Disorders of Lipid Metabolism

DLM: Introduction (2011)

Guideline Title

Disorders of Lipid Metabolism (2011) Evidence-Based Nutrition Practice Guideline

Guideline Narrative Overview

This guideline updates the 2005 ADA Disorders of Lipid Metabolism Evidence-based Nutrition Practice Guideline.

The objective of the Disorders of Lipid Metabolism (DLM) guidelines is to provide Medical Nutrition Therapy (MNT) guideline recommendations that support improvement in lipid levels and risk factor management of cardiovascular disease (CVD). The focus of this guideline is on the treatment of lipid metabolism disorders - that is, patients with elevated low-density lipoprotein cholesterol (LDL-C), total cholesterol (TC), or triglyceride (TG) levels, and low high-density lipoprotein cholesterol (HDL-C) levels, as well as coronary health issues such as metabolic syndrome and hypertension (HTN).

Disorders of Lipid Metabolism are recognized risk factors for atherosclerotic diseases, including coronary heart disease (CHD). The relationship of TC and LDL-C subsequent to CHD events has been well documented in several major observational and clinical studies.[1] An increasing body of evidence links dyslipidemias to the occurrence of stroke.[2] Clinical trials have found that lowering LDL-C lowers coronary events. Evidence is also accumulating that risk for CHD can be reduced beyond LDL-lowering therapy by modification of other risk factors. One potential secondary target of therapy is the metabolic syndrome, which represents a constellation of lipid and non-lipid risk factors of metabolic origin. National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III recognizes the metabolic syndrome as a secondary target of risk reduction therapy.[3] This guideline includes metabolic syndrome management as a consideration. Although the terms CVD and CHD are sometimes used interchangeably, this guideline intentionally differentiates relationships within the overall category of CVD. According to the American Heart Association, CHD is a disease of the heart caused by atherosclerotic narrowing of the coronary arteries likely to produce angina pectoris or heart attack. Cardiovascular disease can include HTN, atherosclerotic disease, heart failure and less common disorders, such as congenital heart defects. Disorders of Lipid Metabolism can contribute to atherosclerotic disease that may manifest in CHD, stroke, abdominal aortic aneurysm and peripheral vascular disease. Hypertension can also contribute to atherosclerotic disease. Topics included in this guideline are:

- DLM: Referral to a Registered Dietitian for Medical Nutrition Therapy
- DLM: Nutrition Assessment
- DLM: Determining Energy and Macronutrient Needs
- DLM: Major Fat Components*
- DLM: Carbohydrate, Protein and Fiber
- DLM: Omega-3 Fatty Acids *
- DLM: Plant Stanols And Sterols*
- DLM: Nuts*
- DLM: Alcohol*
- DLM: Antioxidant Supplements (Vitamin E, Vitamin C, and Beta-Carotene)
- DLM: Homocysteine, Folate, Vitamin B_6 or B_{12}*
- DLM: Coenzyme Q10
- DLM: Physical Activity
- DLM: Hypertension
- DLM: Metabolic Syndrome
- DLM: Triglycerides and Macronutrients
- DLM: Triglycerides and Omega-3 Fatty Acid Supplements
- DLM: Nutrition Monitoring and Evaluation

*In addition to an update of the evidence analysis related to the DLM topics above, results of this review were supplemented by a later evidence review of the literature conducted by the United States Department of Agriculture (USDA) and the 2010 Dietary Guidelines Advisory Committee (DGAC). Therefore, there may be some overlap of the studies included in the evidence analysis.

Guideline Development

This guideline is intended for use by Registered Dietitians (RDs) involved in providing MNT to individuals with DLM. The application of the guideline must be individualized to assist the RD to successfully integrate MNT into the overall medical management of individuals with DLM. The recommendations in the guideline were based on a systematic review of the literature.

The recommendations are based on the work performed by the American Dietetic Association (ADA) DLM expert working group. The number of supporting documents for these topics is below:

- *Recommendations:* Eighteen (18)
- *Conclusion Statements:* One hundred and seventeen (117)
- *Evidence Summaries:* Eighty-nine (89)
- *Article Worksheets:* Four hundred and thirty-four (434).

At the time of this publication, the majority of research has been completed in the adult population; therefore, clinical judgment is crucial in the application of these guidelines for individuals in other age groups and settings.

Application of the Guideline

This guideline will be accompanied by a set of companion documents to assist the practitioner in applying the guideline. A toolkit will contain materials such as the MNT protocol, documentation forms, outcomes management tools, client education resources and case studies. The toolkit is currently under development and will undergo pilot-testing through the ADA's Dietetic Practice-Based Research Network prior to publication.

Revision

The literature search will be repeated for each guideline topic on an annual basis to identify new research that has been published since the previous search was completed. Based on the quantity and quality of new research, a determination will be made about whether the new information could change the published recommendation or rating.

If a revision is unwarranted, then the search is recorded, dated and saved until the next review and no further action is taken. If the determination is that there could be a change in the recommendation or rating, then the supporting evidence analysis question(s) will be re-analyzed following the standard ADA Evidence Analysis Process (see Methodology tab).

When the analysis is completed, the expert workgroup will approve and re-grade the conclusion statements and recommendations. The guideline will undergo a complete revision every three to five years.

Medical Nutrition Therapy and Dyslipidemia

Scientific evidence strongly supports the effectiveness of MNT as a means to manage dyslipidemia and reduce risk factors associated with CVD. In addition to the well documented role of saturated fat and trans fat on LDL-C and CHD, the nutrition prescription incorporates the use of foods containing specific key nutrients with proven benefits for achieving optimal lipid management and CVD outcomes.The RD plays an essential role on the interdisciplinary healthcare team by designing the optimal nutrition prescription tailored to the individual's needs and synergistic with pharmacotherapy when necessary. As part of the nutrition care process, the RD applies her/his knowledge, skills and training to first conduct a comprehensive nutrition assessment in order to determine an accurate nutrition diagnosis(es) for the patient/client. Following collection of the assessment data, the RD then considers other existing comorbidities and medical diagnoses to develop the nutrition prescription, according to the relevant, evidence-based nutrition practice guidelines. These may include weight management, HTN, and type 2 diabetes or other guidelines that will further influence the optimal treatment. The RD skillfully blends the macronutrient and micronutrient mix to achieve the appropriate diet prescription without compromising individual health needs and therapeutic goals. During MNT intervention, the RD plans the course of action and educates or counsels the patient/client on the appropriate diet, behavior and lifestyle changes in a manner and sequence that best meet the patient/client's needs. Use of motivational interviewing or other proven strategies can further enhance adherence. Following the initial intervention, the RD monitors and evaluates progress over subsequent visits to determine whether the goals are being met and provides ongoing support and adjusts the nutrition prescription, as needed.

