



Helping Healthcare Providers Perform According to Standards

by Lani Marquez

Executive Summary

Performance according to standards is the cornerstone of quality assurance in healthcare and the end result inspiring many quality assurance activities. However, even when locally appropriate, evidence-based standards are available, many health workers do not routinely follow them. Motivating and enabling health workers to perform in accordance with standards is deterred by many factors—behavioral, social, and organizational—as well as the nature of healthcare activities and their setting.

This paper reviews several theoretical perspectives to increase understanding of the key determinants of health worker performance, including theories of behavior change, diffusion of innovation, health education, and social influence. The main types of interventions that have been used to encourage health workers to perform in accordance with standards are described, and evidence from empirical research for their effectiveness is summarized.

There is no one best intervention or strategy for achieving health worker performance in accordance with standards. Rather, a wide variety of interventions has been proven in rigorous trials to increase adherence to standards. Combinations of interventions have been shown to be more effective than single ones, particularly when measures to enhance health provider knowledge and awareness are combined with interventions to facilitate and reinforce standards-based performance in everyday practice. Strategies are more likely to be effective when the interventions target specific barriers to performance.

Further research is needed to test locally appropriate and sustainable strategies for inducing performance according to standards under the diverse conditions found in developing



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The QA Project

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Operations Research Issue Paper

Operations Research Issue Papers present important background information about key subjects relevant to the QA Project's technical assistance. Each paper reviews current research (both published and unpublished, theoretical and operational) on a subject and makes recommendations for further research and productive lines of inquiry for the project's technical staff, external researchers, and health professionals.

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Quality Assurance Project

7200 Wisconsin Avenue, Suite 600
Bethesda, MD 20814-4811
Tel: 301-941-8550
Fax: 301-941-8427
E-mail: qapdissem@urc-chs.com
www.qaproject.org



country health systems. Rigorous evaluations of intervention effectiveness in particular settings, taking into account costs and effects over time, should be an essential component of strategies to help health workers perform according to standards.

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Introduction

As used in this paper, “standards” are explicit statements of expected quality in the performance of a healthcare activity. They may take the form of procedures, clinical practice guidelines, treatment protocols, critical paths, algorithms, standard operating procedures, or statements of expected healthcare outcomes. Standards define expectations for how a particular healthcare activity will be performed in order to produce the desired results.

Standards and procedures have traditionally been an integral part of the field of nursing and only more recently gained familiarity and acceptance in the practice of medicine, mainly in the form of clinical practice guidelines. Over the past two decades, there has been growing interest on the part of governments, managed care organizations, provider associations, and consumer groups in the promulgation of clinical guidelines and other types of standards to improve medical practice, reduce the use of ineffective procedures, and promote technological and biomedical advances. While this movement to promote standards in healthcare has been most visible in industrialized countries, the push for wider use of evidence-based standards (i.e., practices supported by scientifically valid research findings) has begun in developing countries, particularly in the context of health sector reform.

In the 1980s, experiences with basic health programs in many developing countries gave rise to the concern that a major barrier to the effective delivery of services was the lack of clear guidelines for primary healthcare workers. In response, the World Health Organization (WHO) spearheaded the development of clinical standards for services that addressed the main causes of morbidity and mortality in the developing world. WHO coordinated international collaboration, involving the United Nations Children’s Fund (UNICEF), the United States Agency for International Development (USAID), and other agencies and leading academic experts, to define treatment protocols for primary healthcare workers for the treatment of diarrheal disease and the use of oral rehydration therapy. Similar efforts in the management of acute respiratory infections (ARI) followed in the early 1990s. More recently, evidence for the effectiveness of new case management approaches has led to the introduction of protocols for the integrated management of childhood illness (IMCI).

The introduction of new services has also given rise to emphasis on clinical and process standards. Organizations such as the International Planned Parenthood Federation, The Population Council, EngenderHealth (formerly AVSC International), and the Johns Hopkins University Program

for International Education in Reproductive Health (JHPIEGO) have developed and promoted performance standards for family planning, reproductive health, and HIV/AIDS services.

Why is performance according to standards important?

Standards define, for both health workers and clients, what is needed to produce quality services. Performance in accordance with standards is thus the cornerstone of quality assurance in healthcare and the end result of a wide range of quality assurance activities, including accreditation of health facilities, external quality evaluation, and performance improvement. In health systems where government agencies are moving away from the direct provision of health services to assume primarily an oversight and regulatory role, standards provide a practical instrument for verifying the delivery of quality services.

The field of quality assurance focuses on performance according to standards because adherence to evidence-based standards is associated with improved health outcomes (Grimshaw and Russell 1993) and because failure to provide clinical care in accordance with standards has serious negative effects on patient outcomes. Walker et al. (1988), in their study of five hospitals in Jamaica, demonstrated that low levels of adherence to standards for the

Abbreviations

AMAP	American Medical Accreditation Program
ARI	Acute respiratory infections
AVSC International	EngenderHealth
CBT	Computer-based training
CME	Continuing medical education
IMCI	Integrated management of childhood illness
JHPIEGO	JHPIEGO Corporation, International Education and Training in Reproductive Health
PRECEDE	Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation
PREP	Physician Review and Education Program
QA	Quality assurance
USAID	United States Agency for International Development
UNICEF	United Nations Children’s Fund
WHO	World Health Organization

case management of acute diarrheal disease correlated with significantly higher rates (by a factor of up to 16) of infant death from gastroenteritis. Quality assurance efforts in developing countries are particularly focused on improving performance in accordance with standards because low compliance with standards is a pervasive problem in many developing country health systems (Heiby 1998; Kelley et al. 2000). Failure to perform according to standards has other negative consequences as well: dissatisfied patients and staff; wasted effort and resources; loss of staff and patient time; and most importantly, lost opportunities. Given limited resources, effective interventions and strategies to enhance performance according to standards are vital for achieving sustainable, quality health services.

Implementing systems in developing country settings to help healthcare providers perform according to well-designed standards of care is a central objective of the Quality Assurance (QA) Project. In particular, the QA Project is concerned with standards for child health, reproductive health, safe motherhood, family planning, infectious diseases, and HIV/AIDS services. The project's operations research program studies ways to cost-effectively achieve performance according to standards for such services in developing country health systems.

To achieve expected health outcomes, standards must, of course, be clearly presented, achievable, and available to healthcare workers. Increasingly, advances in biomedical research have raised expectations for evidence-based medicine. However, even when locally appropriate, evidence-based standards exist on paper, many health workers do not follow them routinely. Motivating and enabling health workers to perform according to standards is thus one of the biggest challenges to producing quality healthcare.

Why is standards-based performance often difficult to achieve and sustain?

The answer to this question is complex and involves many factors—behavioral, social, and organizational. At the most basic level, health workers may simply not be familiar with standards because they have not been clearly communicated. In other cases, health workers may lack the necessary supplies or equipment to perform according to standards. Commonly, providers are aware of standards but may hold beliefs or attitudes that inhibit them from adhering to standards. Health workers may doubt the efficacy of or disagree with specific standards or reject the idea of explicit standards in general, believing that practice guidelines restrict provider autonomy or compromise the “art” of medicine. Even when health workers recognize the appropriateness of standards, they may believe that they, personally, are unable to carry them out or may not do so out of

habit or lack of motivation to change their behavior (Cabana et al. 1999).

A related problem is maintaining performance according to standards once such performance has been achieved. Performance may reach desired levels immediately following training or other performance improvement intervention, but deteriorate over time. QA Project studies in Niger, Kenya, and other countries have documented declines in IMCI performance over time (Kelley et al. 2000; Tavrow et al. 2000) after improved performance was achieved through training, supervision, or the use of reminders. For example, in one study, performance first improved in tasks like recognizing danger signs and assessing clinical status, but then declined when health workers turned their attention to improving their performance of other tasks, such as counseling the mother on administering medication (Kelley 2000).

The nature of healthcare activities and the setting where they are implemented also affect performance according to standards. Some healthcare tasks, such as prescribing medications and preventive services like immunization, readily lend themselves to standardization. In contrast, the appropriateness of many diagnostic procedures is strongly influenced by the characteristics of individual patients. The greater specialization of health workers within hospitals, where providers often limit their focus to certain procedures or clinical areas, facilitates awareness of and performance according to standards in a narrow specialty. In contrast, at the primary healthcare level, individual providers are often confronted with a wide variety of complaints and ailments, and their practice behavior may be more strongly influenced by patient preferences (Wensing et al. 1998).

Individual health worker decisions about performing according to standards are also strongly influenced by whether the provider works in a healthcare organization that exercises significant control over the provider's practice or works independently as a private practitioner. The degree of government control or regulation of the delivery of health services also influences the possibility of encouraging health provider performance according to standards.

There may also be significant external barriers to health worker adherence to standards. Patients may show preference for practices that are inconsistent with established standards. Health workers may not comply with standards because they observe that their peers or co-workers do not. Financial disincentives may exist, such as lack of payment for certain services or tests and greater profitability of treatments that are not suggested by practice guidelines.

Purpose of this paper

This *Issue Paper* reviews theory and research on achieving health provider performance according to standards, with a focus on the lessons for developing country healthcare systems. It examines several theories that illuminate the factors that influence whether health workers perform according to standards and identifies the principles that can help guide the design of interventions to increase adherence. The paper describes the main approaches and interventions that have been applied to help health workers perform in accordance with clinical and administrative standards and summarizes the findings of empirical studies to evaluate their effectiveness. The paper also identifies related questions that merit further research and issues for the design and implementation of interventions to improve healthcare provider performance according to standards in developing countries.

Defining performance according to standards

Defining performance according to standards must begin with an understanding of what is meant by a healthcare standard. Standards are explicit, measurable definitions of how healthcare should be performed. In some places, the term “norms” is used to describe various types of standards and is often used synonymously with standards. This paper is concerned with how to facilitate adherence to standards that are assumed to be appropriate, effective, and achievable in the particular healthcare delivery setting.

In a systems view of healthcare delivery, standards can be applied to any of three components: inputs (the resources needed to provide care or services, such as trained staff, equipment, supplies), processes (activities and tasks intended to cause a particular desired result, such as diagnosis or patient care management), or outcomes (the results of inputs plus processes, such as patient clinical status). An example of an input standard would be the expectation of having a specified number of physicians per 10,000 population. An example of a process standard would be a description of the steps to correctly examine and diagnose a child presenting with fever. An outcome standard describes the results of patient care; an example of an outcome standard for obstetric care would be that the new mother is able to breastfeed without difficulty.

How are standards presented?

There are many types of formats for presenting healthcare standards. Table 1 classifies the main formats through which standards for both technical and administrative tasks are typically presented by type of health system component.

Table 1 ■ Taxonomy of Health System Standards

Health System Component	Category	
	Administrative	Technical
Inputs	Administrative policies	Job descriptions*
	Rules and regulations	Specifications*
	Qualifications*	
Processes	Standard operating procedures	Algorithms
		Clinical pathways
		Clinical practice guidelines
		Procedures
		Protocols
		Standing orders
Outcomes	Expected results*	Health outcomes

*Standards that may be applied to either domain are identified with an asterisk. Source: Ashton (2001)

Interest in healthcare standards usually focuses on health provider performance with respect to processes of care. Procedures (e.g., step-by-step instructions, frequently used in nursing, explaining how to perform a specific task based on technical knowledge) are perhaps the most common form of process standards in healthcare settings. Clinical practice guidelines represent another common format for standards. Practice guidelines consist of systematically developed statements, usually based on scientific evidence and expert consensus, to assist practitioner decision making about appropriate care for a specific clinical situation.

How is performance according to standards measured?

Performance according to standards can be measured through a variety of methods, each with its own advantages and disadvantages. These methods typically involve either some form of direct observation of health worker performance or indirect assessment of provider performance, such as by testing providers, patient interview, or record review. Table 2 gives examples of such methods and their main advantages and disadvantages.

Some methods are more intrusive than others. Performance assessment methods are subject, to varying degrees, to the “observation effect,” wherein subjects are thought to perform better or worse than in everyday practice or provide answers they perceive the interviewer wants to hear

Table 2 ■ Methods for Measuring Performance According to Standards

Method	Advantages	Disadvantages
Observation of service delivery (by expert observers, peers, supervisors)	Greater validity	Time-consuming Requires careful standardization of observers to obtain reliable results Some care activities are difficult to observe Presence of observer may influence provider behavior
Simulated client	Greater validity than indirect methods Eliminates observation effect because health providers are not aware they are being observed	Time-consuming Requires careful training and standardization of simulated clients to obtain reliable results Some care activities are difficult to observe
Audit of individual patient records	Inexpensive	Records are often incomplete; tasks may have been performed but not recorded
Review of data from automated information system	Inexpensive	Data available through automated system may be very limited
Testing (written tests, simulation with standardized patients, computer-based testing)	Affords greater consistency in presentation of cases/problems	Cannot evaluate interpersonal interactions
Health worker interview (self-report)	Relatively quick and easy to implement	Subject to bias due to inaccurate recall, not understanding the question, and the desire to appear competent
Patient exit interview (patient report, including by health workers themselves)	Relatively easy and quick	Subject to inaccurate recall, lack of awareness of all the clinical tasks performed, failure to understand the question, and the desire to provide responses that please the interviewer
Measurement of patient outcomes closely linked to correct health provider performance	Avoids observation effect	Association between patient outcome and provider performance is only implied, not directly measured

because they are aware that their performance is being assessed. The nature of the bias introduced by the observation effect is usually thought to be in the direction of overestimating performance, which assumes that health workers might be performing at their very best when they think their performance is being observed. This is not always the case, however, since the presence of observers might also make workers nervous, which could undermine their performance. The simulated-client method, wherein trained individuals pose as clients seeking health services unbeknownst to the providers and observe whether the providers perform certain predetermined tasks, has been cited as a promising method for reducing observation bias (Madden et al. 1997; Kak et al. 2001).

Another issue in the measurement of performance according to standards is the fact that health providers' performance may vary from one patient to the next or from day

to day, depending on patient characteristics (e.g., disease severity, cultural factors) and other situational factors (e.g., total number of patients, presence of other providers, availability of drugs and supplies). Multiple measurements of provider-patient interaction or performance of the same task are needed to obtain a reliable indication of usual performance. The cost of applying the different performance assessment methods also varies widely depending on the cost incurred to produce each unit of observation.

The unit being measured vis-à-vis performance can also be an issue. While the performance of individual providers is usually of interest, adherence to standards may also be examined from the point of view of a patient or case, looking at how well the overall healthcare team performed according to case management standards. Performance according to standards may also be assessed for a facility as a whole, such as in the case of hospital accreditation. In the

latter instance, performance according to process of care standards may be determined by assessing the performance of a sample of providers in the facility. From a systems viewpoint, interest in the health system's ability to provide functional continuity of care would be concerned with adherence to various technical and administrative standards from the point of entry into the health system up to the highest level of specialization.

Conceptual framework of determinants of performance according to standards

While there is growing international interest in achieving performance according to standards, there is also recognition that the determinants of health workers' performance according to standards are not always well understood. Complex factors influence the decisions and behavior of physicians and other healthcare providers in daily practice.

A number of theoretical models from the social and behavioral sciences offer potentially useful frameworks for characterizing the factors that facilitate and inhibit performance according to standards. To explore their relevance to understanding the determinants of health worker performance, this section describes four such models: the behavior change model, the diffusion of innovation theory, the health education model, and the social influence theory.

