Leading the implementation of change in primary care: a conceptual framework

Lynne S. Nemeth[1§], Chris Feifer[2], Gail W. Stuart[1], Steven M. Ornstein[3]

[1] College of Nursing, Medical University of South Carolina, Charleston, South Carolina, USA
[2] Department of Family Medicine, University of Southern California, Los Angeles, California, USA
[3] Department of Family Medicine, Medical University of South Carolina, Charleston, South Carolina, USA

[§]Corresponding author

Email addresses:
LSN: nemethl@musc.edu
CF: feifer@usc.edu
GWS: stuartg@musc.edu
SMO: ornstesm@musc.edu

Abstract

Background

Implementing change in primary care practices is difficult despite compelling reasons for adoption of clinical practice guidelines and electronic medical records. Methods to structure care and develop new roles are needed to implement an evidence-based practice that improves care. This research explored the process of change used to implement clinical guidelines for primary and secondary prevention of cardiovascular disease in primary care practices that used a common electronic medical record (EMR).

Methods

A mixed methods design was employed using participant observation, interviews, and quantitative evaluation data. Using purposive sampling in eight practices within the PPRNet-TRIP II clinical trial in seven states throughout the United States, 28 staff members and clinicians were interviewed regarding how change in practice occurred while implementing clinical guidelines for primary and secondary prevention of cardiovascular disease and strokes. Grounded theory methods guided analysis of the qualitative data.

Results

"How to Lead Improvement for PPRNet-TRIP" provides a framework for implementing clinical guidelines into primary care practice. The seven concepts of the framework include *leaders setting a vision with clear goals* for staff to embrace; *involving the team* for the goals and vision for the practice to be achieved; *enhancing communication systems* to reinforce goals for patient care; *developing the team* to enable the staff to contribute toward practice improvement; *taking small steps*,

encouraging practices' tests of small changes in practice; *assimilating the electronic medical record to maximize clinical effectiveness*, enhancing practices' use of the electronic tool they have invested in for patient care improvement*, and providing feedback within a culture of improvement,* leading to an iterative cycle of goal setting by the leader.

Conclusions

A well developed team of health care professionals can shape the practice environment to be more adaptive to implementation of change and improvement. By focusing on developing teamwork through interdisciplinary learning and use of performance data, leaders can improve the quality of care provided in their practice.

Background

Translating research into practice has been difficult to achieve by many health services leaders, despite tools such as benchmarks and clinical guidelines [1]. The result is “underuse, overuse and misuse” of healthcare interventions [2-5] and national concerns related to patient safety. Despite the large scientific knowledge base within the American health care system, much of it is not used [3, 6]. The United States’ (US) health care system continues to provide care that is highly variable and fails to achieve sustainable change in practice patterns through the adoption and implementation of recognized best practices and evidence-based medicine [7]. Information technology that can guide care, support best practices and enable measurement is often not yet implemented in many practices. Where electronic medical record (EMR) tools are used, a learning curve poses a barrier for physicians on the path to quality improvement [8].

Implementing tools to use evidence as a basis for decision-making in clinical practice requires concerted actions by individual providers and leaders that are often considered beyond the scope of usual practice management. New approaches are needed to create clinical environments that can easily implement new ideas, use research findings, adopt best practices, and improve clinical outcomes. Many researchers have identified facilitators and barriers to adopting a more evidence-based practice [9-13], and some have recommended that organizational culture may need to be changed [14-17]. Leaders can play a pivotal role, addressing characteristics of the practice environment affecting culture, thus influencing the responsiveness of the players to change.

Complexity science is valuable to explaining the dynamics of primary care office systems and practice [18-20]. The competing demands of the practice must be considered when introducing improvements in the delivery of preventive services [21]. The complexity of the change needs to be considered as well as local adaptation of the process to suit the needs of the practice members involved. Successful change requires identification of a specific process for change [22].

This research explored the process of change used to implement clinical guidelines for prevention and treatment of cardiovascular disease and stroke within practices participating in the PPRNet-TRIP-II (Practice Partner Research Network-Translating Research into Practice) randomized clinical trial. This trial tested the impact of performance reports, site visits and network meetings on guideline adherence in primary care practices that use a common EMR tool [23]. The results of the clinical trial are reported elsewhere [24] as is the logic behind the intervention and the strategies used by practices to improve care [25, 26]. Quantitative data documented improvements in performance but did not explain how the practices accomplished meaningful change. To understand the factors that promote the implementation of change to improve systems and quality in primary care settings, a theoretical explanation was sought.

