

Let food be thy medicine, Thy medicine be thy food

Hippocrates

Importance of nutrition is known to man since time immortal. In fact, before modern medicine came into being, various foods were used as medicine. Older

medical sciences like Chinese medicine and Ayurveda put in a lot of emphasis on foods and dietary restrictions as a mode of therapy.

The term “medical nutrition therapy” (MNT) was introduced in 1994 by then the American Dietetic

Table 1: MNT Provided by RDs

Application of Nutrition Care Process	MNT Provided by RD (for individual)
Nutrition screen/referral	The physician provider sends RD written referral for MNT for diabetes. The referral includes information regarding current laboratory test results, medications, and other medical diagnoses.
Nutrition assessment	The RD performs a comprehensive nutrition assessment utilizing the <i>Diabetes Type 1 and 2 Evidenced-Based Nutrition Practice Guideline for Adults</i> and Toolkit, as well as the best available current knowledge and evidence, client data, medical record data, and other resources.
Nutrition diagnosis	After analyzing assessment data, the RD makes initial nutrition diagnosis(es); for example, inconsistent carbohydrate intake (diagnosis code NI-5.8.4). inconsistent timing of carbohydrate intake throughout the day. day to day, or a pattern of carbohydrate intake that is not consistent with recommended pattern based on physiological or medication needs.
Nutrition intervention	The RD provides counseling and. with the client, determines interventions using the cognitive behavioral model, including problem solving, motivational interviewing, goal setting, and self-monitoring.
Nutrition monitoring and evaluation	The RD monitors A1C. microalbuminuria. BMI. serum lipid levels, goals for food plan/intake, activity, and other behavior changes. The RD implements changes to MNT (e.g.. patient education goals, nutrition intervention, and counseling) in future visits based on outcomes and assessments at each visit.
Nutrition documentation (supports all steps of the Nutrition Care Process)	The RD documents MNT initial assessment, nutrition diagnosis(es). and intervention(s); shares with referring physician: and keeps a copy on file.
Outcome management systems	Based on RD analysis, critical thinking, and review of data from the patient’s medical history and other health care professionals, the RD aggregates individual and population outcomes data: analyzes and shares with quality improvement department/group as indicated: and implements improvements to MNT services based on results.
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Table 1: Summary of evidence for nutrition therapy in diabetes			
Type of intervention (Reference)	Study length	No. of subjects	Outcome
Randomized controlled trials			
MNT only			
UKPDS Group, 1990 ⁵	3 months	3,042 newly diagnosed patients with type 2 diabetes	In 2,595 patients who received intensive nutrition therapy (447 were primary diet failures), HbA _{1c} decreased 1.9% (8.9 to 7%) during the 3 months before study randomization
Franz et al., 1995 ⁶	6 months	179 persons with type 2 diabetes; 62 in comparison group; duration of diabetes: 4 years	HbA _{1c} at 6 months decreased 0.9% (8.3 to 7.4%) with nutrition practice guidelines care; HbA _{1c} decreased 0.7% (8.3 to 7.6%) with basic nutrition care; HbA _{1c} was unchanged in the comparison group with no nutrition intervention (8.2 to 8.4%)
Kulkarni et al., 1998 ⁷	6 months	54 patients with type 1 diabetes; newly diagnosed	HbA _{1c} at 3 months decreased 1.0% (9.2 to 8.2%) with nutrition practice guideline care and 0.3% (9.5 to 9.2%) in usual nutrition care group
MNT in combination with DSMT			
Glasgow et al., 1992 ⁸	6 months	162 type 2 diabetic patients over the age of 60 years	HbA _{1c} decreased from 7.4 to 6.4% in control-intervention crossover group while the intervention-control crossover group had a rebound effect; intervention group had a multidisciplinary team with an RD who provided MNT
Sadur et al., 1999 ⁹	6 months	185 adult patients with diabetes	97 patients received multidisciplinary care and 88 patients received usual care by primary care. MD; HbA _{1c} decreased 1.3% in the multidisciplinary care group compared with 0.2% in the usual care group; intervention group had a multidisciplinary team with an RD who provided MNT
Observational studies			
Cross-sectional survey			
Delahanty and Halford, 1993 ¹⁰	9 years	623 patients with type 1	Patients who reported following their meal plan >90% of the time had an average HbA _{1c} level 0.9% lower than subjects who followed their meal plan <45% of the time
Expert opinion			
DCCT Research Group, 1993 ¹¹			DCCT group recognized the importance of the role of the RD in educating patients on nutrition and adherence to achieve A1c goals; RD is key member of the team
Franz, 1994 ¹²			DCCT made apparent that RDs and RNs were extremely important members of the team in co-managing and educating patients

