

# Chapter 23

## Evaluation of Electronic Medical Records in Primary Care

### A Case Study of Improving Primary Care through Health Information Technology

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#### 23.1 Introduction

Translating research into practice continues to be a challenge within primary care, evidenced by the inconsistent performance in delivery of recommended healthcare (McGlynn et al., 2003). Organizational support for improvement and implementation of guideline-based care in small primary care practices, where the majority of healthcare is delivered, is often fragmented and underdeveloped (Fisher, Berwick, & Davis, 2009).

Workflows in the primary care office are sometimes complicated and inefficient, and replacing paper records with an EMR system does not fix these inefficiencies (Miller & Sim, 2004). To improve quality when implementing the EMR, workflow redesign is important (Fiscella & Geiger, 2006). Smaller primary care practices that operate outside of large healthcare systems often lack systematic resources that assist them to set priorities for quality improvement (QI), and develop the staff that provide and support clinical care. Time and resources are needed to address the steep learning curve and the knowledge development needs of the non-clinician staff. A flexible change management strategy (Lorenzi, Kouroubali, Detmer, & Bloomrosen, 2009) and strategic planning is needed when adopting electronic medical records that can be used beyond the ways of a paper medical record system (Baron, 2007).

HIT adoption may be the catalyst to stimulate a process of change in the provision of primary care service delivery that improves the practice as a system.

When all members of the primary care team have timely access to patient information, the overall coordination of care can be improved, and team members can take on new roles that enhance the quality of healthcare. Yet using EMRS, clinical decision support systems, order entry, appointment schedules, and test results reporting systems requires the adoption and the creation of best practices in implementation, use and maintenance of the systems. Transformation of primary care is needed to redesign the system for improved care coordination, quality and safety, which benefit from better use of HIT (Meyers & Clancy, 2009). A coherent model to assist practices with implementation of evidence-based guidelines using HIT, grounded in the real-world experiences of small primary care offices, can engage newer practices on the path to improve the quality and effectiveness of the healthcare delivered.

## 23.2 Case Study: Improving Primary Care Through Health Information Technology

### 23.2.1 Aims

A series of seven studies that focused on Translation of Research into Practice (TRIP) within the Practice Partner Research Network (PPRNet), a primary care practice-based research network in the United States, were selected for secondary analysis to synthesize a decade of learning regarding how to use health information technology (HIT) to improve quality in primary care practices. A comparative case analysis of the findings of the seven studies created new insights regarding improving quality using HIT. The specific aims of this project were:

- 1 Complete a mixed methods secondary analysis to synthesize findings on using information technology (IT) to improve quality in primary care across seven nationally funded PPRNet initiatives.
- 2 Examine current perspectives of PPRNet-TRIP participants on team development and on methods for developing and sustaining QI efforts.
- 3 Integrate findings from PPRNet's previous studies with the current perspectives of practice representatives to refine the overarching theory-based "PPRNet-TRIP QI Model".

### 23.2.2 Background, Context, Settings, and Participants

PPRNet has conducted a consecutive series of research studies focused on TRIP funded by several United States agencies (Agency for Healthcare Research and Quality [AHRQ], National Cancer Institute [NCI], and National Institute for Alcoholism and Alcohol Abuse [NIAAA]) since 2001. This national practice-

based research network was established in 1995, at the Medical University of South Carolina. Up to 225 practices from 43 states in the U.S. participated in PPRNet activities through the quarterly extraction of electronic health record data from their practices, for benchmarking and quality improvement, and participation in PPRNet research trials and demonstration projects awarded during this time. Network participants shared best practices in improving quality on selected areas of interest at annual network meetings convened to form a collaborative learning community hosted by PPRNet investigators. This particular study was implemented to reach across a body of research that had focused on specific clinical areas for improvement, to generate overarching lessons learned from a decade of specific research that translated research into practice using electronic health records (EHRs).