Methods

Multiple qualitative approaches influenced this research which was guided by the Microsystems framework [27, 28]. Intervention site visits provided the opportunity to directly observe practices involved in improving their cardiovascular disease and stroke prevention. Semi-structured interviews provided perceptions about each

practice setting, including leadership and organizational characteristics. Grounded theory methods guided the analysis of data [29-31], and a hermeneutical process of immersion and crystallization [32] confirmed the conceptual framework as an explanatory theory on the process of change. The institutional review board at Medical University of South Carolina approved this research.

Sample and Sampling Strategy

Eight practices within the PPRNet-TRIP II intervention participated in semi-structured interviews. This homogenous sample of private practices used a common EMR system, joined a practice-based research network, and agreed to participate in this QI research. It was important to cast a wide net within the practices visited to ensure broad points of view were represented. Twenty-eight participants were selected for the interviews which included office and clinical staff of all levels and providers: physicians, nurse practitioners or physician assistants. A maximum variation, purposive sampling strategy was used to elicit barriers to and successful implementation of change. A large variety of different perspectives was sought to prevent bias in the sampling process and to look for possible discordance within the data.

Instruments

A semi-structured interview schedule was adapted from the Microsystems in Healthcare [27] study (Table 1). Field notes and quantitative evaluation data regarding each practice's performance during the study informed the development of this semi-structured interview. The questions guided discovery about the culture of the microsystem and explored the participants' interest in improvement and their own perceptions regarding enablers and barriers to that process. The questions were a

starting point in the initial interviews; as the participants responded to these questions additional questions emerged, and were used within subsequent interviews. The lead author was strongly influenced by the organizational culture perspective, and as a quality improvement leader in acute care, entered into primary care setting without substantial preconceptions. She conducted all of the semi-structured interviews.

Data collection and analysis

The interviews were recorded using an Olympus DS-330 digital voice recorder. Files were transcribed by an administrative assistant, verified by the primary investigator, and exported into NVivo 2.0 (QSR, Pty. *Doncaster, Victoria, Australia*) for coding.

Initial codes were developed using empiric sources from the literature about change, and an iterative process was used within the analysis process that generated new codes as theoretical hunches emerged. Using constant comparison [29, 30], codes were added, and then consolidated to the key themes that summarized the data. The transcripts were shared with qualitative mentors of the first author (nursing faculty and family medicine researchers), and coding validated at both early and late stages in the analysis. The qualitative analysis began with a pilot study using nine interviews from which some initial assumptions and an early conceptual framework was built.

Quantitative data from the outcomes of the PPRNet-TRIP-II study were used to sort the intervention practices into higher and lower performers, related to their improvement of 21 indicators, measured as targets achieved in the trial (Table 2). Practices were compared during qualitative analyses based on their overall achievement of indicator targets, as well as the amount of change this achievement represented from baseline. By reading aloud the transcripts of several practices with

different experiences in the process of change and different levels of performance outcomes, immersion in the data by three qualitative researchers (LSN, CF, BFC) led to crystallization of key meanings (prompting questions and offering explanations that clarified and confirmed the framework that resulted from mapping the key concepts).

Results

The central function of "learning how to better use the features of the EMR" was the nature of the change that most of the practices used to implement the guidelines into their practice. The forthcoming sections illustrate the concepts of the framework. Pseudonyms were assigned to those interviewed, whose comments follow as the framework is explained.

Vision with Clear Goals

Practices were most effective at change when the practice leader set a clear vision. In these practices, staff members discussed the goals for change. A physician in a solo practice who achieved significant change in practice performance benchmarks explained:

> ***Dr. Carl****: It is defined in the guidelines, my professional responsibility for success. That is my profession to get from point A to B. I use information that comes from the specialists in the studies that I am following, and that's how I gauge my success.*

Dr. Carl articulated what was important for him in his practice, that being successful is his responsibility as a physician. He established vision by determining which quality benchmarks are necessary for his practice to achieve, so his patients can benefit. His staff members understood the vision for his practice, and provided

examples of how they understand the goals of the practice. A medical assistant shared the following:

> ***Elaine:*** *Dr. Carl is the one to start something and we just go from there. We implement what he says to do. He gives the direction and we follow.*

Involve the Team

When staff members are clear about the vision and goals, feel included in decision-making, and are responsible for leading some component of the work plan to achieve results they adapt to make change happen. Reinforcement by physicians and their managers of key messages and values with the team can inspire their best work with the patients in the practice.

> ***Dr. Carl****: The business manager really knows what is going on for what the project goals are. From when we started to now, I'm always stressed for time and she can work her schedule to work with more than myself.*

The business manager confirmed how well the team members work together.

