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Dietary Recommendations for Patients with Diabetes



In this Issue...

Commercials on television, ads in magazines, information and misinformation on the internet — there is no shortage of sources touting weight loss program. But which ones are appropriate for patients with type 2 diabetes? And how can clinicians best answer their patients' questions about the diets they've heard or read about?

In this issue, eDiabetes Review Program Director Nestoras Mathioudakis, MD, from the Division of Endocrinology, Diabetes and Metabolism at the Johns Hopkins University School of Medicine, reviews the evidence-based investigations into key nutritional topics in diabetes management.

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1.0 hour Physicians
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July 28, 2016

Expiration Date

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LEARNING OBJECTIVES

- Describe the evidence behind glycemic effects of commonly used diets in diabetes management.
- Identify calorie goals for overweight/obese patients with diabetes wishing to lose weight.
- Summarize recommendations for alcohol intake in adults with diabetes.

GUEST AUTHOR OF THE MONTH

Commentary & Reviews



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Guest Faculty Disclosure

Nestoras Mathioudakis, MD has indicated that he has no financial interests or relationships with a commercial entity whose products or services are relevant to the content of this presentation.

Unlabeled/Unapproved uses

Nestoras Mathioudakis, MD has indicated that there will be no references to unlabeled/unapproved uses of drugs or products.

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COMMENTARY

As a diabetes specialist, I know that staying informed about the latest dietary recommendations is essential to providing useful and practical advice to my patients. With hundreds of commercially available diets, it can be very difficult to keep up with my patients, who often come to clinic with information about specific diets that they have read on the internet, seen on TV, or heard about from a friend. There is significant overlap in many commercially available (eg, Weight Watchers) and medically advocated (eg, DASH) diets, many of which put a simple spin on basic dietary principles for marketing purposes. That can make it difficult for the clinician to know whether to recommend specific diets for glycemic control, weight loss, or both.

The American Diabetes Association provides specific dietary recommendations in their annual Standards of Medical Care. In this issue, we review the key principles of the 2016 ADA dietary recommendations. While the ADA does not recommend a single macronutrient composition (ie, specific percentages of calories from carbohydrates, proteins, and fats), there is a plethora of evidence from both prospective and randomized controlled trials to support commonly used diets – including low-carbohydrate, low-fat, low glycemic index, vegan, and Mediterranean-style diets – for diabetes prevention and management. Many clinical trials evaluating specific diet plans, however, fail to take into account the fact that different diet plans may have differing effects on weight loss. Since weight is such a primary driver of glycemic control in diabetes, it is difficult to know whether the benefits of a particular diet are related more to the unique macronutrient composition or effects on weight loss itself. Emadian et al (reviewed in this issue) sought to isolate the effect of macronutrient composition on glycemic control in their 2015 systematic review.

While a low-fat diet has historically been the mainstay of dietary management for diabetes, other types of diets may be equally beneficial, if not superior. Herein we review two randomized controlled trials that evaluated diets against the standby low-fat diet: a low-carb diet (Tay et al) and a Mediterranean-style diet (Esposito et al). One of the main concerns about a low-carb diet is that reductions in carbohydrates will result in a compensatory increase in fats and that increased saturated fat intake may be deleterious from a cardiovascular risk standpoint. The article by Tay et al, which compared the low-carb to low-fat diet, addressed this particular concern and not only found no worsening in lipid profile, but actually found favorable lipids in the low-carb diet. A key point to highlight here is that in



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both low-carb and low-fat diets, saturated fat content was low (< 10%), so the finding is difficult to extrapolate to commercially available low-carb diets that do not restrict saturated fat (such as the Atkins diet).

A hallmark feature of the Mediterranean diet, which may prevent metabolic syndrome and coronary artery disease, is moderate red wine consumption. Gepner et al (reviewed in this issue) sought to evaluate whether initiation of daily alcohol intake among patients who previously abstained from alcohol intake could have favorable effects on glycemic control and cardiovascular markers. The findings of this study are considered together with the ADA recommendations on alcohol use.

