Diabetes and Me

Health Promotion Administration,
Ministry of Health and Welfare

Preface of Reprint

According to the investigations conducted by Health Promotion Administration of Taiwan, about a quarter of adults are in the stage of pre-diabetes (fasting blood glucose level ranged from 100-125mg/dL). Studies indicated that 5-10% of this population may progress into diabetes. It is necessary to change the life style to attenuate the risks of developing diabetes, such as obesity, thick waist, unhealthy diet, lack of excise and smoking. Diabetes is the top 10 causes of death in Taiwan. Complications caused by diabetes, including nephropathy, major (micro-) vasculopathy, neuropathy and retinopathy, are severe threats to the health of the public. Therefore, diabetic patients must maintain good self-management in all aspects of their disease conditions to prevent complications, including body weight and dietary controls, exercise, taking medicine on time, monitoring blood glucose level regularly, , and active cooperation with doctors, nurses, nutritionists in the shared-care team.

This handbook, “Diabetes and Me”, is a learning material designed for diabetic patients and the high-risk populations, which explained the profound topics in a simple way. Considering the advance of evidence-based medicine and clinical practice, we commissioned the Taiwanese Association of Diabetes Educators to invite experts in preventive diabetes care patients to discuss on the contents of this book. The new edition included additions on introduction of prediabetes, care of elderly diabetic patients, and care of diabetic patients during Covid-19 pandemic. This makes this handbook more evidence-based, comprehensive and practical than ever.

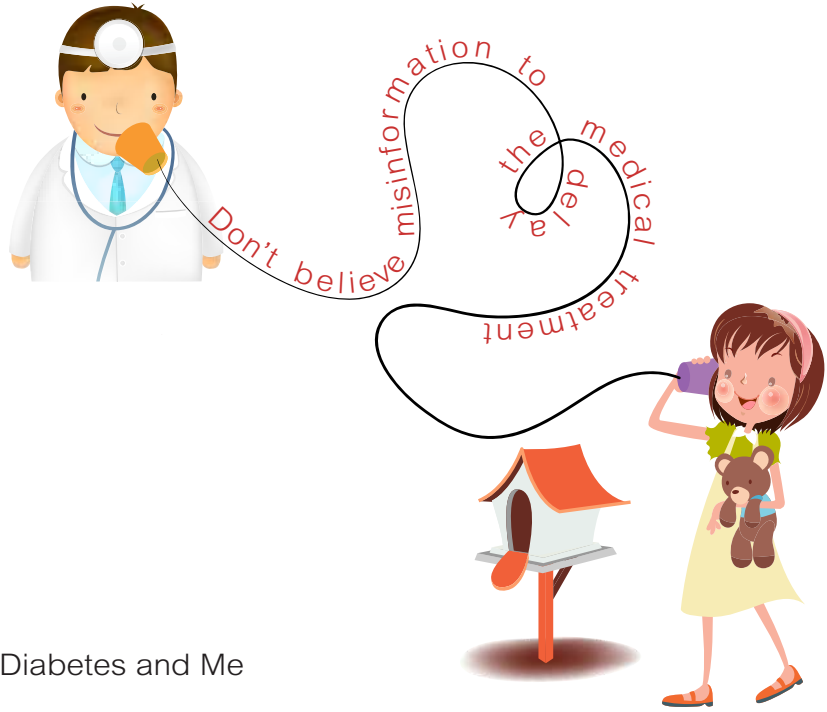
We sincerely thank all experts, scholars and representatives of diabetic patients for their efforts and involvement in the editing of this reprinted version of handbook, which would not be possible without their precious contributions and suggestions.

Chao Chun Wu.

Director-General, Health Promotion Administration

Overview

Diabetes is characterized by high blood glucose, which is resulted from insufficient insulin production or function due to dysfunction or degeneration of the pancreas. Accepting regular treatments and follow-up, learning committing to good lifestyles, and managing the blood glucose levels will slow down and prevent the development of complications. Diabetes cannot be cured, but you can learn to manage it. Don't believe misinformation to delay the medical treatment.



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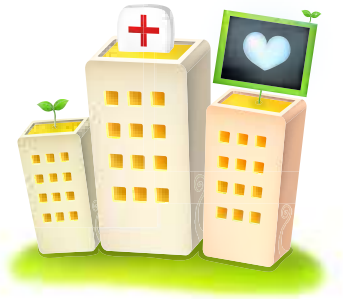
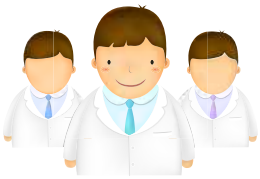




1 What is Diabetes

1-1. About Diabetes

Classification of diabetes includes: type 1 diabetes mellitus (islet cell destruction leading to absolute insulin deficiency), type 2 diabetes (insulin resistance combined with relative insulin deficiency), gestational diabetes, and other types of diabetes.

1-2. Causes of Diabetes

Under normal conditions, the body will digest foods with carbohydrates into glucose and absorb glucose for energy. The pancreas secretes insulin, which helps glucose enter cells for metabolism. When the amount of secreted insulin is not enough or the body fails to response adequately to insulin's effect, i.e., insulin resistance, the glucose level in the blood may become higher than the normal level, and diabetes may occur.

Diabetes is not an infectious disease. It won't pass from one person to another, but hereditary is possible.

1-3. Diagnosis of Diabetes

1. Diabetes can be diagnosed when there are typical hyperglycemia symptoms or acute hyperglycemia accompanied by a random plasma glucose level greater than 200 mg/dL.

2. When there are no typical hyperglycemia symptoms and the following diagnostic criteria are met, it is recommended to repeat the diagnostic test. If the second data meets the diagnostic criteria, the subject can be diagnosed as diabetes. If there are two of the tests meeting the criteria, the subject can also be diagnosed as diabetes. If one result meets the standard and the other does not, it is recommended to repeat the latter test.

Fasting plasma glucose is ≥126 mg/dL (7.0 mmol/L)

Definition of fasting: no consumption of any calories for at least 8 hours*

or

Oral glucose tolerance test
Plasma glucose more than 200 mg/dL (11.1 mmol/L) at the second hour

or

Glycated hemoglobin (HbA1c) more than 6.5%*

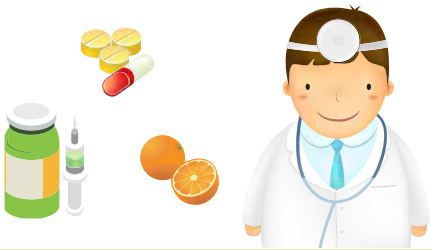
* When the level is near the diagnostic criteria, it is required to repeat the test for confirmation.

1-4. Symptoms of Diabetes

Most patients are asymptomatic in the early stage. In this stage, diabetes is difficult to detect without a health check-up. Without proper control, the condition will deteriorate over time, and blood glucose levels may gradually increase. As a result, "three kinds of excessiveness (excessive eating, excessive thirst, and excessive urination)", fatigue, weight loss, blurred vision, genital itchiness, or prolonged healing wounds may occur.

1-5. Management of Diabetes

1. Balanced diet, regular exercise, medication following your doctor's prescription, and regular self-monitoring of the blood glucose level .
2. Regular follow-up of diabetes related examinations. For example, microalbuminuria examination for early detection of diabetic nephropathy; fundus examination for screening of diabetic retinopathy and macular degeneration.
3. Discuss the best strategies with professional health-care team, build the partnerships, and develop self-resolving skills. Improve the quality of life by changing the lifestyle.



Controlling Glucose From A to G

1-6. Prediabetes and High-risk Population

Prediabetes easily progress to diabetes . Actually, a high blood glucose level can affect heart, blood vessel, kidney functions, and eventually cause stroke, heart diseases, kidney disease, blindness, amputation etc.

Diagnostic Criteria for Prediabetes

Impaired fasting glucose (IFG)

Fasting blood glucose is 100 - 125 mg/dL

Definition of fasting: no consumption of any calories for at least 8 hours*

or

Impaired glucose tolerance (IGT)

Plasma glucose is 140 - 199 mg/dL at two hours on oral glucose tolerance test (OGTT)

or

Glycated hemoglobin (HbA1c) more than 5.7 to 6.4%

* When the level is near the diagnostic criteria, it is required to repeat for confirmation

Recommendations of screening for asymptomatic diabetes in adult

Health check-up is provided by Health Promotion Administration. People over 40 years old are screened every 3 years, and those over 65 years old are screened every year. Check 1 time.

Recommended to screen when you meet the following conditions.

A. Meet two or more risk factors listed below are recommended to be screened. When the result does not reach the diagnostic criteria of diabetes, it is recommended to screen once every three years.
   - Body Mass Index (BMI) ≥ 24 kg/m^2
   - Waist ≥ 90 cm for men and 80 cm for women
   - First-degree relatives with diabetes
   - A medical history of cardiovascular disease
   - Hypertension (≥ 140/90 mmHg) or under treatment of hypertension
   - High-density lipoprotein (HDL) less than 35 mg/dL or triglycerides higher than 250 mg/dL
   - Polycystic ovary syndrome
   - A medical history of gestational diabetes
   - Lack of exercise
   - Syndrome of insulin resistance (severe obesity, acanthosis nigricans)

B. For those who with a medical history of glucose intolerance, high fasting blood glucose, or HbA1 c ≥ 5.7 %, it is recommend to screen every year.

C. • Smoking: nicotine in cigarettes can inhibit the secretion of insulin and increase blood glucose.
   - Excessive alcohol consumption
   - Stress: stress hormone is secreted under long-term stress, which interferes with insulin functions, and increases insulin resistance.

2 Diet for diabetes

2-1 Maintain Healthy Body Weight: Defining Obesity in Adults

Reducing calorie intake and increasing exercise can control weight for subjects with overweight and obesity. Researches showed loss of 5-10% of weight could effectively improve metabolic abnormalities related with blood glucose, blood pressure, and cholesterol.

Approach 1

Body Mass Index (BMI)

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height}^2\ (\text{m}^2)}$$

Range of healthy body weight: 18.5 ≤ BMI < 24 (kg/m^2)

Underweight	BMI < 18.5
Normal weight	18.5 ≤ BMI < 24
Overweight	24 ≤ BMI < 27
Mild obesity	27 ≤ BMI < 30
Moderate obesity	30 ≤ BMI < 35
Severe obesity	BMI ≤ 35

Case

Hight is 158 cm, weight is 64 kg. What is the value of BMI? Ideal weight range? Is it normal?

$$\text{BMI} = \frac{64}{1.58^2} = \frac{64}{2.4964}$$

$$= 25.64 > 24 \rightarrow \text{Overweight}$$

Approach 2

Waist circumference

Men ≥ 90 cm (35 inches)

Women ≥ 80 cm (31 inches)

2-2. Dietary Principles for Diabetes

1. Balanced intake the six categories of food

The basis of a diabetic diet is the "balanced diet." In order to control blood glucose levels and stay healthy, every meal requires a fixed amount of sugar, high fiber, and moderate fat. A "balanced diet" means having an appropriate amount of daily intake from the following six major categories: wholegrain starchy vegetables (staple food), beans/fish/meat/eggs, milk, vegetables, fruits, and fats/oils. Diabetic diet is a personal diet program, which should be discussed with and designed by a dietitian to customize to the characteristics of specific individuals, such as gender, age, height, weight, and physical activity level.

Resources: Health Promotion Administration, Ministry of Health and Welfare

Recommended daily allowance for an adult to achieve a balanced diet

2. Regular intake of sugary foods

Blood glucose levels may be related to the total amount of carbohydrate intake. Having regular meals helps stabilize changes in blood glucose and is also an important principle for controlling blood glucose levels. Therefore, "carbohydrate counting" is a necessary skill for patients with diabetes to control blood glucose level. Categories of foods that contain carbohydrates are whole grain starchy vegetables (staple food), milk, fruits, and vegetables. Among which, vegetables can be omitted since the amount of sugar in vegetables is very low. Please consult your dietitian regarding the details of carbohydrate counting.

3. Avoid the intake of refined carbohydrates and sugary foods

The total amount of carbohydrates is the main factor affecting blood glucose level. Although the amount of carbohydrates in sugary foods may be substituted for the same amount of carbohydrates in the staple food of the diet plan, refined carbohydrates or sugary foods easily lead to increased blood glucose levels and overeating. Meanwhile, most sweets, such as cakes, cookies, and ice cream, contain lots of fat and make people easily intake a significant number of calories and affect weight. Therefore, in order to achieve the goal of controlling blood glucose level and weight, it is recommended to avoid the intake of refined carbohydrates and sugary foods.