Behavioral change model

Psychologists have conceptualized the internal process of intentional behavior change as consisting of five distinct stages of readiness to change: pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska et al. 1992). An individual's transition between stages is a process influenced by experience and environmental factors. Pre-contemplation refers to the state when individuals are not thinking about changing a particular behavior. Moving from pre-contemplation to contemplation (thinking about change but not yet acting on it) involves changing knowledge and attitudes. Movement from contemplation to preparation and action requires positive beliefs about one's ability to enact the change and the development of necessary skills to do so. Movement to the maintenance stage and sustaining the behavior over time involves adapting the environment where the behavior takes place to reinforce and reward the change. The concept of stages of readiness underscores the importance of targeting behavior change strategies to individuals' locations along this readiness-to-change continuum.

Prochaska and his colleagues observed in their research that most people recycle several times through these five

stages before sustaining the desired behavior. Relapses between stages or recidivism should thus be expected and may indeed benefit long-term maintenance of desired behaviors. They found that as providers recycled through a stage, they tended to try new strategies rather than those they had used unsuccessfully in the past, indicating learning from previous failures.

Although this model, also known as the transtheoretical model and the stages of change model, was developed in the context of changing addictive behaviors related to drug and alcohol abuse, several researchers have sought to apply its concepts to the process of changing the behavior of healthcare professionals with respect to adherence to standards. Cohen et al. (1994) applied the behavioral change model to analyze the process of changing physician behavior regarding preventive services. They argued that changing physician behavior is a stepwise process where barriers must be removed. Interventions to induce change must remove these barriers, facilitate the process of change, and consolidate the new practice. Cohen and colleagues also underscored the importance of tailoring interventions to the stage of readiness to change of the target audience. For those in the pre-contemplation or contemplation stages, interventions must increase motivation to prepare for and initiate a change attempt. For those already motivated to change (i.e., in the preparation or action stages), the most effective strategies may be those that provide cues, skills, and environmental support to foster and sustain the behavior change.

Grol (1992), Cabana et al. (1999), and others have described key barriers for physicians in changing their behavior to adhere to clinical practice guidelines. These authors concluded that the transfer of knowledge and skills is necessary but, in many situations, insufficient to achieve change in practice routines. Other barriers that may discourage change include lack of confidence in one's ability to implement the new practice, lack of belief in the expected outcomes, lack of time, negative financial incentives, negative attitudes of colleagues, and resistance from patients.

In a review of the literature on improving prescribing in primary care, Soumerai et al. (1989) observed that many interacting factors contribute to inappropriate prescribing decisions. These include failure of physicians to keep abreast of developments in pharmacology, over-promotion of drugs by pharmaceutical companies, simple errors of oversight or omission, physician ignorance of cost issues, insulation of physicians and patients from cost considerations because of third-party coverage, pressure from patients or families for a particular drug regardless of indication, over-reliance on clinical experience versus scientific

data, physicians' need to provide some treatment for problems with no clear medical solution, pressure from other health workers, and high-volume practices requiring use of the prescription as a termination strategy to keep visits short.

Diffusion of innovation

Diffusion of innovation theory (Rogers 1962) describes how innovations are communicated and adopted by individuals in a social group. Rogers argued that individuals seldom adopt new ideas impulsively. Rather, acceptance of change typically involves passing through five phases: awareness (learning about the innovation), interest, evaluation (forming positive or negative attitudes about the innovation), trial (testing the acceptability of the innovation), and adoption.

Individuals vary in their response to innovation and may be grouped in five categories defined by the speed with which they adopt innovation: (a) innovators, (b) early adopters, (c) early majority (relatively early acceptors), (d) late majority (relatively late acceptors who approach innovation with caution and do not adopt until a majority of others in their social group have done so), and (e) late adopters. Interventions to introduce innovations must incorporate strategies appropriate for each of the adopter categories. Early adopters tend to be younger, have higher social status, and have a more favorable financial situation than late adopters.

Rogers argued that impersonal information sources are most important at the awareness stages and that personal sources are most important at the evaluation phase. Change agents are important for influencing individual decisions about the adoption of an innovation. Innovators and early adopters may serve as opinion leaders and play a critical role in encouraging others to adopt changes in practice. The early and late majority groups, in turn, are likely to be persuaded by peers and opinion leaders. Extra efforts, incentives, resources, and even regulations or sanctions may be needed to reach late adopters.

Rogers also described how several intrinsic features of the innovation affect the rate and process by which professionals encounter and use new processes and products. These features include complexity of the innovation; relative advantage and cost compared to existing methods; compatibility with existing practices and procedures; "trialability" (the opportunity to try the innovation before making a final adoption decision); and the observability of results (the extent to which the results of the innovation are visible to those using it).

Grilli and Lomas (1994) validated Rogers' diffusion of innovation theory in their review of 23 trials measuring the

effectiveness of strategies to disseminate clinical practice guidelines. They found that guidelines and procedures with high complexity had lower adherence than those that were relatively uncomplicated, and that recommendations judged to be high in trialability resulted in significantly higher adherence rates than those judged as low. Their examination found evidence for the influence of observability on adherence rates. Similarly, Grol et al. (1998) found in their observational study of 61 general practitioners in the Netherlands that guidelines that were clearly defined, were compatible with existing values, did not demand too much change to existing routines, and provided an explicit description of the scientific basis for the recommendation were followed more frequently than guidelines without these attributes.

Health education model

The health education literature emphasizes that behavior change cannot take place without addressing gaps in knowledge and skills. Green et al. (1980) presented a comprehensive framework for understanding, planning, and implementing health education activities based on the predisposing, enabling, and reinforcing factors of behavior change. Their model, known as PRECEDE (Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation), highlights the need for carefully assessing individuals' educational needs in terms of these factors and for educational processes to incorporate participatory, experientially based elements, as well as information transfer.

Davis et al. (1992 and 1995) applied the PRECEDE framework to categorize and review the effectiveness of continuing medical education interventions. As shown in Table 3, they characterized interventions to communicate or disseminate information as addressing predisposing factors, those facilitating desired change in the practice setting as targeting enabling factors, and feedback linked to performance as affecting reinforcing factors. They found that strategies focused solely or mainly on predisposing factors were less likely to change physician behavior and had little or no effect on healthcare outcomes. In contrast, those studies that used practice-based enabling or reinforcing elements were more effective in changing physician performance.

Fox and Bennett (1998) argued that continuing medical education programs need to emphasize self-directed learning where physicians assess their own learning needs based on their estimates of what they presently know and do, and manage their own acquisition of new knowledge and skills, using, as resources, colleagues, publications, and formal continuing education events. They also called for continu-

Table 3 ■ Categorization of Continuing Medical Education Interventions Using the PRECEDE Framework

Predisposing	Enabling	Reinforcing
Didactic presentations, lectures, conferences	Opinion leaders	Reminders
Educational materials	Patient-mediated interventions	Audit/performance assessment with feedback
Outreach visits		

Adapted from Davis et al. (1992).

ing medical education (CME) programs to address barriers to using new skills, including linking to interventions to alter the practice environment.

Social influence theory

Social influence theory posits that individuals' beliefs and behavior are strongly influenced by persons in their social network and society at large. The beliefs and values of peers, prevailing social norms, shared assumptions, and organizational culture all influence how individuals perceive and interpret information and are thus influential in behavior change (Bandura 1986).

Research in psychology has found that the degree to which an individual's attitudes and behaviors are influenced by those of peers increases in proportion to uncertainty. When uncertainty is high and clear information is limited, individuals' judgments and interpretations are heavily dependent on those of others in similar situations or sharing similar characteristics (Mittman et al. 1992). Situations of uncertainty are common in healthcare delivery, especially in areas where clinical knowledge is evolving and where patient and physician preferences significantly influence selection of a course of action.

Mittman and his colleagues argued that clinical practice behavior is rooted in social and behavioral norms that define "the way we do things here" in a given setting or culture. These norms, in turn, are based on core values and beliefs about accepted ways of acting and behaving. In medicine, practice norms first develop during the socialization process of medical training and evolve through subsequent interactions with mentors and peers. Moulding et al. (1999) noted that physicians' attitudes are affected by the views of colleagues and respected opinion leaders, as well as by patients and other health professionals.

Social processes influence the success of efforts to implement standards yet are often overlooked in traditional approaches for disseminating standards. Similarly, the role of the prevailing medical culture in determining physicians' beliefs and attitudes toward standards must be considered,

particularly in settings where an evidence-based medicine culture is perceived as at odds with a more humanistic, patient-centered approach. Social influence can provide implicit and explicit suggestions about the inappropriateness of current practices and the acceptability of suggested alternative practices. For this reason, standards implementation strategies that incorporate social influence interventions may be expected to be more effective than strategies limited to only the transfer of information.

Conceptual model of health worker performance in accordance with standards

The social and behavioral science theories discussed above offer important insights about the critical determinants of health worker performance according to standards; these are summarized in Table 4. The common elements of these theories are that changing and maintaining behavior requires removal of barriers, multifaceted interventions to address multiple determinants of behavior, and tailoring interventions to individual readiness and receptivity to change. These theories also underscore the importance of social influence on individual behavior change.

Drawing on these theoretical models, the QA Project has developed a conceptual model of the determinants of health worker performance according to standards that acknowledges the individual, organizational, health system, and social factors that interact to influence provider competence and, ultimately, behavior. Depicted in Figure 1, this model identifies the main influences on health provider performance and, by extension, suggests potential intervention points where efforts to facilitate performance according to standards can be directed. The model divides the determinants of health worker performance according to standards into those related to health providers' **individual** or personal characteristics and **environmental** factors—health system characteristics, organization of the healthcare setting, and social influences on individual providers—that affect provider behavior either directly or through their effects on provider motivation and competence.

Table 4 ■ Relevance of Theories for Achieving Performance According to Standards

Theory	Implications for Increasing Adherence to Standards
Behavior change model	<p>Barriers to change must be overcome to move individuals through the behavior change process</p> <p>Intervention strategies must be targeted to individual readiness</p> <p>Multifaceted interventions that address multiple determinants will be more successful than single-focus interventions</p> <p>The environment where the behavior occurs must be restructured to provide social support and rewards for compliance</p>
Diffusion of innovation theory	<p>Change agents play a pivotal role in encouraging adoption of new behaviors</p> <p>Individuals' different levels of receptivity to innovation must be recognized and interventions targeted to health workers' locations along the continuum of readiness to change</p>
Health education model	<p>Individuals' knowledge and skill needs must be assessed to tailor educational interventions</p> <p>Competency-based education must go beyond knowledge gaps to address enabling and reinforcing factors for behavior change</p>
Social influence theory	<p>Peers, opinion leaders, and social norms influence individual decision making about behavior</p> <p>Social influence can be a powerful facilitator or inhibitor of behavior change</p>

Individual factors

Individual factors relate primarily to the predisposing factors of the PRECEDE framework, individual readiness to change, and receptivity to innovation. Figure 1 groups individual factors that determine health provider performance into motivation¹ factors and competence² factors. **Motivation** builds on elements of diffusion of innovation theory, the health education model, and the behavior change model; it encompasses the provider's own goals and values, expectations of the consequences of performance according to standards (including both outcome efficacy or expected effectiveness of the standards and fear of what will happen if standards are not followed), perceived self-efficacy or one's ability to implement the standard, readiness to change, and response to innovation. **Competence** represents the health worker's knowledge, skills, abilities inherited or acquired through experience, and traits or personality characteristics that predispose a person to behave in a certain way.

Environmental factors

As viewed in the behavior change model and social influence theory, key environmental determinants of performance according to standards include both **social** and **system/organizational** factors. Social factors encompass

the values and beliefs of peers, patients, other health workers, opinion leaders, and members of the larger community.

System and organizational factors are those related to the health setting or system where the health worker operates. Such factors include both those that affect health performance according to standards directly and those that do so indirectly by affecting provider competence and motivation. System factors include how health services are financed and organized, laws and regulations affecting the health sector, clarity of organizational goals and the extent to which the healthcare delivery institution values quality, and how roles and responsibilities are divided among the major health sector actors and between levels of the health system.

Organizational factors are those determinants that enable health workers to perform to their full capacity: training, supervision, health system information and communication, the availability of needed resources, incentives, and efficient work processes. Other important organizational factors are the attributes of the standards themselves, including content (area of medical practice covered by the standard, complexity of the procedures involved), format (readability, ease of use), and comprehensiveness (the extent to which the standard covers the full spectrum of circumstances providers are likely to experience in implementing the standard).

¹ Readers interested in a further discussion of health worker motivation are directed to Bennett and Franco (1999).

² The determinants of health worker competence are discussed in depth in Kak et al. (2001).

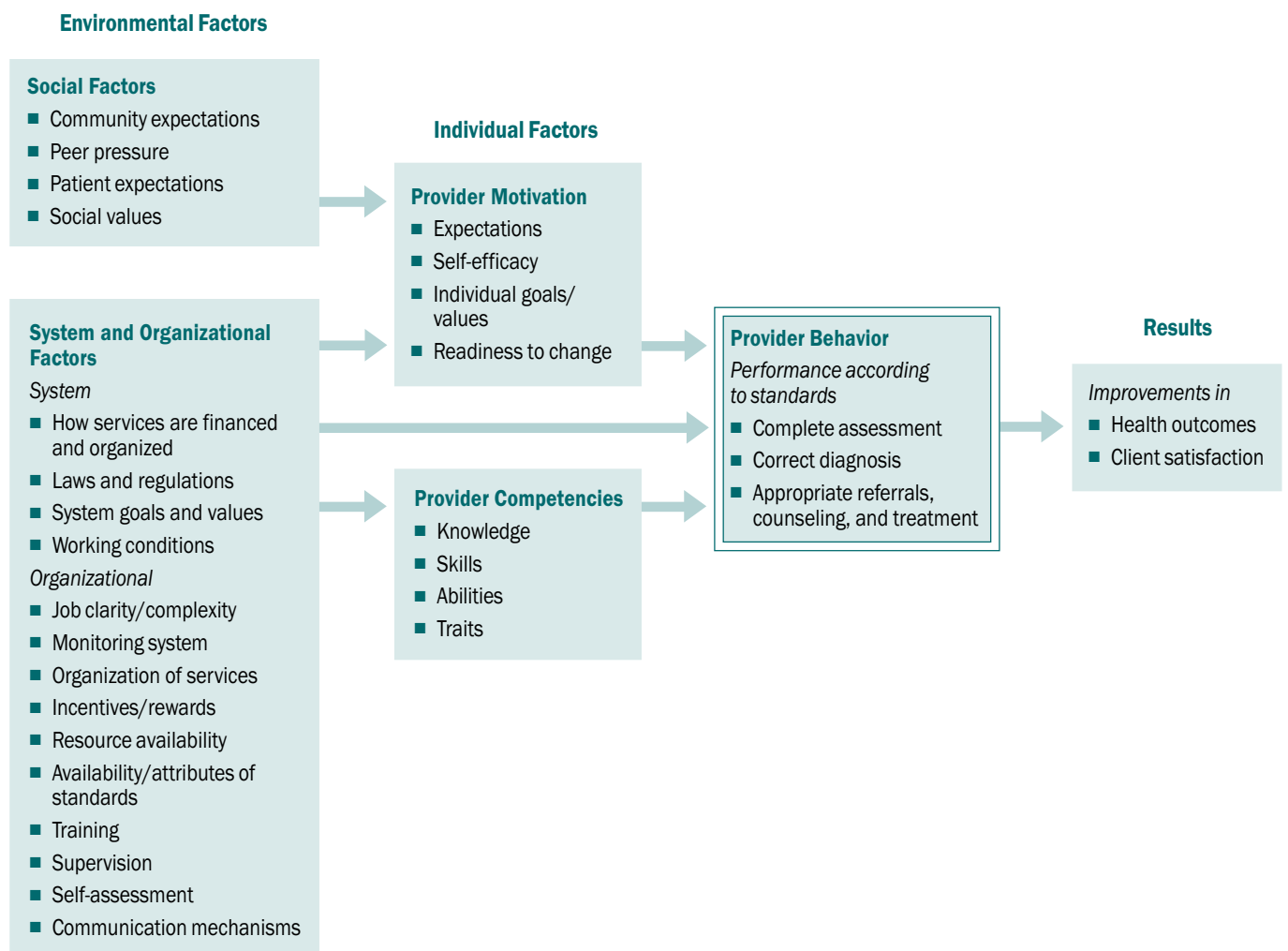
Insights for interventions to achieve performance according to standards

The determinants of health worker performance shown in Figure 1 provide a framework for examining the effectiveness of interventions to encourage healthcare workers to achieve standards. Performing according to standards requires the target group of health providers to have the competence and motivation needed to implement the standard or practice, as well as the resources required to do so. Individual, social, organizational, and systemic barriers to appropriate performance must be identified and strategies enacted to mitigate their influence, taking into account the fact that individuals differ in their readiness to adopt change. Social and organizational support is needed to remove barriers to performance, as well as enable and sustain the appropriate behavior or practice.

