MNT in Diabetes and Related Disorders

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A diabetes diet — medically known as medical nutrition therapy (MNT) for diabetes simply translates into eating a variety of nutritious foods in moderate amounts and sticking to regular mealtimes. Rather than a restrictive diet, a diabetes diet or MNT is a healthy-eating plan that's naturally rich in nutrients and low in fat and calories, with an emphasis on fruits, vegetables and whole grains. In fact, a diabetes diet is the best eating plan for most everyone.

Goals of MNT for Prevention and Treatment of Diabetes

Achieve and maintain

- **Blood glucose levels in the normal range, or as close to normal as is safely possible**
- **A lipid and lipoprotein profile that reduces the risk for vascular disease**
- **Blood pressure levels in the normal range or as close to normal as is safely possible**

- **To prevent or at least slow the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle**
- **To address individual nutrition needs, taking into account personal and cultural preferences and willingness to change**
- **To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence**

Special Considerations

- **Overweight/Obese**
- **Type 1 Diabetes**
- **Type 2 Diabetes**
- **Gestational Diabetes**

- **For youth with type 1 diabetes, youth with type 2 diabetes, pregnant and lactating women, and older adults with diabetes, to meet the nutritional needs of these unique times in the life cycle**

- **For individuals treated with insulin to provide self-management training for safe conduct of exercise, including the prevention and treatment of hypoglycemia and diabetes treatment during acute illness**

Diabetes Assessment: Referral Data

- Age
- Diagnosis of diabetes and other related medical history
- Medications, including diabetes and other related meds
- Laboratory data (A1C, cholesterol/ lipid profile, albumin to creatinine ratio)
- Blood pressure
- Permission for exercise

Diabetes Assessment Data

- **Diabetes history:** previous diabetes education, use of blood glucose monitoring, diabetes problems/ concerns
- **Food/nutrient history:** current eating habits with beginning modifications
- **Social history:** occupation, hours worked/away from home, living situation, financial issues
- **Medications/supplements:** medications taken, vitamin/mineral/supplement use, herbal supplements

TYPE 1DIABETES MELLITUS

Nutritional-related problems

- **Under-/overweight**
  - **Energy not utilised**
  - **Obesity & insulin administration**
  - **Physical activity / exercise**
- **Hyperglycaemia**
  - **Poor balance between amount of CHO / timing of eating & insulin regimen**
- **Hypoglycaemia**
  - **Brain development**
  - **Illness / infection & food intake / absorption**
- **Dehydration (polyuria)**
- **Long-term complications**
  - **Macro vascular**
  - **Microvascular**

Basic Strategies for Type 1 Diabetes

- For individuals with type 1 diabetes, insulin therapy should be integrated into an individual's dietary and physical activity pattern.
- Individuals using rapid-acting insulin by injection or an insulin pump should adjust the meal and snack insulin doses based on the carbohydrate content of the meals and snacks.
- For individuals using fixed daily insulin doses, carbohydrate intake on a day-to-day basis should be kept consistent with respect to time and amount.
- For planned exercise, insulin doses can be adjusted. For unplanned exercise, extra carbohydrate may be needed.