4. Choose high-fiber and substitute foods more often

Eating high-fiber foods can increase satiety, prevent constipation, and slow down the absorption of carbohydrates. Whole grains, such as brown rice, oats, and job's tears, or unprocessed dry beans, such as mung beans and red beans, can be used to replace refined staple foods, such as rice, white noodles, and pastry.

Fresh fruit can be used to replace juices, and increasing the servings of low-oil or oil-free vegetables can also increase the intake of dietary fiber. Having a variety of food choices is helpful in achieving a balanced diet.

5. Vegetables of low-oil or oil-free can be eaten more

Eat more vegetables of low-oil or oil-free can increase food fiber, vitamin, and nutrients intake. In addition, it can increase satiety without exceed calories.

6. Choose low-fat foods and cook them with good-quality vegetable oil

Low-fat foods include non-fat or low-fat milk, lean meat, fish, etc. Less-oil cooking methods include steaming, boiling, sauteing, roasting, baking, tossing, or stir-frying in low heat or mixed with good-quality vegetable oils, such as olive oil, sunflower oil, and camellia oil. Furthermore, moderate intake of nuts can replace some cooking oil.

7. Moderate or no drinking

Patients with diabetes should only drink alcohol in moderate amounts (for men, no more than two standard

drinks per day; for women, no more than one standard drink per day) or not at all. A standard drink is 15 grams of alcohol, which is equivalent to 360 c.c. of beer (4% alcohol), 120 c.c. of wine (12% alcohol), 40 c.c. of whiskey (40% alcohol), and 30 c.c. of sorghum (53% alcohol). Patients receiving insulin injections should only drink with meals to prevent hypoglycemia.

2-3. Diet plan for senior diabetic patients

Physiological changes in aging will affect the nutritional intake of the elderly. The strategies to cope with these changes are shown in Table 1. According to the statistics, 84.7% of the elderly over 65 years old have been diagnosed with one chronic disease. Dietary limitation for chronic disease further affects the nutritional intake of the elderly. Nutritional care and recommendation of senior diabetes are show in Table 2.

Goals of nutritional care for senior diabetic patients:

1. Providing proper nutrition and protein to prevent sarcopenia and frailty.
2. Moderate calorie intake and maintenance of a reasonable weight are required for the elderly with overweight and obesity.
3. Choosing the right food based on the abilities of chewing and swallowing.
4. Preventing the occurrence of hypoglycemia.

Table 1. Physiological changes in aging and nutritional intake

	Physiological changes	Diet habit changes	Strategy
oral	• Change in taste • Altered sense of smell • Tooth loss • Periodontal disease • Reduced saliva production	• Prefer salty, sweet, or spicy food. • Prefer to eat starch food and fatty meat. • Eat less fruits and vegetables leading to insufficient fiber intake and constipation. • Prefer high-moisture food	• Prepare low-salt and low-sugar foods. • Provide soft, chopped or mashed food • Use steaming, boiling and stewing when cooking • Take enough water and fiber intake • Give nutrient-dense food
gastrointestinal tract	• Reduced digestibility • Decrease of intestinal motility • Decreased secretion of stomach acid and digestive enzymes • Decreased secretion of bile and pancreatic lipase	• Easy full thus decrease food intake. • Easy Constipation • Decreased gastric acid secretion causes decreased absorption of calcium, iron, and vitamin B12 • Reduced fat digestion ability	• Have small-portion meals 4-5 times/day • More fiber-rich food • Provide soft, chopped, or mashed meat and foods rich in calcium (milk, whitebait, tofu) • Low oil cooking method (steamed, braised, stewed)

	Physiological changes	Diet habit changes	Strategy
Metabolism	• Decrease of basal metabolic rate	• Weight gain	• Regulate Calorie intake, maintain idea weight • Encourage moderate exercise and activity
	• Decrease of glucose metabolism ability	• Increase of fasting hyperglycemia	• Regulate Calorie intake, maintain idea weight • Encourage moderate exercise and activity • Low-sugar, high-fiber diet

Table 2. Problem of Nutrient care and recommendation for Senior diabetes

Obstacle	Problem of Nutrition Care	Recommendation
Physical disorder	Swallowing problems	• Referral to speech therapy • Adjust food texture (difficultly- swallowed meals) • If mealtime is prolonged, insulin injection after meal is recommended
	Unable to eat by yourself	• Reduce the frequency of blood glucose monitoring • Use assistive devices • Referral to occupational therapy • Need caregivers, and the caregivers need to be re-educated
	Limited cooking ability/ Not interested in cooking	• Meals-on-Wheels and Dinning Together service • Planning divided cooking • Choose suitable convenient food (such as conditioning package, compound frozen food) • Menu simplification and decrease preparation process of food

Table 2 Problem of Nutrient care and recommendation for Senior diabetes (Continued)

Obstacle	Problem of Nutrition Care	Recommendation
Dementia	Mistakes and irregular eating	• Meals-on-Wheels and Dinning Together service • Reminder for regular meals and take medicine. • Need caregivers to assistant meals and medication (including insulin injection)
	Poor for food preparation	• Meals-on-Wheels and Dinning Together service • Choose suitable convenient food (such as, conditioning package, compound frozen food) • Menu simplification and decrease preparation process of food.
Depression	Change in food-intake amount (excessive or inadequate)	• Depression screen and therapy • Encourage participate in social activities • Improvement strategy to eating habit and feeling boring. • Make food interesting can cause appetite • Prepare dining environment (Bright placemat, music, simple decoration • Simple meal preparation
Economic problem	Inadequate nutrition intake	• High nutrient-dense food • Referral to social service agency/ Food bank/ Medical assistance • Reduce the frequency of blood glucose monitoring • Purchasing strategy (buy seasonal agricultural products, non-animal protein food, use discount coupons)
Multiple diseases (such as cancer, acute and chronic diseases)	Change in food-intake amount	• Accept personal nutrition consultation • Cross-professional care • Confirm the goal of blood glucose control. • Nutritional supplements or nutritional support if necessary • Lift the dietary restriction

2-4. Carbohydrate-counting Chart

A fixed amount of carbohydrates in meals and snacks can stabilize blood glucose levels. Foods with carbohydrates that need to be calculated or replaced include whole grains, starchy vegetables, fruits, and milk. A diet plan is customized by a dietician based on the individual's diet, physical activity level, metabolism, etc. The substitution of foods with the same amount of carbohydrates is allowed in the daily diet to increase the variety and choices of foods. This manual includes the "Carbohydrate-Counting Chart' (Appendix I) for reference.

3 Exercise

3-1 Introduction

Beside food control and medical treatment, physical activity is an important way to control blood glucose for diabetic patients. Increased frequency and intensity of physical activity benefit much to diabetic patients, including incresed calorie burn, decrease of insulin resistance, increased insulin sensitivity, enhancement of cardiovascular tolerance for daily activities, increase of skeletal muscle quantity and oxidation capacity, and prevention of sarcopenia. Therefore, appropriate and effective physical activity is very important for diabetic patients.

Exercise is a planned and organized physical activity. We recommend that diabetic patients exercise at least three days per week with different kinds of exercise, and more than 150 minutes per week. Don't quit exercise longer than two straight days.

3-2 Exercise Options

Exercise can be classified into aerobic exercise, resistance exercise, and flexibility exercise. Balance and agility training is also needed for diabetic patients in order to prevent accidental falls caused by poor balance or slow response. At beginning, physical conditions and fitness should be assessed for exercise time and intensity planning. Increase the amount of exercise step by step to achieve the benefits of exercise.

1. Aerobic exercise

Aerobic exercise or endurance exercises are continuous exercise for more than 10-30 minutes. These include walking, climbing, bicycle riding, jogging, swimming, rhythmic gymnastics, Tai-Chi, etc. According to the intensity level, aerobic exercise is divided into low-impact, moderate and vigorous activity. Easy and slow walking, or continuous swinging of the limbs is low-impact aerobic exercise, which improves cardiopulmonary functions. Moderate activity such as speed walking and jogging, or vigorous activity such as playing badminton or tennis will bring the benefits of aerobic exercise.

2. Resistance exercise

Resistance exercise is also called weight training, i.e., the exercise in which body work against resistance. Sources of resistance for resistance exercise include fitness equipment (barbell, dumbbell, handgrip, etc.), thera-band, or body weight (push up, squat, pull up), etc. Resistance exercise strengthens muscle contraction, leading to increase of muscle mass and strength, improved insulin action, and consequently increased carbohydrate storage and utilization of skeletal muscles. All these help diabetic patients blood glucose level control, and benefit to blood pressure and cardiovascular health.

3. Flexibility exercise

Flexibility exercise is also called stretch exercise, which pulls joints to improve their ranges of motion, decreases stiffness during exercise, and reduces damages to tissues adjacent to the joints during exercise.

4. Balance exercise

Long-term increase in blood glucose level will cause peripheral neuropathy, leading to decreases of peripheral sensation and proprioception and sense of equilibrium during walking. Thus, balance exercise is important for chronic diabetic patients.

3-3 How to do correct and effective exercise

1. Aerobic exercise

The principle of aerobic exercise is that movement of big muscles lasts longer than 10 minutes. During aerobic exercise, continuous muscle contraction and excise longer than 30 minutes will maintain the effect of aerobic metabolism. The recommended frequency of aerobic exercise is 3-7 days a week and more than 150 minutes per week. Don't miss workouts for more than two days in a row. The intensity of exercise should start from low-impact to moderate one, and progressed to moderate or vigorous ones. Generally, there are two ways to access the intensity of aerobic exercise: one is based on the heart beat number during exercise, the other is based on the subject's rating of perceived exertion.

A. Heart rate as a basis for exercise intensity

A simple method to assess the intensity of aerobic exercise is as follows: 220 minus age of the subject as the estimated maximum heart rate, then multiply it by a certain percentage.

For example, as for as a 60-year-old adult doing aerobic exercise, the estimated maximum heart rate is 220-60=160, i.e., 160 heart beats per minute. When heart rate is:

1) 160×60% =96/min, less than 96 heartbeats per minute is low-impact exercise.
2) 160×60~90% =96~144/min, moderate exercise.
3) 160×90% =144/min, more than 144 heartbeats per minute is vigorous exercise.

However, the suggested heart rate during exercise mentioned above is recommended for general adults. For diabetic patients, estimated maximum heart rate should be minus the heart rate reserve, which is the difference between your resting heart rate and your maximum heart rate. This is because diabetic patients often have autonomic neuropathy or other chronic comorbidities, the rest heart rate at rest time also varies according to the disease and physical status, the sensitivity of the heart rate during exercise, or tolerate also varies from person to person. However, this method is complicated, you can discuss with expert before you start exercise.

B. Rating of perceived exertion as a basis for exercise intensity

Another index is rating of perceived exertion. According to the feelings during exercise as the personal index. The commonly used rating of perceived exertion scale is Berg Balance Scale.

Perceived Exertion Scale - Berg Balance Scale

Level	Level of Exertion
06	
07	Extremely light
08	
09	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very hard
18	
19	Extremely hard
20	

According to the Berg Balance Scale, the exercise degree of diabetic patients is mostly recommended to be somewhat hard to hard, around levels 12 - 15. This scale is a simple and easy-to-use method that only needs to observe the patient's personal feeling during exercise, no need to monitor the heart rate.

2. Resistance exercise

Resistance exercise is a muscle contraction exercise that targets all major muscle groups in the body. The muscle strength of each muscle group must be evaluated before adopting an appropriate resistance. Take dumbbell exercises as an example, the number of times the upper arm can lift the dumbbell repeatedly as the basis of dumbbell weight selection. If the upper arm can lift a dumbbell repeatedly for 20 times, unable to lift it in the 21st time, then the weight of the dumbbell at this time is called 20RM (repetition maximum) of the upper arm. On the other hand, if the upper arm can lift a dumbbell for 1 time, and unable to lift it for the second time, the weight of this dumbbell is called 1RM. Hence, the smaller the RM, the greater the weight; the larger the RM, the lighter the weight. 8-12RM is the appropriate training weight for adult resistance training. Start from 12-15 RM is suitable for diabetes. For sarcopenia and frail elderly, start with a lighter weight; when the strength increases after training, you can move on to equipment with more resistance. Too little resistance will reduce the effect of training, on the contrary, too much resistance may cause muscle and soft tissue damage during exercise. The frequency of resistance exercise is recommended 2-3 times a week, and don't do rresistance exercise for two straight days. The principle is to do resistance exercises for each major muscle group of the whole body. It is best to train all the major muscle groups of the whole body. After completing one round of exercise for each muscle group, repeat 1-2 rounds.

3. Soft exercise and balance exercise

Soft exercise is like stretching; balance exercise is like straight walking training. It is recommended 2-3 times a week, especially for elderly diabetic patients.

