Nutrition: Healthy Nutrition vs. Medical Nutrition Therapy (MNT)

Kaithlyn N. Rodríguez Otero RDN, LND

Registered Dietitian Nutritionist

Licensed in Nutrition and Dietetics

Disclosure to Learners

Kaithlyn Rodríguez Otero, faculty for this CE activity, has no relevant financial relationship(s) with ineligible companies to disclose.

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Learning Objectives

1. Define what is meant by healthy nutrition and medical nutrition therapy.
2. Describe dietary patterns that have been shown to be effective in treatment and risk reduction of common lifestyle-related chronic diseases.
3. Discuss how diet behaviors impact chronic disease development and progression.
4. Identify macro- and micro nutrient sources as they contribute to disease progression or improvement.
5. Explain when dietary supplements are needed and recommend appropriately.
6. List basic counseling strategies and resources for dietary behavior change.

The Pharmacist's Expanding Role

- Pharmacists and pharmacy technicians are among the most accessible healthcare professionals — ideally positioned to provide evidence-based nutritional counseling.
- The Pharmacists' Patient Care Process (PPCP) provides the framework for integrating nutrition assessment into routine care.
- This activity supports CAPE outcomes: patient-centered care, health promotion, problem-solving, and interprofessional collaboration.
- Applicable competencies: Foundational Knowledge, Patient-Centered Care, Health & Wellness Promotion, Educator, Interprofessional Collaboration, Communication.

Why Nutrition Matters

T2DM

Diabetes Mellitus Type 2

CVD

Cardiovascular Disease

CKD

Chronic Kidney Disease

Obesity

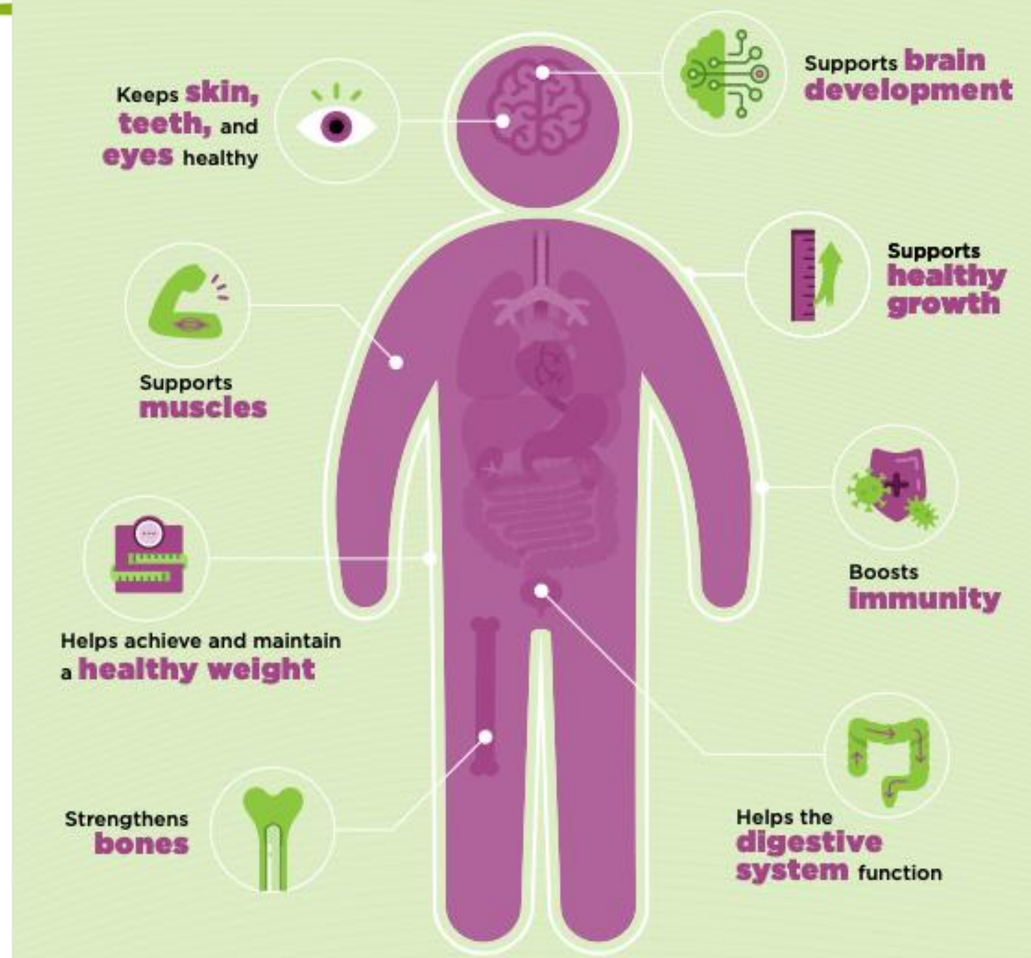
Metabolic Syndrome

Chronic diseases linked to poor nutrition remain the leading drivers of morbidity and healthcare utilization in Puerto Rico and across the United States.

The Educational Gap: Current vs. Best Practice

Provide general dietary advice without distinguishing MNT	Identify patients who need MNT and apply evidence-based referral criteria
Unaware of disease-specific MNT protocols (diabetes, CKD, CVD)	Familiar with disease-specific guidelines; counsel on aligned nutritional goals
Nutrition counseling rarely integrated into the Patient Care Process	Systematically assess nutritional needs as part of PPCP; refer to RDN when appropriate

