

# NUTRITIONAL MANAGEMENT OF TYPE 2 DIABETES

Chronic Disease Network and Access Program

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These materials do not replace the advice or expertise of a registered dietitian.

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## 1.1 Nutritional Management of Type 2 Diabetes in Adults

- The information provided in this manual is for management of type 2 diabetes in adults and is not appropriate for children under 18 years of age.

### Nutritional Goals

- To maintain or improve quality of life, nutritional status and physiological health
- To prevent and treat acute and long-term complications of diabetes and associated conditions (dyslipidemia, hypertension, obesity, etc.)

### The Importance of Nutrition in Diabetes Care

- Nutrition therapy can improve glycemic control, reduce A1C by 1-2% and improve clinical outcomes resulting in reduced hospitalization rates
- Counseling by a registered dietitian with expertise in diabetes management, either in a small group or individually, can benefit those with or at risk for diabetes
- Nutrition therapy should be individualized and regularly evaluated and reinforced
- Consistency in carbohydrate intake, spacing and eating regular meals may help control blood glucose levels
- Refer to Figure 1 Nutritional management of hyperglycemia in type 2 diabetes in the Nutrition Therapy chapter of the Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada

## 1.2 Nutrient Requirements

### Carbohydrate

- Carbohydrate intake should be 45-60% of total daily calories
- Fibre does not raise blood glucose and should be subtracted from the total carbohydrate content of food
- It has been found that soluble fibre (ex. oat products, beans, psyllium, barley, etc.) slows gastric emptying and delays the absorption of glucose in the intestine and therefore improves post meal blood glucose levels
- The fibre (soluble and insoluble) recommendation for people with diabetes is 25-50 grams per day. Refer to the handout "*Foods with Fibre*".

## Sucrose and Fructose

- High consumption of sucrose and fructose (found in candies, junk food, honey, table sugar, syrups, etc.) may increase blood glucose and triglyceride levels
- Sucrose consumption should not exceed more than 10% of total daily intake (eg. approximately 50 grams per day based on 2000 kcal) and fructose consumption should not exceed 60 grams per day

## Sugar Alcohols

- Sugar alcohols (maltitol, mannitol, sorbitol, lactitol, isomalt, xylitol, etc.) effect on blood glucose levels are variable and may have no significant effect
- Consumption of 10 grams or greater may produce gastrointestinal symptoms in some individuals

## Sweeteners

- Acesulfame potassium, aspartame (Equal<sup>®</sup>, NutraSweet<sup>®</sup>, Sugar Twin<sup>®</sup>, Sweet'N Low<sup>®</sup>), cyclamate (Sucaryl<sup>®</sup>, Sugar Twin<sup>®</sup>, Sweet'N Low<sup>®</sup>), saccharin (Hermesetas<sup>®</sup>), sucralose (Splenda<sup>®</sup>) and steviol glycosides (Stevia<sup>®</sup>) have been approved by Health Canada as safe to use by people with diabetes
- Saccharin and cyclamate are not recommended during pregnancy and lactation due to the lack of safety evidence
- Refer to Canadian Diabetes Association (CDA) handout "*Sugars and Sweeteners*". Available at:  
<http://www.diabetes.ca/for-professionals/resources/nutrition/sugars-sweeteners/>

## Protein

- The recommended intake for protein is 15-20% of total daily calories
- People who have complications with their kidneys will need their protein intake evaluated by a Registered Dietitian. See Type 2 Diabetes and Chronic Kidney Disease section.

## Fat

- The recommended intake for fat is 20 - 35% of total daily calories
- A high fat diet increases the risk for dyslipidemia. People with dyslipidemia have an increased risk of developing coronary artery disease. This is significant as

people with diabetes already have a 2 - 3 times higher risk for coronary artery disease.

- Saturated fat should be <7% of total daily calories (eg. 15 grams for a 2000 kcal intake) and trans fat should be minimal
- Fish contains heart healthy fats (omega-3 fats) and people should strive to eat fish 2 times per week (non-battered, non-deep fried fish)

## Alcohol

- The recommendation is  $\leq 3$  standard drinks per day for men and  $\leq 2$  standard drinks per day for women
- 2 - 3 standard drinks consumed with food does not cause concern for hypoglycemic events

<b>What is a standard drink?</b>	
Beer (5% alcohol)	360 ml (12 fl oz)
Hard Liquor (40% alcohol)	45 ml (1.5 fl oz)
Wine (12% alcohol)	150 ml (5 fl oz)

- People who are taking insulin or insulin secretagogues (Glyburide®, Diamicon®, Gluconorm®, etc.) are at high risk of hypoglycemia if they consume alcohol.  
**Hypoglycemia can occur up to 24 hours after drinking alcohol.**
- If a person with diabetes chooses to drink, special considerations should be taken. Stress the importance of continuing to eat 3 meals per day when drinking. Check with a doctor or pharmacist about the safety of taking medications when drinking. Continue to test blood sugars and make sure the client informs their friends and family that they have diabetes and how to identify and treat a low blood glucose.
- Refer to CDA resource titled "*Alcohol + Diabetes*". Available at: <http://www.diabetes.ca/for-professionals/resources/nutrition/alcohol/>

## 2.1 Practical Nutrition Advice

- Nutrition therapy should be individualized to take into consideration the person’s preferences, age, culture, lifestyle, income, activity level and readiness to change
- All people with diabetes should follow Eating Well with Canada’s Food Guide for a healthy lifestyle
- This includes a variety of foods from all four food groups: Vegetables and Fruit, Grain Products, Milk and Alternatives and Meat and Alternatives
- Refer to the Saskatchewan Ministry of Health booklet “*Type 2 Diabetes: Your Guide to Getting Started*”. This booklet is a good overview of diabetes management for people who are newly diagnosed or those who need a refresher. Available at: <http://www.health.gov.sk.ca/type-2-diabetes>
- Refer to CDA “handout” *Just the Basics*”. Available at: <http://www.diabetes.ca/for-professionals/resources/nutrition/just-basics/>  
This handout is explained below.

