LESSON 8
INSULIN MODULE OBJECTIVES

CHAPTER 8 -INSULIN MODULE OBJECTIVES

8.1 Define and list the causes of two types of diabetes mellitus
8.2 Identify activities involved in the management of diabetes
8.3 List common signs and symptoms of hypoglycemia and hyperglycemia

8.4 Perform finger stick procedure for glucose monitoring

8.5 Administer insulin injection

PERFORMANCE OBJECTIVES

I. Demonstrate an understanding of the basic facts about diabetes by completing a written quiz with 80% accuracy.
2. Perform a finger-stick for glucose monitoring according to a rating sheet.
3. Administer an insulin injection according to a rating sheet.

KEY TERMS

- Diabetes
- glucagon
- hyperglycemia
- hypoglycemia
- insulin
- insulin pen
- ketones
- ketoacidosis
- subcutaneous

8. 1 Explain Basic Facts About Diabetes Mellitus

INTRODUCTION : Diabetes Mellitus is a complicated disease which is often misunderstood by clients and caregivers. Many assisted living residents are cognitively impaired and unable to fully participate in the management of their disease.

Unlicensed assistive personnel are the primary caregivers in ALFs and many of them also assume the responsibilities of Medication Aide.

Trainers of Medication Aides must take great care to present the facts about diabetes using a variety of teaching techniques, varied repetition, and reinforcing activities.

To insure safe diabetes management, Medication Aides must understand the role of insulin in the body, the signs and symptoms of hypoglycemia and hyperglycemia and how to perform a finger-stick to monitor blood glucose levels. Identifying types of insulin, accurate measurement of insulin and how to administer subcutaneous insulin injections should be carefully taught.

TOPICAL OUTLINE!

A. The purpose of insulin in the body

1. Insulin is a hormone produced after stimulation by food/meals.
2. Insulin is produced in special cells in the pancreas called beta cells.
3. Insulin allows glucose (the 'fuel' of the body) to enter the cells.

4. Without insulin, glucose, (which comes from the food we eat), nutrients is unable to enter the cells and the body's systems begin to deteriorate and will ultimately fail if untreated.

B. Diabetes

1 Diabetes is a metabolic disease of the endocrine system in which the body's ability to produce or use insulin is impaired.

The two most common types are Type 1 and Type 2.

2. Type 1 diabetes:

a. The body produces no insulin

b. Insulin-dependent (IDDM).

c. A person can develop Type 1 diabetes at any age but it typically develops before the age of 40.

d. Represents about 5% of all cases.

e. Continues throughout life

3. Type 2 diabetes

a. May or may not require insulin.

b. Typically develops after the age of 40 but can develop in the teen years.

c. In many clients the disease can be controlled with diet and exercise.

d. Represents 95% of all cases.

Cause(s) of Type I Diabetes:

a. Heredity
b. Physical injury to pancreas from accident or disease

Cause(s) of Type 2 Diabetes:

a. Obesity
b. Advanced age
c. Poor eating habits
d. Inactivity
e. Heredity

Symptoms of Diabetes Mellitus

1. Fatigue
2. Constipation or diarrhea
3. Numbness and tingling in the lower extremities (lower legs & feet)
4. Headache
5. The "3 P's":
   a. Polydipsia - increased thirst
   b. Polyphagia — increased hunger
   c. Polyuria — increased urination

6. Persistent elevated blood glucose levels.

8.2 Identify Activities Involved In The Management Of Diabetes

INTRODUCTION: Managing diabetes requires setting short-term and long-term goals for meal planning, medications, glucose monitoring and exercise.

It also requires setting long-term goals such as maintaining a target range for blood glucose, and regular physical and eye examinations.

Caregivers in ALFs play an important role in assisting the client with diabetes to achieve these goals and avoid complications of the disease.

A. Diet management

1. Create a meal plan with the HCP or diabetes educator for each individual.
2. Setting goals for therapeutic meal plan:
3. Control weight
4. Control blood glucose levels
5. Reduce the need for additional insulin

Exercise Plan

Design plan with HCP after health evaluation.

Must be in balance with meal plan and insulin regimen.

Goals of the exercise plan:

1. Maintain muscle tone and physical fitnes
2. Lower blood glucose levels
3. Increase sensitivity to medications
4. Control weight

C. Medication

1. Oral diabetes medications

Oral medications are not insulin. Drugs which lower blood glucose levels by encouraging the pancreas to produce and better utilize insulin.