Populations to Whom This Guideline May Apply

Population groups, medical conditions, or coexisting diagnoses where the DLM recommendations may be indicated include:

- CHD
- Cerebral vascular disease
- Familial or combined hyperlipidemia, hypertriglyceridemia, hypercholesterolemia
- Metabolic syndrome
- Diabetes mellitus
- History of CVD and dyslipidemia in first degree relatives
- Peripheral vascular disease
- Abdominal aortic aneurysm
- HTN
- Obesity
- Cigarette smoking
- History of myocardial infarction (MI).

Other Guideline Overview Material

For more details on the Guideline components, use the links on the left to access:

Scope of Guideline

Statement of Intent

Guideline Methods

Implementation of the Guideline

Benefits and Harms of Implementing the Recommendations

Other factors to consider when exploring nutrition therapy options include the presence of secondary causes and conditions associated with hyperlipidemia. Total cholesterol, TG, and HDL-C levels may be affected by an individual's medical history, including use of prescription and over-the-counter drugs, metabolic or endocrine conditions such as diabetes, hypothyroidism or obesity, kidney disease and liver disease. In addition, certain lifestyle and dietary practices such as current cigarette smoking habit and alcohol abuse, a high- or low-fat diet, high cholesterol intake, a low-fiber diet, weight gain and physical inactivity can affect lipid profiles as well.

[1]WRITING GROUP MEMBERS, Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, Ferguson TB, Ford E, Furie K, Gillespie C, Go A, Greenlund K, Haase N, Hailpern S, Ho PM, Howard V, Kissela B, Kittner S, Lackland D, Lisabeth L, Marelli A, McDermott MM, Meigs J, Mozaffarian D, Mussolino M, Nichol G, Roger VL, Rosamond W, Sacco R, Sorlie P, Roger VL, Thom T, Wasserthiel-Smoller S, Wong ND, Wylie-Rosett J; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics--2010 update: a report from the American Heart Association. *Circulation.* 2010 Feb 23; 121(7): e46-e215. Epub 2009 Dec 17. No abstract available. Erratum in: *Circulation.* 2010 Mar 30; 121 (12): e260. Stafford, Randall [corrected to Roger, Véronique L]. PMID: 20019324. Accessed online: http://circ.ahajournals.org/cgi/content/full/121/7/e46

[2] Institute of Medicine, Committee on Nutrition Services for Medicare Beneficiaries. *The Role of Nutrition in Maintaining Health in the Nation's Elderly: Evaluating Coverage of Nutrition Services for the Medicare Population.* Washington, DC: National Academy Press, 2000.

[3] Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC Jr, Stone NJ; Coordinating Committee of the National Cholesterol Education Program. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. *J Am Coll Cardiol.* 2004 Aug 4; 44 (3): 720-732. Review. PMID: 15358046.

- Disorders of Lipid Metabolism
- Disorders of Lipid Metabolism (DLM) Guideline (2011)

Disorders of Lipid Metabolism

DLM: Scope of Guideline (2011)

Below, you will find a list of characteristics that describe the **scope** of this guideline.

Guideline Category

Counseling, Management, Prevention, Treatment

Clinical Specialty

Cardiology, Endocrinology, Family Practice, Geriatrics, Internal Medicine, Nutrition, Pharmacology, Physical Medicine and Rehabilitation, Preventive Medicine

Intended Users

Registered Dietitians

Guideline Objective(s)

Overall Objective:

To provide Medical Nutrition Therapy (MNT) guideline recommendations for Disorders of Lipid Metabolism (DLM) that support improvement in lipid levels and risk factor management of cardiovascular disease (CVD).

Specific Objectives:

- To define evidence-based recommendations within the scope of practice for Registered Dietitians (RDs) that are carried out in collaboration with other healthcare providers
- To guide practice decisions that integrate medical, nutritional, and behavioral elements
- To reduce variations in practice among RDs
- To promote self-management strategies that empower the patient to take responsibility for day-to-day management and provide the RD with data to make recommendations to adjust MNT, or recommend other therapies to achieve clinical outcomes
- To enhance the quality of life for the patient, utilizing customized meal planning strategies based on the individual's eating preferences, lifestyle, and goals to improve metabolic control
- To develop content for intervention that can be tested for impact on clinical outcomes
- To define highest quality of care within cost constraints of the current healthcare environment.

Target Population

Adult (19 to 44 years), Middle Age (45 to 64 years), Aged (65 to 79 years), Male, Female

Target Population Description

Adults with risk factors for cardiovascular disease (CVD), including Disorders of Lipid Metabolism (DLM).

Considerations and Assumptions Based on the National Heart, Lung and Blood Institute Clinical Practice Guidelines for Those With High Blood Cholesterol

Diagnosis and treatment of DLM for prevention of heart disease has been rooted in clinical guidelines from the National Heart, Lung and Blood Institute (NHLBI). In 2011, as this guideline from the American Dietetic Association (ADA) was released, new clinical guidelines were anticipated from NHLBI. This set of guideline recommendations was framed within the context of the therapeutic lifestyle changes (TLC) National Cholesterol Education Program's Adult Treatment Panel (ATP) III and it 2004 update. [1]

Recommendations from the Recent Clinical Trials and NCEP ATP III report that form the basis for the MNT approach for treatment of lipid metabolism disorders are as follows:

Recommendations From the 2004 Update to ATP III[1]

- Therapeutic Lifestyle Changes (TLC) remain an essential modality in clinical management. TLC has the potential to reduce cardiovascular risk through several mechanisms beyond LDL-lowering.
- In high-risk persons, the recommended low-density lipoprotein cholesterol (LDL-C) goal is <100mg per dL
  - An LDL-C goal of <70mg per dL is a therapeutic option on the basis of available clinical trial evidence, especially for patients at very high risk
  - If LDL-C is >100mg per dL, an LDL-lowering drug is indicated simultaneously with lifestyle changes. If baseline LDL-C is <100mg per dL, institution of an LDL-lowering drug to achieve an LDL-C level <70mg per dL is a therapeutic option on the basis of available clinical trial evidence.
  - If a high-risk person has high triglycerides (TG) or low high-density lipoprotein cholesterol (HDL-C), consideration can be given to combining a fibrate or nicotinic acid with an LDL-lowering drug. When TGs are 200mg per dL, non-HDL-C is a secondary target of therapy, with a goal 30mg per dL higher than the identified LDL-C goal.
  - For moderately high-risk persons (2+ risk factors and 10-year risk 10% to 20%), the recommended LDL-C goal is <130mg per dL; an LDL-C goal <100mg per dL is a therapeutic option on the basis of available clinical trial evidence. When LDL-C level is 100mg to 129mg per dL, at baseline or on lifestyle therapy, initiation of an LDL-lowering drug to achieve an LDL-C level <100mg per dL is a therapeutic option on the basis of available clinical trial evidence.
  - Any person at high risk or moderately high risk, who has lifestyle-related risk factors (e.g., obesity, physical inactivity, elevated TG, low HDL-C, or metabolic syndrome) is a candidate for TLC to modify these risk factors regardless of LDL-C level
  - When LDL-lowering drug therapy is employed in high-risk or moderately high-risk persons, it is advised that intensity of therapy be sufficient to achieve at least a 30% to 40% reduction in LDL-C levels
  - For people in lower risk categories, recent clinical trials do not modify the goals and cutpoints of therapy.