Although patients can choose from a wide number of commercial or medically endorsed diets, the physician need not be an expert dietitian to be able to critically appraise a particular diet. In this issue, we emphasize the key nutrition principles of a diabetes-friendly diet, which the clinician can use to assess the appropriateness of specific diet plans being considered by their patients. In practice, most diet plans that achieve weight loss are effective, and only modest weight loss of 5%-7% of body weight is needed to realize glycemic benefits.

We review the calorie goals for overweight and obese adults with diabetes seeking to lose weight. A study by Rothberg et al (reviewed herein) suggests a role for a very low-calorie diet for morbidly obese adults with diabetes who may fail to lose weight with low-calorie targets. The safety implications of recommending very low-calorie diet plans are also discussed.

Although medical nutrition therapy should be provided by a registered dietitian, in my experience patients also look to their physician to provide specific guidance on their dietary choices. The articles reviewed in this issue will help physicians who care for patients with diabetes make informed recommendations about commonly used diets in diabetes and become familiar with current standards of care related to calorie goals, alcohol use, and other relevant nutritional topics.

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LOW-CARB VS LOW-FAT DIET FOR T2DM

Tay J, Luscombe-Marsh ND, Thompson CH, et al. A very low-carbohydrate, low-saturated fat diet for type 2 diabetes management: a randomized trial. *Diabetes Care*. 2014 Nov;37(11):2909-2918.



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Historically, the dietary approach for type 2 diabetes (T2DM) management has been a calorie-restricted, high-carbohydrate (carb), low-protein, low-fat diet. However, because dietary carbohydrate elicits greater postprandial hyperglycemia than fat or protein, there has been increased interest in the role of very low-carb (20-70 gm of carbohydrate/day) diets for diabetes management. These low-carb diets are also high in protein and fat content. Low carb diets have been shown to achieve comparable effects on weight loss, blood pressure, and improved glycemic control compared to high-carb diets. However, these studies have been limited by the lack of control for physical activity, a key component of lifestyle modification for weight and glycemic control. The main concern about low-carb diets has been a compensatory increase in saturated fat, with concomitant increases in LDL cholesterol. Accordingly, the health effects of low-carb diets may depend on the fat quality, whereby a low carb diet with high unsaturated and low saturated fat content may provide glycemic benefits without worsening LDL cholesterol.

The objective of this randomized controlled trial by Tay et al was to compare the glycemic and cardiovascular effects of a low-carb (LC), high-unsaturated/low-saturated fat diet with a calorie-matched high-carb diet (HC). The study enrolled 115 overweight and obese adults with T2DM. The planned macronutrient composition of the LC diet was 14% of total calories from carbohydrate (< 50 g of carbs/day), 28% protein, and 58% fat (35% monounsaturated fat and 13% polysaturated fat). For the HC diet, the planned macronutrient composition was 53% carbohydrate (with an emphasis on low glycemic-index [GI] foods), 17% protein, and < 30% total fat (15% monounsaturated fat and 9% polysaturated fat). Diet plans were individualized with moderated calorie restriction of 500-1000 kcal/day. Diets were limited to

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specific foods that participants recorded in a food diary daily.

The food profile for the LC diet included 30 g high-fiber, low GI cereal; 1 crispbread, 250 g lean chicken, pork, fish, red meat (3-4 times per week), 40 g almonds and 20 g pecans, 3 cups low-starch vegetables, 200 ml skim milk, 100 g diet yogurt, 20 g regular cheese, and 30 g monounsaturated margarine or oil.

The food profile for the HC diet included 40 g high-fiber, low-GI cereal, 5 crispbread, ½ cup cooked pasta, rice, or potato, 2 slices wholegrain bread, 80 g lean chicken, pork, red meat (4 times/week), 80 gm fish (2 times/week), 3 cups vegetables, 400 gm fruit, 250 ml low-fat milk, 150 gm reduced fat yogurt, 20 g cheese, and 25 g monounsaturated margarine or oil.

