

NUTRITION THERAPY FOR THE HOSPITALIZED PATIENT WITH DIABETES

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ABSTRACT

Objective: To summarize recommendations for medical nutrition therapy (MNT), including how to implement it to achieve glycemic control targets for hospitalized patients with diabetes.

Methods: The MNT goals for hospitalized patients with diabetes are reviewed, and suggestions are made for attaining these goals. Emphasis is placed on the importance of proper screening and referral of inpatients to MNT service and on the process of providing MNT in the hospital setting.

Results: Implementing MNT in the hospital can be challenging because of the differences in nutrient and medication requirements compared with the home setting. Individualization of MNT during hospitalization, along with intensive medical management, generally is required if patients with diabetes are to achieve blood glucose targets. Barriers that may impact an individual's nutrition status and subsequently affect glycemic control include poor appetite, inability to eat, increased nutrient and calorie needs due to catabolic stress, variation in diabetes medications, and the possible need for enteral or parenteral nutrition support. There is limited evidence on what constitutes the optimal diet for hospitalized patients with diabetes. The consistent carbohydrate meal-planning system has been recommended because carbohydrate intake is the primary nutritional influence on blood glucose; this system focuses on the total grams of carbohydrate as the key strategy to achieve blood glucose control. Introduction of the consistent carbohydrate system requires that all healthcare disciplines understand the rationale of the system; and for the system to be effective, coordination must exist between nursing and nutrition services.

Conclusion: Established guidelines for integration of diabetes medications with meals, snacks, or nutrition support, developed by a multidisciplinary healthcare team, will help ensure that the nutrition care plan works together with the medical treatment plan. The key areas of focus to improve inpatient glycemic control are: establishing screening criteria for appropriate referral to a registered dietitian; identifying nutrition-related issues in clinical pathways and patient care plans; implementing and maintaining standardized diet orders such as consistent carbohydrate menus; integrating blood glucose monitoring results with nutrition care plans; using standing orders for diabetes education and diabetes MNT as appropriate; and standardizing discharge follow-up orders for MNT and diabetes education post-discharge when necessary. (**Endocr Pract.** 2006;12[Suppl 3]: 61-67)

Abbreviations:

ADA = American Diabetes Association; MNT = medical nutrition therapy; NCP = nutrition care process; RD = registered dietitian

INTRODUCTION

Although clear guidelines exist regarding medical nutrition therapy (MNT) (1) for people with diabetes at home, implementing those recommendations in the hospital setting is less clearly defined. Nutrition therapy outcome studies have demonstrated the effectiveness of diabetes MNT in the outpatient setting through documented decreases in hemoglobin A1c of approximately 1% to 2% depending on duration and type of diabetes (2). When provided by a registered dietitian (RD) experienced in diabetes management, MNT has been shown to be clinically effective (2). The following upper limits for glycemic targets have been recommended for hospitalized patients (3): preprandial, 110 mg/dL; peak postprandial, 180 mg/dL; and intensive care unit, 110 mg/dL. To achieve these blood glucose targets, it is essential to incorporate MNT into the overall medical treatment plan.

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MEDICAL NUTRITION THERAPY IN THE HOSPITAL SETTING

MNT includes an assessment of nutrition status and the provision of diet modification, counseling, or specialized nutrition therapy (4). Although glycemic control is the primary goal for the hospitalized patient with diabetes, the overall goals of MNT are to (5,6):

- Attain and maintain optimal metabolic control of blood glucose, lipids, and blood pressure to enhance recovery from illness and disease
- Incorporate nutrition therapies to treat the complications of diabetes, including hypertension, cardiovascular disease, dyslipidemia, and nephropathy
- Provide adequate calories for illness and recovery
- Improve health through use of nutritious foods
- Address individual needs based on personal, cultural, religious, and ethnic food preferences
- Provide a discharge plan for continuing self-management training and follow-up care

Implementing MNT to achieve these goals can be challenging when the patient is hospitalized. Both nutrient requirements and medication requirements (e.g., temporary need for insulin) for an individual are likely to be different in the hospital setting than in the home setting. Individualization of MNT during hospitalization, along with intensive medical management, generally is required if patients with diabetes are to achieve recommended blood glucose targets (7). Barriers that may impact an individual's nutrition status and subsequently affect glycemic control include poor appetite, erratic eating schedules due to tests and procedures, inability to eat, increased nutrient and calorie needs due to catabolic stress, variation in diabetes medications, the need for enteral or parenteral nutrition support, and the limited ability for hospitals to individualize meal plans (5,7). At times, such barriers can make achieving glycemic control seem unattainable; however, the benefits of improved blood glucose control are many (3,5). A team approach is required to overcome the multiple challenges to blood glucose control and ensure that the nutrition care plan works together with the medical treatment plan. An RD knowledgeable in diabetes care is a critical team member with the unique qualifications to integrate nutritional status measures with metabolic control to achieve optimal health outcomes (2,7).