### 23.2.3 Methods (Study Design, Data Sources/Collection)

#### *Aim 1:*

The mixed methods data from seven PPRNet studies were merged into an NVivo 9.0 database for qualitative secondary analysis. The studies focused on the following indicators and were funded by the following agencies.

- TRIP-II (cardiovascular disease and stroke secondary prevention)  
*AHRQ*
- A-TRIP (36 primary care indicators) *AHRQ*
- AA-TRIP (alcohol screening, brief intervention) *NIAAA*
- C-TRIP (colorectal cancer [CRC] screening) *NCI*
- MS-TRIP (medication safety) *AHRQ*
- SO-TRIP (screening, immunizations and diabetes care management) *AHRQ*
- AM-TRIP (alcohol screening, brief intervention, medication)  
*NIAAA*

Data were incorporated from the variety of sources from the participation of 134 practices (e-mail, meeting notes, site visit evaluations, focus groups, interviews, observations, memos) for analyses within the NVivo 9.0 database. Additionally, the performance data on PPRNet measures were reviewed to identify practices that were effective in implementing changes to improve performance in their practices on selected measures. In the review of these various data, concepts related to how practices revised clinical processes, procedures

and roles were clarified and compared across studies. Practice strategies for improvement within practices were examined after intense immersion with the data, and a cross-case comparison method enabled discovery of common features of each of the cases. Each of the studies listed above was considered a case. An inductive and deductive process was used iteratively in coding the data. The aim of these analyses were to draw out new ideas, to expand on concepts previously noted in these studies, and also to fit data into categories representing newer strategies that evolved over the decade. Current literature representing the advances over the decade in HIT, quality and patient-centred care were used to search more deductively for evidence of characteristics of these trends. An emphasis on data reduction was needed to minimize redundancy/overlap in concepts and to improve the clarity of a model for improvement that might be used to develop practices that are newer in their adoption of HIT.

*Aim 2:*

The 2011 and 2012 PPRNet annual meetings provided opportunities to review the current perspectives of PPRNet-TRIP participants. These diverse, national audiences of PPRNet practice members participated in the meetings held in Charleston, South Carolina for networking and dissemination of best practices related to Medication Safety, Standing Orders, Alcohol Screening and Brief Intervention, and Judicious Use of Antibiotics for Acute Respiratory Infections. Participants represented rural, urban, community-based family and internal medicine practices and included clinicians, clinical staff, practice managers, HIT support staff, and other office staff, primarily from small- to medium-sized practices, but including a number of larger practices as well. Field notes were taken regarding the Medication Safety component of the 2011 meeting that reflected how practices that participated in the MS-TRIP 2 project made improvements in their practice, why working on medication safety mattered to them, case examples of best practice strategies, and how these improvements related to efforts towards Patient Centred Medical Home (PCMH), meaningful use, and other aspects of performance review. Practices shared their best practice plans, and discussed timelines for implementing these plans.

A theme of the 2011 annual meeting focused on using PPRNet reports and quality improvement approaches to achieve Patient Centred Medical Home (PCMH) and other quality recognitions. One of the specific components of the 2011 meeting included a presentation of "Lessons Learned from 10 years of Translating Research into Practice" (Nemeth, 2011), and a panel of practice staff and providers from four practices that had exemplified numerous strategies that were learned from *Aim 1*. The practice panel provided an opportunity to seek the perspectives of other practices on how team development and sustaining quality improvement occurred in practice. Field notes were collected at this meeting (the 2011 meeting included 113 participants, with 57 practices represented) to document the discussion. Topics included: practice progress towards improving quality through participation in PPRNet; what has evolved and im-

proved; how this was accomplished; and what is most important to develop a team practice, to adopt and use HIT tools, to transform practice culture and quality, and to activate patients. There was a deep review of concepts, discussion of strategies and many questions and dialogue from the meeting participants, including discussion of potentially missing components from the model.