Saturated fat was restricted to < 10% for both groups. Both groups performed 60 minutes of supervised exercise three days per week.

Ninety-three participants completed this 24-week study. In patients with baseline A1C values > 7.8%, the LC diet achieved greater reductions in A1C ($-2.6 \pm 1.0\%$) compared to the HC diet ($-1.9 \pm 1.2\%$; $P = .002$). Additionally, the LC diet achieved greater reductions in triglycerides (-44.2 ± 44.2 vs. -8.8 ± 44.2 mg/dl; $P = .001$) and greater increases in HDL cholesterol (7.7 ± 11.6 vs. 1.9 ± 7.7 mg/dl; $P = .007$). There were no differences in weight loss, fasting blood glucose, or blood pressure between the groups. This study suggests that, in the short-term, an LC diet may be an effective dietary approach for T2DM management and did not result in adverse lipid profiles.

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MEDITERRANEAN DIET FOR NEWLY DIAGNOSED T2DM

Esposito K, Maiorino MI, Petrizzo M, Bellastella G, Giugliano D. The effects of a Mediterranean diet on the need for diabetes drugs and remission of newly diagnosed type 2 diabetes: follow-up of a randomized trial. *Diabetes Care*. 2014 Jul;37(7):1824-1830



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Numerous studies suggest that a Mediterranean diet (MedD) may prevent metabolic syndrome and coronary artery disease.¹ A broad definition of a MedD is one that is rich in monounsaturated fat (olive oil), vegetables, fruits, breads and cereals, legumes, and nuts, with modest intake of fish and poultry, eggs, and dairy, rare intake of red meat and sweets, and moderate daily red wine consumption.²

In their follow-up study of a four-year randomized controlled trial, Esposito et al evaluated the long-term effects of a MedD compared to a low-fat (LF) diet in adults with newly diagnosed type 2 diabetes mellitus. Adults with newly diagnosed T2DM ($n = 215$), naïve to treatment with diabetes medications, were randomized to a MedD or a LF diet. In both diets, daily calories were restricted to 1,500 for women and 1,800 for men. The MedD was rich in vegetables and whole grains and low in red meat (replaced with poultry and fish), with the goal of no more than 50% of calories from carbohydrates and no less than 30% of calories from fat. The main source of fat was 30-50 g of olive oil. The LF diet was rich in whole grains and restricted additional fats, sweets, and high-fat snacks, with the goal of no more than 30% of calories from fat (with < 10% from saturated fats). The mean age of participants was ~ 52 years, mean BMI was ~ 30 kg/m², and mean A1C was ~ 7.7%. After four years, participants who were still free of diabetes medications were followed until they reached the primary end point of needing a diabetic drug or remission of diabetes.

The main finding of this study was a higher prevalence of diabetes remission in the MedD compared to the LF diet. After four years, the cumulative incidence of participants requiring diabetic medications was 44% in the MedD vs 70% in the LF diet ($P < .001$). Across all years of the study, the prevalence of complete remission of T2DM was greater with the MedD diet than with the LF diet (prevalence ratio: 5.2; 95% CI 2.5-8.9). At year 1, mean A1C was 0.5% lower in the MedD group than in the LF diet group ($P < .001$). While weight loss was 2.0 kg greater in the MedD group than in the LF diet group at one year, the effects were attenuated by year two.

In summary, this study found that, compared to a LF diet, a MedD resulted in greater reduction in A1C levels, higher rates of diabetes remission, and longer time to diabetes medication requirement. This study aligns with recommendations by the American Diabetes

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Association that a “Mediterranean-style diet rich in monounsaturated fats may improve glucose metabolism...and can be an effective alternative to a diet low in total fat but relatively high in carbohydrates.”³

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ALCOHOL INTAKE AND CARDIOMETABOLIC RISK IN T2DM

Gepner Y, Golan R, Harman-Boehm I, et al. Effects of Initiating Moderate Alcohol Intake on Cardiometabolic Risk in Adults With Type 2 Diabetes: A 2-Year Randomized, Controlled Trial. *Ann Intern Med*. 2015 Oct 20;163(8):569-579.

