Research Methods

A Practical, Robust Implementation and Sustainability Model (PRISM) for Integrating Research Findings into Practice

Adrianne C. Feldstein, M.D., M.S.
Russell E. Glasgow, Ph.D.

There is growing recognition that advances in health care are limited by failure to translate research findings into practice.[1] Although studies address the efficacy and effectiveness of health interventions, far less research addresses what helps practices be implemented and sustained.[2–6] As long as efficacy and effectiveness trials are considered complete without considering implementation outside the research study, the public health potential of the original investments will not be realized.[7]

There is a particular absence of data associating characteristics of local medical practices—where the care is primarily delivered—with the success of program implementation.[6] Although many methods have been described that successfully change practice,[2] the experimental literature addressing the implementation, diffusion, and sustainability of these methods is sparse, and there is insufficient evidence to support the use of any particular strategy in many clinical areas.[3–5,7–9]

One barrier to progress in improving program implementation is the absence of a comprehensive, prescriptive, and robust—yet practical—model to help organizations and researchers understand what factors need to be considered and addressed and how to measure success. A conceptual framework for improving practice is needed to integrate the key features for successful program design, predictors of program implementation success, factors associated with diffusion and maintenance, and appropriate outcome measures. We build on others' work in qual-

Article-at-a-Glance

Background: Although numerous studies address the efficacy and effectiveness of health interventions, less research addresses successfully implementing and sustaining interventions. As long as efficacy and effectiveness trials are considered complete without considering implementation in nonresearch settings, the public health potential of the original investments will not be realized. A barrier to progress is the absence of a practical, robust model to help identify the factors that need to be considered and addressed and how to measure success. A conceptual framework for improving practice is needed to integrate the key features for successful program design, predictors of implementation and diffusion, and appropriate outcome measures.

Developing PRISM: A comprehensive model for translating research into practice was developed using concepts from the areas of quality improvement, chronic care, the diffusion of innovations, and measures of the population-based effectiveness of translation. PRISM—the Practical, Robust Implementation and Sustainability Model—evaluates how the health care program or intervention interacts with the recipients to influence program adoption, implementation, maintenance, reach, and effectiveness.

Discussion: The PRISM model provides a new tool for researchers and health care decision makers that integrates existing concepts relevant to translating research into practice.

Table 1. Models Important to Implementing Evidence-Based Practice*

Model	Key Elements
Diffusion of Innovations†	Relative advantage, compatibility, complexity, trialability, observability
Chronic Care Model (14)	Community, health system leadership, self-management support, delivery system design, decision support, clinical information systems
Model for Improvement (21,25)‡	Leadership responsibility, identification of better ideas, communication, strengthening social system, measurement and feedback, knowledge management
RE-AIM (16)	Reach, effectiveness, adoption, implementation, maintenance

* References in parentheses can be found in the "References" section.
† Rogers E.M.: Lessons for guidelines from the diffusion of innovations. *Jt Comm J Qual Improv* 21:324–328, Jul. 1995.
‡ Institute for Healthcare Improvement: *How to Improve*. http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/HowToImprove/ (last accessed Feb. 21, 2008).

ity improvement (QI),[5,10–13] chronic care,[14] the diffusion of innovations,[9] and measures of the effectiveness of the translation of research into practice[15,16] to propose and describe a practical and prescriptive model for future field testing and refinement. Our primary focus is the health care practice, but the model is also applicable to other settings where health interventions may be delivered, such as work sites or school-based settings. We call the model PRISM—the Practical, Robust Implementation and Sustainability Model.

The following section discusses how PRISM was developed. The "Case Studies" section presents several case studies to retrospectively demonstrate aspects of the model. (All the case studies referenced received Institutional Review Board approval at the sites where they were conducted.)

Developing PRISM

To inform PRISM development, we examined existing models in common use in implementation and diffusion research. To identify existing models of interest, in June 2006 we conducted a literature review to identify articles with the following words in the title or abstract: (*translation* OR *translating*) AND *research* AND *practice*. We also searched using the subject heading terms *information dissemination* AND (*practice guidelines* OR *research* OR *evidence-based medicine*), AND *knowledge transfer*. For relevant additional citations, we used the "Related Articles" feature of PubMed. Model development also was informed by the authors' experience in conducting implementation research studies, examples of which are discussed in the "Case Studies" section. We researched and included in PRISM development related concepts with high face validity in the authors' experience. PRISM is derived from the models and key elements presented in Table 1 (above).

Multiple aspects of the model are derived from work in diffusion of innovations,[9,17,18] social ecology,[19] the PRECEDE/PROCEED model,[20] and more pragmatic QI concepts.[5,10,13,21] This work provides strong support for considering the perceived relative advantage of adopting new behaviors; the cultural compatibility and complexity of the innovation; and the ability to see results (observability), try a new practice (trialability), and terminate it if it is problematic or ineffective (reversibility). These methods also advocate for documenting and defining the one or two most influential elements[22] at each of multiple levels of influence; that is, minimizing the number of areas of focus can lead to maximizing intervention effectiveness and efficiency.

The model also borrows heavily from the Chronic Care Model (CCM),[14,23,24] which has been tested in many randomized clinical trials (RCTs) studying numerous chronic diseases.[24] CCM supports the need to leverage support from the community, health system leadership, delivery system design, clinical information and clinician decision systems, and patient self-management to maximize outcomes. It also highlights the critical role of clinical information systems to define gaps in care, measure performance change, and provide decision support at the point of care.

In developing PRISM we integrated several elements

from the QI literature, including the Model for Improvement.[21,25] Important elements to improve program implementation include creating an infrastructure for encouraging spread, sharing best practices, observing results and adjusting processes accordingly, facilitating internal (across team and specialties) and external (patient and other payor) service, and ensuring adaptability of protocols at the local level. The Model for Improvement is similar to the Six Sigma process[26] (which originated outside of health care), which identifies critical points in the process where changes should be made, guides making the changes, and ensures that the changes are established as permanent practice. The Model for Improvement also contains concepts from the "promoting action on research implementation in health services" (PARIHS) framework,[27] which focuses on three elements: evidence, context, and facilitation.

The outcome measures are guided by the RE-AIM framework,[15,16] which emphasizes public health and population (denominator-based) measures of the effectiveness of the translation of research into practice. RE-AIM measures results along the dimensions of reach (to diverse patient groups), effectiveness, adoption (by practice settings and clinicians), implementation (consistency of delivery by various staff), and maintenance of practices and results over the long term.