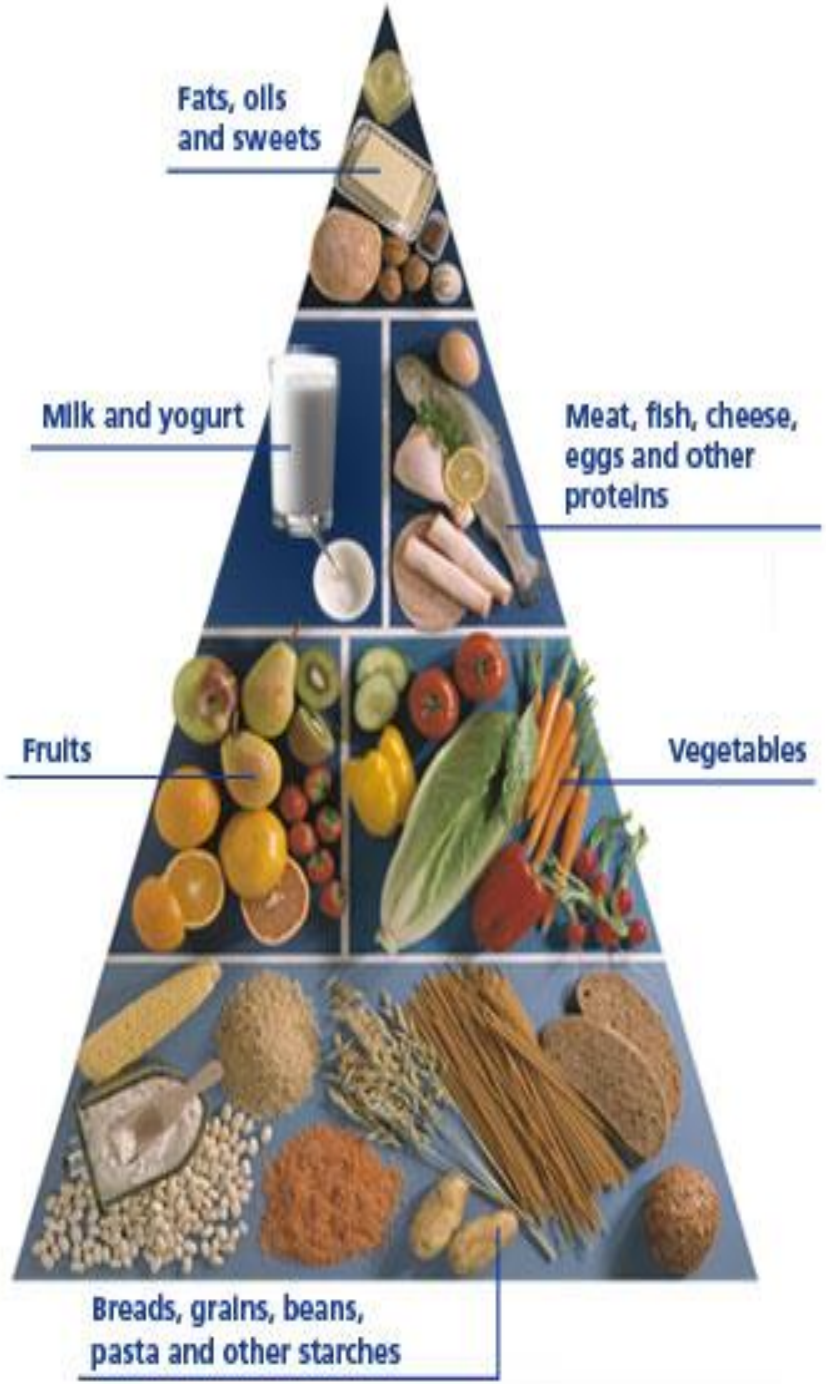
Basic Strategies for Type 2 Diabetes

- Encourage weight loss.
- Moderate calorie restriction (250–500 kcal/day less) is associated with improved control independent of weight loss.
- Spread nutrient intake, especially carbohydrate (CHO) throughout the day.
- Encourage physical activity.
- Decrease fat intake.
- Monitor BG, and add medications if needed.

- **Pregnancy**
  - **Adequate caloric intake and nutrients needed to provide appropriate weight gain for mother and fetus**
  - **Focus on food choices for a healthy and steady weight gain, glycemic control, and absence of ketones**
  - **Aim to develop healthy habits and lifestyle modifications (diet and exercise) for after delivery**

