School Nurses on the Front Line in the Diabetes Epidemic Part 1: Diabetes Overview

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Faculty

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Objectives

- Understand the differences between type 1 and type 2 diabetes and correctly identify the different treatment modalities for each
- Note the specific characteristics of different insulin types and the administration of each

Objectives

- Correctly calculate dosages of insulin to be administered using Insulin: CHO ratio, correction factor and sliding scale

Diabetes Facts

- Diabetes Mellitus is a long-term health condition in which the body does not use sugar in the blood, as it should, for body fuel
- The following are the two most common forms of diabetes
  - Type 1
  - Type 2

Diabetes Facts

- Type 1
  - Your pancreas makes little or no insulin
    - This means that the sugar in your blood cannot be used and high blood sugar happens
    - High blood sugar robs your energy and starves your body

Diabetes Facts

- Type 2
  - Your pancreas makes enough insulin your body cells cannot use the insulin as it should
  - Since your supply of sugar cannot be used, high blood sugar happens

Diabetes Facts

- Type 1
  - Happens in children and young adults
- Type 2
  - Much more common than type 1
  - Happens in more people that are 40 years old or older
  - Now also happening in children, teenagers, and young adults

Diabetes Facts

- Type 1
  - Caused by problems with your body's self-defense system (auto-immune)
  - The cells in the pancreas that make insulin are damaged and destroyed
- Type 2
  - Often caused by being overweight and not getting enough exercise

Diabetes Facts

- Type 1
  - You and all people with type 1 diabetes must take shots of insulin
  - Insulin, healthy eating, and exercise will lower your blood sugar

Diabetes Facts

- Type 2
  - Healthy eating, exercise, and weight loss may help to lower your blood sugar
  - If these things do NOT work you may need one or more types of diabetes pills and/or shots of insulin

Type 1 – Insulin Dependent Diabetes Mellitus

- According to the American Diabetes Association (ADA) 1 in every 500-600 children have type 1 diabetes
- Patient volume at Children's Health System
  - 231 newly diagnosed cases in 2008
  - 3261 outpatients seen with type 1

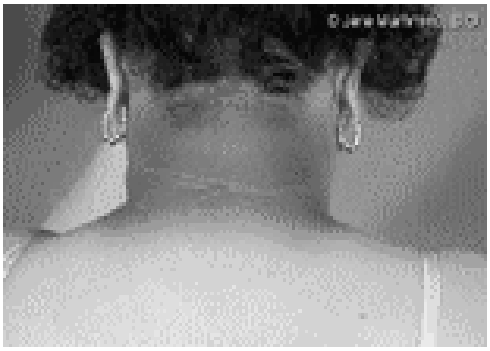
Type 2 Diabetes

- There are no current statistics regarding type 2 diabetes in the <20 yr age group
- It is noted by the ADA that 1 in 6 overweight children have pre-diabetes
  - The pre-cursor to type 2

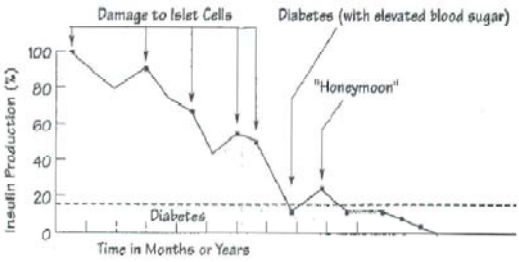
Type 2 Diabetes

- Here at CHS
  - 48 new cases of type 2 were diagnosed last year
  - This is up from 16 in 2002
  - 393 outpatients seen with type 2
  - 166 cases of pre-diabetes in 2008

Acanthosis Nigricans



The Gradual Onset of Diabetes



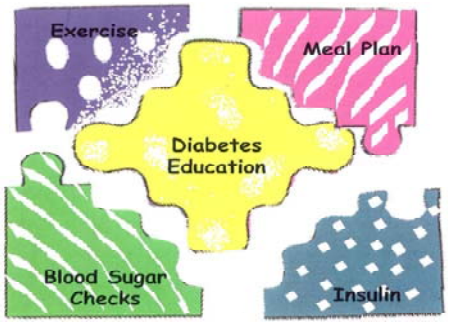
Question

- Is it possible for a child to go into honeymoon and be "cured" of diabetes?

Answer

- Honeymoon is not a cure for diabetes
  - Although a patient's insulin requirement may be so little that they receive no insulin, they are not cured of the disease at this time
  - Eventually the need for insulin will return and they will be dependent on insulin for survival

What Pieces Are Needed to Manage Diabetes?