The model (Figure 1, right) includes organizational and patient perspectives of the intervention and characteristics of the organizational and patient recipients. The organization includes three levels of personnel—top leadership; mid-level managers, including the QI infrastructure; and frontline staff (clinicians and support staff).

We use several implementation case studies, summarized in Table 2 (pages 231–232), to describe and illustrate selected activated PRISM elements. Table 2 also summarizes the way the major PRISM domains (program or intervention, external environment, infrastructure, recipients) influenced the implementation success of the case studies. Table 3 (page 235) lists elements within each of the major PRISM domains, as illustrated in the case studies.

The Practical, Robust Implementation and Sustainability Model (PRISM)

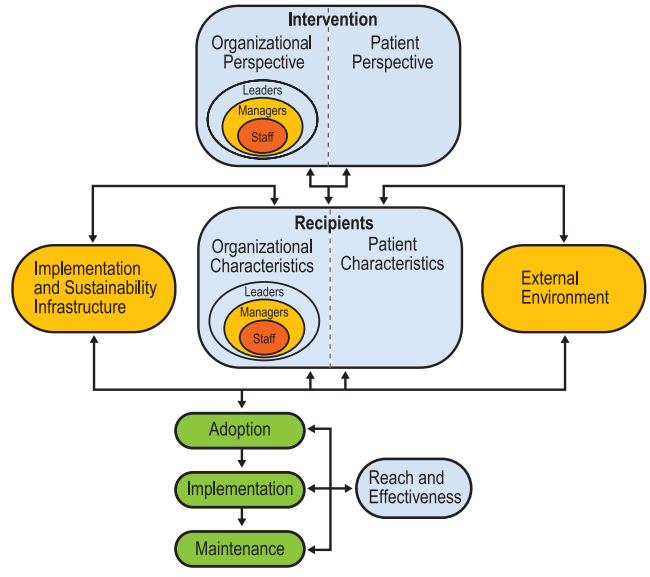

Figure 1. *The model considers how the program or intervention design, the external environment, the implementation and sustainability infrastructure, and the recipients influence program adoption, implementation, and maintenance.*

Case Studies

The Program (Intervention)

The Organizational Perspective. It is important to consider the specific program or intervention elements from the perspective of the organization and staff to be targeted. We recommend assessment of the organizational readiness for the program, the strength of the evidence base for the clinical target area and proposed implementation strategy, whether or not the program addresses the barriers of frontline staff, the need for coordination across departments and specialties, the burden the program presents (complexity and cost), the program usability (ease of use and perceived usefulness) and adaptability to local settings, the ability to try the program (trialability) and reverse course (reversibility) if indicated, and the ability to see program results (observability).

For an organization to accept an intervention and integrate it into current work flow or practice, the innovation needs to be aligned with the organization's mission and stage of development of translational or change capacity. The timing of introduction of innovations is critical. For example, the Safety in Prescribing (SIP) project (see Table 2) assessed the effectiveness of computerized patient-spe-

Table 2. Case Studies Highlighting Elements in PRISM That Affected Implementation/Sustainability*

Study	Clinical Area	Intervention	Results	PRISM Elements Activated
Re-fracture Intervention Trials (REFIT) 1 and 2†	Postfracture management of osteoporosis	REFIT 1: - Patient-specific EMR reminder to PCP - Phone-based nurse case management pilot REFIT 2: - Combined interventions adopted	REFIT 1: - Reminder increased BMD measurement and osteoporosis treatment. - Phone-based nurse case management increased treatment. REFIT 2: - Program led to increased population BMD measurement and osteoporosis treatment; geographic variation in effect noted. - Effect remained positive but eroded somewhat over time.	**Program (Interventions)** - Evidence base strong - Barriers of staff addressed - Solved coordination between specialty and primary care - Tracking of results **External Environment** - New HEDIS measure increased interest. **Implementation and Sustainability Infrastructure** - Dedicated team - Bridge researchers helped identify improvement opportunity and solutions. - Adaptable protocol allowed creative use of staff. - Adopter training and support and sharing of best practices minimal - Plan for sustainability incomplete **Recipients** - Strong management support for improving HEDIS measure - Strong clinical leadership - Patient tracking system facilitated management. - Consistent performance data provided - Expectation by organization of sustainability mixed - Older patient age, prevalent dementia served as barriers to treatment.
Safety in Prescribing	Risky prescribing	Alerts at computerized order entry for medication interactions, elder prescribing, and renal dosing	- Potential prescribing errors reduced - Alerts for elder prescribing adopted nationally	**Program (Intervention)** - Organization aimed to improve benefit from EMR - Safety an organizational priority - Alerts facilitated recognition of risky prescribing. - Alert usability maximized - Methods to track results in place **External Environment** - Increasing regulatory interest in safety **Implementation and Sustainability Infrastructure** - Bridge researcher assisted to develop, implement, and evaluate alerts - Multidisciplinary implementation team - Informatics clinical champion has local and national support roles. - Alert maintenance transferred to local staff **Recipients** - Strong management support - Clinical leadership pharmacy and informatics - Alerts tailor existing EMR functionality. - Sustainability pre-planned and expected
Lab Alert	Therapeutic monitoring	Patient-specific EMR reminder to the PCP, an automated voice message to the patient, and pharmacy team outreach	- All 3 interventions increased laboratory monitoring at treatment initiation compared to usual care. - AVM most cost-effective - AVM implemented for cancer screening reminders	**Program (Intervention)** - Reminders provided safety net for lab monitoring. - Pre-testing enhanced acceptability to staff and patients. - Strength evidence base mixed **External Environment** - Increased regulatory interest in safety - New HEDIS measure for therapeutic monitoring **Implementation and Sustainability Infrastructure** - Data supporting effectiveness - Dedicated teams performed interventions. - Sustainability not pre-planned - Bridge researchers facilitate implementation of AVM in another priority clinical area. **Recipients** - Strong management support - Pharmacy provides clinical leadership. - Existing EMR and pharmacy procedures facilitate interventions. - Little expectation of sustainability - Older patient age facilitated therapeutic monitoring.

