Insulin A to Z

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What is Insulin?

- Insulin is a hormone produced by the pancreas

What is insulin's job?

- When you eat, some of the food (carbohydrates) is broken down into sugar (glucose). Sugar travels in your blood to all your body's cells.
- Insulin is the key that unlocks those cells to help the sugar move into the cells where it is needed for energy.
- Insulin lowers your blood sugar by moving the sugar into the cells.

What is the difference between Type 1 & Type 2 diabetes?

- Type 1 comes on rapidly due possibly to a virus that attacks the immune system, causing destruction of the beta cells in the pancreas.
- Patients with Type 1 diabetes are started on insulin immediately.

Type 2 diabetes

- We see a gradual resistance to insulin, resulting in the pancreas having to work harder to produce more insulin in order to bring blood sugar levels down.
- This results in failure of the pancreas to keep up with the need for insulin production and wearing out the beta cells that produce the insulin.

What can prevent insulin from doing it's job?

- The pancreas may not be making enough insulin
- The muscle cells have become resistant to the insulin the body makes
- The liver may be releasing too much sugar into the bloodstream

How long has insulin been around?

- Insulin was discovered in the early 1920's by Frederick Banting & Charles Best

- Michael Bliss wrote in his book <u>The Discovery of Insulin</u>, "Those who watched the first starved diabetic receive insulin and return to life saw one of the genuine miracles of modern medicine."

How is insulin made?

- The first insulins were harvested from rabbits and pigs.
- Since 1980, most insulin has been produced using genetically modified bacteria or yeast. Human DNA is introduced into the bacteria or yeast's genetic code, causing it to produce insulin.

Changes in insulin injections over the years

- Glass syringes and needles that required sharpening have been replaced by disposable syringes & needles
- The size of needles has changed.
- Injection techniques have changed.

What are the barriers to starting insulin?

- Patient Barriers
- Physician Barriers
- Healthcare System Barriers

Patient Barriers

- Myth-based fear of insulin
- Fear of low blood sugar (hypoglycemia)
- Concern about weight gain
- Fear of needles and pain
- Self-blame
- Time consuming
- Travel issues
- Poor memory
- Visual/hearing/dexterity issues
- Learning difficulties or low literacy

Provider Barriers

- Perceived patient resistance
- Patient's adherence behavior
- Belief that patient's improved status negates need to start insulin
- Concerns about adverse effects (hypoglycemia; weight gain)
- Provider time constraints (instruction; dose titration)
- Lack of resources to insure patient is adhering to instructions

Healthcare System Barriers

- Overburdened workload among physicians
- Access to education
- Limited training of providers in injection techniques
- Underutilization of resources
- Reimbursement issues
- Poor follow-up system

Types of Insulin

- Basal (Background)Insulin
- Bolus (Mealtime) Insulin

Basal Insulin

- Steady and long acting insulin that works between meals & throughout the night
- Most commonly taken at bedtime
- Lantus, Levemir, Toujeo
- NPH ("kind of")

Bolus (Mealtime) Insulin

- Rapid burst of insulin that works to match food intake (bolus dose) or lower high blood sugar (correction dose)
- Novolog, Humalog, Apidra, Afreeza – rapid acting insulins
- Humulin R, Novolin R – short acting insulins

Benefits of basal-bolus therapy

- It allows for greater flexibility throughout the day
- Meals do not have to be eaten at the same time every day
- The mealtime bolus of insulin can be taken prior to meals, whenever those meals are scheduled

How to Measure if Your Insulin is Working

- *Check your blood sugar 4 times a day
- *Check before meals and at bedtime
- *Write your numbers in a log book, on a blood glucose journal sheet, or on a calendar

Know your blood sugar goals

- *Before breakfast: 80 – 120
- *Before lunch & dinner: 90 – 130
- * 2 hours after the start of any meal: 160 or lower
- *At bedtime: 110-150

Know When to call your Doctor

- *Call if you blood sugar is below 70 and does not raise with quick treatment for hypoglycemia
- *Call if blood sugar 250 or higher when checked twice in 24 hours.
- *Call if you are unsure what to do

Low Blood Sugar (less than 70)

- Check your blood sugar if you feel:
  - Weak, shaky, sweaty or clammy, dizzy or lightheaded, irritable, confused, nervous or anxious, have a headache, have a fast heart beat, or are unable to concentrate.
  - Some people don't get early warning signs of a low. This is called "hypoglycemic unawareness".

Treating Low blood sugar

Eat or drink a 15 gram quick acting carbohydrate such as:

- 4 ounces of juice
- 6 ounces of regular soda (not diet)
- 4 glucose tablets

- Wait 15 minutes, then check again
- If still below 70, retreat. If it will be longer than 1 hour until it is time for your meal, have a 15 gram carbohydrate snack that includes protein.

Prevent low blood sugar

Check your blood sugar regularly with your meter. You should also test your blood:

when you change the dose of insulin or start another diabetes medication

before driving a car or operating heavy machinery

before and after exercise

IMPORTANT

- ALWAYS carry enough carbohydrates to treat a low (glucose tablets, Skittles, Juicy Juice)
- Try to figure out why you went low
- Let your doctor know if you experience frequent low blood sugars. He may have to adjust your medication.

Common Injection Issues

- 1. Insulin drips from needle
- 2. Insulin leaks from injection site
- 3. Bubbles in syringe or pen
- 4. Pen or syringe becomes clogged
- 5. Difficulty seeing marks or lines on syringe
- 6. Pain with injection
- 7 . Skin problems

Tips for Choosing Your Injection Sites

- Use your abdomen, arms, thighs or buttocks
- Change your sites regularly
- Avoid your navel and 2 inches around it; avoid scars, moles
- Watch out for skin changes

Factors that Affect Insulin Absorption

- These speed up absorption:

- Injecting into abdomen or arms
- Injecting into an exercised arm or leg
- Applying heat
- Taking smaller doses of insulin
- Massaging the area or injection

- These <u>slow down</u> absorption:

- Injecting NPH or Regular insulin into thighs or buttocks
- Injecting into scarred or lumpy tissue
- Applying a cold compress
- Taking larger doses of insulin
- Smoking

Injections Shouldn't Hurt!

- Let alcohol dry before injecting into the site
- Inject insulin at room temperature
- Do not re-use needles
- Use a thin enough needle
- Do not tense up before injecting
- Do not inject into a muscle

Skin Problems at Injection Sites

- Bruising
- Lipoatrophy (Pitting of the skin)
- Lipohypertrophy (Build up of fat)

TRUE or FALSE?

- Insulin is injected into the fatty layer right below the skin.

- TRUE

- The more you weigh, the thicker your skin.

- FALSE

- Older people have thinner skin than younger people.

- FALSE

- Most people can use the shorter length pen needles.

- TRUE

- You don’t have to “pinch up” when using short needles.

- TRUE

Syringe and Needle Disposal

- Syringe and pen needles are designed for one-time use.
- Safely dispose of needles:
  - Check with local or state health department
    - Do not recap or break needles
    - Do NOT label as "needles"
    - Do NOT put in recycle bins

Storage of Insulin

- Different insulins have varying lengths of stability .
- Check the informational material that comes with your insulin and do not use the insulin beyond the time allowed, due to deterioration and possible bacterial contamination of the medication.

Insulin Delivery Methods

- Vials
- Pens
- Insulin Pump
- Inhaled insulin
- Insulin patch

- http://www.personaltechmd.com/videos/2015/07/how-a-smart-patch-could-replace-insulin-injections.aspx?cmpid=EM