NUTRITION SCREENING AND REFERRAL

To identify the patients with diabetes who need a more comprehensive nutrition assessment, a screening and referral process should be in place; this ensures that patients receive appropriate nutrition care (7). Typically, in the acute-care setting, an initial screening is conducted to identify patients with diabetes patients who may benefit from

further assessment and nutrition intervention. In a survey of hospital-employed clinical dietitians, 59.8% indicated that initial nutrition screenings are always or frequently completed by nursing staff, with patients determined to be at "high nutritional risk" referred to the RD (8) for further assessment and nutrition care. Typically, blood glucose results and patients' self-report of a diagnosis of diabetes are 2 criteria used in the screening process.

Once patients with diabetes are identified, the next step is to prioritize the need for a more thorough nutrition assessment. Unfortunately, with fewer resources currently available to clinical dietetics departments in hospitals today, patients at mild to moderate nutrition risk may not receive potentially beneficial nutrition intervention (8). Screening processes tend to focus on identifying patients who are nutritionally high risk by reviewing lists of hospitalized patients for indicators such as certain medications (e.g., insulin or oral diabetes medications), diet orders (e.g., modified diets), NPO (nothing by mouth) status, specific admitting diagnoses, and laboratory measures (e.g., elevated blood glucose) (7). Patients with newly diagnosed diabetes or admitted with diabetic ketoacidosis are examples of those who may meet the criteria for high nutritional risk requiring further assessment (7).

NUTRITION CARE PROCESS

Once patients are referred, the nutrition care process (NCP) can be initiated. The NCP is described as "a systematic problem-solving method that dietetics professionals use to critically think and make decisions to address nutrition-related problems and provide safe and effective quality nutrition care" (4). The 4 steps of the NCP are nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation (4). This article focuses primarily on the nutrition assessment and nutrition intervention steps and how they apply to hospitalized patients with diabetes.

Nutrition Assessment

For patients who are nutritionally at risk, a thorough assessment is required to identify nutrition-related problems (e.g., inadequate caloric intake, dehydration, or need for enteral or parenteral nutrition). The following components would be examined in a comprehensive nutrition assessment (4,5,7):

- Pertinent diagnoses and medications
- Laboratory measures (including blood glucose values) and anthropometrics (e.g., height, weight, body mass index)
- Nutritional adequacy of dietary intake
- Nutrition-related consequences of disease
- Psychosocial, functional, and behavioral factors related to food and nutrition intake
- Diabetes knowledge and self-management skills
- Readiness to learn, and potential for behavior change

- Lifestyle/cultural influences and literacy skills
- Support systems
- Assessment of mobility, vision, hearing, and dexterity
- Previous education and future educational needs for discharge planning

A nutrition diagnosis is established based on the data gathered and synthesized during the nutrition assessment. Once the nutrition diagnosis is determined, appropriate nutrition intervention can be implemented. Common nutrition interventions include diet modification, initiating specialized nutrition therapies, and providing nutrition counseling (7). Although education needs should be included in any treatment plan, the focus of this article is clinical nutrition interventions. To achieve treatment targets for glycemic control, nutrition care plans must be effectively communicated to all team members. For example, all team members should understand the various diet orders for the facility (e.g., what types of foods are provided, and whether a snack is included as part of the diet order) (7). Nutrition interventions covered in this article include consistent carbohydrate meal planning, diet progression (e.g., clear liquid to full liquid, to soft, etc.), and nutrition support. Some common nutrition issues with key considerations for healthcare professionals are included in Table 1.