Used to treat Type II Diabetes

Examples:

Orinase® (tolbutamide)

Tolinase® (tolazamide)

DiaBeta® (glyburide)

Glucophage® (metformin)

Avandia® (rosiglitazone maleate)

Actos® (pioglitazone hydrochloride)

2. Insulin injections make up for the body's inability to produce insulin. a. See chart on INSULINS below

Tolbutamide

Drug> An oral hypoglycemic agent (a prescription drug that people take to lower the level of glucose in the blood). The pills work for some people whose pancreas still makes some insulin. They can help the body in several ways, such as by causing the cells in the pancreas to release more insulin. (09 Oct 1997)

Tolazamide

An oral hypoglycemic agent (a prescription drug that people take to lower the level of glucose in the blood). The pills work for some people whose pancreas still makes some insulin. They can help the body in several ways, such as by causing the cells in the pancreas to release more insulin. (09 Oct 1997)

Glyburide

Drug: An oral hypoglycemic agent (a prescription drug that people take to lower the level of glucose in the blood). The pills work for some people whose pancreas still makes some insulin. They can help the body in several ways, such as by causing the cells in the pancreas to release more insulin.

Metformin

Metformin

Chemical=A hypoglycemic agent used in the treatment of non-insulin-dependent diabetes mellitus not responding to dietary modification.

Metformin improves glycemic control by improving insulin sensitivity and decreasing intestinal absorption of glucose.

INSULINS

Insulin Types	Onset	Peak (Hours)	Usual Effective Duration (Hours)	Usual Maximum Duration (Hours)
Rapid-Acting				
Humalog (insulin lispro)	< 15 minutes	0.5 – 1.5	2 – 4	4 – 6
NovoLog (insulin aspart)	5 – 10 minutes	1 – 3	3 – 5	4 – 6
Short-Acting				
Humulin R (regular) ✳ (U-100, U-500) Novolin R (regular) Novolin BR (Velosulin: regular buffered) ReliOn/Novolin R (regular)	0.5 – 1 hour	2 – 3	3 – 6	6 – 10
Intermediate-Acting				
Humulin L (lente)	3 – 4	4 – 12	12 – 18	16 – 20
Novolin L (lente) Humulin N (NPH) Novolin N (NPH) ReliOn/Novolin N (NPH)	2 – 4	4 – 10	10 – 16	14 – 18
Long-Acting				
Humulin U (ultralente)	6 – 10	—	18 – 20	20 – 24
Lantus (insulin glargine)	1.1 hours	—	24	24
Mixtures/Combination				
Humulin 50/50 (50% NPH, 50% regular)	30 minutes	3 – 5		24
Humulin 70/30 (70% NPH, 30% regular)	30 minutes	2 – 12		24
Humulog Mix 75/25 (75% insulin lispro Protamine suspension 25 % insulin lispro rDNA origin)	15 minutes	30 – 90 minutes		24
Novolin 70/30 (70% NPH, 30% regular) NovoLog Mix 70/30 (70% insulin aspart [rDNA origin] protamine suspension & insulin aspart [rDNA origin] injection) ReliOn/Novolin 70/30 (70% NPH, 30% regular)				

2. Insulin injections (continued)

b. Clients with Type I diabetes require insulin injections.

c. The client may take one type of insulin by injection or;

d. The client may take a mixture of two types of insulin. (See Objective 8.5 for instructions on mixing two types of insulin for injection.

3. What is BYETTA®?

a.BYETTA® is an injectable medicine used to improve blood sugar control in adults with Type 2 diabetes. It may be used with other oral diabetes medications.

b. BYETTA® is NOT a substitute for insulin in clients with diabetes that requires insulin treatment.

c. BYETTA® has not been studied for use in children.

NOTE: The dose may be made up of one or more blisters.

Do NOT use three 1-mg. blisters in place of one 3-mg blister because the client may receive too much insulin. Always follow the HCP orders exactly as written.

D. Blood-glucose monitoring

1. The main tool for monitoring blood glucose

2. Blood glucose monitoring tells how the body is responding to certain foods, activities, and medications.

3. Clients self-perform with a glucose meter or are assisted by the Medication Aide.

4. The goal of glucose monitoring is to maintain a consistent, normal blood-glucose level and to treat as needed.

5. More on glucose monitoring in Objective 8.4 of this chapter.

E. Ketone testing

1. Ketones are the by-product of the body's burning of fat instead of glucose for energy.

2. Occurs when there is not enough insulin available to use the glucose for energy.

3. If high blood glucose levels are left untreated, ketones can build-up in the blood and a serious condition called ketoacidosis may develop.
4. Ketone levels can be checked in urine samples using ketone testing strips.
5. Ketone test results:
a. If urine test indicates a 'trace' of ketone it may indicate that ketone buildup in the blood is starting..

