Lang - Doctor's In Training Lesson Plan -

Title: Intro to Diabetes Management
Authors: Elizabeth Seashore MD, Christie Gutierez MD, Chelsey Mitchell MD
Lesson Thread: Important Community Health Issues
Date of Presentation: 11/18/15

To the Presenter: *Please read through the lesson plan and make any notes prior to the session. Make yourself familiar with the practice problems that are a part of this lesson. Arrive 15 minutes before session begins to write out Lesson Objectives and Do Now Activity (see below) on whiteboard, and to lay out and organize all supplies.*

Please refer to the Teaching 101 Lesson on the Community Pediatrics Website prior to giving your lesson

Objectives: (have these written on the board before the lesson begins)

- LSWBAT (Lang Scholars Will Be Able To) # 1– explain the basic pathophysiology of the development and symptoms of diabetes (10 min)
- LSWBAT #2 – describe associated illnesses and consequences of undermanaged diabetes (10 min)
- LSWBAT # 3 – recognize signs and symptoms of diabetes (5 min)
- LSWBAT # 4 – learn about treatments used in the management of diabetes (15 min)
- ***LSWBAT #5 – Doctors in Training Skill*** – use the Calorie King website and apply correction factors to calculate insulin requirements for a typical teenager with Type 1 diabetes (35min)

Supplies:

1. Power Point presentation – HAS VISUAL AIDS BUT DOES NOT OUTLINE THE TEACHING SESSION, ONLY THIS LESSON PLAN DOES THAT
2. Practice Problem worksheets and answers
3. Calculators on computers
4. Computers with Internet access for students to work in pairs or independently
5. AV hookup with Internet access

Do Now (display on PowerPoint for students to complete as they walk in): **[SLIDE 2]**

- What do you know about diabetes? Do you know anyone with diabetes? What are their/your experiences?

Intro:

1) Always start lessons reviewing Lang Classroom Rules – **(2 mins)** **[SLIDE 3]**

Key Lang Rules to emphasize for this lesson are:
(*Feel free to ask scholars to share these rules to you!)*

a. **Excellence:** We are not satisfied with mediocrity. We strive for exceptional quality in our academics, professionalism, and service. We are hard workers who aim to go above and beyond what is expected of us.
b. **Innovation:** We are creative problem-solvers who think critically and devise out-of-the-box solutions.

c. **Teamwork:** We listen, help, share, participate, and communicate. Each of us contributes to a positive peer-support network that strives to help every member to reach common goals and aspirations.

2) Review your objectives for the lesson – **(1 min)**
3) Specifically state that the goal for the lesson, like all DIT lessons, is to learn a doctoring skill, point out your Doctoring skill **(1min)**

4) Solicit prior knowledge:

i. Review "Do Now" - ***Think/Pair/Share:***

a. Ask students to share with their neighbor what they wrote down.
b. Go around the room and have the partners share their stories
c. Organize the facts into a WORD WEB – "DIABETES" in center, branches organized as follows:
   - Basic Pathophysiology
   - Consequences of diabetes mismanagement
   - Signs & symptoms of diabetes
   - Treatments

d. You will refer back to this chart throughout the talk so don't erase!

ii. State that in med school we typically learn about the disease by understanding normal first, then pathophysiology, then signs and symptoms of a disease, then what happens when we don't treat it (both acute and chronic consequences), and then finally treatments.

<u>Communicating the new Knowledge…</u>
Using the Word Web on the board, systematically comment on the different categories in the following order:

****The following is plain language for the presenter. By no means is there an expectation for you to cover everything below****

1. **Objective #1 (10 min)**– Start with the **basic pathophysiology** branch. Fill in any major gaps as you go. Try to emphasize the following points **[SLIDES 4-7]:**

- DM is a problem with sugar metabolism.
- When we eat food, the food is turned into energy in the form of glucose. In order for glucose to get into muscle, brain and organ cells, it requires insulin. Insulin is like a key to open the door for glucose. Once glucose is in the cell, the cell can carry out its proper function.
- T1DM, no insulin is made (no key).
- T2DM insulin is made but the tissues are resistant (the key doesn't fit).
- When insulin is not there (T1DM) or the tissues are resistant (T2DM), sugar builds up in the blood, coats proteins so they don't work properly and then the tissues and organs that are starving for sugar don't function properly.