Management Skills for the Diabetic Patient

- There is currently no cure for diabetes
- Diabetes is managed, <u>but it does not go away</u>
- It is essential that we teach patients good management skills early

Management Skills for the Diabetic Patient

- Blood glucose monitoring is a MUST
- A logbook is necessary for modifying insulin dosages

Monitoring

- STEPS
  - Wash (with soap and water) and DRY your hands
    - Using warm water may help the blood flow
  - Obtain a drop of blood
    - Shaking the hands below the wrist or gently squeezing the finger a few times may help

Monitoring

- Apply the drop to the strip
- View the test result within a few seconds
- Discard the lancet properly in designated sharp container

Monitoring

- Don't test on the same finger all the time
- Choose a different finger each time you check

  - Prick the side of the fingertip, not right on top
  - The side hurts less and is less likely to bruise

When to Monitor

- Before all meals and at bedtime
- Anytime signs and symptoms of lows or highs occur
- More frequent testing may be required during times of illness, stress, menstrual cycle or other circumstances such as being on steroid medications

Target Ranges

- Toddlers and preschoolers (<6yr)
  - 100-180 before meals
  - 110-180 before bedtime
- School age (6-12 yr)
  - 80-180 before meals
  - 100 – 180 before bedtime

Target Ranges

- Adolescents/young adults (13-19 yr)
  - 80-130 before meals
  - 80-150 before bedtime

Pattern Management

- Example: #1

	Breakfast	Lunch	Dinner	Bedtime
June 20	109	**211**	134	153
June 21	143	**262**	105	179
June 22	98	**303**	146	152
June 23	160	**237**	202	142
June 24	201	**325**	176	186

Pattern Management

- Example: # 2
  - The pattern is difficult to see when not laid out in the appropriate format.
  - Can you see the pattern?

EXAMPLE: #2

20-Jun	7:09	109
	11:42	211
	5:20	134
	9:30	156
21-Jun	7:15	143
	11:45	262
	5:30	105
	9:00	179
22-Jun	7:00	98
	11:30	303
	5:25	146
	9:25	152
23-Jun	7:15	160
	11:44	237
	5:22	202
	9:27	142

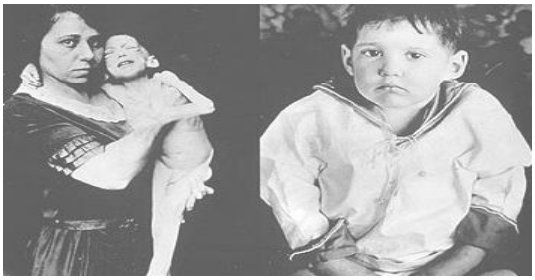
Discovery of Insulin

- One of the greatest medical breakthroughs of the 20th century
- Working at a University of Toronto laboratory, Frederick Banting and Charles Best were able to make a pancreatic extract which had anti-diabetic characteristics

Discovery of Insulin

- **Banting and Best with the first dog to receive insulin, 1921**

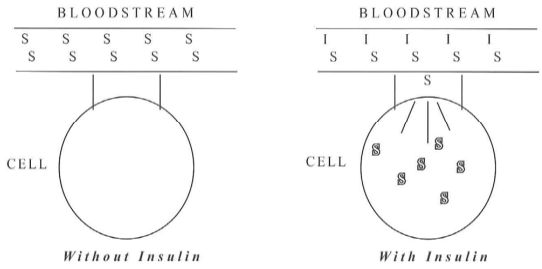
Before the Discovery of Insulin a Diagnosis of Diabetes Meant Certain Death



What is Insulin?

- **When there is not enough insulin to allow sugar to be burned for energy, body fat is broken down and used for an energy source**

What is Insulin?



Ketones

- **Ketones appear in the blood and urine when the body burns fat for energy**
- **Ketone testing is EXTREMELY important**
- **If ketones are not found early, they can build up in the body and ketoacidosis (DKA) will result**

What to Know About Ketones

Check ketones at the following times:

1. When your blood sugar is more than 300 or if two readings in a row exceed 240.
2. On sick days (including vomiting).

Follow these steps to check ketones:

1. Pass your urine in a clean container. Dip the pad of the strip into your urine and quickly remove. Begin timing (you may also pass the pad of the strip through a stream of urine).

2. After exactly 15 seconds, compare the pad of the strip to the color chart on the side of the bottle of ketone strips.

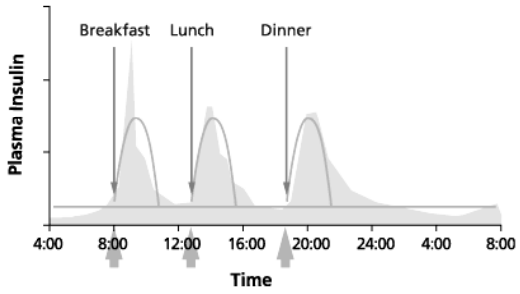
Do the following if you have ketones:
1. Drink lots of sugar-free liquids (no caffeine).
2. Call the diabetes doctor if ketones are moderate to large.
3. Keep checking for ketones until there are none present.