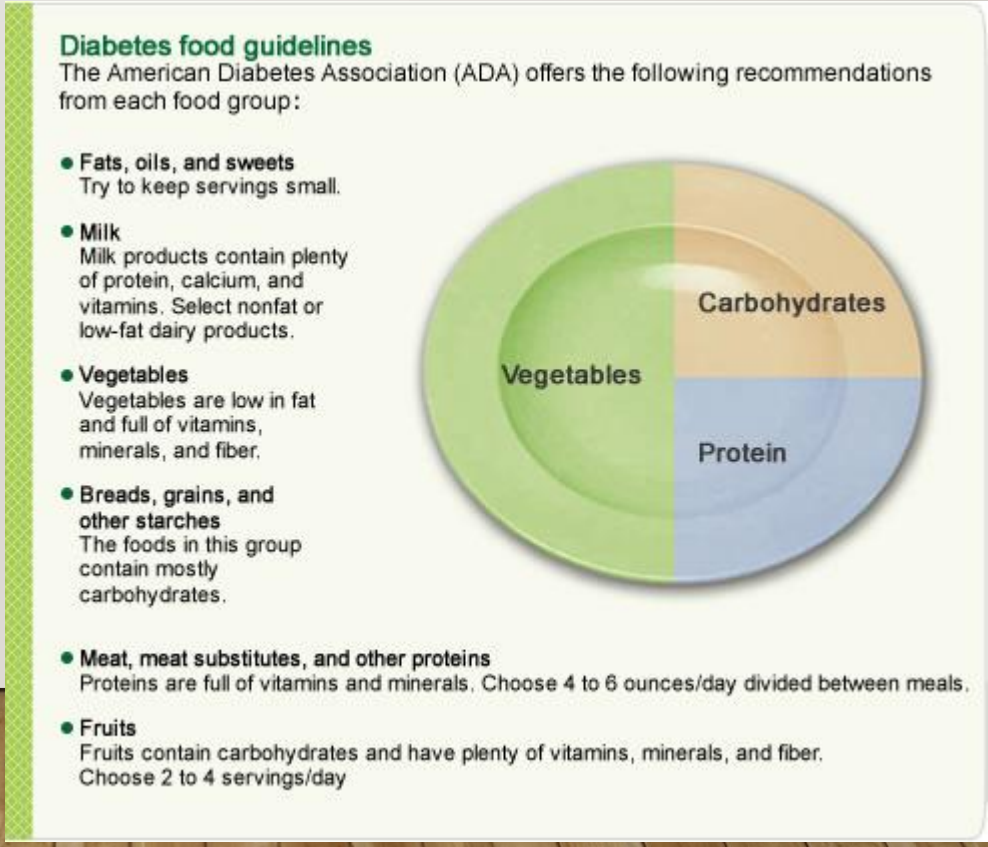
Food Guide Pyramid

- Use basic guide
- Use diabetes-specific guide



The Diabetes Meal Plan

- **The meal plan should be based on**
  - the patient's current eating habits
  - diabetes medications, if any
  - current weight status
  - collaborative goals (e.g., does the patient desire to lose weight?)

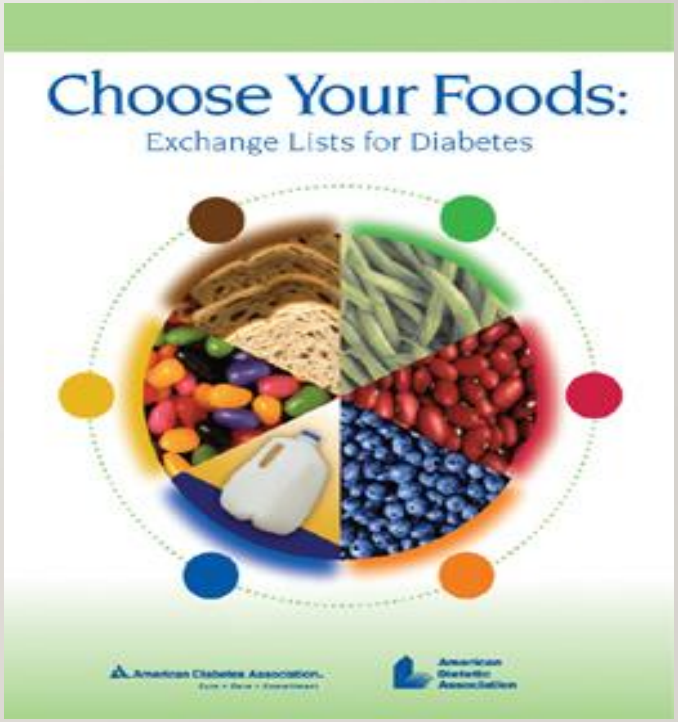


Meal Planning Strategies

- **Timing of meals**
  - **Timing of meals and snacks (no more than 4 hours without eating)**
- **Healthy choices and balanced meals**
- **Variety including nutrient-rich foods and high-fiber foods**
- **Moderation using portion control**
- **Limit refined sugars**

Macronutrients Based On

- Patient's current eating habits (CHO, fat, protein)
- Lipid levels and glycemic control
- Patient goals



The DRIs recommend that healthy adults should consume 45-65% of energy from CHO, 20-35% from fat, and 10-35% from protein

The following menu is tailored for someone who needs 1,200 to 1,600 calories a day

Breakfast: Whole-wheat pancakes or waffles, one piece of fruit, 1 cup of low-fat milk.

Lunch: Chicken kabob, 1/2 cup of steamed broccoli, 1/2 cup of cooked rice, 1/2 cup of juice.

Dinner: Pasta (Whole-wheat) prepared with broccoli, carrots, zucchini, yellow squash and Parmesan cheese, 1 cup of low-fat milk.

There are a few different approaches to creating a diabetes diet that keeps blood glucose level within a normal range.

- **Counting carbohydrates**
- **The exchange system**

Carbohydrate Counting

Carbohydrate, or carb counting is a method of calculating grams of carbohydrate consumed at meals and snacks.

Foods that contain carb have the greatest effect on blood glucose compared to foods that contain protein or fat.

Carbohydrate counting can be used by anyone with diabetes, not just people taking insulin.