[1]Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, Pasternak RC, Smith SC Jr, Stone NJ; Coordinating

Committee of the National Cholesterol Education Program. <u>Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines.</u> *J Am Coll Cardiol.* 2004 Aug 4; 44 (3): 720-732. Review. PMID: 15358046.

Interventions and Practices Considered

Interventions and Practices Considered

The Disorders of Metabolism (DLM) guideline is based on <u>ADA</u>'s Nutrition Care Process and Model, which involves the following steps. Terms relevant to the treatment of DLM come from the *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process.* Third Edition.

- Nutrition Assessment
- Nutrition Diagnosis
- Nutrition Intervention
- Nutrition Monitoring and Evaluation.

This guideline addresses topics that correspond to the following areas of the Nutrition Care Process. Please refer to the DLM algorithm in this guideline for a more detailed view of the recommendations and their application within the Nutrition Care Process.

I. Referral to a Registered Dietitian (RD)
II. <u>Medical Nutrition Therapy</u> (MNT)

A. Nutrition Assessment

Below you will find the nutrition assessment terms related to <u>DLM</u> care from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process.* Third Edition.

1. Food/nutrition history
2. Anthropometric measurements
3. Biochemical data, medical tests, and procedures
4. Nutrition-focused physical findings
5. Client history

B. Nutrition Diagnosis

Below you will find the more common nutrition diagnoses related to DLM care from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process.* Third Edition.

- Excessive energy intake
- Excessive intake of <u>saturated fat</u>
- Inappropriate intake of refined <u>carbohydrate</u> (CHO)
- Excessive <u>alcohol</u> intake
- Inadequate <u>fiber</u> intake
- <u>Overweight</u>/<u>obesity</u>
- Physical inactivity.

C. Nutrition Intervention (Planning and Implementation)

Specific nutrition intervention terminology related to the DLM might include: Nutrition counseling and education which addresses the type and amount of food and nutrients such as major dietary fat components (<u>saturated fat</u>, <u>trans-fat</u>, <u>unsaturated fat,</u> <u>omega-3</u> and <u>omega-6 fatty acids</u>), <u>protein</u> and <u>CHO</u>, addition or change in provision of bioactive substances (<u>plant sterols</u> and <u>plant stanol</u> esters, soy protein, psyllium), and adoption of healthful lifestyle habits such as limiting <u>alcohol</u> and increasing <u>physical activity</u>.

Individualized nutrition prescription based on current reference standards and dietary guidelines and the patient/client's health condition and nutrition diagnosis:

- <u>Calories</u>
- Macronutrients:
  - Major dietary fat components (includes <u>CHO</u> and <u>protein</u> consideration): Fat composition, <u>trans-fatty acids,</u> <u>omega-3 fatty acids</u>, and fiber
- Micronutrients:
  - Vitamin and mineral adequacy
  - Food recommendations: Nuts, fish, soy products, plant stanol/sterol products
- Healthful habits limiting alcohol, increasing physical activity.

Below you will find the nutrition interventions related to DLM care from *International Dietetics & Nutrition Terminology Reference Manual. Standardized Language for the Nutrition Care Process.* Third Edition.

- Meals and snacks
- Enteral or Parenteral nutrition
- Medical Food Supplements
- Bioactive Substance Management
- Feeding Assistance
- Feeding Environment
- Nutrition-Related Medical Management
- Nutrition Education
- Nutrition Counseling
- Strategies
- Coordination of nutrition care
- Discharge planning and transfer of nutrition care to new setting or provider.

D. Monitoring and Evaluation

The monitoring or progress, measuring of outcomes, and evaluating of outcomes against criteria to determine changes in specific indicators of <u>MNT</u> outcomes.

Below you will find the nutrition monitoring and evaluation terms related to DLM care from *International Dietetics & Nutrition Terminology Reference Manual. Standardized Language for the Nutrition Care Process.* Third Edition.

- Food and nutrient intake
- Nutrition-related <u>ADL</u>s and <u>IADL</u>s

- Physical activity
- Nutrition-focused physical findings.

Disorders of Lipid Metabolism

DLM: Statement of Intent (2011)

Disorders of Lipid Metabolism Update Statement of Intent

Evidence-based nutrition practice guidelines are developed to help Registered Dietitians, practitioners, patients, families, and consumers make shared decisions about health care choices in specific clinical circumstances. If properly developed, communicated and implemented, guidelines can improve care.

While the evidence-based nutrition practice guideline represents a statement of promising practice based on the latest available evidence at the time of publication, the guideline is not intended to overrule professional judgment. Rather, it may be viewed as a relative constraint on individual clinician discretion in a particular clinical circumstance. The independent skill and judgment of the health care provider must always dictate treatment decisions. These nutrition practice guidelines are provided with the express understanding that they do not establish or specify particular standards of care, whether legal, medical or other.

The Role of Patient and Family Preference

This guideline recognizes the role of patient and family preferences for possible outcomes of care, when the appropriateness of a clinical intervention involves a substantial element of personal choice or values. With regard to types of evidence that are associated with particular outcomes, Shaughnessy and Slawson (1-3) describe two major classes. Patient-oriented evidence that matters (POEM) deals with outcomes of importance to patients, such as changes in morbidity, mortality, or quality of life. Disease-oriented evidence (DOE) deals with surrogate end-points, such as changes in laboratory values or other measures of response. Although the results of DOE sometimes parallel the results of POEM, they do not always correspond.

When possible, ADA recommends using POEM-type evidence rather than DOE. When DOE is the only guidance available, the guideline indicates that key clinical recommendations lack the support of outcomes evidence.

References

1. Slawson DC, Shaughnessy AF. Becoming an information master: using POEMs to change practice with confidence. Patient-Oriented Evidence that Matters. *J Fam Pract*. 2000 Jan;49(1):63-7. Erratum in: *J Fam Pract* 2000 Mar;49(3):276.
2. Slawson DC, Shaughnessy AF, Ebell MH, Barry HC. Mastering medical information and the role of POEMs--Patient-Oriented Evidence that Matters. *J Fam Pract*. 1997 Sep;45(3):195-196.
3. Shaughnessy AF, Slawson DC. POEMs: patient-oriented evidence that matters. *Ann Intern Med*. 1997 Apr 15;126(8):667.

Disorders of Lipid Metabolism

DLM: Guideline Methods (2011)

General and Specific Methods for Disorders of Lipid Metabolism Update Guideline

Below are links to both the general methods that ADA has put in place for evidence analysis and creating the guidelines, as well as the specific search methods and criteria for each question.

