COMMENTARY

Clinical significance of medical nutrition therapy in achieving diabetes outcomes and the importance of the process

LINDA M. DELAHANTY, MS, RD

Third-party payers, managed care organizations, and primary care physicians want to see evidence that medical nutrition therapy (MNT) makes a difference in patient outcomes. For patients with type 1 diabetes mellitus, these outcomes are lower glycated hemoglobin levels, less frequent hypoglycemia, and reduced incidence of diabetes complications such as retinopathy, nephropathy, neuropathy, and macrovascular disease. For dietitians, the challenge is to collect, organize, and present the evidence that links MNT to such outcomes. Dietitians have risen to this challenge, most recently by field-testing new Nutrition Practice Guidelines for Type 1 Diabetes, and the evidence is clearly mounting.

First, the results of the Diabetes Control and Complications Trial (DCCT) demonstrated conclusively that intensive diabetes therapy aimed at near normoglycemia effectively delays the onset and slows the progression of the long-term complications of type 1 diabetes (1). Furthermore, the DCCT Research Group has recommended that a comprehensive team provide intensive diabetes therapy using the expertise of dietitians, nurses, behaviorists, and physicians to ensure safe and effective treatment.

Second, recognition of the importance of diet in achieving hemoglobin A_{1c} (HbA_{1c}) goals in the DCCT provided dietitians with the opportunity to expand and redefine their role in intensive diabetes therapy. Dietitians became increasingly involved as integral team members and effective case managers. They reviewed food intake data in conjunction with blood glucose levels and insulin doses. In fact, during this 10-year study, DCCT dietitians provided a model for state-of-the-art MNT in intensive diabetes management. They demonstrated their expertise in explaining the relationship of dietary variables to blood glucose levels, insulin dosage, episodes of hypoglycemia or hyperglycemia, and weight changes (2). Moreover, they conducted ancillary research that documented that in the context of intensive diabetes therapy, adherence to certain dietary behaviors was associated with a 1 unit lower HbA_{1c} level (3).

More recently, the Diabetes Care and Education dietetic practice group developed nutrition practice guidelines to provide a systematic approach for implementing MNT based on the best available research and the experience of experts. The development and subsequent field testing of the Nutrition Practice Guidelines for Type 1 Diabetes have been critical steps in translating this model of comprehensive MNT into a wide range of clinical practice settings across the United States. More importantly, field-test results demonstrated the substantial impact of MNT on the clinical outcome of improved blood glucose control, thereby firmly establishing the link to significant patient outcomes.

L. M. Delahanty is a clinical nutrition specialist in the Department of Dietetics, Massachusetts General Hospital, 2 Emerson Pl, Boston, MA 02114.

CLINICAL SIGNIFICANCE OF FIELD-TEST RESULTS

Field-test results of the Nutrition Practice Guidelines showed that MNT implemented according to the guidelines resulted in significantly greater reductions in HbA_{1c} levels at 3 months than usual care (−1.00 vs −0.33). The mean HbA_{1c} level of patients who received practice guidelines care decreased from 9.15 to 8.15, whereas the mean HbA_{1c} for patients who received usual care decreased from 9.53 to 9.2 (4). How clinically significant and clinically meaningful are these results, and how good is the evidence?

First, it is helpful to consider the DCCT results as a frame of reference. At baseline, the mean HbA_{1c} level of patients in both conventional and intensively treated groups was 9.1. The mean HbA_{1c} level of patients who received intensive therapy decreased to 7.2, about 2 units lower (20.8% reduction) than that achieved with conventional treatment. These reductions in HbA_{1c} level resulted in a 47% to 76% reduction in risk for retinopathy, a 34% to 56% reduction in risk for nephropathy, and a 60% reduction in risk for clinically meaningful neuropathy for patients who received intensive therapy for 3 to 9 years (mean=6.5 years) (1). Further analyses of DCCT data have shown that for every 10% decrease in HbA_{1c} level, risk for progression of retinopathy decreased by 43%. Conversely, a 10% higher HbA_{1c} level was associated with a 66% greater risk of developing retinopathy, a 29% greater risk of developing microalbuminuria, a 57% greater risk of developing albuminuria, and a 43% greater risk of developing clinical neuropathy (5). Risk gradients for these outcomes as a function of mean HbA_{1c} level were similar in the conventional treatment group. This suggests that less intensive regimens that are able to achieve and sustain similar reductions in HbA_{1c} level would have similar benefits in terms of reduced risk of long-term complications (5).

In the DCCT, adherence to diet over a 1-year period was associated with an 11% lower HbA_{1c} level in the context of an intensive treatment regimen for diabetes that included blood glucose monitoring 4 or more times per day and use of an insulin pump or multiple (≥3) daily injections (3). It is promising to know that when dietitians provided MNT to patients with type 1 diabetes, using the Nutrition Practice Guidelines, the patients achieved an 11% lower HbA_{1c} level after 3 months of treatment in a variety of health care settings, including diabetes referral centers, endocrinology clinics, primary care and community health clinics, hospitals, and worksite clinics (4). The next step is to document that dietitians using the Nutrition Practice Guidelines can help patients sustain these substantial reductions in HbA_{1c} level over the longer periods of time, which are associated with impressive reductions in risk for long-term complications.