> ***Diane****: It works very smoothly. The biggest asset we have are our employees. We are like a well-oiled machine. Everyone knows what they're doing, and things get done. It works.*

This manager's perspective was that staff contributed to improved outcomes in patient care through teamwork. This practice valued clear leadership, working well together, and staff competence to do things the right way. This allowed them to be successful with their patients' care management.

Diane: It's been a group effort. Everybody has to see the need. It's actually lives that you're saving; it's not just numbers . . . just again, empowering the nurses, Dr. Carl has been real clear about use of guidelines, and to get the nurses and patients more involved in their care management. When patients call in for an appointment they are asked to plan for a cholesterol check. Continuing to call if they miss a visit, we stress the importance of these tests. It's leadership but it's also good patient care.

Enhance Communication Systems

More effective communication can be achieved using the features of the EMR system more efficiently. The higher performing practices communicated within the practice easily related to patient care needs. Many participants described using letter templates for patient follow-up, and reporting results of diagnostic tests with therapeutic goals as well as electronic mail within the EMR for internal messaging and reminder systems.

In one of the more technologically competent practices, one of the providers discussed how patients are informed about follow-up regarding their laboratory tests:

***Dr. Andrew**: … as part of our result letters we have the reminder put in about when they're supposed to get checked again.*

Multiple communication mechanisms allowed providers to follow-up on the important details of patient care. Betty, the partner in this practice explained the

reminder systems for follow up with patients, incidentally illustrating how practice members communicated effectively with each other.

> ***Dr. Betty****: With our patients we communicate face to face. We communicate through our staff extensively. The facilitators for that communication are internal e-mail, and the EMR is huge in terms of inter-physician and staff and inter-staff to get things done . . . also in future activation we also use the e-mail . . . send yourself one so that three weeks from now you remember to go back X or Y or check on things. Then, we use the letters within Practice Partner to do a whole ton of communications to the patients, and the recall letters in the billing to activate patients to come in. Of course, we talk to each other face to face. And the staff talks to the patient by phone. We talk to the patient by phone. I would say (we use) every known strategy (of) communication, except e-mail. We studiously avoided e-mail . . . for communication (with the patients).*

Develop Staff Knowledge

Staff must understand the rationale for the work they are engaged in to be most effective. By providing avenues for staff to ask questions, office and clinical staff can provide critical reinforcement of the ideal plan of care and help the patients understand treatment goals and the importance of follow-up.

Kathy, a receptionist in a large family practice, described the importance of learning what was needed for appointments for diabetic patients, related to lab work and blood pressure examinations in the appropriate intervals.

Kathy: Only with the making of the appointments, making sure that I catch those flags for the appointments. When they call, you know, "are you a diabetic? When's the last time you had, you know, your blood checked?" Checking and seeing if it has been over three months. "Okay, well you need to get this done." So that's definitely impacted my job . . . for the patients, what it comes down to in my opinion, is number one: the computer, the way that it is set up, which is us, the phone girls, that we know what they need. And we can help them to be prepared for those tests. Get them set up for those things.

Take Small Steps

When making changes in practice, perfection is not needed to embrace a different approach. Many of the practices had taken small steps, trying new methods and adjusting to the changes in their practice as they sought to embrace the clinical guidelines. Taking small steps implies motivation is present within the practice, and willingness to test a small change in practice.

Diane explains improvements in cholesterol screening, illustrating the impact of multiple small changes, in combination.

Diane: Buying the machines to do the point-of-care tests, running inquiries to find patients who haven't been in, updating our records help us know whether or not the patients were active, transferred or deceased. We zero in on patients that needed stuff-- the nurses do a lot more than they used to do. They have the authority to say that the patient has had the cholesterol checked.

Assimilating the EMR to Maximize Clinical Effectiveness

Using the EMR features more robustly assists with embedding evidence-based guidelines into practice. The practices and participants had different levels of expertise and experience with the use of the Practice Partner EMR system. Participants modified their approaches and methods to document in the record, search within the record, organize care, and use recalls for population management of specific conditions.

