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# Adoption and Implementation of Strategies for Diabetes Management in Primary Care Practices

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**Background:** Secondary and tertiary prevention of chronic illness is a major challenge for the United States healthcare system. Controlled studies show that interventions can enhance secondary prevention in primary care practices, but they shed little light on implementation of secondary prevention outside the experimental context. This study examines the adoption and implementation of an important set of secondary and tertiary prevention efforts—diabetes management strategies—for type 2 diabetes in the everyday clinical practice of primary care. It explores whether adoption and implementation processes differ by type of strategy or prevalence of diabetes among patients in the practice.

**Methods:** Holistic case studies (those used to assess a single analytic unit, in this case, the physician group practice, as opposed to multiple embedded subunits) were conducted in 2001–2002 on six primary care practices in North Carolina identified from a statewide physician survey on strategies for diabetes management. Practices were selected by prevalence of diabetes and type of strategy for diabetes management—patient oriented (focused on self-management) versus biomedical (focused on secondary prevention practices). Results were derived from thematic analysis of interviews and secondary documents.

**Results:** Adoption and implementation did not differ by diabetes prevalence or type of diabetes strategy. All practices had a routine forum for vetting new strategies, and most used traditional channels for identifying them. Implementation often required adaptation of the strategy and the organization. Sustained use of a diabetes strategy depended on favorable organizational policies and procedures (e.g., training, job redesign) and ongoing commitment of resources.

**Conclusions:** Diabetes management strategies are often complex and require adoption and implementation processes different from those described by classic innovation diffusion models. Alternative conceptual models that consider organizational process, structure, and culture are needed.

(*Am J Prev Med* 2007;33(1S):S35–S49) © 2007 American Journal of Preventive Medicine

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## Introduction

Type 2 diabetes mellitus is a prevalent, costly condition that causes substantial morbidity and mortality. Although the evidence base for diabetes management strategies is well established,<sup>1</sup> studies indicate that diabetes management in primary care settings—where most chronic illness care occurs—could be improved.<sup>2–4</sup> Many patients with diabetes remain at high risk for chronic complications of diabetes and for acute complications that can result in death.<sup>5–9</sup>

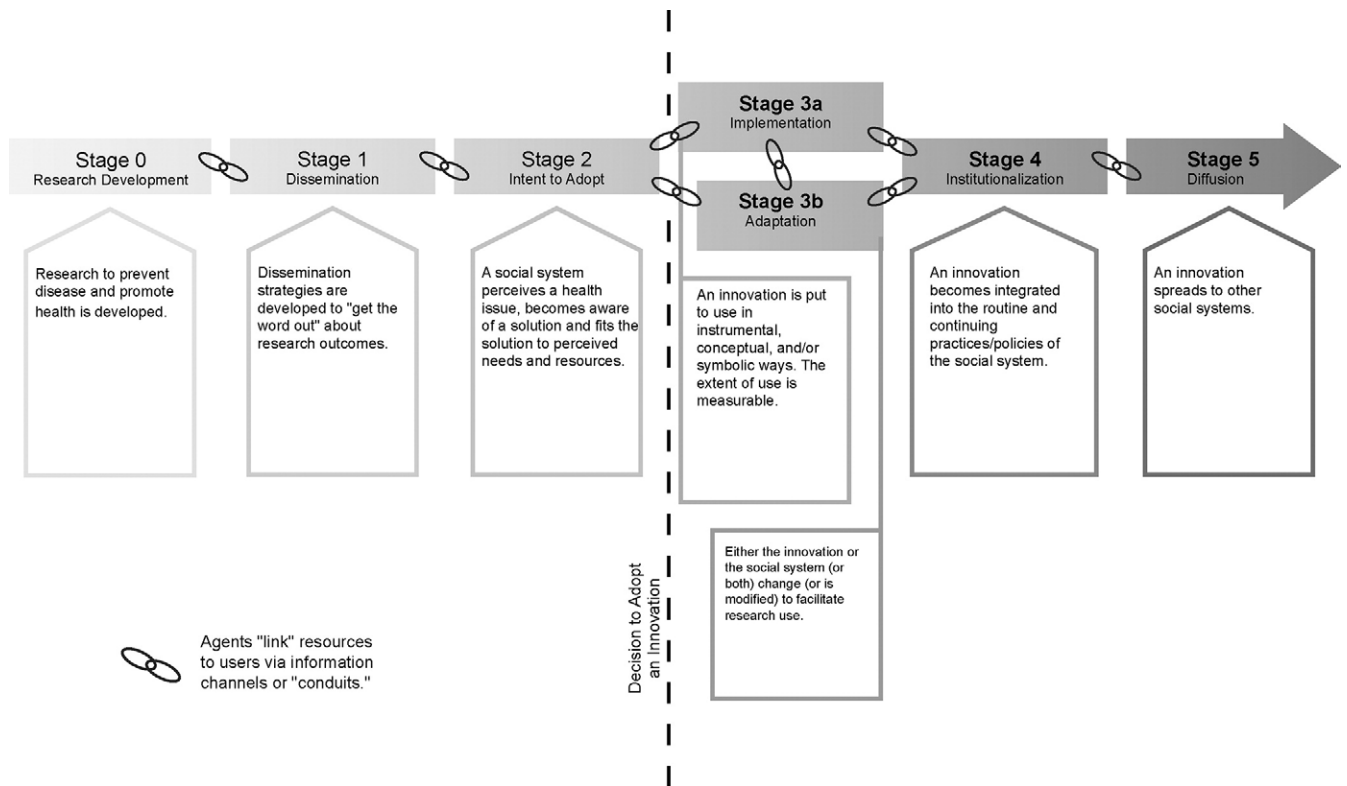
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Several national initiatives, such as the Institute for Healthcare Improvement's Breakthrough Series, have sought to address the difficulties of translating evidence-based interventions for managing chronic illness into everyday clinical practice in primary care settings.<sup>10–14</sup> Evidence is accumulating that quality improvement collaboratives like the Breakthrough Series can increase the utilization of evidence-based diabetes management strategies in primary care settings.<sup>13–16</sup> Yet, studies also indicate that implementing diabetes management strategies can be challenging for primary care practices.<sup>16–18</sup> Even within the supportive environment of a quality improvement collaborative, primary care practices exhibit marked variation in the scope, depth, and speed of implementation.