While the framework identifies a broad range of performance determinants, it must be acknowledged that most of the published literature on improving adherence to standards focuses on organizational factors and provider competence, as opposed to provider motivation and other health system factors. Yet, in many countries, more fundamental problems with lack of organizational concern with quality, poor working conditions, and perverse incentives that do not reward performance according to standards may represent much more important determinants of provider performance than provider competence. These larger questions about motivating health provider performance in an imperfect health system exceed the scope of this paper.

The relative importance of these factors in influencing individual health provider behavior was assessed in a recent study in Wales that used the critical incident method

Figure 1 ■ Determinants of Healthcare Provider Performance According to Standards



to identify why general practitioners and specialists change their clinical practice (Allery et al. 1997). The authors studied a random sample of 50 general practitioners and 50 specialists, asking them to describe incidents where they had changed their clinical practice in the preceding year. Most of the 361 changes identified were brought about by multiple factors, including social, organizational, and individual determinants. The most frequently mentioned reasons for change were organizational factors (involved in 41 percent of the changes), education (involved in 37 percent of the changes), and contact with other healthcare professionals (involved in 33 percent of the changes).

These factors are also important for understanding why appropriate performance may deteriorate over time. In Kenya, the QA Project conducted focus groups to explore the reasons why the performance of providers trained in the IMCI protocol deviated considerably from the standards within a year of training, despite initial strong adherence to the IMCI standards. The providers identified the lack of support of facility in-charges and other staff (negative social influence) and organizational factors, such as heavy workload and the time needed to implement the IMCI

algorithm, as the main causes of performance decline (Tavrow et al. 2000).

The next section examines the range of interventions that have been applied in the health field to induce standards-based performance. It is followed by a summary of the findings of empirical studies and reviews from the literature on intervention effectiveness relating to healthcare quality assurance, continuing medical education, and clinical practice guidelines.

Interventions to achieve performance according to standards

Since 1990, various authors have proposed schemes for categorizing interventions to achieve performance in accordance with healthcare standards (Greco and Eisenberg 1993; Cohen et al. 1994; Wensing and Grol 1994; Oxman et al. 1995). The classification scheme proposed by Wensing et al. (1998) fits well with the conceptual framework of the determinants of performance because it organizes interventions by the primary mechanism through which they affect behavior. As shown in Table 5, Wensing and colleagues

Table 5 ■ Classification of Interventions to Achieve Performance According to Standards

Mechanism	Type of Intervention	Examples
Information transfer	Educational materials	Mailed printed materials, clinical practice guidelines, self-instructional materials, newsletters, audio-visual materials
	Training	Traditional didactic lectures, conferences, seminars, workshops, distance education, problem-based learning, computer-based training, traineeships, study tours, tutorials
	Mass media	Professional journals, press releases, mass mailings
Learning through social influence	Opinion leaders	Mentoring, practice visiting, medical rounds led by respected practitioners
	Individual instruction	Academic detailing, educational outreach
	Patient-mediated interventions	Patient educational materials, patient reminders, patient surveys
	Peer review and support	Peer review groups, quality improvement teams, quality circles, participatory guidelines development, peer consultation, peer mentoring
Information linked to performance	Reminders	Computer-based prompts, patient-specific reminders, generic reminders, job aids
	Audit and feedback	Quality assessment, supervisor performance review, self-assessment, medical record review, utilization review, voluntary accreditation, information system feedback
Management support	Organizational interventions	Changes in workload/work flow/delegation of tasks, provision of special equipment, modifications in processes and procedures
	Incentives	Financial rewards, reimbursement restrictions, symbolic awards and recognition
	Regulations	Legal restrictions on certain activities, licensure/certification requirements

Adapted from Wensing et al. (1998).

classified interventions to support performance according to standards in healthcare as relying primarily on information transfer, learning through social influence, information linked to performance, or management support.

Information transfer interventions include written materials and group training or instruction—the traditional avenues for CME—as well as mass media interventions, including publication in professional journals. Learning through social influence involves information transfer, but adds the dimension of social pressure and influence; it includes the use of opinion leaders, individual training or outreach, patient-mediated interventions, and peer support and reinforcement. Information linked to performance refers to: (a) reminders or prompts to perform certain actions, and (b) the audit or assessment of clinical performance and feedback of this information to the provider after the activity. Management support includes provision of resources and structural changes needed to support performance according to standards, incentives, regulatory interventions, and financial rewards and penalties.

In terms of their relation to the determinants of healthcare provider performance depicted in Figure 1, information transfer interventions may be viewed as primarily affecting provider competence. Social influence interventions address social factors, which in turn affect provider motivation. Interventions giving information linked to performance, such as reminders and audit and feedback, affect the organizational factors that, in turn, influence provider motivation, competence, and, in some cases, behavior. Management support interventions seek to modify the organizational factors that influence provider motivation, competence, and behavior.

Relevance to developing country settings

As will be discussed in the next section, most of the reported experience with these interventions comes from developed countries, so their appropriateness in developing country settings must be viewed with some caution. Because of the significantly greater availability of resources in developed country health systems, the range of options for interventions to improve performance in accordance with standards is understandably greater than may be possible in lower- and middle-income countries. Moreover, the impact of interventions may vary considerably in different cultural contexts due to the effect of distinct socio-cultural values, such as conformity, acceptance of hierarchy or authority, etc.

On the other hand, the relatively greater degree of control over the health system and healthcare providers that ministries of health wield in many countries may provide opportunities for the application of organizational interventions that may not be feasible in more fragmented systems dominated by independent, private practitioners. Similarly, the lack of ready access to print materials and scientific information by health workers in developing countries may make information transfer interventions more effective than is assumed in settings where providers are deluged with information.

Because nonphysician health workers dominate the delivery of basic health services in most developing countries, the relevance of interventions that have been validated mainly among physicians is questionable. Interventions proven to influence physician performance may or may not be applicable to other health workers.

Finally, the effect of the practice setting—primary care versus hospital-based care—is also important. Interventions to improve adherence to standards for preventive and primary care services may differ significantly from those best suited to influence treatment decisions or complex medical procedures in secondary and tertiary care facilities. Consequently, the following discussion of empirical evidence for intervention effectiveness emphasizes results from primary care settings, since these are felt to be most relevant to facilitating standards-based performance in developing countries.

Empirical findings from research on interventions

Since 1990, several systematic reviews of the effects of clinical guidelines and other interventions to improve adherence to standards have been published in the international medical literature (Buntinx et al. 1993; Davis et al. 1992; Grimshaw and Russell 1993; Hulscher et al. 1999; Oxman et al. 1995; Solomon et al. 1998; Wensing and Grol 1994; Wensing et al. 1998). As summarized in Table 6, these reviews have applied rigorous methods for inclusion of studies and have focused on evidence from randomized controlled trials³ in order to validate the effectiveness of specific interventions and strategies to achieve healthcare provider performance according to standards. The studies cited in these reviews took place in North America, Europe, Australia, or New Zealand.

³ Randomized controlled trials, in which subjects are randomly assigned to intervention and control groups, are considered to be the most methodologically rigorous way to measure results because they minimize the effects of various sources of bias, such as the testing or Hawthorne effect and selection bias (when outcome differences are due to non-equivalent intervention and control groups). However, in field settings, randomized controlled trials do not ensure as much bias control as they do in laboratory settings.

This section summarizes the findings of these reviews and of reports from controlled trials of the effectiveness of single and combined interventions to achieve standards-based performance, organized by the four mechanisms and numerous types of compliance interventions presented in Table 5. The lines distinguishing the different types of interventions within each of the four mechanisms are somewhat blurred; there is some overlap between the types of interventions. Nevertheless, the classification scheme provides a useful framework for looking at the salient features of each intervention type.

The systematic reviews and individual articles included in this literature review were selected based on robustness of the evidence presented and relevance to primary care and general practice settings. There is some overlap between the reviews in terms of the original studies included in the review. Articles reviewed for this paper were identified from MEDLINE searches of English-language publications on key words related to communication of standards, compliance with standards, and clinical practice guidelines implementation. Relevant articles were also identified from bibliographies of systematic reviews and individual studies, as well as from suggestions of colleagues. When available and including control group data, research results from developing countries were included. Most of the evidence reviewed comes from developed countries, however, and preponderantly describes interventions applied to influence the behavior of physicians.

Information transfer

Educational materials

Interventions based solely on educational materials directed at healthcare providers include the distribution of printed guidelines or recommendations for clinical care, manuals, pamphlets, and audio-visual materials. Educational materials alone were found in the overwhelming majority of studies reviewed to have little or no effect in inducing performance according to standards (Davis et al. 1992; Davis et al. 1995; Grimshaw and Russell 1993; Hulscher et al. 1999; Oxman et al. 1995; Soumerai et al. 1989; Wensing and Grol 1994). Davis and colleagues concluded from their thorough review of randomized controlled trials on the impact of CME that practice guidelines and other educational materials alone have little or no effect on provider performance. Hulscher et al. (1999) reported on three randomized trials testing the impact of educational materials to increase adherence to preventive procedures; no significant differences were found between intervention and control groups. Soumerai et al. (1989) concluded from their analysis of the best-controlled studies of the effects of mailed, printed educational materials on physicians'

prescribing behavior that print-based materials alone had no effect on prescribing behavior, but may play a useful role in laying the groundwork for other, more effective approaches by providing initial exposure to behavior change messages.

Davis and colleagues did find that when print materials were coupled with other intervention strategies, such as discussion groups, patient education, or reminders, adherence to standards increased. Another potential area for improving the effectiveness of educational materials is to include opportunities for self-audit or assessment as part of the presentation format. For example, the American Academy of Pediatrics includes an annual self-assessment as part of its Physician Review and Education Program (PREP), which thousands of pediatricians subscribe to for continuing education credits. The self-assessment consists of 250 questions, mostly short patient cases that require the physician to choose a diagnosis or treatment. Each question has a one- or two-page critique that explains the correct answer, often incorporating a relevant guideline or policy statement of the academy. Anecdotally, many pediatricians say that PREP helps them to keep their patient management up-to-date and in conformity with evidence-based guidelines.

Post-graduate/in-service education and training

CME has traditionally employed conferences, seminars, short training courses, medical rounds, small group sessions, workshops, tutorials, and other didactic methods to transfer medical information to individuals and groups. Numerous reviews, drawing primarily on studies in North America, have concluded that formal CME events without efforts to enable or reinforce standards-based performance in actual practice have little or no impact (Bero et al. 1998; Davis et al. 1992; Davis 1998a; Oxman et al. 1995; Wensing et al. 1998).

Davis et al. (1995) found that relatively short (one day or less) CME events, such as lectures or conferences, produced no effect on physician practice. Oxman et al. (1995) found in their review of 102 trials to improve physician performance that conferences, rounds, and workshops in which no explicit efforts were made to determine individuals' barriers to change or facilitate changes in provider behavior failed to demonstrate any effect on physician practice. Their review concluded that when such training events were complemented by other interventions to reinforce compliance, improvements were demonstrated. Wensing and Grol (1994) found that group education interventions to induce adherence to standards in primary healthcare had little or no impact on their own but enhanced feedback interventions by providing the knowledge and skill base necessary. However, these alone were not sufficient to achieve the

Table 6 ■ Systematic Reviews of Interventions to Achieve Performance According to Standards

Authors	Scope of Review	Findings/Conclusions
Butinx et al. (1993)	26 controlled trials (including 16 nonrandomized studies) of the effect of feedback and reminders on diagnostic and preventive activities in ambulatory care; selected from studies published between 1973 and 1992	Both feedback and reminders could reduce the use of diagnostic tests and increase adherence to standards of preventive care. In randomized studies, the effects of reminders appeared more pronounced than those of feedback. The effects of feedback appeared more pronounced when it was part of a broader strategy aimed at doctors who had already decided to change their performance.
Davis et al. (1992)	50 randomized controlled trials of the impact of diverse CME interventions on physicians' performance and healthcare outcomes; selected from studies published between 1975 and 1991 and whose subjects included 50% or more physicians	The interventions were grouped into three types according to the PRECEDE model: predisposing (communicating and disseminating information), enabling (facilitating the desired change in practice setting), and reinforcing (by reminders or feedback). Interventions using only predisposing elements to disseminate information were less apt to change physician performance. In contrast, studies that used enabling and/or reinforcing elements were more effective in changing outcomes. Activities described as "academic detail visits" appeared to be effective and warrant further study. Patient education and computerized practice-based information appeared to facilitate practice change. Practice guidelines, when used alone, were not effective. Feedback and reminders appeared to overcome many of the logistical and sociological barriers to facilitate optimal physician performance. The evidence reviewed suggested a direct relationship between the intensity of the intervention and positive outcomes. CME is more effective when it incorporates practice-based enabling and reinforcing strategies. Adequate assessment of physicians' needs leads to increased potential for change.
Grimshaw and Russell (1993)	59 published evaluations of the effects of clinical guidelines on medical practice using "robust" designs (balanced incomplete block, randomized crossover, simple randomized, controlled before and after, and interrupted time series); identified from studies published between 1976 and 1993	<p>Of the 59 studies, 23 evaluated the effects on processes of clinical care of computer-generated reminders, patient-specific feedback, national guidelines placed in patient record, personal instruction, a national seminar, lectures, guidelines embedded in new records, consensus development conferences, mail to target doctors, opinion leaders, computerized protocols, or publication of guidelines in journals; 27 studies examined the effects of guidelines on processes of preventive care, testing computer-generated reminders or questionnaires, new paper records, reminders placed in patient records, patient-specific reminders, and extended educational programs; 8 studies examined the effects of guidelines on prescribing and the use of support services through new records, a marketing campaign, aggregated feedback, posters, lectures, mail to target doctors, and seminar.</p> <p>Of the 59 papers, all but 4 detected significant improvements in the process of care following the introduction of guidelines. Nine out of 11 papers that assessed the outcome of care reported significant improvements. Specific educational interventions and patient-specific reminders at the time of consultation had a higher probability of being effective. Continuing education and patient-specific feedback had above average, mailing target groups and general feedback had below average, and publication in journal and general reminders had low probability of being effective. The successful introduction of clinical guidelines is dependent on the clinical context and the use of appropriate methods to develop, disseminate, and implement the guidelines.</p>
Hulscher et al. (1999)	58 randomized controlled trials or controlled before-and-after studies that focused on improving the delivery of preventive services by primary care clinicians; identified from studies published between 1980 and 1995 in English, Dutch, or German	Among the single intervention studies, 8 tested information transfer, 3 tested learning through social influence, 4 tested feedback, 13 tested physician reminders, and 4 tested organizational interventions. Differences between the experimental and control groups were significant in 5 of the 8 information transfer studies, with differences ranging from -4 to 31 percent. Only 1 of the 3 social influence studies produced a significant difference (44 percent in favor of the intervention). Among feedback interventions, only 1 of the 4 studies showed significant results (26 percent in favor of the intervention). Among reminder interventions, 9 out of 13 studies showed significant results (ranging from 6 to 24 percent in favor of the intervention). Among the multifaceted interventions, 10 out of 18 studies of multifaceted interventions including feedback showed significant results (differences of -2 to 57 percent), and 13 out of 15 multifaceted interventions with reminders showed significant results (differences of 4 to 35 percent). The effectiveness of the interventions varied greatly, and most produced at least small to moderate changes in the delivery of preventive care. The

