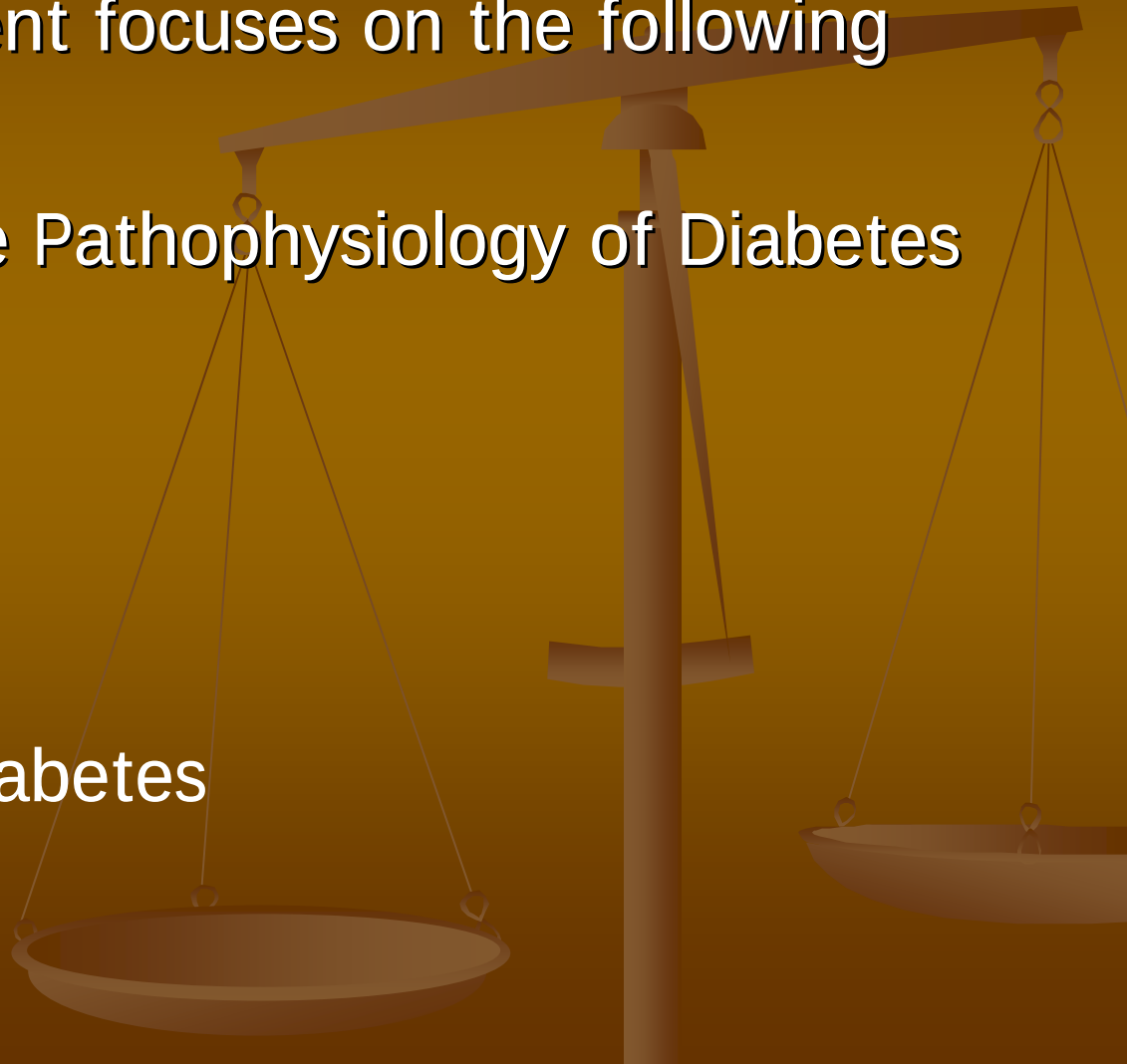
DIABETES

Esther Hernandez, RN, BSN, PHN
Research Subject Advocate
Clinical Research Center

Management of Diabetes

Diabetes management focuses on the following areas:

- Understanding the Pathophysiology of Diabetes
- Diet
- Nutrition
- Exercise
- Medications
- Self-Monitoring Diabetes



Pathophysiology of Diabetes

LEARNING OBJECTIVES

The student will be able to:

1. Recognize characteristics of type 1 and type 2 diabetes.
2. Identify known and suspected causes in the development of diabetes.
3. Recognize signs and symptoms of type 1 and type 11 diabetes.
4. List the definitions of physiologic processes important in glucose metabolism.
5. Recognize the effects of hormones important in the regulation of glucose metabolism.

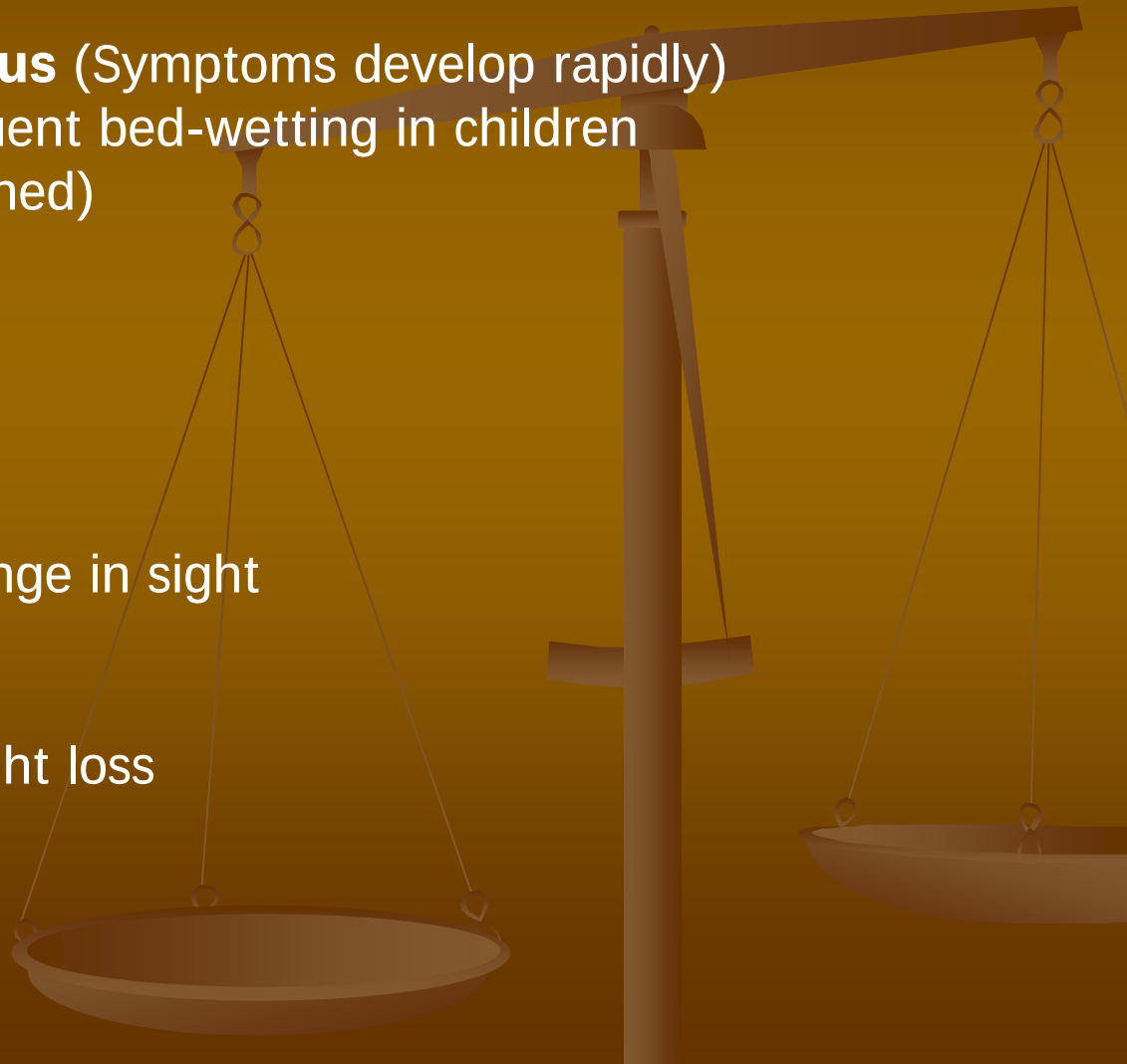
Characteristics of Type 1 Diabetes

- Type 1 diabetes was formerly known as insulin dependent diabetes (IDDM)
- It can develop at any age, although most cases are generally diagnosed when the patient is less than 30 years old.
- Previously, this type of diabetes was often referred to as “juvenile diabetes,” because its onset often occurs in childhood.
- Patients with type 1 diabetes produce little or no insulin
- Insulin therapy is necessary to prevent ketoacidosis and death.
- The immune system attacks and destroys the insulin producing beta cells in the pancreas.
- The actual disease process begins as long as nine years before the onset of clinical symptoms.
- There is a genetic propensity of type 1 diabetes