Tips for nutritional management	Rational
Eat 3 meals per day at regular times and space meals no more than 6 hours apart	Consistency in carbohydrate intake, spacing and regularity in meal consumption may help control blood glucose levels
Limit high sugar foods such as sugar, regular pop, honey, jam, desserts, candies, slurpies, juice, etc.	Eating high sugar foods will make blood glucose levels increase quickly. Artificial sweeteners are a good alternative to sugar. Refer to CDA handout “ <i>Sugars and Sweeteners</i> ”. Available at: <a href="http://www.diabetes.ca/for-professionals/resources/nutrition/sugars-sweeteners/">http://www.diabetes.ca/for-professionals/resources/nutrition/sugars-sweeteners/</a>
Limit high fat foods such as fries, hotdogs, bacon, sausage, bologna, chips, chocolate bars, donuts, cake, cookies, deep fried foods, etc.	Eating high fat foods may lead to weight gain and increase the risk for heart disease. Having a healthy weight can help with blood glucose control and keep the heart healthy. People with diabetes are at an increased risk for heart disease as high blood sugars and a high fat diet can damage the large blood vessels in the body.
Try to have more fibre in your diet	Incorporating fibre into the diet can help to lower blood glucose and cholesterol levels. Fibre helps to slow down the release of glucose from the stomach into the bloodstream therefore blood glucose does not go as high. Fibre helps to keep the stomach full longer which may help to

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	decrease food consumption. Refer to “ <i>Foods with Fibre</i> ” handout.
<b>Tips for nutritional management</b>	<b>Rational</b>
Water is the best for quenching thirst	Water is what our body needs. Drinking fluids such as pop, juice, juice crystals, hot chocolate, cappuccinos, coffee with cream and sugar, etc., will cause blood glucose levels to rise. Milk contains natural sugars that will raise blood glucose levels; however for a balanced diet and good bone health we need 2 cups of milk per day. Having one cup of milk at a time is healthy and will not drastically raise blood glucose levels.
Try to incorporate more physical activity into your day	Being active will help to improve blood glucose levels, maintain or achieve a healthy weight and lower cholesterol levels. See section 5.1 for Physical Activity guidelines.

## 2.2 Using the Food Guide

- When planning a meal try to incorporate 3 - 4 of the food groups. For example, moose meat stew with vegetables (Vegetables and Fruit and Meat and Alternatives), bannock (Grain Products) and a glass of milk (Milk and Alternatives).
- When having a snack try to pick foods from 1 - 2 of the food groups. For example, a banana (Vegetables and Fruit) and yogurt (Milk and Alternatives).
- The Food Guide has recommended serving amounts for different age groups and genders. For each food group one can find their age and gender to know how many servings they need each day. In each food group the serving sizes are printed underneath the pictures of food. Using the serving sizes can help to determine if daily requirements have been met.
- Refer to *“Eating Well with Canada’s Food Guide – First Nations, Inuit and Métis”*. Available at: <http://www.hc-sc.gc.ca/fn-an/pubs/fnim-pnim/index-eng.php>

Food Group	Advice
Vegetables and Fruit  Children 2 - 3 (4 servings) Children 4 - 13 (5 - 6 servings) Female 14+ (7 - 8 servings) Male 14+ (7 - 10 servings)	<ul style="list-style-type: none"> <li>• Limit potatoes, corn, turnips, yams and sweet potatoes to 1 serving per meal (1/2 cup or the size of a light bulb)</li> <li>• Limit juice to ½ cup or less per day</li> <li>• Select 100% fruit and vegetable juices</li> <li>• Eat lots of vegetables, they help you to feel full longer, prevent blood glucose from going too high and help to keep the bowel regular</li> <li>• Limit fruit to 1 serving per meal or snack (1/2 cup or the size of a tennis ball)</li> </ul>
Grain Products  Children 2 - 3 (3 servings) Children 4 - 13 (4 - 6 servings) Female 14+ (6 - 7 servings) Male 14+ (7 - 8 servings)	<ul style="list-style-type: none"> <li>• Choose whole grain products more often</li> <li>• Try making bannock with oatmeal or whole wheat flour</li> <li>• Choose breakfast cereals with more than 4 grams of fibre per serving</li> <li>• Spread food guide servings throughout the day</li> <li>• Limit to 1 - 2 servings per meal (size of a light bulb)</li> </ul>
Milk and Alternatives  Children 2 - 3 (2 servings) Children 4 - 13 (2 - 4 servings) Teens 13 - 18 (3 - 4 servings) Adults 19 - 50 (2 servings) Adults 51+ (3 servings)	<ul style="list-style-type: none"> <li>• Select skim, 1% or 2% milk and limit to 1 cup per meal</li> <li>• Select low fat cheese (20% or less Milk Fat)</li> <li>• Select low fat and artificially sweetened yogurt – limit to ¾ cup</li> </ul>

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Food Group	Advice
Meat and Alternatives  Children 2 - 3 (1 servings) Children 4 - 13 (1 - 2 servings) Female 14+ (2 servings) Male 14+ (3 servings)	<ul style="list-style-type: none"> <li>• Select lean meats such as wild meat, chicken (without skin), fish, beef or pork</li> <li>• Trim off visible fat and drain fat off meat when cooking</li> <li>• Try to bake, roast or boil meat rather than frying</li> <li>• If frying use a vegetable oil such as canola or olive oil. Avoid lard, bacon fat, hard margarine and butter.</li> <li>• Limit high fat meats like bologna, bacon, salami, sausage, hotdogs, canned ham and pepperoni</li> <li>• Try meat alternatives such as peanut butter, eggs, beans and non-salted nuts/peanuts more often</li> </ul>
Junk food	<ul style="list-style-type: none"> <li>• Limit foods high in sodium (salt), sugar and fat</li> <li>• Try to limit to 0 - 1 serving per day</li> <li>• Refer to <i>"Foods that Turn into Sugar"</i> handout for serving examples</li> </ul>