Table 6 ■ Systematic Reviews of Interventions to Achieve Performance According to Standards (Continued)

Authors	Scope of Review	Findings/Conclusions
Oxman et al. (1995)	102 trials investigating one or more interventions targeted at improving the performance of healthcare professionals and outcomes; identified from studies published between 1970 and 1993	<p>authors recommended more detailed studies with better research methodology to show which elements of interventions work, why they work (including measuring and analyzing providers' beliefs, attitudes, reactions and judgements), and at what cost.</p> <p>Twelve studies tested only print materials, and most failed to demonstrate changes in performance or health outcomes. Of the 17 interventions based on conferences, rounds, and workshops, those without explicit effort to determine practice needs or to facilitate practice change failed to demonstrate any change in performance or health outcomes. Individual instruction (tested in 8 studies) was effective in reducing inappropriate prescribing (demonstrating reductions of 12 to 49 percent in inappropriate prescribing) and, to a lesser extent, increasing the delivery of preventive services (gains reported of 5 to 27 percent). The effectiveness of local opinion leaders (5 studies) ranged from insignificant to significant and substantial. Patient-mediated interventions (10 studies) demonstrated mixed results but were more effective when combined with other interventions. Audit and feedback interventions (31 studies) and reminders (52 studies) were varied and achieved results ranging from none to 40 percent. The authors recommended the use of diagnostic strategies to determine the reasons for suboptimal performance and to identify barriers to change as inputs to the design of interventions to improve professional performance.</p>
Solomon et al. (1998)	49 controlled studies assessing interventions to change diagnostic testing practices; identified from English language studies published between 1966 and 1998	<p>This review applied the PRECEDE framework to categorize the interventions studied. Interventions targeting predisposing factors included lectures on cost-effective testing, distribution of educational materials regarding the clinical utility of diagnostic tests, development and dissemination of guidelines, and a problem-oriented order sheet. Interventions that targeted reinforcing factors included displaying charges at the time of ordering using a computer-based, order-entry system, daily laboratory utilization and charge audit followed by weekly radiology utilization and charge audit, computerized print-out of itemized charges placed daily in patient chart, utilization and charge audit with comparison with other physicians, and cumulative comparative charges placed daily in patient chart. Interventions targeting enabling factors included requiring that a radiologist approve all imaging and limiting the number of tests allowed. Three of the 5 interventions targeting only predisposing factors were effective in changing physicians' knowledge and attitudes. Coupling a predisposing intervention with reinforcements (e.g., audit) was more successful than reinforcing interventions alone. When paired with educational strategies, enabling-factor interventions produced change in every study reviewed. Though the primary data were generally of low quality, the authors concluded that interventions that first educated physicians on optimal diagnostic practice (a predisposing factor) and then gave physicians detailed comparative utilization data (reinforcing factor) produced behavior change. They recommended that interventions should target multiple behavioral factors, since multidimensional interventions appeared more successful than those aimed at one level.</p>
Wensing and Grol (1994)	75 studies of single and combined strategies to induce changes in primary care or general practice, including 27 randomized and 17 nonrandomized controlled trials; identified from studies published from 1980–92 in English or Dutch	<p>Providing educational material as a single strategy did not result in improved care. The effectiveness of group education varied. Individual instruction, feedback, and reminders were the most effective single strategies. The most effective combined strategies were individual instruction added to other interventions and the combination of peer review and feedback. The combination of group education and feedback proved to be effective and more effective than feedback alone. The combination of group education and practice support proved to be more effective than only providing practice support. The authors concluded that the effectiveness of combined strategies was related to their ability to deal with different types of barriers simultaneously and that combined strategies made up of strategies dealing with different types of barriers seemed to be more effective than the separate single strategies. For example, combined strategies of feedback (performance-oriented) and peer review (social influence) generally proved to be effective, while feedback and reminders combined (both performance-oriented) did not prove to be more effective than the separate strategies. The authors recommended that future interventions be based on a thorough analysis of the barriers to change that physicians experience and be directed at overcoming these barriers.</p>

Table 6 ■ Systematic Reviews of Interventions to Achieve Performance According to Standards (Continued)

Authors	Scope of Review	Findings/Conclusions
Wensing et al. (1998)	143 studies of the effectiveness of interventions to induce compliance with guidelines and adoption of innovations in general practice; of the 143, only the 39 randomized controlled trials and 22 controlled before and after studies were considered “best evidence” and included in the analysis of intervention effectiveness; selected from studies published between 1980 and 1994	The analysis of the 61 “best evidence” studies partly supported the hypothesis that multifaceted interventions are more effective than single interventions. Single interventions using information transfer were less effective than combinations of information transfer and learning through social influence or management support. Combinations of 3 or 4 different interventions were effective in most situations. The results suggest that transfer of knowledge and skills is necessary but, in many situations, insufficient to achieve change in practice routines. Social influence and management support may help to remove barriers. Patient-specific feedback and reminders are probably more effective than general feedback and reminders. The authors concluded that because many general practitioners work in isolation, interventions using well-respected colleagues or groups of colleagues for the dissemination and implementation of guidelines and innovations may be particularly effective in general practice. Patient-mediated interventions, such as the use of patient reports or patient feedback to induce changes, are also promising in general practice settings.

desired performance. Wood (1998), reviewing the literature on the impact of continuing education on nursing practice in North America and the United Kingdom, found little evidence of the effectiveness of educational interventions on nursing practice because very few studies have attempted to rigorously quantify changes in nurses’ performance after continuing education interventions.

Methodologically rigorous evaluations of the impact of training on primary healthcare worker performance in developing countries are limited in number, but published studies show mixed evidence for the effects of in-service training on performance according to standards. Most studies reporting positive effects only demonstrate evidence of short-term knowledge or behavior gains, without data on long-term retention (Elder et al. 1992; Naimoli et al. 1996; Santoso et al. 1996).

Rowe et al. (2000) examined factors associated with correct treatment of young children with malaria in the Central African Republic using rigorous multivariate analysis techniques to identify significant predictors of correct performance in 204 observed cases of fever. They found that in-service training was not significantly associated with adherence to treatment standards. In contrast, Baig and Thaver (1997) found that training in diarrhea case management in Pakistan was significantly associated with correct assessment and diagnosis performance, but not with adherence to treatment standards.

Formal evaluations of health worker performance following a nine-day training in the IMCI algorithm (which includes the provision of wall chart reminders and recording forms designed to facilitate IMCI-based performance) have shown that health workers achieve modest to good performance

for assessment and treatment tasks with mildly and moderately ill children, but lower performance scores for classification and treatment of severe illness (CDC 1998; Simoes et al. 1997). The fact that IMCI training provides trainees with reminders (wall charts, recording forms designed to prompt health workers) for use in their work place may contribute to its effectiveness in achieving standards-based performance, at least in the short-term. Heiby (1998), in his review of lessons from the implementation of IMCI in developing countries, argued for the incorporation of reminders and job aids and ongoing monitoring or audit of health worker IMCI performance to reinforce performance according to standards.

Despite the accumulated evidence pointing to the lack of effectiveness of traditional didactic training, expert-led teaching still prevails as the most common form of CME in developed as well as developing countries. But in today’s climate of heightened concern with healthcare efficiency and effectiveness and exponential growth of clinical standards, there is increasing intolerance of variance in medical practice and a growing recognition that the central purpose of CME must be to maintain and improve clinical practice (Cantillon and Jones 1999).

More recently, the influence of adult learning theory on undergraduate and postgraduate medical education has resulted in increased interest and application of experiential learning methods and alternative educational formats, including interprofessional education, small group learning, learning contracts, telemedicine, and efforts to use the Internet to link isolated healthcare providers with university resources (Davis 1998b).



The addition of social influence

enhances the transfer of information about standards by communicating social values and cues about the legitimacy and acceptability of performance in accordance with the standards.

One such method, problem-based learning, emphasizes the study of clinical cases in small discussion groups, collaborative independent study, and the application of deductive reasoning as opposed to mastery of factual knowledge. Norman and Schmidt (1992) applied concepts from cognitive psychology to explain why problem-based learning offers certain advantages for medical education, including evidence suggesting that: (a) elaboration of knowledge (e.g., using the knowledge, discussing the knowledge, answering questions) at the time of learning enhances recall, (b) retrieval of information in a context similar to that experienced at the time of learning facilitates recall, and (c) activation of prior knowledge facilitates the acquisition of new information. They concluded that problem-based learning enhances the transfer of concepts to new problems, increases interest in the subject matter, and develops self-directed learning skills. Vernon and Blake (1993), reviewing available evaluative research conducted between 1970 and 1992 that compared problem-based learning with traditional methods of medical education, found that problem-based learning: (a) showed larger effect sizes with respect to measures of students' clinical performance (effect size of +.28) and course satisfaction (effect size of +.55), and (b) was similar to traditional methods with respect to students' scores on factual (effect size of -.09) and clinical knowledge (effect size of +.08).

Another educational innovation that has the potential to improve the effectiveness of health provider continuing education and in-service training is computer-based training (CBT).⁴ In medical education, computer-driven interactive video can portray simulated real-life scenarios that students experience in a setting that threatens neither the student nor the patient. CBT also can provide students with a "clinical" context to enhance recall in later clinical practice settings. Computers also provide immediate feedback on the application of knowledge and permit more individual pacing and interaction than conventional training methods.

Cohen and Dacanay (1994) carried out a meta-analysis of 29 comparative studies of computer-based training in nursing education and concluded that a clear majority of the studies favored CBT over conventional methods of instruction. Interactive video applications of CBT, which allowed for active student involvement in learning, provided directive feedback and realistic simulations of clinical experiences; these applications also produced larger effects (mean effect size of +1.17) than tutorial and computer-managed CBT applications. CBT implementation in elective courses showed larger effects than implementation in required courses. A randomized trial by the QA Project that compared computer-based and conventional IMCI training in Uganda found no differences between the two training groups in IMCI knowledge or performance after training. However, the computer-assisted course was 13 percent less costly, even though computers had to be rented (Kekitiinwa et al. 2000).

Mass media

Professional journals, cable television programs targeted at health professionals, press releases, and bulk mailings are all mass communication interventions that have been used to disseminate practice guidelines and scientific evidence. Though for much of the past century, journal reading was one of the most common continuing education activities for many physicians, its impact on physician behavior has not been studied to any large extent (Davis et al. 1992). With many health professionals now too busy to read individual journals, the electronic dissemination of article abstracts (often limited to preselected topical areas) through computerized distribution services is increasingly common.

Lomas et al. (1989) found that mass mailing of a national consensus statement on cesarean delivery to obstetricians in Ontario had little effect on actual rates of cesarean section despite widespread awareness of the guidelines, a significant decline in physicians' self-reported rate of cesarean section, and an increase in self-reported compliance with the consensus statement. They concluded that mass communication methods will not be effective in achieving adherence to standards in the absence of other strategies to overcome administrative, educational, patient-centered, economic, and other barriers to performance according to standards.

Soumerai et al. (1987) studied national data on the use of propoxyphene (Darvon) before and after a two-year informational campaign by the U.S. Food and Drug Administration and the drug's manufacturer that included warnings mailed to physicians, press releases, and labeling changes.

⁴ For a review of the current body of published and unpublished research on the effectiveness of computer-based training in healthcare, see Knebel (2000).

They concluded that the mass media interventions had no effect on trends in prescribing or overdose deaths. However, in a separate study, Soumerai et al. (1992) argued that media warnings about the association between the use of aspirin among children and Reye's syndrome successfully changed both provider and consumer behavior, perhaps because the message was relatively simple and acceptable alternatives were readily available.

Mittman et al. (1992) argued that incorporating social influence concepts in the design of mass media methods will improve their effectiveness as tools for behavior change. Mass media interventions can accomplish this by demonstrating to target practitioners that a new practice is becoming increasingly common, that it is the new "accepted standard" of care, and that failure to adopt the practice is indicative of atypical or irregular behavior.

Learning through social influence

Social influence interventions build on the effects that recognized authority figures, other healthcare professionals, colleagues, and patients have on the attitudes and behavior of health providers. The addition of social influence enhances the transfer of information about standards by communicating social values and cues about the legitimacy and acceptability of performance in accordance with the standards.

Opinion leaders

Opinion leaders are educationally influential and respected clinicians who influence the practice behavior of other health practitioners through peer pressure and behavior modeling. Opinion leaders attempt to convince colleagues that nonconforming practices are outdated, inappropriate, not supported by research evidence, and no longer accepted by peers in other similar settings. The use of opinion leaders may or may not involve individualized instruction, since the salient social influence of this intervention is that the opinion leader is well known and credible to the target providers. While opinion leader interventions have been tested in only a few randomized controlled trials, they have produced positive changes in health provider adherence to standards (Davis et al. 1995; Oxman et al. 1995).

Lomas et al. (1991) demonstrated an 85 percent increase in vaginal birth rates after previous cesarean sections among obstetricians educated by an opinion leader in a randomized controlled trial of two interventions involving 76 physicians in 16 community hospitals in Ontario. In contrast, their study found that vaginal birth rates among physicians in the audit and feedback intervention group were no different than those in the control group. Seto et al. (1991) found that the use of nurses identified by their peers as opinion

leaders to transmit information on new guidelines to other nurses in a hospital setting led to significantly greater adherence to infection control procedures than did dissemination of the guidelines through lectures. The combination of opinion leaders and in-service lectures achieved even better performance than opinion leaders alone.

