Academy of Nutrition and Dietetics Nutrition Practice Guideline for Type 1 and Type 2 Diabetes in Adults: Systematic Review of Evidence for Medical Nutrition Therapy Effectiveness and Recommendations for Integration into the Nutrition Care Process

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THE PREVALENCE OF DIAGnosed diabetes and prediabetes in the United States increases dramatically with each updated report. In 2011-2012, the estimated prevalence of diagnosed diabetes was 12% to 14% among US adults, with a higher prevalence among non-Hispanic black, non-Hispanic Asian, and Hispanic individuals.[1] The prevalence of prediabetes was 37% to 38% in the overall population and, consequently, 49% to 52% of the US population was estimated to have either diabetes or prediabetes. It is encouraging to note that rates of diabetes-related complications have declined substantially in the past 2 decades (depending on the complication, ranging from −67.8% to −28.3%); however, a large burden of the disease persists because of the continued increase in the prevalence of diabetes.[2]

Medical nutrition therapy (MNT) is essential for the optimal management of type 1 and type 2 diabetes in adults. Recommendations and practice guidelines for diabetes medical care from professional organizations acknowledge the importance of nutrition therapy as the foundation for effective comprehensive initial and ongoing diabetes care management.[3-7] The American Diabetes Association states that, "…each person with diabetes be actively engaged in the collaborative development of an individualized eating plan…It is important that each member of the health care team be knowledgeable about nutrition therapy principles for people with all types of diabetes and be supportive of their implementation."[3] To do this, all health professionals involved in diabetes care must have access to evidence for effective diabetes MNT provided by registered dietitian nutritionists (RDNs) and the evidence-based nutrition practice guideline (EBNPG) implemented for nutrition care.[8] To assist in accomplishing these essential goals, this review and a separate review of diabetes nutrition interventions[9] provides a broader audience of RDNs and health professionals with critical evidence and nutrition practice guideline (NPG) recommendations and, importantly, a summary of the Academy of Nutrition and Dietetics (Academy) Evidence Analysis Library (EAL) EBNPG for type 1 and type 2 diabetes in adults.[8]

The Academy has adopted a five-step process to conduct reviews for the EAL and to develop EBNPG for RDNs and other members of health care teams:

- Step 1: Formulate the evidence analysis questions.
- Step 2: Gather and classify evidence (data collection).
- Step 3: Critically appraise each article (risk of bias).
- Step 4: Summarize the evidence.
- Step 5: Write and grade the conclusion statement.[10]

Based on the evidence reviews and the conclusion statements, NPG recommendations are made and integrated into the Nutrition Care Process.

The Academy's EBNPG for type 1 and type 2 diabetes in adults is published in the EAL.[8] Objectives for the EAL review and guideline include to guide decisions that integrate medical, nutrition-based, and behavior strategies; to reduce variations in practice among RDNs; and to develop a guideline for interventions that have measurable clinical outcomes.[8] This review summarizes the evidence for the effectiveness of diabetes MNT provided by RDNs, NPG recommendations, and the integration of the recommendations into the Nutrition Care Process (nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation). The previous review of evidence and EBNPG for adults with diabetes was

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published in the EAL in 2008[11] and published in the *Journal of the American Dietetic Association* in 2010.[12]

REVIEW METHODOLOGY

The Academy's Evidence Based Practice Committee appointed an expert panel to update the 2008 diabetes NPG. The expert committee followed the EAL's rigorous review and guidelines development processes summarized above to develop the guidelines.[10]

Subtopics and Questions

The expert panel identified subtopics and questions that address the major MNT issues for diabetes in adults. A total of 13 subtopics and 19 questions were identified. Five subtopics and five questions related to the effectiveness of MNT provided by RDNs are addressed in this article. Eight subtopics and 14 questions related to nutrition interventions are addressed in another article.[9] The following five primary questions were identified related to the effectiveness of diabetes MNT.

In adults with type 1 and type 2 diabetes:

1. How effective is MNT provided by an RDN on glycemia (glycated hemoglobin [HbA1c] and/or glucose)?
2. How effective is MNT provided by an RDN on cardiovascular disease (CVD) risk factors (lipid levels and/or blood pressure)?
3. How effective is MNT provided by an RDN on weight management (kilograms, waist circumference [WC], and/or body mass index [BMI])?
4. What influence does MNT provided by an RDN have on medication use (insulin and/or other glucose-lowering medications)?
5. What influence does MNT provided by an RDN have on quality of life?