Urine should be tested again in a few hours

b. If urine test indicates 'moderate' or 'large' amounts of ketones, this is a danger sign of ketoacidosis which can poison the body.

c. Report the presence of ketones in the urine to the client's HCP immediately!

F. Frequent office or phone visits with the HCP

1. Clients with diabetes should maintain close contact with his/her HCP.
2. The HCP should be contacted when there is any doubt about any aspect of treatment, or any change in the client's health.

3 List Common Signs And Symptoms Of Hyperglycemia and Hypoglycemia

INTRODUCTION : Living with diabetes means dealing with problems that go along with having the disease. One of these problems is abnormal blood-glucose levels.

It is important that the Medication Aide recognize the signs and symptoms of hyperglycemia and hypoglycemia to avoid serious complications such as insulin shock or ketoacidosis.

TOPICAL OUTLINE'

A. Hyperglycemia

1. Increased blood-glucose level (high blood-sugar).

2. Cause(s):

a. When the body has too little insulin or is unable to use insulin properly.

b. Over-eating or eating the wrong types of food (excess concentrated sweets).

c. Lack of exercise

d. Illness

e. Stress

3. Signs and symptoms of hyperglycemia

a. Increased thirst
b. Frequent urination
c. Hunger
d. Fatigue and/or unusually sleepy
e. Irritable
f. Frequent infections
g. Slow-healing cuts or sores
h. Increased blood-glucose

i. Increased ketones

j. Fruity smell to breath

k. If untreated: ketoacidosis is life threatening and can progress to death.

4. Treatment of hyperglycemia

a. Lower the blood-glucose level by:

- Exercise

If blood-glucose is over 240 mg/di, check urine for ketones (with order from physician)

- If ketones are present—DO NOT EXERCISE
- Decrease amount of food (especially non-complex carbohydrates)

B. Hypoglycemia (low blood glucose)

1. Cause(s)

a. Missing a meal

b. Too much exercise

c. Poor insulin management

2. There are three degrees of hypoglycemia and the treatment for each varies.

a. Mild hypoglycemia

1. Symptoms include

- shakiness
- sweating
- fast heart beat
- pale skin
- hunger

- 3. Treatment options (per order)
- 4 ounces of juice
- 4 ounces of regular (NOT diet) soda
- 2-3 glucose tablets
- 8 ounces of SKIM milk.
- Moderate hypoglycemia

2. Treatment

- Often requires a larger amount of glucose to recover per order.
- Offer the above treatment options, (see mild hypoglycemia), 15 minutes apart.
- Wait 30 minutes before resuming normal activities

c. Severe hypoglycemia - function begins to be impaired so that the assistance of another person is often necessary to prevent further progression.

1. Symptoms

n may include disoriented behavior or being unconscious

2. Treatment

- Is more of an urgent situation, requiring help from another person.
- Call 911 to insure back up assistance in the event the patient does not respond to treatment.
- If the person is unconscious (eyes are closed and is unable to respond) and cannot swallow, turn the patient on their side and give glucagon.

Do NOT attempt to give anything by mouth until the person is fully conscious.

C. Many HCPs ask their clients to report the following:

1. A severe low blood glucose level that requires treatment by another person.
2. Blood glucose levels that consistently run below 70-80 more than 2-3 times in a row.

3. More than one unexplained low blood glucose reaction in a week.
4. Blood glucose levels consistently higher than 300 (more than 2-3 days).
5. If the client is ill with symptoms of nausea, vomiting, diarrhea or fever.

8.4 Perform Finger Stick Procedure For Glucose Monitoring

TOPICAL OUTLINE'

Blood glucose monitoring

1. Measures how well the body is processing sugar.
2. Random blood glucose test measures the blood sugar without consideration of the last time food (meal, snack, or beverage with calories) was consumed.

a. Used by diabetics to determine if there is a need for food or insulin.

3. Fasting blood sugar tests measure the amount of glucose in the blood after not eating for 8 hour.
4. Blood glucose checks are recommended for:
a. persons taking insulin or oral drugs for diabetes

b. persons having difficulty controlling blood-glucose levels

c. Persons having low blood-glucose levels without warning signs ("hypoglycemic unawareness").

B. Supplies needed for finger-stick

1. Blood glucose meter — reads the blood sugar
2. Test strip — collects the blood sample
3. Lancet or small needle — fits into lancing device, pricks finger, and provides small drop of blood for glucose strip.

4. Lancing device — pricks finger when button is pressed. Most devices have dials to select the depths that the needle goes into the skin.