Mittman et al. (1992) suggested in their review of social influence strategies that opinion leader strategies may prove useful as preparation for other more intensive strategies. They argued that the use of opinion leaders may be most appropriate for groups of providers without an existing tradition of group activity and cohesiveness, such as private practitioners delivering services at community hospitals. This view is supported by the findings of Stross et al. (1983), who achieved improvements in performance according to standards for the management of chronic obstructive pulmonary disease through the use of intensive preceptorships with opinion leaders in 16 community hospitals.

Individual instruction

Individual instruction, often referred to as academic detailing or educational outreach, consists of brief, one-to-one encounters between a health provider and another health professional or educator who seeks to influence the former's behavior. Individual instruction may be distinguished from opinion leader interventions by the fact that the person providing the instruction is not an authority figure personally known to the target provider. Individual instruction interventions combine the transfer of knowledge with social influence, through implicit or explicit suggestions of the inappropriateness of current practices and the acceptability of proposed alternatives. Based on the model of drug detailing, whereby pharmaceutical manufacturer representatives visit individual practitioners with the goal of encouraging prescribing of their products, academic detailing relies instead on establishing the independence and credibility of the "advisor" through association with a respected organizational identity and referencing authoritative and unbiased sources of information. The dynamic and intensive personal nature of the contact, allowing active participation of the target health provider in the educational interaction, also adds to its effectiveness as an educational intervention.

In randomized controlled trials, individual instruction has been found to be effective in reducing inappropriate drug prescribing and laboratory test ordering, increasing the delivery of preventive services, and improving the appropriate use of blood products in surgery (Davis and Taylor-Vaisey 1997; Hulscher et al. 1997; Mittman et al. 1992; Soumerai et al. 1993; Soumerai 1998; Wensing and Grol 1994).

However, not all trials have deemed academic detailing effective. Mittman et al. (1992) suggested that if the visit is too brief or the educator is not known or credible to the target practitioners, the information transfer and social influence effects will be mitigated. This observation was supported by the controlled trial carried out by Schaffner et al. (1983) to test the effects of physician and drug educator visits to private practitioners who had been identified through Medicaid data as inappropriately prescribing antibiotics. The physician visits produced strong attributable reductions in prescribing of contraindicated antibiotics (54 percent reduction in number of prescriptions written for contraindicated antibiotics), while the drug educator visits produced only modest effects.

A few studies have evaluated academic detailing in developing country settings. Ross-Degnan et al. (1996) evaluated the short-term effects of individual instruction through meetings between diarrhea control program educators and private pharmacy owners/pharmacists followed by a small group training in each pharmacy for all counter attendants. The controlled study was carried out in Kenya and Indonesia and involved almost 200 private pharmacies. After the intervention, sales of oral rehydration therapy increased significantly in the intervention pharmacies compared to controls (averaging 30 percent in Kenya and 21 percent in Indonesia), and sales of antidiarrheal drugs decreased significantly (averaging a 15 percent decline in Kenya and a 20 percent decline in Indonesia) compared to controls. A trend toward increased communication between pharmacy assistants and patients, including discussion of dehydration, was also observed. The researchers concluded that face-to-face educational outreach was effective in achieving at least short-term improvements in the dispensing of appropriate products and patient counseling.

While individual visits are labor-intensive and therefore costly, Soumerai and Avorn (1986) demonstrated that academic detailing can produce substantial net savings when directed at increasing adherence to drug-prescribing standards. Soumerai et al. (1989) found that in a hospital setting, brief educational visits by an appropriately trained counselor were associated with practically and clinically significant improvements in prescribing. Despite moderately high personnel costs, some of these programs have saved more than they cost and improved quality of care. Noting that only 8 percent of the physicians in their original study were responsible for over half of all study drug prescriptions, the authors suggested that cost-effectiveness of individual instruction can be enhanced by targeting those providers considered to be most at risk of inappropriate practices.

Patient-mediated interventions

Patient influences on health worker performance can be brought to bear through a number of mechanisms, such as providing patients with information on clinical guidelines, patient satisfaction surveys, and complaint or suggestion procedures. The explicit communication of priorities and concerns by patients has been shown to stimulate and reinforce physician behavior (Cohen et al. 1994).

Patient-based educational interventions have been tested widely in general practice settings to induce physician adherence to guidelines for breast cancer screening, smoking cessation, and diabetes mellitus management. Cohen et al. (1994) reported results from several studies that demonstrated that patient-initiated reminders (e.g., card identifying recommended preventive procedures mailed to patients with instructions to bring the card to their physician at the next visit) significantly increased physician performance according to preventive care standards as compared to performance achieved through providing only physician prompts attached to patient charts. In one study reported, patient reminders resulted in 18 percent higher influenza vaccination, 13 percent higher use of hemocults and rectal exams, 10 percent higher use of Pap smears, and 23 percent higher frequency of clinical breast examinations.

In three separate randomized controlled trials, McDowell et al. (1989a, 1989b) and Rosser et al. (1991) compared the effect of letter reminders sent to patients, telephone call reminders to patients, and computer-generated physician reminders at the time of a patient's visit. All three studies produced similar results, with the patient letter reminders achieving the greatest increases in adherence to preventive services, such as cervical cancer and blood pressure screening (15 to 28 percent higher rate of adherence than control groups). Telephone call reminders to patients also achieved significant increases in performance, but of a slightly lower magnitude (3 to 28 percent higher than controls), while physician reminders achieved 10 to 20 percent higher rates of performance than controls.

Patient-mediated strategies may be more effective for some types of health services than others. Turner et al. (1989) found that a patient questionnaire and educational hand-out on preventive care were more effective than physician reminders in increasing the delivery of preventive services that depended more on patient initiative (e.g., initiating a visit to obtain a Pap smear), while physician reminders were more effective in improving the performance of physician-dependent preventive services (e.g., prescribing of medication). Feder et al. (1999) found in a randomized controlled trial that mailing notices with guidelines for effective secondary prevention of coronary disease to patients who

survived a coronary event did not result in improved prescribing of secondary prevention drugs.

Patient-mediated interventions have also been found to improve physician adherence to preventive care standards for management of diabetes and smoking cessation when combined with other interventions, such as physician reminders (Davis and Taylor-Vaisey 1997; Oxman et al. 1995). Becker et al. (1989) found that combining patient reminders with physician reminders was more effective in increasing performance of preventive services than physician reminders alone.

Peer review and support

Psychologists have observed strong correlations among the decisions and behaviors of members of a cohesive social unit. This phenomenon has been observed in health in terms of geographic variations in healthcare delivery, which are often ascribed to local “practice styles.” Interventions based on peer review and support: (a) rely on the major role that peers’ judgment and beliefs play in an individual’s evaluation and interpretation of new information, and (b) use the influence and pressure of persons in the target practitioners’ social network to affect individual performance. Peer-mediated strategies encompass a diverse group of interventions, including formal peer review, participatory guideline development, and team-based process improvement and problem solving. Mittman et al. (1992) argued that physician-mediated strategies are likely to be more effective in institutional settings with high group cohesiveness (e.g., staff model health maintenance organizations) than among independent, fee-for-service practitioners.

Grol (1992) cited several studies where peer review was shown to be effective in changing practice routines in groups of doctors when it was used as part of a broader quality improvement approach that included participatory development of criteria, quality circles, or group discussion and feedback. Formal peer review was not found to be effective in two “best evidence” studies reviewed by Wensing et al. (1998). A QA Project study in Indonesia found that unstructured, physician-directed peer review groups tended to reinforce collective behavioral norms and behaviors with which physicians were most comfortable (Kim et al. 2000). The peer discussions seemed to prevent questioning the need for change in performance areas like counseling that were less technical or more focused on client behavior.

Greco and Eisenberg (1993) and others have suggested that involving physicians in the process of guideline development should increase adherence to standards by generating a sense of ownership. However, Mittman et al. (1992) reported in their review of rigorous studies of the effect of

physician participation in guideline development that the evidence is mixed, suggesting that participation may not suffice to influence performance.

Team-based process improvement can also serve as a standards implementation strategy when focused on a quality problem related to performance according to standards. However, its effectiveness and efficiency as a means of achieving adherence to standards has not been widely validated in randomized controlled trials. Tavrow et al. (2000) conducted a quasi-experimental intervention study in Kenya to measure the effect of participation in problem-solving teams following IMCI training on IMCI performance. The study showed that providers who participated in teams that were classified by the researchers as higher ability (based on completion of a 60-minute case study exercise) demonstrated significant improvement ($p < .05$) in observed performance of assessment (40 percentage point gain), classification (27 point gain), and counseling skills (16 point gain) and a non-significant decline in treatment skills compared to their baseline performance two years earlier. Providers who did not participate in teams demonstrated significant improvement only in assessment (13 percentage point gain) and a significant decline in counseling performance (15 point decline).

Team-based peer review and support approaches tend to be directed at improving care within a facility as a whole rather than at the individual practitioner level, so they may be useful as part of strategies to achieve performance according to standards on an institutional level. Metersky et al. (1999) reported a nonrandomized, multihospital quality improvement intervention that increased the mean percentage of elderly pneumonia patients who were administered antibiotics within four hours of arrival at the emergency room from 41.5 percent to 61.8 percent in six community hospitals, among other improvements. The intervention included designation of quality champions and multidisciplinary process improvement teams who were given feedback from chart review about opportunities for improvement in the process of care observed in their respective facility. However, one limitation of process improvement teams observed by the QA Project in Zambia and other countries is that even when presented with data on performance failures vis-à-vis standards, teams tend to choose to work on operational or logistical problems rather than those related to achieving standards.

Information linked to performance

Performance-oriented interventions are based on the principle that health providers are interested in improving their performance and presuppose a high level of internal



Despite the accumulated evidence

pointing to the lack of effectiveness of traditional didactic training, expert-led teaching still prevails as the most common form of CME in developed as well as developing countries.

motivation or readiness for change. They provide prompts (reminders) to perform certain actions or information on previous performance (feedback) with the expectation that it will influence future performance. Based on their systematic review, Wensing and Grol (1994) posited that reminders and feedback seem to be particularly effective in primary care settings because general practitioners often work in small organizational units, with high autonomy and little feedback on their behavior. Therefore, the information provided by reminders or feedback may have high impact.

Reminders

Reminders consist of prompts either before or during a patient encounter that suggest a specific behavior should or should not be performed. The reminder may consist of a note in a patient's chart; a computer print-out; a message appearing on a computer screen; a verbal cue from an assistant; or a checklist, wall poster, flowchart, or other paper- or computer-based job aid that guides the health provider through the appropriate steps in a process. The major assumption underlying reminder interventions is that provider forgetfulness or lack of awareness are major barriers to performance in accordance with standards, as opposed to deficiency in knowledge or skill.

Systematic reviews have coincided in concluding that reminders have been proven effective in increasing provider adherence to preventive care standards and prescribing guidelines (Davis et al. 1995; Hulscher et al. 1999; Wensing and Grol 1994). Grimshaw and Russell (1994) reported improvements in performance according to standards in both hospital and general practice settings in several studies where guidelines were imbedded in medical record cards and other forms. However, Solomon et al. (1998) cautioned that not all trials of reminders have demonstrated effects. The effects of reminders often disappeared after the reminders were stopped, suggesting that to be effective, reminders must be applied continuously and incorporated into daily routines.

Asking health providers to respond to the reminder appears to boost effectiveness. In their review of interventions to

influence physician test ordering, Axt-Adam et al. (1993) noted that requiring physicians to acknowledge the reminder (i.e., by noting some response as to whether the reminder was followed and why) enhanced its effect. Litzelman et al. (1993) demonstrated that routine reminders requiring physician response increased adherence to cancer screening protocols by medical residents by 7 to 12 percent, but that the response requirement had no effect on faculty, who showed overall higher compliance with standards than did residents. This finding suggests that the effect of reminders may be greater for less-experienced health workers.

Another application of reminders has been the provision of cost information for diagnostic tests and medications at the time of physician ordering with the intent of reducing unnecessary tests and excess prescribing. Tierney et al. (1990) and others have shown that providing physicians with information on the costs of diagnostic tests at the time of ordering in hospital settings can reduce the number and total costs of tests ordered but that the effects cease once the cost information is no longer provided.

Although computerized reminder systems can represent significant additional costs for hardware, software, and data entry, the spread of computerized information systems in medical practice is expanding opportunities for computer-based reminders in both developed and developing countries. Mandelblatt and Kanetsky (1995) and Shea et al. (1996) examined the evidence comparing the effectiveness of computerized reminders with that of manual ones on the performance of various preventive services, including immunization, breast cancer screening, colorectal cancer screening, and cardiovascular risk reduction in ambulatory care settings. Both reviews found that reminders were effective in improving standards-based performance and that the magnitude of effects was similar for both types of reminders. Shea and colleagues found that adding computerized reminders to manual ones increased overall performance but that adding manual reminders to computerized ones did not.

Hunt et al. (1998) reviewed evidence for the effects of computer-based reminders known as clinical decision support systems on physician adherence to standards and patient outcomes. These software systems go beyond generic reminders about practice guidelines to integrate patient-specific information from a computer database in order to generate patient-specific assessments or recommendations. The majority of the 68 controlled trials reviewed found positive effects on physician performance for preventive services and generally found positive results with computer-based drug-dosing systems.

Job aids are a type of reminder and have been widely used in developing country settings, especially with nonphysician health workers. Job aids are visual tools used by the provider during a healthcare activity that give direction on what actions to take and how. The purpose is to reduce the amount of recall necessary to correctly perform the task. Job aids are thought to be most appropriate when provider forgetfulness or lack of recall is an important barrier to performance, such as when the task to be performed is complex or infrequent. The QA Project study in Uganda found that health workers using the IMCI chart book job aid performed better than those who did not (87 percent correct treatment performance among those using the chart book compared to 72 percent for those not using it; 84 percent correct counseling performance for those using it compared to 50 percent correct performance among those not using it) (Kekitiinwa et al. 2000). More research is needed on the factors that promote the use of job aids in developing country settings (Knebel et al. 2000).

Audit and feedback

In contrast to reminders, audit and feedback interventions provide cues outside the health provider-patient encounter. Audit and feedback mechanisms collect data on providers' performance and then feed information back on their behavior. The feedback may include a comparison of individuals' performance patterns with those of immediate peers, with aggregate data for large groups of providers, or with accepted standards. The audit and feedback process encompasses a wide variety of interventions, including performance review, supervisor assessment, chart review, results generated by computerized information systems, self-assessment, and accreditation surveys. Feedback interventions assume that notifying individuals or groups about deviations from peer behavior or accepted clinical criteria will lead to improved performance.

Several studies have evaluated the effects of audit and feedback, with mixed results. Small to modest improvements in compliance have been demonstrated in some studies, but not others. Feedback has been shown to be effective in reducing length of stay, use of unnecessary diagnostic tests, and number of prescriptions written and increasing adherence to cancer screening guidelines (Butinx et al. 1993; Davis et al. 1995; Oxman et al. 1995; Solomon et al. 1998; Wensing and Grol 1994).

However, Hulscher et al. (1999) concluded that feedback alone did not demonstrate significant improvements in physicians' performance in accordance with preventive care standards. Other studies have suggested that ongoing feedback, particularly from credible sources, can be effective in increasing prescribing rates for generic drugs and

compliance with protocols (Soumerai et al. 1989). Greco and Eisenberg (1993) suggested that feedback may be particularly effective in influencing prevention and test ordering. Since physicians tend to overestimate the amount of preventive services they deliver, providing them with feedback on their actual performance may raise awareness about the need for behavior change (Cohen et al. 1994).