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Although epidemiological studies suggest benefits of moderate alcohol consumption on cardiovascular disease and incident diabetes,^{1,2} it is questionable whether patients with type 2 diabetes should be advised to initiate moderate alcohol intake. The American Diabetes Association recommends that “adults with diabetes who drink alcohol should do so in moderation (no more than one drink per day for adult women and no more than two drinks per day for adult men.)”³ With respect to the choice of alcoholic beverage, some studies have suggested that red wine might confer advantages over other types of alcohol in mediating protective cardiovascular or metabolic effects.^{4,5}

In this randomized controlled trial, Gepner et al sought to determine whether initiating moderate alcohol intake is beneficial in adults with T2DM. This two-year study enrolled 224 alcohol-abstaining adults aged 40-75 years with T2DM and randomized them to receive either mineral water, white wine, or red wine (150 ml at dinnertime). Insulin-requiring patients were excluded, as were subjects with triglyceride levels > 400 mg/dl and A1C levels < 6.4% or > 10%. All participants were advised to follow a Mediterranean diet. To determine whether genetic variability in alcohol metabolism could contribute to disparate metabolic benefits, participants had genetic analysis of the alcohol dehydrogenase genes.

Compared to the control group (water and Mediterranean diet), the red wine group had significantly increased HDL levels by 2.0 mg/dl (95% CI 1.6-2.2 mg/dl; $P < .001$). Only slow ethanol metabolizers (~36% of participants) showed any significant benefits from red or white wine on glycemic control. Although both wines showed trends in improvements in glucose metabolism after two years, only white wine significantly reduced fasting plasma glucose levels compared to water (-17.2 mg/dl; 95% CI, -28.9 to -.5; $P = .004$). However, pooled data among all participants who received wine showed no significant changes in fasting glucose or A1C. There were no significant differences across the three groups' blood pressure, adiposity, liver function, or quality of life. Sleep quality improved in the white wine group compared with the water group. Red wine reduced the number of components of the metabolic syndrome by 0.34 ($P = .049$).

In summary, this study found some favorable improvements in lipids but no significant changes in glycemic measures overall with wine intake, suggesting that moderate wine intake is probably safe and may modestly decrease cardiovascular risk by affecting HDL cholesterol. However, patients with T2DM who currently abstain from alcohol should not be encouraged to begin drinking with the express purpose of improving glycemic outcomes.

References:

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VERY-LOW-CALORIE DIET FOR T2DM

Rothberg AE, McEwen LN, Kraftson AT, Fowler CE, Herman WH. Very-low-energy diet for type 2 diabetes: an underutilized therapy? *J Diabetes Complications.* 2014 Jul-Aug;28(4):506-10.



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Modest weight loss of 5%-7% of body weight has been shown to improve glycemic control and reduce the need for antidiabetic medications.¹⁻⁴ To achieve weight loss, the American Diabetes Association recommends lifestyle programs that promote a 500-750 kcal energy deficit per day.¹ This translates to approximately 1,200-1,500 kcal/day for women and 1,500-1,800 kcal/day, which is adjusted according to the individual's baseline body weight.¹ In the real-world setting, many patients fail to achieve these calorie goals and weight loss. In recent years, bariatric surgery has been advocated as a treatment option for obesity and type 2 diabetes (T2DM) for patients who fail to achieve weight loss targets with traditional calorie restricted diets.