3-4 Notice about exercise for diabetes

Diabetic patients may be accompanied by peripheral neuropathy and optic neuropathy, limiting their perception and vision of the surroundings. In addition, the coordination of diet and medication may cause blood glucose fluctuations during exercise. Therefore, it needs more attention in details when exercising. Diabetes patients need more attention for the followings when exercising:

1. Always carry your "Diabetes ID Card" with you, and never exercise alone.
2. Wear proper clothes, shoes, socks, and other protective gear during exercise.

3. Do appropriate warm-up and cool-down exercises before and after exercise. The intensity of exercise should be gradually increased.
4. Replenish water and food at the right time during exercise, and monitor blood glucose when possible.
5. Remember to carry sugary juice, cookies, sugar cubes, etc. with you. In case of hypoglycemia, patients can have them immediately.
6. Avoid exercising in poorly lit or rough road environments for patients with retinopathy
7. Do not exercise when the rest heart rate > 120/min, or systolic blood pressure > 200 mmHg, diastolic blood pressure > 100 mmHg.
8. Exercise is not recommended for patients with poor blood glucose control or who often get hypoglycemia or sick. Poor blood glucose control are defined as patients with type 1 diabetes who have a blood glucose level more than 250 mg/dL with a positive urine ketone bodies, or blood glucose level more than 300 mg/dL, and patients with type 2 diabetes who have a blood glucose level more than 300 mg/dL.
9. Under extreme weather conditions (extreme heat or extreme cold), bad weather, or poor visibility, exercising outdoors is not recommended.
10. Stop exercise when the symptoms, such as joint pain, swelling of joints in hands and legs, difficulty breathing at rest, and chest tightness appear.

3-5 Notice about exercise for senior diabetic patients

Notice about exercise for senior diabetic patients including:

1. Avoid exercising in high temperature and high humidity environment, because of senior diabetics often have autonomic neuropathy and poor regulation of body temperature.
2. Start resistance exercise early to increase the quality and strength of skeletal muscles, because of senior diabetics often have sarcopenia.
3. Avoid falling when standing on one foot or move quickly, because balance and muscle strength of senior diabetic patients are poor.
4. Wear enough protective gear to protect the joints during exercise and reduce high-impact sports, because senior diabetic patients are often accompanied by bone-joint disease and pain. Water sports are suitable for senior diabetes, such as swimming, can reduce the pressure on the joints of the weight, and further reduce the discomfort of the bones and joints during exercise. However, it is necessary to confirm that there is no wound on the skin to avoid infection.

4

Medications

4-1 Oral Medications

There are currently six categories of oral diabetes medications. The doctor will evaluate the patient's condition such as blood glucose level, comorbidities, and liver and kidney functions to give appropriate drugs. These medications can be used individually or combined with others (common drugs are listed in appendix II).

1. Biguanides

Mechanism	Reduce gluconeogenesis and decrease release of glycogen in the liver
Directions	Take with or after meals
Common side effects	Common gastrointestinal side effects, such as bloating, diarrhea, nausea, and abdominal pain, which are often temporary. Take low dose can reduce the chance and degree of gastrointestinal side effects
Warnings	1) When receiving iodine-containing contrast agent, stop it 48 hours before the test. After that, confirm the kidney function is normal before resuming it 2) It is recommended to suspend medication on the day of surgery 3) When a serious heart disease occurs, the doctor needs to evaluate whether suspend medication necessary 4) Hypoglycemia will occur only

2. Insulin secretagogues

Classified into sulfonylureas and glinides

	sulfonylureas	glinides
Mechanism	Increase secretion of insulin	Increase secretion of insulin, action faster than sulfonylureas, but with shorter duration
Directions	Take with meals or 15-30 minutes before meals dependent on doctor's order	Take with meals
Common side effects	Hypoglycemia Weight gain	Hypoglycemia Mild weight gain
Warnings	Elderly, frailty, irregular eating, liver and kidney dysfunction are prone to hypoglycemia	

3. α-glucosidase inhibitors

Mechanism	Inhibit the digestion of starch and disaccharide and delay the absorption of glucose
Directions	Take the whole tablet before a meal or swallow with the first few mouthfuls of food during a meal crushed and swallowed together
Common side effects	Increase flatulence, diarrhea, and flatulence
Warnings	1) patients with intestinal obstruction, related gastrointestinal diseases, liver cirrhosis, and severe renal dysfunction are contraindicated 2) If hypoglycemia occurs when used together with other drugs will inhibit digestion of starch and disaccharide, please use glucose or milk as treatment

4. Insulin sensitizers

Mechanism	Increase sensitivity to insulin
Directions	Take before or after meals
Common side effects	Weight gain, edema
Warnings	1) Patients with moderate to severe heart failure or ALT level is 2.5 times more than normal value are suspended medication 2) Tell your doctor immediately if you have abnormal weight gain, edema, and shortness of breath 3) Take it alone will not cause hypoglycemia, if combined with other drugs may cause hypoglycemia

5. DPP-4 inhibitors

Mechanism	Inhibit the digestion of incretin and glucagon secretion, and improve insulin release.
Directions	Take before or after meals
Common side effects	Slightly increase the chance of upper respiratory tract inflammation and urinary tract inflammation. Other side effects are rare, such as acute pancreatitis or joint pain.
Warnings	1) For patients with kidney dysfunction, the dosage for certain medications of this classes should be reduced 2) Take it alone will not cause hypoglycemia, if combined with other drugs may cause hypoglycemia

6. SGLT-2 inhibitors

Mechanism	Reduce reabsorption of filtered glucose and thereby promote urinary glucose excretion
Directions	Take before or after meals
Common side effects	Increase the risk of genitourinary tract infections. At first use, there may be symptoms of hypotension such as dizziness, and other rare side effects such as ketoacidemia, and slight weight loss
Warnings	1) Supplement enough water and don't hold off pissy, which can reduce side effects 2) If you have symptoms such as burning, pain, pruritus vulvae, and increase of vaginal secretion, please revisit and inform the doctor. If you have symptoms such as nausea, vomit, stomach ache, shortness of breath, or fruity breath, please revisit a doctor immediately 3) It is recommended to suspend take for three days before surgery, please consult your doctor for medication adjustment before and after surgery 4) Take it alone will not cause hypoglycemia, if combined with other drugs may cause hypoglycemia

7. Combination oral diabetes medications

Combination oral diabetes medications is combined over 2 types medications into the one pill, which can reduce the number of pills take. The side effects are same to the individual medication.

Please take medicine according to the package insert or instructions on the medicine bag.

4-2 Injectable Medications

4-2-1 Glucagon-like peptide 1 analogues (Incretin) treatment

1. Mechanism: Stimulate insulin secretion according to blood glucose level. Reduce glucagon secretion. Slow the rate of the stomach empties after eating. Inhibit appetite.
2. Besides decreasing blood glucose, it can reduce weight (reduce hunger and increase satiety), and even reduce the risk of cardiovascular complications.
3. Based on different drug effect durations, there are two injections a day, one injection a day, or one injection a week. The option depends on the patient's diet and lifestyle habits.
4. Administration: Subcutaneous injection in the abdomen, thigh, or arm.
5. Adverse/Side Effects: Nausea, vomiting, diarrhea, headache, dyspepsia, and subcutaneous nodule.

4-2-2 Insulin

1. Reasons for insulin injection

   Insulin is a kind of hormone secreted by the pancreas. It can used to treat insulin-deficit diabetic patients.

2. Insulin is mainly used as treatment for the following conditions:

   1) Patients with Type 1 diabetes

   2) Pregnancy or breastfeeding women

   3) Patients with serious surgery

   4) Patients with huge stress, such as serious injury or serious infection

   5) Patients with adverse reactions, allergy, or poor efficacy to oral diabetes medications

   6) Patients with obvious heart failure, or liver and kidney dysfunction

   7) Patients with type 2 diabetes with fasting blood glucose level more than 300 mg/dL, excessive eating, excessive amount of urine, excessive drinking, and weight loss, or combined with ketoacidosis.

3. Types of insulin

Commonly used insulin subtypes are summarized in the following table (the brand names of common insulin are listed in appendix 3)

Categories	Pharmacologic classification	Appearance	Onset	peak	Duration
Fast-acting	Humalog	Clear	<15-30 minutes	0.5-2.5 hour	3-6.5 hour
	NovoRapid	Clear	10-20 minutes	1-3 hour	3-5 hour
Short-acting	Humulin R	Clear	30-60 minutes	2-3 hour	3-6 hour
	Actrapid	Clear	30 minutes	4-6 hour	8 hour
Inter-mediate-acting	Humulin N	Cloudy	2-4 hour	4-10 hour	10-16 hour
	Insulatard	Cloudy	1.5 hour	4-12 hour	24 hour
Long-acting	Levemir	Clear	1.5 hour	6-8 hour	24 hour
	Lantus	Clear	1-2 hour	No peaks	24 hour
	Toujeo	Clear	1-2 hour	No peaks	24 hour
	Tresiba	Clear	1-2 hour	No peaks	42 hour
Combi-nation insulin products	Humulin 70/30	Cloudy	30-60 minutes	Double peaks	10-16 hour
	Humalog Mix25	Cloudy	0-15 minutes	Double peaks	10-16 hour
	Humalog Mix50	Cloudy	0-15 minutes	Double peaks	10-16 hour
	NovoMix30	Cloudy	10-20 minutes	Double peaks	24 hour

Combination insulin and incretin mimetics injectable medication

Generic Name	Brand Name	Indication
Glargine+ Lixisenatide	Soliqua	Once a day, subcutaneous injection

Co-formulation of insulin injectable medication

Generic Name	Brand Name	Indication
Degludec + Aspart	Ryzodeg	Once or twice a day, subcutaneous injection

4. Notices for using injectable medications

1) Learn the proper technique of injectable medication and execute it actually every day.

2) The injectable medications you in use can be stored for a month at room temperature. Please store them away from direct sunlight, extreme heat, or extreme cold.

3) Unopened injectable medication should be stored in the refrigerator (2-8°C) until the expiration date but not stored in the freezer.

4) The relationship between injectable medication and mealtime should adhere to the prescription.

5) Injectable medications are usually performed subcutaneously. Patients can choose the following sites with a layer of fat and take turns for injections: abdomen, upper thigh, outer thigh, outer arm, or outer hip.

6) Injections may cause swelling, hollows, and lumps. Correctly performing the injection, regular checks, and rotating injection sites can decrease the risk of these. If any of the above happens, please consult your medical professionals for evaluation immediately. Please do not massage or use a warm compress to prevent affecting the efficacy and leading to large fluctuation of blood glucose levels.

7) Understand the symptoms of hypoglycemia and carry glucose powders (gels) or candies with you.

8) Injectable medications (incretin mimetics and insulin) must not be used as oral medications.

5

Hypoglycemia (Low Blood Glucose)

When the blood glucose concentration is lower than 70 mg/dL, symptoms of hypoglycemia will appear. The reason is that when blood insulin level is too high, insufficient sugar will reach the brain and muscles. Severe hypoglycemia will impair the cognitive function of the brain, increase the risk of cardiovascular disease, and increase the mortality rate. When the blood glucose is lower than 70 mg/dL or there are symptoms of hypoglycemia, you should pay attention and actively deal with it.

5-1 Causes of Hypoglycemia

1. Overdose or inappropriate use of anti-diabetic medication.
2. No meal after taking anti-diabetic medication, delayed meal, or decreased intake of sugary foods.
3. Exercise when fasting, abruptly excess exercise, or prolonged exercise without proper supplement of sugary foods.

5-2 Symptoms of Hypoglycemia

Symptoms of autonomic nervous reaction will appear at the early stage of hypoglycemia, such as hunger, trembling, rapid heartbeat, pale face, cold sweat, etc. Then symptoms of central nervous system occur, including dizziness, blurred vision, slurred speech, inability to concentrate and general weakness caused by lack of sugar supply. If there is no immediate treatment with sugary foods, unconsciousness, cramps, or coma will occur. Sometimes symptoms similar to hypoglycemia occurs when patients' blood glucose drops rapidly from a high concentration (the blood glucose level is not too low), but the body is too late to adapt to the changes in blood glucose may produce symptoms similar to hypoglycemia. Thus, monitoring of the blood glucose is necessary.