2. **Objective #2 (10 min):** Next, address **consequences and associated illnesses** – Comment on what is already there, fill in the gaps. Try to emphasize the following points: **[SLIDE 8]**

Consequences:

- Too much sugar in the blood → nerve damage, dehydration, weight loss
- Not enough sugar in the tissues → fatigue, alternative ways to produce energy → build up of acid in the blood → which can cause further complications→ diabetic ketoacidosis!

Associated illnesses :

- DKA, Blindness, peripheral nerve damage, renal failure, hypertension, high cholesterol, heart attacks and strokes. Some is causal, some is associated, all are important.

3. **Objective #3 (5 min)**– Next address **signs/symptoms** – Again fill in any major gaps or comment on what is already there. Try to emphasize the following points:

- Too much sugar in the blood → sugar in urine → more water out of your blood and into your urine → pee and drink all the time. **[SLIDE 9]**
- Too little sugar in the tissues → use stored fat for energy → weight loss.
- The byproducts of using fat as energy is acid and when too much acid builds up you can go into DKA which can present anywhere from feeling ill to a full-on coma! **[SLIDE 10]**

****NOTE: The goal of this lesson is not for kids to understand what DKA really is but to recognize there are both immediate and long term **severe** consequences to under or mismanagement of DM****

4. **Objective #4 (15 min)** – **Treatments** - Again fill in any major gaps or comment on what is already there. Try to emphasize the following points

- Today's focus is T1DM so we will talk about its treatment strategy.
- Insulin – via a self-injection. What you give depends on two things, 1) how high your sugar level is and 2) what you are planning to eat
- Patients with T1DM have to check their blood sugar around 4 times a day, sometimes even more!

Briefly explain the typical scenario for how a patient ends up on the medicine inpatient floor requiring management of their T1DM. (e.g. They come to the ER… They feel sick, tired, dehydrated, and perhaps even they are very sick because they are in DKA and need to go to the PICU first).

Once they are more stable, they come to the floor with an insulin dose calculation regimen that accounts for 1) What they eat and 2) What their blood glucose level is at the time it is checked.

Typically we check 4 times a day for blood glucose corrections and we always administer insulin when the patient eats meals or snacks.

i. Use a **Blood Glucose Correction Factor** of (DS – 150 / 50)
   - **Blood Glucose Correction Factor =** (Actual blood sugar – Target range) / Insulin sensitivity (how much 1 unit of insulin is expected to change your blood sugar)

   - The below practice problems are helpful in first practicing the math and second illustrating what the two calculations are used for.

Blood Glucose Correction Factor

Examples: (write on board)

(1) Blood sugar = **300**

300 (blood sugar) – **150** (target range)
50 (how much 1 unit insulin will change the patient's blood sugar) = **3** units

(2) Blood sugar = **345**
345 – 150 / 50 = **3.9** units

ii. Use a **Carb Correction Ratio** (1unit of insulin : 15 grams of carbs) – this is required because carbohydrates can raise blood glucose, and you want to correct for that before the patient eats so that the blood glucose does not go too high

Carb Correction Ratio

1 unit insulin for every 15 grams of carbohydrates eaten or 1 unit / 15 grams

***Examples (write on board)**:*

(1) 45 grams eaten (45 grams / 15 grams) x 1 unit = **3** units
(2) 68 grams eaten (68 grams / 15 grams) x 1 unit = **4.5** units

If the blood sugar is high and the patient is about to eat some carbohydrates, then you can do these calculations separately and add them together to figure out how much total insulin they will need.