### 2.3 Foods that Turn into Sugar

Food Group	Foods that affect blood sugar
Vegetables and Fruits	<ul style="list-style-type: none"> <li>• Potato/sweet potato/yam/turnip</li> <li>• Corn</li> <li>• Peas/parsnips/squash (if eat more than 1 cup)</li> <li>• Vegetable juice</li> <li>• Fruits – all fruits</li> <li>• Fruit juice</li> </ul>
Grain Products	<ul style="list-style-type: none"> <li>• Bread</li> <li>• Buns/pitas/wraps</li> <li>• Bannock</li> <li>• Cereal/oatmeal</li> <li>• Pasta/noodles</li> <li>• Rice</li> <li>• Crackers</li> <li>• Perogies</li> <li>• Waffle/pancake</li> </ul>
Milk and Alternatives	<ul style="list-style-type: none"> <li>• Milk (carton, canned, powder)</li> <li>• Chocolate milk</li> <li>• Yogurt</li> <li>• Soy milk</li> <li>• Pudding</li> </ul>
Meat and Alternatives	<ul style="list-style-type: none"> <li>• Dried beans, peas or lentils (if you eat more than ½ cup)</li> </ul>
Sugar and Sweet Foods	<ul style="list-style-type: none"> <li>• Sugar/jam/honey/syrup</li> <li>• Chocolate bar</li> <li>• Chips</li> <li>• Candies</li> <li>• Cake/cookies/donut/pie</li> <li>• Muffins</li> <li>• Ice cream/frozen treats</li> <li>• Pop</li> <li>• Ice tea/drink crystals</li> <li>• Granola bar</li> <li>• Hot chocolate</li> <li>• Sport and energy drinks</li> <li>• French fries</li> </ul>

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## 2.4 Budgeting

- Healthy eating is important for the management of diabetes. However, healthy eating may be challenging for people who have limited food availability.
- Budgeting skills are important to learn for people with diabetes
- Refer to the handout *“Healthy Eating on a Budget”*

## 2.5 Carbohydrate Counting

- Carbohydrate counting can help to control blood glucose levels. Carbohydrate counting takes time to learn and requires client involvement. This type of diet teaching is for a select group of clients.
- Carbohydrate counting can be useful for people on insulin. Clients are able to match their amount of insulin with the amount of carbohydrate containing foods they consume.
- When planning a meal include 3 - 4 of the food groups. Snacks should include 1 - 2 food groups.
- A guideline to start with when starting carbohydrate counting is 45 – 60 grams for women and 60 – 75 grams for men per meal. Snacks may contain 0 - 30 grams of carbohydrate. However, carbohydrate limits need to be individually evaluated and take into account a person’s age, gender, level of physical activity, etc. Carbohydrate limits are only a guideline and the best way to find out an individual’s carbohydrate limit is to test blood glucose levels before and after meals and snacks.
- Reading food labels is the best way to determine the carbohydrate content of foods. When reading a label, find the bolded word, **carbohydrate**. Beside this word are the total grams of carbohydrates that will affect blood glucose levels. Underneath the word carbohydrate you will find fibre. Fibre does not raise blood glucose levels and should be subtracted from the total carbohydrate amount.

For example:

Nutrition Facts	
Per 1/2 cup (125 mL)	
Amount	% Daily Value
<b>Calories</b> 70	
Fat 0.5 g	1 %
Saturated Fat 0 g + Trans Fat 0 g	0 %
Cholesterol 0 mg	
Sodium 250 mg	10 %
<b>Carbohydrate</b> 13 g	4 %
Fibre 2 g	8 %
Sugars 6 g	
Protein 2 g	
Vitamin A 1 %	Vitamin C 2 %
Calcium 0 %	Iron 4 %

For example:

- 1/2 cup of corn has 13 grams of carbohydrate
- Corn has 2 grams of fibre therefore subtract 13 grams – 2 grams
- This equals 11 grams of carbohydrates that will affect blood glucose.

## 3.1 Special Occasions

### 3.2 Hunting and Fishing

- It is important for people with diabetes to plan ahead when they plan on spending time away from home
- People with diabetes need to be prepared if they are going to be in isolated areas such as when hunting and fishing
- People with diabetes should not go hunting or fishing alone. They should make sure a family member or a friend knows where they are going and when they plan to return. A cell phone should be carried for emergencies (if there is cell service).
- If the client is using insulin, make sure they have a glucagon kit to treat severe hypoglycemia. Anyone going with them should also know how to use the glucagon kit.
- In extreme temperatures, insulin and testing strips need to be protected by using thermal bags with hot or cold packs, or by carrying the insulin next to the body in cold weather.
- Make sure the client takes their medication with them; tests blood glucose levels often (due to the increased activity) and has a proper treatment for low blood glucose. Refer to *“Treatment of Low Blood Sugar”* handout.
- People with diabetes need to pack enough food so they can eat every 4 - 6 hours. **Do not rely on eating what you catch.** When planning meals they should include foods from each of the 4 food groups. It is important to have carbohydrate and protein foods at each meal to maintain appropriate blood glucose levels.
- A first aid kit should be carried to treat cuts, burns, blisters and bites to prevent infection
- It is important to wear proper footwear. The footwear should be comfortable and not too tight. The clients should wear shoes that do not pinch or rub the feet. Socks should be worn with shoes and an extra pair of socks needs to be packed in case socks get wet.
- Refer to handout *“Diabetes Care: Hunting and Fishing”*

### 3.3 Fasting

- When fasting there is a concern for low blood sugars. It is important to perform frequent blood glucose tests to monitor fluctuations in blood glucose levels.
- People with diabetes should talk with the person(s) who are organizing the fast. The client could ask if special considerations are made for people with diabetes.

Special considerations could include drinking water, eating a small meal, drinking other fluids, etc.

- People with diabetes should talk to their caregiver to learn how to fast safely. Clients on insulin and/or insulin secretagogues may need to adjust their doses.
- When fasting there is a concern for low blood glucose levels. Therefore, it becomes important to ensure frequent blood glucose testing is performed to detect low blood glucose levels.
- If a low blood glucose level is detected then it needs to be treated. Refer to *“Treatment of Low Blood Sugar”* handout.
- **People with diabetes should never perform a fast in seclusion.** A family member or friend should be present and educated on how to recognize and treat a low blood glucose.