Benefits of Healthy Eating
for Children

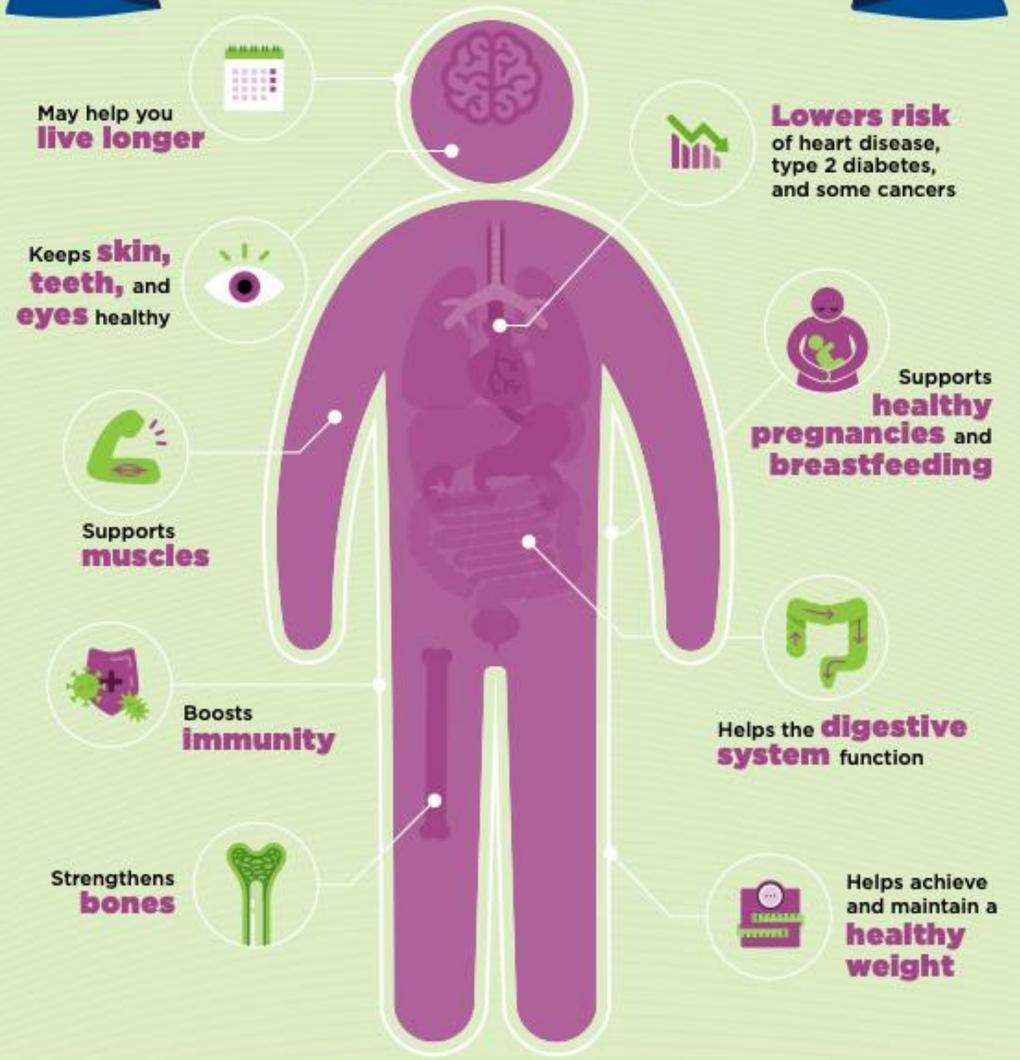


TO LEARN MORE VISIT
cdc.gov/healthyweight/healthy_eating

CDC

April 2021

Benefits of Healthy Eating
for Adults



TO LEARN MORE VISIT
cdc.gov/nutrition/php/resources/healthy-eating-benefits-for-adults.html

CDC

April 2021

Defining Healthy Nutrition

- Healthy nutrition refers to dietary practices that support overall wellness and disease prevention for the general population.
- Guided by population-level frameworks: the Dietary Guidelines for Americans (DGA), 2025–2030 is the current edition.
- The DGA are published every five years by the U.S. Department of Health and Human Services (HHS) and U.S. Department of Agriculture (USDA).
- The first Dietary Guidelines were published in 1980.
- The statements of the DGA are based on current scientific views on nutrition and its effect on health.
- Applies broadly — it is not individualized to a diagnosed medical condition.

Dietary Guidelines for Americans 2025-2030

Dietary Guidelines for Americans 2025-2030

Eat the Right Amount for You

- Caloric needs depend on age, sex, height, weight, and activity level
- Pay attention to portion sizes for higher-calorie foods and beverages
- Prioritize water (still or sparkling) and unsweetened beverages for hydration

Protein

- Prioritize high-quality, nutrient-dense protein from both animal and plant sources
- Favor baking, broiling, roasting, stir-frying, or grilling over deep-frying
- Target: 1.2–1.6 g protein/kg body weight per day, adjusted individually

Dairy

- Include full-fat dairy with no added sugars
- Goal: 3 servings/day on a 2,000-calorie pattern intake

Dietary Guidelines for Americans 2025-2030

Gut Health

- Supports the microbiome; recommends fermented foods (sauerkraut, kimchi, kefir, miso), and high-fiber foods

Vegetables & Fruits

- Eat a colorful variety, prioritizing whole/fresh forms; frozen/dried/canned with minimal added sugar (100% juice or light)
- Limit or dilute 100% juice
- Goal: 3 servings of vegetables + 2 servings of fruit per day

Fats & Healthy Fats

- Found in meats, poultry, eggs, omega-3-rich seafood, nuts, seeds, full-fat dairy, olives, avocados
- Olive oil prioritized for cooking; butter or beef tallow listed as alternatives
- Saturated fat capped at ~10% of daily calories

Dietary Guidelines for Americans 2025-2030

Whole Grains

- Prioritize fiber-rich carbohydrates
- Goal: 2–4 servings/day

Limit Highly Processed Foods, Added Sugars & Refined Carbs

- Avoid processed salty and sweet snacks, artificial dyes/flavors/preservatives, and non-nutritive sweeteners
- No more than 10g added sugar per meal
- Guidance on identifying added sugars on nutrition facts
- Reduce refined-carb products (white bread, white pasta, white rice, flour tortillas, crackers)

Dietary Guidelines for Americans 2025-2030

Alcohol

- Recommends reduced consumption overall
- Full avoidance advised for pregnant women, those in recovery from alcohol use disorder, and those on interacting medications

Sodium

- General population (14+): under 2,300 mg/day
- Age-specific limits for children (1–3, 4–8, 9–13)
- Avoid high-sodium processed foods

Dietary Guidelines for Americans 2025-2030

Special Populations

Infancy (0–4 yrs): breast milk/formula exclusively for ~6 months; vitamin D and iron supplementation guidance; timing for introducing allergens (peanut, egg, shellfish, wheat) and solids

Middle Childhood (5–10): whole foods focus, full-fat dairy, no added sugars, avoid caffeine

Adolescence (11–18): increased energy/protein/calcium/iron needs (especially for menstruating girls); limit sugary/energy drinks

Young Adulthood: supports peak bone mass/strength and reproductive health (iron and folate for women, protein for men)

Pregnancy: increased iron, folate, iodine needs; daily prenatal vitamin recommended

Dietary Guidelines for Americans 2025-2030

Special Populations

Lactation: increased energy and nutrient needs, B12-rich foods, omega-3 seafood, folate-rich legumes

Older Adults: prioritize protein, B12, vitamin D, calcium-dense foods; fortified foods and supplements are advised if needed

Chronic Disease: lower-carbohydrate approaches may help some conditions; individualize with a health care professional

Vegetarians/Vegans: attention to nutrient deficiencies (vitamin D/E, choline, iron for vegetarians; broader gaps including B12, A, D, E, riboflavin, minerals, protein for vegans)

Dietary Guidelines for Americans 2025-2030

VS.