The nurse who worked with Dr. Glenn demonstrated an effective process for maximal use of the EMR:

> ***Dana****: Basically to help Dr. Glenn I try to make his life simpler and make him go faster. I do a lot of the recalls, sending out the letters, to get a hold of the patients. When they are here, I make sure that they get everything done that they need, a little bit of everything, really . . . Templates. I do a lot more with them now. I put in the quality stuff for this project. Those are really constantly changing. Before, in the beginning, I was just doing a lot of the recalls, and getting the patients in here. Since then it's really been the templates, sending out the letters. I do more than I used to do before . . . we usually go over the templates and what we need for each disease process, what questions we need to ask . . . A lot has been the templates; it cues us on what needs to be done when the patient is here. … The templates we use probably change on a weekly basis. We meet on a weekly basis but between those meetings, the templates change, and we can just jump*

right on them without even talking to him. One of the main things is to make his life easier… I try to get the notes done before he walks in. So he can do more talking with them instead of typing, and when he walks out he just has to put in his recommendations and impressions and then he'll be done with it all.

Feedback within a Culture of Improvement

Change in the practices was most enhanced by PPRNet-TRIP interventions. This had an impact on the practices organization and communication. A culture of participation and a competitive spirit emerged among numerous successful practices within the intervention group, revealing the motivating effect of feedback from the intervention. Performance data from quarterly reports and allowing time for prioritizing how to make improvements was valuable to the process of change. Dr. Valerie explained:

Dr. Valerie*: I think the patient's achievements themselves give you the kind of day-to-day feedback that keeps you going . . . I think that what I am doing differently now is what I thought I was doing before. I do a better job of it now. I have an understanding of how I can go about measuring the effectiveness of any particular approach that I am doing. And, it also has to do with the aging of the practice. I could have continued to emphasize care of younger people and health maintenance to a degree that would have eventually succeeded in excluding people who have chronic health problems cause they were going to move on or die. . . So, I think it just clarified in my mind that this is actually where the most effect is going to be felt.*

Discussion

The Microsystems framework with its emphasis on four quadrants, including leading organizations, people, performance and improvement, and information builds a foundation for an improvement-oriented environment [27, 28]. This informed the design and analysis of this research, which identified a framework for successfully leading the process of change that included seven concepts: *Vision with Clear Goals, Involve the Team, Enhance Communication Systems, Develop Staff Knowledge, Take Small Steps, Assimilate the EMR to Maximize Clinical Effectiveness, and Feedback within a Culture of Improvement*. These characteristics were found within the most successful "changers" or those practices that achieved the highest performance.

Developing the clinical team is important to successfully implementing change in practice. In a case study of one exemplary primary care practice without an EMR, Solberg and colleagues [33] found 12 principal attributes explained their excellent outcomes: visionary leadership; patient-centeredness; strong support for physician-patient relationship; strong group, team and standardization orientation; extensive involvement and management of all physicians and staff; highly organized change management; focused; strong change and improvement orientation; broad physician sense of ownership and responsibility; market driven; data-based, transparent and accountable; and pride and joy. This practice's culture of "leadership and patient-centeredness" influenced core changes within the group to adopt team processes that focus on quality.

Implementing an EMR without understanding how communication and decision-making occur, and how to resolve conflicts may undermine the benefits of the

information system's potential to improve care [34]. Developing implementation teams, establishing mechanisms for clinician knowledge and agreement about guidelines to be used within the context of specific practices, and explicitly addressing through the workflow, social and organizational issues, incorporating change management techniques can enhance the success of integrating the EMR system into practice [35]. Understanding the motivation of key stakeholders, resources and opportunities for change are also important. Cohen et al, found that change was influenced by complex interactions of factors inside and outside the practice [36]. Practice change occurred in relation to the interdependencies of these concepts: motivational reciprocity, evaluating and exercising opportunities for change; motivation, innovation and independence; outside motivators and resources for change; developing change trajectories and external influences on the change option landscape. Cohen's model for change provides rationale for additional work on team development, for the core variable found in this research: *assimilating the EMR into clinical practice to maximize clinical effectiveness*.

EMR systems are not merely substitutes for handwritten medical records, yet full integration by practice staff is not frequently seen. Staff resources or trainers to assist team members in effective use of the system may increase the benefits of the system. More research is needed to investigate the dynamics of organizational change within the context of EMR implementation. This type of change is interactive and non-linear [37].

Cultivation of group processes for team development can assist to implement changes in practice that result in improvement. Practice leadership needs to be willing and able

to set the tone and direction within a practice, allowing for diversity of opinion and approaches to change that can be implemented easily without long delays and procrastination for perfect solutions. Perceived team effectiveness has been noted within interdisciplinary teams that balance input, participation, achievement, and openness to innovation [38]. Staff at the front line of patient care can improve care using problem-solving techniques and a practical framework for structuring team improvement efforts and diffusing innovation [39, 40]. Nurses in primary care practices generally support clinical guidelines, and their role and influence within primary care is in a process of transition to one in which they may undertake responsibility for influencing the behavior of providers [41].