Finally, while the majority of studies reported did not monitor performance after the intervention ended, Tierney et al. (1990) found that the effect of feedback disappeared soon after the intervention stopped.

Many of the studies reviewed sought to shed light on the conditions that make feedback most effective. Mugford et al. (1991) found in their review of 36 studies of feedback interventions to change clinical practice that information feedback was more likely to influence clinical practice if it was part of a larger strategy aimed at physicians who were already receptive to review their performance and if the feedback was presented close to the time of decision making. Solomon et al. (1998) found that utilization audits can act to reinforce desired diagnostic practices, but only if delivered to physicians who understand, or are predisposed to, the optimal testing strategies. The effect of feedback also appears to be enhanced if it is provided by a respected colleague or academician (Cohen et al. 1994). Everett et al. (1983) found that house staff were strongly influenced in their use of laboratory tests by feedback from faculty chart review but not by cost education and cost feedback. (See discussion on opinion leaders and other social influence interventions.)

In their systematic review of 26 trials of feedback and reminder interventions, Butinx et al. (1993) found that the effects of feedback were greater when the target physicians themselves had contributed to the development of the standards or criteria being applied and when individual feedback included comparisons to the performance of peers. Grol (1992) also found that individual feedback was more effective than group feedback. Cantillon and Jones (1999) noted that personalized feedback tended to be effective, while unsolicited, unpersonalized feedback was not. O'Connell et al. (1999) found in a randomized controlled trial that mailed, unsolicited, government-sponsored feedback based on aggregate data had no impact on prescribing levels of general practitioners in rural Australia.

Several studies compared the effects of reminders with those of audit and feedback interventions. Butinx et al. (1993) reported that in randomized trials comparing feedback and reminders, the effects of reminders were larger than those of feedback. Mandelblatt and Kanetsky (1995) found that audit and feedback was as effective as reminders

in raising physician adherence to breast cancer screening standards but that feedback interventions cost more than twice as much as reminders.

Supervisory audit of health worker performance is one of the few audit and feedback interventions used widely in developing countries. Anecdotal evidence and the few published studies suggest that supervisory audit can be effective in increasing performance according to standards. In a controlled trial in rural health facilities in the Philippines, Loevinsohn et al. (1995) demonstrated improvements in health worker performance of primary healthcare tasks by 42 percent through the use of structured supervision, wherein supervisors routinely audited the performance of 20 indicators during their visits to the facilities and were presumed to provide related feedback. Control groups that received unstructured supervision improved only 18 percent. Zeitz et al. (1993) found in an uncontrolled trial that supervisors' use of a checklist for diarrhea case management during monthly visits to rural health facilities in Nigeria resulted in improvements in history-taking, physical examination, disease classification, treatment, and counseling.

Kelley et al. (2000) studied the impact of structured supervisory feedback on health worker adherence to IMCI standards for assessment, treatment, and counseling of sick children in Niger. They concluded that supervisory feedback had a significant short-term impact on IMCI performance, although the effect was not universal across all IMCI skill areas. Performance feedback from supervisors had the greatest effect in areas where health workers were performing poorly. Short-term gains were observed following each occurrence of feedback in areas of poor performance, but those gains accompanied declines in performance in skill areas where health workers had previously been performing well. In Uganda, Kekitiinwa et al. (2000) found that having an IMCI supervision visit two weeks after training resulted in better IMCI clinical performance than training alone, especially in assessment (88 percent correct performance compared to 81 percent for those receiving only training, $p=.02$) and counseling (80 percent correct performance compared to 65 percent, $p=.01$).

Another variant of audit and feedback is the self-audit. A QA Project study in Indonesia that evaluated the cost-effectiveness of peer review and self-assessment following training in interpersonal communication and counseling skills found that, in the short run, self-assessment resulted in significant improvements in counseling performance as opposed to training alone. Self-assessment was also

markedly more cost-effective than peer assessment in boosting performance following training (Kim et al. 2000).

Voluntary accreditation is yet another audit and feedback intervention increasingly used to improve performance according to standards of care at the facility or organizational level. Accreditation⁵ is a formal process by which a recognized body audits a healthcare organization or facility for its compliance with pre-established criteria, typically consisting of both input and process standards, but occasionally also including outcomes. Accreditation is awarded to organizations and facilities found to meet the criteria, often after a period of intervention to improve areas where performance was found lacking. A QA Project study underway during 2001 in South Africa is measuring the impact of a hospital accreditation program on quality of care; results are expected in late 2001.

Certification is a process similar to accreditation that is used to recognize individual practitioners who have achieved competence in a specific clinical area (e.g., certified by a specialty board, such as the American College of Nurse-Midwives). The American Medical Association recently introduced a standards-based program for evaluating physicians: the American Medical Accreditation Program (AMAP). The AMAP is intended to establish a national "gold standard" for physician quality by assessing practitioners' credentials, personal qualifications and continuing education, environment of care, clinical performance, and patient results. The program is in its infancy, so its effect on adherence to standards and patient outcomes is unknown (Skolnick 1998).

A number of accreditation programs have been initiated in developing country settings to improve performance according to standards in specific areas of care, such as the Baby Friendly Hospital Initiative by WHO and UNICEF (to promote achievement of breastfeeding standards), the PROQUALI⁶ Project in northeast Brazil, and the Gold Star program of the Ministry of Health and Population of Egypt (the latter two programs seek to promote achievement of quality standards in family planning) (Rooney and vanOstenberg 1999). Though such approaches are promising, their long-term effectiveness in inducing routine performance according to standards has not been evaluated.

Management support

Organizational interventions

Organizational interventions that modify the practice environment seek to facilitate and reinforce performance in

⁵ A complete discussion of the use and characteristics of accreditation and certification is found in Rooney and vanOstenberg (1999).

⁶ "PROQUALI" was a USAID/Brazil-funded initiative to promote healthcare quality in two Brazilian States.

accordance with standards by providing additional resources or equipment; introducing organizational changes, such as redistribution of tasks; or redesigning processes to imbed cues to facilitate correct performance and controls to constrain incorrect performance. Principal advantages of such interventions are that they are usually inexpensive and under the control of managers. Increasing concern with preventable medical errors fosters support for such interventions. A recent Institute of Medicine report on ways to reduce medical errors (Kohn et al. 2000) strongly advocated process redesign to simplify and standardize key processes and to design tasks in ways that ensure safety and facilitate correct performance. Key principles of such process redesign efforts are to avoid reliance on memory and use constraints and forcing functions to guide healthcare providers to the next appropriate action and prevent further action if an error is made.

The effectiveness of some organizational interventions has been tested in randomized controlled trials, often in conjunction with other interventions. Cohen et al. (1994) cited several studies where the role of nurses and other supporting staff played a key role in increasing physicians' performance of preventive services, including patient counseling about smoking and screening of diabetic patients for complications. Hulscher et al. (1999) reviewed three studies that used administrative interventions to increase performance of preventive services, including assigning screening tasks to nurses and changing how preventive services were scheduled. Two of these studies reported only small improvements, while the third achieved 30 percent higher delivery of preventive services when patients were screened by a nurse practitioner. Morrisey et al. (1995) demonstrated in a randomized controlled trial that assigning several preventive procedures to nurses, coupled with physician reminders, dramatically increased the performance of screening tests, though lack of follow-up of abnormal findings by physicians remained a problem. Herman et al. (1994) achieved a 20 percent higher compliance with influenza vaccination through the redefinition of support staff tasks and use of a flow sheet in a randomized controlled trial in a university hospital outpatient clinic.

Providing additional supplies and equipment has also been shown to improve performance according to standards, particularly for the delivery of preventive care. Cohen et al. (1994) reported that the provision of a flexible sigmoidoscope in family practice settings increased the rate of compliance with colorectal cancer screening from 2 to 21 percent.

Organizational interventions to improve work processes play a prominent role in much of healthcare quality improvement activities in developing countries, but have not often been subject to randomized controlled trials or rigorous evaluations of their effectiveness. Nevertheless, impressive results have been documented from process redesign interventions. After the redesign of the system of care for neonates suffering from respiratory distress syndrome in five hospitals in Tver Oblast (Russian Federation), neonatal mortality due to respiratory distress decreased by 63 percent, and the seven-day survival rate after initial resuscitation increased by 93 percent (Massoud 2001).

Incentives

Incentives include both positive ones to induce performance according to standards and negative ones (disincentives) to sanction performance that does not accord with standards. There are few reports of randomized intervention trials of incentives. Greco and Eisenberg (1993) noted evidence from observational studies that different methods of reimbursing physicians do result in different styles of practice and that the introduction of prospective payment systems under Medicare has led to reduced lengths of stay for certain diagnoses. Grimshaw and Russell (1993) reported that denial of reimbursement by Medicaid for physician office claims not meeting guidelines for the use of antibiotic injections for respiratory infections resulted in a substantial reduction in administration of injectable antibiotics and increased adherence to criteria for prescribing of antibiotics for six conditions. Grol (1992) reported the results of several studies of the effects of financial incentives to induce compliance with certain procedures, noting that effects were demonstrated but seemed to diminish over time.

Because of the limited resources available in most developing country health systems, Heiby (1998) argued for more research to test nonmonetary incentives to achieve performance according to standards, such as symbolic awards, public recognition, and providing opportunities for advancement and specialized training. Bennett et al. (1994) reported that government health agencies in some developing countries have attempted to motivate private providers to deliver preventive and public health interventions through invitations to attend trainings and conferences and through the provision of free supplies. The effectiveness of such measures has not been rigorously evaluated. In general, there has been little study of the effects of incentives and sanctions on healthcare provider performance in developing country health systems.

Regulations

The use of coercion or obligation through regulations, rules, and requirements is a form of management intervention that is used by governments throughout the world to enforce compliance with input standards (such as training requirements for licensed practitioners and the availability of space and other requirements for healthcare facilities) and to define who is authorized to perform what kinds of medical interventions (such as licenses to prescribe certain medications). In countries where government agencies directly provide healthcare services to a substantial segment of the population or where the government is the primary payer, public sector agencies potentially hold considerable power to influence the delivery of care. In reality, however, regulations are a rather blunt instrument for inducing behavior change at the facility or provider level. Moreover, most government health agencies in developing countries have very limited funds and capacity to enforce such regulations. Perhaps for these reasons, regulations have not been applied widely to achieve performance according to standards.

A unique experiment in the use of regulation to encourage adherence to standards was implemented by the state of Florida. Florida enacted legislation in 1992 requiring that guidelines for cesarean section deliveries be disseminated to all obstetric physicians practicing in the state and that peer review boards be established at all hospitals to review adherence to these guidelines. The boards were also required to report to a state agency about the dissemination of the guidelines. Studnicki et al. (1997) carried out a retrospective analysis of live births before and after formal hospital certification of implementation of the guidelines. They concluded that the legislation did not achieve the desired magnitude or specificity of results and that it was an ineffective and inefficient intervention to promote adherence to cesarean section standards.

Regulations intended to reduce excessive or unnecessary procedures and services by placing restrictions on reimbursements to hospitals and physicians have been used widely by both the federal government and private insurance companies in the U.S. Greco and Eisenberg (1993) warned of the importance of monitoring patient outcomes as part of the impact assessment of regulatory measures that place limits on services and medications as a means to control escalating medical expenditures. They cite a Medicare regulation limiting reimbursement for prescription drugs that was introduced to reduce prescribing practices considered by regulators to be excessive. Prescribing was reduced significantly, but the measure was also found to be associated with increased rates of nursing home admissions.

Bennett et al. (1994) looked at regulatory experiences internationally to influence private provider behavior and noted that most developing countries have the necessary legislation to regulate healthcare delivery in the private sector but lack sufficient resources or political will to enforce it. Health sector reform movements that seek to change the role of ministries of health to a primarily regulatory rather than service delivery role represent new opportunities for the use of regulatory mechanisms to induce performance according to standards. Such mechanisms include performance-based contracts between providers and payers, decentralized health networks with great oversight roles for local authorities and citizen representatives, and the establishment of minimum requirements for health facilities that wish to compete for contracts to provide health services financed by the government.

For example, the Secretariat of Public Health of Honduras recently established minimum standards for primary healthcare facilities with respect to human resources, infrastructure, equipment, supplies, and, to a limited extent, technical performance. The secretariat is developing a licensing process with the long-term goal of licensing all public and private facilities in the country. The licensing process is being linked to investment projects to rehabilitate facilities, with funding from the Inter-American Development Bank, in order to bring public sector facilities up to the levels established in the minimum licensing requirements (Carías 2000).

Combined versus single interventions

Many studies have compared the effectiveness of combinations of two or more interventions. Combined strategies have the advantage of being able to simultaneously address different types of barriers.

Several of the major reviews of interventions to achieve performance according to standards examined the evidence of the effectiveness of various combinations of interventions (Bero et al. 1998; Davis et al. 1992; Davis et al. 1995; Davis and Taylor-Vaisey 1997; Grol 1992; Hulscher et al. 1999; Mittman et al. 1992; Oxman et al. 1995; Soumerai et al. 1989; Wensing and Grol 1994; Wensing et al. 1998). While the specific studies varied, several common themes and observations emerge in these reviews.

First, as noted in the title of Oxman and colleagues' 1995 review, there are "no magic bullets"—no interventions are universally effective and no intervention combinations are optimal. Many different combinations of interventions have proven effective, but the effects of interventions and combinations are not consistent across practitioners, settings, or practice areas. There does appear to be a direct

relationship between the intensity of the interventions and the number of studies with positive outcomes (Davis et al. 1992).

Combining interventions that individually were deemed effective seemed to produce more positive results than combining interventions that individually seemed less effective (Davis et al. 1995). However, other reviewers have noted that many interventions that alone had modest or negligible effects produced significant effects when coupled with other strategies (Oxman et al. 1995). This may be because weaker interventions (such as information transfer) play an important predisposing function by creating awareness or transferring knowledge that enhances health providers' susceptibility to other interventions that facilitate and reinforce behavior change in everyday practice (Davis and Taylor-Vaisey 1997). Davis et al. (1995) noted that interventions using only predisposing elements to disseminate information (i.e., traditional information transfer) were less likely to induce change in physician performance, but that such interventions were effective in changing behavior when combined with enabling and reinforcing interventions.



Creative strategies, built into the healthcare delivery system, are needed to sustain performance according to standards once it has been achieved.

Furthermore, combining different types of interventions, e.g., combining social influence interventions with information transfer, seemed to be more effective than combining interventions of the same type, e.g., using both reminder and audit and feedback interventions (Wensing and Grol 1994). Wensing et al. (1998) found that adding social influence and management support interventions can improve the effectiveness of information transfer. Similarly, strategies combining feedback (performance-oriented) and peer review (social influence) generally proved to be effective. Pérez-Cuevas et al. (1996) achieved a 31 percent lower rate of prescribing of contraindicated antibiotics among primary care physicians working in Social Security and Secretariat of Health facilities in Mexico City. Their study used interactive workshops where participants contributed to the development of treatment guidelines (information transfer and learning through social influence), followed by peer review sessions where clinical records were discussed in terms of the physicians' own adherence to the guidelines (information linked to performance).

