The Concept of Diabetes Translation

Addressing barriers to widespread adoption of new science into clinical care

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The National Commission on Diabetes (NCD) performed a landmark review of diabetes in the U.S. in 1975 (1). Its four-volume 10-part report contained extensive testimony from all aspects of the diabetic community, including scientists, clinicians, patients, and their families. The NCD promoted a concept that was new to the diabetes field: the concept of translation. The NCD recognized that a significant weakness in the nation's overall approach to diabetes was its failure to "translate" research findings into practice. Scientific knowledge was accumulating through the efforts of many basic and clinical investigators, but the application of this knowledge to all patients with diabetes who might benefit from it was spotty. The NCD initially charged Diabetes Research and Training Centers (DRTCs) with the responsibility of conducting translation with the following citation:

> Translate the advances in the field of diabetes research with least delay into improved care for the diabetic (sic) in the setting of model patient care demonstration units within the centers and through outreach programs in the regional community.

Translation responsibilities were further extended to the Centers for Disease Control and Prevention in 1990 with the establishment of the Division of Diabetes Translation, which was created to implement translational programs that had been developed and shown to be effective. Development of such programs (i.e., translational research) remained the principal charge to the demonstration and education divisions of the DRTCs. Long-standing National Institutes of Health guidelines for DRTCs have stated (2):

> The central purpose of the Demonstration and Education (D&E) Division is to address barriers between what is thought to represent ideal diabetes care reflecting current scientific advances in the understanding of diabetes and what is routinely practiced.

This commentary addresses the approach that the Michigan Diabetes Research and Training Center (MDRTC) has used to fulfill this charge (3).

Conceptual framework of translational research

Figure 1 displays the conceptual framework that underlies the approach to translational research within the Demonstration and Education Division of the MDRTC. This framework was derived from our 20-year experience with community-based diabetic patients. In 1980, we randomly chose eight Michigan communities, four large and four small, and within those communities we randomly chose 61 primary care physicians and 428 of their diabetic patients. The physicians' practices were studied, and the patients were extensively evaluated; 261 of those patients were reevaluated 5 years later (4,5). During the latter part of the 1980s, we conducted retinopathy screening clinics in three communities, evaluating 489 patients (6,7). In 1990 we repeated the 1980s study in the eight original communities, but with 61 freshly chosen primary care physicians and 440 patients (3,8). From 1980 to 1992, we met three times yearly with community-based diabetes advisory councils that we had formed in six communities, groups of health care professionals and patients who had an interest in improving diabetes care in their communities (3,4,9).

In the mid 1990s, two further large-scale evaluations of community-based patients were conducted, one involving 431 patients in four of the original communities (10) and a second (just recently completed) involving 1,203 patients receiving diabetes care and education at their local public health department (11). The aggregate experience of evaluating nearly 3,000 patients in 12 Michigan communities (the original 8 plus the 4 counties of the public health department project) and the many discussions with the six community advisory councils formed the basis for our framework of translational research.

If the road to adoption of new science were clear, the natural appeal of new science that might benefit a sick patient would be sufficient for applying it to all appropriate patients. Unfortunately, the road is frequently not clear and instead is blocked by numerous barriers. Some of these barriers to adoption are listed in Fig. 1. The translational strategy appropriate for negotiating a particular barrier depends upon the nature of the barrier and the unique influence that it may have on the adoption of a particular element of new science. Barriers are not universal in their effect on all science, nor are they universal in their ability to impair adoption by all potential recipients. The role of translational research is to analyze the kinds of barriers, the influence they have in particular situations, and the development of specific strategies to deal with these situations.

An important first step in determining a route around barriers is to precisely define the message to be translated. Translational activities that carry blurred