Interdisciplinary education has increased students' perceptions of professional roles [42-44]. Research is needed to evaluate the effectiveness of interventions for interdisciplinary continuing educational opportunities, and the relationship of such staff development on patient outcomes. Assuming a more team oriented practice environment requires considerable investment in the education of non-providers within the setting. Structured approaches such as Quality Team Development program have promoted positive results in teamwork and patient outcomes [45]. Encouraging the non-provider staff to engage patients in appropriate ways that support and reinforce treatment goals may further enhance quality.

Activating learning cultures in primary care practice settings that focus on individual and team capabilities to learn together might stimulate aligned efforts to promote the patient's best interest. Cohesive vision can be developed together, based upon the complex system [46]. Further research is needed that evaluates the outcomes of

interventions to promote “learning practices”. This can strengthen the processes that interdisciplinary teams use to improve quality.

Conclusions

The conclusions and framework developed to lead implementation of change resulted from research within a small and homogenous group of primary care practices in community settings. These practices were all independent, small practices, and part of a network of users of a common primary care based electronic medical record. The nature of this network involved self-selected practices that were interested in quality improvement and research in primary care practice. It is difficult to suggest that these findings would apply in an unmotivated group or a group without sufficient organizational resources.

Creating learning organizations is not an easy task for health care leaders, yet this direction is needed for the future and aligns well with the Future of Family Medicine’s goals [47]. With practices adapted to effective teamwork, interdisciplinary learning and use of performance data to drive improvement leaders can shape more successful Microsystems.

Competing interests

This research was funded by Agency for Healthcare Research and Quality, US Department of Health and Human Services, Public Health Service. Grant No. 1 U18 HS11132-01. The authors declare they have no competing interests.

Authors' contributions

LSN interviewed participants, coded the interview transcripts, analyzed the data and was principally responsible for the research idea, analysis and draft of the manuscript. CF reviewed all of the qualitative data, participated in the analysis and development of the framework, and editing of the manuscript. GWS provided leadership and direction to the first author in the research process, serving as the dissertation chair, and edited the manuscript. SMO is the principal investigator on the grant that funded this study, making this work possible. He provided oversight for this specific research within the context of the larger PPRNet-TRIP II study, enabling more credibility and applicability to additional testing of these concepts within the research network. All authors reviewed and approved of the final manuscript.

Acknowledgements

This manuscript is a portion of a dissertation submitted in partial fulfilment of the doctoral degree requirements of the Medical University of South Carolina. The first author thanks Jean Leuner who provided early advisement in this research and validated initial qualitative analysis. Benjamin F. Crabtree provided consultation and mentorship in the qualitative analysis process, and played an important role in this research on the dissertation committee. William Hueston and Tara Hulsey provided

advisement on the dissertation committee. Ruth Jenkins, Paul Nietert, Andrea Wessell and Loraine Roylance (members of the PPRNet-TRIP research team) contributed valuable input during the research process. Suzanne Gresle critically reviewed the manuscript providing editorial advice.

Figures

Title: Figure 1 - How to Lead Improvement for PPRNet (Nemeth, 2005)

Legend: The concepts of the model reflect an iterative and interactive process by which additional cycles of change are stimulated through performance feedback and subsequent opportunities to recreate vision with clear goals.

…

Tables

Title: Table 1- Semi-structured Interview Guide

Legend: (adapted from Microsystems In Healthcare [27])

Title: Table 2 - Levels of Achievement and Change for Practices in the Sample

Legend: Cut points for high, medium and low categories are based on dividing all 20 TRIP practices into 3 equally sized groups. Only a sample of 8 practices is described in this paper.

…

Additional files

Figure 1 - How to Lead Improvement for PPRNet (Nemeth, 2005)