The amount of meal and snack carbohydrate is adjusted based on the pre-meal blood glucose reading.

Depending on the reading, more or less carbohydrate may be eaten. Likewise, insulin may be adjusted based on what the person wants to eat.

For example, if patient want to eat a much larger meal than usual, carb counting can help him determine how much extra insulin to take.

Most adults with diabetes should eat no more than 200 grams per day. But each person should have their own carbohydrate goal.

A place to start is at about 45-60 grams of carbohydrate at a meal.

What Foods Have Carbohydrate?

Foods that contain carbohydrate or "carbs" are:

- **grains like rice, oatmeal, and barley**
- **grain-based foods like bread, cereal, pasta, and crackers**
- **starchy vegetables like potatoes, peas and corn**
- **fruit and juice**
- **milk and yogurt**
- **dried beans**
- **sweets and snack foods like sodas, juice drinks, cake, cookies, candy, and chips**

- **Non-starchy vegetables like lettuce, cucumbers, broccoli, and cauliflower have a little bit of carbohydrate but in general are very low.**

For example there is about 15 grams of carbohydrate in:

1 small piece of fresh fruit (4 o z)
1/2 cup of canned or frozen fruit
1 slice of bread (1 o z) or 1 (6 inch) tortilla
1/2 cup of oatmeal
1/3 cup of pasta or rice
4-6 crackers
1/2 cup of black beans or starchy vegetable
1/4 of a large baked potato (3 oz)
2/3 cup of plain fat-free yogurt or sweetened with sugar substitutes
2 small cookies
2 inch square brownie or cake without frosting
1/2 cup ice cream
1 Tbsp syrup, jam, jelly, sugar or honey
6 chicken nuggets
1 cup of soup
1/4 serving of a medium French fry

➢The exchange system

The word exchange refers to the fact that each item on a particular list in the portion listed may be interchanged with any other food item on the same list.

- **An exchange can be explained as a substitution, choice, or serving.**
- **Each list is a group of measured or weighed foods of approximately the same nutritional value.**
- **Within each food list, one exchange is approximately equal to another in calories , carbohydrate , protein , and fat .**

Foods on each list have about the same amount of carbohydrate, protein, fat and calories.

To use the exchange lists, an individual needs an individualized meal plan that outlines the number of exchanges from each list for each meal and for snacks.

The meal plan is developed in cooperation with the person with diabetes and is based on an assessment of eating changes that would assist the individual in achieving his or her target metabolic goals and of changes the individual is willing and able to make.

Because of the accuracy and convenience of the exchange system, the exchange lists are used for weight management as well for diabetes management.

The exchange system categorizes foods into three main groups:

1-Carbohydrates

2-Meat and Meat Substitutes

3-Fats.

Foods are further subdivided in these three groups into specific exchange lists.

1-The Carbohydrate Group contains the *Starch, *Fruit, *Milk, *Sweets and *desserts (other carbohydrates), and* Vegetable lists.

Foods from the Starch, Fruit, Milk, and Sweets lists can be interchanged in the meal plan, as they each contain foods with 60 to 90 calories and approximately 15 grams of carbohydrate.

2-The Meat and Meat Substitute Group

contains food sources of protein and fat.

The group is divided into four lists: *Very Lean Meats, *Lean Meats, *Medium-Fat Meats, and *High-Fat Meats.
Allowing the user to see which meats are low-fat and which meats are high-fat.

The lists have foods containing 35, 55, 75, and 100 calories, and 1, 3, 5, and 8 grams of fat, respectively.

3-The Fat Group contains three lists:

Monounsaturated Fats, Polyunsaturated Fats, and Saturated Fats.
Each food source contains an average of 45 calories and 5 grams of fat.

- **The exchange lists also identify foods that contribute significant amounts of sodium. A sodium symbol is shown next to foods that contain 400 mg or more of sodium per exchange serving.**

YOUR DAILY MEAL PLAN

fruit ▲ exchange

starch/bread ♦ exchange

milk ★ exchange

protein ■ exchange

fat & oil ● exchange

free ✓ vegetables

free foods

_____'s daily meal plan

Age _____ CHO gms. _____

Height _____ (_____ cm % for age) Pro gms. _____

Weight _____ (_____ kg % for age) Fat gms. _____

Calories _____

Dietician _____

Phone _____

Time:	Breakfast	Snack	Lunch	Snack	Supper	Snack
FRUIT ▲						
STARCH/BREAD ♦						
MILK ★						
PROTEIN ■						
FAT ●						
FREE VEGETABLES ✓						

Legend

▲ One fruit exchange = 15 grams carbohydrates (60 calories).