### 3.4 Feasting

- When feasting there is a concern for high blood glucose levels. It is important to perform frequent blood glucose tests to monitor fluctuations in blood glucose levels.
- It is important for people with diabetes to control the portion size of the carbohydrate containing foods
- Those who are on insulin may be able to make adjustments to their insulin to handle the extra carbohydrate intake during a feast
- Encourage people with diabetes to have more of the foods that do not affect blood glucose (ie. vegetables) and have smaller portions of foods that do affect blood glucose (ie. bannock, bread, rice, potatoes, corn, noodles, etc.)
- It is important for people with diabetes to control the portion size of meat as some meats (processed meats, beef, pork) are high in saturated fat. Saturated fat can increase cholesterol levels.
- Eating smaller meals more often, rather than having one big meal, may help with blood glucose control

## 4.1 Special Considerations

### 4.2 Treatment of Low Blood Glucose

- Some symptoms of hypoglycemia include shaking, sweating, hunger, nausea, dizziness, confusion, etc.
- A low blood glucose can be caused by doing more physical activity than usual, skipping, delaying or not finishing a meal or snack, taking too much diabetes medication and drinking alcohol on an empty stomach
- If a client is experiencing these symptoms they should check their blood glucose. If the blood glucose reading is below 4 mmol/L it must be treated immediately with 15 grams of quick acting sugar. Some examples of quick acting sugars include regular pop, juice, honey, jam, sugar, candies, etc. Some foods that are high in sugar are also high in fat such as a chocolate bars, chips and cookies. These foods should not be used as they do not raise blood glucose levels fast enough. Refer to handout *“Treatment of Low Blood Sugar”* for appropriate treatment of low blood glucose
- Consuming too much quick acting sugars can cause the blood glucose to go too high causing rebound hyperglycemia

### 4.3 Sick Days

- When sick, the body makes stress hormones to help fight the illness. When there are a lot of stress hormones, insulin may not work as usual, which can result in high blood glucose levels and dehydration.
- Always remind the client to get their annual flu shot

### Dealing with Illness

1. Continue taking diabetes medications and/or insulin
  - Illness may cause blood glucose levels to increase regardless of food intake
  - People who take insulin may need insulin adjustments
2. Drink plenty of fluids
  - When someone is sick and blood glucose levels are high this may cause increased urination as the body is trying to get rid of the excess glucose. It is important to drink plenty of fluids to stay hydrated.

- Drink one cup of sugar-free liquids every hour. Avoid coffee, tea and some pop as they contain caffeine which may make dehydration worse.
- Choose from these liquids
  - Water
  - Broth
  - Caffeine free tea
  - Diet caffeine-free pop
  - Artificially sweetened beverage

### 3. Eat at regular meal times

- If the client is well enough to eat they should continue with their usual meals. If they are too sick to eat, suggest they have a snack or a sugar containing fluid instead. Try to have one of these items every hour:
- Snack Ideas
  - 1 slice of bread or toast
  - 7 crackers
  - $\frac{3}{4}$  cup of oatmeal
  - A piece of fruit
  - Half a cup of applesauce
  - $\frac{1}{2}$  cup of regular gelatin
- Fluids
  - 1 cup of milk (skim, 1% or 2%)
  - $\frac{1}{2}$  cup of 100% juice
  - $\frac{3}{4}$  cup of regular caffeine free pop
  - 1 cup of caffeine free tea with 1 tbs of sugar or honey

### 4. Test your blood glucose

- Test blood glucose levels every 2 - 4 hours
- If client has nausea, vomiting or stomach pains they should be tested for ketones.

5. Not all cold and flu medicines are appropriate due to the high sugar content
  - Use sugar free cough syrups and cough drops
  - Not all cold and flu medication are safe for people on high blood pressure medication
  - Talk to a pharmacist
  
6. When to tell the client to seek medical advice
  - If they cannot eat or drink
  - If they are vomiting and/or have diarrhea 2 times or more in 4 hours
  
- Refer to the handout "*Diabetes and Sick Days*"

## 5.1 Physical Activity

- Physical activity has many benefits for people with type 2 diabetes including:
  - Helps insulin to work better
  - Prevents heart disease and stroke
  - Improves blood pressure and cholesterol levels
  - Controls appetite and helps people to lose weight
  - Enhances energy, mood and decreases stress levels
  - Improves quality of life
- Regular physical activity can improve blood glucose control. Engaging in regular physical activity can result in a decrease or elimination of diabetes medications.
- All clients who have not exercised in a long time should check with their doctor to make sure there are no reasons why they should not be active
- People with possible cardiovascular disease or microvascular complications who want to undertake exercise more vigorous than brisk walking should have a medical evaluation for conditions that might increase exercise-associated risk.
- Assess for conditions such as:
  - Neuropathy (autonomic and peripheral)
  - Retinopathy
  - Coronary heart disease (resting ECG and/or exercise stress test)
  - Peripheral artery disease
- It is important to wear proper footwear when doing physical activity. The footwear should be comfortable and not too tight. The client should wear shoes that do not pinch or rub the feet. Socks should be worn with shoes and an extra pair of socks needs to be packed in case socks get wet.
- People with diabetes should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic exercise each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise
- People with diabetes (including elderly people) should perform resistance exercise at least twice a week and preferably 3 times per week in addition to aerobic exercise

## 5.2 Types of Physical Activity

- We all need a combination of aerobic, resistance and flexibility activities

### 1. Aerobic Activities

- Helps to keep the heart strong and healthy
- This activity involves continuous, rhythmic movements of large muscle groups and must be done for at least 10 minutes at a time to have a benefit for the heart
- Example: brisk walking, biking, dancing, hockey, soccer, jogging, swimming, etc.

### 2. Resistance Activities

- Increases muscle strength and power
- Helps the body to be more sensitive to insulin
- If the client has hypertension or retinopathy, they need to check with their doctor first before starting strength activities. Strength activities may strain the blood vessels in the eye.  
Example: lifting weights, hauling wood, using tension bands, push ups, etc.