An interview guide was pretested with four practices, and these four practices presented their views on practice development and sustainability for QI at a panel presentation. Telephone interviews followed up the annual 2011 meeting to gain perspectives of other providers and staff that had participated in PPRNet research. Interviews were conducted between 2011 and 2012, in the context of current research underway within each practice, or practice initiatives to improve and capture additional practice revenue from payer initiatives, such as Patient Centred Medical Home pilots or Meaningful Use. The practice activities underway during the years 2010 through 2012 incorporated new interests in incentives with healthcare reform legislation passed.

The 2012 annual meeting included 98 practice participants, from 46 practices. In a session related to promoting the judicious prescribing of antibiotics for acute respiratory infections, we gathered practice perspectives in field notes related to the use of a template for clinical decision support, how to embed patient education into a structured visit guided by a template, and how to respond to patients requesting antibiotics when they were not indicated. Regarding the AM-TRIP project, we collected practice comments regarding the use of alcohol screening and brief interventions, and medication management for high-risk drinkers. The discussion reflected challenges with patients, reluctance from providers and nursing staff and how these were overcome in practices that participated in this study. Practice participants who did not participate in this study had the opportunity to learn from these practices, and raise awareness of the progress of other participating practices in improving performance on alcohol screening, intervention and treatment. Field notes taken during these sessions documented additional perspectives to the qualitative data that underlies the refined model.

### *Aim 3:*

This aim involved a creative synthesis in mapping the key concepts as variables that impact the process of improving primary care. Once the four key concepts were identified, the inputs and outputs related to these activities were mapped as a visual logic model. Yet, the visual representation of the relationships between these concepts evokes an understanding that makes practical sense to many practicing clinicians and their staff who provide primary care. After developing the visual figure the concepts and model were reviewed and, after an iterative process of revision and presentation to numerous audiences, the new PPRNet model was finalized. A logic model was added to more clearly specify how the model can be used as an implementation and evaluation framework similar to other implementation science efforts.

### 23.2.4 Results (Principal Findings, Outcomes, Discussion, Conclusions, Significance, Implications)

*Aim 1. Secondary analysis of seven studies.* The original PPRNet-TRIP QI model was developed through grounded theory development in the TRIP-II and A-TRIP studies which were formative to the subsequent PPRNet body of research. It became clear after lengthy immersion in the data, reflecting on the evolution of practice activities over the decade, that greater sophistication about how to improve on quality measures had occurred, and that many practices were highly motivated to achieve a competitive position. Four main concepts central to the new framework were identified: (a) developing a team care practice; (b) adapting and using HIT tools; (c) transforming the practice culture and quality; and (d) activating patients. The four concepts emphasize the complex interactions and roles within primary care practice, and interventions related to improvement on performance measures. Figure 23.1 presents the framework, and Figure 23.1 elaborates how the concepts in the early studies led to more sophisticated and complex practice transformation.

*Aim 2: Examine current perspectives of PPRNet-TRIP practice participants on team development and on methods for sustaining QI efforts.* Twenty interviews were conducted with primary care providers of practices in PPRNet after the development of the revised model. The findings of these interviews contributed to furthering an understanding of how practices developed their teams, and what enabled them to sustain their efforts to improve. These interviews elaborated provider perspectives about how they have developed during a more recent trend towards rewards for quality and performance in ambulatory care, a desire for designation as patient-centred medical homes, and participation in early pilots from commercial payers, Medicare and Medicaid demonstration projects, and meaningful use.