5. Alcohol wipes or soap and water — to clean fingers or other testing site.

6. Blood glucose meter user manual — provides information about use, cleaning and storage of the device.

B. Normal blood glucose ranges for adults.

Time Blood Glucose is Tested	Desirable Ranges
Fasting blood glucose before breakfast (Taken on an empty stomach and shows how well the body uses the long-acting insulin.)	**90 —130 mg/dl**
Pre-meal blood glucose before dinner & lunch (Show the effectiveness of the breakfast and lunch insulin doses).	**90 —130 mg/di**
Two hours after eating (Blood glucose peaks a few hours after eating. This reading shows if the insulin taken was enough to cover the carbohydrates eaten).	**Less than 180 mg/dl**
Just before bedtime (This is a target range. The client should not go to bed with blood glucose that is too low to avoid the risk of having a sever hypoglycemic episode during the night).	**110 - 150 mg/dl**

8.5 Administer or Assist the Client With Self-Administration of Insulin

INTRODUCTION : Most people with type I diabetes take insulin by injection. The goal is to mimic insulin-blood glucose action that occurs normally. The type of insulin therapy is individualized for each client and is based on age, weight, diet, exercise, and lifestyle choices.

TOPICAL OUTLINE]

A. General guidelines for administration of subcutaneous injections

1. Follow the "Five Rights" of medication administration.
2. Follow Standard Precaution procedures.
3. Select a syringe-needle unit that is appropriate for the medication.

4. Insulin syringe units must match the insulin type. a. U-100 syringes must be used with U-100 insulin.
5. Select the correct site for the injection using a subcutaneous injection site chart.

6. Prepare the client properly.
7. Clean the injection site with an alcohol swab.
8. Holding the syringe like a dart, (not a plunger), use a smooth, quick, dart-like motion to insert the needle into the client's skin.

9. Use the correct angel of insertion (45 to 90), for the injection.
10. Do NOT pull back on the plunger (aspirate) when administering insulin.
11. Inject the medication slowly into the client.
12. Remove the needle from the injection site with a quick, smooth motion.

13. Discard the syringe/needle unit immediately into a hard-walled (`sharps') container.
14. Observe the client for any signs of hypersensitivity.
15. Document on the medication administration record according to facility policy.

Note: Do not attempt to administer insulin injections until you have been supervised by) (at least 3 times) by a health care professional. Remember: When in Doubt…Don't!

B. Mixing two types of insulin

1. Rapid or short acting insulin may be ordered to be mixed with intermediate insulin. Long acting insulin is Lantus and CANNOT be mixed with any other insulin.

2. Steps in mixing two types of insulin:

a. Assemble needed supplies including appropriately sized insulin syringe.

b. Provide for client privacy & explain procedure

c. Verify medication order for accuracy on the MAR three times

d. Inspect both bottles of insulin for expiration date and condition of vials.

e. Insert needle into the clear bottle, inject the air then withdraw the prescribed number of units from the clear bottle.

f. Pull the needle from the clear bottle.
g. Push the needle into the cloudy bottle and pull the plunger back to withdraw the prescribed number of units.
h. Pull the needle out.
i. Mix the cloudy bottle by rolling between palms

j. Wipe the tops of both bottle stoppers with alcohol

k. Pull the plunger down to prescribed number of units for the cloudy bottle of insulin.

1. Push the needle into the cloudy bottle, inject the air then remove the syringe from the bottle.

m. Pull the plunger down to the prescribe number of units for the clear bottle of insulin.

n. Cleanse the injection site with and alcohol swab in a circular motion from inner to outer point of site and allow skin to dry.

o. Properly rotate injection sites.
p. Pinch approximately two inches of skin
q. Insert syringe quickly at a 45°-90° angle and release skin
r. Inject insulin into released skin
s. Immediately dispose of needle/syringe into a puncture-proof container.

t. Properly dispose of gloves and washes hands

u. Document correctly in MAR

C. The insulin pen.

1. Types of insulin pens:

a. Disposable pens which come pre-filled with insulin. The pen is discarded when the insulin is used.

b. Reusable pens are loaded with a new insulin cartridge when the old cartridge of insulin has expired or there is no more insulin in the cartridge.

c. Insulin pens are not all the same so it is very important to read and completely understand the operating instructions for the pen that the client chose.

D. Administering insulin using a insulin pen

1. Basic steps that are common to most models and types of pens are:

a. Remove the pen cap.

b. Check the insulin (amount and appearance)

c. Clean the injection site with an alcohol swab.

d. Attach the pen needle and remove both caps.

e. Prime the pen.
f. Dial the dose and inject.
g. Count 5 seconds before removing needle from the skin — insulin pens often need extra time to completely empty the full dose into the skin.
h. Remove the needle from the pen and dispose of properly. i. Replace the pen cover!