### 3. Flexibility Activities

- Keeps the muscles relaxed and joints flexible
- Enhances the ability of joints to move through their full range of motion
- Example: stretching, bending, reaching, yoga etc.

## 5.3 How often to Exercise

### 1. Aerobic activities

- Everyone needs 150 minutes (2 ½ hours) of aerobic activities each week of moderate to vigorous intensity
- Aerobic exercise should be spread over at least 3 days with more than 2 consecutive days without any activity

### 2. Resistance activities

- Try to do strength activities at least 2 times a week, preferably 3 times a week

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- Try for one set of 15 - 20 reps of each exercise and gradually increase to 2 sets of 10 - 15 reps then 3 sets of 8 reps

### 3. Flexibility activities

- Try to do flexibility activities everyday
- It is recommended to stretch before and after activity to prevent injury

## 5.4 How Exercise helps Blood Sugars

- Being physically active can help to achieve good blood glucose control
- Regular activity and healthy eating can help people to lose weight, improve insulin sensitivity and have better blood glucose control
- Regular exercise may also lead to a decrease in the amount of diabetes medication needed

## 5.5 Testing Blood Sugars and Exercise

- Testing should be done before the client starts exercising and after. This will help to show how effective the exercise was on lowering blood glucose levels. This can be motivating for people to see the result on their blood glucose levels.
- Clients taking insulin or insulin secretagogues should ingest 15 – 30 grams of carbohydrate if their pre-exercise blood sugar is < 5.5 mmol/L
- Exercise needs to be delayed or avoided if blood glucose levels go below 4 mmol/L
- Generally exercise does not need to be postponed because of high blood glucose, provided they feel well. If blood sugar levels are elevated >16.7 mmol/L, it is important to ensure proper hydration and monitor for signs and symptoms (e.g. increased thirst, nausea, severe fatigue, blurred vision or headache), especially for exercise to be performed in the heat.

## 5.6 Snacks and Exercise

- If the client is not on any medications to manage diabetes then a snack is not required and there is no risk for a low blood glucose
- If the activity is unplanned and the client is taking pills that increase the secretion of insulin or are taking insulin, they are at risk of having a low blood glucose. Blood glucose levels should be monitored and depending on the intensity of the physical activity a snack may be needed. The client should be prepared to treat a low blood glucose.

- If the client is on insulin and wants to control their weight they may need to reduce the dose of insulin so added snacks are not required

## 5.7 Fluids and Exercise

- Water is the best choice for staying hydrated
- Sports drinks contain added sugar and are not required for most people
- To avoid dehydration:
  - Keep blood glucose level in target ranges
  - Aim for 8 - 10 cups of fluid everyday
  - Avoid excess caffeine and alcohol
  - Do not wait until you are thirsty to have a drink
  - Carry a water bottle with you
  - Exercise when it is cooler. This is usually in the mornings and evenings.
- Refer to the handout *“Diabetes and Physical Activity”*

## 6.1 Weight loss

- Approximately 80 - 90% of persons with type 2 diabetes are overweight or obese
- A small weight loss of 5 - 10% of body weight can improve insulin sensitivity, blood glucose, blood pressure and lipid control
- The initial assessment should include weight and waist circumference
- Waist circumference values  $\geq 102$  cm (40 inches) in men and  $\geq 88$  cm (35 inches) in women is associated with increased health risks
- A healthy weight loss means eating 3 meals a day and taking diabetes medications regularly

## 6.2 Treatment of Obesity:

### Goals

- Reduce body fat
- Attain and maintain a healthy or lower body weight
- Prevent weight regain

### Healthy Weight Loss

- A healthy weight loss is 1 - 2 kg (2.2 - 4.4 lbs) per month
- Eating appropriate portion sizes and being physically active are an important part of weight management. For most people a calorie deficit of 500 kcal is required to lose 0.45kg/week, however this may not apply to all individuals.
- Refer to the handout *"Tips for Healthy Weight Loss"*

## 6.3 Safety of Alternative Weight Loss Solutions

- There are many different natural health products (NHP) being promoted for weight loss. They are sold over the counter in many retail stores such as pharmacies, grocery stores and health food stores.
- There is not enough evidence to support that supplementation with NHP will lead to significant weight loss
- The evidence is very strong that healthy, well-balanced diets and regular physical activity will help with weight loss and weight control
- Many NHP have been shown to be unsafe when not used properly
- The long term effects of these products are unknown
- The safety of many NHP are unknown for people with medical conditions
- The use of weight loss products such as pills or herbal supplements should be discussed with a physician before starting

## 7.1 Type 2 Diabetes and Hypertension

- Most people with diabetes will develop hypertension, which is a major risk factor for microvascular and cardiovascular complications.
- Cardiovascular risk is 2 - 7 times higher in people with diabetes. Up to 75% of this risk can be attributed to hypertension.

### Nutrition Goal

- To attain or maintain a healthy blood pressure of < 130/80 through healthy eating and exercise

## 7.2 Nutrition Recommendations

### 1. Sodium (salt)

- Maximum sodium intake should be limited to 2300 mg per day while working towards a goal of 1500 mg per day
- This includes sodium added during cooking, at the table and from sodium already in food
- Refer to the handout *“How to Reduce Salt Intake”*

### 2. Alcohol

- The recommendation is  $\leq 3$  standard drinks per day for men and  $\leq 2$  standard drinks per day for women

What is a standard drink?	
Beer (5% alcohol)	360 ml (12 fl oz)
Hard Liquor (40% alcohol)	45 ml (1.5 fl oz)
Wine (12% alcohol)	150 ml (5 fl oz)

- People who are taking insulin or insulin secretagogues are at high risk of hypoglycemia due to alcohol consumption. **Hypoglycemia can occur up to 24 hours after drinking alcohol.**

### 3. Caffeine

- Limit to 400 mg per day
- Caffeine can be found in coffee, most pops, some teas, chocolate and energy drinks