Consistent Carbohydrate Plan

There remains limited evidence regarding an optimal diet for hospitalized patients with diabetes. Hospital diets continue to be inappropriately ordered by specific calorie levels based on the “ADA diet,” even though it has been recommended that this term no longer be used (1). Since 1994, the American Diabetes Association (ADA) has not endorsed any specific meal plan or percentages of macronutrients (1). The consistent carbohydrate meal-planning system was developed for hospitals to provide a practical way of serving food to diabetes patients while aiding improvement of glycemic control. This system is not based on set calorie amounts; rather, it focuses on the total grams of carbohydrate spread throughout the day as the primary strategy to achieve glycemic control (6). The carbohydrate amount is consistent from meal to meal, and from day to day, and the focus is on the total carbohydrate content of each meal (9). The primary sources of carbohydrate should be fruits, vegetables, whole grains, and low-fat or non-fat milk (6). Sucrose-containing foods also may be included in the total carbohydrate amount for the meal (10). On average, consistent carbohydrate daily menus served in the hospital setting provide between 1,800 and 2,000 calories, with approximately 12 to 15 carbohydrate servings divided among meals and snacks (5,6). One carbohydrate serving provides approximately 15 grams of carbohydrate.

Facilities have implemented consistent carbohydrate meal plans in different ways. Some hospitals still allow for an “ADA diet” order, with the consistent carbohydrate plan being the default diet. Others have “carbohydrate

controlled” diets with a consistent carbohydrate pattern. To allow for more flexibility and individual preference, some facilities have select menus in which carbohydrate foods are grouped together and the patient is instructed to select a predetermined number of choices per meal (5). Although the consistent carbohydrate meal plan is gaining acceptance, set calorie-level diets based on the exchange system, per physician order, remain common. Use of other meal plans such as those with “no concentrated sweets,” “no added sugar,” or “low sugar” is not appropriate (6). Such diets unnecessarily restrict sucrose-containing foods and do not reflect current evidence-based nutrition recommendations (11).

Varying beliefs exist about including snacks in the consistent carbohydrate meal plan. It remains common practice to include at least one snack as part of a “diabetic diet” order, regardless of the medical treatment plan for the patient (7). With appropriate insulin or oral diabetes medication adjustments, snacks should not be required but rather provided as an option to meet patient preference and/or additional caloric needs (7).

Even when patients are not on a regular texture diet, a consistent carbohydrate pattern is still recommended. Patients with diabetes should not receive non-caloric, sugar-free liquid diets when on a clear liquid diet order (6). Calories and carbohydrates are needed to meet increased glucose requirements during illness, surgery, and recovery (9). To prevent starvation ketosis, individuals on clear or full liquid diets should receive approximately 200 g of carbohydrate throughout the day, divided in equal amounts (6,12-15). It is desirable to initiate feeding in post-surgical patients as soon as possible to protect intestinal integrity (9). Diets should be advanced from clear liquid to full liquid to solid foods as quickly as the patient is able to tolerate the progression. Table 2 shows sample consistent carbohydrate menus for diet progression.

To gain acceptance and understanding for the transition to a consistent carbohydrate system, it is essential to have extensive staff and provider education, in addition to patient education. Introduction of the consistent carbohydrate system involves coordination among healthcare disciplines, especially between nutrition services and nursing services. There are no specific guidelines for consistent carbohydrate diets, but it is recommended that each hospital nutrition committee specify the unique needs of their patient population (5). No single meal-planning system will meet the requirements of all patients or facilities. Current nutrition guidelines encourage individualization based on treatment goals, physiologic parameters, and medication usage (1).

Nutrition Support

In the hospital setting, it is often difficult for patients to follow their usual food plan, and in many cases caloric intake is lower than usual. Oral nutrition supplements or nutrition support may be necessary to meet the patient’s

Table 1
Common Nutrition Issues With Key Considerations for Healthcare Professionals*