5-3 Treatment of Hypoglycemia

Once you have symptoms of hypoglycemia, you should check your blood glucose immediately. If blood glucose cannot be detected, you should treat it as hypoglycemia, and supplement food immediately:

1. If patients are conscious, they should consume 15 grams of carbohydrates.
   - For food or drinks containing 15g of carbohydrates, the recommended order of selection and serving size are as follows:

3-4 Glucose Tablet
1/2 Bowl of Porridge or Oatmeal
3-4 Sugar Cubes
1/2 Bowl of Mashed Potatoes
120cc 100% Pure Juice
Half Slice of Toast
150cc Regular Juice
3 High-fiber Biscuits
1/3 Can (110 ml) of Sugary Soda, Coke
Half a Banana
1 Bottle of Yakult
1 Bowl of Diced Fruit
200cc Sport Drink
1 Cup of Milk
3-4 Small Sugary Jelly
Half a Cup of Yogurt
1 Sugary Tea Jelly or Coffee Jelly
100g of Ice Cream

- Measure blood glucose 15 minutes after supplementing food. If the blood glucose level has not risen to 70 mg/dL and the symptoms have not been relieved, you can take another meal. If still not improved after another 15 minutes, go to the hospital immediately.
- When the blood glucose level goes up, but the duration to next meal is longer than one hour, patients should consume one serving of food with 15 gram carbohydrates, such as a thin slice of toast or three cookies.

2. If the patient is unconscious or coma, do not forcibly infuse food to avoid choking. You can put the patient's head on the side and apply every 15 minutes a tablespoon of syrup, honey, or fructose to the teeth or cheeks with your fingers, or inject glucagon by intramuscular injection and send for medical treatment immediately.

5-4 Prevention of Hypoglycemia

1. Follow the instructions of the medical team to take hypoglycemic drugs on time
2. Have meals regularly
3. Always carry candy, cookies, and drinks with you, just in case
4. Please replenish snacks, if needed when you do high-intensity or prolonged exercise
5. Be aware of the symptoms of hypoglycemia
6. When hypoglycemia occurs, immediate treatment is necessary. Find out the causes afterwards in order to prevent another episode again

6 Acute Hyperglycemia

When the body is lack of enough insulin, it cannot make full use of carbohydrates, which causes acute hyperglycemia. There are two kinds of common acute hyperglycemia:

1. Hyperosmolar Hyperglycemia

Clinical characters include:

1) High blood glucose level: blood glucose level is higher than 600 mg/dL and can even higher than 1000 mg/dL.
2) High osmotic pressure: effective osmotic pressure is higher than 320 mOsm/kg.
3) Keto acid: no significant ketonuria and ketonemia.
4) pH value and bicarbonate level are usually normal.

This commonly occurs in elderly patients with type 2 diabetes who often have some precipitating factors for hyperglycemia such as infection, stroke, myocardial infarction, or use of steroids or diuretics. Some cases represent the early symptoms of diabetes. Clinical outcomes are mainly a gradual loss of consciousness, leading to coma and shock in some severe cases.

2. Diabetic Ketoacidosis

This commonly occurs in young patients with type 1 diabetes, but may also occur occasionally in patients with type 2 diabetes. Clinically, diabetic ketoacidosis includes three components: high blood glucose level, ketonemia, and acidosis. Diabetic ketoacidosis is usually caused by some precipitating factors, such as an infection or missing an insulin injection. The main cause of diabetic ketoacidosis is insufficient secretion or malfunction of insulin. Insufficient insulin leads to the degradation of triglycerides in adipose tissues, which produces free fatty acids. Then, the free fatty acids enter the liver through circulation and are gradually metabolized into keto acids.

6-1 Symptoms of Acute Hyperglycemia

Symptoms of acute hyperglycemia:

1) Thirsty, excessive urination, fatigue, weakness, nausea, vomiting, abdominal pain, dry skin, dehydration, shortness of breath, postural hypotension, confusion, coma, and even shock.
2) Patients with ketoacidosis experience hyperventilation and breath with a fruity odor.

6-2 Treatment of Acute Hyperglycemia

1) Go to the hospital immediately
2) Drink water if you can take foods
3) Check blood glucose level

6-3 Prevention of Acute Hyperglycemia

1) Follow your prescription to regularly take oral anti-diabetic medication or insulin injections.
2) Follow your diet plan. Regular exercise can help stabilize blood glucose level.
3) Check blood glucose level regularly. Patients with infection should check glucose levels more often.
4) Be aware of the symptoms of hyperglycemia and take proper actions against possible causes.

Notices:

When acute hyperglycemia occurs, patients should be admitted to the hospital immediately.

7

Chronic Complications

If patients with diabetes cannot control their blood glucose levels, their organs soak in the sugar-like blood and thus easily experience complications. Complications are often ignored due to ambiguous early symptoms. Long-term poor blood glucose control causes gradual pathological changes, which are usually irreversible (meaning unable to get back to their original status)!

7-1 Chronic Complications

1. Macrovascular complications

Diabetic patients often suffer from comorbidities such as hyperlipidemia and hypertension, which can aggravate arteriosclerosis, leading to cerebrovascular disease,

cardiovascular disease, and peripheral vascular disease. Control of blood glucose, blood pressure, blood lipid , and smoking cessation can slow down the occurrence of macrovascular diseases.

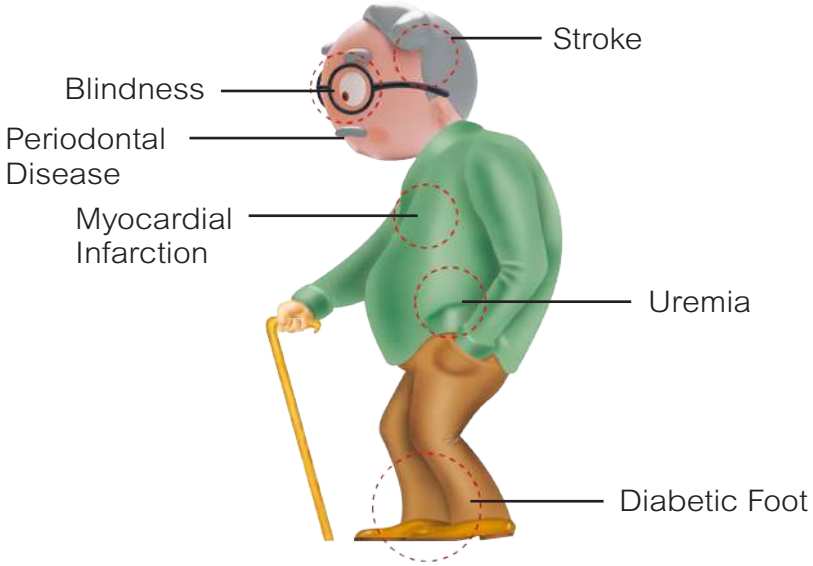
1) Cerebrovascular disease: such as transient cerebral ischemia, ischemic stroke
2) Cardiovascular diseases: such as ischemic heart disease, myocardial infarction
3) Peripheral vascular disease: such as intermittent claudication

The risk of stroke in diabetic patients is 1.5 to 3.7 times higher than non-diabetic subjects. The risk of developing cardiovascular diseases in diabetic patients is 2 to 4 times higher than non-diabetic patients.

2. Microvascular complications

1) Eye complications: Common pathological changes are retinopathy, macular edema, and so on, which will aggravate cataract, glaucoma, and lead to blindness. In fact, diabetic retinopathy is the main cause of blindness.
2) Kidney complications: About half of the patients who undergo hemodialysis have pathological changes in kidneys caused by poor blood glucose control. This leads to proteinuria, increased blood pressure, chronic kidney disease, and finally uremia, which requires hemodialysis (or peritoneal dialysis) for the rest of their lives.

3) Neurological complications: Such complications include pathological changes in the autonomic nervous system and peripheral nervous system, which cause palpitations, bloating, constipation, diarrhea, difficulty in urination, incontinence, postural hypotension, sexual dysfunction, numbness and tingling in hands and feet.



Chronic Complications of Diabetes

7-2 Prevention of Chronic Complications

Regular examinations, early detection, and early treatment are needed to prevent chronic complications. Recommendations for screening and diabetes comorbidity control target values are as follows:

Blood glucose	HbA1c	< 7.0 % (need to be considered individually)
	Fasting (before meals) blood glucose	80 ~ 130 mg/dL
	Blood glucose at 2 hours after meal	80 ~ 160 mg/dL
Blood Pressure	General advice	< 140/90 mmHg
	Nephropathy patient	< 130/80 mmHg
Blood Lipid (Primary Target)	Low-density Lipoprotein Cholesterol (LDL-C)	< 100 mg/dL
		< 70 mg/dL (if you have cardiovascular disease)
Blood Lipid (Secondary Target)	Total Cholesterol (TCH)	< 160 mg/dL
	non-HDL-C	< 130 mg/dL
		< 100 mg/dL (if you have cardiovascular disease)
	HDL-C	> 40 mg/dL (male) > 50 mg/dL (female)
	Triglyceride	< 150 mg/dL
Lifestyle Modification	Quit Smoking	Highly Recommended
	Exercise	For moderate-intensity aerobic exercise, it is recommended > 150 minutes per week; for moderate-intensity aerobic exercise, it is recommended at least 3 days a week and at least 20 minutes a day.
	Body Mass Index (BMI)	18.5 ~ 24 kg/m^2
	Waist	< 90 cm (male) < 80 cm (female)

Reference: Guidelines for Diabetic Care 2018, The Diabetes Association of the Republic of China (Taiwan)

The following suggestions are related indicators of regular screening of complications:

Examination	Meaning	Frequency
Blood Glucose	Understand blood glucose control and learn methods to adjust it	Often discussion with the medical team and regular examination
HbA1c	3 months average of blood glucose	Every 3 months
Lipid	Total cholesterol, triglycerides, LDL, and HDL are the main causes of atherosclerosis, and also increase the risk of coronary heart disease	At least once a year If patients have abnormal results or taking lipid-lowering agents, they will have to follow up every 3-6 months
Ophthal-moscopy	If patients have abnormal results or taking lipid-lowering agents, they will have to follow up every 3-6 months.	At least once a year Once retinopathy occurs, more frequent examinations are required
Albuminria and GFR	Find retinopathy early and treat it early to prevent blindness	Once a year When abnormal results occur, follow-up every 3-6 months are required
Feet	Once retinopathy occurs, more frequent examinations are required	At least once a year Checks can be performed by yourself and family in daily life
Oral	Find pathological changes in kidneys early and treat them early to prevent uremia	At least once every 6 months
Cancer screening	The risk of cancer in diabetic patients is higher than in the general population	Regular screening (together with the screening program provided by the Health Promotion Administration)
Self-check of patient with diabetes: weight, blood pressure, blood glucose, and feet		Often discussion with the medical team and regular examination

Reference: Guidelines for Diabetic Care 2018, The Diabetes Association of the Republic of China (Taiwan)

Control target of blood glucose in senior diabetes

According to the American Diabetes Association Treatment Guidelines, control target of blood glucose is based on personal health status for senior diabetes:

Health status and patient characte-ristics	Good physical condition, Normal cognitive function, Few comorbidities	Multiple chronic comorbidities or mild to moderate cognitive impairment	Long-term or terminal chronic disease patients or moderate to severe cognitive impairment
HbA1c	<7.0-7.5%	< 8.0%	Avoid relying on HbA1c. Blood glucose control is to avoid hypoglycemia and symptomatic hyperglycemia.
Fasting blood glucose	80-130 mg/dL	90-150 mg/dL	100-180 mg/dL
Bedtime blood glucose	80-180 mg/dL	100-180 mg/dL	110-200 mg/dL
Blood pressure	140/90 mmHg	140/90 mmHg	150/90 mmHg

8 Self-Care in Diabetic Patients

Diabetes is a disease closely related to lifestyle. During the medical and healthcare process, what the most important is that patients with diabetes should "manage the disease and learn the control of blood glucose levels and self-care activities." Furthermore, the early detection of abnormalities and early treatments can delay the onset of complications.

Self-care activities include not only the diet, exercise, weight control, and medication mentioned above, but also self-monitoring of blood glucose and blood pressure, as well as foot care.

8-1 Self-monitoring of Blood Glucose

Blood glucose levels vary with diet and lifestyle. Therefore, if patients with diabetes monitor their glucose levels only through clinic visits every one to three months, this will not be enough to determine the real condition of control. Furthermore, patients will have insufficient information to discuss controlling their diabetes with healthcare professionals.

In addition to regular revisits, patients with diabetes should monitor blood glucose levels on their own with the methods suggested by their medical team. Currently, blood glucose meters can assist patients in monitoring their blood glucose levels by themselves. Moreover, patients can understand the relationship between different foods, physical activities, and anti-diabetic medications through blood glucose monitoring. Discussing the results with healthcare professionals is also helpful for self-control.

8-1-1 Frequency and Principle of Self-monitoring of Blood Glucose

Due to different conditions, medications, and life styles, the timing and frequency of self-monitoring may have to be adjusted. However, higher frequency can provide a better understanding of the changes of blood glucose levels. HbA1c reflects the average blood glucose control in the past three to four months.