<b>Food or Drink</b>	<b>Caffeine</b>
Brewed Coffee (1cup)	100 mg
Instant Coffee (1 cup)	66 mg
Decaffeinated Coffee (1 cup)	3 mg
Tea (1cup)	50 mg
Herbal Tea (1 cup)	0 mg
Cola (1 can)	37 mg
Chocolate bar (1)	0 - 10 mg
Chocolate chips (1/4 cup)	26 mg

### 4. Fibre

- Try to include high fibre foods in the diet. A goal of 25 - 50 grams per day is recommended for people with diabetes.
- Refer to the handout "*Foods with Fibre*" for examples

### 5. Food Guide

- Include fruits and vegetables, whole grain products and dairy products in a healthy diet
- These foods contain potassium, calcium and magnesium which helps to lower blood pressure
- Supplementation of potassium, calcium and magnesium is not recommended to lower your blood pressure

### 6. Herbal Supplements

- Some herbal products may interact with cardiovascular drugs and have variable effects on blood pressure
- The use of herbal products should be discussed with a doctor or pharmacist
- For example, avoid grapefruit, grapefruit juice, seville oranges, black licorice, ephedra, coenzyme Q-10 and garlic preparation

### 7.3 Lifestyle Factors

#### 1. Smoking

- Encourage smoking cessation
- Refer to Partnership to Assist with Cessation of Smoking (PACT) website for additional resources. Available at: <http://www.makeapact.ca/>

#### 2. Stress

- Additional stress in life can increase blood pressure and blood glucose
- Discuss with the client ways that they can relax

#### 3. Exercise

- People with diabetes should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic exercise each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise
- People with diabetes (including elderly people) should perform resistance exercise at least twice a week and preferably 3 times per week in addition to aerobic exercise
- Refer to the Physical Activity section above
- Refer to the handout *"Diabetes and Physical Activity"*

#### 4. Weight loss

- Refer to Weight Loss section above
- Refer to handout *"Tips for Healthy Weight Loss"*

## 8.1 Type 2 Diabetes and Cholesterol

- Diabetes is associated with a high risk of vascular disease (2 - 4 fold greater than that of individuals without diabetes)
- Cardiovascular disease is the primary cause of death (65 – 80%) among people with type 2 diabetes

### Nutrition Goals

- To attain or maintain appropriate cholesterol levels through healthy eating and exercise (LDL  $\leq$  2 mmol/L)

## 8.2 Nutrient Requirements

1. Total dietary fat intake should be 20 - 35% of total daily caloric intake. For example, if you are consuming a 2000 kcal diet your fat intake should be between 45 - 75 grams of fat.
2. Limit the unhealthy fats which are saturated and trans fats. Saturated fat intake should be no more than 7% of your total caloric intake. For example if you are consuming a 2000 kcal diet your saturated fat intake should be less than 15 grams. Your diet should not include any trans fats.

Saturated fats are found in animal based foods such as meat, dairy, butter, lard and processed foods. This type of fat is solid at room temperature. Trans fats are found in hard margarines and processed foods such as store bought cookies and crackers. Trans fat is also known as hydrogenated oil.

3. Consume more of the unsaturated fats such as the monounsaturated and polyunsaturated fats (omega-3). Unsaturated fats are found in plant foods such as canola or olive oil, peanut butter, flax seed, fatty fish, nuts and seeds, soy and non-hydrogenated margarine. Omega-3 fats are mainly found in fish (salmon, sardines, mackerel, herring, northern pike, trout, whitefish, perch and pickerel) and flax seed.
4. Increase soluble fibre intake to be in the range of 10 – 25 grams per day. Sources of soluble fibre include cereals with psyllium, oatbran, barley, legumes and fruits and vegetables.

### 8.3 Nutrition Recommendations

#### 1. Ways to lower LDL Cholesterol

- Consumption of saturated and trans fats can lead to increased LDL
- Limiting saturated and trans fat can lead to a decrease in LDL
  - Limit meat and alternative servings to 2 food guide servings (5 oz or 1 cup) for women and 3 food guide servings (7.5 oz. 1 ½ cups) for men each day
  - Choose lean meats such as wild game, fish and poultry (without skin). Wild game is a healthy choice. These animals are very active which makes them have less fat stores.
  - Choose meat alternatives instead of meat more often. This includes peanut butter, eggs and beans.
  - Trim visible fat off meat and remove skins off poultry
  - Drain fat off hamburger and use vegetable oil for frying instead of lard or butter
  - Cook meat in a way that fat drains away such as baking, boiling or roasting
  - Limit foods high in saturated fat such as bacon, bologna, hotdogs, sausage, pepperoni, salami, deep fried foods, chips, chocolate, baking, pastries and prepackaged foods (frozen meals, pizza, lasagna, corn dogs, fries, fish sticks, chicken fingers, instant noodles, etc.)
  - Limit fast food and restaurant meals
  - Choose low fat dairy products such as skim, 1% or 2% milk, light cheese and low fat yogurt
  - Limit added fats to 3 tbsp per day. For example oil, margarine, butter, lard, salad dressing, mayonnaise, sour cream, coffee creamer, gravy, etc.
- Consuming the majority of fat from plant sources can help lower LDL
- Increase the amount of fibre in your diet by choosing whole grain breads, cereals, pasta, beans, fruits and vegetables
- Increase physical activity
- Refer to the handout *“Ways to Lower your Cholesterol”*

## 2. Ways to increase HDL Cholesterol

- Increasing physical activity is the most effective way to increase HDL
- Smoking cessation can increase HDL
- Limit saturated fats and choose plant based fats more often
- Eating fatty fish (salmon, sardines, mackerel, herring, northern pike, trout, whitefish, perch and pickerel) 2 times a week may help increase HDL
- Refer to handout *“Ways to Lower your Cholesterol”*