Elements of successful interventions

The systematic literature reviews and individual studies cited in this paper point to several elements that tended to recur in successful intervention strategies. These include well-designed graphic aids, opportunity for individual discussion of needs and barriers, clinically relevant and understandable recommendations for positive alternative actions, and repetition of messages, with reinforcement of improved practice patterns over time. In Soumerai and colleagues' 1989 review of interventions to improve drug prescribing, the most important characteristic of successful strategies was that the intervention was either tailored to the specific needs of individual physicians or was communicated individually or in very small groups of physicians.

Some authors of systematic reviews tried to explain why a particular intervention combination worked in some settings but not in others. Davis et al. (1995) and Grol (1992) argued that some of the variability in effectiveness is due to differences in the readiness to change of individual practitioners. Davis and colleagues also examined whether a needs analysis or an analysis of specific barriers to performance was done prior to implementing an intervention; they compared studies where such analysis was conducted against studies where none had been done and found a tendency toward more positive results with the analysis.

Finally, most reviewers coincided in concluding that successful intervention strategies build in the identification of specific barriers to standards-based performance, including readiness to change, and design interventions around factors that can directly influence these barriers. This approach is supported by the theoretical literature (discussed under "Conceptual framework" above), which emphasized the importance of: (a) multifaceted interventions, (b) targeting to individual readiness, and (c) taking into account organizational, health system, and social influence factors.

Implications for standards dissemination and implementation

Moulding et al. (1999), drawing on behavior change theories and the results of many of the same systematic reviews and articles discussed in this paper, proposed a five-step process for successful dissemination and implementation of clinical practice guidelines:

Step 1: Assess the readiness to change of individuals within the target population of healthcare providers to determine the appropriate mix of strategies for providers at each stage of readiness

Step 2: Identify the specific barriers to performance according to the standards

Table 7 ■ Strategies for Carrying out the Five Steps for Successful Standards Dissemination and Implementation

Step	Strategies
1. Assess providers' stage of readiness to change	Surveys and/or interviews of target health providers to identify the distribution and characteristics of those in the pre-contemplation, contemplation, preparation, action, and maintenance stages with respect to the standards to be implemented
2. Identify specific barriers to performance according to the standards and possible intervention points	<p>Surveys and interviews to assess target health providers' competence, awareness/familiarity, and agreement with the standards, perceived ability to perform according to the standards (self-efficacy), expected outcome of performance according to the standards, and current practices that are affected by the standards</p> <p>Interviews with and observation of health providers to identify characteristics of those who are already performing according to the standards and who may serve as models for benchmarking of appropriate practices</p> <p>Focus groups with patients and providers to assess social barriers to performance according to the standards, including patient preferences and expectations</p> <p>Facility and institutional assessment of organizational barriers to performance according to the standards, such as availability of needed equipment and supplies and organization of service delivery activities</p>
3. Select appropriate level of intervention	Determine what are potential population-based and individual or small-group interventions, given the readiness, barriers, resources, and characteristics of the healthcare delivery environment
4. Design standards dissemination and implementation interventions	<p>Design interventions to address target providers in the pre-contemplation and contemplation stages, such as information transfer combined with social influence interventions (opinion leaders, peer discussions, etc.)</p> <p>Identify feasible interventions for target providers in the preparation and action stages to develop provider competence and motivate provider performance according to standards, adapt the service delivery environment to facilitate and reinforce performance, and educate patients to build support for performance according to standards</p> <p>Identify interventions to support providers in the maintenance stage by providing feedback on performance, reminders, and rewards for performance according to standards</p>
5. Carry out and evaluate the interventions	Evaluate the effectiveness of the interventions, beginning with a pre-intervention baseline followed by post-intervention time series measurements to track changes in performance over time, and modify interventions as appropriate to maintain performance and prevent deterioration

Step 3: Decide what level of intervention (i.e., individual, group, or population) would likely be most effective given the target providers' stage of readiness and the specific barriers to performance

Step 4: Design standards dissemination and implementation strategies that match the needs, readiness, and barriers of target groups

Step 5: Carry out and evaluate the effectiveness of the strategies

These five steps offer a straightforward approach for developing multifaceted interventions to help healthcare providers reach and maintain performance according to standards. Moreover, there is a growing base of experience with such approaches in developing countries from health and family planning behavior change communication and social marketing activities, which emphasize target audience segmentation, analyzing determinants of individuals' and communities' behaviors, and targeting interventions to address different determinants of behavior. Quality assur-

ance programs may benefit from applying to health workers some of the same techniques and approaches that have been used to modify health behaviors of mothers and caretakers related to symptom recognition, home treatment of childhood illnesses, and appropriate care-seeking.

Table 7 outlines strategies for implementing the five steps proposed by Moulding et al. (1999) to design effective intervention strategies to achieve and sustain performance according to standards in developing country settings.

More work is needed applying these strategies in developing country settings. The next section discusses issues that should be considered in applying lessons from this review in research and practice.

Research and implementation issues

Several issues emerge from the empirical literature for future research and for the design of compliance with standards interventions in developing countries.

Which interventions are both effective and affordable in developing country settings?

While credible trials have proven that some interventions are effective in hospital and general practice settings in technologically developed and resource-intensive health systems, it remains to be demonstrated whether these approaches can be successfully adapted for physician and nonphysician health workers in developing country settings. Because the advantages of multiple intervention strategies have been clearly demonstrated, further research on interventions to achieve performance according to standards in developing countries should concentrate only on combined interventions and not individual ones.

Intervention strategies that emphasize learning through social influence—combining information transfer with the socialization effect of peers, authority figures, and opinion leaders—seem especially promising for moving health workers through the early stages of readiness to change and for addressing some of the motivational determinants of healthcare provider performance. Similarly, reminders and feedback interventions to support and maintain performance according to standards have been shown to be feasible in developing country healthcare settings and merit further testing, in combination with other interventions.

The key question is: What combinations of effective interventions are affordable in specific settings? There is a critical need for explicit measurement of intervention costs and incorporation of cost-effectiveness analysis in the evaluation of strategies to achieve performance according to standards. Affordability and sustainability of interventions are of foremost concern to those responsible for improving the quality of health services in developing countries, yet these issues have not been well documented in many previous empirical studies. Studies that have used cost-effectiveness ratios to compare interventions often recommend the selection of measures that may not have the highest effectiveness but achieve modest effectiveness at lower cost and are therefore more cost-effective for health systems with limited resources (Santoso et al. 1996).

How can interventions proven to improve performance with respect to narrow sets of standards be broadened to address the full spectrum of services delivered in most health facilities?

Most of the studies discussed in this paper focused on interventions to increase adherence to narrowly defined standards. Yet the problem facing program managers in most countries is how to improve performance according to healthcare process standards in general, and not on an

experimental basis, but rather as a sustained part of the overall process of healthcare delivery.

Efforts to improve performance of the IMCI algorithm are an important step in the direction of integrating standards for the care of multiple conditions. More work is needed on the redesign of service delivery systems to incorporate measures to facilitate and positively reinforce performance according to a broad range of standards covering routine care processes, such as job aids, built-in reminders, information system feedback, supervisory performance review, and incorporating patient input and peer support.

How can interventions to induce performance according to standards be institutionalized to sustain their effectiveness?

Sustaining the effects of interventions to help healthcare providers perform according to standards is a critical issue that has received scant attention in the literature. As was noted in several of the developing country studies, performance of frontline health workers is often found to deteriorate over time and after external support and reinforcement are removed. Creative strategies, built into the healthcare delivery system, are needed to sustain performance according to standards once it has been achieved. Such strategies include integrative rather than vertical supervision, self-directed quality improvement teams, self-assessment, peer assessment and reinforcement, voluntary accreditation, and increased patient advocacy of quality of care. Moreover, as many reviews pointed out, interventions to improve standards-based performance are more effective and sustainable if they are part of larger, institutionally supported QA efforts.

What interventions are particularly appropriate to increase private sector providers' adherence to standards?

The impetus of health sector reform in many countries is changing the traditional role of ministries of health, moving their responsibilities away from emphasis on provision of services to focus instead on setting standards for the entire health sector and monitoring the performance of a myriad of providers. Whereas historically, highly centralized public sector institutions had the potential to exert direct control over health providers covering large portions of the population, this practice is declining. Interventions to achieve standards-based performance that rely on internal administrative decree or direct employer control over large numbers of health providers are less and less an option.

Instead, public sector agencies responsible for assuring the quality of health services must find ways to stimulate

standards-based performance by an array of independent providers, private healthcare institutions, nongovernmental organizations, and local governments that may be responsible for delivery of primary care services in geographically circumscribed areas. This will require flexibility and ingenuity to find new ways to create incentives for adherence to healthcare standards. Accreditation, typically involving professional associations, academic institutions, and consumers, is one approach where interest and experience are growing. Creating a constituency for quality healthcare is another, by increasing the public's awareness of and demand for performance according to evidence-based standards. More research and experimentation in different country settings are needed to find effective tools for promoting performance according to standards in the changing structure of health systems.

What directions should be taken in future research?

Future research on interventions to achieve performance according to standards in developing countries should contribute to understanding which combinations of interventions are most cost-effective in achieving changes and sustaining performance in resource-constrained environments and among peripheral level health workers. Research is also needed to develop and refine efficient methods for identifying provider readiness to change and individual, social, and organizational barriers to performance according to standards, to enable incorporation of these factors in intervention design.

Studies should strive to overcome methodological weaknesses observed in previous research: lack of controls, lack of randomized assignment, failure to address confounding variables in data analysis, inability to show effect due to too small sample size, limited scope of outcome variables, limited monitoring of intervention effects over time, and lack of measurement of contextual variables that help explain the conditions that make interventions most effective.

Conclusion

Many factors—individual competence and motivation, social forces, health system characteristics, and organizational characteristics of the practice setting—influence health workers' performance and must be addressed in efforts to achieve and maintain desired performance levels. Health workers' own experience, abilities, attitudes, learning styles, and readiness to change all influence the effectiveness of strategies to improve their performance, as do the views of their colleagues, clients, and supervisors. Social

and organizational factors exert a strong influence on individual providers' behavior and can be powerful facilitating factors as well as barriers to change.

There is no one best intervention or strategy for inducing and maintaining health worker standards-based performance. This paper has examined a wide variety of interventions shown to improve performance according to standards in rigorous trials. Combinations of interventions have proved more effective than single interventions, particularly when measures to enhance health provider knowledge and awareness are combined with interventions to facilitate and reinforce performance in everyday practice. The use of well-designed graphic aids; clarity and repetition of messages; provision of opportunities to discuss and try out new behaviors; attention to making desired behaviors compatible with existing practices; and the approval and support of patients, peers, and supervisors have been found to facilitate intervention effectiveness.

While research experience with interventions to improve performance according to standards in developing country settings is still limited, many of the successful interventions are potentially feasible or could be adapted for use in primary care facilities and with nonphysician health workers. Equally important, the empirical literature identifies approaches that have *not* been successful in increasing performance according to standards and that do not need to be retested to demonstrate their ineffectiveness in developing country settings.

Intervention strategies are more likely to be effective when the selection and design of interventions are based on the identification of specific barriers to performance in each healthcare setting. Further research is needed to test locally appropriate and sustainable strategies for helping healthcare providers perform according to standards under the diverse and resource-constrained conditions found in developing country health systems. Evaluations of intervention effectiveness, taking into account costs and effects over time, should be an essential component of strategies to assure performance according to standards.

References

- Allery, L.A., P.A. Owen, and M.R. Robling. 1997. Why general practitioners and consultants change their clinical practice: A critical incident study. *British Medical Journal* 314:870–74.
- Ashton, J. 2001. Monitoring the quality of hospital care. *Health Manager's Guide*. Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Axt-Adam, P., J.C. van der Wouden, and E. van der Does. 1993. Influencing behavior of physicians ordering laboratory tests: A literature study. *Medical Care* 31(19):784–94.
- Baig, L.A., and I. Thaver. 1997. Does training affect quality of diarrhea case management? *Journal of the Pakistan Medical Association* 47(8):204–07.
- Bandura, A. 1986. *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Becker, D.M., E.B. Gomez, D.L. Kaiser, A. Yoshihasi, and R.H. Hodge, Jr. 1989. Improving preventive care at a medical clinic: How can the patient help? *American Journal of Preventive Medicine* 5(6):353–59.
- Bennett, S., G. Dakpallah, P. Garner, L. Gilson, S. Nittayaramphong, B. Zurita, and A. Zwi. 1994. Carrot and stick: State mechanisms to influence private provider behaviour. *Health Policy and Planning* 9(1):1–13.
- Bennett, S., and L.M. Franco. 1999. *Public sector health worker motivation and health sector reform: A conceptual framework*. Major Applied Research 5, Technical Paper 1. Chevy Chase, MD: Partnerships for Health Reform Project, Abt Associates, Inc.
- Bero, L.A., R. Grilli, J.M. Grimshaw, E. Harvey, A.D. Oxman, and M.A. Thomson. 1998. Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. *British Medical Journal* 317:465–68.
- Buntinx F, R. Winkens, R. GroL, and J.A. Knottnerus. 1993. Influencing diagnostic and preventive performance in ambulatory care by feedback and reminders: A review. *Family Practice* 10(2):219–28.
- Cabana, M.D., C.S. Rand, N.R. Powe, A.W. Wu, M.H. Wilson, P. Abbond, and H.R. Rubin. 1999. Why don't physicians follow clinical practice guidelines? A framework for improvement. *Journal of the American Medical Association* 282(15):1458–65.
- Cantillon, P., and R. Jones. 1999. Does continuing medical education in general practice make a difference? *British Medical Journal* 318:1276–79.
- Carías, D. 2000. Licensing facilities: Challenges in Honduras. Presentation at the Managing Quality Through Regulation: Priorities and Possibilities Conference, October 4–5, 2000, Washington, DC. (Proceedings available on CD-ROM from the Quality Assurance Project.)
- CDC (Centers for Disease Control and Prevention). 1998. Health worker performance after training in integrated management of childhood illness: Western Province, Kenya, 1996–1997. *Morbidity and Mortality Weekly Report* 47(46): 998–1001.
- Cohen, P.A., and L.S. Dacanay. 1994. A meta-analysis of computer-based instruction in nursing education. *Computers in Nursing* 12(2):89–97.
- Cohen, S.J., H.W. Halvorson, and C.A. Gosselink. 1994. Changing physician behavior to improve disease prevention. *Preventive Medicine* 23:284–91.
- Davis, D.A. 1998a. Does CME work? An analysis of the effect of educational activities on physician performance or healthcare outcomes. *International Journal of Psychiatry in Medicine* 28(1):21–39.
- Davis, D.A. 1998b. Continuing medical education: Global health, global learning. *British Medical Journal* 316:385–89.
- Davis, D.A., M.A. Thomson, A.D. Oxman, and R.B. Haynes. 1992. Evidence for the effectiveness of CME: A review of 50 randomized controlled trials. *Journal of the American Medical Association* 268(9):1111–17.
- Davis, D.A., M.A. Thomson, A.D. Oxman, and R.B. Haynes. 1995. Changing physician performance: A systematic review of the effect of continuing medical education strategies. *Journal of the American Medical Association* 274(9):700–04.
- Davis, D.A., and A. Taylor-Vaisey. 1997. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. *Canadian Medical Association Journal* 157(4):408–16.
- Elder, J.P., T. Louis, O. Sutisnaputra, N.S. Sulaeiman, L. Ware, W. Shaw, C. de Moor, and J. Graeff. 1992. The use of diarrhea management counseling cards for community health volunteer training in Indonesia: The HealthCom Project. *Journal of Tropical Medicine and Hygiene* 95(5):301–08.
- Everett, G.D., C.S. deBlois, P.F. Chang, and T. Holets. 1983. Effect of cost education, cost audits, and faculty chart review on the use of laboratory services. *Archives of Internal Medicine* 143(5):942–44.
- Feder, G., C. Griffiths, S. Eldridge, and M. Spence. 1999. Effect of postal prompts to patients and general practitioners on the quality of primary care after a coronary event: Randomised controlled trial. *British Medical Journal* 318:1522–26.
- Fox, R.D., and N.L. Bennett. 1998. Continuing medical education: Learning and change: Implications for continuing medical education. *British Medical Journal* 316:466–68.
- Greco, P.J., and J.M. Eisenberg. 1993. Changing physicians' practices. *New England Journal of Medicine* 32:1271–74.