Recently, some medical centers provide Glycated Albumin (GA) test for diabetic patients with HbA1c interpretation interfered by anemia, bleeding, hemolysis, or increase of abnormal hemoglobin. This test reflects the average blood glucose in the past 2 to 4 weeks. Fasting blood glucose should be the priority for the purpose of glucose control. When HbA1c levels are less than 8°% or GA levels are less than 24%, more frequent monitoring and subsequent control of postprandial glucose is suggested. Patients using intensive insulin treatments (patients with

more than three times of insulin injection and using an insulin pump) are suggested to monitor glucose levels more than three times a day. Patients using other treatments should develop a monitoring plan together with their medical team based on the purpose of monitoring, individual wills, and feasibility. For control of postprandial glucose, we suggest that the glucose level in two hour after meals should be monitored in addition to the fasting glucose.

8-1-2 Notes about self-monitoring of Blood Glucose

1. Blood glucose meters take blood from the capillary, but the blood glucose test in the hospital takes blood from the vein. Thus, the results may differ due to the different meters. Regular comparisons with fasting results are recommended.
2. Patients should follow the instructions that come with the meter when monitoring blood glucose levels and properly perform the testing.

   Causes of errors in blood glucose measuring:

   1) Expired test strips or deliquescence.
   2) Insufficient or excessive amount of blood
   3) Over-squeezing the sample sites
   4) Alcohol does not dry thoroughly during sampling
   5) Meters are unclean
   6) Number of test strips shown on the glucose meter is different from what the strip bottle labels

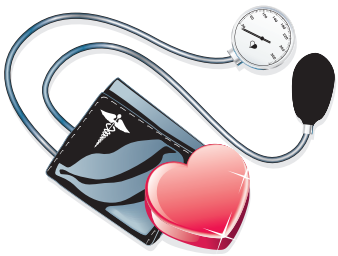
3. Patients should check the expiration date of test strips every time they test. Using expired test strips will lead to incorrect readings. Please use the strips within three months once the box is opened and do not separate strips into several packages. After removing one strip, please immediately close the lid tightly to prevent moisture from entering. Store test strips in a dark and cool environment.
4. Calibrate your blood glucose meter regularly. Bring the meter to the hospital to compare the readings from vein and capillary. For a reading > 100 mg/dL, the difference should be between ± 15 %

8-2 Timing for Testing Ketonuria or Ketonemia

When the body lacks insulin, glucose cannot enter cells to provide energy. The body has to decompose lipids for fuel. During the degradation of lipid, ketone bodies will be produced and excreted through the urine, which is also known as ketonuria or urine ketone. When ketonuria occurs, the patient has an insufficient intake of carbohydrates or relatively insufficient insulin. Test strips can be purchased at medical supply stores or pharmacies.

Who should test urine ketone or blood ketone:

1) Patients with type 1 diabetes and increasing blood glucose levels (>250 mg/dL)
2) Those with other diseases, such as common colds or influenza
3) Those showing other suspicious symptoms of ketoacidosis, such as nausea, abdominal pain, fatigue, thirst, dizziness, or breath with a fruity odor.
4) Pregnant women with diabetes (including gestational diabetes) are recommended to test ketone levels every morning before meals.
5) Patients with diabetes aggressively trying to lose weight through limited calorie intake.



8-3 Quitting Smoking

Smoking raises blood glucose and increases the risk of cardiovascular disease in patients with diabetes. Second and third-hand smoke produced by smokers will indirectly affect the health of family members living with you.

Please quit smoking now!

Use some tips to help quit smoking, such as move your body or drink a cup of hot or iced tea when you want to smoke, announce the "Cessation Proclamation" to family members or colleagues, use the chewing gum or stickers and other smoking cessation products, call the toll-free Taiwan smokers' helpline 0800-636363, or consult the smoking cessation clinic of a medical institution. Professional smoking cessation medical team will assist you to quit smoking successfully.

Resources for quitting smoking

- Taiwan smokers' helpline (toll free): **0800-636363**
- More than 3500 clinics provide smoking cessation services. To find a clinic near you, call **02-2351-0120**

9

Treatment During Illness

Diseases, infection, and injuries all cause stress on our bodies. Stress hormones will be secreted, which makes the liver release excessive glucose into the blood to provide more energy to fight against the virus. This reaction leads to increased levels of blood glucose; this increase occurs even without having any meals. Therefore, patients still need to take oral anti-diabetic medications or insulin injections.

9-1 Causes of Raising Blood Glucose Level During Illness

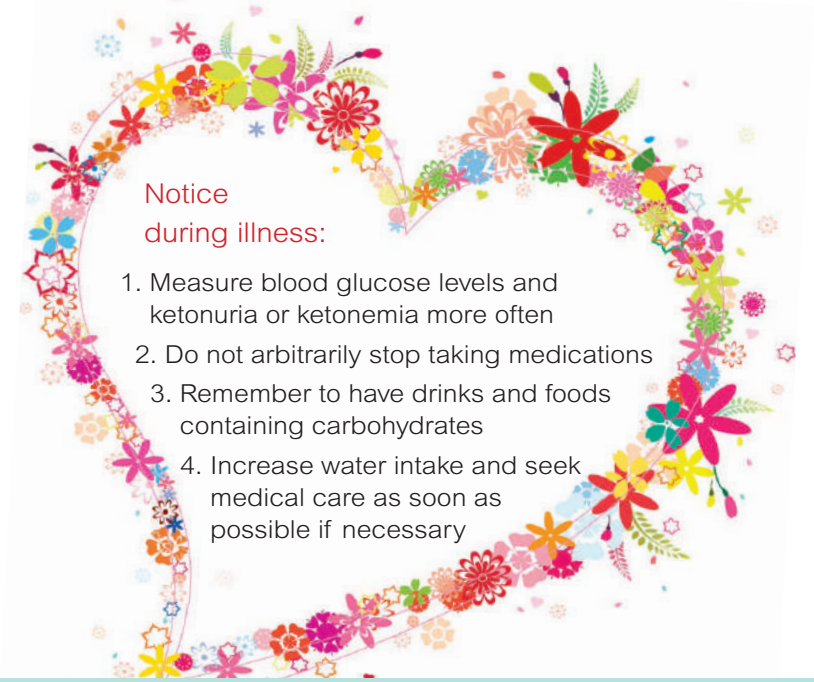
Illness, such as colds, fevers, infections, and other diseases, will cause an inflammatory reaction, leading to insulin resistance and thus increasing blood glucose levels.

9-2 Treatment Principle During Illness

1. During illness, please do not stop taking medication or reduce dosages on your own.
2. Increase the frequency of self-monitoring (When your blood glucose level is elevated, testing blood glucose level every 2 to 3 hours is recommended. If your blood glucose level is higher than 250 mg/dL, testing ketonuria or ketonemia is recommended).
3. When patients have vomiting or diarrhea or are unable to eat, more frequent glucose monitoring is needed. If the blood glucose level remains elevated, ketonuria or ketonemia occurs, or the condition of hypoglycemia maintains, the patient should be admitted to the hospital immediately.
4. Drink enough amount of water, at least 240 c.c. per hour.
5. During illness, patients should keep normal diets. Patients who have a poor appetite but can still eat can take a liquid diet such as rice soup, porridge, or supplemental nutrients.
6. Do not buy medications (such as cough syrup) or inject intravenously without physicians' prescription
7. If you have fever or upper respiratory symptoms, such as cough, sputum, stuffy nose, runny nose, or sore throat, etc. Please wear a mask, wash your hands frequently, maintain a social distance of 1.5 meters or more, avoid access to public places, Avoid crowds, etc.

9-3 When to see a doctor

1. Continuous vomiting and diarrhea.
2. Sudden weight loss.
3. Fever, upper respiratory tract symptoms, and difficulty in breathing.
4. Dizziness and weakness.
5. Unusual or severe abdominal cramps.
6. Sleepiness, confusion, unconsciousness, or gibberish.
7. Levels of ketonuria or ketonemia continuously increase.
8. Patients who are younger than 2 years of age or older than 80 years of age should have intensive care and be admitted to the hospital as soon as possible if necessary.



10

Foot Self-care

Patients with diabetes usually have pathological changes in blood vessels and nerves that cause hypoesthesia and poor circulation. Patients easily get infections, and their wounds heal slowly. In some serious cases, amputation may be necessary. Therefore, if patients can take good care of their feet in the early stage, damage can be minimized.

10-1 Tips for Daily Foot Care

1. Use warm water and soap to wash feet and practice close observation every day, including toes, sides of feet, and bottom of feet. Patients can use adjustable mirrors or have family members assist them.

2. If patients have thickened skin or calluses, they can put feet in warm water to soften the skin and use a pumice stone to scrub the thick skin. Then, apply lotion or cream to keep the skin soft.

3. In order to prevent dry skin, patients can apply alcohol-free cream to moisturize the skin and remove scales. However, applying the cream between toes is not recommended because eczema or athlete's foot may occur due to poor absorption of the cream. Wear soft and sweat-absorbing socks to protect feet.
4. In winter, patients can wear sweater socks or electric blankets to warm their feet, raise the temperature on the heater, or do foot exercises. However, do not put feet directly on the heater blanket (or electric blanket) or hot water bags to keep warm in order to prevent scalding.
5. Avoid sitting with legs crossed for too long, as this will affect or even reduce blood flow to the lower limbs.

6. Trim toenails straight across, not curved at the edges or with a pointed shape. Trim nails with a nail file. Nails cannot be shorter than the ends of toes. Patients can ask family members to help if they have poor vision or difficulty cutting their nails.
7. Avoid walking or working barefoot, such as working in the farm, walking on the healthy trail, or taking a walk for prevent damage to your feet. Even indoors, the kitchen, or the bathroom, patients should wear closed-toe slippers.
8. Doing more foot exercises (in your spare time, like while watching TV), including heel cord stretches, ankle range of motion, heel raises, upping on tiptoes, and toe extensions, can increase the flexibility of feet and also improve the blood flow of lower limbs.
9. For clean and superficial wounds smaller than 1 cm, patients can use normal saline to clean the wound if there is no secretion. Patients should also check the condition every day and monitor glucose levels to keep their level in the ideal range for the recovery.
10. During the night, winter, or a rainy day (humid weather), blood flow will be poor, so patients should take special care of their feet.
11. Patients should not treat corns or calluses on feet on their own. Most common corn remover patches contain corrosive chemicals and salicylic acid, which can easily cause ulcers on feet, which will require treatment at the hospital.

10-2 Ways to choose shoes and socks

1. It is better to buy shoes in the afternoon since the feet are larger in the afternoon than in the morning.
2. Choose shoes with a wide width that can accommodate your feet and their depth, allowing toes to stretch freely.
3. Shoes with thick soles and a boat shape are better. Shoes with shoestrings are better than those without due to fixation. Also, choosing strips with hook-and-loop fasteners provides convenience for wearing and taking on and off.
4. Patients can choose soles that will release the stress on feet if they have corns or call uses.
5. Materials should be breathable and waterproof. Patients should prepare at least two pairs of shoes to replace every day and keep the shoes dry.
6. It is recommended to wear new shoes one hour on the first day and then gradually increase hours every day.
7. Check if there are any small stones or other foreign matters or if the sole is displaced or not.
8. Choose breathable and sweat removal socks made with cotton and light colors. Do not choose socks with tight elastic bands and indelicate stitches in order to prevent rubbing.
9. Avoid shoes that are too tight, because excessive friction will produce thick calluses or scratches
10. Do not wear wet shoes. Avoid wearing high heels, long boots, or rain boots to reduce the stress on your feet.

10-3 When to see a doctor

1. Redness, swelling, heat or pain (meaning inflammation) on the skin or wounds.
2. Wounds heal slowly or become black or purulent.
3. Ingrown nails (nail embedded) or paronychia.
4. Have skin disorders such as corns, calluses, athlete's foot, or gray nails.

Diabetes educators will provide foot examination when the patient receives health education in the diabetes shared care network in the hospital (as the picture shows). In principle, diabetes patient must have foot examinations at least once a year in order to ensure the skin, nerves, and blood circulation of foot in good condition.