TRANSLATION
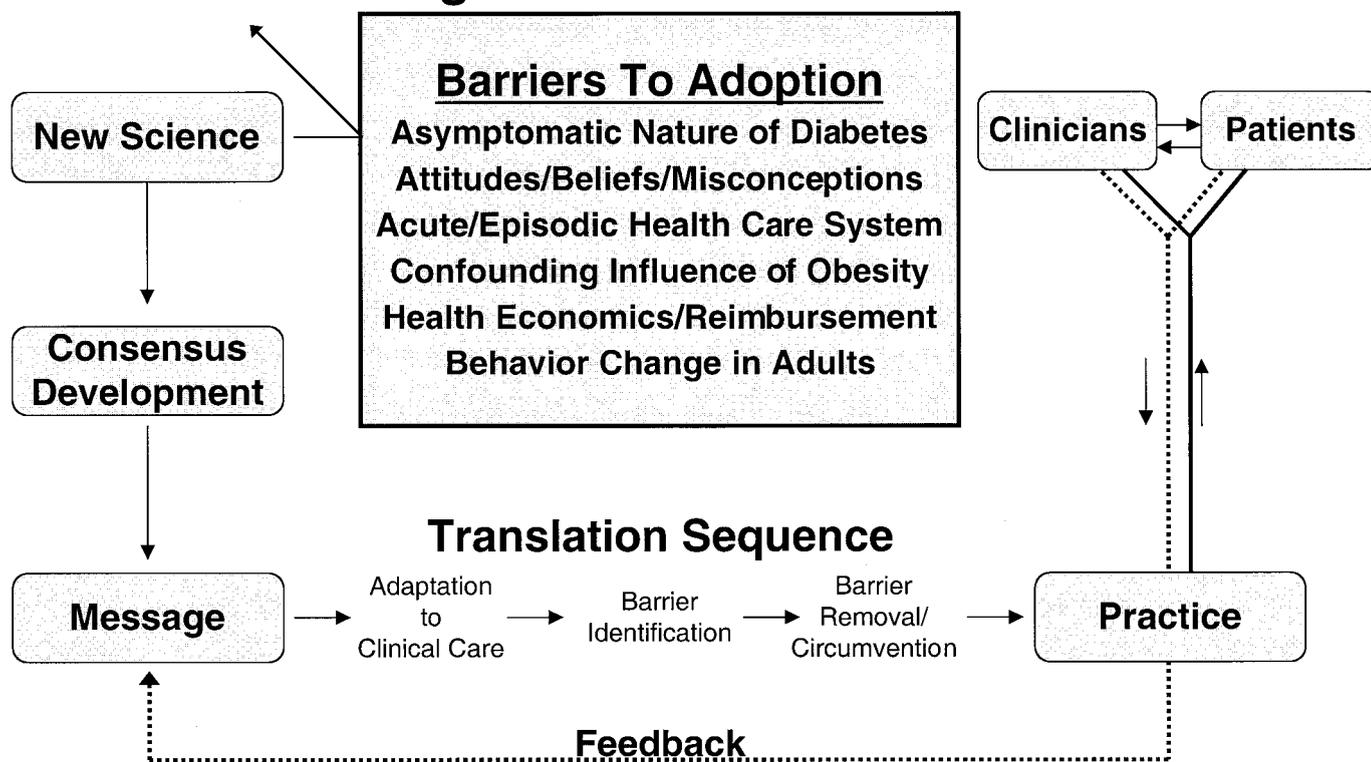## Putting New Science To Work

Figure 1—*Conceptual framework of translational research.*

or imprecise messages can only be expected to yield blurred and imprecise results. To clarify the message, a consensus that is evidence-based is necessary for identifying the content of translational activity. The steps of translating the message into practice are sequential across a continuum that includes *1*) adaptation of the research finding to clinical care, often denoted as "bench to bedside," *2*) specific barrier(s) identification applicable to a specific situation, and *3*) development of novel approaches to dealing with the barrier(s) so identified. A feedback loop, as shown in Fig. 1, continually informs the translational research team of both the degree of success they are having and the appearance of new barriers and problems not previously recognized.

Barriers to adoption of new science into widespread practice
The asymptomatic nature of diabetes. Diabetes is its own worst enemy. During the precomplication phase and the early phase of most complications, the type 2 diabetic patient is asymptomatic. Nonspe-

cific or vague symptoms that are diabetes-related go unrecognized. As a consequence, the driving forces that cause most people to seek medical care—unpleasant symptoms and fear of a serious illness—are not present. Valuable time, during which intensive and continuous preventive care could forestall or prevent complications, is lost. Furthermore, if preventive care is implemented, it must be maintained for years, and yet the only reward for this effort is for nothing adverse to happen. Sustained effort without a more tangible reward is very difficult.

Attitudes/beliefs/misconceptions. Although type 1 diabetes has been recognized for years as a life-threatening and therefore serious illness, type 2 diabetes has traditionally been lightly regarded by both provider and patient. The "little touch of sugar" phenomenon is a sad metaphor for the diminished reputation of type 2 diabetes as largely a patient lifestyle problem. Although the scientific evidence acquired over the past decade speaks volumes to the severity and life-shortening characteristics of type 2 diabetes, the atti-

tudes of both the clinicians trained before the current era and the general public have not changed.