It is also important to note that for both conventional and intensive treatment groups in the DCCT, the risk of developing complications increased as a function of higher initial HbA_{1c} level (previous glycemic exposure) and longer duration of type 1 diabetes. In both treatment groups, there was a 50% greater risk of progression for each 1 unit higher screening HbA_{1c} level (eg, 9 vs 8). For patients with 1, 5, 10, and 15 years duration of type 1 diabetes, intensive therapy was estimated to reduce risk of retinopathy by 92%, 77%, 64%, and 53%, respectively (5).

Thus, the DCCT Research Group concluded that there is a continuing reduction in risk of complications as the level of HbA_{1c} is reduced; prior exposure to hyperglycemia has long-lasting effects; and continued exposure to hyperglycemia associated with conventional treatment results in progressive increase in risk over time. The group recommends that intensive diabetes therapy with the goal of achieving normal glycemia be implemented as early as possible in as many patients with type 1 diabetes as is safely possible (5). Clearly, dietitians who promote widespread use of the Nutrition Practice Guidelines in a variety of clinical practice settings take an important step in translating this recommendation. Promotion is imperative, especially because patients involved in the field testing reported a range of 2 months to 8 years since their last contact with nutrition counseling (4).

CLINICAL IMPLICATIONS FOR DIETITIANS

Once third-party payers, managed care organizations, and primary care physicians see the evidence that MNT has positive effects on patient outcomes, they are much more interested in supporting greater numbers of referrals and better reimbursement for MNT services. The field-test process and results clearly delineated the effects of using the practice guidelines on blood glucose outcomes and dietitian practices (ie, the process of implementing MNT). The following observations describe the distinguishing features of state-of-the-art quality diabetes care according to the Nutrition Practice Guidelines in comparison with usual care for diabetes.

- Dietitians using practice guidelines paid greater attention to glycemic control goals at the first visit.
- Dietitians using practice guidelines were more likely to do an assessment and discuss results with the patient at the first visit.
- Dietitians using practice guidelines spent more time with patients. The first visit was about 1 hour for dietitians using practice guidelines and ½ hour for dietitians providing usual care. In addition, dietitians using practice guidelines were more likely to have a 3rd or 4th visit in a 3-month period (4).

The importance of these observations should not be underestimated. When glycemic control goals become the focus of the nutrition visit, dietitians automatically shift the emphasis of their interaction away from evaluation of the diet according to nutrition recommendations toward evaluation of the diet as one of many factors that affect blood glucose patterns. This change in the way dietitians use their knowledge and skills occurred in the DCCT as well, when dietitians were challenged to use a variety of strategies to help patients achieve the goal of normoglycemia.

Detailed assessments beyond food intake are required to facilitate problem solving and help patients match insulin delivery to changes in food intake, activity, and other lifestyle factors. When dietitians extend their assessments beyond food intake, they redefine their relationships with their clients. In the process, dietitians are less likely to be perceived as "food police" and more likely to be viewed as important advocates of diabetes control. The more dietitians use their knowledge and skills to show their clients how variations in food intake, combined with insulin and activity levels, affect blood glucose levels, the more their clients see the evidence that MNT is an important part of quality diabetes care. Carbohydrate counting is a particularly useful way to help patients understand the effects of food intake on blood glucose levels because it allows the dietitian to transform the food consumed in each meal and snack into a number that patients can easily relate to variations in blood glucose levels and insulin doses.

It is not surprising that more comprehensive assessments that integrate blood glucose data, food records, and changes in activity level and insulin doses take more time. In the current health care environment, where demands for productivity are high, dietitians must convey the message that quality diabetes care takes time. Dietitians need to use the Nutrition Practice Guidelines and the field-test results as references to support the number and frequency of visits as well as the time necessary at each visit to provide quality MNT.

When third-party payers, managed care organizations, and primary care providers finally realize that they can allocate less costly resources in the form of dietitian services as a way to prevent the need for more costly resources (eg, laser treatment, dialysis) to treat the long-term complications of diabetes, dietitians will be supported in providing quality diabetes care to their patients. Until then, dietitians must continue to communicate and document how MNT lowers HbA_{1c} levels and the frequency of severe hypoglycemia. These efforts, it is hoped, will justify the need for the more frequent follow-up of these patients that is necessary to sustain the benefits achieved by MNT.

NEXT STEPS FOR DIETITIANS

Dietitians need to continue to collect, organize, and present research and clinical practice data that adds to the evidence that MNT affects diabetes outcomes. Some of the necessary steps are discussed next.

All dietitians who work with patients with type 1 diabetes should regard the Nutrition Practice Guidelines as a gold standard for quality diabetes care. They should take whatever steps are necessary to ensure that the MNT that they provide emulates the practice guidelines process and achieves similar outcomes. (Dietitians should be aware of the normal range for HbA_{1c} levels in their reference laboratory as they evaluate HbA_{1c} outcomes achieved.)