Insulin Carbohydrate Ratio + Correction Factor

Example (write on board):

Carbohydrates:	Blood sugar
60 grams	335

Carb Correction: (60 grams/15 grams) x 1 unit= **4units**
Blood sugar correction: (335 – 150) = 150 / 50 = **3.7 units**

Total amount to be given = **3.7** units + **4** units = **7.7 units**

5. **Objective #5 – DOCTORING SKILL (35min):** Break up into small groups (one resident per group)

(8 min) Go to www.calorieking.com at a computer at your group's station and work through this problem with your group:

****Of note, you can search by brand names of foods, and you can adjust serving size. Fool around with the website before you try and demonstrate how to use it!*

****Exact dosages of insulin will end up varying based on type of foods selected on the website. Don't stress this!*

First model - Work through the following practice problem on the worksheet:

1. You are the overnight resident on call. For dinner, your new diabetic in room 403 is going to have a cheeseburger, a serving of boiled broccoli and 12 ounces of a sweetened Snapple Mango Madness. Her blood glucose level is 220.

a. How much insulin will you need to give for the carbohydrates she is about to eat? → Tally up grams of carbs using calorieking.com

-Cheeseburger – 33g
-Broccoli – 6g
-12 oz Snapple Mango Madness- 39g
-TOTAL = 78grams of carbs = 5.2 units

b. What is her blood glucose correction factor at this time?

-220-150/50 = 1.4 units

c. What is the total amount of insulin you plan to give? = 5.2 + 1.4 = 6.6 units

2. If you feel the group needs it, use this as a second example… It is 8am and your patient in room 408 has a blood glucose level of 280. He is about to eat 2 scrambled eggs, two dry pieces of white toast and an 8oz glass of sweetened orange juice.

a. How much insulin will you need to give for carbohydrates?

-2 scrambled eggs – 1.6g
-2 pieces of toast – 24g
-8 oz of sweetened Orange Juice – 27g
-TOTAL = 52.6g = 3.5 units

b. What is her blood glucose correction factor at this time?

-280-150/50 = 2.6 units

c. What is the total amount of insulin you will tell the nurse to give?

3.5 + 2.6 = 6.1 units

Worksheet problems (15 min): *After you go over the practice problem(s), the students in your group should work individually or in pairs to solve the other problems on the worksheet. Each group should be responsible for sharing the answer to one problem, so you can start at a different problem in each group. For example, all students in Group 1 start on problem 1, those in Group 2 start at problem 2, etc. After they finish the problem they are responsible for, they can attempt the other ones. 1-2 students from each group should be prepared to come to the board to explain how they got their answer.*

(12 min) Beginning with Group 1, ask the representatives from each group to come to the board to demonstrate how they calculated their answers.

<u>Conclusion: (5 mins)</u>

1. Summarize the lesson. (3mins) – Point towards word web and the practice problems to show what they have done. Solicit answers to the following questions:

- Are there foods that surprise you with how much or how little insulin you need to give? Which ones?

- *Much – Pancakes, whole wheat bread, syrup Little - veggies and proteins*

- If you gave insulin but the kid did not eat all he said he was going to eat. What are you concerned about? What do you think you should do?
  - *Her blood sugar may go very low. I'd give her a snack, juice, etc.*

2. Always leave time for student questions: (2mins)

IF TIME PERMITS, CAN DO A WRAP UP QUESTION: **[SLIDE 11]**
As you can see, treating diabetes is a lot of work! Not following and not understanding the treatment regimen is a big problem for teenagers.

a. Why do you think this is so hard for teenagers?
b. If you were the doctor, what would YOU do to address the fact that many teens don't understand how and why they are supposed to take their insulin? How would you keep them healthier?