(Continued on page 232)

Table 2. Case Studies Highlighting Elements in PRISM That Affected Implementation/Sustainability*

Study	Clinical Area	Intervention	Results	PRISM Elements Activated
Diabetes Priority Program	Diabetes care quality improvement	Computer-assisted quality improvement program for adult diabetes patients and health care providers in 30 Colorado primary care offices	Improved patient-centered self-management counseling and HEDIS-related performance measures	**Program (Intervention)** - Provided patient information not conveniently available - Summarized tests and HEDIS criteria the patient was 'due for' - Included user-friendly prompts for patients, physicians, and staff to enhance communication about diabetes care **External Environment** - Supported and promoted by malpractice insurer - Congruent with many diabetes quality improvement efforts in state and nation **Implementation and Sustainability Infrastructure** - Several aspects were automated and did not require staff time. - Nurse or staff telephone follow-up proved difficult to sustain. - Touch-screen computers and study implementation materials left with practices following study **Recipients** - Diabetes was a high-priority area these practices were interested in. - A number of participating practices were rural, small, unaffiliated mixed-payor settings that typically did not have such support.
Health Information Technology (HIT) Smoking Cessation Project	Smoking cessation	Fax referral system to the state tobacco quit line through a one-step fax referral system	Enhanced provision of smoking cessation services	**Program (Intervention)** - Generated feedback reports based on highly credible USPSTF "5A's" counseling model - Feedback reports generated from EMR information did not require added time from clinical staff. - Format and content of feedback reports developed in collaboration with practices **External Environment** - Smoking identified as important key preventive service in health care plan - State had developed and publicized Quit Line with easy referral from physicians. **Implementation and Sustainability Infrastructure** - Individual practitioner reports automatically were generated using natural language programming. - Tie-in with state Quit Line and easy referral enhanced implementation. **Recipients** - All staff recognized importance and cost-effectiveness of smoking counseling; just challenging to implement.

* PRISM, Practical, Robust Implementation and Sustainability Model; EMR, electronic medical record; BMD, bone mineral density; PCP, primary care provider; HEDIS, The National Center for Quality Assurance, Health Plan Employer Data and Information Set; AVM, automated voice messaging to patient; USPSTF, U.S. Preventive Services Task Force.

† References for the case studies are as follows:

- **Re-Fracture Intervention Trial Phase 1 and Phase 2 (REFIT1, REFIT2)**
  - Feldstein A.C., et al.: Electronic medical record reminder improves osteoporosis management after a fracture: A randomized, controlled trial. *J Am Geriatr Soc* 54:450–457, Mar. 2006.
  - Feldstein A.C., et.al.: An outreach program improved osteoporosis management after a fracture. *J Am Geriatr Soc* 55:1464–1409, Sep. 2007.
- **Safety in Prescribing**
  - Feldstein A.C., et al.: Design and implementation of decision support for outpatient prescribing in an electronic medical record. The Safety in Prescribing study. *Advances in Patient Safety: From Research to Implementation.* AHRQ Publication No. 050021: 2005. Rockville, MD.
  - Feldstein A.C., et al.: How to design computerized alerts to safe prescribing practices. *Jt Comm J Qual Saf* 30:602–613, Nov. 2004.
- **Lab Alert**
  - Feldstein A.C., et al.: Improved therapeutic monitoring with several interventions: A randomized trial. *Arch Intern Med* 166:1848–1854, Sep. 25, 2006.
- **Diabetes Priority Program**
  - Glasgow R.E., et al.: A practical randomized trial to improve diabetes care. *J Gen Intern Med* 19:1167–1174, Dec. 2004.
  - Glasgow R.E., et al.: Randomized effectiveness trial of a computer-assisted intervention to improve diabetes care. *Diabetes Care* 28:33–39, Jan. 2005.
- **Health Information Technology (HIT) Smoking Cessation Program**
  - Rahm A K., Palen T.E., Glasgow, R.E.: Challenges in switching electronic medical record systems: The Kaiser Permanente Colorado experience. Paper presented at the 12th Annual HMO Research Network Conference, Boston, May 2, 2006.
  - Hazlehurst B., et al.: Natural language processing in the electronic medical record: Assessing clinician adherence to tobacco treatment guidelines. *Am J Prev Med* 29:434–439, Dec. 2005.

cific decision support tools for providers to improve prescribing safety. Implementation of the alerts benefited from the organization's growing interest in patient safety and previous successes with computerized alerts on which it was ready to build. This innovation likely would not have worked well when the organization was in the midst of changing over to a new electronic medical record (EMR) or without other groundwork laid.[28]

PRISM also addresses factors involved in the implementation of evidence-based practices. The strength of the evidence base can affect staff willingness to change practices, however. For example, in the Lab Alert study, automated telephone call reminders to complete therapeutic monitoring were less effective for statins than for other medication classes. Several prescribers expressed doubts about the clinical importance of baseline laboratory monitoring for statins. Yet the strength of the evidence base is only one among many factors clinicians will consider when making a decision. The clinician's own experience, the particulars of the impending decision, and a complex web of sources of power and covert and overt sources of influence all contribute to decision making.[29] Six primary clinician and staff barriers need to be considered when promoting the implementation of evidence: lack of awareness, lack of familiarity, lack of agreement, lack of self-efficacy, lack of outcome expectancy, and the inertia of previous practice.[30]

Above all, programs need to address the barriers of frontline staff to effect change. In general, interventions that begin with a barrier and needs assessment are most effective.[5,31] The Re-Fracture Intervention Trial (REFIT; Table 2) Phase 1 RCT revealed that patient-specific clinical guideline advice to the primary care provider (PCP) delivered through an EMR reminder was highly effective in increasing the proportion of postfracture patients who receive guideline-recommended treatment. A major barrier to the evaluation and treatment of osteoporosis after a fracture was the discontinuity in care between acute fracture treatment and the evaluation and treatment of risk factors for fractures. Fractures generally were treated by an orthopedic specialist. When a postfracture patient returned to his or her PCP, often the fracture was healed and forgotten, so the PCP did not evaluate or address the patient's future fracture risk.

It is important not to create new barriers unintentionally with the intervention.[32] How useful a program is in meeting needs at the local level and how adaptable the program is to improve that usability appear important to successful diffusion.[33] For example, in the SIP project, our qualitative observation of user reactions and actions during alert presentation revealed unanticipated flaws[34] that led us to revise the alert presentation and text. The program later adopted the format of the safety alert nationwide, at least in part because of its improved face validity after usability testing. How much and through what mechanisms adaptation should be encouraged is a key area for future implementation research.[35]

The extent to which coordination is required across multiple departments or specialties is an important consideration in the success of new interventions.[9] The need for complex interdepartmental coordination may be a barrier to implementing new practices. Or, it may serve to bring new energy into a stagnant process, especially if energetic change agents can serve as departmental or specialty-based champions. For example, in REFIT2, a study that evaluated implementation of the REFIT1 intervention, the engagement of multiple departments involved in the care of osteoporotic fractures created an organizational groundswell of support for improvement and persuaded organizational leaders to fund the necessary dedicated intervention staff. Future studies should evaluate the notion that the need for change across departments slows the initial integration of programs, but once adoption and implementation have occurred, then the innovation is more likely to be sustained.