Foot exam of patients with diabetes

1 Check appearance of feet

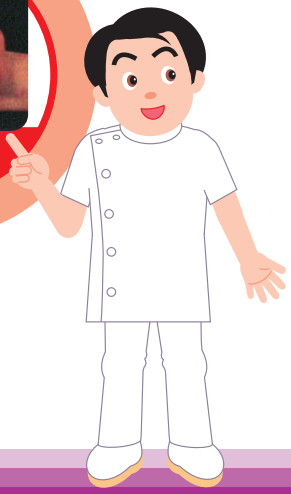
2 Check arteries of feet

3 Check pedis dorsalis artery

4 Check posterior tibial artery

5 Use single strain nylon thread to check the feelings of pain, touch, and pressure

6 Use 128 Hz tuning fork to check vibration of feet



11

Oral health

11-1 Importance of Oral Health

Patients with diabetes are at a higher risk for oral bacteria and infection of the gums and mucosa, which can cause oral health problems and periodontitis, as well as poor control of glucose levels. Having good oral health care helps reduce the onset of oral health problems and efficiently control glucose levels.

11-2 Common Oral Problems in Diabetic Patients

1. Dry mouth, decreasing saliva flow, angular cheilitis, and burning mouth.
2. Poor healing of oral wounds and fungal infection.
3. Bleeding gums, swollen gums, periodontal abscess, and loose teeth.
4. Dysgeusia and oral lichen planus.
5. Tooth decay.

11-3 Daily Oral Health

1. Use fluoride toothpaste to brush teeth correctly. Develop habits of brushing teeth after meals and before bed to have good oral health, protect gums, and prevent bacteria and teeth decay.
2. Choose a toothbrush with soft bristles. In order to prevent bacteria, please replace toothbrush every three months (or when bristles spew in different directions).
3. Use interdental brushes in different sizes at least once every day. Apply fluoride toothpaste on them to clean the gaps between teeth. Then, use a toothbrush to brush the tongue to clean bacteria and provide a coating to prevent bad breath.



4. Regular dental visits and tooth scaling every six months. Frequency may be increased if necessary. (Please inform dentists about your medical history of diabetes during your visit.)
5. All kinds of cleaning tools:
   1) Electric toothbrushes, toothbrushes, interdental brushes, dental floss, fluoride toothpaste, and mouthwash.
   2) Good toothbrush: toothbrush with soft bristles and round head. The length of the brush head should cover 2 to 3 teeth at a time. The bristles should be up straight and at least 3 to 4 lines, but not too thick. The handle should be easy for patients to grasp.
   3) How to use floss: form a "C." The correct way to use floss, which is instructed by professionals is recommended.

   4) How to use interdental brushes: The appropriate size should be "a little bit tight in the gap, but not too tight" and "a little bit larger than the gap." If the gap is too small, please do not force the brush in, or it will hurt the gums. Gently brush 2-3 teeth with back and forth motion and then move to next 2-3 teeth and repeat.

Notices:
oral health 333

- Brush teeth for 3 minutes after 3 meals
- Replace brushes every 3 months
- To brush teeth after meals and before bed

6. Basic method for brushing teeth:
   1) Place the brush at the teeth at a 45-degree angle and cover a little bit of gums. Massage the gums in place for 10 times.
   2) Brush the teeth with a rolling motion.
   3) Brush the biting surface of the teeth.
   4) Brush all surfaces of teeth following the order of inner, outer, upper, and lower with a group of 2-3 teeth.
   5) Brush the tongue.
   6) If periodontitis occurs, please use all kinds of methods and tools to brush teeth in order to clean every surface, including all biting surfaces of teeth and every gap between the teeth.

Recommended methods for patients with diabetes

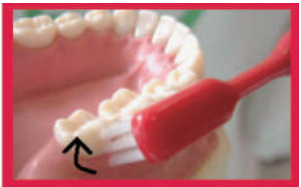
Bass method

Place the brush at the teeth at a 45-degree angle

Horizontal scrub method

Bristles are perpendicular to the teeth

Rolling method



Roll the brush from the gums towards the teeth

Individual method

Brush each tooth individually and vertically

11-4 Daily self-check and when to see a doctor

1. Sore feeling of teeth when eating cold and hot drinks or sweets.
2. The gums bleed frequently when brushing the teeth.
3. Often have bad breath.
4. Red and swollen gums, periodontal abscess, lose or longer teeth, or larger gap between teeth.
5. Teeth shake when touched with a finger.
6. Loose or inappropriate dentures.
7. Frequent canker sores, ulcers, or pain in the mouth.

Reference:
1. 2020 Core Textbook of Diabetes, Taiwanese Association of Diabetes Educators.
2. https://heho.com.tw/archives/134882 (Picture reference).

12

Travel

12-1 Preparation before Traveling

1. Ask doctors for a certification of diagnosis in Chinese and English and a copy of your prescription.
2. Prepare twice as much medications based on the number of days you are traveling. Pack them separately in different travel bags or ask companions to keep medications for you. Always bring the medications with you.
3. Prepare tools for measuring blood glucose levels.
4. Prepare snacks in case meals are delayed. Bring some food to prevent hypoglycemia, such as glucose powder (gel), sugary drinks, or cookies.
5. Prepare two pairs of comfortable walking shoes to replace during long walks.
6. Prepare tools for foot care, such as cream, nail clippers (put in the checked baggage), cotton socks, or sweater socks.

12-2 Notice for Travel

1. Always carry your "Diabetes ID" or "Diabetes Passport" with you.
2. It is better to monitor glucose levels several times a day since the excitement, stress, diet, and changes in schedule may affect glucose levels.
3. Pre-order diabetic-friendly meals on the flight.
4. Please consult your doctor or medical professional about jet-lag issues.

12-3 Notice for Patients with Insulin or Incretin Mimetics Treatments

1. Pack twice as much medicine and enough syringes or pen needles you will need in the journey.
2. Pay attention to and prevent the occurrence of hypoglycemia. Be sure to carry enough food such as sugar, sugary drinks, or cookies.
3. In order to ensure that the medications can be stored properly and avoid deterioration, pay attention to the climate change in the travel area, and prepare a cryogen or insulin thermostat bag.
4. When purchasing the insulin in foreign countries, you need to notice the insulin units at that country
5. Adjust the insulin dose when traveling according to the amount of sugar in the meal.

13

Emerging Infectious Diseases - COVID-19

Introduction

A global outbreak of COVID-19 has started since January 2020. Many patients diagnosed with COVID-19 also have chronic diseases, such as diabetes, cardiovascular diseases, or hypertension. They have a worse prognosis.

Q : Will diabetes increase the infection and severity of COVID-19?

A : Yes, diabetes is a risk factor for severe pneumonia or sepsis. Researches showed that 20% of patients with severe pneumonia or sepsis also have diabetes, and the mortality is increased by 50%. Furthermore, diabetic patients have a higher risk of potential cardiovascular disease which resulted in more cases with fatal complications after COVID-19 infection.

Q : In what conditions a COVID-19 vaccines not suggess?

A : 1. After 21 days of first dose vaccination, although there is a small chance to get COVID-19, the occurrence of severe COVID19 symptoms is effectively prevented, and chances of hospitalization and death are decreased.

2. For the patients with unstable control of chronic diseases, fever, or acute moderate to severe disease, it is recommended to postpone the vaccination.

Q : What are the precautions after administering the COVID-19 vaccine?

A : 1. Fever within 2 days of vaccination:

Drink more water and rest more. Avoid high-sugar, high-oil, and heavy-salt foods, smoking, drinking alcohol, and staying up. Take anti-fever medicine prescribed by the doctor if necessary. If continued fever or other discomfort, inform the doctor of your symptoms, when the symptoms occurred and when you were vaccinated as a diagnostic reference.

2. If a fever persists for longer than 2 days:

Please go to emergency department immediately and inform you vaccination history

3. The most common potential post-vaccination response is pain, headache, fatigue, muscle pain, joint pain at the injection site, which generally disappears in a few days. If not, please go to hospital.

4. For subjects with severe allergic reaction (such as difficulty breathing, shortness of breath, dizziness, accelerated heartbeat) after receiving a vaccine shot, stay at the vaccination station or nearby for at least 30 minutes. The vaccination station is equipped with first-aid equipment to deal with immediate severe allergic reactions which occurs rarely.
5. Thrombosis with thrombocytopenia (TTS) (very rare).

If you experience any of the symptoms listed below within 14 days after vaccination please go to emergency department: difficulty in breathing, chest pain, persistent abdominal pain, swelling or cold limbs, persistent severe headaches or increased pain, blurred vision, or spontaneous bleeding spots, bruising or purpura on the skin.

Q : What are the precautions to take for diabetes treatment during the COVID-19 pandemic?

A : 1. Diabetic patients may miss the appointment for a diabetes clinic because of the “Lockdown” or “Three-level alert” during the COVID-19 pandemic. Discontinuation of medications caused high or low blood glucose levels in diabetic patients. Traditional remedies or folk remedies for treating diabetes may result in poor blood glucose control.

2. Keep in touch with your medical team through remote health education resources to enhance your ability of self-care for diabetes.

Q : What should I do if I am in a bad mood during the COVID-19 pandemic?

A : 1. Diabetic patients need to pay special attention to their mental health, such as social isolation and estrangement, and feelings of anxiety and depression caused by the spread of the COVID-19 epidemic, especially when the environment is full of killings and nervous public health news.

2. Encourage diabetic patients to spontaneously reduce social outings and interact with family members at home.

3. It is recommended to appropriately reduce the daily time on over-reading and listening news related to COVID-19 pandemic.

4. Have indoor activities in a safe environment at home to replace outdoor exercise. Exercise can also heal and get out of negative emotions.

Q : What are the precautions during the COVID-19 pandemic?

A : 1. Researches shows that, the frequency of hypoglycemia increases in both type 1 or type 2 diabetic patients during the COVID-19 pandemic. The symptoms of hypoglycemia include hand tremor, anxiety, sweating, chills, clammy, restlessness, irritability, intense hunger, pale complexion, rapid heartbeat, dizziness, general weakness, numbness of lips, tongue and cheeks, nightmare, epilepsy, and even coma.

2. Be careful of ketoacidosis, including shortness of breath, breath with fruity flavor, nausea, vomiting, etc.
3. We suggested that during the COVID-19 pandemic, diabetic patients should live with caregivers to avoid the risk of unassisted hypoglycemia.

Conclusion

During the COVID-19 pandemic, diabetic patients have a higher risk of getting COVID-19 and higher rates of severe illness and death compared with non-diabetic subjects. Adequate control of blood glucose level, and having the self-care ability are the very ways to effectively prevent COVID-19 during the pandemic.

14

Vaccination

Patients with diabetes can easily get infections due to poor immunity and protection. Among all kinds of infections associated with diabetes, 25% of cases are related to pneumonia. Therefore, in addition to taking the influenza vaccine every year, patients should also take the pneumococcal vaccine for the most comprehensive protection.

The prevalent influenza virus subtype varies every year, and the effectiveness of vaccine lasts only one year. Thus, patients should take the vaccines every year. The protection of the pneumococcal vaccine will gradually decrease after being administered. Please consult doctors regarding booster shot of vaccination.

The side effects of the influenza and pneumococcal vaccines are very minor. Sometimes, mild pain and swelling might occur at the injection site, or mild fever may occur but generally resolves within 48 hours. These two vaccines can be injected at the same time at different sites to effectively prevent pneumonia and other severe complications. The vaccination will effectively reduce the risk of influenza. However, patients should pay attention to colds caused by other viruses. Patients should also take care of personal health and other prevention strategies to stay healthy.

