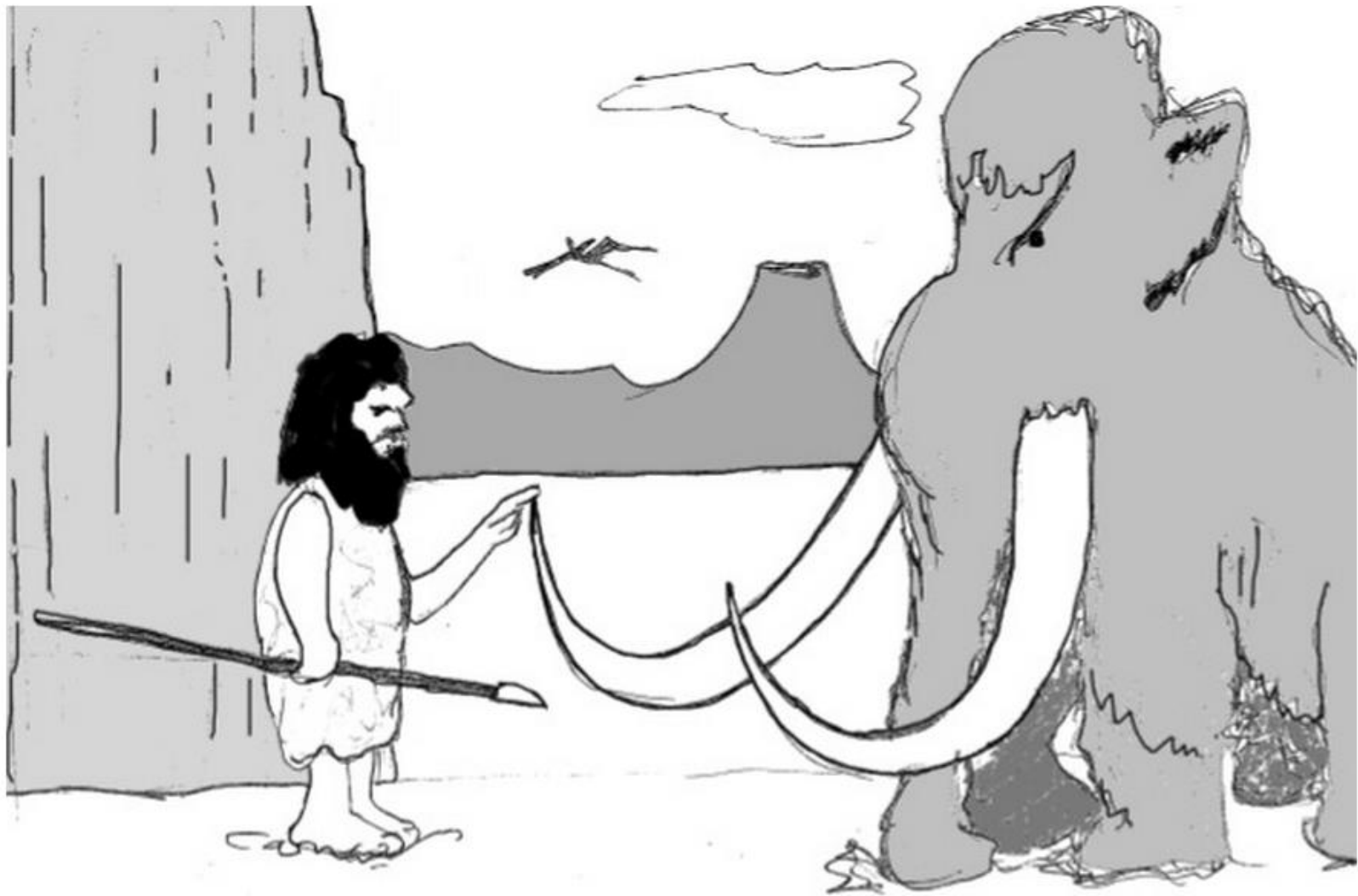

Insulin Pump Therapy

WakeMed Children's Endocrinology & Diabetes





HISTORY OF DIABETES - EARLY LANCETS

Overview

- ▶ What is an insulin pump?
- ▶ What are the advantages and disadvantages of an insulin pump?
- ▶ Lifestyle Changes
 - ▶ Food Management
 - ▶ Exercise
 - ▶ Psychological Issues
- ▶ Are you ready for an insulin pump?
 - ▶ Readiness
 - ▶ Responsibilities of Patient and Parents
- ▶ Researching and Picking A Pump
 - ▶ Insulin Pump Basics
- ▶ Know Your Resources



"I pump iron. What do you pump?"