Staff at all levels of an organization are more apt to try an innovation if they can assess how well it might work before making a long-term commitment to it. "Observability," "trialability," and "reversibility"[9] form the basis of rapid cycle improvement methods[10] and are related to the ability to observe results. In REFIT, a trial of small-scale staff messaging through the EMR, which demonstrated that the messaging was acceptable to clinicians and improved the care of osteoporosis after a fracture, helped promote the program's implementation.

The ability of top and middle managers and frontline staff to observe meaningful results is important to implementing and sustaining interventions.[5,33] Positive initial results generally promote confidence and self-efficacy[36] among staff; thus, a monitoring program that provides

early results is important. The Lab Alert study assessed the effectiveness of several interventions to improve laboratory monitoring in patients taking high-risk medications. Once managers saw the results—that automated telephone calls were an effective and efficient means of encouraging patients to complete needed services—they quickly adopted this innovation for mammography screening reminders.

The Patient Perspective. The patient perspective is often diluted by other concerns, and patient representatives may not be included on planning or innovation teams. Entire frameworks are devoted to the patient perspective, however.[37–39] Key patient-related features of interventions that should be considered when attempting to successfully implement a program include patient-centeredness, providing choices, addressing barriers, striving for seamless transition between program elements, addressing service and access, minimizing patient burden (that is, the complexity and cost required to respond), developing collaboratively set goals and action plans, and providing patient feedback. These features are common to many clinical domains. The extent to which programs are "patient centered,"[38,39] provide advice or tools appropriate to patient readiness or stage of change,[4,40] and provide patients with choices to enhance patient activation[41,42] and autonomy will predict success, especially in the face of chronic illness. It is also important to evaluate the target patient group's key barriers to following the program advice or collaboratively set goals.[31] For example, in REFIT2 we found that a large proportion of the target population had been diagnosed with dementia—a subgroup that the program did not target. The Diabetes Priority Program (Table 2), on the other hand, placed a heavy emphasis on patient choice, tailoring, collaborative goal setting, and barriers identification.

Patients may encounter difficulty in following through with advice because of barriers presented by the way in which the program is organized. Seamless transitions between program elements and service and access issues is important, especially for patients with complex health care needs and many providers, or for transitions in and out of the hospital or other care settings.[43] It is important to provide mechanisms for rapid feedback and program adjustment and to design and pilot a critical path that patients can use to follow through with advice. When considering the usability of an intervention tool for clinicians, it is equally important to consider usability and burden from the patient's perspective. Clear and simple delivery and minimal barriers can help patients follow through on advice. For example, attending to health literacy issues is critical.[44]

Patients concerned about confidentiality may perceive major barriers to follow-through. We were surprised to discover such concerns in the pilot phase of the Lab Alert study. When receiving the telephone reminders for medication-related laboratory testing, patients requested to enter personal information to ensure they were the individual for whom the message was intended often feared that this information would be misused, and the intervention was adjusted to address this concern.

Finally, if we expect patients or provider teams to participate in repetitive tasks, such as serial screening, or multiple behaviors related to lifestyle or medication adherence, we need to provide feedback on their successes and failures. In this respect, patients are similar to clinical and managerial staff that benefit from feedback. In the Diabetes Priority Program, patients received feedback at each office visit on care criteria that they had met and those that they were due for. In the Health Information Technology program for smoking cessation, practice teams receive quarterly feedback reports on their performance.

The Recipients

Organizational Characteristics. Organizations have characteristics that affect their ability to successfully change behaviors in a given clinical area (Table 3, page 235). These factors need to be considered at three organizational levels—top management, middle managers, and frontline teams.

The organization's financial and structural health and staff history, culture, and morale can help predict a given intervention's fit and potential success. Organizations with a culture of risk taking may be more apt to try programs that deviate from previous practices. Others may need to limit themselves to smaller steps on the road to improvement. We found during the course of REFIT and SIP that there was a great deal of enthusiasm for improving quality by capitalizing on computerized decision support and identifying ways to receive a return on investment on an EMR. In the Health Information Technology project,

Table 3. Elements Within the Practical, Robust Implementation and Sustainability Model (PRISM)

Program (Intervention)	
Organizational perspective*	■ Readiness ■ Strength of the evidence base ■ Addresses barriers of frontline staff ■ Coordination across departments and specialties ■ Burden (complexity and cost) ■ Usability and adaptability ■ Trialability and reversibility ■ Ability to observe results
Patient perspective	■ Patient centeredness ■ Provides patient choices ■ Addresses patient barriers ■ Seamlessness of transition between program elements ■ Service and access ■ Burden (complexity and cost) ■ Feedback of results
External Environment	■ Payor satisfaction ■ Competition ■ Regulatory environment ■ Reimbursement ■ Community resources
Implementation and Sustainability Infrastructure	■ Performance data ■ Dedicated team ■ Adopter training and support ■ Relationship and communication with adopters (bridge researchers) ■ Adaptable protocols and procedures ■ Facilitation of sharing of best practices ■ Plan for sustainability
Recipients	
Organizational characteristics*	■ Organizational health and culture ■ Management support and communication ■ Shared goals and cooperation ■ Clinical leadership ■ Systems and training ■ Data and decision support ■ Staffing and incentives ■ Expectation of sustainability
Patient characteristics	■ Demographics ■ Disease burden ■ Competing demands ■ Knowledge and beliefs

* Organization to be considered at three levels: leaders, managers, and staff.

many practices were interested primarily in "referral options" that did not involve restructuring office visits.

Management support is a commonly described key success factor for practice improvement.[21] Tangible and symbolic management support is a prominent feature of CCM[14] and diffusion of innovations.[9] However, the engagement of senior leaders is often prioritized, so that other (especially mid-level) managers may also have little interest in implementation efforts with lower priority.[33,41] Goals shared across all organizational levels and clear communication of those goals appear important, particularly at the level of frontline staff.[45] The case studies highlighted here began with extensive efforts to involve key leaders and to work with them to strategically communicate their support to other staff. There is no one right way to do this, and the size and extent of the necessary buy-in and communication vary by project. There is value to including representatives from all involved departments and staff roles as advisors or as part of a formal advisory or decision-making committee. REFIT 1 and 2 capitalized on an existing QI committee for osteoporosis, an approach that was particularly effective and is generalizable to many health care organizations. The committee members were involved in selecting the clinical area to target, obtaining funding, finalizing study methods, and interpreting and implementing the results. Community-based participatory research,[46] used to address public health problems in complex settings, has had limited use for translating medical research into practice but was helpful in involving office staff in planning for implementation of the Diabetes Priority Program.