Dietary Guidelines for Americans 2025-2030

Highlights of the new DGA

- Updated protein recommendations: 1.2-1.6g/kg
- More focus on animal protein especially dairy and meat
- Importance of fruits and vegetables
- Recommends full fat dairy and meat, keeping the limit of 10% total fat for saturated fats
- Less sugar and ultra processed foods
  - Avoid artificial flavors and preservatives, food dyes and non-nutritive sweeteners
- Limits sodium intake
- No specific alcohol guidelines
- Importance of gut health and microbiome

Dietary Patterns

&

Chronic Disease Risk Reduction

Mediterranean Diet

Limits saturated fat and trans fat

- Saturated fat can raise your LDL cholesterol.
- A high LDL raises your risk of plaque buildup in your arteries (atherosclerosis).
- Trans fat has no health benefits.
- Both of these fats can cause inflammation.

Encourages healthy unsaturated fats, including omega-3 fatty acids

- Unsaturated fats promote healthy cholesterol levels, support brain health and combat inflammation.
- A diet high in unsaturated fats and low in saturated fat promotes healthy blood sugar levels.

Mediterranean Diet

Limits sodium

- Foods high in sodium can raise blood pressure
- Greater risk for a heart attack or stroke

Limits refined carbohydrates

- Refined carbs can cause blood sugar to spike
- Sugar provides excess calories without much nutritional benefit

High in fiber and antioxidants

- Reduce inflammation and improves glycemic control
- Fiber keep waste moving through the large intestine
- Antioxidants protects against cancer reducing oxidative stress and fighting free radicals

Mediterranean Diet

Foods

- Olive oil as primary fat, vegetables, fruits, legumes, nuts, whole grains, fish, seafood, limited red meat and sweets

Research

- PREDIMED trial (Estruch et al., 2018, NEJM) ~7,400 high-risk patients
- Mediterranean diet + olive oil or nuts vs. low-fat control → roughly 30% relative reduction in major cardiovascular events

Benefits

- CVD and metabolic syndrome prevention
- T2DM (modest A1C improvement)

Dietary Approaches to Stop Hypertension (DASH)

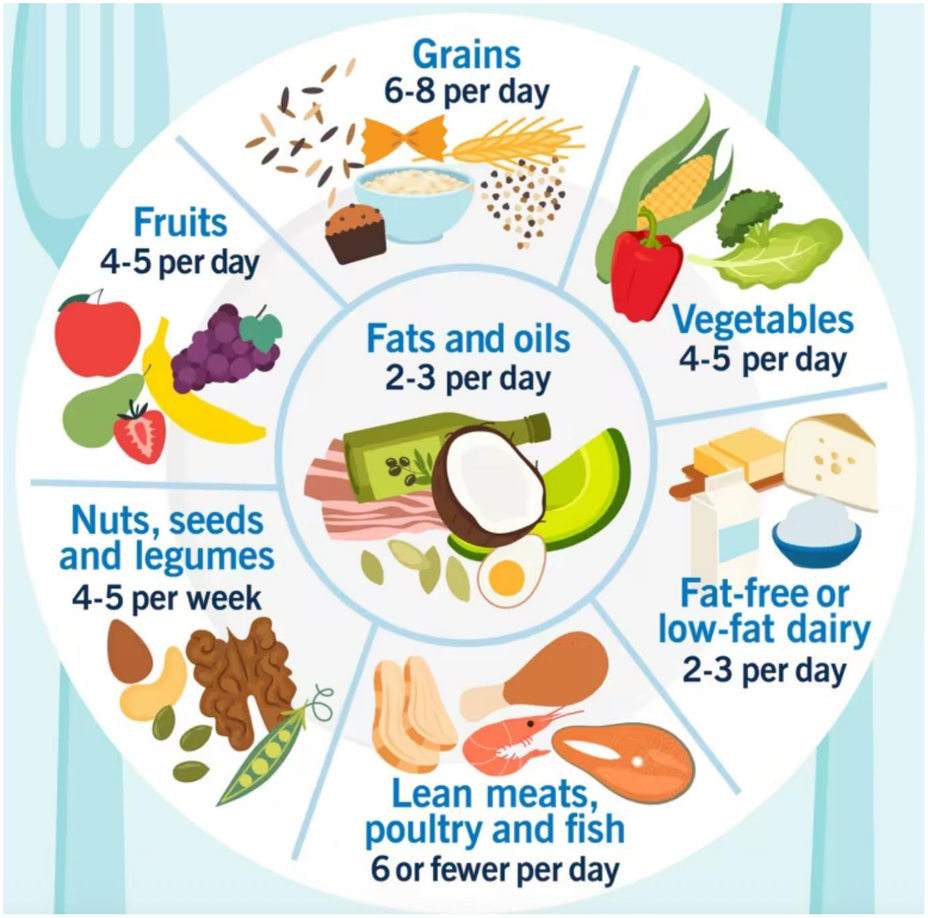
High blood pressure affects 1 in 3 U.S. adults and is a major risk factor for heart disease.

Foods

- Fruits, whole grains, vegetables, fat free/low-fat dairy, lean protein, legumes and healthy fats

Evidence

- Systolic BP reductions of roughly 8–14 mmHg — comparable to a single antihypertensive agent for some patients.