△ One half fruit exchange.

♦ One starch exchange = 15 grams carbohydrates, 3 grams protein (80 calories).

◊ One half starch exchange.

★ One milk exchange=12 grams carbohydrates, 8 grams protein (90 calories) for skim milk, 1% milk, or buttermilk.

☆ One-half milk exchange.

■ One protein exchange = 7 grams protein; the amount of fat and number of calories vary, depending on what kind of protein you choose. The chart is divided into 3 parts from top (leanest) to the bottom (highest in fat): lean = 3 grams of fat, 55 calories; med. fat = 5 grams fat, 75 calories; high fat = 8 grams fat, 100 calories.

● One fat exchange = 5 grams fat (45 calories).

✓ Free vegetables may be eaten at mealtimes, but if you eat a large amount—more than 1-1/2 cups of the last six vegetables—then consider that amount as one starch/bread exchange (1/2 cup vegetables = 5 grams carbohydrates, 2 grams protein; 25 calories).

Free foods may be eaten as desired. Consult your dietitian for further recommendations regarding this group.

Measurements

1 tsp. = 1 level teaspoon
1 T. = 1 level tablespoon
2 T. = 1 fluid ounce
1 c. = 1 measured cup, 8 oz., or 1/2 pint
1/2 c. = 1/2 measured cup, 4 oz.

5 g = 1 tsp.
30 g = 1 oz.

* Whole milk has more calories because fat has not been removed.

Advantages and Disadvantages

An advantage of the food exchange system is that it provides a system in which a wide selection of foods can be included, thereby offering variety and flexibility to the person with diabetes. Other advantages of the lists are:

(1) They provide a framework to group foods with similar carbohydrate, protein, fat, and calorie contents.

(2) They emphasize important management concepts, such as carbohydrate amounts, fat modification, calorie control, and awareness of high-sodium foods.

(3) By making food choices from each of the different lists a variety of healthful food choices can be assured

(4) They provide a system that allows individuals to be accountable for what they eat.

Despite the many advantages the exchange lists offer, they may not be the most appropriate meal-planning tool for many persons.

They are not appropriate for those who cannot understand the concept of "exchanging" foods. Because the exchange booklets are written at a ninth- to tenth-grade reading level, individuals must be able to either read at this level or understand the concept of exchanging foods.

For an individual to use them effectively, several educational sessions, and practice, may be required.

Exchange Table (Food)

Food Group	Exchanges	Cho	Protein	Fat	Calories
Cereals	12	180	24	6	900
Fruits	2	30	--	--	120
Skimmed Milk	1	15	11	--	105
Vegetables	*free*				
Lean Meat	2	--	14	8	130
Fish	2	--	14	2	70
Oil	7	--	--	35	315
Total		225	63	51	1640

Exchange Table (Meal)

Food Group	Exchanges	BF	MT	L	AT	D	S
Cereals	12	3	0	3	3	3	0
Fruits	2	0	0	1	0	1	0
Skimmed Milk	1	1	0	0	0	0	0
Vegetables	*free*						
Lean Meat	2	0	0	2	0	0	0
Fish	2	0	0	0	0	2	0
Oil	7	1	0	3	1	2	0

BF	Breakfast
MT	Morning Tea
L	Lunch
AT	Afternoon Tea
D	Dinner
S	Supper

Suggestion Menu
Food Detail

	Food	Measurement	Kcal	Cho	Pro	Fat
Breakfast						
1	Milk, powder, skim	1.5 table spoon heap	42	6.83	3	0.3
2	Bread, white	4 piece[LxWxT, 10.5x10.5x1.2cm]	292	60	11.2	1.2
3	Margarine	1.5 tea spoon level	69	0.15	0.15	7.5
Total			403	66.98	14.35	9
Lunch						
1	Rice, cooked	1.5 cup	195	45	3.6	0.15
2	Mackerel, Spanish	1 piece	70	0	14	1.6
3	Apple Red	1 whole	64	15	0.3	0.5
4	Oil, palm olein	1.5 tea spoon heap	67.5	0	0	7.5
Total			396.5	60	17.9	9.75
Afternoon Tea						
1	Milk, powder, skim	2 table spoon heap	56	9.1	4	0.4
2	Biscuit, cream crackers	9 Pieces(square, LxWxT, 5x5x0.2cm)	132	22.5	2.7	3.9
Total			188	31.6	6.7	4.3
Dinner						
1	Rice, cooked	2 cup	260	60	4.8	0.2
2	Henn Egg, Whole	2 whole	168	1	14	12
3	Papaya	1 slice	74	15	3.2	0.2
4	Oil, palm olein	2 tea spoon heap	90	0	0	10
Total			592	76	22	22.4
Total(Overall)			1579.5	234.58	60.95	45.45