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What is an insulin pump?

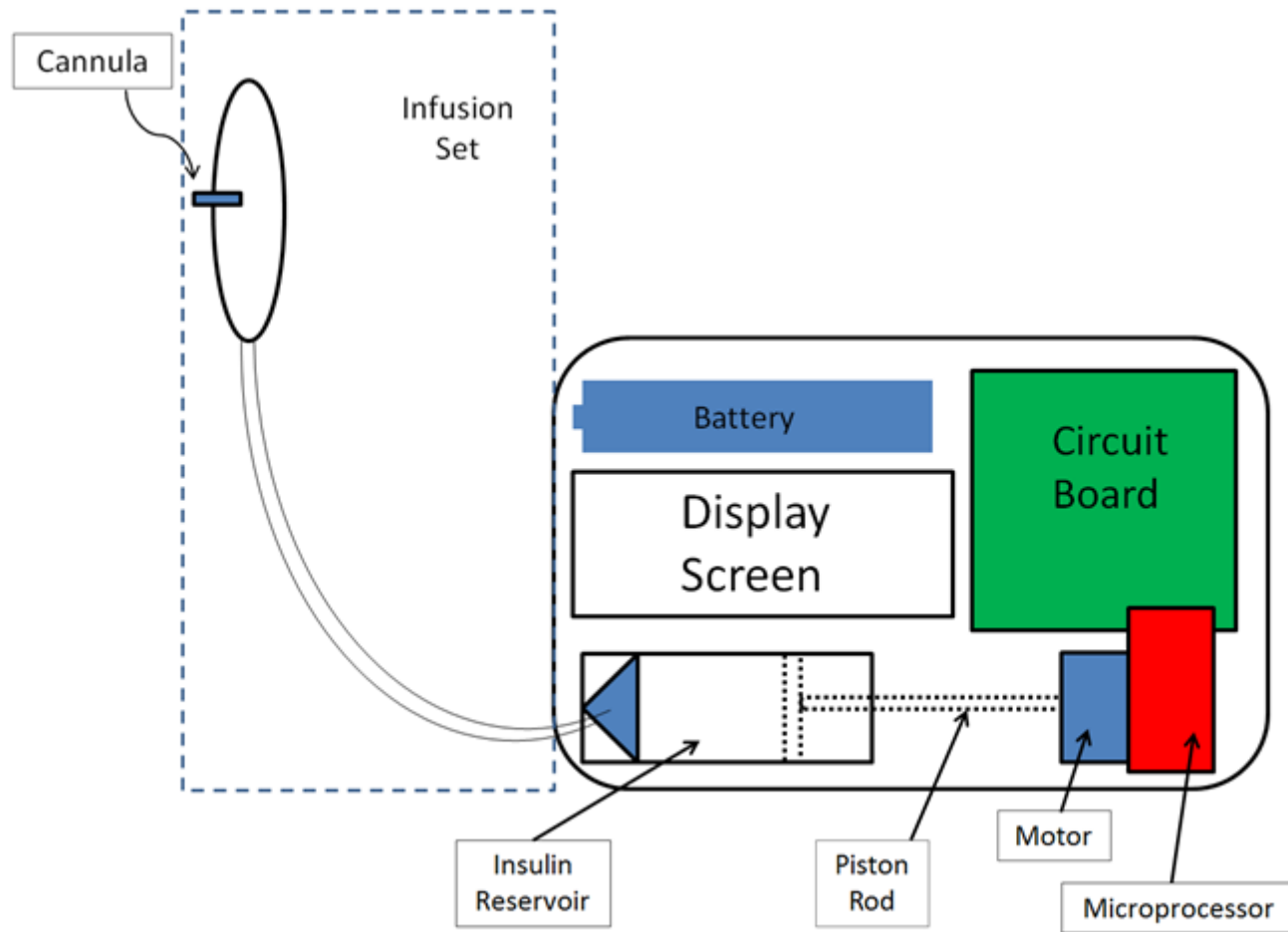
What it is...

- ▶ Battery operated microcomputer that delivers insulin continuously throughout the day through a catheter in the skin
 - ▶ Delivers **rapid-acting** insulin in two ways:
 - ▶ Basal rate
 - ▶ Bolus dose
- ▶ Alternative to delivering insulin through a syringe or pen

What it is **NOT**...