Characteristics of Type 1 Diabetes

Signs and Symptoms

- **Type 1 Diabetes Mellitus** (Symptoms develop rapidly)
- Frequent urination (Frequent bed-wetting in children who have been toilet trained)
- Excessive Thirst
- Excessive Hunger
- Weakness and fatigue
- Drowsiness
- Irritability
- Blurred vision or any change in sight
- Fruity breath
- Nausea and vomiting
- Sudden unexplained weight loss



Characteristics of Type 1 Diabetes

Signs and Symptoms

- The signs and symptoms of type 1 diabetes are usually acute and have a rapid onset

The classic signs and symptoms of diabetes are the three "polys":

- Polyuria (excessive urination)
- Polydipsia (excessive thirst)
- Polyphagia (excessive hunger)

These three are related to:

- The elevated levels of blood glucose (hyperglycemia)
- "Spilling" of glucose into the urine (glycosuria).

Characteristics of Type 1 Diabetes

- Hyperglycemia occurs when the body cannot properly metabolize Glucose
- Normal renal threshold (is the amount of glucose filtered by the
- glomeruli of the kidney). If the blood level of glucose is sufficiently high, this threshold is exceeded, and glucose spills into the urine
- Polyuria (excessive urination) occurs as a result of a large loss of water
- Polydipsia (excessive thirst) occurs as a result of the intracellular dehydration that occurs, including consumption of literally gallons of fluids per day.
- Polyphagia (excessive hunger) Dramatic weight loss in a short time (*ex:* 10–20 pounds in a 2 week period) despite increased food intake.

Characteristics of Type 1 Diabetes

When the body cannot properly metabolize glucose the body switches to using fat for energy, producing harmful by products called ketones causing Ketoacidosis
Signs and Symptoms of Ketoacidosis
include:

- Nausea
- Vomiting
- A “fruity” breath odor
- Kussmaul’s breathing which is due to the use of body stores to produce energy
- These are dangerous signs and symptoms and warrant immediate medical attention.

Characteristics of Type 1 Diabetes

The most important risk factors for type 1 diabetes are:

- Genetic propensity
- A “trigger” is necessary for the development of the disease in those with the genetic propensity.
- Several possible triggers for the development include viruses (the number of cases diagnosed increased in the flu and cold season), environmental toxins, serum, and drugs
- The risk is increased in children of parents with diabetes
- Individuals with type 1 diabetes are also prone to other autoimmune disorders, particularly the thyroid disorders of Graves disease and Hashimoto thyroiditis, Addison’s Disease, vitiligo and pernicious anemia.

Characteristics of Type 11 Diabetes

- Type 11 diabetes can occur at any age, but it is most often diagnosed in a person after the age of 40 years.
- It is often called “adultonset diabetes” for this reason.
- Patients with type 2 diabetes are often obese at the time of diagnosis or have a history of obesity,
- Type 11 diabetes can also occur in the non-obese as well, especially in older persons

Characteristics of Type 11 Diabetes

Type 2 diabetes formerly called non insulin dependent diabetes (NIDDM) or type II diabetes, are not prone to ketoacidosis because enough insulin is present to prevent excess fat breakdown to supply energy

- *Fewer Insulin Receptors*
- Obesity often associated with lack of exercise, reduces the number of insulin receptor sites and the target cells can't take in glucose,
- blood sugar levels rise.
- The kidneys are unable to reabsorb all the glucose from the blood they filter, so some will pass into the urine.
- Patients with type 2 diabetes have insulin resistance, they have more than enough insulin, but not enough receptors for the insulin to bind
- Insulin resistance may improve with weight reduction, increased physical activity or medication
- Higher than normal amounts of glucose may be released from the liver before food intake with abnormalities of hepatic glucose production

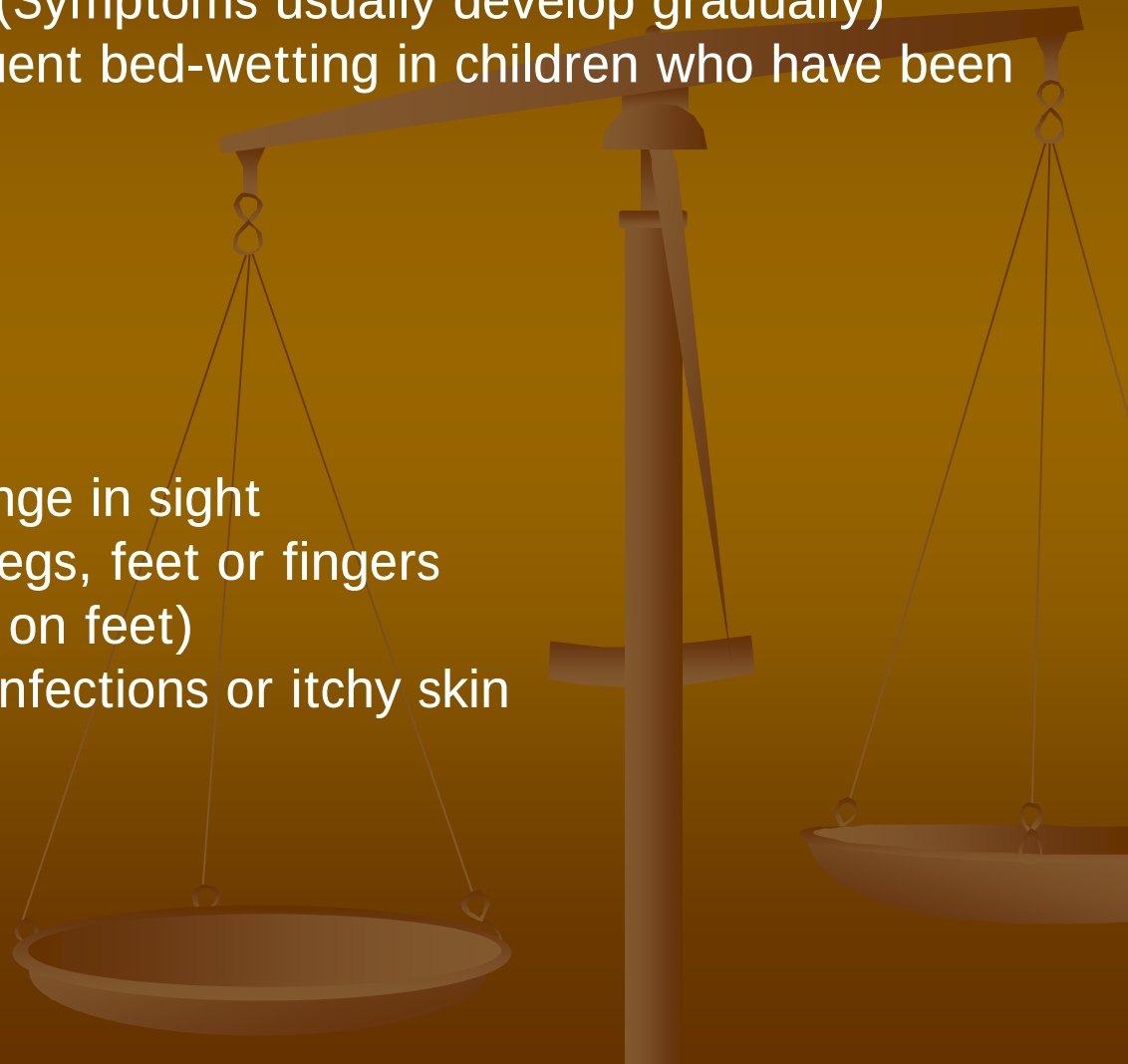
Characteristics of Type 11 Diabetes

Signs and Symptoms

- Type 2 diabetes often goes undiagnosed for many years because of the gradual development of high blood glucose that is not severe enough for the person to notice any of the classic symptoms of diabetes.
- Type 2 diabetes is often diagnosed when a patient seeks medical care for another reason or may be discovered during a routine dental, eye or physical examination.
- It is estimated that a number of people may have had the
- disease for an average of 7–10 years at the time of
- diagnosis.
- Unfortunately by the time diagnosis is made, complications may have already developed.