Common issues	Considerations for healthcare professionals
Decreased appetite with poor oral intake	<ul style="list-style-type: none"> • Consistent carbohydrate intake is the goal whether the individual with diabetes is eating regular food or on a progression diet (e.g., clear liquid or full liquid). • Amount of carbohydrate is more important than source. Allow individuals with diabetes to make substitutions of carbohydrate-containing foods with similar carbohydrate content to maintain consistent intake. • Snacks and/or supplements may need to be included for individuals with diabetes to ensure adequate calorie and protein intake. The need for snacks should be individualized. • Insulin dose requirements should be based on “basal” “and nutritional” needs. The “nutritional insulin requirement” includes the amount of insulin necessary to cover enteral or parenteral nutrition, intravenous dextrose, meals, snacks, and/or supplements—not just discrete meals. Combination insulin therapy may be appropriate to cover basal needs and match intermittent nutritional intake. • For individuals on insulin, it may be appropriate to inject rapid-acting insulin immediately after a meal so that the insulin dose can be more accurately matched to actual carbohydrate intake.
Delayed meals or inconsistent meal timing	<ul style="list-style-type: none"> • If meals will be delayed or missed due to tests or procedures, nutritional insulin may need to be withheld; however, basal insulin is typically still required. • For individuals taking oral diabetes medications that may cause hypoglycemia, it may be appropriate to provide a snack if a meal delay is anticipated.
Inconsistent carbohydrate intake	<ul style="list-style-type: none"> • Inconsistent carbohydrate intake can contribute to either hypo- or hyperglycemia. Individuals who are eating may or may not need snacks, depending on their medication therapy. Individuals with poor nutritional intake may need medication adjustments (i.e., decrease in medication) based on amount of carbohydrate intake. • Individuals with diabetes, along with family and hospital volunteers, may need to be educated on the carbohydrate content of foods and to notify hospital staff when the patient is brought food in addition to that of the hospital diet. • Meal-coverage insulin should not be withheld for “normal” blood glucose levels. It is necessary to cover the carbohydrate content of the meal.
Decreased activity level	<ul style="list-style-type: none"> • Glucose-lowering medications may need to be adjusted as activity level increases or decreases.
Inconsistent blood glucose monitoring	<ul style="list-style-type: none"> • When individuals are eating, check blood glucose level before each meal and at bedtime. • For individuals receiving nothing by mouth, check blood glucose level every 4 to 6 hours.
Timing of blood glucose monitoring to meal and insulin/medication delivery	<ul style="list-style-type: none"> • If the patient is on pre-meal rapid-acting insulin, wait until the meal tray arrives to give insulin. If the patient is on pre-meal regular insulin, it can be provided 30 minutes before the meal, depending on pre-meal blood glucose results. • Pre-meal blood glucose monitoring and insulin injections should be timed in relation to the delivery of the meal, not at a predetermined time of day.

*This list is not intended to cover all medical conditions and treatments that may impact glycemic control. It addresses common nutrition issues and how the care provided may contribute to either hyperglycemia or hypoglycemia. From Swift and Boucher (7). Adapted with permission.

altered nutritional needs. The needs of most hospitalized patients can be met by providing 25 to 35 calories per kilogram body weight, per day (6,16). Individuals with normal hepatic and renal function require approximately 1 to 1.5 grams of protein per kilogram body weight, per day, depending on the degree of catabolic stress (16). Enteral or parenteral support should be considered only if an individual is unable to meet calorie and protein needs through oral intake because of inadequate consumption or a medical condition that contraindicates oral intake (7,16).

Insulin dose requirements should be based on basal, nutritional, and supplemental or correction needs (17). The “nutritional insulin requirement” includes the insulin needed to cover enteral or parenteral nutrition, and/or intravenous dextrose, along with snacks or oral supplements, not just discreet meals (7). Sources of dextrose outside of nutrition-specific solutions include intravenous fluids and medications as well as dialysates used with peritoneal and continuous renal replacement therapy (18).

Enteral Nutrition

When nutrition support is necessary, enteral nutrition is preferred. Advantages include a more physiologic route, avoidance of catheter-related complications, the trophic effect on gastrointestinal cells, and reduced cost (16). A recent meta-analysis of enteral nutrition support and use of diabetes-specific formulas reported a benefit in improving glycemic control from their use over standard formulas (19). However, most of the studies were short term, and diabetes medications may not have been adjusted properly. To date, there are no long-term studies comparing diabetes-specific formulas with standard formulas that use appropriate adjustments in glucose-lowering medications (18).