- ▶ An artificial pancreas
- ▶ A substitute for checking blood sugar and/or administering insulin
- ▶ A continuous glucose monitor (CGM)

What is an insulin pump?



What is an insulin pump?

Basal Rate

- ▶ Delivers rapid-acting insulin (Humalog, Novolog, Apidra) in small amounts every few minutes over 24 hours
 - Programmed; can be the same or varied
- ▶ Example:
 - 12AM: 0.5 units/hour

Bolus Dosing

- ▶ User initiated dose of rapid-acting insulin given before meals or to correct a high blood sugar
- ▶ Much more precise (ex: 0.5, 0.25, 0.025 units)
- ▶ Food bolus is based on insulin to carb ratio (I:C)
 - Example:
 - 1 unit of insulin for every 15 grams of carbohydrate
- ▶ A blood sugar correction is based on your target and sensitivity factor
 - Example:
 - $\frac{BG-125}{50} = \# \text{ of units}$

What are the advantages and disadvantages of an insulin pump?

Advantages

- ▶ Improved blood sugar control
- ▶ More accurate dosing
- ▶ Convenience and flexibility
- ▶ Eliminate individual injections
- ▶ Ease of adjusting insulin doses/regimen

Disadvantages

- ▶ Remembering to give insulin boluses
- ▶ DKA
- ▶ Psychological factors
- ▶ Expensive
- ▶ Infusion site locations/skin infections
- ▶ Physical/logistical considerations
- ▶ Back up plan (Lantus, pen needles, etc)

Lifestyle Changes

Food Management

- ▶ Knowing to balance carbohydrate intake with insulin is essential to blood sugar control
 - ▶ Involves counting the grams of carbs that will be eaten and taking a matching amount of insulin (I:C ratio)
- ▶ Can have different ratios for different times of the day