General Methods

[Click here](#) to view a description of the Academy's process of evidence analysis and guideline creation.

Methods for Specific Topics

Click on Specific Methods from the left to view descriptions of search criteria and findings for each topic covered in this guideline.

History of the Development of This Guideline

This guideline is an update of the ADA Disorders of Lipid Metabolism 2006 Evidence-Based Nutrition Practice Guideline.

Disorders of Lipid Metabolism

DLM: Specific Methods (2011)

Search Criteria and Results for Specific Topics

Each evidence analysis topic has a link to supporting evidence, where the **Search Plan and Results** can be found. Here, you can view when the search plan was performed, inclusion and exclusion criteria, search terms, databases that were searched and the excluded articles.

Below are a list of the recommendations and the related evidence analysis questions, with the link to each search plan. Some recommendations are supported by multiple conclusion statements and therefore have multiple search plans listed.

Consensus-rated recommendations were not developed using ADA's evidence analysis process, but based on consensus documents. Therefore, these recommendations do not have links to *Search Plans.*

To see the recommendations, select Major Recommendations from the left menu bar.

Disorders of Lipid Metabolism Update (DLM) Evidence-Based Nutrition Practice Guideline

Nutrition Screening

DLM: Referral to a Registered Dietitian for Medical Nutrition Therapy - 2010

Search Plan and Results

Nutrition Assessment

DLM: Nutrition Assessment - 2010

Search Plan and Results

Nutrition Intervention

DLM: Major Fat Components- 2010

Search Plan and Results
Search Plan and Results
Search Plan and Results

DLM: Carbohydrate, Protein and Fiber - 2010

Search Plan and Results
Search Plan and Results
Search Plan and Results

DLM: Omega-3 Fatty Acids - 2010

Search Plan and Results
Search Plan and Results

DLM: Plant Stanols And Sterols - 2010

Search Plan and Results
Search Plan and Results

DLM: Nuts - 2010

Search Plan and Results
Search Plan and Results

DLM: Alcohol -2010

Search Plan and Results

DLM: Antioxidant Supplements (Vitamin E, Vitamin C, and Beta-Carotene) - 2010

Search Plan and Results
Search Plan and Results
Search Plan and Results

DLM: Homocysteine, Folate, Vitamin B6 or B12 - 2010

Search Plan and Results

DLM: Coenzyme Q10 - 2010

Search Plan and Results

DLM: Physical Activity - 2010

Search Plan and Results

The following recommendation was not analyzed through ADA's evidence analysis, but developed based on available consensus documents. See this specific recommendation and references under Major Recommendations

DLM: Determine Energy and Macronutrient Needs - 2010

Disorders of Lipid Metabolism

DLM: Implementation of the Guideline (2011)

This publication of this guideline is an integral part of the plans for getting the ADA Medical Nutrition Therapy (MNT) evidence-based recommendations on unintended weight loss to all dietetics practitioners engaged in, teaching about or researching the topic. National implementation workshops at various sites around the country and during the ADA Food Nutrition Conference Exposition (FNCE) are planned. Additionally, there are recommended dissemination and adoption strategies for local use of the *ADA Disorders of Lipid Metabolism Update Evidence-Based Nutrition Practice Guideline.*

The guideline development team recommended multi-faceted strategies to disseminate the guideline and encourage its implementation. Management support and learning through social influence are likely to be effective in implementing guidelines in dietetic practice. However, additional interventions may be needed to achieve real change in practice routines.

Implementation of the guideline will be achieved by announcement at professional events, presentations and training. Some strategies include:

- **National and local events:** State dietetic association meetings and media coverage will help launch the guideline
- **Local feedback adaptation:** Presentation by members of the work group at peer review meetings and opportunities for continuing professional education units (CPEUs) for courses completed
- **Education initiatives:** The guideline and supplementary resources will be freely available for use in the education and training of dietetic interns and students in approved Commission on Accreditation of Dietetics Education (CADE) programs
- **Champions:** Local champions will be identified and expert members of the guideline team will prepare articles for publications. Resources will be provided that include PowerPoint presentations, full guidelines and pre-prepared case studies
- **Practical tools:** Some of the tools that will be developed to help implement the guideline include specially-designed resources such as clinical algorithms, slide presentations, training and toolkits.

Specific distribution strategies include:

Publication in full: The guideline is available electronically at the ADA Evidence Analysis Library website (www.adaevidencelibrary.com) and announced to all ADA Dietetic Practice Groups. The ADA Evidence Analysis Library will also provide downloadable supporting information and links to relevant position papers.

Disorders of Lipid Metabolism

DLM: Benefits and Risks/Harms of Implementation (2011)

Benefits and Risks or Harms of Implementing the Recommendations

Safety issues should be considered for each form of treatment recommended. A description of the general benefits and risks associated with implementation of this guideline must be addressed.

Potential Benefits

A priority aim and benefit of implementing the recommendations in this guideline would be to improve the percentage of individuals, with or without known <u>coronary heart disease</u> (CHD), with lipid disorders, who meet their treatment goal.

Risk or Harm Considerations

Risk or Harm Considerations

In terms of potential harm, the long-term use and safety of specific dietary components or supplements is an important consideration in recommendations to lower <u>serum cholesterol</u> levels or to modify <u>CHD</u> risk.

Other factors to consider when exploring <u>Medical Nutrition Therapy</u> (MNT) options include:

- Patients may present secondary causes and conditions associated with hyperlipidemia
- <u>Total cholesterol</u>, <u>triglycerides</u>, and <u>HDL-C</u> levels may be affected by an individual's medical history, including use of prescription or over-the-counter drugs, metabolic or endocrine conditions such as diabetes, hypothyroidism or <u>obesity</u>, kidney disease, and liver disease
- In addition, certain lifestyle and dietary practices such as current cigarette smoking habit and <u>alcohol</u> abuse, a high- or low-fat diet, high <u>cholesterol</u> intake, low-<u>fiber</u> diet, weight gain, and physical inactivity can affect lipid profiles as well
- Some food sources of recommended nutrients may carry their own risks (for example, the presence of methyl mercury in some <u>omega-3 fatty acid</u>-rich fish).

- <u>Disorders of Lipid Metabolism</u>
- <u>Disorders of Lipid Metabolism (DLM) Guideline (2011)</u>

Disorders of Lipid Metabolism

DLM: Executive Summary of Recommendations (2011)

Executive Summary of Recommendations

Below are the major recommendations and ratings for the Academy of Nutrition and Dietetics Disorders of Lipid Metabolism (DLM) Update Evidence-Based Nutrition Practice Guideline. More detail (including the evidence analysis supporting these recommendations) is available on this website to <u>Academy</u> members and <u>EAL</u> subscribers under Major Recommendations.

To see a description of the Academy Recommendation Rating Scheme (Strong, Fair, Weak, Consensus, Insufficient Evidence), <u>click here</u>.