The key perspectives included support for developing enhanced roles for staff in the practice to collect more data from patients, acting on decision support, reminders, and alerts provided within the EHR, and implementing routine actions that save the provider time during clinical encounters. The need for technical support to ensure that the EHR was set up correctly to provide the needed health information to be alerted was clearly articulated, and often the role of technical support was provided by a lead physician who was more technically savvy than others or more inclined to take on this responsibility. In practices that lacked this internal leadership, and in larger practices, IT support staff were needed and worked with a lead provider. Care coordination and outreach to follow up on patients not at goals for values of quality measures, or for those that needed chronic care management, was clearly becoming a more important activity in practices that wanted to act on the performance data that was generated within PPRNet reports. The activities related to increasing patient-centredness and patient activation were newer activities in many of the practices, and the EHR resources proved to be a very important component of reaching out to patients using Web portals, letters, and after-visit summaries and re-

mindsets to patients to follow up on issues that were important to their care. Most of these additional activities were undertaken to reap financial rewards for the quality of care that the practice was aiming for.

The interviews established validity for the revisions to the PPRNet-Translating Research into Practice (TRIP) QI model that had been used within practices to improve quality of care using HIT.

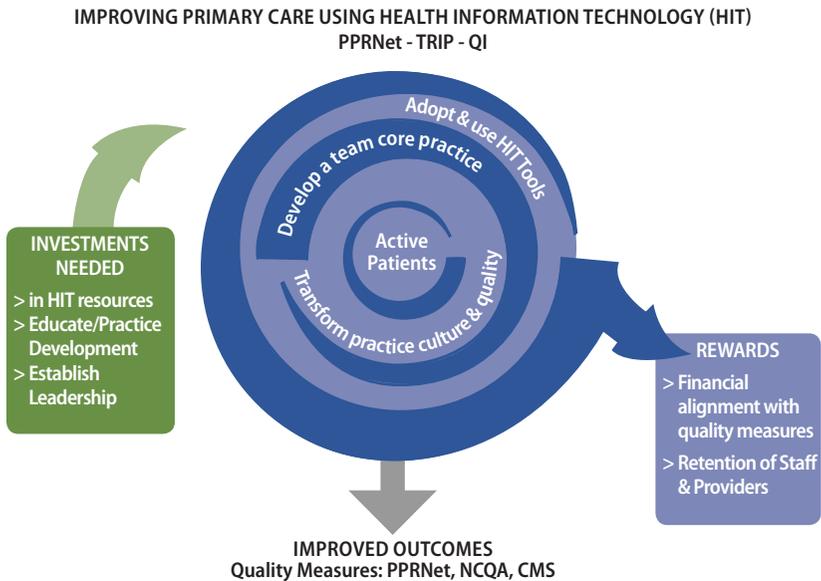


Figure 23.1. PPRNet-TRIP QI: A refined framework guiding primary care improvement.

Note. From “Lessons learned from 10 years of translating research into practice,” by L. Nemeth, 2011, a presentation to the 16th annual meeting of the Practice Partner Research Network (PPRNet), Medical University of South Carolina, Charleston, SC. [Acknowledgement: AHRQ R03HS018830].

*Aim 3: Integrate findings from PPRNet’s previous studies with the current perspectives of practice representatives to refine the overarching theory-based “PPRNet-TRIP QI Model.”* The four concepts in the new model — “Improving Primary Care through Health Information Technology” (IPC-HIT) — provide clear areas of focus for developing primary care practices towards high performance on quality measures using HIT. Figure 23.1 presents the concepts and relationships of the framework. The inputs to the process viewed as a logic model include that practices must decide to make investments in HIT resources, which require the financial capacity and time to be allocated for selection and learning to use the EHR. Education of the providers and staff is required, and leaders must be appointed to ensure appropriate use of new systems. In some practices this required hiring HIT coordinators, and in others a technically savvy clinician might take the lead. Outputs of the process shown in the centre of the model in

the figure include: (a) financial rewards to the practice for their accomplishments in improvement, and (b) retention of staff and providers who work together to increase value in the healthcare services provided. Outcomes are demonstrated performance improvements on measures that are important to the practice, such as PPRNet quality measures, and how they stand on these measures compared to the other practices in PPRNet as noted by PPRNet medians and benchmarks (90th percentile).