Several other critical organizational factors are well documented in CCM: the need for strong clinical leadership, clinical information systems that provide performance data, and decision support and systems of care that support improved implementation of care pathways. An endocrinologist who was an opinion leader facilitated the research methods that allowed the documentation of efficacy in REFIT1 and then ensured that organizational resources were allocated for REFIT2. Decision support enabled by an EMR formed the basis of both the REFIT and SIP interventions.

Also as noted in Table 3, staffing levels and mix and alignment of staff incentives with organizational goals can influence the success of program implementation. It is important to present new programs and interventions in the context of key organizational goals and values. For example, in the second intervention year of REFIT2, improvement of postfracture management of osteoporosis became a formal organizational goal. As a result, clinical leaders assisting with guiding the QI effort were able to obtain increased staffing for the program, resulting in more complete implementation.

Staffing levels that allow use of existing staff during early piloting and delivery of programs generally facilitate translation of research findings into practice. For example, in Safety in Prescribing, programming of the alerts was completed by existing staff, encouraging longer-term use of the intervention. In the Diabetes Priority Program, existing staff within each specific clinic were trained to assist patients with the computer-based assessment and goal-setting program and to follow up on patient action plans.

The goal of program and performance maintenance (sustainability) should be planned for from the beginning.[26,47] For example, in the SIP project, two aspects of implementation facilitated long-term maintenance of the alerts:

1. Two physician leaders—the director of the formulary committee and the director for clinical content for the EMR—were involved from the development phase and served as organizational champions after the research project ended.

2. Programming and maintenance of the prescribing alerts used a combination of organizational and research staff and were fully turned over to the organization during the project period.

Lab Alert was an efficacy study; sustainability was not expected or preplanned, and as predicted by PRISM, it was not achieved. In REFIT, plans for sustainability and implementation training and support were incomplete. These elements likely explained the erosion of the effect of the intervention observed over time.

Patient Characteristics. Characteristics of patient recipients of interventions need to be considered to maximize intervention effectiveness and reach important patient subgroups. A complete review of this area is outside the scope of this article, but a few factors are common to all clinical areas. The targeted patients' range of characteristics must be considered, such as age, gender, socioeconom-

ic status, health literacy,[48,49] native language, and culture. Patients often have competing demands for their attention, and pre-existing health conditions or family or work demands may make it physically challenging to follow through with encouraged actions. For example, in REFIT2, some elderly patients found it difficult to travel to bone mineral density screening sites. In SIP, older age facilitated laboratory monitoring, perhaps because older patients were likely to go to medical facilities where testing could be completed. Often these elements can be ascertained by literature review, but there is no substitute for evaluating local and individual barriers to participation, especially among nonresponders. The Diabetes Priority Program coordinated multilevel QI sessions with existing clinic visits to avoid additional transportation barriers.

Patients who experience social support through families, friends, coworkers, or other patients with similar conditions are often more likely to respond to interventions.[50] Other potentially modifiable factors include patient knowledge and beliefs, including fear of the outcomes of the condition or its diagnostic or treatment process; perception of their own personal risk for or from the condition; and fatalism,[51] or the perception that the outcome is going to be bad whether or not the condition is discovered and managed.

External Environment. Elements relevant to the external environment (Figure 1 and Table 3) may be some of the most powerful predictors of success and therefore are key to implementation and maintenance.

Market forces such as payor satisfaction, especially when compared to satisfaction with the competition, can help accelerate change. The organization's "public face" is also affected by regulatory, accreditation, or reporting authorities. We saw this in REFIT2, where the implementation of a new osteoporosis National Committee for Quality Assurance Health Plan Employer Data and Information Set (HEDIS®) measure redoubled organizational efforts to improve program implementation. A Joint Commission requirement for specific safety programs may have facilitated SIP implementation.

Reimbursement and coverage issues also serve as a powerful motivator of provider, health care organization, and patient behavior. Community resources available to assist with interventions can help make a complex intervention affordable for organizations. For example, in the Health Information Technology project, partnering with the state's Tobacco Quit line through a one-step fax referral system substantially enhanced the provision of evidence-based smoking cessation services at minimal cost.

Implementation and Sustainability Infrastructure. Successful implementation requires a carefully crafted infrastructure. The initial support structure can be modified over time as the project moves from implementation to maintenance, but the key, as stated earlier, is to plan for sustainability from the start.[47] The relationship and communication between the individuals in this infrastructure and frontline adopters appear important.[18] The case studies highlight the value of partnerships that bridge the gap between research and health care operations, as others conducting implementation research have noted.[52] The REFIT, SIP, Health Information Technology, and Lab Alert projects were led by individuals who bridged the world between research and medical practice because of the nature of their work, training, interest, and/or experience. This bridging facilitated program implementation and the use of strategies with a strong evidence base.

The QI literature suggests the following success factors:

- A dedicated team for implementation,[53,54] as opposed to the addition of unrealistic new work expectations for already committed staff
- Routine performance measurement and data sharing[55]
- Protocols and procedures that are adaptable at the local level[18]
- Implementation training and support, including providing forums for sharing best practices[33,53,54]

In REFIT2, a QI committee facilitated implementation and monitored performance. Although dedicated individuals completed discrete tasks related to the intervention, no specific infrastructure assisted with protocol adaptation or training. Although the program was effective, it was applied inconsistently, with local staff repeating mistakes from which others had already learned. Planned analyses will determine if this variation was associated with diminished program effectiveness.

A maintenance infrastructure needs to address periodic performance review and adjustments to infrastructure, protocols, and procedures. Often, this is forgotten soon after initial implementation. In SIP, after the study period had ended, alert malfunction periodically went unno-

ticed, and it became apparent to all involved that the maintenance infrastructure was inadequate. This prompted a move to using a more richly staffed nationwide maintenance source for the alerts. Careful consideration of sustainability infrastructure needs during implementation may smooth the way for long-term program maintenance.