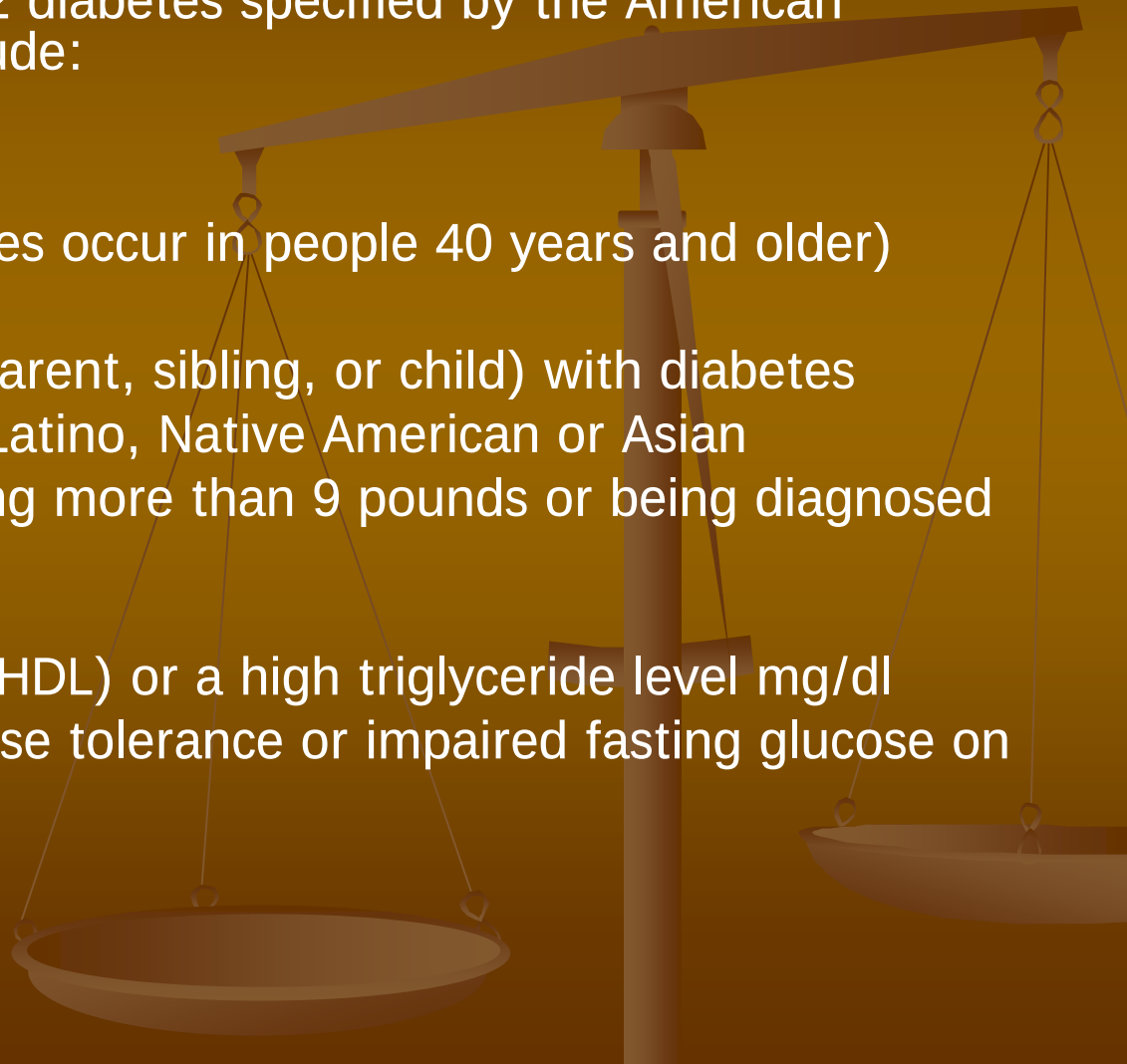
Characteristics of Type 11 Diabetes

- Type 2 Diabetes Mellitus (Symptoms usually develop gradually)
- Frequent urination (Frequent bed-wetting in children who have been toilet trained)
- Excessive Thirst
- Excessive Hunger
- Weakness and fatigue
- Drowsiness
- Irritability
- Blurred vision or any change in sight
- Tingling or numbness in legs, feet or fingers
- Slow healing of cuts (esp on feet)
- Frequent skin or vaginal infections or itchy skin



Characteristics of Type 11 Diabetes

- The risk factors for type 2 diabetes specified by the American Diabetes Association include:
- Obesity
- Sedentary lifestyle
- Increasing age (most cases occur in people 40 years and older)
- Family history
- Having a close relative (parent, sibling, or child) with diabetes
- Being African-American, Latino, Native American or Asian
- Delivering a baby weighing more than 9 pounds or being diagnosed with gestational diabetes
- High blood pressure
- High density lipoprotein (HDL) or a high triglyceride level mg/dl
- Previously impaired glucose tolerance or impaired fasting glucose on testing



Physiologic Processes Important in Glucose Metabolism.

There are many hormones involved in the process of glucose metabolism:

- Beta cells make insulin (insulin allows glucose to enter the cells)
- Alpha cells make glucogan (throws out glucose if you have too much insulin in your body)
- Delta cells make somatatastin (counter regulatory hormone)

All these three cells are located in the pancreas islet of Langerhans, millions of them

- Insulin allows glucose to enter the cells
- Glucogan causes the liver to throw out glucose so that if you have to much insulin in your body the glucogan immediately causes the liver to throw out glucose and than the insulin level goes down.
- Glucagon acts in opposition to insulin
- When the glucose level goes down the insulin level comes up and they seesaw one another.
- Somatastatin is a counter regulatory hormone that is mainly involved in keeping the balance of insulin and glucogan

Physiologic Processes Important in Glucose Metabolism

- Glucose is transported through the bloodstream to the cells where insulin binds with the receptor sites on the surface of target cells (cells that require insulin for glucose metabolism)
- This binding makes the wall of the cell permeable and allows the glucose to enter

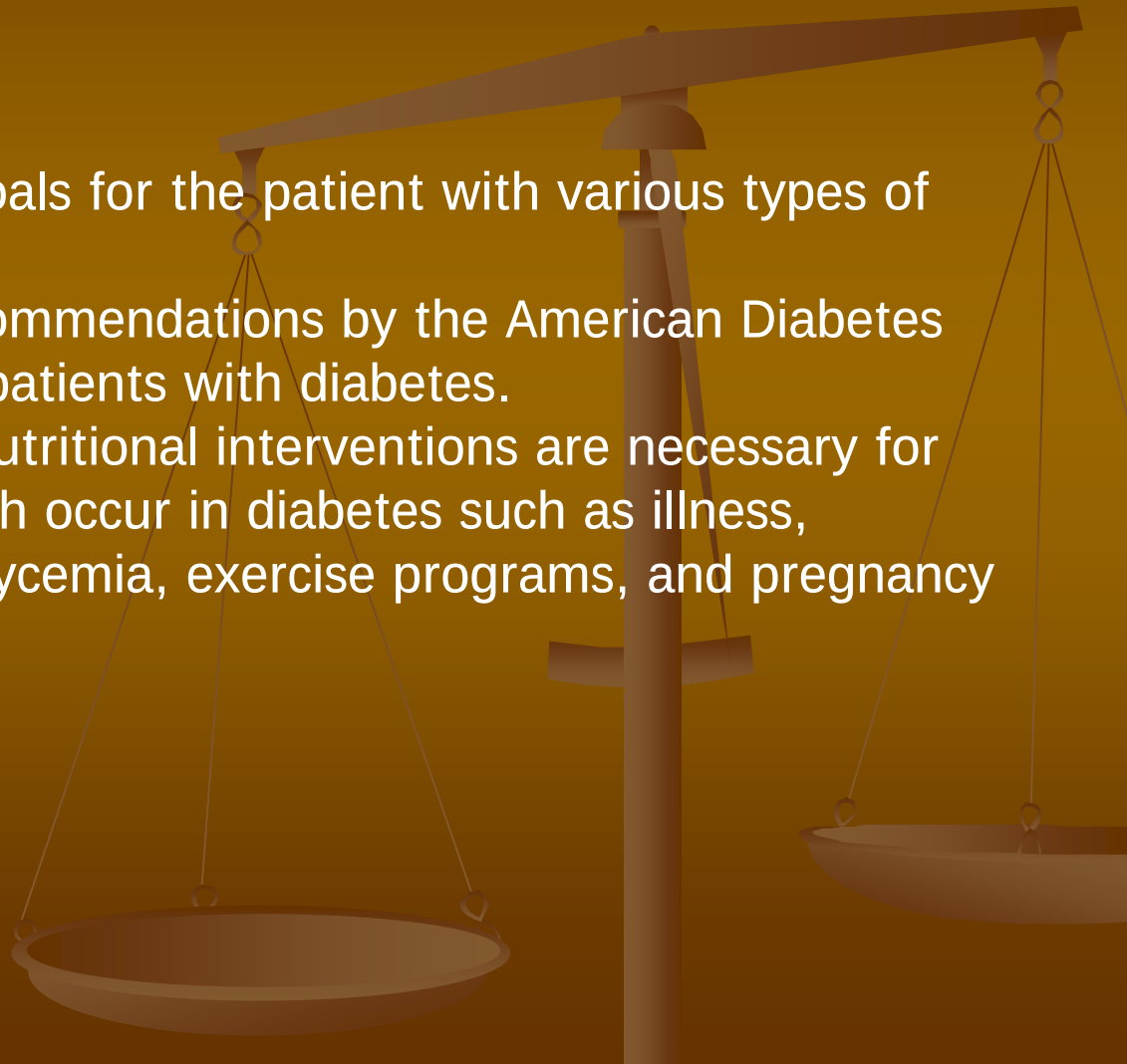
Physiologic Processes Important in Glucose Metabolism