Acute/episodic health care system. The current U.S. health care delivery system is primarily designed to react to acute and episodic events. The system does well with these responsibilities, although its efficiency, cost, and coordination leave room for improvement. However, chronic illnesses are not well served by the current system, as they require a long-term plan that is proactively implemented in a before-the-fact (preventive) manner. Diabetes is the classic example of a chronic illness that has a poor fit in the acute care–oriented U.S. health care system (12–14).

A particular weakness of the acute/episodic care system in this country, with regard to diabetes care, is the unenviable position of the primary care physician. The majority of care for the type 2 diabetic patient is provided by primary care physicians, as it should be. However, these physicians are usually working alone without the valued, but elusive, "diabetes

Table 1—*Barrier-free and barrier-impaired translation*

Characteristics of barrier-free adoption	Example of barrier-free adoption: CABG	Example of barrier-impaired adoption: medical nutritional therapy
It really works (efficacious)	Yes	Yes, if vigorously and continually pursued
Little or no controversy associated with widespread adoption	Only with regard to candidate selection*	Some (e.g., glycemic index, fat content)
Effort required is time-limited	Yes	No
Equally desired by provider and patient	Yes	No
Reimbursement mechanism in place	For most	Patchy, often patient pay

CABG, coronary artery bypass grafting. *See references 18 and 19.

team," and the economic requirement for fast-paced care virtually precludes the primary care physician from providing comprehensive, continuous, and proactive care for most type 2 (and also many type 1) diabetic patients. The diabetic care system in this country is truly broken, and if any of the scientific advances of the past decade are to touch the lives of most diabetic patients, a new care system must be implemented, one that is designed for the long-term management of chronic illness (15,16).

Confounding influence of obesity. The majority of the type 2 diabetic patient population is obese and has been for most of their adult life. Although there are many complex and poorly understood genetic reasons for lifelong obesity, health care providers, patients' families, and the general public attribute obesity to lifestyle problems. That is, the patient receives full blame for his/her body habitus and becomes a walking billboard for failure. To be sure, lifestyle factors do contribute to obesity and should be addressed in the therapeutic plan, but they are not the root cause of the obesity associated with type 2 diabetes. The misinterpretation on the part of health care providers of the etiology of obesity in the diabetic patient places a wall between provider and patient. Providers interpret obesity as evidence of patient noncompliance, which adversely affects the provider's care plan. For their part, patients avoid encounters with their health care providers about their diabetes because the experience is often demeaning and judgmental. "Diabesity" is diabolic.

Health economics/reimbursement. The economic forces at play in the U.S. health care delivery system are chaotic (17). A wide range of insurance plans creates unevenness of access to medical care across the U.S. population, and there are

millions of Americans without any insurance at all. For diabetes, reimbursement for what are widely considered essential services—physician, diabetes educator, and dietitian services as well as medications and supplies—is particularly uneven and rarely adequate for anyone. For example, the services of a dietitian may be included in the initial self-management training series but are rarely reimbursed for the ambulatory patient thereafter.

Behavior change in adults. This barrier needs no explanation. Adult behavior change, whether on the part of the provider or the patient, occurs only when a palpable reason for such change becomes apparent and the motivational forces to effect such change are created. In his recent review of efforts to control health care expenditures in this country, Blumenthal (17) stated succinctly, "Like most of humanity, health care professionals and organizations generally resist efforts to change their behavior unless they have strong incentives to do so. Providing such incentives would require reforms in the financing and organization of care." Translational efforts that overlook this factor will flounder.

An approach to translational research

The need for a translational strategy to bring about widespread adoption of new clinical science depends on the presence or absence of barriers to such adoption. In our experience, a new science message must possess five characteristics to be adopted in a barrier-free manner. These characteristics are listed in Table 1. Table 1 also compares an example of barrier-free adoption (coronary artery bypass grafting surgery) with one that has many barriers to adoption (medical nutritional therapy for the diabetic patient).

For translational efforts that are not

barrier-free (i.e., that do not possess all of the characteristics noted in Table 1), the following steps are recommended: first, identify the operative barriers and the specific settings to which they apply. This step is paramount to the success of any translational effort. Second, do not depend on information dissemination to solve the problem. Lack of knowledge is rarely the issue. Information dissemination publications, no matter how well designed, rarely remove barriers and are usually developed without awareness of the barriers that are present. Examples of well-intentioned, but generally ineffective, information dissemination publications include guidelines for clinical care and position papers published by prominent organizations. These can serve the role of consensus development (see Fig. 1), but they cannot transcend the translational sequence. The intended target audience often regards these messages as unfunded mandates. The third and final step is to design a novel translational strategy that the recipients will welcome because it lessens one of their problems without increasing any of them.