Measures of Implementation Success

Measurement and feedback are critical elements for implementation success. The extent to which programs are adopted or fully and consistently implemented[16] is an important measure of how acceptable adopters find the interventions and of implementation infrastructure function. Programs and processes should be adjusted early in response to these measures, as a program that is not used has no chance of being effective. Programs that have limited reach to important patient subgroups will have diminished effectiveness, and identification and measurement of subgroup response will enable critical intervention enhancements.[56] Organizational feedback of early measures of program effectiveness should guide program adoption and maintenance in a critical feedback loop. Also, success breeds success, in that organizations will replicate programs and implementation strategies across different clinical areas if enough elements in the important domains (Table 3) are aligned. To be successful long term in producing panel- or populationwide improvement, a program needs to address all or most of the RE-AIM factors of reach, effectiveness, adoption, implementation, and maintenance.[57] Programs often focus only on indicators of effectiveness among active participants—for example, those patients who come to a particular program—without also considering denominator issues such as overall program reach and representativeness or implementation costs and demands on staff. Recently available RE-AIM metrics help to keep a broad and balanced evaluation focus when assessing program outcomes, including success across patient subgroups (especially health disparities), and different intervention staff and intervention costs.[56]

Discussion

PRISM highlights elements associated with the success of intervention implementation and sustainability in our case studies. As detailed in Table 2, each study had specific elements that came into play in all the key domains: the program (intervention), the external environment, the implementation and sustainability infrastructure, and the recipients. The degree to which each intervention achieved results delineated in the RE-AIM metrics—reach, effectiveness, adoption, implementation, and maintenance—was explainable on the basis of the PRISM elements for success.

Table 4 (pages 239–241) summarizes key questions and suggestions to enhance implementation and sustainability for each PRISM domain. It is helpful to assess each key domain and its success factors early in implementation efforts to guide any necessary modifications. In this preliminary assessment of the utility of PRISM in the case studies presented, it appears that success is more likely if the intervention and implementation process activates three to four domains and one or more elements in each domain. There are perhaps even more helpful lessons from the many examples of failed implementation efforts[58]; a full review of them is beyond the scope of this paper. More often than not, however, failed implementation efforts do not focus on the core issue, that is, changing the delivery system design to overcome patient and clinician barriers to improving care.[13] For example, the use of continuous QI alone without a clear focus on implementation leads to the activation of at most one or two PRISM domains and has failed in multiple settings.[59,60] Further research is needed to determine (1) if the number of PRISM domains activated is an important predictor of success in other implementation and dissemination reports and (2) which PRISM elements are most important for particular settings and clinical targets.[61]

Conclusion

The PRISM model provides a new tool for researchers and health care managers by integrating existing concepts relevant to translating research into practice. It also adds a new focus on the need to consider the characteristics and perspectives of three key levels of organizational workers—senior leaders, middle managers, and frontline staff; the value of partnerships between the QI infrastructure and researchers that bridge the gap between research and operations; and the need to plan for an implementation and sustainability infrastructure from the outset to optimize

Table 4. Key Questions and Suggestions by Relevant Project Phase to Enhance Implementation and Sustainability for Each Practical, Robust Implementation and Sustainability Model (PRISM) Domain

PRISM Domain	Key Questions	Project Phase	Suggestions
Program (Intervention) Organizational Perspective	Are key staff ready to conduct intervention?	Development	Consider readiness of top leadership, middle management, and frontline staff before selecting intervention.
	Is the program complex and burdensome?	Development	Simplify the program while maintaining essential elements.
	Does the clinical target area have a strong evidence base?	Development	If clinical evidence is weak, find the compelling need for change (e.g., business imperative).
	Can decision support be embedded in work flow?	Development	Don't rely on strong evidence to create change; whenever possible, embed tools to support evidence base in work flow.
	How much cross-departmental coordination will be necessary?	Implementation	Assure processes coordinate needs of all stakeholders.
	Can cross-departmental coordination be used to increase the number and strength of project champions?	Implementation	Capitalize on the need for coordination to deepen support.
	Can staff try the program and easily stop it if needed?	Implementation	Trialability and reversibility help convince staff to adopt new programs.
	Will the program be usable and modifiable without threatening essential elements?	Development, Implementation	Assess the usability and adaptability of the program.
	Will key staff be able to observe results?	Development, Implementation	Design monitoring so results can be seen early.
Program (Intervention) from Patient Perspective	Does the program address important patient barriers to response?	Development	Evaluate and address at least 1–2 important barriers with the program.
	Is the program patient-centered?	Development	Provide opportunities for patients to make positive steps regardless of stage of change.
	Does the patient get the "run-around" when trying to follow advice?	Implementation	Assess patient usability of program and address service issues.
	Is the program complex and/or costly for patients?	Implementation	Simplify program and reduce patient out-of-pocket cost as much as possible.
	Does the patient understand when he/she has done well?	Implementation	Integrate patient feedback into programs.

(Continued on page 240)

Table 4. Key Questions and Suggestions by Relevant Project Phase to Enhance Implementation and Sustainability for Each Practical, Robust Implementation and Sustainability Model (PRISM) Domain

PRISM Domain	Key Questions	Project Phase	Suggestions
Characteristics of Organizational Recipients	Will the financial and cultural health be barriers to success?	Development	Assess organizational health and culture; tailor program as needed.
	Has the program received support of key managers?	Development, Implementation	Work with all levels of management to earn and communicate program support.
	Are systems available to support data gathering and provision of decision support?	Development, Implementation	Assess how to and who will gather performance data; encourage system improvement to enhance clinical decision support whenever possible.
	Will staffing levels and training allow for use of existing staff?	Development, Implementation	Use existing staff during early stages to ease implementation.
	Do key staff expect program to be sustainable?	Development, Implementation	Assess factors that facilitate sustainable programs; encourage key managers to expect and communicate expectation of sustainability.
	How do staff at all levels perceive net benefit of program?	Development, Implementation	Assess and provide education in modifiable areas, i.e., knowledge, beliefs, and perceived risk of inaction.
	Does the organization have one or more clinical opinion leaders in target area?	Development, Implementation, Maintenance	Engage clinical leaders from planning through implementation and maintenance stages.
	Do staff incentives relate to target area?	Development, Implementation, Maintenance	Highlight how program helps staff meet organizational expectations.
Characteristics of Patient Recipients	Are the prevailing characteristics and barriers of patient participants known?	Development	Assess target group characteristics and barriers prior to program implementation.
	Are disease burden and competing demands of target patient group understood?	Development	Assess disease burden and pattern of care to better design program.
	What are common knowledge, beliefs, and perceived risk patterns?	Development	Assess modifiable factors regarding patient perceived net benefit.
External Environment	Have performance gaps led to patient or group payor dissatisfaction? Is this a public measure, and has the competition had better performance?	Development, Implementation, Maintenance	Highlight gaps in satisfaction and other areas of performance to build support.