- Insulin is the only hormone known to have the direct effect of decreasing the level of glucose in the blood. It decreases the level by promoting transport of glucose into skeletal muscle and adipose tissue
- Secretion of insulin is regulated through blood glucose levels, increasing when blood levels of glucose increase and decreasing when glucose is lowered in the blood stream.
- Insulin is released in two phases.
- The first phase occurs within the first 10 minutes after the ingestion of glucose. This is the insulin that was stored in the beta cells.
- The second phase is the release of newly synthesized insulin

Physiologic Processes Important in Glucose Metabolism

- Insulin is necessary for the glucose supply of most cells that comprise a large body mass and energy expenditure and perform a large part of tissue building and repair
- Not all tissues depend on insulin for glucose to enter the cells.
- Insulin-independent tissues that allow glucose to enter freely are often the site of complications associated with diabetes (eyes, erythrocytes, kidneys, brain and nerves)

Nutrition in the Management of Diabetes



LEARNING OBJECTIVES

The student will be able to:

1. Identify the primary goals for the patient with various types of diabetes.
2. List the nutritional recommendations by the American Diabetes Association (ADA) for patients with diabetes.
3. State when and why nutritional interventions are necessary for specific situations which occur in diabetes such as illness, hypoglycemia, hyperglycemia, exercise programs, and pregnancy

Nutrition in the Management of Diabetes

- The primary goals for the patient with various types of diabetes is:
- Education
- Counseling

Education and counseling for nutrition is done to facilitate the patient's ability to make positive changes in nutritional habits

- Nutritional recommendations for patient's with diabetes are very similar to the recommendations made by national health organizations for all persons to improve overall health through good nutrition

Nutrition in the Management of Diabetes

- Nutritional recommendations by the American Diabetes Association (ADA) for patients with diabetes improve blood glucose control and enhance their health
- All nutritional guidelines must be individualized for the specific patient taking into account their particular therapeutic needs and goals

Nutrition in the Management of Diabetes

- Nutritional interventions necessary for Specific situations which occur in diabetes such as illness, hypoglycemia, hyperglycemia, exercise programs, and pregnancy must be individualized for the specific patient taking into account their particular therapeutic needs and goals

Nutrition in the Management of Diabetes

- The exchange system developed by the American Diabetes Association, American Dietetic Association and the Public Health Service is the fundamental tool used in the dietary treatment of diabetes.
- The exchange list groups similar types of foods into

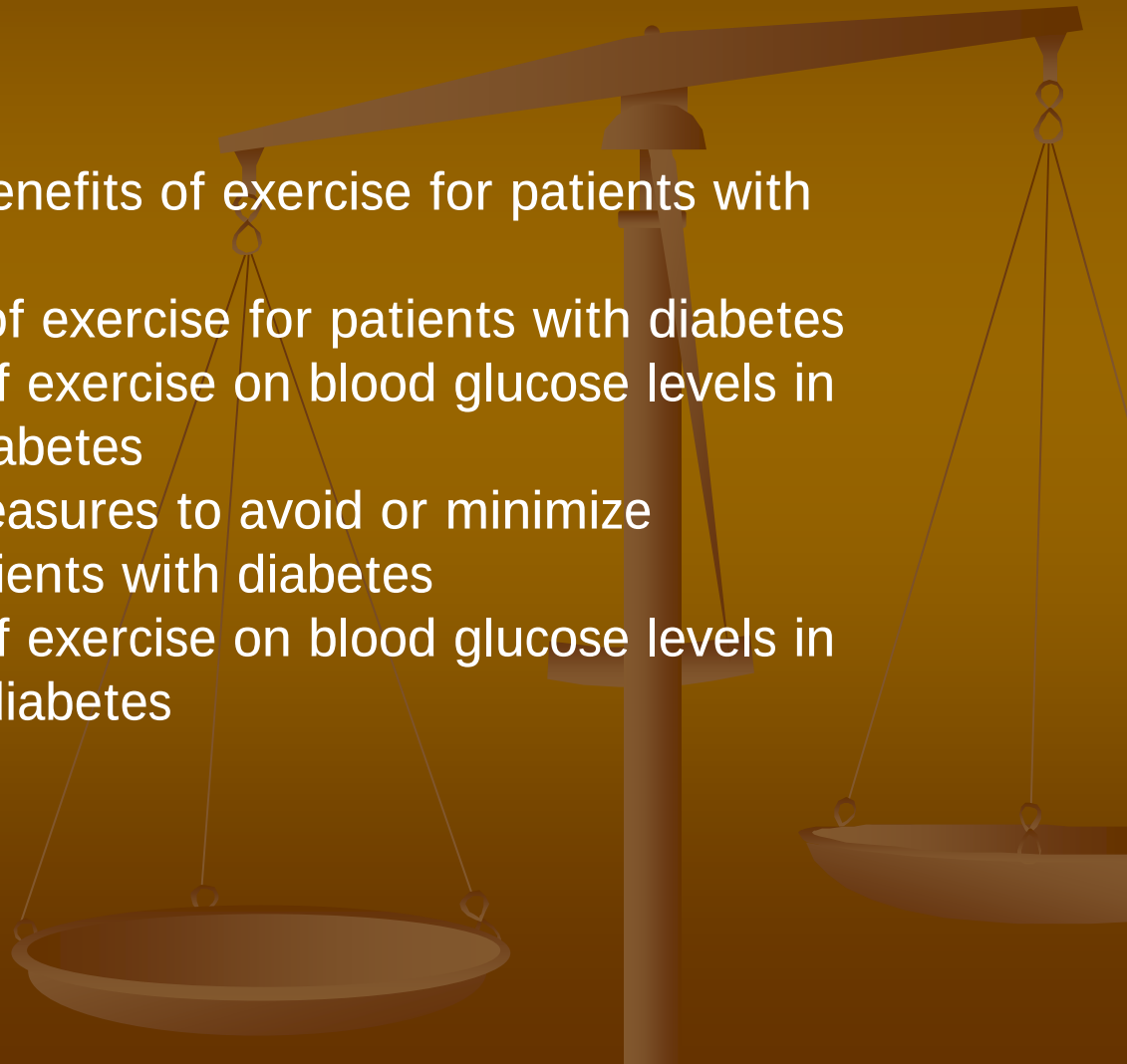
  six categories so that when a definite number of each exchange is consumed, a constant number of calories and nutrients is maintained
- A wide variety of food choices is given

Exercise in the Management of Diabetes

LEARNING OBJECTIVES

The student will be able to:

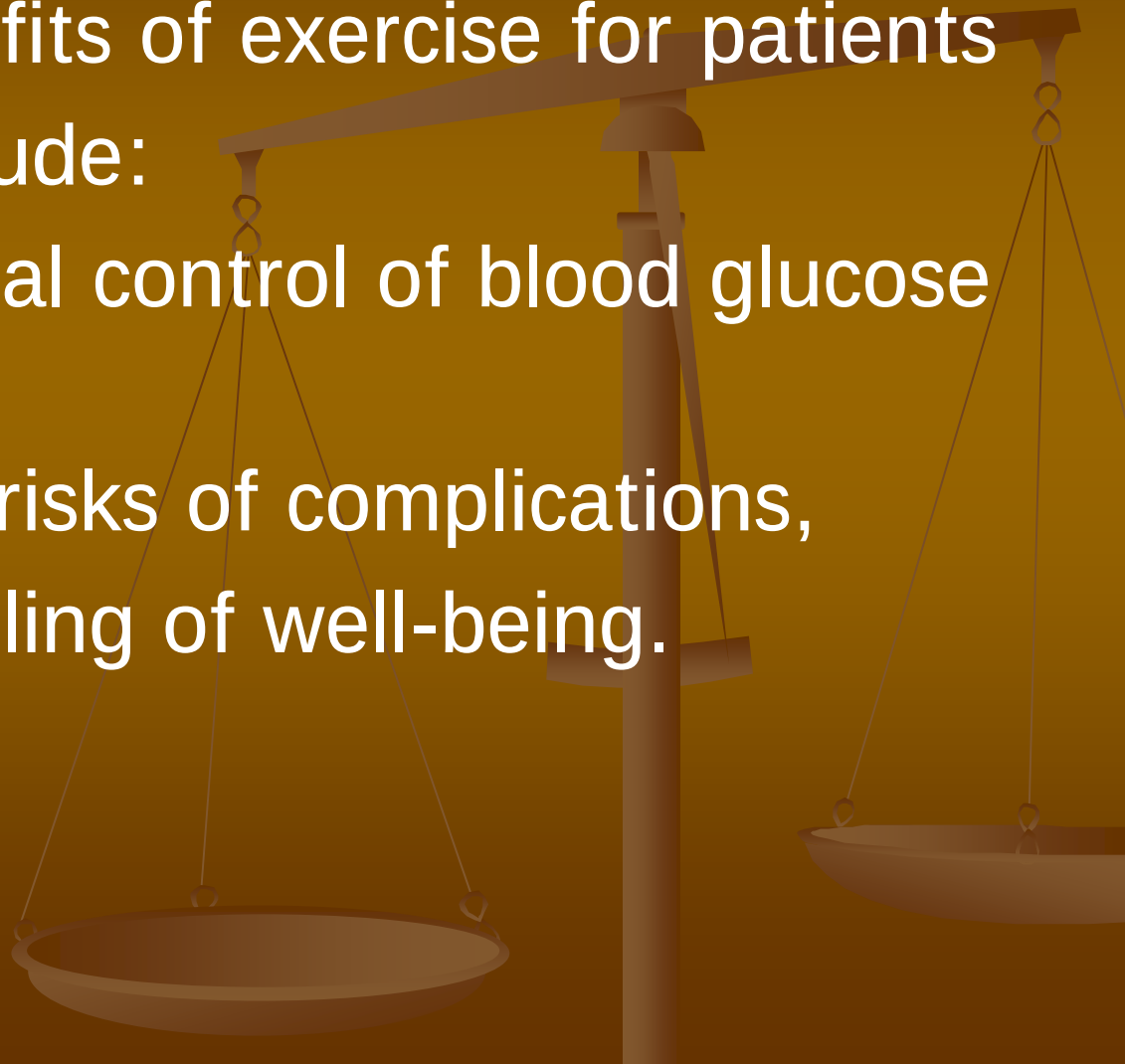
1. Identify some of the benefits of exercise for patients with diabetes
2. Recognize three risks of exercise for patients with diabetes
3. Indicate the benefits of exercise on blood glucose levels in patients with type 1 diabetes
4. Specify appropriate measures to avoid or minimize risks of exercise in patients with diabetes
5. Indicate the benefits of exercise on blood glucose levels in patients with type 11 diabetes



Exercise in the Management of Diabetes

Some of the benefits of exercise for patients with diabetes include:

- Achieving optimal control of blood glucose levels
- Decreasing the risks of complications,
- Promoting a feeling of well-being.



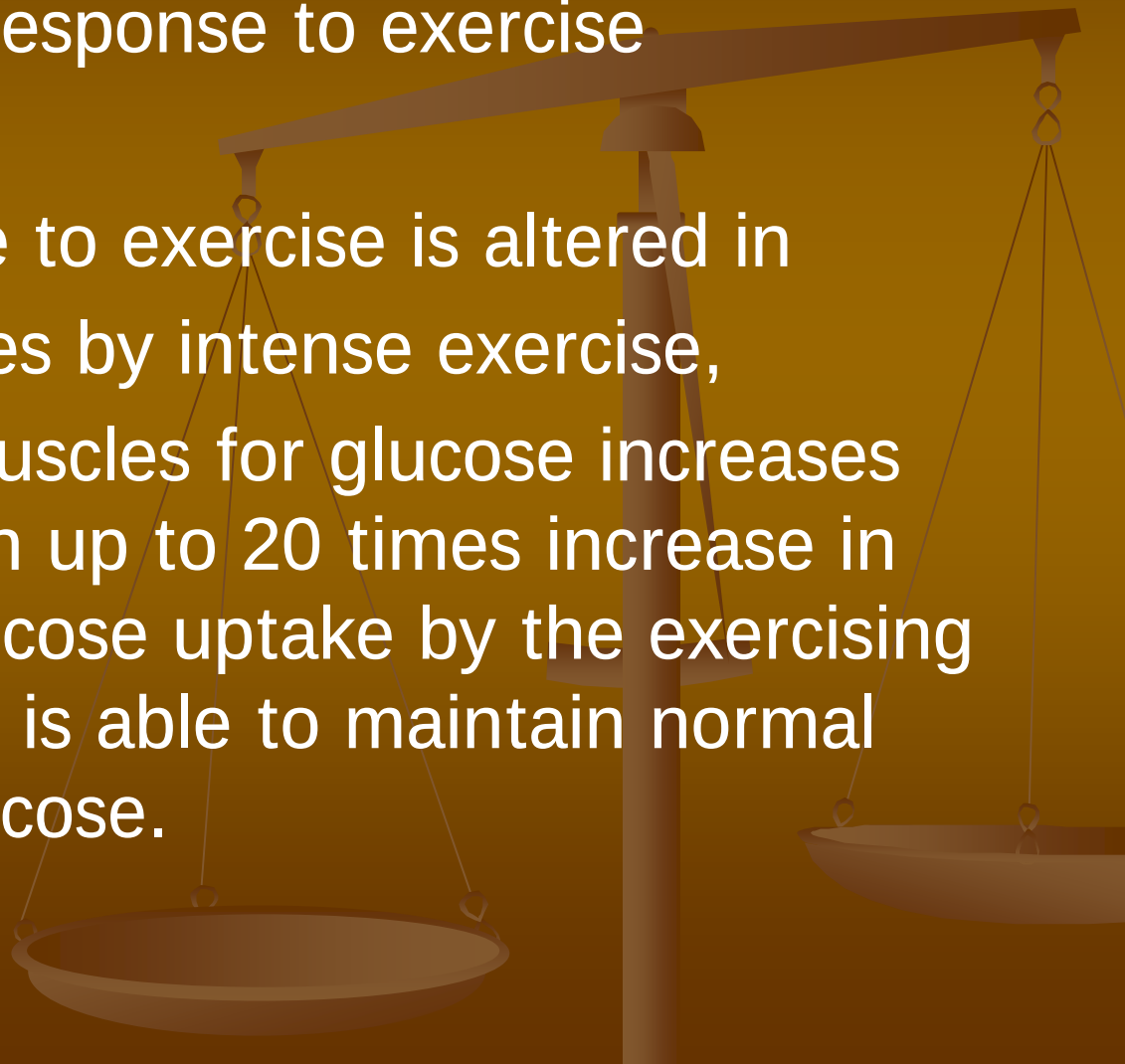
Exercise in the Management of Diabetes

Normal physiologic response to exercise

Include:

Physiologic response to exercise is altered in patients with diabetes by intense exercise,