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Type of intervention (Reference)	Study length	No. of subjects	Outcome
Chart audit			
Johnson and Valera, 1995 ¹³	6 months	19 patients with type 2 diabetes	At 6 months, blood glucose levels decreased 50% in 76 of patients receiving nutrition therapy by an RD. Mean total weight reduction was ~5 pounds
Johnson and Thomas, 2001 ¹⁴	1 year	162 adult patients	MNT intervention decreased HbA _{1c} levels 20%, bringing mean levels <8% compared with subjects without MNT intervention who had a 2% decrease in HbA _{1c} levels
Retrospective chart review			
Christensen et al., 2000 ¹⁵	3 months	102 patients (15 type 1 and 85 type 2 diabetic patients with duration of diabetes >6 months)	HbA _{1c} levels decreased 1.6% (9.3 to 7.7%) after referral to an RD
Meta-analyses of trials			
Brown, 1996, 1990 ^{16,17}		89 studies	Educational intervention and weight loss outcomes; MNT had statistically significant positive impact on weight loss and metabolic control
Padgett et al., 1988 ¹⁸		7,451 patients	Educational and psychosocial interventions in management of diabetes (including MNT, SMBG, exercise, and relaxation); nutrition education showed strongest effect
Norris et al., 2001 ¹⁹		72 studies	Positive effects of self-management training on knowledge, frequency and accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control were demonstrated in studies with short follow-up (<6 months)

Association to better articulate the nutrition/ diet therapy process. It is defined as the use of specific nutrition therapy to treat an illness, injury, or other condition. Medical nutrition therapy involves two phases: 1) assessment of the nutritional status of the client and 2) treatment, which includes nutrition therapy, counselling, and the use of specialized nutrition supplements if required or indicated.¹

MNT incorporates a process that, when implemented correctly, includes: 1) an assessment of the patient's nutritional status and disease specific self-management knowledge and skills; 2) identification and negotiation of individually designed nutrition goals; 3) nutrition intervention involving a careful match of both a meal-planning approach and educational materials to the patient's needs, with flexibility in mind to have the plan be implemented by the patient; and 4) evaluation of outcomes and on-going monitoring. These four steps are necessary to assist patients in acquiring and maintaining the knowledge, skills, attitudes, behaviours, and

commitment to successfully meet the challenges of daily self-management.²

In general, MNT consists of many, one-on-one sessions between an RD and a patient, in which the RD performs the nutrition assessment, diagnosis, counselling, and other therapy services according to the "MNT Evidence-Based Guide for Practice/Nutrition Protocol" or according to the best available current evidence in the nutrition science. As part of nutrition monitoring and evaluation, the RD monitors biochemical factors, as well as lifestyle factors such as dietary intake. Depending on how many sessions the RD has with the patient, these factors are used to evaluate the effectiveness of interventions in meeting goals. Diagnoses and interventions might then be revised based on nutrition-related outcomes. Therefore, MNT for nutrition-related disorders is not necessarily a linear process. Counselling in MNT is individualized and tailored to a patient's clinical and lifestyle needs.³⁻⁴

MEDICAL NUTRITION THERAPY IN DIABETES

Historically, a challenge to proving the benefit of MNT has been the lack of clinical and behavioral research. In recent years, however, evidence-based outcomes research that documents the clinical effectiveness of MNT in diabetes has been reported. The evidence from randomized controlled trials, observational studies, and meta-analyses that nutrition intervention improves metabolic outcomes, such as blood glucose and HbA_{1c} levels in individuals with diabetes, is summarized in Table 1.⁵ Metabolic outcomes were improved in nutrition intervention studies, both as independent MNT and as part of overall DSMT. This evidence also suggests that MNT is most beneficial at initial diagnosis, but is effective at any time during the disease process, and that on going evaluation and intervention are essential.

Brown and colleagues^{6,7} completed a meta-analysis of 89 studies of educational interventions and outcomes specific to weight loss in diabetes care. An important highlight of the results from these findings is that nutrition therapy alone had the largest statistically significant impact on weight loss and metabolic control. The combination strategy of nutrition and behavioral therapy plus exercise had a small effect on body weight, but a very significant impact on HbA_{1c}. These findings lend support to the effectiveness of diabetes patient education in improving patient outcomes.

In a review of the effects of educational and psychosocial interventions in the management of diabetes (including education and skill training in diabetes, nutrition, self-monitoring, exercise, and relaxation) in 7,451 patients, Padgett et al.⁸ found that nutrition education showed the strongest effect and relaxation training showed the weakest effect.