Although informative, studies of the Breakthrough Series and other national initiatives to improve chronic illness care do not shed light on how primary care practices translate evidence-based diabetes management strategies into everyday clinical practice outside



**Figure 1.** Stages of the research utilization model.<sup>23</sup>

the context of a quality improvement collaborative or a controlled study. Generalizing from these studies is difficult because practices that participate in collaboratives and control studies may differ in systematic ways from those that do not (e.g., they might exhibit greater readiness to change). Moreover, participating practices receive advice and resources to support implementation, whereas nonparticipating practices must often proceed without the benefit of technical consultation or other forms of assistance. Finally, participation in collaboratives or studies may itself give efforts to improve of diabetes care greater salience than such efforts might otherwise receive. For nonparticipating practices, improving diabetes care must compete with other priorities without help of compensating forces such as peer support, routine reporting, and external monitoring.

This study examines how primary care practices adopt and implement diabetes management strategies for type 2 diabetes in the context of everyday clinical practice (i.e., outside the context of quality improvement collaboratives or randomized controlled trials). Using case study research methods,<sup>19</sup> this study examines three questions:

1. How do primary care physicians adopt and implement evidence-based diabetes management strategies in the context of everyday clinical practice?
2. Do the processes for adoption or implementation differ when the diabetes management strategy tar-

gets primarily patient behavior (patient-centered) or provider behavior (biomedical)?

3. Does the adoption or implementation process differ across primary care practices with varying levels of diabetes prevalence among patients served?

### Conceptual Framework

For the present study, diabetes management strategies were viewed as innovations. *Innovation* refers to a technology or practice that an organization uses for the first time, regardless of whether other organizations have previously used the technology or practice.<sup>20–23</sup> *Adoption* refers to an organization's decision to install an innovation within the organization.<sup>21</sup> *Implementation* refers to "the transition period during which targeted organizational members ideally become increasingly skillful, consistent, and committed in their use of an innovation."<sup>21</sup>

According to Rogers,<sup>23</sup> the process of innovation by an organization comprises five stages, two for adoption and three for implementation (Figure 1).<sup>24</sup> In the agenda-setting stage, organizational members identify and prioritize organizational problems and search for innovations that address these problems. In the matching stage, they assess the fit between the innovation and the problem and between the innovation and organizational capabilities and constraints. The matching stage concludes with adoption or rejection of the innovation. Implementation begins with the redefining

and restructuring stage, in which “the innovation is reinvented so as to accommodate the organization’s needs and structure more closely, and . . . the organization’s structure is modified to fit with the innovation.”<sup>23</sup> In this stage, a process of mutual adaptation occurs. In the clarifying stage, use of the innovation becomes more widespread, and further adaptation of the organization and the innovation takes place, as unintended consequences or unwanted side effects arise. Finally, in the routinizing stage, the innovation becomes embedded in organizational structures and procedures and loses its identity as an innovation. For data collection and data analysis, the clarifying stage and the redefining and restructuring stage were collapsed into one stage.

Innovation and organization theories suggest that adoption and implementation processes vary depending on attributes of the “adopter” (i.e., primary care practice) and attributes of the innovation (i.e., diabetes strategy). Building on this concept, the prevalence of diabetes in the population of patients in the physician group practice was explored to determine whether practices serving higher proportions of patients with diabetes differed from those serving lower proportions in the methods used to adopt and implement diabetes strategies. This attribute of the adopter might affect the perceived need for diabetes strategies, the sources of information routinely scanned, the types of strategies adopted, the willingness to commit resources and adjust policies and procedures to accommodate the strategies adopted, and the acceptance and use of the strategies implemented. In addition, adoption and implementation processes might differ for two classes of diabetes strategies: biomedical strategies and patient-centered strategies. Biomedical diabetes strategies are defined as those that target health care providers and focus on changing the content or process of clinical care (e.g., performing foot examinations or using flow sheets to track diabetes care). Patient-centered diabetes strategies are defined as those that focus on enhancing the knowledge, skills, or motivation of the patient (e.g., teaching self-care skills or offering nutrition counseling). Biomedical strategies might be more familiar to providers and have a better perceived fit with providers’ competencies and practice experience. Consequently, these strategies might be more readily adopted, pose fewer concerns, encounter fewer barriers to implementation, and enjoy greater acceptance and use than patient-centered strategies.

## Methods

Replicated, holistic case studies were conducted on six physician group practices. Holistic case studies<sup>19</sup> are used to assess a single analytic unit, in this case, the physician group practice, as opposed to multiple embedded subunits. Such studies are preferable when the theory being applied pertains

to the organizational unit. The case studies were replicated, meaning they were conducted sequentially, with findings from one informing data collection on the next.

The sampling frame was constructed from 168 respondents to a mailed survey of 526 primary care physicians affiliated with managed care organizations in North Carolina, and who provided care to 10 or more patients with diabetes in 2001 (see Appendix A). Sites were recruited based on two variables related to the study questions: (1) prevalence of diabetes among patients in the group practice and (2) the type of diabetes strategy.<sup>19</sup> The mailed survey asked physicians to indicate the proportion of the group practice’s patients who had diabetes. On the advice of clinical study advisors, sites were dichotomized at 10%. Three group practice sites with a prevalence of 10% or less and three with a prevalence of 11% or more were recruited. The survey also asked physicians to describe a diabetes strategy recently put into place that was “aimed at improving the effective diagnosis and/or management of [diabetes].” The survey listed several patient-centered strategies and several biomedical strategies as examples. These “tracer” diabetes strategies served as both a sampling criterion and a point of reference during interviews.<sup>25</sup> Because of stronger interest in biomedical strategies, this strategy type was over-sampled; four sites with biomedical strategies and two sites with patient-centered strategies were selected. The group practices and diabetes strategies examined in the study are described in Table 1.