Two secondary questions were also identified: How many encounters with an RDN are needed for the implementation of effective MNT, and What types of MNT interventions implemented by RDNs are effective?

Study Selection

An intensive electronic search was conducted using PubMed and Medline, Cumulative Index of Nursing and Allied Health, Food Science, Sport Discuss, Embase, and the EBSCO Discovery Service databases. The list of titles and abstracts were independently reviewed and titles and abstracts selected that appeared to meet inclusion criteria. The study inclusion criteria included English language; adults aged 18 years or older with type 1 or type 2 diabetes; outpatient and ambulatory care; randomized controlled trials (RCTs), cohort studies, nonrandomized clinical studies, and observational/noncontrolled trials; study duration of at least 12 weeks; 10 or more subjects per study group; and 80% completion rate. In addition to the criteria listed, studies on the effectiveness of MNT must also have documented that MNT is provided by an RDN using an individualized application of the Nutrition Care Process.

Articles were marked for inclusion or exclusion (along with the reason) and any differences were resolved by discussion with a third reviewer. Full texts of articles meeting inclusion criteria were ordered and reviewed and a final list of included articles developed.

Sixty studies met inclusion criteria and were reviewed.[13-73] Twenty-two were related to effectiveness of MNT provided by RDNs[13-35] and 38 studies were related to diabetes nutrition interventions.[36-73] The Figure illustrates the search strategy and study selection process.

Data Extraction and Quality Assessment

Using a standardized online data extraction tool,[10] key data were extracted from each included study: study design, purpose of the study, inclusion and exclusion criteria, country where study was performed, blinding, funding, sample (ie, size, age, ethnicity, and sex), dropout rate, interventions, outcomes measured (HbA1c, glucose values, lipid profile, blood pressure, insulin levels, and weight status), and influence of MNT on medication use and quality of life. From the effectiveness studies, number of RDN encounters, length of time for encounters, and types of nutrition therapy interventions were also extracted. A total of 22 primary studies (18 RCTs, 1 nonrandomized clinical study, and 3 cohort studies, no systematic reviews and no meta-analyses) were analyzed for the effectiveness questions. For the nutrition therapy intervention questions, a total of 38 primary studies (33 RCTs, 4 observational, and 1 systematic review) were analyzed.[9] Risk of bias was assessed for each study using the Academy's quality criteria checklist.[10]

Data Synthesis and Grade

From the summary of evidence, the committee wrote conclusion statements that aggregated the overall evidence presented in the summary tables and answered the research question.[8] Conclusion statements were graded as I (good/strong), II (fair), III (limited/weak), IV (expert opinion only), and V (grade not assignable). From the review and conclusion statements, recommendations were written and rated: strong (quality of evidence is grade I or II), fair (quality of evidence is II or III), weak (quality of evidence is either suspect or well-done studies show little clear advantage to one approach versus another), consensus (expert opinion, grade IV), and insufficient evidence (lack of pertinent evidence, grade V, and/or unclear balance between benefits and harms). Recommendations were also rated as imperative (applies to all members of the specified guidelines population generally) or conditional (applies only under certain circumstances).

EFFECTIVENESS EVIDENCE: MNT IMPLEMENTED BY RDNs FOR TYPE 1 AND TYPE 2 DIABETES IN ADULTS

It is essential that Academy NPGs for any disease/condition be developed based on evidence for the effectiveness of MNT provided by RDNs for that disease/condition. Use of effectiveness evidence facilitates the integration of NPG into the Nutrition Care Process and the successful implementation of the NPG by RDNs. To provide evidence of effectiveness of diabetes MNT provided by RDNs, five primary questions listed in the Review Methodology section were identified. Table 1 summarizes the studies meeting inclusion criteria for effectiveness evidence of MNT reviewed in this article.[13-35] Conclusion statements for the evidence effectiveness of the MNT and nutrition intervention questions are in Table 2. Based on the evidence reviewed and conclusion statements, NPG recommendations for type 1 and