Medical Nutrition therapy in Prediabetes: Studies^{9,10} have shown that type 2 diabetes can be prevented by lifestyle interventions in subjects who are at high risk for diabetes. In the Finland Diabetes Prevention Study, published in May 2001,⁹ 522 overweight subjects with impaired glucose tolerance were randomised in to an intervention or control group. The intervention group received individualized counseling to reduce weight (seven sessions the first year and every 3 months for the remainder of study), to decrease intake of total and saturated fat, and to increase intake of fiber and physical activity. Subjects were followed for 3.2 years and received an oral glucose tolerance test (OGTT) annually. Results at the end of 1 year showed a weight loss of 4.2 and 0.8 kg for the intervention and control groups, respectively. The incidence of diabetes after 4 years was 11% in the intervention group and 23% in the control group. During the study, the risk of diabetes was reduced by 58% in the intervention group.

The initial results of a similar study, the Diabetes Prevention Program (DPP), a multicenter National Institutes of Health study, suggest that type 2 diabetes can be prevented and delayed.¹⁰ The DPP was a randomized trial involving more than 3,200 adults who were 25 years

of age and who were at increased risk of developing type 2 diabetes (i.e., having impaired glucose tolerance, being overweight, and having a family history of type 2 diabetes). The study involved a control group (standard care plus a placebo pill) and two intervention groups: one that received a intensive lifestyle modification (healthy diet, moderate physical activity of 30 min/day for 5 days/ week) and one that received standard care plus an oral diabetes agent (metformin). The major study findings indicate that participants in the intensive lifestyle modification group reduced their risk of developing diabetes by 58% compared with the medication intervention group who reduced their risk by 31%. Even more dramatic was the finding that individuals over 60 years of age in the intensive lifestyle modification group decrease their incidence of developing type 2 diabetes by 71%.

MEDICAL NUTRITION THERAPY IN CARDIO VASCULAR DISEASES

Epidemiologic, experimental, and clinical trial evidence have demonstrated a relationship between diet, nutrients, and blood lipid levels; blood pressure; and coronary heart disease (CHD). Evidence from prospective studies have shown that dietary patterns are associated with risk and, specifically, that dietary patterns high in saturated fatty acids, cholesterol, and animal fat increase low-density lipoprotein (LDL) cholesterol levels.¹¹ Clinical trials involving dietary interventions to reduce total fat, saturated fatty acids (SFAs), and cholesterol have further demonstrated favorable responses among dyslipidemic and normolipidemic individuals. The National Cholesterol Education Program Adult Treatment Panel III (ATP III) reviewed the evidence in 1999 and recommended the Therapeutic Lifestyle Changes diet and lifestyle.¹² Since 2000 research has shifted to other dietary factors, including whole foods and favorable dietary patterns that likewise appear to affect blood lipid levels. As potential nonlipid biomarkers for CVD have also been identified (ie, blood pressure, thrombogenicity, and inflammation) research interest about how diet might influence these factors has increased.^{13,14}

Numerous dietary factors/nutrients have been identified that affect CVD risk factors. Because most patients present with multiple risk factors, including the diagnosis of metabolic syndrome, an individualized dietary pattern is recommended to optimize CVD risk factor reduction while meeting nutrient needs. RDs are uniquely skilled in this process. Dietary considerations to help achieve these goals include a diet:

- low in SFA (7%), TFA (1% calories), and dietary cholesterol (200 mg);
- rich in n-3 fatty acids, EPA, and DHA (500 mg/day for primary prevention; 1 g/day for secondary prevention; and 2 to 4 g/day for TG lowering; physician supervision is indicated for patients); consume fish at least twice a week;
- ample in total dietary fiber (30 g/day) with emphasis on soluble fiber;

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- that includes unsalted nuts (1 oz) as tolerated and limited by energy needs; consider other vegetable protein sources such as soy and legumes;
 - that includes skim/low-fat dairy foods and/or other calcium/vitamin D-rich sources;
 - rich in vitamins, minerals, phytochemicals, and antioxidants from multiple servings of fruits and vegetables and low in sodium (2,300 mg/day);
 - rich in B vitamins and fiber from food sources such as whole grains and vegetables;
 - that may include plant sterols and stanols in high risk individuals; and
 - that achieves a healthful body weight and energy balance with the recommended dietary intervention by increasing physical activity and maintaining an adequate energy intake. MNT represents the ideal approach to treating these patients.¹⁵

CONCLUSION

Lifestyle intervention, of which medical nutrition therapy is a cornerstone is essential both in prevention and treatment of many metabolic diseases.

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