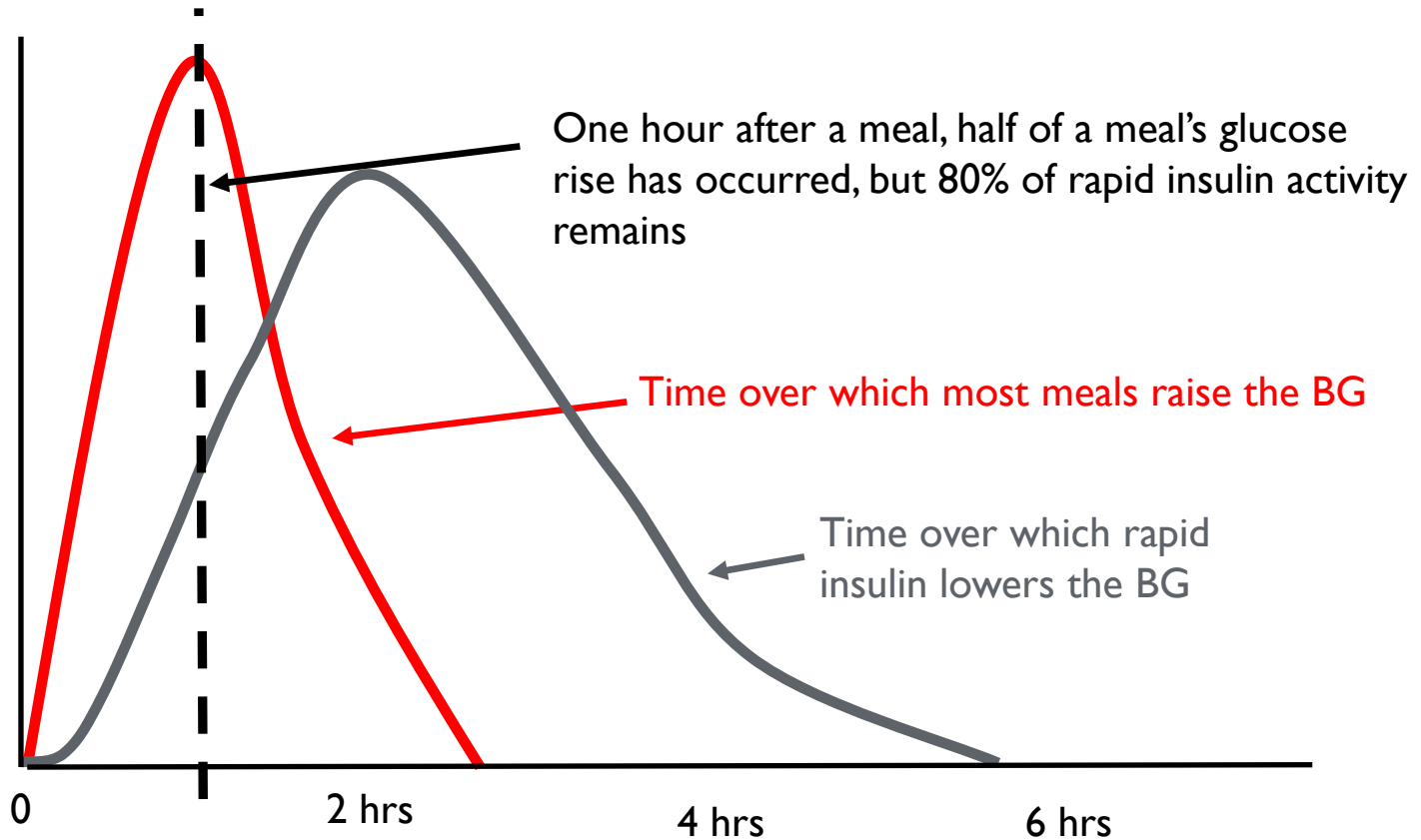
Lifestyle Changes

Food Management

- ▶ Pumps offer convenience of bolusing whenever carbohydrates are eaten
 - ▶ Smart pumps (currently on market) can calculate food boluses based on inputted I:C ratio
 - ▶ One of the most common difficulties for pump users is forgetting to bolus for food eaten (before and after)
 - ▶ Tip to remember: carbs are faster than insulin

- ▶ There is no reason to not cover any time carbs are eaten!

Timing: Most Carbs Are Faster Than Insulin



▶ **Take Home:** **Bolus 15 to 30 minutes before meals when possible. Use extended and square wave boluses sparingly.**

Lifestyle Changes

Food Management

- ▶ Some people can gain weight when beginning pump therapy:
 - ▶ Better control of blood sugars after eating and use of the sugar by the body
 - ▶ May eat more because one can key in extra insulin into the pump (in contrast to taking another shot)
- ▶ Tips for weight control:
 - ▶ Reduce portion sizes
 - ▶ Limit snacking
 - ▶ Regular exercise



Lifestyle Changes

Exercise

- ▶ People with diabetes who exercise more regularly are more sensitive to insulin
- ▶ One of the greatest advantages of a pump is the ability to reduce insulin before, during, and/or after exercise
 - ▶ Temporary basal rates
 - ▶ Decrease in bolus dose for blood sugar correction
 - ▶ Physically removing pump
- ▶ See table on next slide for general guidelines



Lifestyle Changes

Exercise and Insulin Adjustments

Duration (minutes)	Intensity	Blood sugar level mg/dL	Possible decrease in basal (% decrease)	Possible decrease in bolus
<30	Mild (ex: walking)	≥180 70-180 <70	0-25 0-50 50-100	50 50-75 75-100
30-60	Moderate (ex: tennis)	≥180 70-180 <70	50-75 75-100 100	50-75 75-100 100
>60	Intense (ex: running)	≥180 70-180 <70	50-85 85-100 100	50-85 85-100 100

Lifestyle Changes

Exercise

- ▶ **Points to remember with exercise:**
 - ▶ Always consider a snack when blood sugar is below 130 mg/dL
 - ▶ If blood sugar is above 250 mg/dL, check ketones; if ketones are present, do **not** exercise
 - ▶ Consider a temporary basal rate before, during, and/or even after exercise to prevent hypoglycemia
 - ▶ Taking off (disconnecting) the pump is always an option with heavy exercise/swimming
 - ▶ **Experience** is the best way to learn how to handle changes in insulin dosage and blood sugar fluctuations with exercise

Lifestyle Changes

Psychological Factors

- ▶ **Motivation/Desire**
 - ▶ Parents AND person wearing the pump must be motivated to use the pump and remain involved in care
 - ▶ Lack thereof may be due to a number of issues but can lead to noncompliance and can become a safety issue
- ▶ **Family Involvement**
 - ▶ Very important, especially with younger children
 - ▶ Decision making, age-related responsibilities, set changes, downloading data, clinic appointments