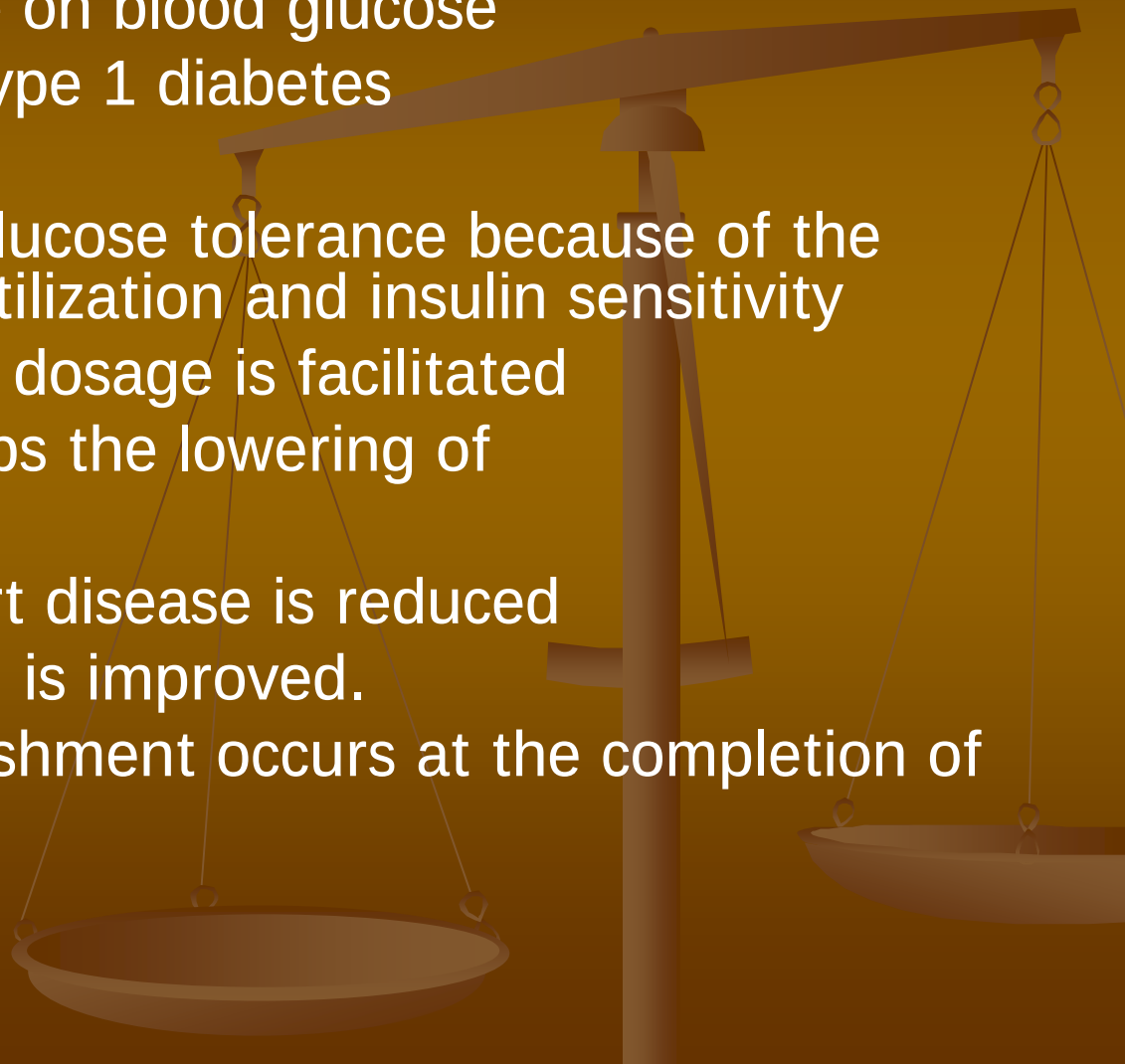
- Demand by the muscles for glucose increases greatly. Despite an up to 20 times increase in the demand in glucose uptake by the exercising muscles, the body is able to maintain normal levels of blood glucose.



Exercise in the Management of Diabetes

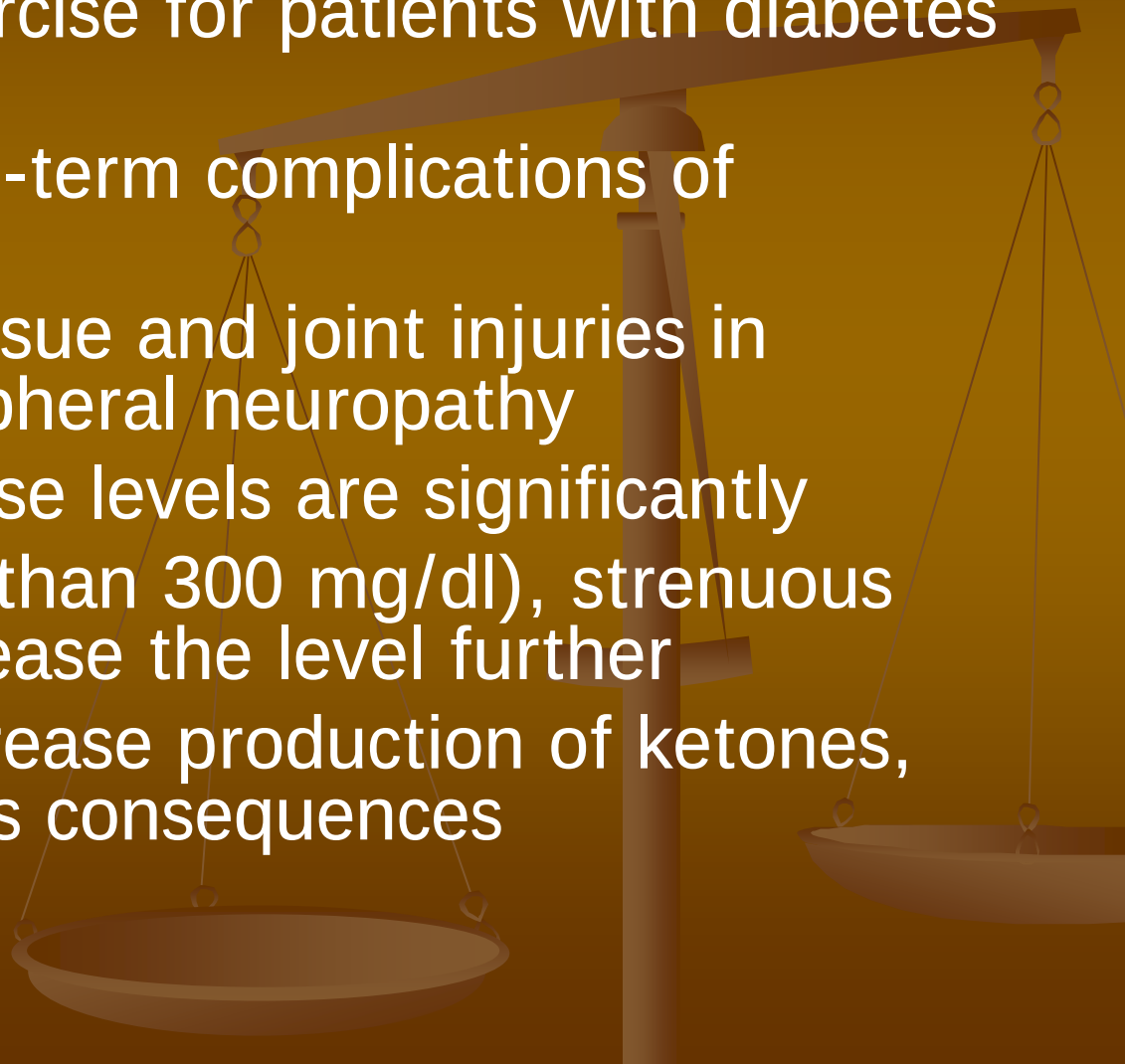
The benefits of exercise on blood glucose levels in patients with type 1 diabetes include:

- An improvement in glucose tolerance because of the increase in glucose utilization and insulin sensitivity
- A reduction in insulin dosage is facilitated because exercise helps the lowering of blood glucose levels
- Risk of coronary heart disease is reduced
- A sense of well-being is improved.
- A feeling of accomplishment occurs at the completion of an exercise session.



Exercise in the Management of Diabetes

- Three risks of exercise for patients with diabetes include:
- Worsening of long-term complications of diabetes
- The risk of soft-tissue and joint injuries in patients with peripheral neuropathy
- When blood glucose levels are significantly elevated (greater than 300 mg/dl), strenuous exercise may increase the level further and initiate or increase production of ketones, resulting in serious consequences