Compared to nonsite visit practices, physicians hosting site visits may have differed in practice tenure (mean years, 16 vs 19) and practice size (mean number of physicians, 9.5 vs 5.5), but due to the small number of site-visit practices, the differences were not statistically significant. Small but insignificant differences were also observed in rates of reported familiarity with state and national practice guidelines and use of point-of-care hemoglobin A1c (HbA1c) testing.

## Data Collection

During a 1-day site visit to each group practice, individual interviews were conducted, and documents pertaining to the diabetes strategy were obtained. Site visits took place in December 2001 through July 2002. Four weeks before a site visit, the physician who responded to the mailed survey completed a second survey, which was transmitted by fax. The survey requested information about the group practice (e.g., size and staffing mix), details about the diabetes strategy, and information about the timing of adoption, extent of implementation, extent of use, intended and realized benefits, and associated costs and outcomes. The survey also asked for a list of physicians, physician assistants, nurses, and other clinical and nonclinical staff members (e.g., pharmacists and office managers) who possessed detailed knowledge about the tracer diabetes strategy who could be interviewed during the site visit. Through semi-structured interviews, these participants supplied general information about decision-making processes in the practice and sources of information considered before changes in diabetes care were implemented (see Appendix B). They also supplied specific information about the adoption, implementation, use, and adaptation of the tracer strategy. Between two and five participants were interviewed at each site with a total of twenty-three interviews conducted. One member of the research team conducted the interview while another took notes.

**Table 1.** Attributes of physician group practices and tracer strategies for management of type 2 diabetes in six group primary care practices in North Carolina, 2001–2002

Attributes	Practice 2 Pt/low	Practice 5 Pt/high	Practice 1 Bio/low	Practice 6 Bio/low	Practice 3 Bio/high	Practice 4 Bio/high
Group practice						
Physician FTEs	6	6	8	4	3	4
Other clinical FTEs	7	4	8.9	9	8	8.6
Nonclinical FTEs	10	22	6	11	10	14
Patients in managed care (%)	26–50	11–25	11–25	1–5	11–25	26–50
Patients with diabetes (%)	5–10	26–50	5–10	5–10	26–50	11–25
Strategy	Frequent visits, with teaching about self-management of diabetes and nutritional counseling	Course on self-management of diabetes, recognized by ADA	Point-of-service (in-office) testing to measure hemoglobin A <sub>1c</sub> concentrations at patient visit	Diabetes protocol with flow sheet	Diabetes flow sheet used to monitor care after education of physicians and nurses	Foot examination at routine visits
Time to adoption decision (years)	>3	>3	1–3	1–3	>3	<1
Implementation date	DM	05/99	01/98		03/02	DM
Current physician users	DM	6	30	6	3	2
Expected physician users	DM	6	30	7	3	4–5
Current PA users	DM	2	1	NA	2	0
Expected PA users	DM	2	1	NA	2	3
Current nurse users	DM	2	8	1	DM	0
Expected nurse users	DM	2	DM	1	6	0
Current other users	DM	NA	2	NA	2	0
Expected other users	DM	NA	2	NA	2	0

Note: Tracer = diabetes strategies serving as sampling criterion and point of reference during interviews of participants. Pt = patient-oriented strategy (focused on self-management of diabetes); low = reported prevalence of diabetes  $\leq 10\%$  in patient population of practice; high = reported prevalence of diabetes  $> 10\%$  in patient population of practice; Bio = biomedical strategy (focused on secondary prevention practices). ADA, American Diabetes Association; DM, data unknown or not available; FTEs, full-time equivalents; PA, physicians' assistant; NA = not applicable.

## Data Analysis

Results were derived from thematic analysis of individual interviews and secondary documents. The interview data were coded by two people using a shared codebook, checking each other's work, and reconciling differences in interpretation. Coded interviews were used to construct individual-level and site-level matrices of adoption and implementation themes by using a set of explicit decision rules.<sup>26</sup> For example, codes for interview data were based on at least two mentions of a theme by interview participants who appeared to have knowledge or information pertaining to the theme.<sup>26</sup> Analysis followed replication logic for pattern matching; each case was viewed as a single "experiment" and was used to confirm, reject, or modify both conceptually derived and empirically emergent propositions.<sup>19</sup> Cases were compared to determine whether similar cases produced similar results (e.g., by comparing results at sites using biomedical strategies) and whether different cases produced different results for predictable reasons (e.g., by comparing results at sites using biomedical diabetes strategies with those at sites using patient-centered strategies).

## Results

### Adoption

**Agenda setting.** Two aspects of agenda setting were examined: how the agenda gets set and what informa-

tion (or evidence) shapes the agenda. Table 2 provides an overview of factors that interview participants described contributing to the agenda setting and matching phases. Across the six group practice sites, participants described similar general processes and sources of information for identifying new diabetes strategies.

All six sites reported that a routine forum existed for identifying problems, opportunities, and strategies for improving diabetes care (Table 2). In most cases, monthly staff meetings served as the forum. Sites varied in the extent of participation in agenda setting by physician assistants and other clinical professionals (e.g., pharmacists). However, involvement of nonphysicians in an agenda setting did not appear to differ as a result of either the type of innovation or the prevalence of diabetes among patients at the practice. These group practices generally involved nurses and nonclinical staff members only peripherally in decisions on adoption of diabetes strategies, although these staff members played a more central role in implementation decisions.