Lifestyle Changes

Psychological Factors

▶ Realistic Expectations

- ▶ Pump therapy requires more responsibility, new skills and new equipment, often described as “learning diabetes all over again”
- ▶ Continually connected to a device

▶ Body/Self Image

- ▶ Continuous wear of the pump, eliciting questions about pump and/or diabetes from others, site locations



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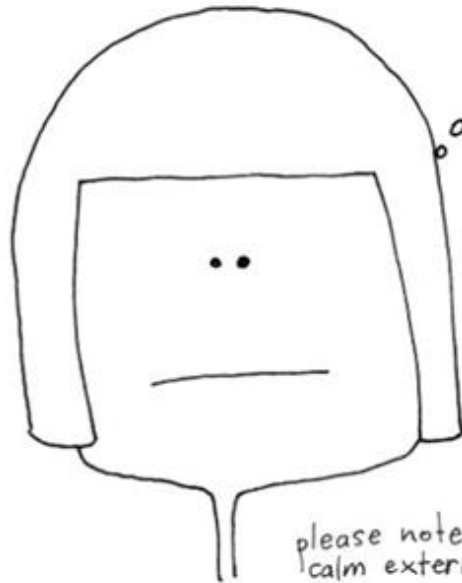
Being self-conscious of wearing his new insulin pump in public, Bob pretended he was a member of the Secret Service.

Lifestyle Changes

Psychological Factors- Problem-Solving Skills

- ▶ Problem-Solving is a process that involves identifying, analyzing and solving problems with the ultimate goal to overcome obstacles and find the best solution to the issue
- ▶ Critical for families considering insulin pump therapy
 - ▶ What do you do if you encounter problems with the pump?
 - ▶ What if the pump fails?
 - ▶ Do you know who to call?
 - ▶ Do you have a back-up plan?

what goes on in a diabetic's head:



please note the calm exterior

When did I last eat? Where's my meter? What's my blood sugar? How many carbs in that cookie? How many carbs in that salad? Do I need to pee? Are my feet dry? How long until lunch? Who will attend? Any doctor's appointments today? tomorrow? Am I shakey? Am I nervous or is my blood sugar low? Is my blood sugar low? Is there sugar nearby? Am I doing my best? What does the clock say? What does the meter say? What does the pump say? What does the A1C say? What will my friends say? Am I acting normally? Am I pale? Can I make it to lunch? Am I ok to drive? do I have enough teststrips? Does he know I'm diabetic? Am I hungry or am I full? How many Oreos make a serving? Do I have bad genes? Can I afford health care? why does my head hurt? Who's...

what goes on in a non-diabetic's head:



Lifestyle Changes

Psychological Issues- Problem-Solving Skills

- ▶ Know your pump company's contact information and your pump representative's contact information
- ▶ For technical support, such as pump capabilities, specific pump functions, infusion site issues, or troubleshooting a possible malfunction within the pump, contact the pump company
 - ▶ Number is listed on back of the pump!
- ▶ For clinical support, such as blood glucose /insulin adjustments or pump back-up plans, contact our office



“I agree, buying in bulk does save you money, but I don’t think that applies to insulin.”

Lifestyle Changes

Psychological Factors- Pump Vacation/Back-up Plan

▶ Pump Vacation

- ▶ Patient goes back to injection for a period of time decided on by pump user and family
- ▶ Initiated by patient and family; must contact office 3-5 business days before pump vacation start date to get prescriptions and doses