The DLM Update Recommendations are listed below. *[Note: If you mouse-over underlined acronyms and terms, a definition will pop up.]*

- <u>Screening and Referral</u>
  DLM: MNT and Referral to a Registered Dietitian
  <u>Medical Nutrition Therapy</u> (MNT) provided by a registered dietitian (RD) is recommended for patients with an abnormal lipid profile as defined by current <u>National Heart, Lung and Blood Institute (NHLBI) Clinical Practice Guidelines</u> and <u>low-density lipoprotein</u> cholesterol (LDL-C) goals. All patients who have existing <u>coronary heart disease</u> (CHD) should receive MNT provided by an RD. Patients who attend multiple <u>RD</u> visits for <u>MNT</u> lasting an average of 45 minutes (30-60 minutes per session) over six to twelve weeks can reduce daily dietary fat (5% to 8%), <u>saturated fat</u> (2% to 4%) and energy intake (232-710 kcal per day). This can result in a reduction in serum <u>total cholesterol</u> (TC) (↓7% to 21%), <u>LDL-C</u> (↓7% to 22%) and <u>triglycerides</u> (↓11% to 31%).

  Strong
  Imperative
  DLM: MNT Number and Duration of Visits
  Registered Dietitians (RD) should provide more than two visits for <u>Medical Nutrition Therapy</u> (MNT) (three to six visits) to further improve a patient's lipid profile. The magnitude of <u>low-density lipoprotein</u> cholesterol (LDL-C) reduction increases with additional visits or time spent with the <u>RD</u>. Studies report that further reduction in <u>total cholesterol</u> (TC) (↓19% with four <u>RD</u> visits vs. ↓12% with two RD visits) and LDL-C (↓21% with four RD visits/180 minutes vs. ↓12% with two RD visits/120 minutes) were observed. Further research is needed to define the optimal duration and frequency of follow-up visits with the RD.

  Fair
  Imperative
  DLM: Lipid-Lowering Medication Re-evaluation
  If a patient is on lipid-lowering medications, the Registered Dietitian (RD) should provide three or more visits for <u>Medical Nutrition Therapy</u> (MNT) averaging 45 minutes per session over a six to eight week period to improve the patient's lipid profile. Three studies have examined the reduction in the use of lipid lowering medications when <u>MNT</u> is provided by an <u>RD</u>. Two retrospective studies showed 50% of patients were obviated from lipid drug eligibility after three MNT visits with the RD. In a <u>randomized controlled trial</u> (RCT), at the end of 12 months, no subject in the MNT group needed lipid-lowering drugs, while six of 44 in the Usual Care group needed medication at an average cost of $446 (in 1995 dollars) for months seven to 12 of the trial.

  Fair
  Conditional

-

DLM: Assessment of Food and Nutrient Intake

The registered dietitian (RD) should assess the food/nutrition intake and related history of <u>adults</u> with disorders of lipid metabolism (DLM) including, but not limited to the following:

- Food, beverage and nutrient intake including:
  - Energy intake, <u>serving sizes</u>, meal-snack pattern, fat, types of fat and <u>cholesterol</u>, <u>carbohydrate</u>, <u>fiber</u>, micronutrient intake
  - Bioactive substances (<u>alcohol</u> intake, <u>plant stanols and sterols</u>, soy protein, psyllium, fish oil)
- Food and nutrient administration (patient's experience with food)
  - Previous and current diet history, diet orders, exclusions and experience, cultural and religious preferences
  - Eating environment, eating out
- Medication and herbal supplement use: Prescription and over-the-counter medications, herbal and complementary product use (coenzyme Q-10, red yeast rice)
- Knowledge, beliefs or attitudes: Motivation, readiness to change, self-efficacy
- Behavior: Diet adherence, disordered eating, meal timing and duration
- Factors affecting access to food: Psychosocial/economic issues (e.g., social support) impacting nutrition therapy
- <u>Physical activity</u> and function: Exercise patterns, functionality for activities of daily living, sleep patterns.

Assessment of the above factors is needed to effectively determine nutrition diagnoses and plan the nutrition interventions. Inability to achieve optimal nutrient intake may contribute to poor outcomes. Dietary intake can be assessed using a variety of approaches, including multiple 24-hour recalls or three non-consecutive days of food records (i.e., two weekdays and one weekend day). In addition, the more sophisticated multiple-pass technology may be used. Dietary results can be analyzed using nutrient analysis software programs that have complete nutrient data. Manufacturers' nutrition facts labels may also be included.

Consensus
Imperative

DLM: Assessment of Anthropometric Data

In addition to <u>body mass index</u> (BMI), the Registered Dietitian (RD) should use <u>waist circumference</u> (WC) or <u>waist-to-hip ratio</u> (WHR) to assess <u>obesity</u> and <u>cardiovascular disease</u> (CVD) risk. <u>BMI</u> alone is not a good predictor of <u>CVD</u> risk in persons over 65 years old. Increases in <u>WC</u>, <u>WHR</u>, and BMI are associated with <u>coronary heart disease</u> (CHD) events and CVD mortality.

Strong
Imperative

DLM: Assessment of Biochemical Data

The Registered Dietitian (RD) should assess the biochemical data, medical tests and procedures of <u>adults</u> with disorders of lipid metabolism (DLM) including, but not limited to lipid profile [<u>total cholesterol</u> (TC), <u>high-density lipoprotein</u> cholesterol (HDL-C), non-HDL-C, <u>low-density lipoprotein</u> cholesterol (LDL-C), <u>triglycerides</u> (TG)], <u>blood pressure</u>, and <u>fasting</u> glucose. Additional values such as Lp(a), hemoglobin A1c (HbA1c), 25-OH vitamin D, thyroid function tests and <u>C-reactive protein</u> (CRP) may also be assessed. Assessment of these factors is needed to effectively determine nutrition diagnoses and plan the nutrition interventions. Inability to achieve optimal nutrient intake may contribute to poor outcomes.

Consensus
Imperative

DLM: Assessment of Medical and Health History and Physical Findings

The registered dietitian (RD) should assess the medical and health history of <u>adults</u> with disorders of lipid metabolism (DLM) for the presence of other disease states and conditions, such as endocrine/metabolism disorders, <u>metabolic syndrome</u>, <u>HIV</u>/ <u>AIDS</u>, <u>hypertension</u> (HTN), <u>obesity</u> and food allergies and intolerances. Adults with <u>DLM</u>, have a higher prevalence of comorbidities, which are risk factors for the progression of <u>cardiovascular disease</u> (CVD). The <u>RD</u> should note observations of fat distribution (i.e., abdominal obesity or lipodystrophy) and fluid retention (i.e., edema or ascites), as well as any evidence of xanthomas, xanthelasma, corneal arcus, and palmar discolorations. Assessment of the above factors is needed to effectively determine nutrition diagnoses and plan the nutrition interventions. Inability to achieve optimal nutrient intake may contribute to poor outcomes.