Submitted separately : Figure 1.pdf

References

1. Kiefe CI, Allison JJ, Williams OD, Person SD, Weaver MT, Weissman NW: **Improving quality improvement using achievable benchmarks for physician feedback: A randomized controlled trial**. *JAMA* 2001, **285**(22):2871-2879.
2. Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, Sibbald G, Straus S, Rappolt S, Wowk M *et al*: **The case for knowledge translation: shortening the journey from evidence to effect**. *BMJ* 2003, **327**:33-35.
3. Chassin MR, Galvin RW: **The urgent need to improve health care quality. Institute of Medicine National Roundtable on Health Care Quality**. *JAMA* 1998, **280**:1000-1005.
4. Berwick DM: **A user's guide to the IOM's "Quality Chasm" report**. *Health Affairs* 2002, **21**(3):80-90.
5. McGlynn E, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, Kerr EA: **The quality of health care delivered to adults in the United States**. *New England Journal of Medicine* 2003, **348**(26):2635-2645.
6. Berwick DM: **Disseminating innovations in health care.[comment]**. *JAMA* 2003, **289**(15):1969-1975.
7. Coye MJ: **No Toyotas in health care: Why medical care has not evolved to meet patients' needs**. *Health Affairs* 2001, **20**(6):44-56.
8. Miller RH, Sim I: **Physicians' use of electronic medical records: Barriers and solutions**. *Health Affairs* 2004, **23**(2):116-126.
9. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud P-AC, Rubin HR: **Why don't physicians follow clinical practice guidelines? A framework for improvement**. *Journal of the American Medical Association* 1999, **282**(15):1458-1465.
10. Cabana MD, Ebel BE, Cooper-Patrick L, Powe NR, Rubin HR, Rand CS: **Barriers pediatricians face when using asthma practice guidelines**. *Archive of Pediatrics and Adolescent Medicine* 2000, **154**(7):685-693.
11. Clark M: **Barriers to the implementation of clinical guidelines**. *Journal of Tissue Viability* 2003, **13**(2):62-64.
12. Cranney M, Warren E, Barton S, Gardner K: **Why do GPs not implement evidence-based guidelines? A descriptive study**. *Family Practice* 2001, **16**(4):359-363.
13. Jiang HJ, Lagasse RS, Ciccone K, Jakubowski MS, Kitain EM: **Factors influencing hospital implementation of acute pain management practice guidelines**. *Journal of Clinical Anesthesia* 2001, **13**(4):268-276.
14. Crawford P, Brown B, Anthony P, Hicks C: **Reluctant empiricists: community mental health nurses and the art of evidence-based praxis**. *Health & Social Care in the Community* 2002, **10**(4):287-298.
15. Lomas J: **Evidence-based practice in Steeltown: a good start on needed cultural change.[comment]**. *Healthcarepapers* 2003, **3**(3):24-28.
16. Porto JV: **A culture of expertise, not conflict.[comment]**. *Healthcarepapers* 2003, **3**(3):58-64.
17. Rundall TG, Shortell SM, Wang MC, Casalino L, Bodenheimer T, Gillies RR, Schmittdiel JA, Oswald N, Robinson JC: **As good as it gets? Chronic care**

management in nine leading US physician organisations. *BMJ* 2002, **325**:958-961.
18. Miller WL, Crabtree BF, McDaniel R, Stange KC: **Understanding change in primary care practice using complexity theory.[comment]**. *Journal of Family Practice* 1998, **46**(5):369-376.
19. Miller WL, McDaniel R, Crabtree BF, Stange KC: **Practice jazz: Understanding variation in family practices using complexity science**. *Journal of Family Practice* 2001, **50**(10):872-878.
20. Crabtree BF: **Primary care practices are full of surprises![comment]**. *Health Care Management Review* 2003, **28**(3):279-283.
21. Jaen CR, Stange KC, Nutting PA: **Competing demands of primary care: A model for the delivery of clinical preventive services**. *Journal of Family Practice* 1994, **38**:166-171.
22. Solberg LI: **Guideline implementation: What the literature doesn't tell us**. *Joint Commission Journal on Quality Improvement* 2000, **26**(9):525-537.
23. Ornstein SM: **Translating research into practice using electronic medical records the PPRNet-TRIP project: primary and secondary prevention of coronary heart disease and stroke**. *Topics in Health Information Management* 2001, **22**(2):52-58.
24. Ornstein S, Jenkins RG, Nietert PJ, Feifer C, Roylance LF, Nemeth L, Corley S, Dickerson L, Bradford WD, Litvin C: **A multimethod quality improvement intervention to improve preventive cardiovascular care: a cluster randomized trial.[summary for patients in Ann Intern Med. 2004 Oct 5;141(7):I53; PMID: 15466764]**. *Annals of Internal Medicine* 2004, **141**(7):523-532.
25. Feifer C, Ornstein SM: **Strategies for increasing adherence to clinical guidelines and improving patient outcomes in small primary care practices**. *Joint Commission Journal on Quality and Safety* 2004, **30**(8):432-441.
26. Feifer C, Ornstein SM, Jenkins RG, Wessell AM, Corley ST, Nemeth LS, Roylance LF, Nietert PJ, Liszka H: **The logic behind a multimethod intervention to improve adherence to clinical practice guidelines in a nationwide network of primary care practices**. *Evaluation & the Health Professions* 2006, **29**(1):65-88.
27. **Exploring innovation and quality improvement in health care micro-systems: A cross-case analysis** [http://www.nap.edu/openbook/NI000346/html/65.html]
28. Nelson EC, Batalden PB, Huber TP, Mohr JJ, Godfrey MM, Headrick LA, Wasson JH: **Microsystems in health care: Part 1. Learning from high-performing front-line clinical units**. *Joint Commission Journal on Quality Improvement* 2002, **28**(9):472-494.
29. Glaser BG: *Basics of grounded theory analysis*. Mill Valley: Sociology Press; 1992.
30. Glaser BG: *Doing grounded theory: Issues and discussions*. Mill Valley: Sociology Press; 1998.
31. Strauss A, Corbin J: *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 2nd edition. Thousand Oaks: Sage Publications, Inc.; 1998.