In some cases, a discrepancy between an organization's expected and actual performance triggered the recognition of a problem and the search for a solu-

**Table 2.** Components of agenda setting and matching for adoption of strategies for management of type 2 diabetes in six primary care group practices in North Carolina, 2001–2002

Attributes	Practice 2 Pt/low	Practice 5 Pt/high	Practice 1 Bio/low	Practice 6 Bio/low	Practice 3 Bio/high	Practice 4 Bio/high
Number of interviews	2	4	5	3	4	5
<b>Agenda setting<sup>a</sup></b>						
<b>Organizational attributes</b>						
Routine forum	+	+	+	+	+	+
Nonphysician staff involvement	+	+	+	+	-	+
Decision process	Collective	Collective	Collective	Authority	Authority	Collective
Contingent decision	+	-	-	+	-	+
<b>Information sources</b>						
Opinion leader	+	+	+	+	+	+
Published literature	+	+	+	+	+	+
Promulgated care guidelines	+	+	+	+	+	+
Research study of patients	-	+	+	-	+	-
Personal practice experience	+	+	+	+	+	+
<b>Matching<sup>b</sup></b>						
<b>Motivation</b>						
New evidence—external	+	-	+	-	-	+
New evidence—internal	+	+	+	-	+	+
Acceptable to physicians	-	+	+	+	-	-
Acceptable to staff	-	-	-	-	-	-
Effectiveness in practice	+	-	+	-	-	-
Role of patient	+/-	+/-	-	-	-	-
Regulatory issues	-	-	-	+	-	-
Organizational mandate	-	-	-	+	+	-
<b>Resources</b>						
Reimbursement available	+/-	+/-	+	-	-	-
Acquisition/installation/use	+	-	+	-	-	-

<sup>a</sup>Agenda setting is the process of identifying problems and opportunities and deciding on their priority for action.

<sup>b</sup>Matching is the process of assessing the fit between problems or opportunities and an innovation.

Note: Bio = biomedically-oriented tracer strategy, Pt = patient-oriented tracer strategy, High = reported burden of diabetes in patient population of >10%, Low = reported burden of diabetes in patient population of ≤10%. + = factor present and favorable to adoption or implementation; - = factor absent or not favorable; +/- = factor present but neither favorable nor unfavorable. Collective = decision-making process characteristics of traditional partnership structure and collegial culture of group practice; Authority = decision-making authority rests in hands of a few individuals at high organizational levels, such as board of directors or medical director.

tion.<sup>23</sup> At Practice 5, one interview participant noted: “Physicians felt that they were seeing diabetes patients but didn’t have [the diabetes] under control. They couldn’t stay on top of it all. They realized that patients needed education. They tried, but it’s not like having a specialized person.”

In response to this performance gap, the physicians hired a nurse family practitioner who was a certified diabetes educator to see diabetes patients more frequently and to develop classes for diabetes self-management. In other cases, however, agenda setting took the form of “solution-driven problems”; organizational participants identified an innovative idea or strategy and then sought a matching problem.<sup>27</sup> In Practice 1, for example, a laboratory technician heard about the point-of-service device for measuring concentrations of HbA1c from a Bayer laboratory distributor. That information led to an assessment of the need for point-of-service testing.

Agenda setting involved either authority-based or collective decision making, depending on the organi-

zational structure and culture of the practice. For group practices embedded within a larger organizational structure (Practice 3 and Practice 6), decisions to make diabetes a priority rested in the hands of a few individuals at high organizational levels, such as a medical director or board of directors (authority based). The other four practices, however, engaged in collective decision making, a process fitting the traditional partnership structure and collegial culture of group practice, which is based on consensus, primarily among physicians but also including some nursing or other allied health staff (Practice 1, Practice 2, Practice 4, and Practice 5).

Because of the professional autonomy of physicians, decisions to adopt new diabetes strategies often represent “contingent innovation decisions,” in which a physician retains the option to adopt or reject the strategy, even after the organization adopts it.<sup>23</sup> Most of the tracer diabetes strategies, except for foot examinations at Practice 5, required coordinated use by many people to realize the desired clinical and organizational

benefits. Although this requirement created strong normative expectations, none of the group practices mandated that a physician adopt this diabetes strategy or, as discussed later in this article, held them accountable for not adopting the strategy.

The six group practices did not differ significantly in the information sources considered before adopting new diabetes strategies. Interview participants at all sites mentioned scanning the peer-reviewed literature, clinical guidelines, and recommendations issued by the American Diabetes Association (ADA), the U.S. Preventive Services Task Force, or professional societies. Participants noted, however, that they used their experience in medical practice to “reality test” information from external sources. Three sites (Practices 1, 3, and 5) also cited research of their own patients.

Due to the volume of information available and the speed with which new information arises (e.g., new medications, practice standards and technologies), it is not surprising that interview participants reported heavy reliance on opinion leaders to keep abreast of the literature and to inform other physicians in the practice (Table 2). Rogers notes that opinion leadership is often not a function of formal position or status within an organization or social system.<sup>23</sup> The author defines opinion leadership as “the degree to which an individual is able to influence other individuals’ attitudes or overt behavior informally in a desired way with relative frequency.”<sup>23</sup> Opinion leaders ranged from physicians to pharmacists to dedicated specialists, such as certified diabetes educators.

## Matching

Two broad classes of factors affect how organizational members judge the fit of an innovation with the organization’s agenda: motivation and resources (Table 2).<sup>28</sup> Study results indicate that both willingness (motivation) and perceived feasibility (resources) influenced the decision to adopt new diabetes strategies. The factors affecting motivation varied from site to site and showed no relationship to the type of diabetes strategy or the prevalence of diabetes among patients in a group practice. In most cases, the information that shaped the practice’s agenda for diabetes management also increased willingness of the members to adopt an innovative diabetes strategy (e.g., new ADA guidelines at Practice 5 and an internally conducted study at Practice 1). At Practices 3 and 6, people at high organizational levels mandated adoption of the tracer diabetes strategy, essentially short-circuiting the matching process. Patients played a limited role in shaping motivation. At Practice 2, for example, physicians wondered whether patients would accept frequent office visits involving diabetes education and nutritional counseling:

“Can the patients [with financial difficulty] pay for it? Can they afford the copayment? The thing is, if they can make the [copayment], then we get a lot of sample meds [medications] and can give them the meds and save money on prescriptions. Time is the other thing. For the patients, they’re working two jobs on minimum wage and can’t just come in for an appointment whenever.”