Diet Plans: Exchange Groups

TABLE 2.5 Exchange Groups and Their Energy and Macronutrient Content (1 of 2)

Exchange List	Calories	Carbohydrate (g)	Fat (g)	Protein (g)	Serving Sizes
Starch/ Bread	80	15	Trace (0.5 to 1)	3	1 oz bread ¾ cup dry, unsweetened cereal ½ cup cooked cereal 4–5 snack crackers ½ cup pasta or starchy vegetable ½ cup rice, grains, stuffings 1 cup soup ½ cup cooked beans, peas, lentils 3 cups popcorn without added fat
Meat and Meat Substitutes					
Lean Meat	55	0	3	7	1 oz fish, poultry, lean beef (round sirloin, flank steak), processed hams, veal, cottage cheese, low-fat cheeses, lean luncheon meats
Medium-Fat Meat	75	0	5	7	1 oz of most beef and pork cuts, poultry with skin, skim-milk cheeses, 1 egg
High-Fat Meat	100	0	8	7	1 oz fried meats, poultry, or fish; 1 oz prime cuts of beef, corned beef, spareribs, regular cheeses, regular luncheon meats, sausages, hot dogs, and peanut butter
Vegetables	25	5	0	2	½ cup cooked vegetables ½ cup vegetable juice 1 cup raw vegetables

Table 2.5 (1 of 2)

Unfortunately, Martha's idea of the Diabetic 'Exchange' system was to exchange an empty plate for a full one.

Meal Plan: Oral Medications

- **May do well with smaller, more frequent meals and snacks.**
- **Snack servings should be taken from the meal plan**

Meal Plan: Insulin

- Can start with the meal plan and devise an insulin regimen to fit
- Many patients require a bedtime snack to prevent night-time hypoglycemia
- Patients who use morning intermediate-acting insulin (NPH) may require afternoon snack
- Patients on rapid-acting insulin do not need a snack

Carbohydrates in Diabetes

- Dietary pattern that includes CHO from fruits, vegetables, whole grains, legumes, and low fat milk is encouraged for good health
- Monitoring CHO, whether by CHO counting, exchange, or estimation remains a key strategy in achieving glycemic control

- Focuses on CHO as major driver of post-prandial blood glucose
- Can be used for intensive management or for basic meal planning
- May be most appropriate for Type 1 patients at desirable weight
- Must still address energy needs and composition of overall diet
- Allows increased flexibility
- 1 carbohydrate serving = 15 grams

- **Sucrose-containing foods can be substituted for other carbohydrates in the meal plan or, if added to the meal plan, covered with insulin or other glucose-lowering medications.**

- **Care should be taken to avoid excess energy intake.**

- **The use of glycemic index and load may provide a modest additional benefit over that observed when total CHO is considered alone**

Glycemic Index

- **The blood glucose response of a given food compared to an equal amount of a CHO standard (typically glucose or white bread)**

Examples of G.I. ratings

High-G.I.		Low-G.I.*	
Foods	Rating	Foods	Rating
Glucose	100	Grapefruit Juice	48
Baguette	95	All Bran	43
Cornflakes	84	Oatmeal	42
Rice Cakes	82	Spaghetti	41

Any food rating less than 55 in the G.I. is considered low

Glycemic Index

Low GI (<55), Medium GI (56-69) and High GI (70>)

Grains / Starchs		Vegetables		Fruits		Dairy		Proteins	
Rice Bran	27	Asparagus	15	Grapefruit	25	Low-Fat Yogurt	14	Peanuts	21
Bran Cereal	42	Broccoli	15	Apple	38	Plain Yogurt	14	Beans, Dried	40
Spaghetti	42	Celery	15	Peach	42	Whole Milk	27	Lentils	41
Corn, sweet	54	Cucumber	15	Orange	44	Soy Milk	30	Kidney Beans	41
Wild Rice	57	Lettuce	15	Grape	46	Fat-Free Milk	32	Split Peas	45
Sweet Potatoes	61	Peppers	15	Banana	54	Skim Milk	32	Lima Beans	46
White Rice	64	Spinach	15	Mango	56	Chocolate Milk	35	Chickpeas	47
Cous Cous	65	Tomatoes	15	Pineapple	66	Fruit Yogurt	36	Pinto Beans	55
Whole Wheat Bread	71	Chickpeas	33	Watermelon	72	Ice Cream	61	Black-Eyed Beans	59
Muesli	80	Cooked Carrots	39						
Baked Potatoes	85								
Oatmeal	87								
Taco Shells	97								
White Bread	100								
Bagel, White	103								

The glycemic index is a useful aid for diabetics or for anyone who wishes to control their blood glucose levels.