## 3. Ways to lower Triglycerides

- Try to achieve a healthy weight
  - Limit alcohol to  $\leq 3$  standard drinks a day for men and  $\leq 2$  standard drinks for women
  - Increase physical activity
  - Achieve optimal blood glucose levels
  - Limit high sugar foods such as table sugar, honey, syrup, juice (100% fruit juice, frozen, crystals, carton), pop, candy, baking, coffee whitener, chocolate bars, ice cream, sports and energy drinks and high sugar cereals
  - Limit high fat foods. Refer to points listed under the section Ways to lower LDL Cholesterol.
  - Refer to handout *“Ways to Lower your Triglycerides”*
- 
- Refer to the following handouts for more information *“Tips for Healthy Weight Loss”*, *“Diabetes and Physical Activity”*, *“Foods with Fibre”* and *“Foods that Turn into Sugar”*

## 9.1 Type 2 Diabetes and Chronic Kidney Disease

- 50% of people with diabetes have chronic kidney disease
- Chronic kidney disease associated with diabetes is the leading cause of kidney disease in Canada
- Clients with Chronic Kidney Disease would benefit from a consult with a Registered Dietitian
- Clients who manage their diabetes with healthy eating, being active and keeping blood sugars and blood pressure in target will help keep their kidney's healthy
- Refer to the Saskatchewan Ministry of Health booklet "*Diabetes and Kidney Disease*". Available at: <http://www.health.gov.sk.ca/diabetes-and-kidney-disease>. This booklet is intended for clients who are at risk for chronic kidney disease and for people diagnosed with early stage chronic kidney disease.

### Nutrition Goals

- To promote blood glucose control through diet and exercise to prevent the progression to chronic kidney disease
- To promote healthy eating to help reduce the workload on the kidney, lessen symptoms and to prevent disease progression
- To delay the need for dialysis or transplant

## 9.2 Nutrient Requirements

- For nutrition information on protein, sodium (salt), potassium, phosphorus and healthy eating refer to Saskatchewan Ministry of Health booklet "*Nutrition Tips for those with Diabetes and Chronic Kidney Disease*". Available at: <http://www.health.gov.sk.ca/nutrition-diabetes-kidney-disease>. This booklet is intended for people diagnosed with early stage chronic kidney disease. People diagnosed with later stages of chronic kidney disease will need to be referred to a registered dietitian.
- This booklet contains information on potassium and phosphorus. If the client's lab values are not consistently high then potassium and phosphorus foods do not need to be restricted.

### 1. Protein

- When protein foods are broken down in the body, a waste product called urea is formed. As the function of the kidney decreases the kidney can no longer excrete urea efficiently. Too much protein in the diet can cause urea to build up in the blood.

- Too much urea in the blood may cause tiredness, nausea, headaches and a bad taste in the mouth
- Too little protein may cause muscle loss, weight loss, lack of energy and the body may have difficulty fighting infections
- In order to meet protein requirements clients should consume 0.8 g/kg/day of protein. Clients who are on dialysis may require more protein and would benefit from a consultation with a registered dietitian.
- Try to consume protein foods such as wild meat, lean meats, eggs, fish, poultry, milk, cheese, yogurt and beans

## 2. Energy

- Energy is needed for daily activities and to maintain a healthy body weight
- Adequate energy is needed in order for protein to be used to build, maintain and repair body tissues

## 3. Sodium (salt)

- Effects fluid balance and blood pressure
- Control sodium intake and avoid foods high in sodium
- Try to limit sodium intake to less than 2300 mg per day or approximately 1 tsp of salt per day
- Salt substitutes should not be used as they replace the sodium content with potassium. Potassium levels can be elevated in people with chronic kidney disease. Be aware of other types of salt such as sea salt, seasoning salt and garlic salt.
- If a client has high blood pressure, swelling of the face, hands or legs and experiencing shortness of breath a further sodium restriction may be required
- Refer to handout *"Tips to Reduce Salt Intake"*

## 4. Fluids

- Certain people may need to limit fluids depending on their kidney function
- As kidney function declines the body may become overloaded with fluid, which can cause swelling of the face, hands or legs and high blood pressure
- Fluids include anything that is liquid at room temperature such as water, soup, juice, milk, popsicles and gelatin
- Limit salty foods as salt can increase thirst

## 5. Potassium

- Is a mineral which helps the nerves and muscles function properly
- If the potassium level is too high or low it can affect the heart rhythms
- If lab values are consistently high for potassium then potassium containing foods need to be restricted
- Salt substitutes should be avoided as they contain potassium and may cause potassium levels to increase

## 6. Phosphorus

- Is a mineral that is involved in bone development and maintenance
- Too much phosphorus can cause itchy skin, painful joints and calcium loss from the bones
- If phosphorus levels are consistently high then phosphorus containing foods need to be limited
- Phosphate binders may be needed to reduce phosphorus levels
- In order for phosphate binders to work best they need to be taken with a meal or snack. They should not be taken with iron supplements.
- Phosphate binders can lead to constipation. If a client has constipation they may need to see a dietitian. Usually the increase of high fibre foods can help relieve constipation. However, high fibre foods containing potassium and phosphorus may need to be limited.

## 7. Calcium and Vitamin D

- Renal osteodystrophy is a complex bone disease that results from mineral (calcium, vitamin D, phosphorus) and hormonal (parathyroid hormone) imbalance in chronic kidney disease
- There are 3 main events that occur in the body that lead to renal osteodystrophy:
  1. As renal function declines the kidney's production of the active form of vitamin D (D3) decreases. This leads to a decline in calcium absorption from the intestine leading to decreased serum blood calcium levels. Lower serum blood calcium leads to the release of parathyroid hormone (PTH). This increase in PTH causes calcium to be released from the bone to restore serum blood calcium levels.
  2. As renal function declines the kidney is unable to excrete excess phosphorus, which leads to increased serum blood phosphorus. An increase in serum blood phosphorus

leads to the release of PTH. This increase in PTH causes calcium to be released from the bone to restore serum blood calcium levels.