Despite these concerns, Practice 2 adopted the diabetes strategy because “it comes from the literature” and because “we follow what Dr. \_\_\_ does” (a prominent university-based physician seen as an opinion leader). Likewise, at Practice 5, physicians wondered whether patients would respond if diabetes self-management classes were offered. Interview participants assessed the feasibility of the diabetes strategy in terms of both the availability of reimbursement and the cost and ease of acquisition, installation, and use. At Practice 1, for example, both factors proved favorable. The practice acquired the point-of-service machine for measuring HbA1c concentrations at no charge and could bill for the service. At other group practices, reimbursement proved to be available, but either the level of reimbursement was inadequate or the timing created a temporary financial burden for the practice during the adoption phase. As noted earlier, physicians at Practice 2 thought that diabetes patients might not be able to afford the copayments for frequent office visits and that Medicare and Medicaid reimbursement rates would be insufficient. Similarly, physicians at Practice 5 expressed concern that they would have to deliver classes on diabetes self-management for 18 months before obtaining ADA certification, which was required to obtain Medicare and Medicaid reimbursement. However, they felt confident that the practice could partially subsidize the cost of the classes with grants from pharmaceutical companies. Thus, although the cost of acquisition, installation, and use were a concern, the availability of resources proved to be both a driver and a concern, as physicians weighed the decision to adopt diabetes strategies.

## Implementation

**Redefining and restructuring.** Implementation often involves adaptation of both the innovation and the organization.<sup>23,29,30</sup> At Practices 3 and 6, for example, multidisciplinary committees created and then modified several times both the content and the format of flow sheets to track diabetes care. Similarly, at Practice 5, instructional materials obtained from external sources were adapted for use in the course on self-management of diabetes. Even a “fixed” innovation such as the point-of-service device for measuring HbA1c concentrations was adapted, as physicians defined the appropriate frequency of testing and the optimal range of values for diabetes management.

**Table 3.** Components of restructuring, redefining, and clarifying procedures and routinizing for implementing strategies for management of type 2 diabetes in six primary care group practices in North Carolina, 2001–2002

Attributes	Practice 2 Pt/low	Practice 5 Pt/high	Practice 1 Bio/low	Practice 6 Bio/low	Practice 3 Bio/high	Practice 4 Bio/high
<b>Redefining/restructuring<sup>a</sup></b>						
Organizational mandate	-	-	-	+	+	-
Reward/recognition	-	-	-	-	-	-
Financial/budgetary support	+	+	-	-	-	-
Staff involvement	+	-	+	+/-	+	-
Training/education	-	+	+	-	+/-	+
Monitoring	-	+	+	-	+	-
<b>Other facilitators/barriers</b>						
Innovation champion(s)	-	+	+	-	+	+
Experience with innovation	+	+	-	+	-	-
Data/information systems	-	-	+	-	-	+/-
Space/equipment issues	-	+/-	+	-	-	+
Organization-innovation fit	-	-	+/-	+	-	-
Acceptance by physicians	+	+	+	+/-	+	+/-
Perceived benefit/cost	+/-	+	+	+/-	+	+/-
<b>Clarifying/routinizing<sup>b</sup></b>						
	Secure	Secure	Secure	Uncertain	Secure	Tenuous
Budgetary support	+	+	-	Uncertain	-	-
Personnel allocation	+	+	+	Uncertain	+	-
Training and education	+	-	+	-	Needed	Needed
Policies and procedures	-	+	+	+	+	Needed
Supply and maintenance	-	-	+	-	-	+
Routine monitoring	-	+	+	+	+	Needed

<sup>a</sup>Redefining and restructuring involves the organization and the innovation adapting to one another in an effort to maximize the benefits of the innovation to the organization

<sup>b</sup>Clarifying and routinizing is the process by which the innovation, once it is implemented, either spreads beyond its base of first users to become an accepted part of organizational processes or it falls into disuse.

Note: + = factor present and favorable to registry adoption or implementation; - = factor absent or not favorable; +/- = factor present but neither favorable nor unfavorable.

Organizational adaptation took the form of implementation policies and practices, a shorthand phrase for the “array of innovation, implementation, organizational, and managerial policies, practices, and characteristics that may influence innovation use”<sup>21</sup> (Table 3). Each group practice invoked a different combination of implementation policies and practices, depending on the physician specifications for the diabetes strategy and the practice setting. For example, some diabetes strategies imposed more acquisition and installation costs than others did. Practice 1 acquired the point-of-service device for measuring HbA1c concentrations at no cost. Practice 5, on the other hand, subsidized the courses on self-management of diabetes for 18 months while the practice sought ADA certification for the course. Staff involvement in design and implementation of diabetes strategies was more extensive when the strategy required many people to change their behavior (e.g., point-of-service device for measuring HbA1c concentrations at Practice 1). More limitations were evident when a specialist was responsible for implementing and using the strategy (e.g., teaching about diabetes self-management and nutritional counseling at Practice 2). Unlike studies of nonclinical organizations, there was no use of financial incentives or administrative sanctions in the physician group practices, even in those embedded in complex organizational structures.

Some interview participants commented that monitoring the use of diabetes strategies might have been more effective in combination with incentives and sanctions. “It came down as a corporate mandate,” said an interview participant at Practice 3, “but there were no penalties.” A participant in Practice 6 observed, “There is no one breathing down our neck[s]. There’s not really a mechanism for enforcing it anyway. The [chart] audits are at the clinic level not at the provider level, which is too bad, [because] it would be helpful.”