A diet based on foods with low glycemic response has been associated with diabetes management, improved blood lipids (cholesterol), reduced risk of heart disease, and weight management

Not only will foods with a low glycemic index take longer to digest (therefore prolonging satiety) they will also maintain blood glucose levels at a relatively constant state.

Foods with a high glycemic index not only digest quickly, they can cause extreme fluctuations in blood glucose.

There are some specific factors to look for in foods that can indicate their glycemic index:

Low glycemic foods contain: Fat, Whole grains, Protein, Raw Starches, legumes, vegetables, fruits and dairy products.

High Glycemic Foods contain: Refined grains, refined sugars, increased amylopectin: amylose ratio, and often high sugar fruits have a high glycemic index

Switching from a high glycemic index diet to a low glycemic index diet can be made relatively easy.

Switching white bread and pastas to whole grain, eating breakfast cereals from oats, bran or barley, add more fruits and vegetables when cooking and reducing potato consumption can all aid in lowering glycemic index.

GLYCEMIC INDEX

Influenced by various factors

- Starch structure
- Fiber content
- Cooking methods
- Degree of processing
- Whether it is eaten in the context of a meal
- Presence or absence of fat
- A given food can elicit highly variable responses

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it.

One unit of glycemic load approximates the effect of consuming one gram of glucose.

Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

Glycemic load is based on the glycemic index (GI), and is defined as the grams of available carbohydrate in the food times the food's GI and divided by 100.

For one serving of a food, a GL greater than 20 is considered high, a GL of 11-19 is considered medium, and a GL of 10 or less is considered low.

Glycemic Index- examples

High GI ≥ 70 **potatoes, white bread**

Low GI ≤ 55 **whole grain pasta**

⇧ Glycemic index means ⇧ Glycemic load

Not just about *individual* foods – about your diet

GI: glycemic index; GL: glycemic load

Glycemic Index and Glycemic Load of Foods

Food	Glycemic Index	Glycemic Load
Carrots	47	3
Potato baked	85	26
Sweet corn	60	11
Apple	38	6
Chocolate cake	38	20
Corn flakes	92	24
Oatmeal	42	9
Pumpkin	75	3
Sucrose	68	7

Fiber and Diabetes

- As for the general population, people with diabetes are encouraged to consume a variety of fiber-containing foods.
- It requires very large amount of fiber (~50 grams) to have a beneficial effect on blood glucose level.

- Soluble fiber: 3 grams of soluble fiber (3 servings of oatmeal) or 3 apples can lower total cholesterol by 5 mg (2%)

Protein and Diabetes

- Evidence to suggest that usual protein intake (15-20% of energy) should be modified
- In individuals with Type 2 diabetes, ingested protein can increase insulin response without increasing plasma glucose concentrations.
- Therefore, protein should not be used to treat acute or prevent night time hypoglycemia

- **High-protein diets are not recommended as a method for weight loss at this time. The long-term effects of protein intake >20% of calories on diabetes management and its complications are unknown.**

- **Although such diets may produce short-term weight loss and improved glycaemia, it has not been established that these benefits are maintained long term, and long-term effects on kidney function for persons with diabetes are unknown.**

Dietary Fat

- **Saturated Fat: <7% of total calories**
- **Cholesterol: <200 mg/day in people with diabetes**
- **Minimize intake of trans-fatty acids**
- **Two or more servings of fish per week providing OMEGA-3 polyunsaturated fatty acids are recommended**

Lipid Goals in Diabetes

- **LDL cholesterol <100 mg/dl**
- **HDL cholesterol**

  Men >40 mg/dl

  Women >50 mg/dl
- **Triglycerides <150 mg/dl**

Blood Pressure Goals in Diabetes

- **Patients with diabetes should be treated to a systolic blood pressure <130 mmHg**

- **Patients with diabetes should be treated to a diastolic blood pressure of <80 mmHg**

Sodium

- Association between hypertension (HTN) and both types of diabetes mellitus (DM)
- Same intake as general population is recommended for otherwise healthy people with DM—less than 3000 mg/day
- For people with mild HTN and diabetes—should have less than 2400 mg/day
- For people with more serious HTN or edematous clients with nephropathy recommend 2000 mg/day or less

Energy Balance, Overwt and Obesity

- In overweight and obese insulin-resistant individuals, modest weight loss has been shown to improve insulin resistance. Thus, weight loss is recommended for all such individuals who have or are at risk for diabetes.