Primary care practices that have used EHRs, participated in PPRNet practice-based research to improve the translation of research into practice, or have been willing to share their strategies, successes, barriers, and rewards have been able to make improvements towards higher performance. This learning community has provided opportunities for reciprocal knowledge dissemination from researchers to clinicians and vice versa. The lessons of this decade of research together provide a model for other practices newer in the transition and adoption of EHR tools to improve quality using their enhanced teams and a quality culture to activate patients.

To explain these concepts in more detail, Table 23.1 presents “what” (concepts) and explains “how” (strategies) improvements in primary care have been made during participation in PPRNet studies.

The logic model for IPC-HIT is presented in Table 23.2. For practices that are implementing the IPC-HIT model the following strategies and measures should be considered.

**Table 23.1***Specific Approaches Found Within a Decade of PPRNet Research*

		Improving Primary Care Using HIT: Specific Approaches/Strategies Within PPRNet		
		TRIP-II to ATRIP (2001-2006)	AA/AM/SO/C-TRIP (2005-2012)	MS-TRIP (2007-2012)
Concepts	Develop a Team Care Practice	<ul style="list-style-type: none"> <li>• “Involve all staff,” new roles/responsibilities</li> <li>• Clinicians agree to decrease practice variation</li> </ul>	<ul style="list-style-type: none"> <li>• Structured screening tools (MAs/nurses)</li> <li>• Complementary team roles better defined, providers closing loop</li> </ul>	<ul style="list-style-type: none"> <li>• Medication reconciliation, outreach as needed</li> </ul>
	Adapt and Use HIT Tools	<ul style="list-style-type: none"> <li>• Staff increased use of EHR</li> </ul>	<ul style="list-style-type: none"> <li>• Specific templates used for decision support</li> <li>• Revised/edited, add macros, applied age, gender, Dx/ Rx templates</li> <li>• Lab interfaces, scanning, eRX, Web-based patient portals added</li> </ul>	<ul style="list-style-type: none"> <li>• Rx/Dx templates applied</li> <li>• Improved medication reconciliation</li> <li>• Increased attention to dosing alerts</li> </ul>
	Transform Practice Culture and Quality	<ul style="list-style-type: none"> <li>• Emphasis on quality, set goals, celebrated successes</li> <li>• Quality committees/coordinators</li> </ul>	<ul style="list-style-type: none"> <li>• Liaisons coordinate projects/communication, use performance reports at practice and patient level</li> <li>• Staff education; SO’s increased, explicit policies, practice culture rewarded by P4P etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Reports used for outreach</li> <li>• Refill protocols</li> <li>• Standing orders for labs</li> <li>• Printed med lists</li> </ul>
	Activate Patients	<ul style="list-style-type: none"> <li>• Handouts, posters, screening/immunization events</li> <li>• Press releases</li> </ul>	<ul style="list-style-type: none"> <li>• Brief intervention, counselling, treatment, referrals</li> <li>• Targeted messages: “Rethinking Drinking”; Screen for Life; birthday letters, HM reminders in letter</li> <li>• Active f/u for completion of tests; outreach</li> </ul>	<ul style="list-style-type: none"> <li>• Patient update forms, bring all meds, labs in advance</li> <li>• Long appointments for med reviews, med list provided at end of visit</li> </ul>

Note. From “Making sense of electronic medical record adoption as complex interventions in primary health care,” by F. Lau, L. Nemeth, and J. Kim, 2012, a presentation to the *Canadian Association for Health Services and Policy Research (CAHSR)* conference, Montreal. [Acknowledgement: AHRQ R03HS018830].