Neither the type of diabetes strategy used nor the prevalence of diabetes among patients in a group practice provided much insight into the pattern of implementation processes, facilitators, and barriers (Table 3). However, three general findings emerged. First, physician group practices that invoked multiple, mutually reinforcing implementation policies and practices demonstrated greater use of diabetes strategies than those that did not have such policies and practices. Practice 3, for example, combined an organizational mandate to adopt a flow sheet for diabetes care with extensive physician and nurse involvement in the design and implementation of the flow sheet, as well as educating both clinical and administrative staff before implementation. These strategies reinforced each other and promoted high levels of use of a diabetes strategy.

Second, implementation of a diabetes strategy can be facilitated by an innovation champion—"a charismatic individual who throws his or her weight behind the innovation."<sup>23</sup> However, implementation also depends on factors such as experience with related innovations, compatibility with existing information systems, and fit with the priorities and procedures of the larger organization in which the practice is embedded. At Practice 2, where implementing frequent office visits focused on teaching self-management of diabetes and nutritional counseling, experience with a related innovation, smoking cessation, gave the practice the confidence that diabetes counseling could work. For Practice 5, hiring a family nurse practitioner who was also a certified diabetes educator was an innovation that facilitated the implementation of classes in diabetes self-management. One participant in the practice said, "The physician extender concept was new to the practice."

Finally, even when a diabetes strategy is implemented, the strategy may not be used often if members of the organization, especially physicians, do not place a high importance on the problem or see benefit in the solution. At Practices 4 and 6, for example, physician acceptance was mixed, because "some physicians are more focused on diabetes than others." Even among physicians who valued a diabetes strategy, some reported inconsistent use due to pressures for productivity, inadequate reimbursement, or both. For example, an interview participant in Practice 4 noted, "I'm challenged when I see 14 to 16 patients a day. The [hospital] administration is pushing for us to see 18 patients a day." Similarly, a Practice 6 interview participant stated, "Keeping up is a challenge—remembering all of the stuff [that we are supposed to do]."

## Routinizing

Routinizing an innovation depends on the continued allocation of five types of resources: budgetary resources, personnel resources, training programs, organizational policies and procedures, and supply and maintenance operations.<sup>29,32</sup> Ongoing monitoring of the use of a diabetes strategy also supports "routinization" by signaling to targeted users the importance of continued use of innovation and by providing performance feedback, enabling users to adjust practice patterns. Not all resource types are relevant to all innovations, but the more resource types committed to sustaining an innovation and the longer the duration of that commitment, the more "routinized" the innovation becomes.<sup>29</sup>

These findings suggest that, in four of the six group practices (1, 2, 3, and 5), the tracer diabetes strategy had become routinized (Table 3). For example, in Practice 1, use of the point-of-service device for measuring HbA1c concentrations replaced the earlier prac-

tice of sending blood samples to outside laboratories for measuring blood glucose concentrations after fasting or under normal conditions. Adequate reimbursement obviated the need for Practice 1 to provide ongoing budgetary support to provide the service. At the same time, the practice continued to devote personnel, training, and supply and maintenance resources to support the diabetes strategy. Moreover, Practice 1 made lasting changes in organizational policies and procedures for appointment scheduling, office workflow, and documentation. In contrast, Practice 4 has not yet committed the training resources needed to promote widespread, routine performance of foot examinations. "There is a need for an in-service [training] to bring everyone into the loop," said one interview participant. Moreover, Practice 4 has not adapted its organizational policies and procedures to sustain the diabetes strategy. One interview participant remarked, "We need to put it in writing." Another concurred, "A standing order would move it practice wide." Practice 6 offered a mixed picture. Organizational mandates and routine monitoring supported routine use of the flow sheet on diabetes care. However, Practice 6 relied heavily on a grant-funded clinical pharmacist to support physician use of the diabetes strategy. It was unclear whether Practice 6 would commit the necessary internal budgetary and personnel resources when the grant funding ended.

Study results also suggested that the degree of routinization depended in part on the dynamics and outcomes of earlier stages. At Practice 2, for example, the presence of an innovation champion facilitated implementation of the diabetes strategy. Although not all physicians made use of this strategy, they continued to commit budgetary and personnel resources to support it, because they believed in its value to patients and held the innovation champion in high esteem. At Practice 3, the tangible benefits perceived by physicians in restructuring and redefining the innovation enhanced the routinization of the diabetes strategy by increasing their willingness to commit to the nursing staff time needed to keep the flow sheet current. As one interview participant noted, "The flow sheet was very convenient from the physicians' perspective. They could find all the data on diabetes care and patient progress on one sheet in the chart." In contrast, at Practice 4, a weak set of implementation policies and practices (e.g., little training, no monitoring, and no incentives) did little to promote the acceptance and use of foot examinations. Consequently, the group practice seemed unwilling to commit additional resources on an ongoing basis to make foot examinations a stable, routine activity in the practice. Using an innovation and routinization are related but distinct concepts. An innovation can be moderately or even frequently used but only tenuously routinized (e.g., flow sheet for diabetes care at Practice 6). Likewise, an innovation can be moderately or even

little used but highly routinized (e.g., flow sheet for diabetes care at Practice 3).

## Conclusion

This study examined how primary care practices adopt and implement evidence-based diabetes management strategies under outside the supportive context of a quality improvement collaborative or a randomized controlled trial. These findings, with respect to adoption processes, although not surprising, underscore the persistent challenges of translating research into everyday clinical practice. Primary care providers can work long hours at a busy pace with relatively lean staffing. Providers have little time to keep up with the literature, search for evidence-based interventions, or engage in collective deliberation about the appropriateness and feasibility of new diabetes management strategies. Providers in this study learned about new diabetes management strategies primarily through traditional information sources (e.g., medical journals, professional associations, and other colleagues), but they did not systematically scan these sources on a routine basis. Moreover, they did not employ a set of explicit decision criteria or a structured assessment process in making adoption decisions. As a result, they sometimes underestimated the cost of installation and maintenance, the difficulty of implementation, and the ease of use of the diabetes management strategies they considered.