- For weight loss, either low-carbohydrate or low-fat calorie-restricted diets may be effective in the short term (up to 1 year). For patients on low-carbohydrate diets, monitor lipid profiles, renal function, and protein intake (in those with nephropathy), and adjust hypoglycemic therapy as needed.

- **Weight loss**
  - **Weight loss has been shown to improve insulin resistance**
  - **Encourage dietary changes, increased physical activity, and behavior modification**

- **Physical activity and behavior modification are important components of weight loss programs and are most helpful in maintenance of weight loss.**

  - **Weight loss medications may be considered and can help with an additional 5-10% weight loss with lifestyle modifications**
  - **Bariatric surgery**

- **Short term weight loss in subjects with Type 2 diabetes is associated with improvement in insulin resistance, glycaemia, serum lipids, and blood pressure.**

Micronutrients

- There is no clear evidence of benefit from vitamin or mineral supplementation in people with diabetes (compared with the general population) who do not have underlying deficiencies.

- Routine supplementation with antioxidants such as vitamins E and C and carotene is not advised because of lack of evidence of efficacy and concern related to long term safety benefit from chromium supplementation in individuals with diabetes or obesity has not been clearly demonstrated and therefore can not be recommended

- **Vitamin/mineral needs of people with diabetes who are healthy appear to be adequately met by the RDAs.**
- **Those who may need supplementation include those on extreme weight-reducing diets, strict vegetarians, the elderly, pregnant or lactating women, clients with malabsorption disorders, congestive heart failure (CHF) or myocardial infarction (MI)**
- **Chromium and magnesium are beneficial only if the client is deficient.**

Goals of MNT for Diabetes in Children

- **Maintain normal growth and development**
  - **Evaluate using growth charts every 3-6 months**
- **Base nutrition prescription on the nutrition assessment**
  - **Re-evaluate every 3-6 months**
- **Meal planning approach can be based on CHO counting for increased flexibility or other systems**
- **Review blood glucose records and revise medication regimen as necessary**

- **Improved glycemic control with intensive insulin therapy sometimes results in weight gain**
- **Insulin therapy should be integrated into usual eating and exercise habits**
- **Overtreatment of hypoglycemia should be avoided**
- **Adjustments of insulin should be made for exercise**

Estimating Minimum Energy Requirements for Youth

Age	Energy Requirements
1 yr	1000 kcals for first year
2-11 yr	Add 100 kcals/yr to 1000 kcals up to 2000 kcals at age 10
Girls 12-15 >15 years	2000 kcals + 50-100 kcals/yr after age 10 Calculate as for an adult
Boys 12-15 >15 yr	2000 kcals plus 200 kcal/ yr after age 10 Sedentary 16 kcals / lb (30-35 kcals/kg) Moderate activity 18 kcals/ lb (40 kcals/kg) Very physically active: 23 kcals/ lb (50 kcals/kg)

MNT for Type 2 Diabetes in Youth

- **Cessation of excessive weight gain**
- **Promotion of normal growth and development**
- **Encourage healthy eating habits and increased activity for the whole family**
- **Address other health risk factors**
- **Add Metformin if lifestyle changes are insufficient to achieve goals**

MNT Essential Self-Management Skills

- Sources of CHO, pro, fat
- Understanding nutrition labels
- Modification of fat intake
- Use of BG monitoring data for problem solving

- Recipes, menu ideas, cookbooks
- Vitamin, mineral supplements
- Behavior modification techniques

- Adjustments of CHO or insulin for exercise
- Guidelines for eating out
- Snack choices
- Mealtime adjustments
- Use of sugar-containing foods and non-nutritive sweeteners
- Problem solving tips for special occasions
- Travel schedule changes
- Work shifts if applicable

Managing Acute Complications

Hypoglycemia Treatment

- Glucose of 70 mg/ dL or lower should be treated immediately
- A level of 60 to 80 mg/ dL may require carbohydrate ingestion, deferral of exercise, change in insulin dosage
- Treatment involves ingestion of glucose or carbohydrate-containing food (glucose preferred)
- Protein does not help with treatment or prevent recurrence of hypoglycemia

- **Ingestion of 15-20 grams of glucose (3 glucose tablets, ½ cup fruit juice or regular soft drink, 1 tbsp. honey or sugar)**
- **Wait 15 minutes and retest; if BG<70 mg/dL, take another 15 g CHO**
- **Repeat until BG is WNL**
- **If next meal is >1 hour away, take additional 15 g glucose**
- **Glucagon injection may be prescribed for patients at risk for severe hypoglycemia**