(Continued on page 241)

Table 4. Key Questions and Suggestions by Relevant Project Phase to Enhance Implementation and Sustainability for Each Practical, Robust Implementation and Sustainability Model (PRISM) Domain

PRISM Domain	Key Questions	Project Phase	Suggestions
External Environment, cont.	Have gaps in performance put the organization at legal or regulatory risk?	Development, Implementation, Maintenance	Highlight these factors, as they are the most powerful in this domain.
	Do reimbursement or coverage issues affect patient or staff behavior?	Development, Implementation, Maintenance	Assess effect on staff and patients; work with policy- and decision-makers to alleviate burden or provide incentives when possible.
	Are there community resources that can enhance program?	Development, Implementation, Maintenance	Assess availability and quality of community resources and integrate when possible.
Implementation and Sustainability Infrastructure	Can a "bridge" researcher facilitate implementation of a proven practice?	Development	Utilize individuals who participate in research, evaluation, and implementation.
	Should the sustainability infrastructure be the same as that used for implementation?	Maintenance	Identify key tasks after start-up is over and determine who will complete them.
	Can implementation and sustainability tasks be part of key staff job descriptions?	Development, Implementation, Maintenance	Whenever possible, avoid long-term nonsustainable add-on tasks for staff—plan for sustainability.
	Is there an existing infrastructure that can take on key implementation/ sustainability tasks?	Development, Implementation, Maintenance	Use existing structures as much as possible but enhance as needed to assure completion of key tasks.
Overall	Can I activate multiple PRISM domains and multiple elements in each domain to capitalize upon?	Development	Select an intervention and implementation infrastructure that utilizes at least one important element for success in 3–4 PRISM domains.

results. We have found it useful in conceptualizing, implementing, and evaluating health care improvement programs, and we encourage readers to provide feedback on its usefulness in their settings. J

This work was partially supported through cooperative agreement U18 HS11843 from the Agency for Healthcare Research and Quality; Kaiser Permanente's Garfield Memorial Fund; research contracts from Merck & Co., Inc.; and grant #R01CA090974 from the National Cancer Institute. The authors acknowledge Martha Swain for her editorial assistance and Debra Burch for her secretarial assistance.

Adrianne C. Feldstein, M.D., M.S., is Medical Liaison for Research, Northwest Permanente, and Adjunct Investigator, the Center for Health Research, Kaiser Permanente Northwest, Portland, Oregon. **Russell E. Glasgow, Ph.D.,** is Senior Scientist, Kaiser Permanente Colorado, for the Clinical Research Unit, Penrose, Colorado. Please address correspondence to Adrianne C. Feldstein, M.D., M.S., Adrianne.c.feldstein@kpchr.org.

References

1. Ellis P., et al.: A systematic review of studies evaluating diffusion and dissemination of selected cancer control interventions. *Health Psychol* 24:488–500, Sep. 2005.
2. Bero L.A., et al.: Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. *BMJ* 317:465–468, Aug. 15, 1998.
3. Rubenstein L.V., Pugh J.: Strategies for promoting organizational and practice change by advancing implementation research. *J Gen Intern Med* 21(suppl):S58–S64, Feb. 2006.
4. Glasgow R.E., Emmons K.M.: How can we increase translation of research into practice? Types of evidence needed. *Annu Rev Public Health* 28:413–433, Dec. 6, 2006.
5. Grol R., Grimshaw J.: Evidence-based implementation of evidence-based medicine. *Jt Comm J Qual Improv* 25:503–513, Oct. 1999.
6. Feifer C., et al.: From research to daily clinical practice: What are the challenges in "translation?" *Jt Comm J Qual Saf* 30:235–245, May 2004.
7. Lenfant C.: Shattuck lecture—Clinical research to clinical practice: Lost in translation? *N Engl J Med* 349:868–874, Aug. 28, 2003.
8. Cain M., Mittman R.: *Diffusion of Innovation in Health Care*. May 2002. http://www.chcf.org/documents/ihealth/DiffusionofInnovation.pdf (last accessed Feb. 11, 2008).
9. Rogers E.M.: *Diffusion of innovations*. New York City: Free Press, 1995.
10. Berwick D.M.: Disseminating innovations in health care. *JAMA* 289:1969–1975, Apr. 16, 2003.
11. Institute of Medicine: *Crossing the Quality Chasm: A New Health System for the 21st century*. Washington, DC: National Academy Press, 2001.
12. Leape L.L., et al.: Preventing medical injury. *QRB Qual Rev Bull* 19:144–149, May 1993.
13. Sperl-Hillen J.M., et al.: Do all components of the chronic care model contribute equally to quality improvement? *Jt Comm J Qual Saf* 30:303–309, Jun. 2004.
14. Wagner E.: *The Chronic Care Model.* http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2 (last accessed Feb. 11, 2008).
15. Glasgow R.E.: Evaluation of theory-based interventions: The RE-AIM model. In Glanz K., Lewis F.M., Rimer B.K. (eds.): *Health Behavior and Health Education*. San Francisco: John Wiley & Sons, 2002, pp. 119–127.
16. Kaiser Permanente Colorado Region, Institute for Health Research: http://www.re-aim.org/ (last accessed Feb. 11, 2008).
17. Ellis P., et al.: *Diffusion and Dissemination of Evidence-Based Cancer Control Interventions.* http://www.ahrq.gov/clinic/tp/cancontp.htm (last accessed Feb. 7, 2008).
18. Bradley E.H., et al.: Translating research into practice: Speeding the adoption of innovative health care programs. *Issue Brief (Commonw Fund)* 724:1–12, Jul. 2004.
19. Green L.W., Richard L., Potvin L.: Ecological foundations of health promotion. *Am J Health Promot* 10:270–281, Mar.–Apr. 1996.
20. Green L.W., Kreuter M.W.: *Health Promotion Planning: An Educational and Ecological Approach.* Mountain View, CA: Mayfield Publishing, 1999.
21. Nolan K., et al.: Using a framework for spread: The case of patient access in the Veterans Health Administration. *Jt Comm J Qual Saf* 31:339–347, Jun. 2005.
22. Glasgow R.E., et al.: Disseminating effective cancer screening interventions. *Cancer* 101:1239–1250, Sep. 1, 2004.
23. Wagner E.H., Austin B.T., Von Korff M.: Improving outcomes in chronic illness. *Manag Care Q* 4:12–25, Spring 1996.
24. Wagner E.H., et al.: Improving chronic illness care: Translating evidence into action. *Health Aff (Millwood)* 20:64–78, Nov. 2001.
25. Langley G.J., et al.: *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. San Francisco: Jossey-Bass, 1996.
26. Eldridge N.E., et al.: Using the six sigma process to implement the Centers for Disease Control and Prevention Guideline for Hand Hygiene in 4 intensive care units. *J Gen Intern Med* 21(suppl. 2):S35–S42, Feb. 2006.
27. Santisteban D., Vega R.R., Suarez-Morales L.: Utilizing dissemination findings to help understand and bridge the research and practice gap in the treatment of substance abuse disorders in Hispanic populations. *Drug Alcohol Depend* 84(suppl 1):S94-S10, Sep. 2006.
28. Scott J.T., et al.: Kaiser Permanente's experience of implementing an electronic medical record: A qualitative study. *BMJ* 331:1313–1316, Dec. 3, 2005.
29. Lipman T.: Power and influence in clinical effectiveness and evidence-based medicine. *Fam Pract* 17:557–563, Dec. 2000.
30. Cabana M.D., Rushton J.L., Rush A.J.: Implementing practice guidelines for depression: Applying a new framework to an old problem. *Gen Hosp Psychiatry* 24:35–42, Jan. 2002.
31. Stetler C.B., et al.: The role of formative evaluation in implementation research and the QUERI experience. *J Gen Intern Med* 21(suppl 2):S1–S8, Feb. 2006.
32. Litaker D., et al.: Using complexity theory to build interventions that improve health care delivery in primary care. *J Gen Intern Med* 21(suppl 2):S30–S34, Feb. 2006.
33. Hagedorn H., et al.: Lessons learned about implementing research evidence into clinical practice: Experiences from VA QUERI. *J Gen Intern Med* 21(suppl 2):S21–S24, Feb. 2006.
34. Sittig D.F., et al.: Discount usability testing of computer-generated clinical alerts uncovers flaws. Paper presented at the 9th Annual HMO Research Network Conference, Denver, Apr. 1, 2003.
35. Green L.W., Glasgow R.E.: Evaluating the relevance, generalization, and applicability of research: Issues in external validation and translation methodology. *Eval Health Prof* 29:126–153, Mar. 2006.
36. Bandura A.: Self-efficacy mechanism in physiological activation and health-promoting behavior. In Madden J., et al. (eds.): *Learning and Affect*. New York: Raven Press, 1991, pp. 226–269.
37. Austin J.K.: Predicting parental anticonvulsant medication compliance using the theory of reasoned action. *J Pediatr Nurs* 4:88–95, Apr. 1989.
38. Bechel D.L., Myers W.A., Smith D.G.: Does patient-centered care pay off? *Joint Commission Journal on Quality Improvement* 26:400–409, Jul. 2000.
39. Perlin J.B., Kolodner R.M., Roswell R.H.: The Veterans Health Administration: Quality, value, accountability, and information as transforming strategies for patient-centered care. *Am J Manag Care* 10:828–836, Nov. 2004.
40. Prochaska J.O., Redding C.A., Evers K.E.: The transtheoretical model and stages of change. In Glanz K., Lewis F.M., Rimer B.K. (eds.): *Health Behavior and Health Education*. San Francisco: Jossey-Bass, 1997, pp. 99–120.
41. Feifer C., Ornstein S.M.: Strategies for increasing adherence to clinical guidelines and improving patient outcomes in small primary care practices. *Jt Comm J Qual Improv* 30:432–441, Aug. 2004.
42. Hibbard J.H., et al.: Development of the Patient Activation Measure (PAM): Conceptualizing and measuring activation in patients and consumers. *Health Serv Res* 39:1005–1026, Aug. 2004.