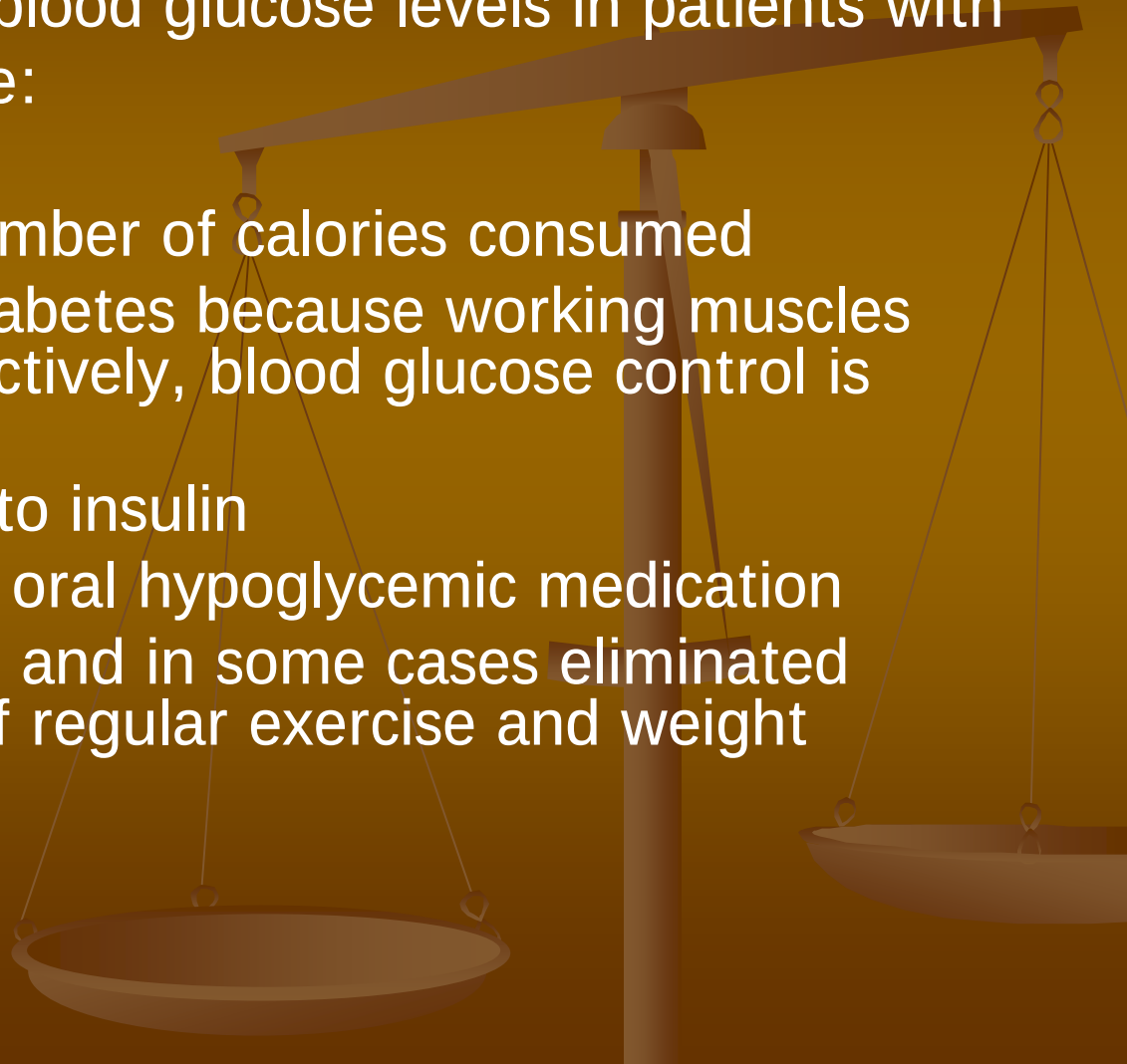
Exercise in the Management of Diabetes

- Appropriate measures to avoid or minimize risks of exercise in patients with diabetes include:
- Exercise programs should be postponed until hyperglycemia is adequately controlled
- Blood glucose monitoring is an essential component of exercise.
- Monitoring glucose levels before, during, and after an exercise session can help the patient determine how exercise affects these levels

Exercise in the Management of Diabetes

Benefits of exercise on blood glucose levels in patients with type 11 diabetes include:

- Weight control
- A reduction in the number of calories consumed
- Can control type 2 diabetes because working muscles use insulin more effectively, blood glucose control is improved
- Enhanced sensitivity to insulin
- Dosages of insulin or oral hypoglycemic medication can often be reduced and in some cases eliminated through a program of regular exercise and weight control.



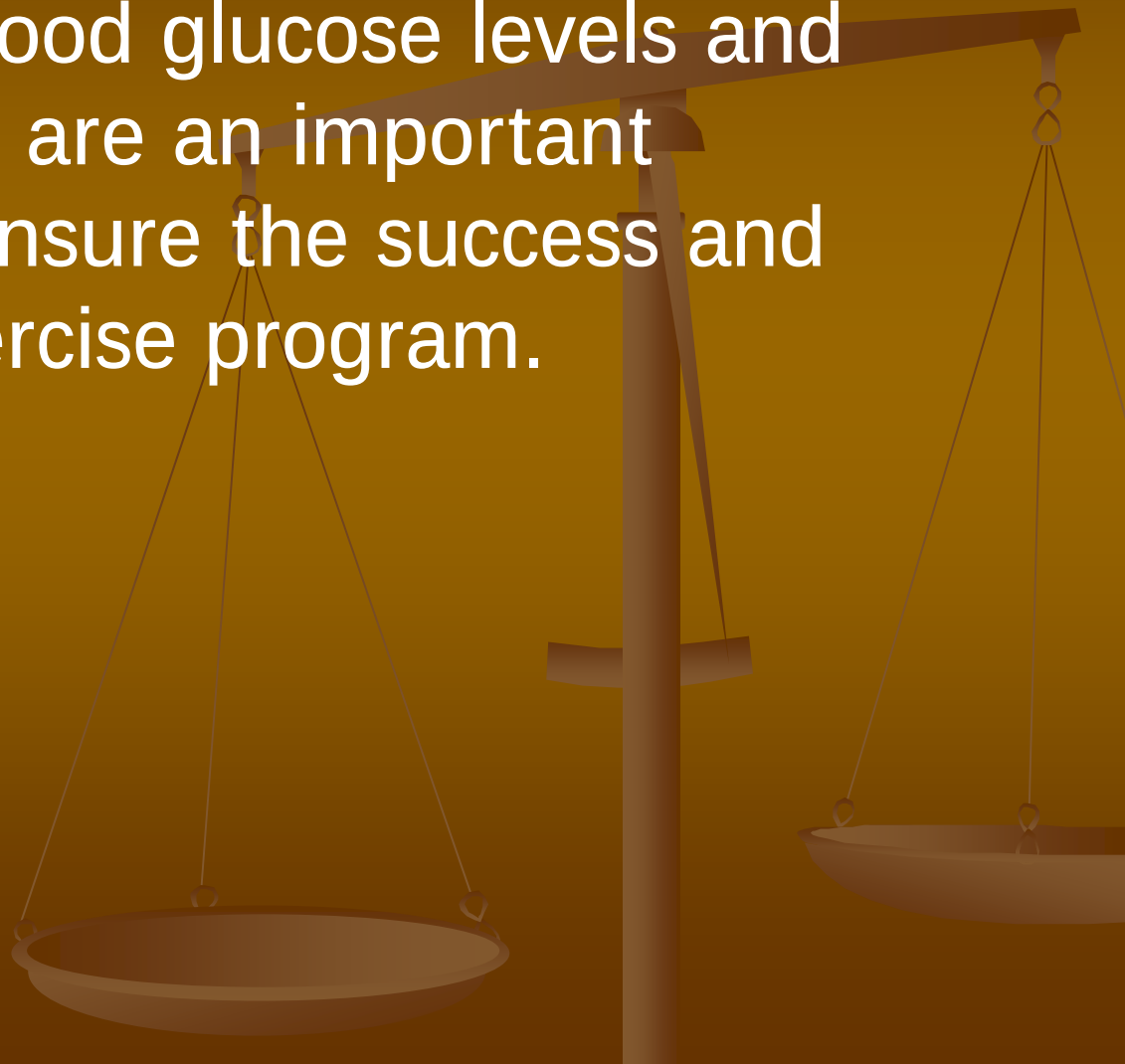
Exercise in the Management of Diabetes

Precautions and risks listed for patients with type 11 diabetes include:

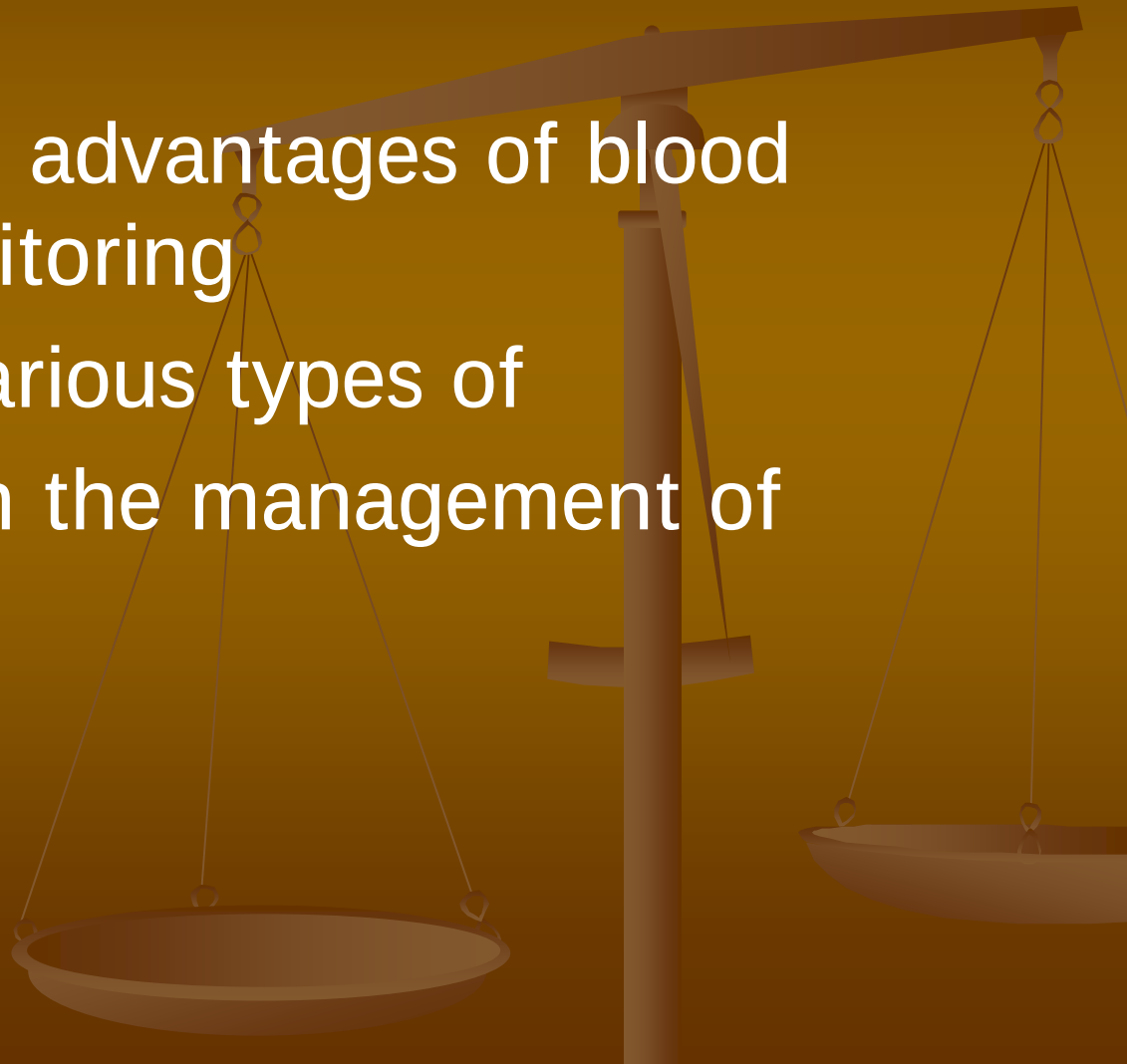
- Injuries to the ligaments occur more often and degenerative joint disease may be worsened by some types of exercise
- Are usually older, are often overweight or obese, and may have significant long-term complications

Exercise in the Management of Diabetes

- Monitoring of blood glucose levels and keeping records are an important component to ensure the success and safety of an exercise program.



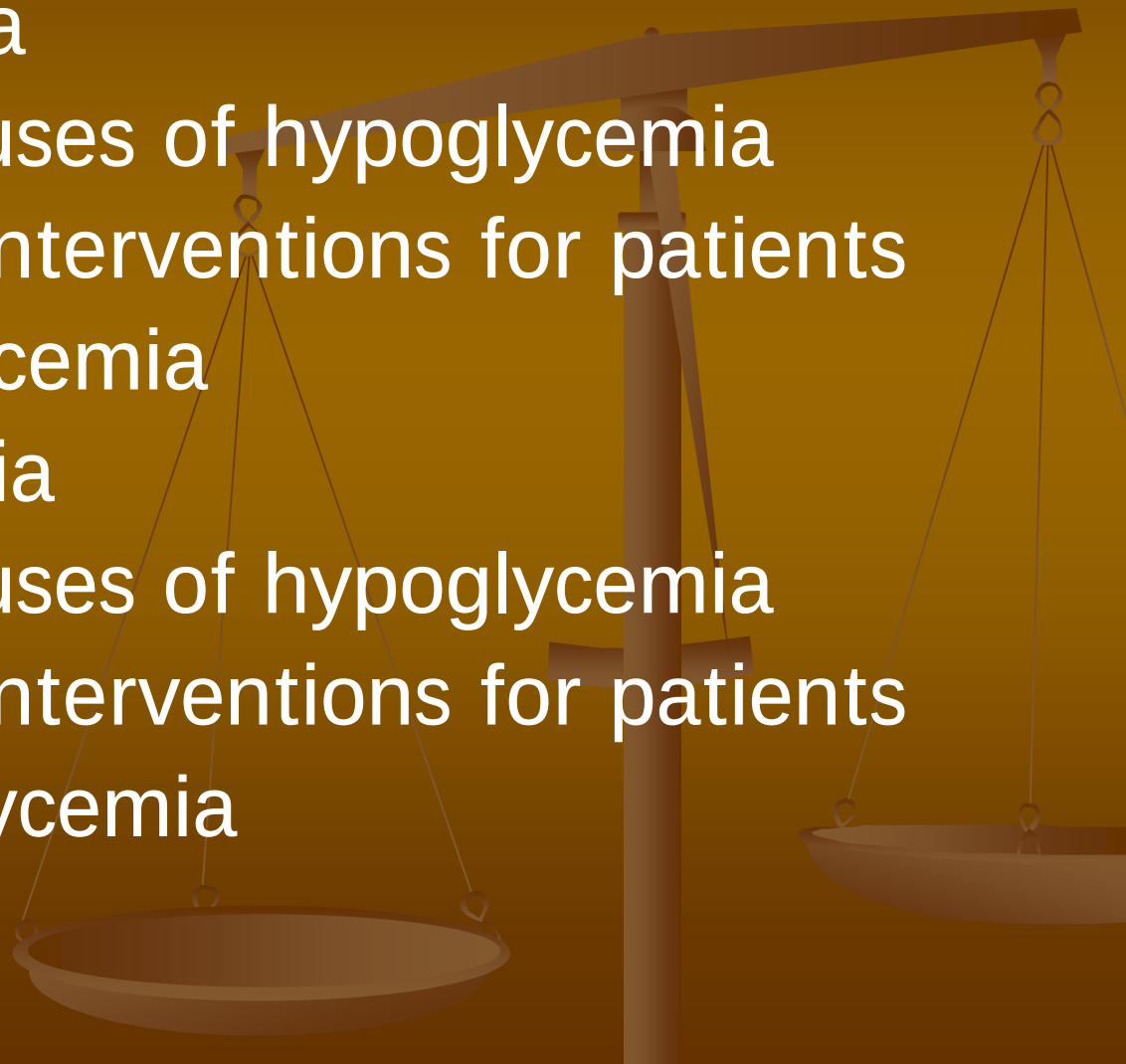
Self-Monitoring Diabetes



1. Recognize the advantages of blood glucose monitoring
2. The use of various types of monitoring in the management of diabetes

Complications of Diabetes

1. Hypoglycemia
   Common causes of hypoglycemia
2. Appropriate interventions for patients with hypoglycemia
3. Hyperglycemia
   Common causes of hypoglycemia
4. Appropriate interventions for patients with hyperglycemia



Long-Term Complications of Diabetes

Every complication of diabetes is circulatory. There is a direct relationship between the long-term elevation of blood glucose levels and some of the most serious complications of diabetes. But you are dealing with two types of circulatory distress, small vessel disease and large vessel disease.

Two major kinds of complications:

- **Macro** Angiopathy (large vessel disease) the heart, strokes, peripheral vascular disease
- Heart attacks
- In large vessel disease a formation of plaque in the large vessels that causes them to close down.

Long-Term Complications of Diabetes

- **Micro** Angiopathy (small vessel disease) the eyes, kidneys and neuropathy
- In small vessel disease, the little capillaries at the nerve endings become inflamed and engorged.
- Strokes
- Blindness
- Neuropathy, retinopathy and nephropathy

Resources for Diabetes

- **American Diabetes Association**
  1660 Duke Street, Alexandria,VA 22313
  Tel: (800) 232-3472
  www.diabetes.org
- **Joslin Diabetes Center**
  One Joslin Place, Boston, MA 02215
  Tel: (800) 344-4501
  www.joslinharvard.edu

Resources for Diabetes

- **Juvenile Diabetes Foundation International**
  120 Wall Street, New York, NY 10005
  Tel: (800) 223-1138
  www.jdf.org
- **American Heart Association**
  7272 Greenville Avenue, Box 45
  Dallas, TX 75231-4596
  Tel: (800) 242-8721
  www.americanheart.org