Dietary Approaches to Stop Hypertension (DASH)

Limits sodium

- ~2,300 mg/day standard recommendation
- ~1,500 mg/day sodium variant (stronger results)

Benefits

- Improve cholesterol levels
- Reduce risk for cardiovascular diseases
- Could lower risks of breast cancer, colorectal cancer and metabolic syndrome (conditions that raises the risk of type 2 diabetes, heart disease and stroke)

Vegetarian & Vegan

Vegetarian: All vegetarian diets exclude meat (beef, pork, lamb, venison, chicken, and other fowl) and meat products, but some can include other animal foods.

- Lacto-vegetarian diet: is a plant-based diet that includes dairy products
- Lacto-ovo-vegetarian diet means including eggs, milk, cheese, butter, yogurt, sour cream, ice cream, and other dairy products.
- Ovo-vegetarian diet: doesn’t include dairy products, but does incorporate eggs.
- Pescatarian diet: includes dairy products and eggs tends to vary from person to person.
- Plant forward/Plant–based/Flexitarian: does not eliminate meat, dairy, seafood, or eggs; it reduces portion sizes and frequency of consumption.

Vegetarian & Vegan

Vegan Diet

- Excludes all animal-derived products, including all meats and fish, dairy products, and eggs
- Some exclude honey because it’s produced by bees
- Typically goes beyond the plate excluding consumer products that use animal ingredients or are tested on animals

Both focus on plants, whole foods and fresh foods

- At least 50% of the plate features vegetables and fruits
- Focus on whole foods and complex carbohydrates
- Includes nuts, seeds, legumes, peas and health fats
- Emphasizes minimally processed choices over processed mock meats or "vegan junk food”

Vegetarian & Vegan

Benefits

- Weight management, lower BMI when coupled with calorie restriction
- Glycemic control: improved insulin sensitivity
- Lower LDL and reduced cardiometabolic risk
- Lowering the risk of coronary heart disease
- Protection against oxidative stress and inflammation

Deficiency risks

- Risk of B12, iron, zinc, omega-3, vitamin D, calcium inadequacy

Explore

- Reasons: Health, environmental, or ethical
- Adherence: Nutritional quality, cost, ease of use, and how easy it will be to sustain

Low Carbohydrate & Low Glycemic Index

Low carbohydrate

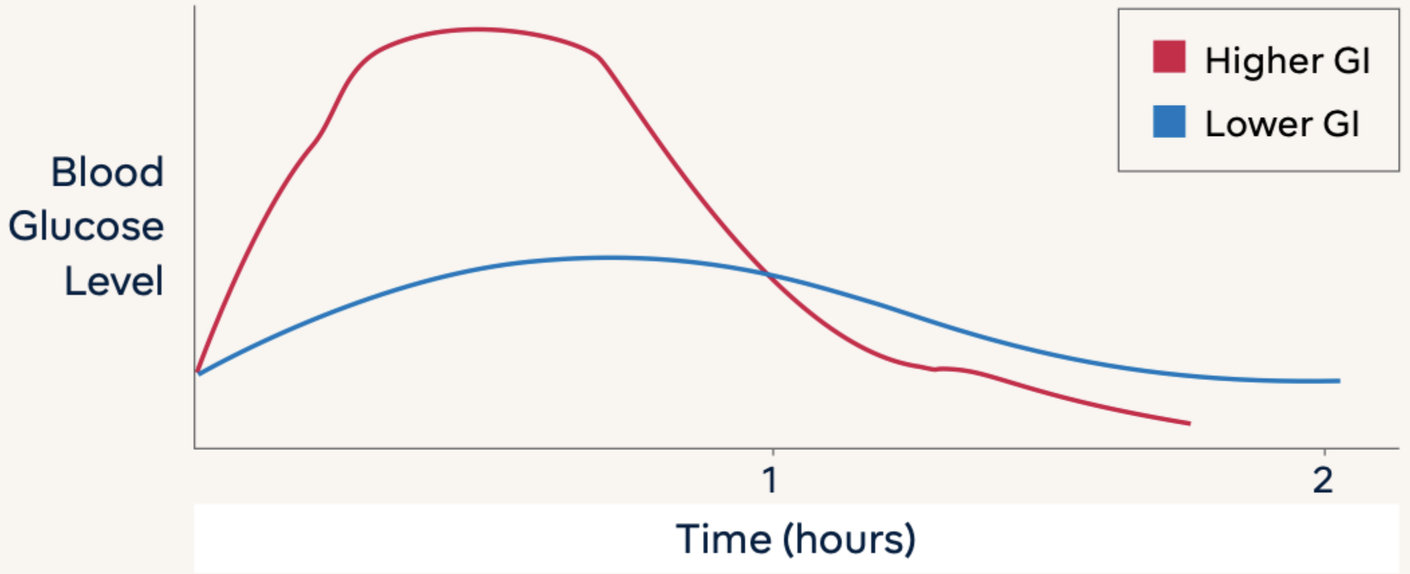
- 50-130g/day of carbohydrates
- Effective for glycemic control
- Short/medium-term weight loss if combined with caloric deficit
- Limits foods groups: grains, starchy vegetables, dairy products, fruits and sweets
- Quality of fat and protein source matters
- Research data is mixed about long-term cardiovascular benefits
- Often confused with ketogenic diet which is a high fat diet with less than 5-10% of total calories (20-50g).

Low-Carbohydrate & Low-Glycemic Index

The glycemic index is a measure of how quickly or slowly a carbohydrate food is digested and increases blood sugar levels.

- **Low glycemic index** (GI of 55 or less): Most fruits and vegetables, beans, minimally processed grains, pasta, low-fat dairy foods, and nuts.
- **Moderate glycemic index** (GI 56 to 69): White and sweet potatoes, corn, white rice, couscous, breakfast cereals.
- **High glycemic index** (GI of 70 or higher): White bread, rice cakes, most crackers, bagels, cakes, doughnuts, croissants.