These findings suggest that policymakers, health plans, and others seeking to promote evidence-based diabetes care in primary care settings must develop more effective ways to disseminate information, tools, and programs to support primary care providers. Several of the providers in this study pointed to a stack of medical journals sitting in their offices, noting that they were "a little behind" in keeping up with the literature. Some noted that they found the ADA guidelines too long, too complex, or too impractical for use with their own patients. We can only speculate whether scientific journals, professional associations, and health plans have become more adept in recent years at packaging and delivering evidence-based information and strategies. We suspect, however, that we would hear the same concerns from primary care providers if we were to repeat this study today. Beyond simply getting information and tools in the hands of primary care providers in a more timely and effective manner, proponents of evidence-based diabetes care could help providers make more informed adoption decisions by providing explicit guidance about the factors they should keep in mind when considering a new diabetes management strategy (e.g., compatibility, complexity, cost, and risk).

With respect to implementation processes, these findings suggest that putting new diabetes management strategies into practice often entails mutual adaptation of the innovation and the organization. This is espe-

cially true for diabetes management strategies that require specialized training, resource allocation, and administrative coordination. Primary care practices that participate in quality improvement collaboratives gain a keen appreciation of the importance of implementing mutually reinforcing changes in organizational staffing, work flow, communication patterns, and rewards. For primary care practices implementing diabetes management strategies on their own, this appreciation is most likely gained the hard way: through trial and error. Again, proponents of evidence-based diabetes care could help providers by highlighting the organizational supports that are necessary to promote implementation and sustain use.

It is important to note that well-known frameworks for conceptualizing innovation adoption also ignore or underemphasize organizational aspects of implementation. Rogers's diffusion of innovation model,<sup>23</sup> for example, assumes that (1) individuals can make autonomous choices to adopt or not adopt the innovation, (2) putting the innovation into place and using it does not impose heavy coordination demands on intended users, and (3) obtaining successful outcomes does not depend on collective innovation use (i.e., individuals benefit from innovation use regardless of whether others also use the innovation). Although these conditions might hold for some diabetes management strategies, they do not hold for others (e.g., disease registries). For complex, multifaceted strategies, Klein and Sorra's innovation implementation model<sup>21, 31</sup> and other models from the field of organization science may prove more realistic and useful.

Case study methods are well suited for studying implementation processes, which tend to be fluid, nonlinear, and context sensitive.<sup>19,33,34</sup> In addition to permitting in-depth analysis of individual cases, case study methods offer analytic strategies for systematically comparing patterns observed across cases.<sup>19</sup> Although case studies are useful for gaining insight into the complexities and dynamics of action in everyday context, they do not provide a strong foundation for generalizing from observed samples to unobserved populations. Study designs involving statistical sampling strategies and larger sample sizes would be necessary to establish the range and limits within which these study findings apply.

The finding that adoption and implementation processes did not vary in any discernable way with the type of diabetes management strategy or prevalence of diabetes among group practice patients could reflect measurement error, small sample size, or selection bias.

Alternatively, it is possible that adoption and implementation processes depend more on other innovation or adopter characteristics, such as whether a diabetes management strategy can be implemented by individuals acting independently or the size of the physician group practice.

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This research was funded by Special Interest Project 17 (Cooperative Agreement U48/CCU409660), Prevention Research Program, Centers for Disease Control and Prevention, through the Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill.

This publication was supported in part by cooperative agreements from CDC's Prevention Research Centers Program (PRC) at the University of North Carolina (U48-DP-000059). Its content is solely the responsibility of the authors and does not necessarily represent the official views of the CDC.

No financial conflict of interest was reported by the authors of this paper.

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**UNC Collaboratively Managing the Public's Health Project**

Thank you for allowing us to visit [insert group practice name] on [insert date] to understand how your group practice adopts and implements new strategies or protocols when caring for diabetes patients. In your completed survey you listed [insert best practice] first among the strategies and protocols you employed when caring for your diabetic patients. Please take a few minutes to answer the following questions. Your answers will help us make the most of our time together during our upcoming visit.

If you have questions regarding the questions on this survey, feel free to contact \_\_\_\_\_. Please fax your completed survey to \_\_\_\_\_ by \_\_\_\_\_. Thank you for your assistance.

1. Please describe the size and staffing mix of your group practice FTEs
- (a) Number of physician FTEs \_\_\_\_\_
  - (b) Number of physician assistant FTEs \_\_\_\_\_
  - (c) Number of nurse FTEs \_\_\_\_\_
  - (d) Number of non-clinical staff FTEs \_\_\_\_\_
  - (e) Number of other FTEs (please specify: \_\_\_\_\_) \_\_\_\_\_

2. What percentage of patients in your practice belong to managed care plans? (check one)
- < 5%       5-10%       11-25%       26-50%       > 50%       Unsure

3. In general, are decisions to adopt new strategies or protocols for diabetes patients made by individual physicians or by the group as a whole? (check one)
- By individuals       By the group       Varies

4. In a recent survey, Dr. \_\_\_\_\_ indicated that your group practice [*identify best practice*]. Please provide a more detailed description of [*best practice*]. This information will help make our site visit more efficient. *Please include in the Federal Express envelope any written materials (e.g., forms, protocols, or documents) that describe your use of the [*best practice*].*

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Please focus on the [*best practice*] as you answer the questions below.**

5. How long ago did your group practice decide to adopt the strategy or protocol? (check one)
- Less than 1 year ago       1 – 2 years ago       More than 2 years ago
6. Has [insert group practice name] fully implemented the strategy or protocol? (check one)
- No → Expected date of full implementation \_\_\_\_\_ (month and year)
- Yes → Date of full implementation \_\_\_\_\_ (month and year)
7. What is the current extent of use of the strategy or protocol in your group practice?
- Number
- (a) Number of current physician users \_\_\_\_\_
  - (b) Number of expected physician users \_\_\_\_\_

- (c) Number of current physician assistant users \_\_\_\_\_
- (d) Number of expected physician assistant users \_\_\_\_\_
- (e) Number of current nurse users \_\_\_\_\_
- (f) Number of expected nurse users \_\_\_\_\_
- (g) Number of current non-clinical staff users \_\_\_\_\_
- (h) Number of expected non-clinical users \_\_\_\_\_

8. Please identify the benefits that your group expected from the [best practice] and the extent to which the [best practice] has delivered those benefits.