- Green, L., M. Kreuter, S. Deeds, and K. Partridge. 1980. *Health education planning: A diagnosis approach*. Palo Alto, CA: Mayfield Press.
- Grilli, R., and J. Lomas. 1994. Evaluating the message: The relationship between compliance rate and the subject of a practice guideline. *Medical Care* 32(3):202–213.
- Grimshaw, J.M., and I.T. Russell. 1993. Effect of clinical guidelines on medical practice: A systematic review of rigorous evaluation. *The Lancet* 342:1317–22.
- Grimshaw, J.M., and I.T. Russell. 1994. Achieving health gain through clinical guidelines II: Ensuring guidelines change medical practice. *Quality in Health Care* 3:45–52.
- Grol, R. 1992. Implementing guidelines in general practice care. *Quality in Health Care* 1:184–91.
- Grol, R., J. Dalhuijsen, S. Thomas, C. Veld, G. Rutten, and H. Mokkink. 1998. Attributes of clinical guidelines that influence use of guidelines in general practice: Observational study. *British Medical Journal* 317:858–61.
- Heiby, J.R. 1998. Quality improvement and the integrated management of childhood illness: Lessons from developing countries. *Journal on Quality Improvement* 25:264–79.
- Herman, C.J., T. Speroff, and R.D. Cebul. 1994. Improving compliance with immunization in the older adult: Results of a randomized cohort study. *Journal of the American Geriatrics Society* 42(11):1154–59.
- Hulscher, M.E., B.B. van Drenth, J.C. van der Wouden, H.G. Mokkink, C. van Weel, and R.P. Grol. 1997. Changing preventive practice: A controlled trial on the effects of outreach visits to organise prevention of cardiovascular disease. *Quality in Health Care* 6(1):19–24.
- Hulscher, M.E., M. Wensing, R.P.T.M. Grol, T. van der Weijden, and C. van Weel. 1999. Interventions to improve the delivery of preventive services in primary care. *American Journal of Public Health* 89(5):737–46.
- Hunt, D.L., R.B. Haynes, S.E. Hanna, and K. Smith. 1998. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: A systematic review. *Journal of the American Medical Association* 280(15):1339–46.
- Kak, N., B. Burkhalter, and M. Cooper. 2001. Measuring the competence of healthcare providers. *Operation Research Issue Paper* 2(1). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Kekitiinwa, A., G. Ndeezi, A. Maganda, A. Sebina-Zziwa, J.N. Sabiiti, and P. Tavrow. 2000. A comparison of IMCI standard vs. computer-assisted training in Uganda. Presentation handout (June 22). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Kelley, E., C. Geslin, S. Djibrina, and M. Boucar. 2000. The impact of QA methods on compliance with the Integrated Management of Childhood Illness Algorithm in Niger. *Operation Research Results* 1(2). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Kim, Y.M., F. Putjuk, E. Basuki, and A. Kols. 2000. Improving provider-client communication: Reinforcing IPC/C training in Indonesia with self-assessment and peer review. *Operations Research Results* (1)6. Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Knebel, E. 2000. The use and effect of computer-based training: What do we know? *Operations Research Issue Paper* 1(2). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Knebel, E., S. Lundahl, A. Edward-Raj, and H. Abdallah. 2000. The use of manual job aids by health care providers: What do we know? *Operations Research Issue Paper* 1(1). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Kohn, L.T., J.M. Corrigan, and M.S. Donaldson, eds. 2000. *To err is human: Building a safer health system*. Report of the Committee on Quality of Healthcare in America, Institute of Medicine. Washington, DC: National Academy Press.
- Litzelman, D.K., R.S. Dittus, M.E. Miller, and W.M. Tierney. 1993. Requiring physicians to respond to computerized reminders improves their compliance with preventive care protocols. *Journal of General Internal Medicine* 8(6):311–17.
- Loevinsohn, B.P., E.T. Guerrero, and S.P. Gregorio. 1995. Improving primary healthcare through systematic supervision: A controlled field trial. *Health Policy and Planning* 10:144–53.
- Lomas, J., G.M. Anderson, K. Domnick-Pierre, E. Vayda, M.W. Enkin, and W.J. Hannah. 1989. Do practice guidelines guide practice? The effect of a consensus statement on the practice of physicians. *New England Journal of Medicine* 321(19):1306–11.
- Lomas, J., M. Enkin, G.M. Anderson, W.J. Hannah, E. Vayda, and J. Singer. 1991. Opinion leaders vs audit and feedback to implement practice guidelines: Delivery after previous cesarean section. *Journal of the American Medical Association* 265(17):2202–07.
- Madden, J.M., J.D. Quick, D. Ross-Degnan, and K.K. Kafle. 1997. Undercover careseekers: Simulated clients in the study of health provider behavior in developing countries. *Social Science and Medicine* 45(10):1465–82.
- Mandelblatt, J., and P.A. Kanetsky. 1995. Effectiveness of interventions to enhance physician screening for breast cancer. *The Journal of Family Practice* 40(2):162–70.

- Massoud, M.R.F. 2001. (Re)Designing the system of care for neonates suffering from respiratory distress syndrome in Tver Oblast, Russian Federation. *QA Brief* 9(1). Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- McDowell, I., C. Newell, and W. Rosser. 1989a. A randomized trial of computerized reminders for blood pressure screening in primary care. *Medical Care* 27(3):297–305.
- McDowell, I., C. Newell, and W. Rosser. 1989b. Computerized reminders to encourage cervical screening in family practice. *Journal of Family Practice* 28(4):420–24.
- Metersky, M.L., D.H. Galusha, and T.P. Meehan. 1999. Improving the care of patients with community-acquired pneumonia: A multi-hospital collaborative QI project. *Journal on Quality Improvement* 25(4):182–90.
- Mittman, B.S., X. Tonesk, and A. Jacobson. 1992. Implementing clinical practice guidelines: Social influence strategies and practitioner behavior change. *Quality Review Bulletin* 18:413–22.
- Morrissey, J.P., R.P. Harris, J. Kincade-Norburn, C. McLaughlin, J.M. Garrett, A.M. Jackman, J.S. Stein, C. Lannon, R.J. Schwartz, and D.L. Patrick. 1995. Medicare reimbursement for preventive care. Changes in performance of services, quality of life, and healthcare costs. *Medical Care* 33(4):315–31.
- Moulding, N.T., C.A. Silagy, and D.P. Weller. 1999. A framework for effective management of change in clinical practice: Dissemination and implementation of clinical practice guidelines. *Quality in Health Care* 8:177–83.
- Mugford, M., P. Banfield, and M. O'Hanlon. 1991. Effects of feedback of information on clinical practice: A review. *British Medical Journal* 303:398–402.
- Naimoli, J.P., S. Endsley, J.B. ROUNGOU, K. Parker, J. Bryce, R. DOUTIZONGA, and M. Gbadjamo. 1996. Strengthening patient education for ORT services in the Central African Republic. *Patient Education and Counseling* 27(2):161–69.
- Norman, G.R., and H.G. Schmidt. 1992. The psychological basis of problem-based learning: A review of the evidence. *Academic Medicine* 67(9):557–65.
- O'Connell, D.L., D. Henry, and R. Tomlins. 1999. Randomised controlled trial of the effect of feedback on general practitioners' prescribing in Australia. *British Medical Journal* 318:507–11.
- Oxman, A.D., M.A. Thomson, D.A. Davis, and R.B. Haynes. 1995. No magic bullets: A systematic review of 102 trials of interventions to improve professional practice. *Canadian Medical Association Journal* 153(10):1423–31.
- Pérez-Cuevas, R., H. Guiscafré, O. Muñoz, H. Reyes, P. Tomé, V. Libreros, and G. Gutiérrez. 1996. Improving physician prescribing patterns to treat rhinopharyngitis: Intervention strategies in two health systems of Mexico. *Social Science and Medicine* 42(8):1185–94.
- Prochaska, J.O., C.C. DiClemente, and J.C. Norcross. 1992. In search of how people change: Applications to addictive behaviors. *American Psychologist* 47(9):1102–14.
- Rogers, E.M. 1962. *Diffusion of Innovations*. New York, NY: The Free Press. (Note: several subsequent editions have been published.)
- Rooney, A.L., and P.R. vanOstenberg. 1999. *Licensure, accreditation, and certification: Approaches to health services quality*. Chevy Chase, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.
- Ross-Degnan, D., S.B. Soumerai, P.K. Goel, J. Bates, J. Makhulo, N. Dondi, Sutoto, D. Adi, L. Ferraz-Tabor, and R. Hogan. 1996. The impact of face-to-face educational outreach on diarrhea treatment in pharmacies. *Health Policy and Planning* 11(3):308–18.
- Rosser, W.W., I. McDowell, and C. Newell. 1991. Use of reminders for preventive procedures in family medicine. *Canadian Medical Association Journal* 145(7):807–14.
- Rowe, A.K., M.J. Hamel, W.D. Flanders, R. DOUTIZONGA, J. NDOYO, and M.S. Deming. 2000. Predictors of correct treatment of children with fever seen at outpatient facilities in the Central African Republic. *American Journal of Epidemiology* 10(8):1029–35.
- Santoso, B., S. Suryawati, and J.E. Prawaitasari. 1996. Small group intervention vs formal seminar for improving appropriate drug use. *Social Science and Medicine* 42(8):1163–68.
- Schaffner, W., W.A. Ray, C.F. Federspiel, and W.O. Miller. 1983. Improving antibiotic prescribing in office practice: A controlled trial of three medical methods. *Journal of the American Medical Association* 250(13):1728–32.
- Seto, W.H., T.Y. Ching, K.Y. Yuen, Y.B. Chu, and W.I. Seto. 1991. The enhancement of infection control in-service education by ward opinion leaders. *American Journal of Infection Control* 19(1):86–91.
- Shea, S., W. DuMouchel, and L. Bahamonde. 1996. A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *Journal of the American Medical Informatics Association* 3:399–409.
- Simoès, E.A., T. Desta, T. Tessema, T. Gerbresellassie, M. Dagne, and S. Gove. 1997. Performance of health workers after training in integrated management of childhood illness in Gondar, Ethiopia. *Bulletin of the World Health Organization* 1:43–53.
- Skolnick, A.A. 1998. JCAHO, NCQA and AMAP establish council to coordinate healthcare performance measurement. *Journal of the American Medical Association* 279:1769–70.
- Solomon, D.H., H. Hashimoto, L. Daltroy, and M.H. Liang. 1998. Techniques to improve physicians' use of diagnostic tests: A new conceptual framework. *Journal of the American Medical Association* 280:2020–27.

- Soumerai, S.B. 1998. Principles and uses of academic detailing to improve the management of psychiatric disorders. *International Journal of Psychiatry in Medicine* 28:81–96.
- Soumerai, S.B., and J. Avorn. 1986. Economic and policy analysis of university-based drug “detailing.” *Medical Care* 24(4):313–31.
- Soumerai, S.B., J. Avorn, S. Gormaker, and S. Hawley. 1987. Effect of government and commercial warnings on reducing prescription misuse: The case of propoxyphene. *American Journal of Public Health* 77(12):1518–23.
- Soumerai, S.B., T.J. McLaughlin, and J. Avorn. 1989. Improving drug prescribing in primary care: A critical analysis of the experimental literature. *The Milbank Quarterly* 67(2):268–317.
- Soumerai, S.B., D. Ross-Degnan, and J.S. Kahn. 1992. Effects of professional and media warnings about the association between aspirin use in children and Reye’s syndrome. *The Milbank Quarterly* 70(1):155–82.
- Soumerai, S.B., S. Salem-Schatz, J. Avorn, C.S. Casteris, D. Ross-Degnan, and M.A. Propvsky. 1993. A controlled trial of educational outreach to improve blood transfusion practice. *Journal of the American Medical Association* 270(8):961–66.
- Stross, J.K., R.G. Hiss, C.M. Watts, W.K. Davis, and R. MacDonald. 1983. Continuing education in pulmonary disease for primary-care physicians. *American Review of Respiratory Diseases* 127:739–46.
- Studnicki, J., R. Remmel, R. Campbell, and D.C. Werner. 1997. The impact of legislatively imposed practice guidelines on cesarean section rates: The Florida experience. *American Journal of Medical Quality* 12(1):62–68.
- Tavrow, P., L. Malianga, and M. Kariuki. 2000. Using problem-solving teams to improve compliance with the Integrated Management of Childhood Illness (IMCI) guidelines in Kenya. Paper presented in October at the 17th International Conference of the International Society for Quality in Health Care (ISQua), Dublin, Ireland.
- Tierney, W.M., M.E. Miller, and C.J. McDonald. 1990. The effect on test ordering of informing physicians of the charges for outpatient diagnostic tests. *New England Journal of Medicine* 322(21):1499–1504.
- Turner, B.J., S.C. Day, and B. Borenstein. 1989. A controlled trial to improve delivery of preventive care: Physician or patient reminders? *Journal of General Internal Medicine* 4(5):403–09.
- Vernon, D.T.A., and R.L. Blake. 1993. Does problem-based learning work? A meta-analysis of evaluative research. *Academic Medicine* 68:550–63.
- Walker, J.A., D.E.C. Ashley, and R.J. Hayes. 1988. The quality of care is related to death rates: Hospital inpatient management of infants with acute gastroenteritis in Jamaica. *American Journal of Public Health* 78:149–52.
- Wensing, M., and R. Grol. 1994. Single and combined strategies for implementing changes in primary care: A literature review. *International Journal of Quality in Health Care* 6:115–32.
- Wensing, M., T.V.D. Weijden, and R. Grol. 1998. Implementing guidelines and innovations in general practice: Which interventions are effective? *British Journal of General Practice* 48:991–97.
- Wood, I. 1998. The effects of continuing professional education on the clinical practice of nurses: A review of the literature. *International Journal of Nursing Studies* 35:125–31.
- Zeitz, P.S., C.G. Salami, G. Burnham, S.A. Goings, K. Tijani, and R.H. Morrow. 1993. Quality assurance management methods applied to a local-level primary healthcare system in rural Nigeria. *International Journal of Health Planning and Management* 8(3):235–44.