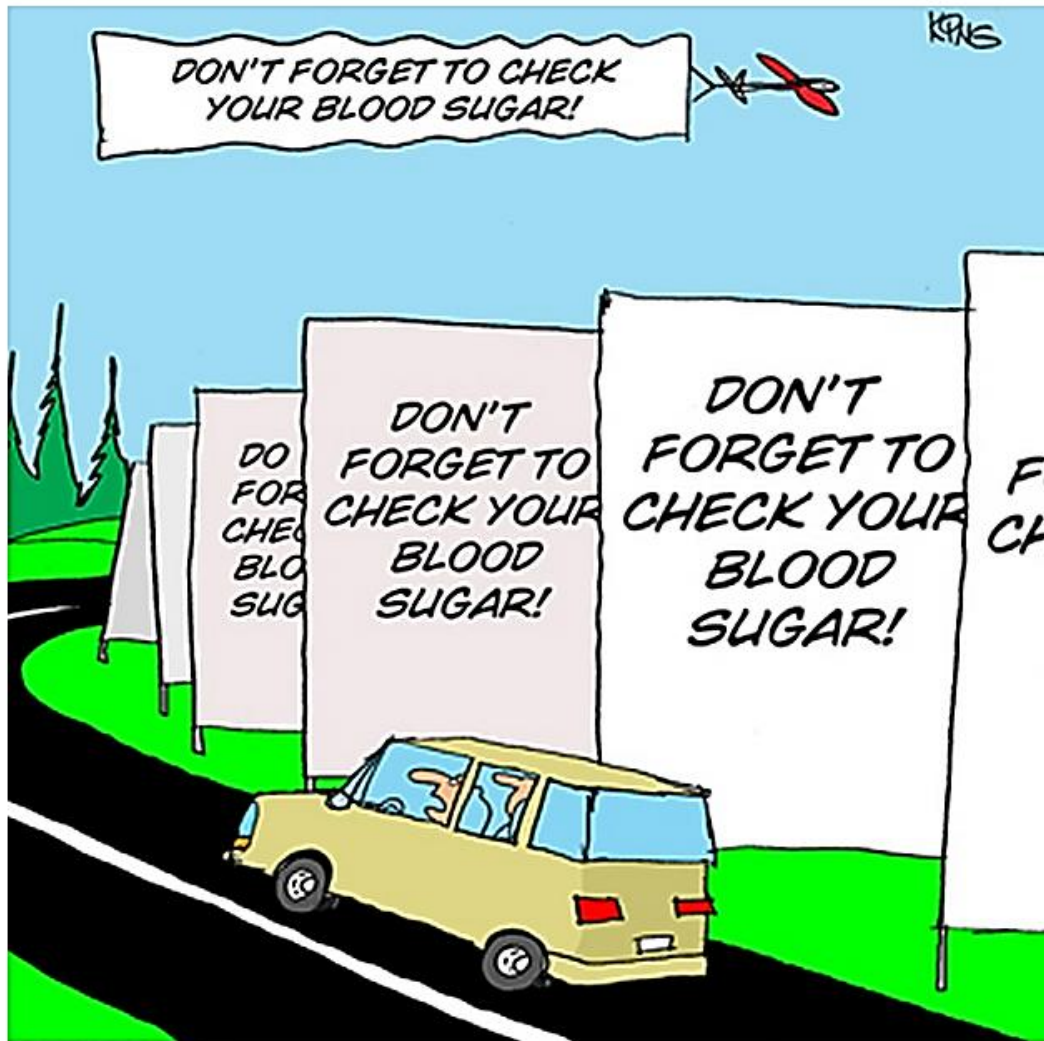
▶ Back-up Plan

- ▶ Pumps are not infallible; sometimes they can malfunction or fail
- ▶ Imperative to be prepared-
 - ▶ Have short-acting insulin pens or syringes, Lantus prescription

Lifestyle Changes

Psychological Factors

- ▶ **Overconfidence/Noncompliance**
 - ▶ Develop a false sense of security, may bolus without checking blood sugar, not accurately counting carbs
 - ▶ Remembering to bolus
 - ▶ Most common problem with pump use
 - ▶ Overconfidence or noncompliance can not only mean discontinuation of pump therapy but can be harmful to the health of the pump user



“I used to forget to check my blood sugar, but thanks to my wife’s friendly reminders, that’s no longer a problem.”

Are you ready for an insulin pump?