Not at All		To Some Extent		To a Great Extent	Don't Know or Too Early
1	2	3	4	5	DK

<b>Expected Benefit</b> <i>(please write-in as many benefits as you need)</i>	<b>Extent to Which Benefit Delivered</b> <i>(Please use the scale above)</i>					
(a) _____	1	2	3	4	5	DK
(b) _____	1	2	3	4	5	DK
(c) _____	1	2	3	4	5	DK
(d) _____	1	2	3	4	5	DK
(e) _____	1	2	3	4	5	DK

9. Has your group practice investigated how much it cost to implement the [best practice]?

- No → Any reason why? \_\_\_\_\_
- Yes → What did you do? \_\_\_\_\_
- What did you find? \_\_\_\_\_

10. Has your group practice assessed the impact of the [best practice] on key intended benefits such as patient outcomes, patient satisfaction, employee productivity, or the like?

- No → Any reason why? \_\_\_\_\_
- Yes → What did you do? \_\_\_\_\_
- What did you find? \_\_\_\_\_

During our visit we would like to complete 3-4 key informant interviews (each approximately 30 minutes long) with members of your practice who are instrumental in the adoption and/or implementation of the [insert best practice] to help us learn more about how strategy/protocol is adopted, implemented and institutionalized. Please identify by name those staff members who have detailed knowledge about the [best practice] that you just described.

**Administrative Staff**

Name	Phone:
_____	_____
_____	_____
_____	_____
_____	_____

**Clinical Staff (both physician and non-physician)**

Name	Phone:
_____	_____
_____	_____
_____	_____
_____	_____

**Thank You!**

**Appendix B**

Key Informant Interview for SIP 17-00  
"A Model for Collaboratively Managing the Public's Health"

Adoption of Strategies or Protocols to Improve Care

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1. In general how do you make decisions about the adoption of new technology or new practices for managing the care of your diabetes patients?
2. Could you tell me about the history of your decision to adopt the [best practice]? For example, what was the source of the idea and what were the key events that led to the decision to adopt?
3. What were some of the driving factors that led your practice to adopt the [best practice]?

NOTE TO INTERVIEWER. Did he or she mention... (check all that apply)

- New evidence
- Changes in physician expectations about state-of-the-art care?
- Changes in patient expectations about state-of-the-art care?
- Changes in reimbursement policies?
- Changes in regulations?

4. What types of information or evidence do you (or the group) consider when making decisions to change your practice in treating diabetes patients?

*NOTE TO INTERVIEWER.* Did he or she mention... (check all that apply)

- Recommendations by respected colleague or opinion leader
- Consensus of practice partners
- Reported research study in the literature (evidence based)
- Promulgated care guidelines by a respected source
- Research study of own patients
- Recommendation by professional organization
- Recommendation by managed care organization
- Own practice experience

5. What role, if any, did your patients play in your awareness of or decision to adopt the [*best practice*]?

6. What were some concerns or anticipated problems that your practice considered in making the decision to adopt the [*best practice*]?

*NOTE TO INTERVIEWER.* Did he or she mention...

- Effectiveness of best practice under "real life" conditions?
- Cost of acquiring or implementing best practice?
- Ease of use?
- Acceptability by physicians and clinical staff?
- Acceptability by patients?
- Adequacy of existing infrastructure and human resources?
- Feasibility or ease of reimbursement?

#### Implementation of Strategies or Protocols to Improve Care

---

7. How did your practice implement the [*best practice*]? For example, what key events took place in the implementation phase?

*NOTE TO INTERVIEWER.* Probe for:

- Detailed assessment and planning (e.g., infrastructure adequacy, training needs, timing, user support services)
- Pilot testing
- Staff involvement
- Training/education (initial and ongoing)
- Monitoring implementation activities
- Parallel systems of care during transition

8. What challenges arose in implementing the [*best practice*]?

*NOTE TO INTERVIEWER.* Did he or she mention... (check all that apply)

- Poor acceptability by physicians and clinical staff?
- Poor acceptability by patients?
- Insufficient financial resources?
- Inadequate infrastructure or human resources?
- Misaligned reward and compensation systems?
- Incompatibility with other organizational goals or programs?
- Changes in reimbursement rates or policies?
- Physical environmental constraints (e.g. lack of space)?

9. What factors supported the implementation of the [best practice]?

NOTE TO INTERVIEWER. Did he or she mention... (check all that apply)

- Influence of the champion?
- Personal or organizational experience with innovation?
- Sufficient financial resources?
- Aligned reward and compensation systems?
- Well planned implementation approach?
- Involvement of end users in implementation planning and execution?
- Fit with other organizational goals or programs?
- Changes in reimbursement rates or policies?

Institutionalization of Strategies or Protocols for Improving Care

10. Is the [best practice] a routine and accepted part of the way diabetes care is done in your group practice?

- a. If not, why do you think that is the case?
- b. If so, what changes have had to make in your practice in order to make the [best practice] a routine and accepted part of the way diabetes care is done?

NOTE TO INTERVIEWER. Did he or she mention... (check all that apply)

- Changes in staffing
- Changes in training and user support
- Changes in information systems
- Changes in policies (including reward and compensation systems)
- Changes in relationships with other organizations

Lessons Learned

11. Did your practice learn any important lessons from its decision to adopt and implement the [best practice]? If so, does your organization [group] do things differently now?

12. Is there anything else that we ought to know about how your practice adopted and implemented the [best practice]? Did we miss anything?

Thank you for your time.

INTERVIEWER \_\_\_\_\_

KEY INFORMANT \_\_\_\_\_