Note: The insulin pen user manual provides information about proper use and storage of the device. Do NOT attempt to use an insulin pen until you have been supervised by a health care professional.

Remember: When in Doubt...DON'T

LESSON 8
INSULIN MODULE
CLASS TEST/QUIZ

1. Glucagon is a hormone secreted by the pancreas and raises the blood glucose/sugar.

a. True
b. False

a. True

2.Hyperglycemia is one of the following:

a. Too high
b. Too low
c. In the therapeutic range
d. Critical

a. Too high

3. Hypoglycemia is one of the following:
a. Too high
b. Too low
c. In the therapeutic range
d. Critical

b. Too low

4. Insulin is a hormone that enables the body to metabolize and use glucose for energy.

a. True
b. False

b. False

5. Subcutaneous means beneath the skin and is where insulin is normally administered.

a. True

b. False

a. True

6. Type 1 Diabetes is usually an insulin-dependent situation.

a. True

b. False

a. True

7. Type 2 Diabetes is never insulin dependent.

a. True
b. False

b. False

8. The purpose of insulin in the body is to
a. allow the body to produce glucagon
b. allow the body to produce glucose
c. allow glucose to enter the body's cells
d. allow beta cells to produce glucose

c. allow glucose to enter the body's cells

9.Diabetes is usually caused by

a. eating foods with a lot of sugar
b. not eating enough sugar
c. the inability of the body to produce or use insulin
d. Failure of the kidneys to control the glucose in the urine

c. the inability of the body to produce or use insulin

10. When diabetes goes untreated, the blood glucose is:

a. usually normal
b. always increased
c. always decreased
d. sometimes increased, sometimes decreased

d. sometimes increased, sometimes decreased

11. In Type 1 Diabetes, the body

a. produce insulin in normal amount

b. produces little or no insulin

c. produces either not enough insulin but doesn't use it effectively

d. produces insulin but not glucose

b. produces little or no insulin

12. In Type 1 Diabetes, the body

a. may be unable to effectively use the insulin it produces
b. is unable to produce enough glucose
c. may produce some insulin but not enough
d. Both a and c

d. Both a and c

13. All of the following are important actions required to manage diabetes, EXCEPT

a. proper nutrition/meal planning

b. Exercise

c. high calorie/high sugar food

d. blood glucose monitoring

c. high calorie/high sugar food

14. Humulin-R (regular) is a long acting type of insulin.

a. True

b. False

False

15. The purpose of monitoring blood glucose levels in the client with diabetes include:

a. ensure blood glucose stays within normal limits

b. to determine a need for additional insulin

c. to determine Type 1 or Type 2 diabetes

d. a and b only

e. all of the above

d. a and b only

Blood glucose monitoring reveals individual patterns of **blood glucose** changes, and helps in the planning of meals, activities, and at what time of day to take medications. Also, testing allows for quick response to high **blood** sugar (hyperglycemia) or low **blood** sugar (Hypoglycemia)

16. Three main symptoms of diabetes are:

a. increased hunger, decreased thirst, increased urination

b. increased hunger, increased thirst, increased urination

c. decreased hunger, decreased thirst, decreased urination

d. decreased hunger, increased thirst, decreased urination

b. increased hunger, increased thirst, increased urination

17 When performing assisted blood glucose monitoring, it is acceptable to use the same fingerstick device on more than one resident.

a. True
b. False

b. False

24. Clients with Type 1 Diabetes require regular injections of insulin

True

False False

25. Clients who have Type 1 Diabetes should not exercise

True

False False

26. Excess weight is considered to be a contributing factor in Type 2 Diabetes

True True

False

27. Heredity is considered to be a contributing factor in both types of diabetes

a. True True
b. False

28. An individualized meal plan helps a diabetic control blood-glucose levels

a. True True
b. False

29. Foods high in fat and sugar are NOT likely to be found on a diabetic meal plan

a. True True
b. False

30.Exercise for a diabetic must be done consistently

a. True True

b. False

31. Premixed insulin contains both short-acting and intermediate acting insulin

a. True True

b. False

32. Hypoglycemia is a condition in which the blood glucose is very high.

a. True

b. False False

33. Hypoglycemia can occur when the insulin is high

a. True

b. False

34. Feeling sweaty, shaky , or lightheaded may indicate mild hyperglycemia

a. True

b. False False

35.Increased frequency of urination is a sign that may indicate hyperglycemia

a. True True

b. False.

36. Hyperglycemia is a condition in which the blood glucose is high.

a. True True

b. False