Many of the barriers to widespread adoption of new clinical science that would benefit people with diabetes could be addressed by implementing a chronic disease model of care in this country. Such a system could provide the previously identified essential services that people with diabetes will require for the rest of their lives, and it could provide appropriate payment for each of them. Although critics will point out that implementation of a chronic disease model will increase the cost of care provided to patients with diabetes, those costs pale in comparison to the costs of not doing so (20–22).

Commentary

References

1. Crofford OB: *Report of the National Commission on Diabetes to the Congress of the United States*. Washington, D.C., U.S. Govt. Printing Office, 1975 (DHEW publ. no. NIH 76–1018)
2. *Guidelines for Diabetes Research and Training Centers* (*DRTCs*): Bethesda, MD, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Dept. of Health and Human Services, March 1991
3. Hiss RG, Bowbeer MA, Hess GE, Stepien CJ, Armbruster BA, Eds.: *Diabetes in Communities II.* Ann Arbor, MI, University of Michigan, 1992
4. Hiss RG, Lengyel MC, Hess GE, Bowbeer LA, Eds.: *Diabetes in Communities I.* Ann Arbor, MI, University of Michigan, 1986
5. Anderson RM, Hess GE, Davis WK, Hiss RG: Community diabetes care in the 1980s. *Diabetes Care* 11:519–526, 1988
6. Stepien CJ, Bowbeer MA, Hiss RG: Screening for diabetic retinopathy in communities. *Diabetes Educ* 18:115–120, 1992
7. Hiss RG, Stepien CJ, Bowbeer MA: Community-based retinopathy clinics. *Diabetes Care* 15:144–145, 1992
8. Hiss RG, Anderson RM, Hess GE, Stepien CJ, Davis W: Community diabetes care: a 10-year perspective. *Diabetes Care* 17: 1124–1134, 1994
9. Hiss RG: Barriers to care in non-insulin-dependent diabetes mellitus: the Michigan experience. *Ann Intern Med* 124:146–148, 1996
10. Hiss RG, Gillard ML, Armbruster BA, McClure LA: Comprehensive evaluation of community-based diabetic patients: effect of feedback to the patients and their physicians: a randomized controlled trial. *Diabetes Care* 24:690–694, 2001
11. Hiss RG: County Health Department Diabetes Program. In *Proceedings of the Centers for Diseases Control & Prevention (CDC) Annual Diabetes Translation Conference, New Orleans, LA, 2000*
12. Wagner EH: Chronic disease management: what will it take to improve care for chronic illness? (Editorial) *Eff Clin Pract* 1:1–4, 1998
13. Glasgow RE, Wagner E, Kaplan RM, Vinicor F, Smith L, Norman J: If diabetes is a public health problem, why not treat is as one? A population-based approach to chronic illness. *Ann Behav Med* 21:159–170, 1999
14. Etzwiler DD: Chronic care: a need in search of a system. *Diabetes Educ* 23:569–573, 1997
15. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH: Collaborative management of chronic illness. *Ann Intern Med* 19:1097–1102, 1997
16. Hiss RG, Greenfield S: Forum Three: changes in the U.S. health care systems that would facilitate improved care for non-insulin-dependent diabetes mellitus. *Ann Intern Med* 124:180–183, 1996
17. Blumenthal D: Controlling health care expenditures. *N Engl J Med* 344:766–769, 2001
18. Hemingway H, Crook AM, Feder G, Banerjee S, Dawson JR, Magee P, Philpott S, Sanders J, Wood A, Timmis AD: Underuse of coronary revascularization procedures in patients considered appropriate candidates for revascularization. *N Engl J Med* 344:645–654, 2001
19. Shekelle PG: Are appropriateness criteria ready for use in clinical practice? (Editorial) *N Engl J Med* 344:677–678, 2001
20. *National Diabetes Fact Sheet*: *National Estimates and General Information on Diabetes in the United States*. Atlanta, GA, U.S. Dept. of Health and Human Services, Centers for Disease Control and Prevention, 1997
21. American Diabetes Association: Economic consequences of diabetes mellitus in the U.S. in 1997. *Diabetes Care* 21:296–309, 1998
22. Rubin JR, Altman WM, Mendelson DN: Health care expenditures for people with diabetes mellitus, 1992. *J Clin Endocrinol Metab* 78:809A–809F, 1994