. Trautwein. 2009. “Exploratory Structural Equation Modeling, Integrating CFA and EFA: Application to Students’ Evaluations of University Teaching.” *Structural Equation Modeling* 16: 439–76.
- McMullen, C. K., J. Schneider, A. Firemark, J. Davis, and M. Spofford. 2013. “Cultivating Engaged Leadership through a Learning Collaborative: Lessons from Primary Care Renewal in Oregon Safety Net Clinics.” *The Annals of Family Medicine* 11 (Suppl 1): S34–40.
- Meyerson, D., K. E. Weick, and R. M. Kramer. 1996. *Swift Trust and Temporary Groups*. Thousand Oaks, CA: Sage.
- Miller, W. L., R. R. McDaniel, B. F. Crabtree, and K. C. Stange. 2001. “Practice Jazz: Understanding Variation in Family Practice Using Complexity Science.” *Journal of Family Practice* 50: 872–8.
- Miller, W. L., B. F. Crabtree, P. A. Nutting, K. C. Stange, and C. R. Jaen. 2010. “Primary Care Practice Development: A Relationship-Centered Approach.” *Annals of Family Medicine* 8 (Suppl 1): S68–79.
- Muthén, B., and T. Asparouhov. 2010. *Bayesian SEM: A More Flexible Representation of Substantive Theory*. Technical Manuscript. Los Angeles: Muthén & Muthén. www.statmodel.com.
- Muthén, L. K., and B. O. Muthén. 2010. *Mplus User’s Guide*, 6th Edition. Los Angeles: Muthén & Muthén.
- Neily, J., P. D. Mills, Y. Young-Xu, B. T. Carney, P. West, D. H. Berger, L. M. Mazzia, D. E. Paull, and J. P. Bagian. 2010. “Association between Implementation of a Medical Team Training Program and Surgical Mortality.” *Journal of the American Medical Association* 304 (15): 1693–700.
- Nutting, P. A., W. L. Miller, B. F. Crabtree, C. R. Jaen, E. E. Stewart, and K. C. Stange. 2009. “Initial Lessons from the First National Demonstration Project on Practice Transformation to a Patient-Centered Medical Home.” *Annals of Family Medicine* 7: 254–60.
- Nutting, P. A., B. F. Crabtree, E. E. Stewart, W. L. Miller, R. F. Palmer, K. C. Stange, and C. R. Jaen. 2010. “Effect of Facilitation on Practice Outcomes in the National Demonstration Project Model of the Patient-Centered Medical Home.” *Annals of Family Medicine* 8 (Suppl 1): S33–44.

- Nutting, P. A., B. F. Crabtree, W. L. Miller, K. C. Stange, E. E. Stewart, and C. R. Jaen. 2011. "Transforming Physician Practices to Patient-Centered Medical Homes: Lessons from the National Demonstration Project." *Health Affairs* 30: 439–45.
- Parchman, M. L., P. H. Noel, S. C. Culler, H. J. Lanham, L. K. Leykum, R. Lozano-Romero, and R. F. Palmer. 2013. "A Randomized Trial of Practice Facilitation to Improve the Delivery of Chronic Illness Care in Primary Care: Initial and Sustained Effects." *Implementation Science* 8 (93): 1–7.
- Paul, D. L., and R. R. McDaniel. 2004. "A Field of Study of the Effect of Interpersonal Trust on Virtual Collaborative Relationship Performance." *MIS Quarterly* 28 (2): 183–227.
- Plsek, P. E., and T. Greenhalgh. 2001. "Complexity Science: The Challenge of Complexity in Health Care." *British Medical Journal* 323 (7313): 625–8.
- Provost, S., H. J. Lanham, L. K. Leykum, R. R. McDaniel, and J. A. Pugh. 2015. "Improving Health Care Delivery through Huddles." *Health Care Management Review* 40 (1): 2–12.
- Reid, R. J., and E. H. Wagner. 2014. "The Veterans Health Administration Patient Aligned Care Teams: Lessons in Primary Care Transformation." *Journal General Internal Medicine* 29 (Suppl 2): S552–544.
- Rittenhouse, D. R., L. A. Schmidt, K. J. Wu, and J. Wiley. 2014. "Incentivizing Primary Care Providers to Innovate: Building Medical Homes in the Post-Katrina New Orleans Safety Net." *Health Services Research* 49 (1): 75–92.
- Schön, D. A. 1983. *The Reflective Practitioner*. New York: Basic Books.
- Shaw, E. K., S. M. Chase, J. Howard, P. A. Nutting, and B. F. Crabtree. 2012. "More Black Box to Explore: How Quality Improvement Collaboratives Shape Practice Change." *Journal of the American Board of Family Medicine* 25 (2): 149–57.
- Stange, K. C. 2009. "The Generalist Approach." *Annals of Family Medicine* 7 (3): 198–203.
- Stroebel, C. K., R. R. McDaniel, B. F. Crabtree, W. L. Miller, P. A. Nutting, and K. C. Stange. 2005. "Using Complexity Science to Inform a Reflective Practice for Improvement in Primary Care." *Joint Commission Journal on Quality and Patient Safety* 31: 438–46.
- Tai-Seale, M., C. J. Wilson, L. Panattoni, N. Kohli, A. Stone, D. Y. Hung, and S. Chung. 2014. "Leveraging Electronic Health Records to Develop Measurements for Processes of Care." *Health Services Research* 49 (2): 628–44.
- Tallia, A. F., H. J. Lanham, R. R. McDaniel, Jr., and B. F. Crabtree. 2006. "Seven Characteristics of Successful Work Relationships." *Family Practice Management* 13: 47–50.
- Wagner, E. H., K. Coleman, R. J. Reid, K. Phillips, M. K. Abrams, and J. R. Sugarman. 2012. "The Changes Involved in Patient-Centered Medical Home Transformation." *Primary Care: Clinics in Office Practice* 39: 241–59.
- Weick, K. E. 1993. "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." *Administrative Science Quarterly* 38: 628–52.
- . 1995. *Sensemaking in Organizations*. Thousand Oaks, CA: Sage Publications.

- . 2002. “The Reduction of Medical Errors through Mindful Interdependence.” In *Medical Error: What Do We Know? What Do We Do?*, edited by M. M. Rosenthal, and K. M. Sutcliffe, pp. 177–99. San Francisco, CA: Jossey-Bass.
- . 2005. “Managing the Unexpected: Complexity as Distributed Sensemaking.” In *Uncertainty and Surprise in Complex Systems: Questions on Working with the Unexpected*, edited by R. R. McDaniel, and D. J. Driebe, pp. 51–65. Berlin: Springer-Verlag.
- Weick, K. E., and K. H. Roberts. 1993. “Collective Mind in Organizations: Heedful Interrelating on Flight Decks.” *Administrative Science Quarterly* 38: 357–81.
- Zimmerman, B., C. Lindberg, and P. Plsek. 1998. *Edgework: Insights from Complexity Science for Health Care Leaders*. Irving, TX: VHA Inc.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.