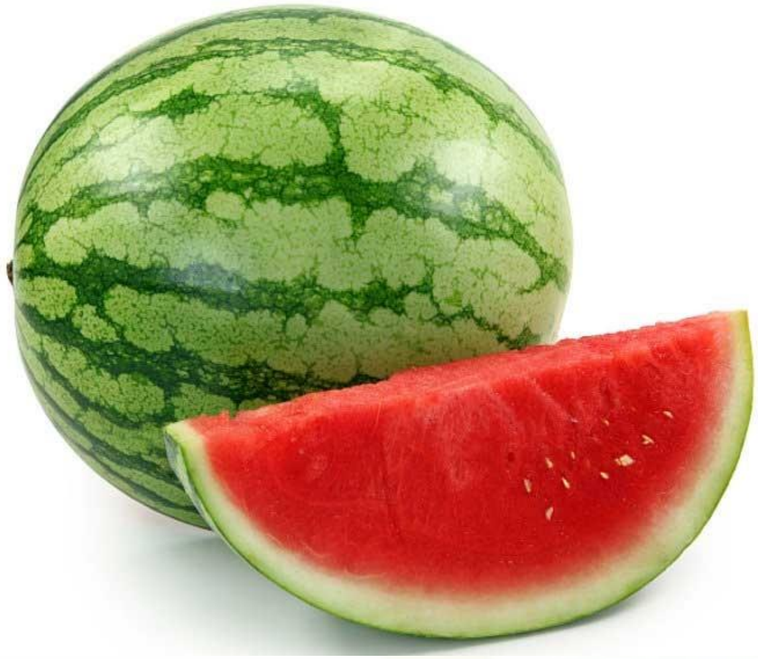
Low-Carbohydrate & Low-Glycemic Index



Higher GI carbohydrates increase blood glucose levels more quickly. Choose these less often.

Lower GI carbohydrates increase blood glucose levels more slowly. These are a better choice.

This or that?



This or that?

This or that?

AUDIENCE POLLING QUESTION

Which dietary pattern has the strongest trial evidence for reducing cardiovascular events?

A. Low carbohydrate/low glycemic index diet

B. Plant-based diet

C. Mediterranean diet

D. DASH diet

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Building Blocks of a Healthy Eating Pattern

Vegetables & Fruits

Variety and color; aim for half the plate

Whole Grains

At least half of grains consumed

Lean Protein

Fish, poultry, legumes and nuts

Low-Fat Dairy

Fat free or other fortified alternatives

Healthy Fats

Unsaturated fats over saturated fats

Limit Added Sugars & Sodium

Defining Medical Nutrition Therapy (MNT)

- Defined by the Academy of Nutrition and Dietetics as an **individualized, evidence-based therapeutic approach** using specific dietary modifications to treat or manage a **diagnosed medical condition**.

- Prescribed and monitored by a qualified clinician (typically a registered dietitian nutritionist, RDN).

- Integral to medical management of conditions such as diabetes, renal disease, and cardiovascular disorders — the nutrition prescription is tailored to laboratory values, disease stage, and the patient's specific physiology.

Core Distinction

Dimension	Healthy Nutrition	Medical Nutrition Therapy
Population	General public	Patients with a diagnosed condition
Purpose	Wellness & disease prevention	Treatment & disease management
Who Directs It	Self-directed / general guidance	Prescribed & monitored by a RDN
Individualization	Broad, population-based	Individualized to labs, diagnosis, GFR, etc.
Example	“Eat more vegetables, less sodium”	Renal diet tailored to potassium/phosphorus/GFR

Ultra-Processed Foods & Chronic Inflammation

True or False

High intake of ultra-processed foods and added sugars is associated with increased inflammation, insulin resistance, and accelerated progression of T2DM and NAFLD.

Diet Behaviors and Chronic Disease Development

The Core Concept: Specific eating behaviors — not just nutrient content — drive the biological mechanisms that both cause chronic disease and worsen it over time.

Key Behavioral Pathways

1. **Ultra-processed food/added sugar consumption** → elevated postprandial glucose & oxidative stress → gut microbiome disruption → systemic low-grade inflammation → insulin resistance → T2DM, NAFLD, CVD.

2. Chronic caloric surplus → visceral adiposity → inflammatory cytokine secretion → worsened insulin resistance independent of total body weight → shared upstream risk for T2DM, NAFLD, CVD.

Diet Behaviors and Chronic Disease Development

The Core Concept: Specific eating behaviors — not just nutrient content — drive the biological mechanisms that both cause chronic disease and worsen it over time.

3. Eating frequency/glycemic load behavior → repeated glucose & insulin spikes → beta-cell fatigue → progression from prediabetes to T2DM.

4. Habitual high-sodium/fluid behavior → sustained hypertension → in existing CKD, accelerates GFR decline via sustained glomerular hypertension.

5. Sustained high saturated fat/cholesterol intake → rising LDL over years → atherosclerotic plaque development and progression → CVD.

Diet Behaviors and Chronic Disease Development

Behavioral Feedback Loops Worth Highlighting

- Ultra-processed/high-sugar foods are engineered to be highly palatable, reinforcing consumption via reward pathways.
- ”Just eat less sugar" fails without behavior-change strategies.

Diet-disease relationship is bidirectional: as disease progresses, dietary needs change — the handoff point to MNT.

It’s like a cycle, not a single cause: dietary behavior → biological mechanism (inflammation, insulin resistance, etc.) → disease onset → altered dietary need → MNT intervention → if unmanaged, further progression.

Diabetes Mellitus & MNT

Diabetes is a disease that occurs when your blood glucose is too high.

- Approximately 40.1 million adults in the United States are living with diagnosed or undiagnosed diabetes.
- Insulin is a hormone made by the pancreas that helps glucose get into your cells to be used for energy.
- If you have diabetes, your body doesn't make enough insulin, doesn't make any insulin, or doesn't use insulin properly.
- Glucose then stays in your blood and doesn't reach your cells.

The most common types of diabetes: type 1, type 2 and gestational diabetes

Diabetes Mellitus & MNT

- MNT is a core component of diabetes management per current Standards of Medical Care in Diabetes.
- Focus areas: education on food groups, carbohydrate consistency and counting, glycemic index awareness, weight management, and individualized meal timing.
- Coordinated with pharmacologic therapy to reduce hypoglycemia risk and improve A1C outcomes.
- Pharmacists can reinforce dietitian-set goals during medication counseling encounters
- Uncontrolled diabetes increases risks for
  - Nephropathy: damage to the kidneys
  - Neuropathy: damage to the nerve cells
  - Retinopathy: damage to the blood vessels in the retina

Cardiovascular Disease & MNT

Cardiovascular Disease (CVD) is a group of conditions affecting the heart or blood vessels, most notably coronary heart disease, stroke, and heart failure.