In this prospective observational study, Rothberg et al evaluated the effect of an intensive calorie-restricted diet on glycemic outcomes. Sixty-eight participants with established or newly diagnosed T2DM were enrolled in this 12-week study. The intervention was an intensive caloric restriction (800 kcal/day) in the form of total meal replacement (chocolate or vanilla shakes or chicken soup). Additional calories were prescribed for those who weighed more than 160 kg. Patients were advised to follow a low to moderate intensity exercise regimen of 30-40 minutes daily.

The mean participant age was 53 ± 7 years; 53% of study subjects were male. After 12 weeks of a very-low-calorie diet, BMI fell from 40.1 ± 6.6 to 35.1 ± 6.5 kg/m² ($P < .0001$). A1C fell from 7.4% ± 1.3% to 6.5% ± 1.2% ($P < .0001$). Among patients with established diabetes, 76% achieved an A1C <7%, whereas all patients with newly diagnosed diabetes achieved A1C <7%. Factors that were significantly associated with A1C reductions included change in body mass, baseline A1C, GLP-1 agonist initiation, and insulin treatment at baseline and follow-up. Each one unit (kg/m²) drop in BMI was associated with a 0.24% reduction in A1C at follow-up ($P < .0001$). The authors of this study conclude that in the short term, a very low-calorie diet can produce glycemic outcomes similar to those following bariatric surgery. A limitation of this study was the nonrandomized design and possible selection for more motivated participants.

Although a very low-calorie diet was shown to be effective in improving glycemic control, it is important to note that severe calorie restriction should only be encouraged in the setting of a medically supervised weight loss program. These calorie targets are far below those recommended by the American Diabetes Association for the majority of overweight and obese adults wishing to lose weight.

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EFFECT OF MACRONUTRIENTS ON GLYCEMIC CONTROL

Emadian A, Andrews RC, England CY, Wallace V, Thompson JL. The effect of macronutrients on glycaemic control: a systematic review of dietary randomised controlled trials in overweight and obese adults with type 2 diabetes in which there was no difference in weight loss between treatment groups. *Br J Nutr*. 2015 Nov 28;114(10):1656-1666.

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There is a plethora of medically endorsed and commercially available diet plans aimed at weight loss and cardiovascular disease prevention.¹ Observational studies have shown that certain diets, such as the Mediterranean diet, have been associated with significant diabetes risk reduction (up to 20%).² However, it is unclear which specific diets are most effective in improving glycemic control in patients with established type 2 diabetes.³ Since weight loss has proven effects on glycemic control, it is difficult to determine whether the beneficial effects of a given diet on glycemic control are due to the weight loss itself or to the composition of the diet.

Unlike previous systematic reviews, Emadian et al included only randomized controlled trials (RCTs) where different dietary interventions were compared and in which total mean weight loss between groups was not statistically different. The purpose of excluding randomized trials where there were differences in weight loss between the different diet groups was to isolate the effect of the macronutrient composition of the diet on glycemic control.

For this review, inclusion criteria included RCTs of at least six months' duration that enrolled overweight patients with T2DM. Of 11 eligible studies, only four indicated the benefits of a particular diet on glycemic control (A1c levels). Specifically, the Mediterranean, vegan, and low glycemic index diets were found to be superior to their respective control diets. These four studies are summarized as:

- In a study of 79 obese adults with T2DM, the A1C reduction was 0.7% greater with a low glycemic index diet compared to a low fat diet ($P = .01$).⁴
- In a study of 215 overweight adults with T2DM, the A1C reduction was 0.4% greater with a low-carb Mediterranean diet compared to low-fat diet (the authors stated significant difference but reported no P value).⁵
- In a study of 259 overweight and obese adults with T2DM, the A1C reduction was 0.2% greater in low-carb Mediterranean diet compared to ADA diet ($P = .021$).⁶
- In a study of 99 obese adults with T2DM, the A1C reduction was 0.3% greater in low-fat vegan diet compared to the American Diabetes Association (ADA) diet, when adjusted for medications ($P = .03$).⁷