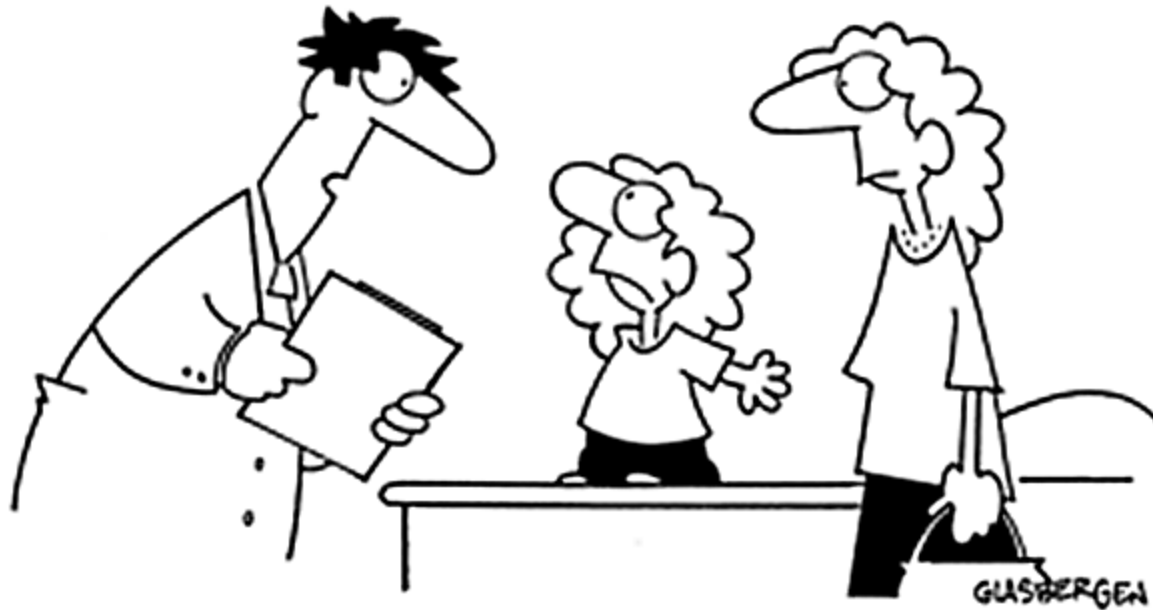
Clinic Criteria to Start

▶ Pump Readiness

- ▶ Self monitoring of blood sugar levels
- ▶ Motivation
- ▶ Compliance
- ▶ Family involvement and support
- ▶ Knowledge
- ▶ Adequate diabetes knowledge
- ▶ Adequate communication with diabetes team
- ▶ Realistic expectations
- ▶ Problem solving skills
- ▶ Manual dexterity
- ▶ Health insurance
- ▶ Literacy

- ❖ Insulin dosing compliance
- ❖ Ability to calculate insulin doses
- ❖ Testing blood sugar **at least** four times a day
- ❖ Appropriate carbohydrate counting
- ❖ <2 No Show's for appointments (per rolling year)
- ❖ Attendance at required classes
- ❖ Most recent A1c < 11%

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"I know Sleeping Beauty pricked her finger and went to sleep for 100 years...but she wasn't diabetic!"

Are you ready for an insulin pump?

▶ Responsibilities

- ▶ For pump user and parents
 - ▶ Continue checking blood sugars at least four times a day and bolusing for meals and high blood sugars
 - ▶ Making appropriate insulin adjustments in line with comfort level of doing so
 - ▶ Appropriate infusion set placement
 - ▶ Know how to troubleshoot with insulin pump
 - ▶ Know when to contact our office and your pump company/pump representative
 - ▶ Keeping track of insulin pump supplies (usually done through separate mail-order company)

Researching and Picking a Pump

- ▶ www.childrenwithdiabetes.org
- ▶ www.diabetesnet.org
- ▶ www.medtroniclilly.webmd.com/insulinpumps
- ▶ www.jdrf.org

▶ Pump Company Websites

- ▶ <https://www.accu-chekinsulinpumps.com/>
- ▶ www.animas.com
- ▶ www.medtronicdiabetes.com
- ▶ www.myomnipod.com
- ▶ www.tandemdiabetes.com



▶ Books

- ▶ Understanding Insulin Pumps and Continuous Glucose Monitors by Peter Chase
- ▶ Pumping Insulin by John Walsh

Researching and Picking a Pump

- ▶ Talk with other pump users and families

- ▶ JDRF



dedicated to finding a cure

- ▶ Investigate your insurance coverage

- ▶ It will be up to you to determine which pump your insurance company will prefer
 - ▶ Insulin pump warranties usually cover four years
 - ▶ Most insurances will not pay for a new pump until warranty is out
 - ▶ Upgrading to a newer model is an option with most companies but may be an out-of-pocket expense





"Have you thought about an insulin pump upgrade?"

Researching and Picking a Pump

Common things to look for...

- ▶ “Smart” pump (bolus calculator)
 - ▶ I:C ratio
 - ▶ Blood sugar sensitivity/correction factor
 - ▶ Target blood sugar ranges
- ▶ Adjustable time for insulin action (Insulin on board)
- ▶ Locking keypads
- ▶ Preset special basal patterns
- ▶ Specialized boluses
 - ▶ Extended bolus (for grazing) or combination bolus (for high fat meal)
- ▶ Programmable Alarms

Researching and Picking a Pump

Things to consider...