15

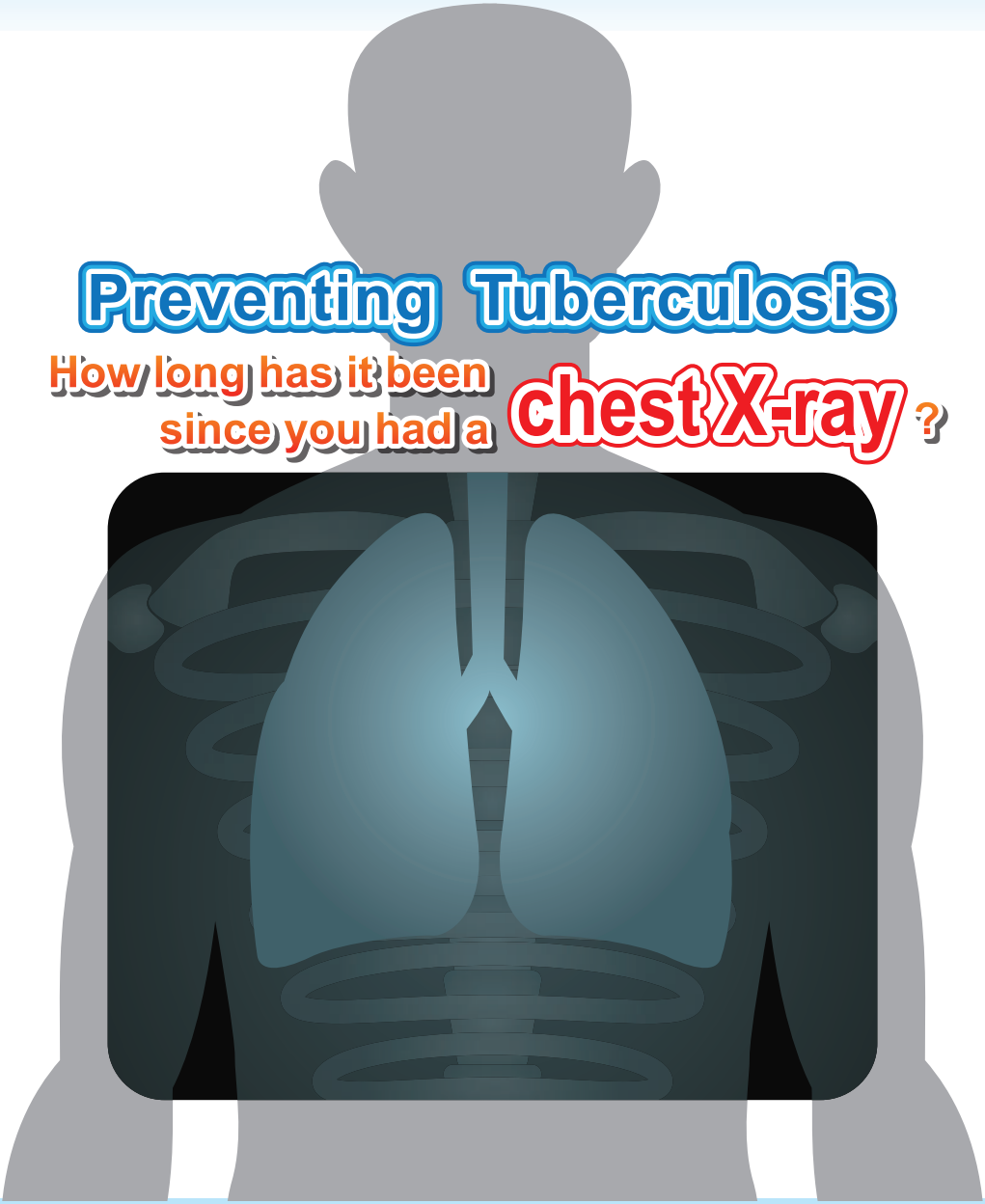
Tuberculosis Screening

Diabetes will reduce immunity, and long-term hyperglycemia may reduce the ability of immune cells. Furthermore, hyperglycemia is beneficial for bacteria, so the risk of tuberculosis in patients with diabetes is 2 to 3 times higher than in the general population. Risks of treatment failure and mortality rate are also higher in diabetic patients.

Patients with diabetes should see a chest medicine or infectious disease specialist if they have coughing symptoms for more than two weeks. Furthermore, patients should be screened for tuberculosis infection for early diagnosis and thus treatment.

Preventing Tuberculosis

How long has it been since you had a chest X-ray?



16 Mental Accommodation

Type 1 or type 2 diabetes can be controlled but not cured. Thus, patients must learn to live with diabetes. Diabetes affects not only physical health, but also mental health of the patients, family life, and social roles. If patients have difficulty in accommodating, glucose control will also be affected. After diagnosed with diabetes, most patients experience stages of anxiety, denial, anger, sadness, and acceptance. Some of them reach the stage of acceptance very quickly and actively face the challenge of this chronic disease. However, some patients slowly wander over these stages and have difficulty accepting the fact that they have diabetes.

The control of diabetes mainly depends on self-care ability, personality, family support, and the use of social resources. Among these, the feelings associated with the disease and the mental accommodation are important factors affecting self-care ability. Patients with diabetes can improve the accommodation by accepting the facts, understanding the feelings, being assertive, adjusting stress, staying calm, asking family, friends, and society for support and assistance, and building a positive attitude and healthy lifestyle. Maybe diabetes is a turning point in the journey of life.

Way to Improve Mental Accommodation

1. Keep blood glucose levels within the ideal range.
2. Make exercising a habit. Exercise can increase the sensitivity of insulin and stimulate the brain to make people happy.
3. Learn to relax: By adjusting your breathing rate to relax yourself, or listening to some light music.
4. Change your mind: Think about "how to deal with" instead of "how to have a problem again" when you are under pressure. Facing the problem and learning to manage the disease, you are able to manage the diseases.
5. Participate in social activities more often and build up good relationships.
6. Establish a positive attitude and outlook on life. Although diabetes has many dietary limitations, plenty of foods are still available to you. Patients with diabetes can still go to school, work, and travel despite their condition.
7. Ask family, friends, and medical professionals for support and assistance, and do not be afraid to do so.
8. Join a diabetes support group.
9. If you have problems of mental accommodation, you can seek the assistance of resources such as the care team and the counselor of the psychologist

Reference :

1. Improving Care and Promoting Health in Populations: Standards of Medical Care in Diabetes—2021.
2. https://www.commonhealth.com.tw/diabetes/article/13.
3. Taiwanese Association of Persons with Diabetes.

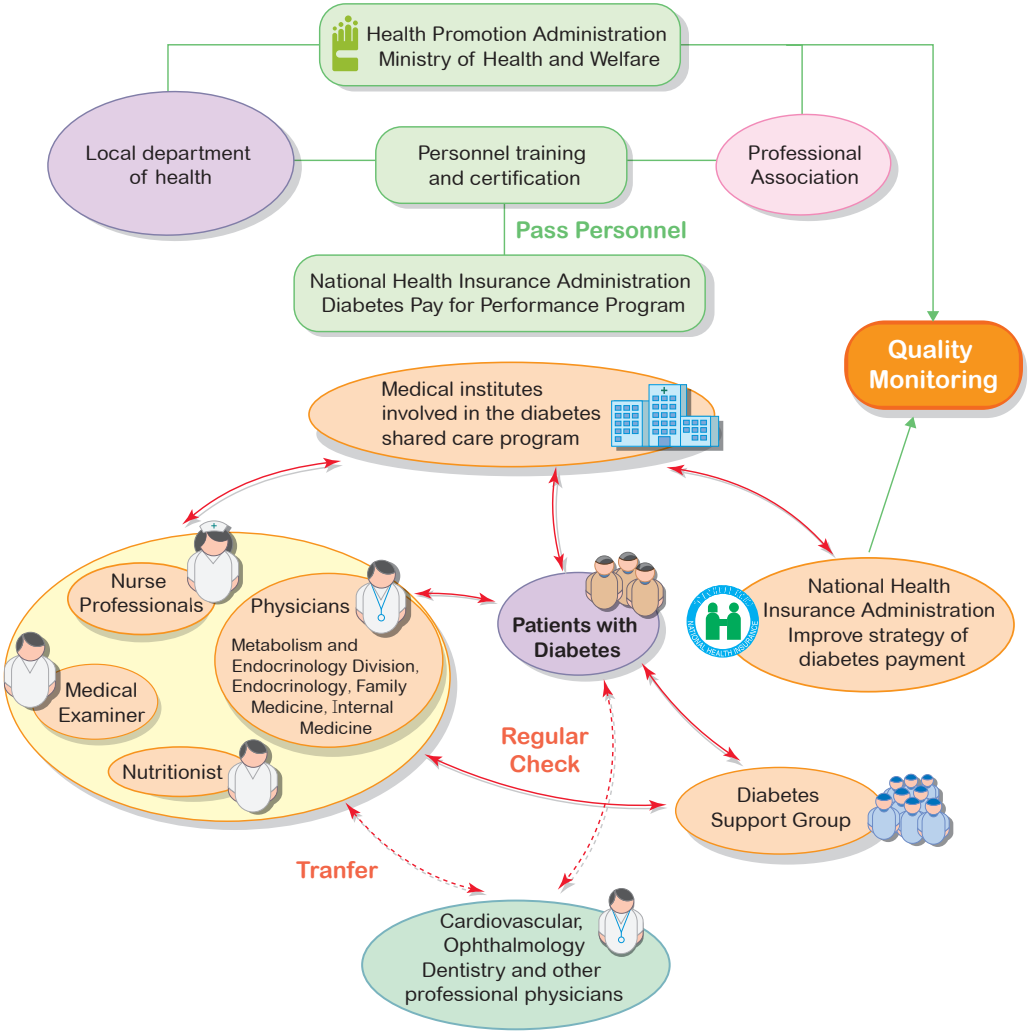
17

Resources Related to Diabetes Prevention

17-1 Diabetes Shared Care Network

The "Diabetes Shared Care Network" incorporates all levels of medical institutes (hospitals and clinics), diabetes-related specialists (endocrinology & metabolism, family medicine, cardiology, nephrology, neurology, ophthalmology, and dentistry), and other related professionals (physicians, nurse professionals, dietitians, and pharmacists) to work together and establish practice and quality guidelines for this care system.

Currently, the "Diabetes Shared Care Network" has been established in all 22 cities and counties in Taiwan. We expect that this care network can improve self-care ability and diabetes control. Moreover, we hope that patients with diabetes can have constant, continuous, convenient, and comprehensive medical care and service quality across different medical resources.



Diabetes Shared Care Network

17-2 Diabetes Health Promotion Institutions

"Diabetes Health Promotion Institutions" are diabetes care institutes certified by the Health Promotion Administration. These institutes not only provide medical care from physicians, nurse professionals, dietitians, and other medical professionals, but also customize long-term medical care programs for every patient with active prevention, including medications, diets, exercise, and so on. The condition of diabetes can be comprehensively controlled with this program. Furthermore, it provides the population at high risk of diabetes and metabolic syndromes with a new lifestyle to improve health, such as healthy diets, regular exercise, and weight control, in order to delay and even prevent the onset of diabetes.

17-3 Diabetes Support Group

The "Diabetes Support Group" is composed of patients with diabetes, their family, and people at high risk. Patients satisfy needs through sharing experiences, expressing emotions, supporting each other, and cooperating to achieve the purpose of mutual aid and self-aid. In other words, this is a voluntary group that provides emotional support and helps patients learn how to deal with problems by sharing experience and mutual help, thus improving health behaviors and control of diabetes.

Benefits of Joining a Diabetes Support Group

1. Learn about diabetes care: Learn the knowledge and techniques of diabetes care and acquire information.
2. Emotional support: In a safe and warm environment, patients share experiences with each other and build trust in order to acquire emotional support.
3. Group identity: Develop a group identity through interaction. Understand the importance of regular medication, control of diet, regular exercise, and self-monitoring of blood glucose levels.
4. Rebuild healthy behaviors: Learn from other patients to rebuild healthy behaviors and control the conditions of diabetes.
5. Strive for related rights: Cooperate with each other to strive for related welfare and rights.

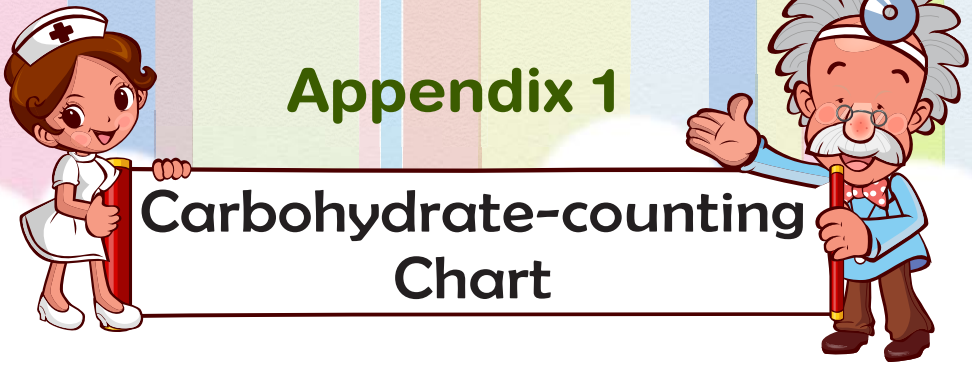
Furthermore, the "Diabetes Health Promotion Institutions" establish support groups to improve the self-management of blood glucose control among patients with diabetes and populations at high risk.

All related information can be found on our Chronic Disease Control website (http://www.hpa.gov.tw/).

17-4 Organization Providing Related Information

- Medical Institutes of Local Diabetes Shared Care Program
- Diabetes Health Promotion Institutions
- Local Department of Health
- The Diabetes Association of the Republic of China (Taiwan) TEL: 02-23753352
- Taiwanese Association of Diabetes Educators TEL: 02-25603118
- Formosan Diabetes Care Foundation TEL: 0800-032323
- Catholic Sanipax Socio-Medical Service & Education Foundation Diabetes Children Service Group TEL:02-23657780 #18
- Taiwanese Association of Persons with Diabetes TEL: 02-23810096
- Diabetes Support Groups
- Taiwan Academy of Dental Hygiene TEL: 02-24271451
- Taiwan Smokers' Helpline 0800-636363

If you have any questions, please contact your local department of health or search for more details on Health Promotion Administration, MOHW website (http://www.hpa.gov.tw/).