- Approximately 128 million adults in the United States are living with some form of cardiovascular disease.
- Cardiovascular diseases are the leading cause of death globally.
- American Heart Association dietary guidance emphasizes reducing saturated fat, sodium, and added sugars.
- MNT for CVD is individualized to lipid panel (LDL, triglycerides), blood pressure, and comorbid conditions.

Cardiovascular Disease & MNT

- Focus areas: sodium and fluid restriction, education on saturated and trans fat, soluble and insoluble fiber, refined carbohydrates, alcohol consumption.
- Mediterranean diet, DASH diet and low carbohydrate diets can be advised.
- Pharmacists can reinforce dietary alignment with lipid-lowering and antihypertensive therapy.
- If CVD is not treated, risk of heart attack, heart failure, stroke and other complications can increase.

Chronic Kidney Disease & MNT

Chronic Kidney Disease (CKD) is when the kidneys have become damaged over time (for at least 3 months) and have a hard time doing it's job.

- Removing natural waste products and extra water from your body
- Helping make red blood cells
- Balancing important minerals in your body
- Helping maintain your blood pressure
- Keeping your bones healthy

Chronic Kidney Disease & MNT

Chronic Kidney Disease (CKD): divided into 5 stages to guide treatment.

- Stage 1: eGFR 90 or higher and kidney damage
  - Stage 2: eGFR 60-89 and kidney damage
  - Stage 3
    - Stage 3a: eGFR 45-59 and mild to moderate loss of kidney function
    - Stage 3b: eGFR 30-44 and moderate to severe loss of kidney function
  - Stage 4: eGFR 15-29 and severe loss of kidney function
  - Stage 5: eGFR less than 15 or on dialysis and kidney failure

Chronic Kidney Disease & MNT

- CKD requires individualized management of protein, potassium, phosphorus, sodium, and fluid intake.
- Dietary adjustments are based on GFR and lab values.
- The complexity of the disease exceeds general nutrition advice.
- KDOQI Clinical Practice Guidelines for Nutrition in CKD (2020 update) guide RDN-directed care.
- Referral to a registered dietitian is warranted to protect kidney function, manage laboratory values, prevent malnutrition and other complications
- If not treated complications can include CVD, HBP, anemia, metabolic acidosis, mineral and bone disorder, hyperkalemia and kidney failure.

Obesity & MNT

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese.

- Obesity is a complex disease, and it's difficult to identify a single determinant.
- Multifactorial: various factors can influence a person's weight.
- ***"Gold Standard"*** **: Comprehensive Lifestyle Intervention Programs**
  - Individual or group treatment
  - Three key principles
    - ✓ Supervised diets
    - ✓ Physical activity
    - ✓ Behavioral therapy

Obesity & MNT

Supervised diets

- The registered dietitian is recognized as the professional qualified to provide guidance and design a weight-loss meal plan.
  - Adequacy: meeting nutritional requirements
  - Balance: providing sufficient energy for the body
  - Moderation: satisfying tastes and preferences
  - Food variety: consuming a range of vitamins and minerals
  - Portion control: limiting calorie intake
  - Nutrient density: focusing on healthy foods to provide volume

Obesity & MNT

Physical activity

- Exercise program tailored to the individual's capabilities, needs, and goals

Improves cardiovascular health and metabolism

- Recommendation
  - >150 minutes/week (equivalent to >30 minutes/day) of cardiovascular activity
  - 2 or more days of resistance training
  - 200 to 300 minutes/week to maintain weight loss or minimize long-term (>1 year) weight regain

Obesity & MNT

Behavioral therapy

- Provided by psychologists, social workers, and/or licensed counselors
- Therapies that promote lifestyle changes in a structured manner
- Self-monitoring of food intake, physical activity, and weight
- At least once a week
- Provides tools to improve self-control and self-esteem
- Offers support and establishes realistic expectations
- Helps sustain the modification of habits and behaviors to maintain weight loss

Obesity & MNT

Medical and surgical interventions

- **Pharmacotherapy:** Anti-obesity medications or oral combinations may be prescribed for patients with a BMI ≥ 30, or a BMI ≥ 27 with weight-related health conditions.
  - GLP-1 receptor agonists (semaglutide, tirzepatide)
- **Metabolic/Bariatric Surgery:** Surgical options are considered when lifestyle and medication approaches are insufficient for patients with a BMI ≥ 40, or a BMI ≥ 35 with comorbidities.
  - Sleeve gastrectomy
  - Roux-en-Y gastric bypass

Obesity & MNT

- Other considerations: stress management, hydration, sleep and rest.
- Comprehensive patient assessment combining both approaches to maximize weight loss.
- Referral is appropriate when weight management intersects with diagnosed metabolic disease.
- Consideration of eligibility criteria for medical and surgical interventions.
- Program involving a multidisciplinary team to minimize potential barriers.
- Decisions must be based on patient well-being.
- Goal: achieving sustainable, long-term weight loss
- Obesity is a major modifiable risk factor for T2DM, CVD, NAFLD, respiratory diseases, gallbladder disease, various types of cancer, CKD, metabolic syndrome and premature death.

Macronutrients

Macronutrients are nutrients that our body needs in larger quantities to obtain energy, support structural growth, and regulate its metabolic functions.

Carbohydrates

- Sugar molecules your body breaks down carbohydrates into glucose.
- Glucose is the main source of energy for your body's cells, tissues, and organs.
- Glucose can be used immediately or stored in the liver and muscles for later use.
- Energy: 4 calories per gram.
- Examples: Whole grains, fruits, vegetables, and legumes

Macronutrients

Carbohydrates

- Sugar molecules your body breaks down carbohydrates into glucose.
- Main source of energy for your body's cells, tissues, organs and brain.
- Glucose can be used immediately or stored in the liver and muscles for later use.
- Provides dietary fiber for digestive health.
- Helps protein-sparing, allowing proteins to carry out their function.
- Energy: 4 calories per gram.
- Examples: Whole grains, fruits, vegetables, and legumes

Macronutrients

Protein

- Found throughout the body in muscle, bone, skin, hair, and virtually every other body part or tissue.
- Important for building and repairing tissues
- Catalyzing chemical reactions and sending chemical signals
- Immune system and transporting vital substances
- Energy: 4 calories per gram.
- **Animal sources:** Meat, poultry, fish, eggs, and dairy.
- **Plant sources:** Beans, lentils, nuts, seeds, and soy

Macronutrients

Fats (also called ‘fatty acids’ or ‘lipids’)

- Fats in our body are made up of three molecules joined together. This three-molecule structure is called a “triglyceride”.
- They are the most concentrated form of energy storage in the body.
- Necessary for the body to absorb and utilize vitamins A, D, E, and K.
- Fundamental for hormonal health.
- Help maintain body temperature.
- Form part of nervous tissue.