Name:_____

Worksheet for Managing Hospitalized Type 1 Diabetics

Practice Problem:
You are the overnight resident on call. For dinner, your new diabetic in room 403 is going to have a cheeseburger, a serving of boiled broccoli and 12 ounces of a sweetened Snapple Mango Madness. Her blood glucose level is 220.

Cheeseburger:

Boiled broccoli:

Sweetened Snapple Mango Madness:

1. It is 9am. For breakfast your patient would like to have 3 pancakes, 2 ounces of maple syrup, a scrambled egg, 2 strips of bacon and a 6oz glass of apple juice. Her current blood glucose level is 300. What is the total amount of insulin you will give her before she has breakfast?

2. Your patient is now ready for lunch. It is 12:15pm. Her blood glucose level is 200. She is going to have a turkey sandwich on whole wheat bread, a bag of Nacho Cheese Doritos and a 12oz can of diet Coke. What is the total amount of insulin you will give her before she has lunch?

3. Its 3:30pm, your patient now wants a snack. Her blood glucose level is 260 and she is going to have a small bag of baby carrots and a bottle of Lipton 100% Natural Iced Tea with Lemon. What is the total amount of insulin you will give her before she has her snack? How would it be different if she had chosen Lipton Diet Lemon Iced Tea?

4. Its 7pm, your patient is going to eat dinner. Her blood glucose level is 210. She's going to have a slice of pepperoni pizza, a mixed vegetable tossed salad with 1 tablespoon of reduced fat ranch dressing, and a 8oz glass of 1% milk. How much insulin will you give?

WORKSHEET Answer Key:

1. 3 pancakes, 2 ounces of Maple syrup, a scrambled egg, 2 strips of bacon and a 6oz glass of apple juice. Her current blood glucose level is 300
    a. Carb Correction Ratio
        i. 3 Pancakes – 42g
        ii. 2 oz Maple Syrup – 48g
        iii. 1 Egg – 0g
        iv. 2 strips Bacon – 0g
        v. 6oz Apple Juice – 20g
        vi. TOTAL – 110g = 7.3 units insulin
    b. Blood Glucose Correction Factor – 300-150/50 = 3 units
    c. TOTAL = 7.3 + 3 = 10.3 units

2. Blood glucose level = 200. Turkey sandwich on whole wheat bread, a bag of Doritos – nacho cheese and a 12oz can of diet Coke
    a. Carb Correction Ratio
        i. Turkey sliced – 0g
        ii. 2 Slices whole wheat bread – 40g
        iii. Doritos – 17g
        iv. Diet coke – 0g
        v. Total – 57g = 3.8 units
    b. Blood Glucose correction factor – 200-150/50 = 1 unit
    c. TOTAL = 4.8

3. Blood glucose = 260. Baby carrots, Lipton 100% Natural Iced Tea with Lemon or Lipton Diet Lemon Iced Tea.
    a. Carb Correction Ratio
        i. Baby Carrots – 0g
        ii. 100% Natural Iced Tea with Lemon – 32.4g
        iii. Lipton Diet Lemon Iced Tea – 0g
        iv. Total – 32.4g = 2.16units
    b. Blood Glucose correction factor – 260-150/50 = 2.2 units
    c. TOTAL (with sweetened iced tea) – 2.16 +2.2 = 4.36 units ~4.4 units
    d. TOTAL (with diet iced tea) – 2.2 units ***This is a healthy snack!

4. Blood glucose level = 210. Slice of pepperoni pizza, mixed vegetable tossed salad with 1 tablespoon of ranch dressing, 8oz glass of 1% milk.
    a. Carb Correction Ratio
        i. Slice of pepperoni pizza – 34g
        ii. Mixed vegetable tossed salad – 3.3g
        iii. Ranch dressing – 3.2g
        iv. Glass of 1% milk – 12.2g
        v. Total – 52.7g = 3.5 units
    b. Blood Glucose correction factor – 210-150/50 = 1.2 units
    c. TOTAL = 4.7