**Table 23.2***Logic Model Disseminating Effective Strategies to Improve Preventive Services Using HIT*

<b>Construct</b>	<b>Practice Strategy</b>	<b>Measures of Implementation /Outcomes</b>
Develop a Team Care Practice	<ul style="list-style-type: none"> <li>• Design practice roles and processes that support workflow</li> <li>• Provide tools to clarify care process, staff understand new roles</li> <li>• Create environment of mutual trust and open communication</li> <li>• Recruit staff members comfortable working in an empowered practice</li> <li>• Regular team meetings to determine best processes</li> </ul>	<ul style="list-style-type: none"> <li>• Process evaluation (Q):</li> <li>- Roles clear/adopted</li> <li>- Policies/protocols</li> <li>- Communication mechanisms in place</li> <li>- Staff selected that embrace practice goals/retained</li> <li>- Team meets regularly and engaged in decision-making</li> </ul>
Adapt and Use Health Information Technology Tools	<ul style="list-style-type: none"> <li>• Leader oversees adapting and updating electronic health record (EHR) for clinical decision support</li> <li>• Use embedded utilities to ensure age, gender and condition specific templates are applied within EHR</li> <li>• Embed structured templates for staff data collection and follow-up</li> <li>• Use medication prescribing alerts and e-prescribing</li> <li>• Interface labs, scan procedure reports and outside services to ensure accurate records</li> </ul>	<ul style="list-style-type: none"> <li>• Time and cost allocated for HIT support by practice (who, how much time, financial impact) (S)</li> <li>• Extent of use of CDS tools among practice staff and providers (S)</li> <li>• Proportion of patients within practice with e-prescriptions (PR)</li> <li>• Proportion of patients with up-to-date health maintenance (HM) received (PR)</li> </ul>
Transform Practice Culture and Quality	<ul style="list-style-type: none"> <li>• Review performance reports to identify priorities for improvement</li> <li>• Practice-wide discussion and agreement re: quality goals</li> <li>• Training to increase staff self-efficacy to implement changes</li> <li>• Evaluate and support learning and improvement efforts as a team</li> </ul>	<ul style="list-style-type: none"> <li>• Performance on selected quality measures improved (PR)</li> <li>• Staff adopt roles/responsibilities (S)</li> <li>• Providers perceive effectiveness of workflow (S)</li> <li>• Practice receives increased revenues for performance (S)</li> </ul>
Activate Patients	<ul style="list-style-type: none"> <li>• Engage patients through screening conversations and reminders</li> <li>• Use posters, letters, and Web portals</li> <li>• Outreach to ensure completion of recommended services</li> <li>• Remind patients to bring all medications to visits for; reconciliation and review</li> </ul>	<ul style="list-style-type: none"> <li>• Process evaluation to assess (Q):</li> <li>- Posters, letters</li> <li>- Patient Web portals, kiosks</li> <li>- Review and reconciliation processes</li> <li>- Outreach</li> <li>• Up to date HM received (PR)</li> </ul>
Legend: Measures can be evaluated by: Qualitative data (Q); Performance Reports (PR); or Survey (S)		

Acknowledgement: AHRQ R03HS018830 (Final progress report to AHRQ, 2013, unpublished)

### 23.2.5 Issues, Guidance and Implications

*Developing a Team Care Practice* adds an understanding that providers engage their staff as partners to achieve quality outcomes with patients. Front office staff members who receive and schedule patients for follow-up care need to fully understand the goals for improvement that the practice has set, to increase the follow through by patients. Clinical staff participated to a larger extent in role expansion when they were clear about the goals, what the practice wanted to do as a team, and knew what their role expectations were.

*Adapting and Using Health Information Tools* involves developing more sophisticated use of the HIT tools available in the practice's EHR. Effective use of EHR features requires practice customization related to patient populations served, and practice patterns. Some degree of HIT expertise is needed to be able to customize these tools to provide efficient and accurate data that drives reminders, alerts and any other decision support that is needed to deliver quality primary care. This may require the allocation of practice-based resources to ensure this component is managed effectively.

*Transformation of Practice Culture and Quality* is a process that evolves from engagement as a team, and using data from performance to inspire practices to develop new approaches. This occurs while learning, evaluating and reflecting on practice-specific progress in the improvement efforts that have been prioritized, and the research evidence that has been translated into practice.