Macronutrients

There are three main types of fat:

- Unsaturated fats from plant foods
  - Monounsaturated fats
    - ✓ Olive and canola oil
  - Polyunsaturated fats
    - ✓ Safflower, sunflower, corn, and soy oil
- Saturated fats from animal foods
- Trans fats from commercially prepared and processed foods
- Energy: 9 calories per gram.

Macronutrients & Disease Relevance

Carbohydrates

Glycemic load affects glucose control; fiber-rich sources support cardiometabolic health

Protein

Individualized targets in CKD; supports satiety and muscle maintenance in older adults

Fats

Unsaturated fats support cardiovascular health; limit saturated & trans fats

Macronutrients & Disease Relevance

Carbohydrates

Glycemic load affects glucose control; fiber-rich sources support cardiometabolic health

Worsen: refined grains, added sugars, sugar-sweetened beverages → glycemic spikes → insulin resistance, NAFLD, higher triglycerides

Improve: whole grains, legumes, non-starchy vegetables → soluble fiber slows glucose absorption, lowers LDL, feeds beneficial gut bacteria.

Disease link: Constipation, T2DM, NAFLD, CVD, obesity, metabolic syndrome.

Macronutrients & Disease Relevance

Protein

Individualized targets in CKD; supports satiety and muscle maintenance in older adults

Worsen: excess intake in CKD accelerates GFR decline (increased glomerular filtration pressure); processed/cured meats linked to CVD and colorectal cancer risk (nitrates/sodium).

Improve: plant protein may produce less renal acid load in CKD. Also, focus on lean proteins with adjusted grams of protein per day according to GFR and renal function.
fish and plant proteins associated with better cardiovascular outcomes than red meat;

Disease link: CKD progression (quantity-sensitive), CVD (source-sensitive), sarcopenia risk if under-consumed.

Macronutrients & Disease Relevance

Fats

Unsaturated fats support cardiovascular health; limit saturated & trans fats

Worsen: saturated fat and trans fat raise LDL cholesterol, promote atherosclerotic progression.

Improve: monounsaturated (olive oil, avocado, nuts) and omega-3 (fatty fish, flax, walnuts) improve lipids, reduce triglycerides, anti-inflammatory.

Disease link: CVD, metabolic syndrome, obesity — the core mechanism behind the Mediterranean diet's benefit.

Micronutrients

Nutrient	Primary Role	Foods
Vitamin B12	Red blood cell formation, build and repair DNA, and support central nervous system	Clams, sardines, salmon, beef liver, beef, chicken, fortified soy milk, egg, cheese
Vitamin D	Bone health, immune function	Fatty fish, egg yolk, cow’s milk, orange juice, cereal, yogurt, plant-based milks
Potassium	Cellular balance, muscle function Nerve and Muscle function, Blood Pressure Regulation	Baked potatoes, white beans, dark leafy greens, lentils, banana, cantaloupe
Iron	Transport and store oxygen	Red meat, lentils and beans, spinach, fortified grains, seeds, liver

Micronutrients & Their Clinical Relevance

Vitamin B12 — Body cannot produce vitamin B12 on its own. It must be obtained through diet (animal products only) or through supplements. Deficiency common in strict vegans, older adults, long-term metformin users; untreated deficiency causes irreversible neurologic damage.

Vitamin D —It acts like a helper hormone to absorb calcium, support nerve signals from your brain, and keep your immune system healthy. Relevant in CKD (impaired renal activation → secondary hyperparathyroidism) and limited sun-exposure populations.

Potassium — protective for BP in healthy individuals; in advanced CKD, impaired excretion makes the same nutrient dangerous (hyperkalemia/arrhythmia risk). Restricted in CKD; monitored with certain diuretics

Iron — heme (meat, more bioavailable) vs. non-heme (plant, needs vitamin C for absorption). Deficiency in heavy menstrual loss, GI bleeding, poor intake.

Micronutrients

Nutrient	Primary Role	Foods
Sodium	Nerve function, red blood cell formation, muscle contraction, fluid/electrolyte balance	Canned products, frozen meals, processed/packaged foods, deli meats, soups, broths
Phosphorus	Bone and tooth structure, genetic material, metabolic regulation	Salmon, sardines, chicken, plain yogurt, cheese, milk, dark colas, fast food, packaged and deli meats
Magnesium	Muscle/nerve function, bone health, heart and blood regulation	Pumpkin seeds, almonds, cashews, legumes, cooked spinach
Zinc	Immune support, wound healing, growth and development	Oysters, crab, lobster, beef, pork, chicken, pumpkin seeds, cashews, almonds, chickpeas, lentils, fortified cereals

Micronutrients & Their Clinical Relevance

Sodium —hypertension; in CKD, promotes fluid retention and accelerates GFR decline.

Phosphorus —phosphate food additives (highly bioavailable, often unlabeled). In CKD, impaired excretion contributes to vascular calcification and bone mineral disease.

Magnesium: Depleted in chronic conditions like type 2 diabetes, hypertension, and congestive heart failure. Also, in certain conditions that block absorption, such as Celiac disease, Crohn's disease, or past gastrointestinal surgery. Long-term use of proton pump inhibitors (PPIs) for acid reflux or certain diuretics.

Zinc: Levels drop in metabolic diseases, diabetes, and chronic gastrointestinal disorders due to impaired utilization and increased bodily losses.

AUDIENCE POLLING QUESTION

A patient on long-term metformin therapy is at increased risk for deficiency of which vitamin?

A. Vitamin B12

B. Vitamin A

C. Vitamin B6

D. Vitamin K

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When Are Dietary Supplements Needed?