Glycemic management options during initiation of enteral feeding depend on various factors, including pre-hospitalization regimen (e.g., oral diabetes medication or insulin), level of stress, admitting diagnosis, and continuous or intermittent feeding rate (18). For patients who had previously required insulin, one recommended approach is to correlate insulin dose at initiation of the enteral feeding with the amount of feeding given (18). For example, if the enteral feeding is 25% of usual intake, then 25% of usual insulin may be given, depending on the patient’s current glycemic control and illness. Continuous insulin infusion or subcutaneous short-acting insulin given every 4 to 6 hours can be successfully used to manage glycemic control depending on the feeding regimen and medical condition of the patient. Sudden interruption of either enteral or parenteral nutrition may lead to hypoglycemia (17). Frequent blood glucose monitoring, accompanied by adjustments in insulin or oral diabetes medications relative to the change in nutrition support or oral intake, is critical in preventing

hypoglycemic events and in effectively controlling blood glucose (5).

Parenteral Nutrition

For certain medical conditions, parenteral nutrition is necessary. The goal of parenteral nutrition support is to sustain the patient during critical illness and to not aggravate metabolic management (16). Care should be taken not to overfeed patients receiving nutrition support. Overfeeding can result in hyperglycemia, abnormal liver function, increased oxygen consumption, and increased carbon dioxide production (16).

Dextrose infusions should be maintained at no more than 4 mg/kg per minute (20). Lipids may be provided to reduce dextrose content of parenteral nutrition solutions, but should not exceed 0.11 g/kg per hour (19). Continuous scheduled insulin coverage generally is needed to achieve and maintain adequate glycemic control for individuals receiving parenteral nutrition (17). Insulin may be added to the parenteral nutrition solution; however, providing insulin through a separate intravenous insulin infusion will allow for more frequent dose adjustments (17).

MULTIDISCIPLINARY TEAM APPROACH

Optimal outcomes may be achieved in the inpatient setting much as recommended in the outpatient setting, in that care is “most effective when delivered by a multidisciplinary team with a comprehensive plan of care” (21). The key areas of focus related to nutrition for optimal glycemic control are: establishing effective screening criteria for appropriate referral to an RD; identifying nutrition-related issues in clinical pathways and patient care plans; implementing and maintaining standardized diet orders such as consistent carbohydrate menus; integrating blood glucose monitoring results with nutrition care plans; and standardizing discharge follow-up orders for MNT and diabetes education post-discharge when appropriate. Additionally, hypoglycemia and insulin protocols should be implemented to standardize care (7). The identification of education needs for clinical hospital staff related to glycemic management of patients with diabetes should help determine the facility training plan. Once the needs are identified, a plan should be implemented to educate staff through means determined by each facility (e.g., in-service training, computer-based training, self-learning modules, or grand rounds). Competencies should optimally be monitored and demonstrated on an annual basis.

Once all staff understand the rationale for treatments, protocols, and policies, they are more likely to support and implement them. The end result is the provision of appropriate, high-quality nutrition and diabetes care for the hospitalized patient with diabetes (7).

Table 2
Sample Consistent Carbohydrate Meals for Hospital Diet Progression

Diet order	Sample menu	Carbohydrate content (grams)
Clear liquid	Regular gelatin	4 oz
	Orange juice	4 oz
	Supplemental* clear liquid beverage	8 oz
	Chicken broth	6 oz
	Coffee or tea	6 oz
Full liquid	Chocolate pudding	4 oz
	Supplemental beverage for diabetes patients	8 oz
	Orange juice	4 oz
	Chicken broth	6 oz
	Coffee or tea	6 oz
Mechanical soft diet	Ground baked chicken	3 oz
	Mashed potatoes	1/2 cup
	Gravy	2 oz
	Green beans	1/2 cup
	Finely minced lettuce	1/2 cup
	Ranch salad dressing	1 oz
	Light pound cake	1 oz
	Strawberry sauce with whipped topping	3 Tbsp
	Margarine	1 pat
	Coffee or tea	6 oz
		68 grams total
Regular diet	Baked chicken	3 oz
	Mashed potatoes	1/2 cup
	Gravy	2 oz
	Green beans	1/2 cup
	Tossed salad	1/2 cup
	Ranch salad dressing	1 oz
	Light pound cake	1 oz
	Strawberry sauce with whipped topping	3 Tbsp
	Margarine	1 pat
	Coffee or tea	6 oz
		69 grams total

*Regular supplemental beverages or supplemental beverages designed for diabetes patients (e.g., having reduced carbohydrate content) may be used. Total carbohydrate content of the meal is the primary concern.

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