** Ketostix expires (vial = six months after vial opened / foil-wrapped = expiration dated printed on wrapper).

What are the Different Types of Insulin

	Starts Working	Works Hardest	Lasts
Fastest Acting: Novolog/Humalog and Apidra (clear)	10-15 minutes	½ - 1 ½ hours	4-6 hours
Fast Acting: Regular (clear)	30-60 minutes	2-3 hours	6-8 hours
Slower Acting: NPH (cloudy)	2-4 hours	6-10 hours	14-18 hours
Slowest Acting: Lantus and Levimir (clear)	1.1 hours		24 + hours

Basal/Bolus Insulin



Insulin Administration

- It is very important that insulin be given on time
  - This is crucial for blood glucose control
- Insulin times
  - Breakfast
  - Lunch
  - Dinner

Insulin Administration

- Regular
  - Insulin is usually given 30 minutes before meals
- NOVOLONG/HUMALOG/APIDRA
  - Insulin is usually given 5-15 minutes before meals

Insulin Administration

- In younger children
  - Novolog/Humalog/Apidra may be given after meals
    - You must have a MD order for this

Where Should Insulin be Kept?

- Open vials of insulin can be kept in the refrigerator or at room temperature
- The vial must be kept at a temperature not greater than 86° Fahrenheit
- Shield away direct light and heat

Where Should Insulin be Kept?

- Cold insulin stings!
  - If administering insulin straight from the fridge allow it to warm to room temperature before giving

How Long Is Insulin Good?

- Once an insulin bottle is opened, it is safe to use for 28-30 days (1 month) ONLY
- Once an insulin cartridge (for an insulin pen) is opened, its time limit for use depends on the type of insulin cartridge

How Long Is Insulin Good?

- Novolog, Humalog, Apidra & Regular
  - 28 days
- NPH
  - 14 days
- Premixed 70/30 & 75/25
  - 10 days
- Novolog Mix 70/30 pens
  - 14 days

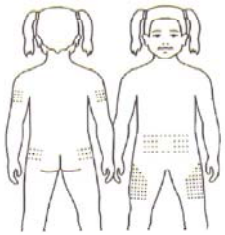
Insulin Syringes

- Insulin syringes come in the following sizes
  - 1/4cc = 25 units (each mark = 1 unit)
  - 3/10cc = 30 units (each mark = 1 unit)
  - 3/10 = 30 units (each mark = ½ units)
  - ½ cc = 50 units (each mark = 1 unit)
  - 1 cc = 100 units (each mark = 2 units)

Insulin Syringes

- All insulin syringes come in short and regular lengths
  - The needle should be appropriate to the child's size

Where Can Insulin be Given?



- The best places are the stomach, arms, thighs, and hips
- Give in different locations within the same site
- Rotate sites daily

Correction Factor

- Correction Factor is used to correct a high blood sugar
- Each child will have a Correction Factor specific to their insulin sensitivity

Correction Factor

- Example
  - Correction Factor = Blood sugar 150/ 50
  - Blood sugar = 300
    - 300-150= 150
    - 150 / 50 = 3

* 3 units of short-acting insulin are to be administered as a correction

Insulin Administration

- Only rapid acting insulins such as Novolog, Humalog, or Apidra are to be used to correct a high blood sugar
  - Correction may be used every 3 hours

Insulin Administration

- Example
  - Correction Factor (blood sugar – 150/50) = amount of insulin to be given

Insulin Administration

- If blood sugar 250 then
  - 250-150=100, 100/50= 2 units of Novolog, Humalog or Apidra to be given

* Never use Lantus, Levimir, or NPH to correct a high blood sugar

Insulin to Carbohydrate Ratio

- Unit per carb ratio = Give 1 unit of Novolog per 15 grams of carbohydrates (I:CHO ratio)
- Correction factor = Blood sugar – 150 / 50

Insulin to Carbohydrate Ratio

- **Example 1**
  - **Breakfast: 60 grams for meal**
    350 AM fasting blood sugar
  - **Calculation: 60grams/15 = 4 units (meal)**

$$350 - 150 = \frac{200}{50} = 4 \text{ units}$$

Total = 8 units of Novolog

- **May have intermediate or long acting insulin also ordered**

Scenario

Shelby comes to the nurse's office to have her blood sugar checked at 10:15 am. Upon checking, her glucose reading is 357. Shelby eats lunch at 11:45 am. She did not receive a correction dose at breakfast this morning. What should you as the nurse do?

Scenario

Shelby should receive a correction factor dose now and then receive her lunch dose at her meal. However, due to the fact that she has already received a correction dose, if she is high at lunch she may not receive another correction dose. There must be 3 hours between correction doses.

Questions?