32. Borkan J: **Immersion/Crystallization**. In *Doing Qualitative Research*. Edited by Crabtree BF, Miller WL. Thousand Oaks: Sage Publications, Inc.; 1999:177-194.
33. 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):109-116.
34. Crosson JC, Stroebel C, Scott JG, Stello B, Crabtree BF: **Implementing an Electronic Medical Record in a Family Medicine Practice: Communication, Decision Making, and Conflict**. *Ann Fam Med* 2005, **3**(4):307-311.
35. Sim I, Gorman P, Greenes RA, Haynes RB, Kaplan B, Lehmann H, Tang P: **Clinical decision support systems for the practice of evidence-based medicine**. *Journal of the American Medical Informatics Association* 2001, **8**:527-534.
36. Cohen D, McDaniel R, Crabtree BF, Ruhe MC, Weyer SM, Tallia A, Miller WL, Goodwin MA, Nutting PA, Solberg LI *et al*: **A practice change model for quality improvement in primary care practice**. *Journal of Healthcare Management* 2004, **49**(3):155-170.
37. Wears RL, Berg M: **Computer technology and clinical work: Still waiting for Godot**. *JAMA* 2005, **293**(10):1261-1263.
38. Shortell SM, Marsteller JA, Lin M, Pearson ML, Wu SY, Mendel P, Cretin S, Rosen M: **The role of perceived team effectiveness in improving chronic illness care**. *Medical Care* 2004, **42**(11):1040-1048.
39. Dorran DMI, Baker GR, Murray M, Bohnen J, Zahn C, Sidani S, Carryer J: **Achieving clinical improvement: An interdisciplinary intervention**. *Health Care Management Review* 2002, **27**(4):42-56.
40. Gosling AS, Westbrook JI, Braithwaite J: **Clinical team functioning and IT innovation: a study of the diffusion of a point-of-care online evidence system**. *Journal of the American Medical Informatics Association* 2003, **10**(3):244-251.
41. Harrison S, Dowswell G, Wright J: **Practice nurses and clinical guidelines in a changing primary care context: an empirical study**. *Journal of Advanced Nursing* 2002, **39**(3):299-307.
42. Fineberg IC, Wenger NS, Forrow L: **Interdisciplinary education: evaluation of a palliative care training intervention for pre-professionals**. *Academic Medicine* 2004, **79**(8):769-776.
43. Cooper H, Carlisle C, Gibbs T, Watkins C: **Developing an evidence base for interdisciplinary learning: a systematic review**. *Journal of Advanced Nursing* 2001, **35**(2):228-237.
44. Goodrow B, Olive KE, Behringer B, Kelley MJ, Bennard B, Grover S, Wachs J, Jones J: **The Community Partnerships Experience: a report of institutional transition at East Tennessee State University**. *Academic Medicine* 2001, **76**(2):134-141.
45. Macfarlane F, Greenhalgh T, Schofield T, Desombre T: **RCGP Quality Team Development programme: an illuminative evaluation**. *Quality & Safety in Health Care* 2004, **13**(5):356-362.
46. Rushmer R, Kelly D, Lough M, Wilkinson JE, Davies HTO: **Introducing the learning practice-II. Becoming a learning practice**. *Journal of Clinical Evaluation* 2004, **10**(3):387-398.

47. Future of Family Medicine Project Leadership Committee: **The future of family medicine: A collaborative project of the family medicine community**. *Annals of Family Medicine* 2004, **2 Supplement 1**:S3-S32.

