Insulin Pump Management and Continuous Glucose Monitoring Systems (CGMS)

Faith Daily, RN, BSN, CDE, CPT
Certified Diabetes Educator/Insulin Pump Trainer
August 16, 2014
Why Pump Therapy?

- Mimics normal insulin secretion
- Provides a continuous baseline level versus long acting insulin that slowly weans out
- No peaks or valleys
- Insulin is given every time you eat or have a high blood sugar
- Improved Quality of Life
Insulin Pumps

Before

Now
What is the Insulin Pump?

- Beeper-sized machine
- Many communicate with glucometer
- Delivers rapid-acting insulin ONLY
  - Novolog
  - Humalog
  - Apidra
FDA Approved Insulin Pumps

- Medtronic Revel
- Animas Ping
- Insulet-Omnipod
- Tandem T:Slim
How Pump Therapy Works
Pump Gives Insulin in Two Ways

- **Basal rate:** Covers basic metabolic needs. An hourly rate of insulin delivered to replace the basal insulin you were once taking such as NPH, Lantus or Levemir.

- **Bolus rate:** Covers food and high blood sugars. A dose is given EVERY TIME you eat any carbs AND/OR have a high blood sugar that requires insulin. Delivered just as if you were taking a shot of Humalog, Novolog or Apidra.
What are some potential advantages of the pump?

- Fewer injections
- Flexibility
- Precision
- Individualization
- Better A1C
- Prevention of complications

- Less hypoglycemia
- Being like other kids
- Trigger foods
- School days
- Control during illness
- Picky eating
- Information storage
What are some potential disadvantages of the pump?

- Cost
- Attachment – cannot disconnect for more than 1 hour without checking BG levels.
- Testing basal rates
- Risk of DKA

- Risk of infection
- Fear of insertion
- Skin irritation
- Frequent blood sugar testing
Insulin Pump System

- **Insulin reservoir**
  A large syringe filled with rapid-acting insulin that delivers insulin from the pump through a thin plastic tubing into the infusion set.
How does the pump deliver a bolus?

- The pump is programmed with:
  - Insulin to Carbohydrate Ratio
  - Correction Factor/Sensitivity Factor

- Bolus by entering carbs and blood sugar into the pump.

- The pump will calculate how much insulin to bolus.

- Each pump can be set to alert you if there is still insulin working from a previous bolus. This is called “insulin on board” or “active insulin”.
Animas Ping insulin pump using EZCarb feature.
Patients change reservoirs and infusion sets every 2-to-3 days.

- a. Patients use a Serter™ device to place the infusion set.
- b. The set's cannula sits just beneath the skin.
- c. The user can disconnect at any time.
Infusion set
- Delivers insulin from pump to you
- Some can be injected with an inserter device
- Needs to be changed every 2-3 days
3 Types:
- Angled (30° entry) with flexible cannula
- Straight (90° entry) with flexible cannula
- Metal needle
Examples of Infusion Sites

Abdomen

Anterior thigh

Upper arm

Upper hip

Medial thigh
Continuous Glucose Monitors (CGM)
Understanding CGM & Glucose Readings

- The **Blood Glucose Meter** measures glucose in the **blood**.
- The **Sensor** measures glucose in the fluid surrounding the cell in the tissue, which is called **interstitial fluid**.
- Glucose travels throughout the interstitial fluid. Sensor may read different levels of glucose.
- Meter and sensor readings will be close.
- Advised to do a fingerstick before reacting to the sensor reading.
Point in time blood sugar checking vs. CGM

Even patients with acceptable A1C levels can experience glycemic variability\textsuperscript{1,2}

![Graph showing glucose levels over time with various events indicated.]
Why Use Continuous Glucose Monitoring?

- Low blood glucose alarms set by user.
- High blood glucose alarms set by user.
- Alerts to possible need to check for ketones.
- Alerts to wide blood glucose fluctuations.
- Assists user in behavior modification.
- Improves diabetes management.
Why Use Continuous Monitoring

Examples:

- Detects if the blood sugar is already decreasing before exercise or activity.
- Indicates if you are responding to low blood sugar treatment.
- Shows the stability or instability of blood sugars at school before walking home or getting on the bus.
How many CGM’s are there?

2 types

- Clinic only device
  - Ipro

- Patient home use device
  - Dexcom G4
  - Medtronic Guardian
  - Medtronic Real-Time
  - Medtronic 530G
Cgm: Home Use Options

- If you want a CGM that displays data on a separate device:
  - Dexcom G4
  - Medtronic Guardian

- If you want a CGM that displays data on a pump:
  - Medtronic Real-Time
  - Medtronic 530G

- If you want a CGM that displays data on a pump and shuts off insulin when glucose goes low:
  - Medtronic 530G
CJM Systems

**Medtronic**
- Communicates to Medtronic insulin pump
- Frequency of real time every 5 minutes
- 3 or 6 day wear
- Receiver (Pump) & Transmitter communicate within 6 feet
  
  www.minimed.com

**Dexcom**
- Frequency of real time every 5 minutes
- 7 day wear
- Receiver & Transmitter communicate within 20 feet
  
  www.dexcom.com
Sensors

Medtronic

Dexcom
Transmitters

DexCom

Medtronic
Receiver or Monitor

DexCom

Medtronic
Software Component for families
Generates reports, graphs, and charts
Some Smiling Pumpers