Case by case, dietitians need to clearly demonstrate to each patient, referring physician, and third-party payer that MNT affects diabetes outcomes. This can be done through personal interactions, letters, telephone calls, or team meetings. Additional documentation can appear in the medical record, in treatment plans submitted to insurance companies requesting additional dietitian visits, and in an outcomes notebook that

describes cases in which MNT achieved positive patient outcomes.

Dietitians should conduct audits to document the degree to which the Nutrition Practice Guidelines are followed, the effect of MNT using the guidelines on HbA_{1c} level and frequency of hypoglycemia, and the extent to which clients with type 1 diabetes are receiving MNT from dietitians.

Every dietitian who cares for patients with type 1 diabetes should seek to change patient referral patterns by using results of the field testing and audits to market the benefits of MNT to patients, primary care physicians, and third-party payers.

When these steps are carried out successfully, dietitians will find that patients will increasingly request dietitian services from physicians and insurers. Likewise, physicians and insurers will increasingly allocate resources and referrals to dietitians for their patients who have diabetes.

References

1. DCCT Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med.* 1993;329:977-986.

2. DCCT Research Group. Expanded role of the dietitian in the Diabetes Control and Complications Trial: implications for clinical practice. *J Am Diet Assoc.* 1993;93:758-764.

3. Delahanty LM, Halford BN. The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the Diabetes Control and Complications Trial. *Diabetes Care.* 1993;16:1453-1458.

4. Kulkarni K, Castle G, Gregory R, Holmes A, Leontos C, Powers M, Snetselaar L, Splett P, Wylie-Rosett J, for the Diabetes Care and Education dietetic practice group. Nutrition Practice Guidelines for Type 1 Diabetes positively affect dietitian practices and patient outcomes. *J Am Diet Assoc.* 1998;98:62-70.

5. DCCT Research Group. The relationship of glycemic exposure (HbA_{1c}) to the risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. *Diabetes.* 1995;44:968-983.

OF INTEREST TO YOU

New etiologic classification of diabetes mellitus

In July 1997, the American Diabetes Association released the "Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus" (*Diabetes Care.* 1997;20:1183-1197). This report signaled a move away from a system in which diabetes was classified by the type of treatment used in its management to a system based primarily on disease etiology. The following list, adapted from the report, shows the detailed etiologic classifications of diabetes mellitus. Most cases of diabetes fall into the broad etiopathogenic categories of type 1 and type 2 diabetes mellitus. The report also notes that patients with any type of diabetes may require insulin therapy at some stage of their disease; however, such use of insulin does not, of itself, classify the patient.

1. Type 1 diabetes (β-cell destruction, usually leading to absolute insulin deficiency)
   - A. Immune mediated
   - B. Idiopathic
2. Type 2 diabetes (may range from predominantly insulin resistance with relative insulin deficiency to a predominantly secretory defect with insulin resistance)
3. Other specific types
   - A. Genetic defects of β-cell function
     1. Chromosome 12, HNF-1α (formerly MODY3)
     2. Chromosome 7, glucokinase (formerly MODY2)
     3. Chromosome 20, HNF-4α (formerly MODY1)
     4. Mitochondrial DNA
     5. Others
   - B. Genetic defects in insulin action
     1. Type A insulin resistance
     2. Leprechaunism
     3. Rabson-Medenhall syndrome
     4. Lipoatrophic diabetes
     5. Others
   - C. Diseases of the exocrine pancreas
     1. Pancreatitis
     2. Trauma/pancreatectomy
     3. Neoplasia
     4. Cystic fibrosis
     5. Hemochromatosis
     6. Fibrocalculous pancreatopathy
     7. Others
   - D. Endocrinopathies
     1. Acromegaly
     2. Cushing's syndrome
     3. Glucagonoma
     4. Pheochromocytoma
     5. Hyperthyroidism
     6. Somatostatinoma
     7. Aldosteronoma
     8. Others
   - E. Drug- or chemical-induced
     1. Vacor
     2. Pentamidine
     3. Nicotinic acid
     4. Glucocorticoids
     5. Thyroid hormone
     6. Diazoxide
     7. β-adrenergic agonists
     8. Thiazides
     9. Dilantin
     10. α-Interferon
     11. Others
   - F. Infections
     1. Congenital rubella
     2. Cytomegalovirus
     3. Others
   - G. Uncommon forms of immune-mediated diabetes
     1. "Stiff-man" syndrome
     2. Anti-insulin receptor antibodies
     3. Others
   - H. Other sometimes diabetes-associated genetic syndromes
     1. Down syndrome
     2. Klinefelter's syndrome
     3. Turner's syndrome
     4. Wolfram's syndrome
     5. Friedreich's ataxia
     6. Huntington's chorea
     7. Lawrence Moon Beidel syndrome
     8. Myotonic dystrophy
     9. Porphyria
     10. Prader Willi syndrome
     11. Others
4. Gestational diabetes mellitus