Appendix 1

Carbohydrate-counting Chart

How many servings of carbohydrate can I eat every day? Which foods is belonged to carbohydrate foods?

For servings of carbohydrate every day, the nutritionist will make recommendations based on the individual's calorie needs, metabolic goals, and diet status.

Daily servings of carbohydrate in different calorie and carbohydrate for percente in total calories

Carbohydrate for percentage in total calories	40%	45%	50%	55%
1200 cal	7 serving	8 serving	9 serving	10 serving
1400 cal	8.5 serving	9.5 serving	10.5 serving	12 serving
1500 cal	9 serving	10 serving	11.5 serving	13 serving
1600 cal	9.5 serving	11 serving	12.5 serving	13.5 serving
1700 cal	10 serving	12 serving	13 serving	14.5 serving
1800 cal	11 serving	12.5 serving	14 serving	15.5 serving

Among the six categories of foods are belong to the carbohydrate foods, including dairy products, Whole grains, and fruits. The following table shows the calories and serving size of 1 serving of carbohydrate food (15 g of sugar).

Dairy Products

3 tablespoons
Non-fat milk power

- **1 serving of 80 cal**

= 240 cc Non-fat milk
= 3 tablespoons Non-fat milk power (25 gram)

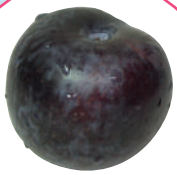
- **1 serving of 120 cal**

= 240 cc Low-fat milk
= 3 tablespoons Low-fat milk power (25 gram)

- **1 serving of 150 cal**

= 240 cc Whole milk
= 4 tablespoons Whole milk power (30 gram)

240 cc
Whole milk



1 California Black Plum

Fruits

• 1 serving of 60 cal

= 1/2 Apple (140 g)

= 1/2 Grapefruit (190 g)

= 1/2 Banana (95 g)

= 1/3 Guava* (160 g)

= 1/2 Melon* (165 g)

= 1/2 Small Papaya* (120 g)

= 1 Slices of Red Watermelon (365 g)

= 1 California Black Plum (110 g)

= 1/8 Pineapple* (130 g)

*Peeled and Seeded

= 13 Grape (130 g)

= 2 Wax Apple (180 g)

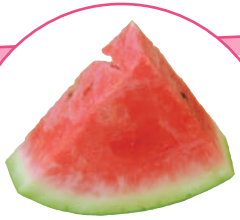
= 1 Kiwi (125 g)

= 2 Jujube (140 g)

= 5 Litchi (185 g)

= 1 Orange (170 g)

= 1 Ponkan (190 g)



1 Slices of Red Watermelon

1/2 Banana

1/2 Bowl of cooked noodles

1/4 Bowl of rice

Wholegrain starchy vegetables

- **1 serving of 70 cal**

= 1/4 Bowl of rice (40 g)
= 1/2 Bowl of cooked noodles (60 g)
= 2 Slices of thin toast (25 g)
= 1/4 Steamed bun (30 g)
= 1/4 Bowl of sweet potatoes (55 g)
= 1/2 Bowl of potato (90 g)
= 2 Slices of soda cookies (20 g)
= 2 Tablespoons of oatmeal (20 g)
= 6 water chestnuts (80 g)
= 1 Slices of turnip cake (50 g)

= 1/2 Bowl of porridge (125 g)
= 1/2 Bowl of rice flour (60 g)
= 1/2 Bowl of taro (55 g)
= 1/3 Corn (65 g)
= 1/2 Bowl of pumpkin (110 g)
= 6 Chestnuts (40 g)
= 3 Dumpling wrappers (30 g)
= 1/3 Bowl of red (green) beans (20 g)
= 1/2 Bowl of rice moss (60 g)
= 1/2 Handful of winter noodles (20 g)

2 Slices of soda cookies

Appendix 2 List of Anti-Diabetic Medications

Categories	Name			
Biguanide	**Metformin**			
	Andm ER	Glibudon	Henformin	Metformin
	Anformin	Glibudon XR	Ilimin	Metformin ER
	Ankomin	Glubin	Kotang XR	Meto
	Ansures ER	Glucobin	Liformin	Panformin
	Anxofin	Glucodue	Loditon	Simelin
	Anxoken	Glucofit ER	Loformin	Slosugar
	Bentomin	Glucofit	Lvtangsu	Uformin
	Betaform	Glucomine	Meforin FC	Urimin
	Bicanol	Glucomin XR	Meglucon	Volv
	Bigsens-XR	Glucophage	Memin	Volv ER
	CTL XR	Glumetin	Metdia ER	
	Diaformin	Glupin	Metfogamma	
	Eutomin	Glyformin	Metfopin	
Insulin secretagogues sulfonylureas	**Glibenclamide**			
	Antiglucon	Diabetin	Gleuton	Gliucon
	Apo-glyburide	Eucon	Gliben	Tantell
	Daonil	Euglucon	Glibenclamide	
	Diaben	Gabemid	Glibide	
	Glipizide			
	Contan	Glibetin	Gliglucon	Glizide
	Diabac	Glidiab	Glipin	Glutrol
	Diabes	Glidier E.R.	Glipizide	Glupizide
	Diabetrol S.R	Glidin	Glix	Minidiab
	Gliclazide			
	Anneuton	Diclazide	Gliclazide MR	Glycon
	Chitian	Dicron	Glicron	Hanazide M.R.
	Clazide	Dicron MR	Glicron MR	Kludone M.R.
	Daycose M.R	Dimatan	Glictan	Mezide
	Diacron	Dimax	Gligen	Mezide MR
	Diaglucon	Dimicon	Glimed M.R.	Policron
	Diamicron	Gelid	Glimicon	Sinclazide
	Diamicron MR	Glic	Glizide	Syncon
	Diamin	Glicalin	Glu-a	Syncon MR
	Diamin MR	Glica	Gluzide	Tadin
	Diaronzide	Gliclax S.R.	Glyade	
	Glimepiride			
	Amadm	Amepiride	Glimaryl	Glufar
	Amalin	Donglu	Glipid	Grumed
	Amaride	Glimepine	Glipiride	Nonin
	Amarine	Glimepiride	Glusafe	

Categories	Name			
Glinides	**Repaglinide**			
	Novonorm	Reglide	Repaglinide	Tansin
	Relinide	Repade	Rovo	
	Reglinide	Repaglinid jubilant	Supernide	
	Nateglinide			
	Glunat	Natenide	Roxiton	Starnet
	Naglix	Netcose	Starlix	
	Mitiglinide			
	Glufast			
α-glucosidase inhibitor	**Acarbose**			
	Acaben	Deglu	Glucobose	Litacarbose
	Acarbose	Dibose	Glucocar	Precose
	Acarose	Glibos	Glucout	Taglu
	Carlipin	Glubose	Karbose	Tonfuse
	Comtoff	Glucobay	Kertonbose	
	Miglitol			
	Diaban	Diaset	Migbose	Miglu
Insulin sensitizers	**Pioglitazone**			
	Actos	Glitos	Piogo	Pitazone
	Anxotos	Glufit	Piosugar	Politone
	Befree	Glutazone	Piota	Vippar
	Diazone	Pioglit	Piotas	
	Glitis	Pioglitazone	Piozon	

Dipeptidyl peptidase IV(DDP-4) inhibitor

Sitagliptin	**Saxagliptin**	**Vildagliptin**	**Linagliptin**	**Alogliptin**
Januvia	Onglyza	Galvus	Trajenta	Nesina

SGLT2 inhibitors

Empagliflozin	**Dapagliflozin**	**Canagliflozin**	**Ertugliflozin**
Jardiance	Forxiga	Canaglu	Steglatro

Combination 1: Biguanide+Insulin sensitizers

Actosmet	Diabecon	Lodiglit

Combination 2: Biguanide+Sulfonylureas

Amaryl M	Glimet	Glucomet	Glucovance

Combination 3: Biguanide+DPP-4 inhibitor

Janumet	Kombiglyze XR	Galvus-Met	Trajenta duo	Nesina Met

Combination 4: Biguanide+SGLT2 inhibitors

Jardiance Duo	Xigduo XR

Combination 5: DDP-4+SGLT2 inhibitors

Glyxambi	Qtern	Steglujan

Appendix 3 Pictures of Common Insulin Medications

Categories	Package	Name	Manufacturer	
Short-acting	Bottle	Actrapid® HM	Novo Nordisk	
		Humulin® R	Eli Lilly	
Intermediate-acting	Bottle	Insulatard® HM	Novo Nordisk	
		Humulin® N	Eli Lilly	
Long-acting	Bottle	Lantus®	Sanofi	
Combination insulin Products	Bottle	Humulin® 70/30	Eli Lilly	

Categories	Package	Name	Manufacturer	
Fast-Acting	Insulin Pen	NovoRapid®	Novo Nordisk	
		Humalog®	Eli Lilly	
		Apidra®	Sanofi	
Combination Insulin Products	Insulin Pen	NovoMix® 30 Penfill	Novo Nordisk	
		NovoMix® 50 Penfill	Novo Nordisk	
		Humalog® Mix 50	Eli Lilly	
		Humalog® Mix 25	Eli Lilly	
Long-acting	Insulin Pen	Lantus® SoloStar	Sanofi	
		Levemir® FlexPen	Novo Nordisk	
		Toujeo® SoloStar®	Sanofi	
		Tresiba® FlexTouch®	Novo Nordisk	

Fast-Acting	Penfill	NovoRapid®	Novo Nordisk	
		Humalog®	Eli Lilly	
Combination Insulin Products	Penfill	NovoMix® 30 Penfill	Novo Nordisk	
		Humalog® Mix 50	Eli Lilly	
		Humalog® Mix 25	Eli Lilly	

Appendix 4 Pictures of Common Incretin Medication

Drug Name	Name	Instruction	
Exenatide	Byetta	Twice a day Subcutaneous injection	
Prolonged-release suspension Exenatide	Bydureon	Once a week Subcutaneous injection	
Liraglutide	Victoza	Once a day Subcutaneous injection	
Semaglutide	Ozempic	Once a week Subcutaneous injection	
Lixisenatide	Lyxumia	Once a day Subcutaneous injection	
Dulaglutide	Trulicity	Once a week Subcutaneous injection	

Appendix 5 Premixed Insulin and Incretin for Injectio

Glargine+ Lixisenatide	Soliqua	Once a day Subcutaneous injection	

Appendix 6 Co-formulation Insulin for Injection

Degludec+ aspart	Ryzodeg	Once or twice a day Subcutaneous injection	

Diabetes and Me

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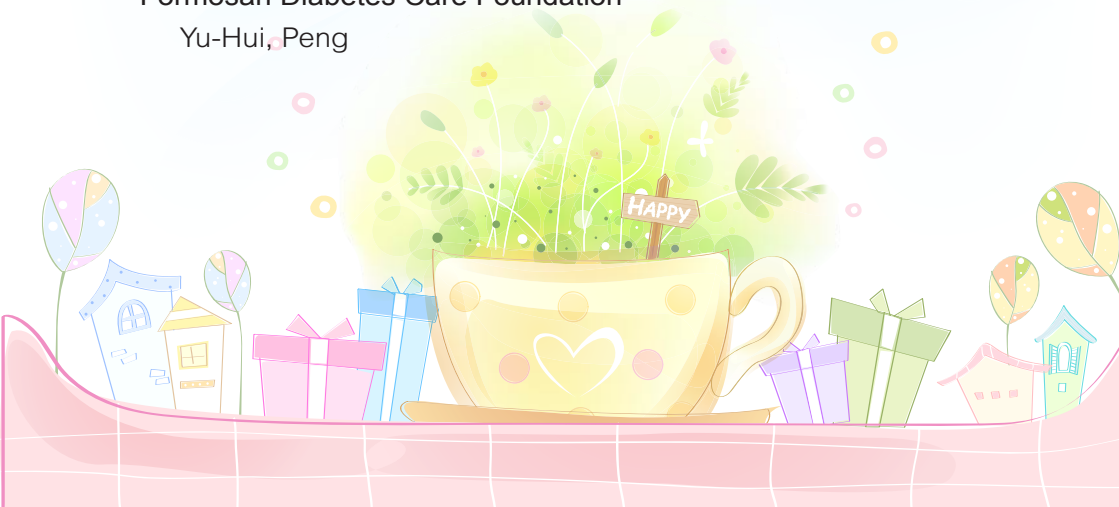

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