Consensus
Imperative

DLM: Determining Energy and Macronutrient Needs

The registered dietitian (RD) should determine energy and macronutrient needs (e.g., <u>quantity and quality of fat</u>, <u>carbohydrate and protein</u>) of <u>adults</u> with disorders of lipid metabolism (DLM). Use of <u>indirect calorimetry</u> is preferred for measuring energy needs. When indirect calorimetry is not available, <u>predictive equations</u> can be used. After estimation of current energy needs, a recommended energy intake can be developed with consideration of whether the goal is weight maintenance or weight loss.   The recommended macronutrient intake is:

- Total fat of 25-35% (achieving goals of <u>saturated fat</u> (SFA) and <u>trans fat</u> <7% of <u>kcals</u> and <u>dietary cholesterol</u> <200 <u>mg</u> per day is typically feasible only with total fat ≤30% <u>kcals</u> per day)
- Total <u>protein</u> of 15-20% (encourage <u>vegetable protein</u> to help achieve <u>SFA</u> goals and cholesterol goals)
- Total <u>carbohydrates</u> (CHO) of 45-60% of kcals (with emphasis on high <u>fiber</u>/complex <u>CHO</u> sources and avoidance of refined CHO foods).

Comparison of the assessed food and nutrient intake with estimated needs will help the <u>RD</u> to develop strategies to meet the recommendations of the <u>cardioprotective diet</u>. Estimating current (or baseline) energy and macronutrient intake, is essential to establishing the relevant nutrition diagnoses and tailoring the appropriate <u>medical nutrition therapy</u> (MNT).

Consensus
Imperative

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DLM: Marine-Derived Food Sources of Omega-3 Fatty Acids and Risk for CVD Events

If consistent with patient preference and not contraindicated by risks or harms, the Registered Dietitian (RD) should encourage food sources of <u>marine-derived omega-3 fatty acids</u>, preferably from fish to reduce risk of <u>cardiovascular disease</u> (CVD).

- For patients *without <u>coronary heart disease</u> (CHD):* Recommend two fish servings per week (4<u>oz</u> servings each)
- For patients *with <u>CHD</u>*: Recommend two or more fish servings per week (4<u>oz</u> servings each).

Studies report, that in persons *with CHD* higher plasma levels of <u>docosahexaenoic acid</u> (DHA) and <u>eicosapentaenoic acid</u> (EPA) are associated with a reduction in <u>arrhythmias</u> and fatal heart disease and reduced progression of coronary atherosclerosis. In persons *without CHD*, consumption of fish and marine-derived omega-3 fatty acids may or may not be associated with reduced incidence of arrhythmia, including atrial fibrillation.

Fair
Conditional

DLM: Plant-derived Omega-3 Fatty Acids and Risk for CVD Events

If consistent with patient preference and not contraindicated by risks or harms, the Registered Dietitian (RD) can recommend foods rich in <u>plant-derived omega-3 fatty acids</u> (ALA; <u>alpha-linolenic acid</u>) to reduce the risk of <u>cardiovascular disease</u> (CVD) or CVD events. In persons *with <u>coronary heart disease</u> (CHD),* higher intakes of plant-derived omega-3 fatty acids, are associated with a decreased rate of cardiac death and non-fatal <u>myocardial</u>

infarction (MI) and may be protective against recurrence of MI. One study reported use of 4.8% of calories from ALA. In persons *without CHD*, higher intakes of food sources of ALA are associated with a lower risk of fatal ischemic heart disease (IHD) and prolonged repolarization (mean intake 0.74 g per day of ALA). In case-control studies, ALA lowered the risk of IHD in men and women (amount of ALA from mustard oil not specified) and sudden cardiac death in women (median intake 1.16g per day ALA). Alpha-linolenic acid, however, was not related to other non-sudden fatal CVD events or to non-fatal MI. These studies contrasted lower intake of approximately 0.6g per day with higher intakes of approximately 1.4g per day. This recommendation can be followed within the context of diets that meet the Adequate Intake (AI) for ALA of 1.6g per day for men and 1.1g per day for women (within the Acceptable Macronutrient Distribution Range of 0.6% to 1.2% of energy) (DRI).

Fair
Conditional
DLM: Omega-3 Supplements and Risk for CVD Events
If persons choose to consume eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA) supplements or EPA alone to reduce the risk of cardiovascular disease (CVD) mortality and events (sudden death and re-infarction), the Registered Dietitian (RD) should advise:
- Patients *without coronary heart disease (CHD):* Intervention studies of omega-3 supplementation have not been done in patients *without CHD*
- Patients *with CHD*, but no angina or implantable cardioverter defibrillators (ICD): Supplementation with 850mg per day EPA and/or DHA reduced sudden death by 45%
- Patients *with CHD* with angina or ICDs: EPA and DHA supplements may be contraindicated.

The US Food and Drug Administration advises that consumption of more than three grams of omega-3 fatty acids per day may cause gastrointestinal symptoms.

Fair
Conditional
DLM: Antioxidants and the Cardioprotective Diet
The Registered Dietitian (RD) should specifically plan antioxidant-rich foods such as fruits, vegetables, whole grains and nuts containing Vitamin E, vitamin C and ß-carotene (and other carotenoids), into a cardioprotective dietary pattern. These foods have been shown to be associated with reduced coronary heart disease (CHD) risk.

Consensus
Imperative
DLM: Antioxidant Supplements and Cardiovascular Disease
The Registered Dietitian (RD) should not recommend taking supplemental vitamins E, C and/or ß-carotene for the prevention and treatment of cardiovascular disease (CVD). Research indicates high doses of these antioxidants [above the Recommended Dietary Allowance (RDA)] do not provide cardiovascular benefit and may cause harm and even shorten life span.

Strong
Imperative
DLM: Nuts and Coronary Heart Disease
If consistent with patient preference and not contraindicated by risks or harms, the Registered Dietitian (RD) may isocalorically incorporate daily consumption of unsalted peanuts and lower saturated fat tree nuts, specifically walnuts, almonds, pecans, and pistachios into a cardioprotective dietary pattern. Consuming five ounces (average ~900 kcals) of nuts per week is associated with a reduced risk of coronary heart disease (CHD). Because of their beneficial fatty acid profile, as well as other nutritional components, nuts may be isocalorically incorporated into a cardioprotective dietary pattern to achieve lipid lowering. Studies demonstrate that 1.75 to 4 oz (½ to 1 cup or 315 to 720kcals) nuts per day lowers total cholesterol (TC) by 4% to 21% and low-density lipoprotein cholesterol (LDL-C) by 6% to 29%. The practicality of this recommendation is limited, because of the significant caloric contribution this amount of nuts provides.