Lastly, *Activate Patients* is the focus of practice-based efforts to improve. This often was seen as a paradigm shift from an era of provider-dominated healthcare agendas to a focus on developing patient-centredness in an era of stakeholder-engaged teams seeking to improve knowledge regarding healthcare decisions and behaviours, activation of patients as partners in their care, and understanding of values and preferences of patients. In this study we learned that by using HIT tools, practice teams can reach out to patients to provide and validate recorded health information data, present needed services, request patient decisions and ensure medications are reconciled, and monitor chronic conditions as needed.

Noted within this synthesis of seven studies were both barriers and facilitators to improvement in primary care using HIT.

- 1 Barriers included: lack of practice leadership, vision and goals related to improvement using HIT; lack of provider agreement and consensus on approaches; need for HIT technical support, expertise and resources for using HIT effectively; staff and provider turnover, organizational change or change in practice ownership.
- 2 Facilitators included: having practice policies and protocols; staff education and follow-up by leaders and clinicians; enhanced communication processes; streamlined tools and templates to improve workflow and efficiency; having a practice-wide approach that re-

inforced consistent staff expectations for adoption of expanded roles; and having providers close the loop on what practice staff initiate.

New questions and hypotheses were generated by this research. Most importantly, the introduction of the four concepts in the IPC-HIT model provide direction to practices that want to improve their workflow and processes to achieve goals of improved healthcare delivery to their activated patients. By introducing the concepts and example practice strategies for improving primary care through HIT, there should be corresponding implementation plans and measurement of outcomes such as noted in the logic model in Table 23.2. Some examples of the hypotheses related to processes and outcomes found in this table include:

- Staff will adopt expanded roles with clear policies and protocols regarding using the HIT in their work with patients.
- Providers will close the loop with patient care when staff members initiate patient services that are warranted by practice protocol.
- HIT will be supported by a designated leader within the practice, who will educate staff and providers regarding changes.
- Performance on clinical quality measures show improvement after developing practice teams with this model.
- Financial revenues are increased related to performance on clinical quality measures.
- Providers and staff are retained in practices that provide attention to the four concepts in the model.

A primary limitation to this research should be noted. The principal investigator was the qualitative analyst of the original research and this synthesis. Limited resources to review the wealth of qualitative data obtained in the primary studies precluded analytic support. However, with the assistance of the primary researchers, and review by the member practices in PPRNet, it was clear that the model was supported as valid. Overcoming this limitation, it should be noted that the strength of the research was that it was conducted in a national network and not limited to a specific geographic region. Participants in PPRNet were clear about how they develop their staff toward high performance, and have a track record evidenced in their performance data that demonstrated the effective approaches resulted in clear improvements.

### 23.3 Summary

Over the past decade, PPRNet established a theoretically-informed framework for translating research into practice (TRIP) in small- to medium-sized primary care practices that use the Practice Partner® electronic medical record (EMR). The PPRNet-TRIP Quality Improvement (QI) Model included three components: an intervention model, an improvement model, and a practice development model that assists practices with implementation of strategies to improve on selected performance measures. During the course of the present research, we have streamlined the most important components to four main concepts that can provide an organizing framework for improvement.

This research included a robust evaluation of the mixed methods data and lessons learned from a decade of PPRNet-TRIP. The experience of PPRNet research participants and researchers enhanced understanding of the PPRNet-TRIP components and how practices improve primary care quality with their health information technology and team-based approaches to care. The cross-case analyses conducted through this research generated important themes, provided new insights, and generated new hypotheses about factors that improve the quality of care through the use of EMRs. The new framework will provide practical guidance for practices that are undertaking these efforts to achieve meaningful use, patient centred medical home recognition and paths for improved financial resources pertaining to quality improvement in primary care practice.

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