A previous (2013) systematic review by Ajala et al concluded that Mediterranean, low-carb, low-GI, and low-protein diets are more effective from a glycemic control standpoint compared to respective control diets (low fat, high GI, low protein, and ADA diets).⁴ Weight loss appears to be greatest with the Mediterranean and low-carb diets, which might explain their superior glycemic effects.⁸ An earlier (2012) systematic review by Wheeler et al showed that many diets improve both cardiovascular risk factors and glycemic control but

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failed to identify any single diet as superior.⁹

The present systematic review identified diets that were shown to have superior glycemic effects independent of weight loss; however, it is important to note that only four of 11 included trials reported benefits on glycemic control. While macronutrient composition should be considered, ultimately the total calorie content and its effect on weight loss are probably more important factors when providing dietary recommendations for overweight and obese patients with T2DM.

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AMERICAN DIABETES ASSOCIATION DIETARY RECOMMENDATIONS IN 2016

Foundations of Care and Comprehensive Medical Evaluation. In American Diabetes Association Standards of Medical Care in Diabetes – 2016. *Diabetes Care* Volume 39, Supplement 1, Jan 2016.

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The Standards of Medical Care in Diabetes – 2016 provide evidenced-based nutrition therapy recommendations in the section on “Foundations of Care and Comprehensive Medical Evaluation” (S25-S27). These recommendations cover a broad range of topics, including effectiveness of nutrition therapy, energy balance, eating patterns and macronutrient distribution, protein, dietary fat, macronutrients and herbal supplements, alcohol, and sodium. Below are some of the key nutrition recommendations for clinicians caring for patients with diabetes:

- Medical nutrition therapy provided by a registered dietitian should be offered to all people with type 1 and type 2 diabetes.
- Modest weight loss (5%-7% of body weight) is associated with glycemic benefits.
- Weight loss can be achieved through a 500-750 kcal/day energy deficit (1,200-1,500 kcal/day for women and 1,500-1,800 kcal/day for men, adjusted for the patient's baseline weight).
- For insulin treated patients, a consistent pattern of carbohydrate intake is advised to improve glycemic control and minimize the risk of hypoglycemia.

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- There is no single ideal macronutrient composition (ie, carbohydrate, fat, and protein distribution) for people with diabetes.
- Carbohydrate intake should come from healthy sources including whole grains, vegetables, fruits, legumes, and dairy products. An emphasis should be placed on high fiber and low glycemic index carbohydrates.
- Sugar-sweetened beverages should be avoided and added sugar should be minimized.
- A diet rich in monounsaturated fats like the Mediterranean diet may improve glucose metabolism and provide cardiovascular benefits and can be an alternative to a low-fat/higher-carb diet.
- Foods rich in long-chain omega-3 fatty acids, such as fatty fish (EPA and DHA), nuts, and seeds are recommended for CVD prevention and treatment; however there is no evidence to support supplementation with omega-3.
- Micronutrient supplementation (vitamins, minerals) have not been proven to improve diabetes and may pose a safety concern with long-term use of vitamins E, C, and carotene.
- There is no clear evidence to support herbal supplements for diabetes.
- Moderate alcohol intake is defined as no more than one drink per day for adult women and no more than two drinks per day for men. Adults with diabetes who choose to drink alcohol should do so in moderation.
- Patients should be made aware that alcohol consumption may result in increased risk of delayed hypoglycemia when taking insulin or insulin secretagogues.
- Sodium should be limited to < 2,300 mg/dl, as for the general population.

These recommendations should form the basis of any diet endorsed by clinicians for their patients.

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KEY TAKEAWAYS

- Low-carb, Mediterranean, vegan, and low-glycemic index diets have all been shown to have glycemic benefits independent of weight loss effects compared to control diets.
- Alcohol initiation in previously abstinent patients with type 2 diabetes should not be recommended for improved glycemic control.
- Very low calorie diets can be effective from a weight loss and glycemic control standpoint, but they should only be recommended under a medically supervised program.

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