3. As serum blood calcium increases from the bone this causes PTH to be secreted. This causes the cycle to start over. As calcium is released from the bone so is phosphorus, which also causes PTH to be secreted.
  - This continuous cycle of releasing calcium from the bone to maintain serum blood calcium can lead to weak bones which increases the risk of bone pain, deformities and fractures

#### Nutrition Implications:

- If phosphorus is high a dietary restriction of phosphorus will be needed (see above). A phosphate binder may be needed to help decrease phosphorus levels.
- Supplementation of vitamin D3 may be needed, however vitamin D increases the absorption of both calcium and phosphorus therefore the phosphate binder may need to be adjusted
- Some people who are unable to consume dietary calcium may need a calcium supplement. However, the serum calcium needs to be monitored as high serum blood calcium can lead to vascular and soft tissue calcification throughout the body.
- Supplementation in renal disease should be discussed with a Nephrologist

## 10.1 Diabetes and Pregnancy

- At conception and during the first trimester, hyperglycemia increases the risk of fetal malformations. Later in pregnancy hyperglycemia increases the risk of macrosomia and metabolic complications at birth.

### Nutrition Goals

- To achieve optimal blood glucose levels through healthy eating and exercise in order to provide the best outcome for mother and baby

## 10.2 Preconception

- The best start to a healthy pregnancy is to have good blood glucose control before becoming pregnant
- Before becoming pregnant women should check with their doctor as their medications may need to be changed
- For good blood glucose control, women with diabetes need to follow a healthy eating pattern as outlined above and be physically active
- It is best to have blood glucose in control 3 - 6 months before pregnancy
- All women of child bearing age should be on a folic acid supplement:
  - Supplement with multivitamins containing 5 mg of folic acid for at least 3 months preconception and continue until at least 12 weeks postconception
  - Supplementation should continue with a multivitamin containing 0.4–1.0 mg folic acid from 12 weeks postconception to 6 weeks postpartum or as long as breastfeeding continues
- If you need more information on specific nutrients that are important during pregnancy such as iron, folate, calcium, vitamin D and vitamin A then refer to the handout *“Healthy Pregnancy”*

## 10.3 Types of Diabetes in Pregnancy

- Gestational Diabetes – this type of diabetes develops during pregnancy and usually goes away after the baby is born. Women who have had gestational diabetes are at increased risk of developing type 2 diabetes.
- Diabetes before pregnancy – when a woman has been diagnosed with diabetes before becoming pregnant

## 10.4 Insulin Levels and Hormones

- During pregnancy there is an increase in hormone production
- This increase in hormones causes an increased need for insulin to be able to move glucose out of the bloodstream
- During pregnancy the pancreas must produce 2 - 3 times more insulin to keep blood glucose levels in range
- Some people's bodies are not able to make enough insulin during this time and may have to take insulin
- If the client already has diabetes and is on insulin they may have to increase their insulin dose during pregnancy. However, during the first trimester some women experience lower blood sugars and are at risk for a low blood sugar.
- The hormone levels continue to increase throughout pregnancy making it more difficult to control blood glucose levels
- It is important to be testing blood glucose levels frequently as the need for insulin can change on a weekly basis
- Regular follow up with a health care provider is necessary
- Once the baby is delivered the hormones levels decrease and insulin levels will need to be adjusted

## 10.5 Healthy Eating for Diabetes and Pregnancy

- Eat 3 meals and snacks as needed each day. Try to make breakfast the smallest meal as blood glucose tends to be highest in the morning. Adding protein to breakfast can help regulate blood sugars.
- Follow Eating Well with Canada's Food Guide. See above for detailed explanation.
- Take prenatal vitamins
- Avoid eating high sugar and high fat foods
- Control portion sizes to prevent excess weight gain and to help control blood glucose levels
- Limit caffeine from coffee, strong tea and pop to 300 mg per day. Use only herbal teas considered safe in pregnancy such as citrus peel, ginger, lemon balm and rosehip.
- Satisfy thirst with water
- Most artificial sweeteners are safe in moderate amounts. Avoid cyclamate (Sucaryl®, Sugar Twin®, Sweet'N Low®) and saccharin (Hermesetas®) sweeteners as these have not been proven to be safe in pregnancy.
- Follow healthy eating guidelines outlined above for type 2 diabetes

- Refer to the booklet *“Diabetes in Pregnancy: Gestational Diabetes”* published by the Saskatchewan Ministry of Health. Available at: <http://www.health.gov.sk.ca/diabetes-in-pregnancy>

### **10.6 Physical Activity**

- It is important to control blood glucose levels, maintain a healthy weight and help the body prepare for childbirth
- Refer to the Physical Activity section above

### **10.7 Ketones**

- Ketone testing may be necessary when there is unexpected weight loss, dehydration, the client has been sick or has had high blood glucose levels
- Ketones can be produced when blood glucose levels are >14 mmol/L
- An evening snack may help prevent ketones from being produced overnight

### **10.8 After Pregnancy**

- Breastfeeding can help to prevent the baby from becoming overweight and developing diabetes later in life
- Breastfeeding helps the mother to return to her pre-pregnancy weight faster
- If a woman had gestational diabetes she will need to be screened for type 2 diabetes between 6 weeks and 6 months after birth
- Before the next pregnancy, the client should have her blood glucose screened
- It is important to continue to eat healthy and be active to reduce the risk of developing type 2 diabetes
- If the client has a subsequent pregnancy, screening for gestational diabetes should occur in the first trimester. If the client is not found to have gestational diabetes repeat screening should occur in the second and third trimester.

## 11.1 Diabetes and Vitamin D

- Vitamin D is synthesized in the skin when exposed to ultraviolet B (UVB) radiation. However, this synthesis is affected by latitude, season, time of day, age, sunscreen use, and skin pigmentation. In Canada, we can not synthesize vitamin D during the winter months (October to March). During the winter months we must rely on dietary intake of vitamin D to maintain adequate levels of vitamin D in the body.
- Vitamin D is used in the body to help absorb and use calcium for strong bones and teeth
- Most body tissues have vitamin D receptors and the enzyme required for converting vitamin D into its active form.
- Hypovitaminosis D has been suspected as a risk factor for glucose intolerance and has been associated with impaired insulin secretion in populations at high risk for diabetes
- Interest remains in the potential role vitamin D may play to aid in the prevention of diabetes and the scientific community continues to investigate this area of research

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