Documented nutritional deficiency confirmed by laboratory testing

- Strict vegan (B12 deficiency)
- Limited sun exposure/obesity (Vitamin D deficiency)

A physiological state that makes adequate dietary intake impossible

- Malabsorption syndromes
- Post-bariatric surgery (iron, calcium deficiency)
- GI conditions

A clinically recognized increased physiologic need

- Pregnancy (folic acid, iron)
- Medications that deplete specific nutrients
  - Long-term metformin and B12
  - Long-term PPI use and B12/magnesium

When Are Dietary Supplements Not Needed?

As a default substitute for a balanced diet without a documented deficiency or physiologic barrier

- Healthy adult with “low energy levels”

Based on marketing claims or non-specific symptoms without lab confirmation where feasible

Pharmacist's Practical Role

- Screen for supplement-relevant risk factors
- Not a "more is better" approach

Integrate Nutrition Screening into the Pharmacists' Patient Care Process (PPCP)

Pharmacist screens patient

General guidance or MNT?

Refers to registered dietitian

Collaborative follow-up and monitoring

Who Provides MNT and When to Refer

Patient identified with dietary concern

Pharmacist screens using PPCP

Determine: general guidance or MNT need?

Refer to Registered Dietitian if indicated

Collaborative follow-up & monitoring

Registered dietitians hold the clinical training to individualize renal, diabetic, and cardiac diets to lab values and disease stage — pharmacists play a critical role in recognizing when that referral is needed.

Recognizing When to Refer

- Unintentional weight loss or gain, or signs of malnutrition on routine assessment
- New diagnosis of diabetes, CKD, CVD, or obesity-related comorbidity
- Laboratory abnormalities suggesting nutrient deficiency or metabolic derangement
- Patient expresses confusion between general dietary advice and their prescribed treatment plan
- Complex polypharmacy with potential drug-nutrient interactions

Interprofessional Collaboration

Pharmacist

Screens, educates, reinforces goals, manages drug-nutrient interactions

Registered Dietitian

Delivers individualized MNT, sets clinical nutrition prescriptions

Physician / PCP

Diagnoses condition, coordinates overall treatment plan

Patient

Active participant — goals are collaborative, not imposed

Motivational Interviewing: Resistant Patients

Explore	Elicit	Collaborate	Support
Assess the patient's readiness and ambivalence toward change	Draw out the patient's own reasons for change rather than lecturing	Set small, achievable, patient-driven goals	Reinforce self-efficacy and autonomy over time

Explore —Avoid assuming they're ready to change
Elicit — No lecturing about why they should change
Collaborate — Don’t impose a strict and non-flexible plan
Support —Change is rarely linear, be present

MI significantly improves dietary adherence compared to didactic instruction, particularly in patients who are pre-contemplative or resistant to change.

Key Takeaways

- Healthy nutrition supports general wellness; MNT is an individualized clinical treatment for a diagnosed condition
- Evidence-based dietary patterns can help reduce chronic disease risk
- Diet behaviors directly influence progression of diabetes, CKD, CVD, and obesity
- Macro- and micronutrient status can drive or mitigate disease — assess before recommending supplements
- Supplements are appropriate only with a documented deficiency, need, or physiological barrier
- Motivational interviewing and interprofessional referral improve long-term patient outcomes

POST-TEST: QUESTION 1

Which statement best distinguishes MNT from general healthy nutrition?

A. Both terms refer to the same concept and are used interchangeably.

B. Healthy nutrition promotes overall wellness for the general population, while MNT is an evidence-based clinical intervention tailored to treat a specific condition.

C. MNT is only used in hospital settings and requires IV nutritional support.

D. Healthy nutrition focuses on macronutrients only, whereas MNT addresses micronutrients exclusively.

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POST-TEST: QUESTION 2

True or False: Chronic high intake of ultra-processed foods and added sugars has been associated with increased inflammation, insulin resistance, and accelerated progression of chronic diseases such as type 2 diabetes and non-alcoholic fatty liver disease (NAFLD).

A. True

B. False

POST-TEST: QUESTION 2

True or False: Chronic high intake of ultra-processed foods and added sugars has been associated with increased inflammation, insulin resistance, and accelerated progression of chronic diseases such as type 2 diabetes and non-alcoholic fatty liver disease (NAFLD).

A. True

B. False

POST-TEST: QUESTION 3

Which scenario MOST appropriately warrants a supplement recommendation?

A. A healthy adult eating a well-balanced omnivorous diet who wants extra energy

B. A strict vegan patient with laboratory-confirmed vitamin B12 deficiency

C. A patient requesting omega-3 supplements because they occasionally skip fish

D. An athlete who wants to improve performance without a documented nutritional gap

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POST-TEST: QUESTION 4

Which of the following statements about the pharmacist's role in nutritional counseling is MOST accurate?

A. Pharmacists should only discuss drug-nutrient interactions and avoid all nutritional counseling

B. Pharmacists can provide general nutrition education and identify patients who may benefit from MNT referral

C. Pharmacists are legally prohibited from discussing nutrition with patients

D. Nutritional counseling is solely the responsibility of physicians and nurses

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POST-TEST: QUESTION 5

Which clinical situation MOST warrants referral to a registered dietitian nutritionist?

A. A healthy 30-year-old who wants to lose 5 pounds before summer.

B. A patient newly diagnosed with Stage 3 chronic kidney disease.

C. A college student asking about protein powders for muscle building.

D. An elderly patient interested in starting a multivitamin.

POST-TEST: QUESTION 5

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C. A college student asking about protein powders for muscle building.

D. An elderly patient interested in starting a multivitamin.

POST-TEST: QUESTION 6

Which strategy is most aligned with evidence-based approaches for a change-resistant patient?

A. Providing a strict meal plan and instructing the patient to follow it exactly.

B. Advising the patient to eliminate all unhealthy foods immediately.

C. Using motivational interviewing to explore readiness and set small, achievable goals.

D. Referring the patient to a dietitian without any pharmacist follow-up.

POST-TEST: QUESTION 6

When counseling a patient resistant to dietary behavior change, which strategy is most aligned with evidence-based approaches for improving long-term adherence?

A. Providing a strict meal plan and instructing the patient to follow it exactly.

B. Advising the patient to eliminate all unhealthy foods immediately.

C. Using motivational interviewing to explore readiness and set small, achievable goals.

D. Referring the patient to a dietitian without any pharmacist follow-up.

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Kaithlyn Rodríguez Otero

Kaithlyn.rodzotero@gmail.com

(787) 948-6187