Fair
Conditional
DLM: Fat Components of the Cardioprotective Diet
The Registered Dietitian (RD) should tailor the cardioprotective dietary pattern to the individual's needs to provide a total fat intake of 25% to 35% of calories, (ATP III) with <7% of calories from saturated fat and trans-fatty acids (TFA). Because TFAs raise total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) and may decrease high-density lipoprotein cholesterol (HDL-C), TFA consumption should be as low as possible. Cholesterol should be <200 mg per day. The majority of total fat intake should be derived from unsaturated fat sources. For individuals at their appropriate body weight, without elevated LDL-C or triglyceride (TG) levels, and with normal HDL-C levels, saturated fat calories could be replaced by unsaturated fat and/or complex carbohydrate (CHO). This dietary pattern can lower LDL-C up to 16% and decrease risk of coronary heart disease (CHD) and CHD events.

Strong
Imperative
DLM: Replacing Saturated Fat in the Diet
The Registered Dietitian (RD) should develop a nutrition prescription within a cardioprotective dietary pattern that replaces saturated fat calories with calories from either complex carbohydrate (CHO) principally contributed by fruits, vegetables and whole grains, protein and/or unsaturated fat. Robust evidence documents that saturated fat increases low-density lipoprotein cholesterol (LDL-C). Under isocaloric conditions, large scale, randomized controlled trials (RCTs) indicate that a cardioprotective diet reduced LDL-C by 9% to 16% in both normo- and hyperlipidemic individuals. Advantages for substituting complex CHO for saturated fat calories include the following:
- It is difficult to achieve a saturated fat reduction of <10% of calories in diets that are 30% to 35% of total calories from fat
- A diet high in complex CHO includes shortfall nutrients (e.g., dietary fiber, potassium and magnesium and other micronutrients)
- A diet high in complex CHO is nutrient-dense and is less likely to contribute excess calories
- In addition, a diet rich in omega-3 fatty acids and/or monounsaturated fat, and reduced in refined CHO may also be effective in reducing serum triglycerides (TG) without adverse impact on high-density lipoprotein cholesterol (HDL-C).

In treating overweight or obese patients, where the goal is reduction of total energy, reduction rather than replacement of saturated fat calories may be warranted, depending on current intake of unsaturated fat.

Strong
Imperative
DLM: Plant Stanols and Sterols
If consistent with patient preference and not contraindicated by risks or harms, the Registered Dietitian (RD) should consider incorporating plant sterol and stanol ester-enriched foods into a cardioprotective diet, to be consumed two or three times per day, for a total consumption of two to three grams per day. These doses further lower total cholesterol (TC) by 4% to 11% and low-density lipoprotein cholesterol (LDL-C) by 7% to 15%. Doses beyond three grams do not provide additional benefit. To prevent weight gain, isocalorically substitute stanol- and sterol-enriched foods for other foods. Plant stanols and plant sterols are also effective in people taking statin drugs.

Strong
Conditional
DLM: Plant Stanols and Sterols and Adverse Effects
The Registered Dietitian (RD) should be aware that research to date has not documented adverse
effects, including reduced absorption of carotenoids, retinol and tocopherols. Plant stanols and sterols may be included in
a patient's nutrition prescription (e.g., two or three grams per day) to lower cholesterol. Research from 17 randomized
controlled trials (RCTs) indicates effective serum cholesterol-lowering benefits without any reported adverse effects,
including no significant effect on plasma fat soluble vitamin status. Two observational studies reported an association
between plasma levels and aortic tissue concentration of stanols and sterols in a small number of individuals who
consumed foods supplemented with plant sterol and stanol esters. The clinical significance of the association has not been
documented.

Fair
Imperative
DLM: Alcohol Intake
If a patient currently drinks alcohol, and if not contraindicated by risks and harms, then the Registered Dietitian (RD)
could incorporate a maximum of one drink per day for women and up to two drinks per day for men into a
cardioprotective dietary pattern that meets the patient's caloric needs. This level of alcohol consumption has been
associated with a reduced risk of cardiovascular disease (CVD). One type of alcohol does not appear to be better than
another. Current evidence does *not* justify recommending that non-drinkers begin drinking alcohol.

Fair
Conditional
DLM: Physical Activity and Coronary Heart Disease
If not contraindicated by risks and harms, the Registered Dietitian (RD) should recommend resistance exercise for a
minimum of two days a week and moderate intensity physical activity for at least 30 minutes most, if not all, days of the
week. Many individuals will have to start slowly and increase gradually to achieve goals. Moderately intense physical
activity reduces the risk of cardiovascular disease (CVD) events, decreases low-density lipoprotein cholesterol (LDL-C) and
triglycerides (TG), and increases high-density lipoprotein cholesterol (HDL-C).

Strong
Conditional
DLM: Coenzyme Q10 and Disorders of Lipid Metabolism
If a patient is taking coenzyme Q10 supplements, then the Registered Dietitian (RD) *may* discuss the insufficient
evidence for the association of CoQ10 and coronary heart disease (CHD) and allow the patient to make an individual
decision based on his or her specific needs. The clinical significance of normalizing CoQ10 levels in patients treated with
statin medications is inconclusive.

Weak
Conditional
DLM: Metabolic Syndrome
For individuals with metabolic syndrome, the Registered Dietitian (RD) should recommend a calorie-controlled
cardioprotective dietary pattern that avoids extremes in carbohydrate and fat intake, limits added sugar and alcohol, and
includes physical activity at a moderate intensity level for at least 30 minutes on most (preferably all) days of the week.
Weight loss of 7% to 10% of body weight should be encouraged, if indicated. These lifestyle changes improve risk factors
of metabolic syndrome.

Fair
Imperative
DLM: Elevated Triglycerides and Macronutrients
For individuals with elevated triglycerides (TG) (≥150 mg per dL), the Registered Dietitian (RD) should recommend a
calorie-controlled, cardioprotective dietary pattern that avoids extremes in carbohydrate and fat intake and includes
physical activity. Non-nutrient dense calorie sources including alcohol and added sugar, should be limited as much as
possible. Weight loss of 7% to 10% of body weight should be encouraged, if indicated. These lifestyle changes have been
shown to lower TG levels.
  It is unclear what the ideal macronutrient composition (e.g., protein and unsaturated fat) should be for someone with
borderline high TG. At this time it seems prudent to follow recommendations appropriate for people with the metabolic
syndrome, as moderately elevated TG are a component of this disease.

Fair
Conditional
DLM: Elevated Triglycerides and EPA/DHA Supplements
In patients with elevated triglycerides (TG), in addition to lifestyle modification with a cardioprotective diet, the
Registered Dietitian (RD) can advise that high-dose supplemental eicosapentaenoic acid (EPA) and docosahexaenoic acid
(DHA) (two to four grams per day) may be utilized under medical supervision. High-doses of supplemental EPA and DHA
have been shown to lower TG in patients with elevated TG (greater than 200 mg per dL).