Table 1. Semi-structured Interview Guide

- Level of performance:
  - How successful do they feel they are (at the practice level) implementing change?
  - How do they define success?
  - How would they describe the day-to day work environment of their system?
  - What are the communication patterns in the practice?
- Investment in improvement:
  - How would they describe what their system has done to implement the project, and improve quality?
  - What specific strategies have they used to improve their performance on selected indicators?
  - What assisted in making it successful?
  - What have been the barriers?
  - How have these been overcome?
- Leadership:
  - Have there been any special efforts to develop an effective team?
  - How does the leadership of this system affect the care that is provided here?
  - How does the practice handle new ideas?
  - Have new leaders (formal or informal) emerged to champion quality improvement efforts?
  - What is helpful?
  - What does not assist in improving care here?

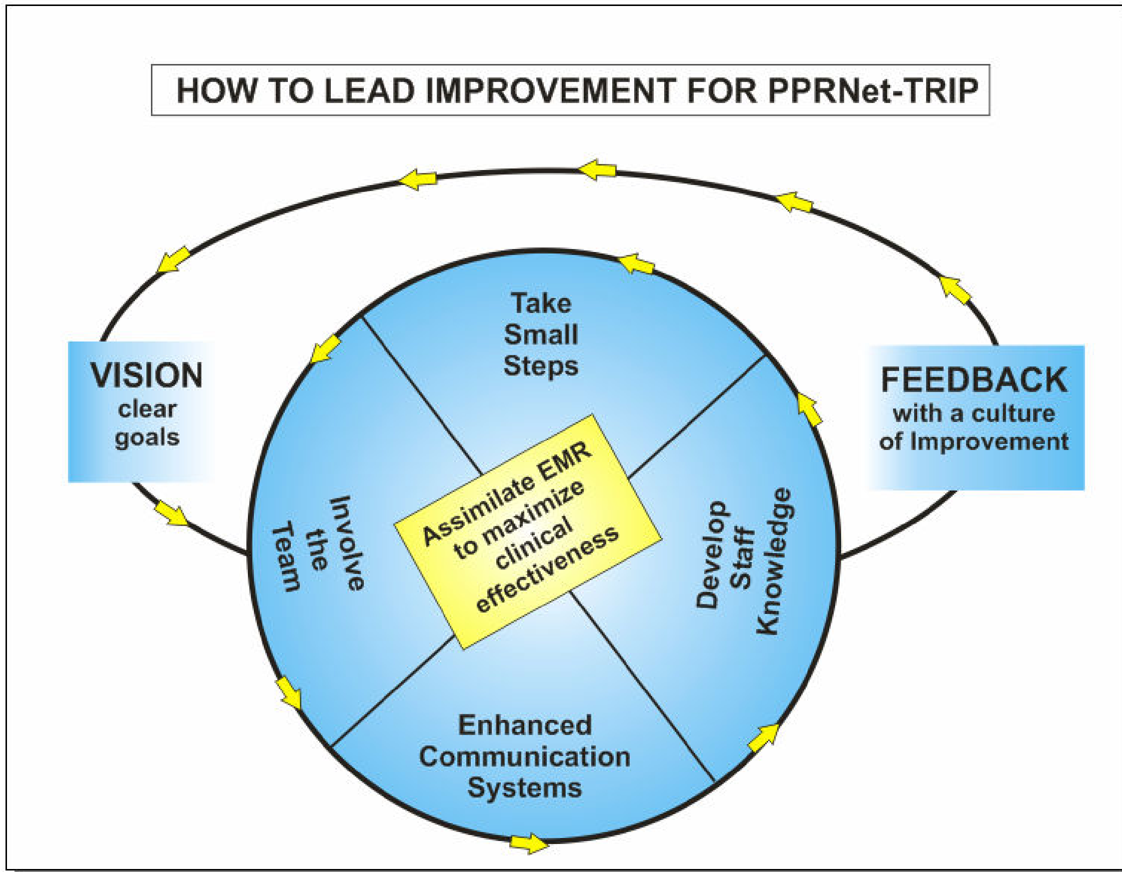
Legend: (adapted from Microsystems In Healthcare [27])

Table 2. Levels of Achievement and Change for Practices in the Sample

Achievement		Change	
% of targets reached	Number of Practices	difference between % of targets at end from baseline	Number of Practices
High (46 to 70%)	5	High (39 to 60%)	4
Medium (32 to 45%)	2	Medium (18 to 38%)	3
Low (9 to 31%)	1	Low (-17 to 17%)	1

Legend: Cut points for high, medium and low categories are based on dividing all 20 TRIP practices into 3 equally sized groups. Only a sample of 8 practices is described in this paper.

Figure 1. How to Lead Improvement for PPRNet (Nemeth, 2005)



Legend: The concepts of the model reflect an iterative and interactive process by which additional cycles of change are stimulated through performance feedback and subsequent opportunities to recreate vision with clear goals.