43. Coleman E.A., Berenson R.A.: Lost in transition: Challenges and opportunities for improving the quality of transitional care. *Ann Intern Med* 141:533–536, Oct. 5, 2004.
44. Institute of Medicine: *Health Literacy: A Prescription to End Confusion.* Washington, DC: National Academies Press, 2004.
45. Stetler C.B.: Role of the organization in translating research into evidence-based practice. *Outcomes Management* 7:97–103, Jul. 2003.
46. Viswanathan M., et al.: Community-based participatory research: Assessing the evidence. Agency for Healthcare Research and Quality. Evidence Report-Technology Assessment No. 99 Jul. 2004. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat1a.chapter.44133 (last accessed Feb. 22, 2008).
47. Klesges L.M., et al.: Beginning with the application in mind: Designing and planning health behavior change interventions to enhance dissemination. *Ann Behav Med* 29:66–75, Apr. 2005.
48. Lindau S.T., et al.: Improving rates of cervical cancer screening and Pap smear follow-up for low-income women with limited health literacy. *J Gen Intern Med* 21:829–834, Aug. 2006.
49. DeWalt D.A., et al.: A heart failure self-management program for patients of all literacy levels: A randomized, controlled trial. *BMC Health Serv Res* 6:30, Mar. 13, 2006.
50. Beck R.S., Daughtridge R., Sloane P.D.: Physician-patient communication in the primary care office: A systematic review. *J Am Board Fam Pract* 15:25–38, Jan. 2002.
51. Hay J.L., Buckley T.R., Ostroff J.S.: The role of cancer worry in cancer screening: A theoretical and empirical review of the literature. *Psychooncology* 14:517–534, Jul. 2005.
52. Lavis J.N., et al.: How can research organizations more effectively transfer research knowledge to decision makers? *Milbank Q* 81(2):221–222, 2003.
53. Solberg L.I.: Guideline implementation: What the literature doesn't tell us. *Jt Comm J Qual Improv* 26:525–537, Sep. 2000.
54. Solberg L.I., et al.: Lessons from experienced guideline implementers: Attend to many factors and use multiple strategies. *Jt Comm J Qual* 26:171–188, Apr. 2000.
55. Bradley E.H., et al.: A qualitative study of increasing beta-blocker use after myocardial infarction: Why do some hospitals succeed? *JAMA* 285:2604–2611, May 23, 2001.
56. Glasgow R.E., et al.: Using RE-AIM metrics to evaluate diabetes self-management support interventions. *Am J Prev Med* 30:67–73, Jan. 2006.
57. Wagner T.H.: The effectiveness of mailed patient reminders on mammography screening: A meta-analysis. *Am J Prev Med* 14:64–70, Jan. 1998.
58. Mittman B.S.: Creating the evidence base for quality improvement collaboratives. *Ann Intern Med* 140:897–901, Jun. 1, 2004.
59. Fischer L.R., Solberg L.I., Zander K.M.: The failure of a controlled trial to improve depression care: A qualitative study. *Jt Comm J Qual* 27:639–650, Dec. 2001.
60. Brown J.B., et al.: Controlled trials of CQI and academic detailing to implement a clinical practice guideline for depression. *Jt Comm J Qual* 26:39–54, Jan. 2000.
61. Pawson R., et al.: Realist review: A new method of systematic review designed for complex policy interventions. *J Health Serv Res Policy* 10:21–34, Jul. 2005.