- ▶ Look, feel, color
- ▶ Data management system
- ▶ Features: alarms, reminders, child block, waterproofing
- ▶ Size of basal and bolus increments
 - ▶ Critical for toddlers
- ▶ Size of reservoir
 - ▶ Critical for teens
- ▶ Infusion set choices
- ▶ Safety/reliability
- ▶ Customer support
- ▶ Upgrade options
- ▶ Accessories (meters, covers, cases, etc.)
- ▶ Continuous Glucose Monitoring options

Researching and Picking a Pump

▶ Infusion Sets

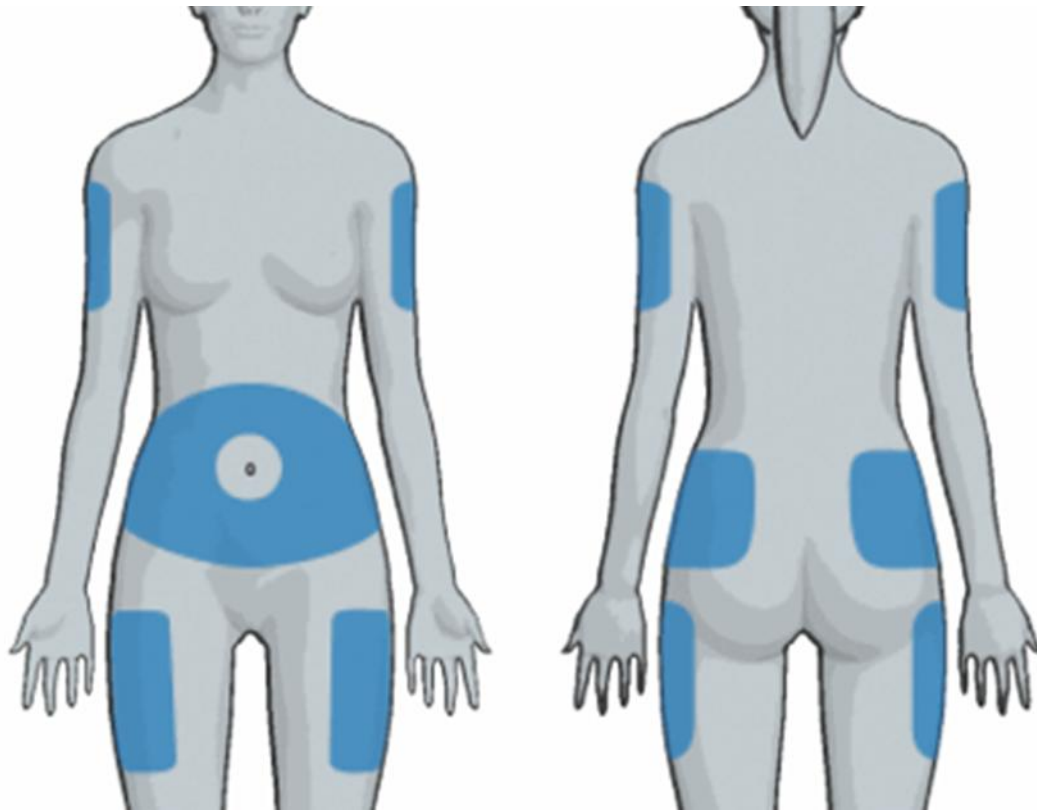
- ▶ Traditional (tubing)
 - ▶ Straight-in or angled
- ▶ Self-contained (OmniPod)
 - ▶ Straight-in



▶ Site Considerations

- ▶ Infection prevention
 - ▶ Always pick a clean site
- ▶ Disconnecting
 - ▶ Aside from a pod, sites can easily disconnect leaving the cannula in the skin
- ▶ Adhesives/Site removal
- ▶ Sensitivities
 - ▶ Be sure to rotate sites; be aware of tape allergies

Infusion Site Selection



Know Your Resources

- ▶ **Your diabetes clinic team**
 - ▶ Dr. Lagarde or Dr. Lockemer
 - ▶ CDE (Certified Diabetes Educator)
 - ▶ Diabetes Counselor
 - ▶ Patient Educators
- ▶ **Your pump representative and company contact information**
- ▶ **Mail-order company providing pump supplies**
- ▶ **Insurance company contact information**

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“Welcome to the Diabetic Hotline! If you need a new excuse for cheating on your diet, press 1. If you need a new excuse for skipping your workout, press 2...”

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