Strong
Conditional
DLM: Homocysteine, Folate, Vitamin B6, Vitamin B12 and CHD
The Registered Dietitian (RD) should include food sources of folate, vitamin B$_6$, and vitamin B$_{12}$ in the cardioprotective
dietary pattern to meet the Dietary Reference Intakes (DRI). Supplemental doses of these vitamins to lower
cardiovascular disease (CVD) risk should not be recommended. Although supplemental B-vitamins (folic acid, vitamin B$_6$,
and vitamin B$_{12}$) may lower homocysteine in people with high serum homocysteine levels (>13 umol per L), this has
not translated into reduced CVD events and in fact, may be harmful.

Strong
Imperative
DLM: Carbohydrates and Protein in the Cardioprotective Diet
The Registered Dietitian (RD) should consider replacing saturated fat and trans-fatty acids with unsaturated fatty acids,
complex carbohydrates and/or protein in the cardioprotective dietary pattern. Saturated and trans fatty acids should
be as low as possible. Studies are needed to determine the ideal percentages of these macronutrients as replacements
for saturated fat.

Strong
Imperative
DLM: Fiber in the Cardioprotective Diet
The Registered Dietitian (RD) should incorporate fiber-rich foods that contribute at least 25g to 30 g of fiber per day, with
special emphasis on soluble fiber sources (7g to 13g) into the cardioprotective dietary pattern. These foods rich in
soluble fiber include: fruits, vegetables and whole grains, especially high-fiber cereals, oatmeal, and legumes, especially
beans. Risk factors associated with coronary heart disease (CHD) and cardiovascular disease (CVD) are decreased as
dietary fiber intake increases. Diets high in total and soluble fiber, as part of a cardioprotective diet, can further reduce
total cholesterol (TC) by 2% to 3% and low-density lipoprotein cholesterol (LDL-C) up to 7%.

DLM: Hypertension
For individuals who need to lower their blood pressure, the registered dietitian (RD) should recommend a cardioprotective dietary pattern, such as the DASH diet, to include nine to 12 servings of fruits and vegetables and two to three servings of low-fat dairy products. Sodium should be reduced to less than 2,300 mg per day and gradually lowering to the Adequate Intake (AI) of 1,500mg per day (DRI). In addition to this dietary pattern, weight loss (if necessary), and increased moderate-intensity physical activity have been demonstrated to lower systolic blood pressure (SBP) by at least four to 12 mmHg.

- Nutrition Monitoring and Evaluation

DLM: Monitor and Evaluate Food and Nutrient Intake
Following the nutrition intervention, to check progress, the registered dietitian (RD) should monitor and evaluate at each visit the food/nutrition intake of adults with disorders of lipid metabolism (DLM) and compare to desired individual outcomes relevant to the nutrition diagnosis and intervention. This may include, but is not limited to the following:
- Food, beverage and nutrient intake:
  - Energy intake, serving sizes, meal/snack pattern, fat, types of fat, and cholesterol, carbohydrate, fiber, micronutrient intake
  - Bioactive substances (alcohol intake, plant stanols and sterols, soy protein, psyllium, fish oil)
- Food and nutrient administration (patient's experience with food)
  - Current diet history, diet exclusions, cultural and religious preferences
  - Eating environment, eating out
- Medication and herbal supplement use: Prescription and over-the-counter medications, herbal/complementary product use (coenzyme Q10, red yeast rice)
- Knowledge, beliefs or attitudes: Motivation, readiness to change, self-efficacy
- Behavior: Diet adherence, disordered eating, meal timing and duration
- Factors affecting access to food: Psychosocial/economic issues (e.g., social support) impacting nutrition therapy
- Physical activity and function: Exercise patterns, functionality for activities of daily living, sleep patterns.

Dietary intake can be assessed using a variety of approaches, including multiple 24-hour recalls or three non-consecutive days of food records (i.e., two weekdays and one weekend day). In addition, the more sophisticated multiple pass technology may be used. Dietary results can be analyzed using nutrient analysis software programs that have complete nutrient data. Manufacturers' nutrition facts labels may also be included. Monitoring and evaluation of the above factors is needed to effectively determine nutrition diagnoses that should be the focus of further nutrition interventions. Inability to achieve optimal nutrient intake may contribute to poor outcomes.

DLM: Monitor and Evaluate Anthropometric Data
Following the nutrition intervention, to check progress, the Registered Dietitian (RD) should monitor and evaluate at each visit, the anthropometric data of adults with disorders of lipid metabolism (DLM) including body mass index (BMI), waist circumference (WC), or waist-to-hip ratio (WHR) and compare to desired individual outcomes relevant to the nutrition diagnosis and intervention. BMI alone is not a good predictor of cardiovascular disease (CVD) risk in persons over 65 years old.

DLM: Monitor and Evaluate Biochemical Data
Following the nutrition intervention, to check progress, the Registered Dietitian (RD) should monitor and evaluate after three months (according to ATP III), the biochemical data, medical tests and procedures of adults with disorders of lipid metabolism (DLM), including but not limited to lipid profile [total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), non-HDL-C, low-density lipoprotein (LDL-C), triglycerides (TG)], blood pressure and fasting glucose and compare to desired individual outcomes relevant to the nutrition diagnosis and intervention. Additional values such as hemoglobin A1c (HbA1c), 25-OH vitamin D, thyroid function tests and C-reactive protein (CRP) may also be monitored and evaluated. Monitoring and evaluation of the above factors is needed to effectively determine nutrition diagnoses that should be the focus of further nutrition interventions. Inability to achieve optimal nutrient intake may contribute to poor outcomes.

DLM: Monitor and Evaluate Energy and Macronutrient Needs
Following the nutrition intervention, to check progress, the registered dietitian (RD) should monitor and evaluate the energy and macronutrient needs (e.g., quantity and quality of fat, carbohydrate and protein) of adults with disorders of lipid metabolism (DLM). If changes in weight or serum lipid parameters warrant an adjustment of initial energy and macronutrient needs, estimated energy needs can be revised based on indirect calorimetry, predictive equations or comparison of energy intake and weight changes. If indicated by changes in energy needs or serum lipids, recommended levels of macronutrients can be recalculated using the macronutrient standards:
- Total fat of 25-35% (achieving goals of saturated fat (SFA) and trans fat <7% of kcals and dietary cholesterol <200 mg per day is typically feasible only with total fat ≤30% kcals per day)
- Total protein of 15-20% (encourage vegetable protein to help achieve SFA goals and cholesterol goals)
- Total carbohydrates (CHO) of 45-60% of kcals (with emphasis on high fiber/complex CHO sources and avoidance of refined CHO foods).

Results of the evaluation of caloric and macronutrient needs and intake will help the RD to develop strategies to meet the recommendations of the cardioprotective diet. Monitoring and evaluation effectively tracks patient's progress, or lack thereof, and determines whether or not nutrition care goals have been achieved, or further action is warranted.