

The Clinical Dietitian's Approach to Initiating Insulin Pump Therapy

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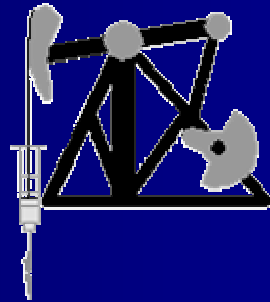
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Outline

- Introduction
- Goals of Insulin Pump Therapy
- Advantages and Disadvantages
- Role of Clinical Dietitian
- Concluding Remarks

Insulin Pump Therapy

Also known as Continuous
Subcutaneous Insulin Infusion



What is an Insulin Pump?

A small device, the size of a cell phone or pager, that delivers insulin continuously to the body via a soft catheter that is inserted under the skin



The Evolution of the Insulin Pump



First insulin pump,
late 1970s



Smaller, easier,
smarter, and safer to
use pumps, 1980s-



Insulin pump with
optional continuous
glucose monitoring,
2006

Insulin Pump Statistics

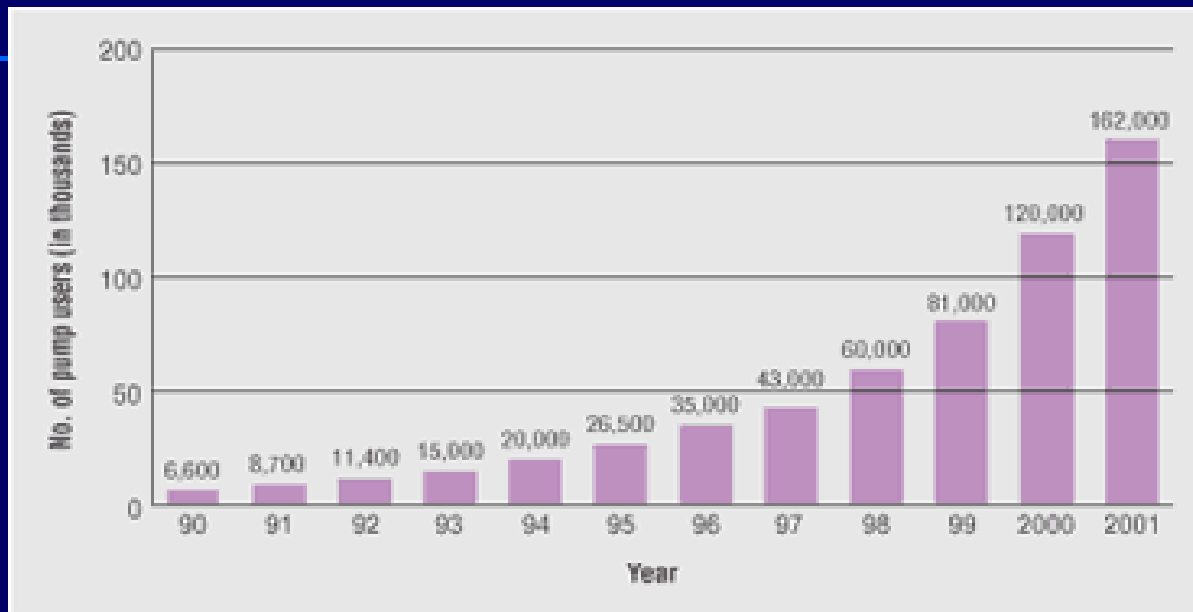


Figure 2. Number of patients using continuous subcutaneous insulin infusion pumps in United States by year. Total for 2001 is estimate.

http://www.postgradmed.com/issues/2002/05_02/bode3.htm

- * USA, approximately 20% of type 1 use insulin pumps
- * Germany, Sweden,.... range from 12% – 15%
- * UK approximately 1% (2003)

Goals of Insulin Pump Therapy

- Achieve and maintain near-normal blood glucose control (HbA1c < 7%, preferably < 6%)
- Increase lifestyle flexibility
- Minimize hypoglycemic events
- Minimize future complications
- Improve quality of life

Candidates for Insulin Pump

Patients that already practice self-management:

- Monitoring Blood Glucose (BG) regularly
- Recording BG / Insulin
- Visiting medical team regularly
- Counting Carbohydrates (CHO)

Advantages of Insulin Pump Therapy

- Less variability in insulin absorption than Multiple Daily Injections (MDI)
- About 10 needle pricks vs. 120 with MDI, per month
- Improvement in lifestyle flexibility
 - Flexible Meal Plan
 - Carbohydrates per meal can vary
 - Time of meal or snack can vary
 - Meal or snack can be skipped
 - Reduce insulin quickly for exercise

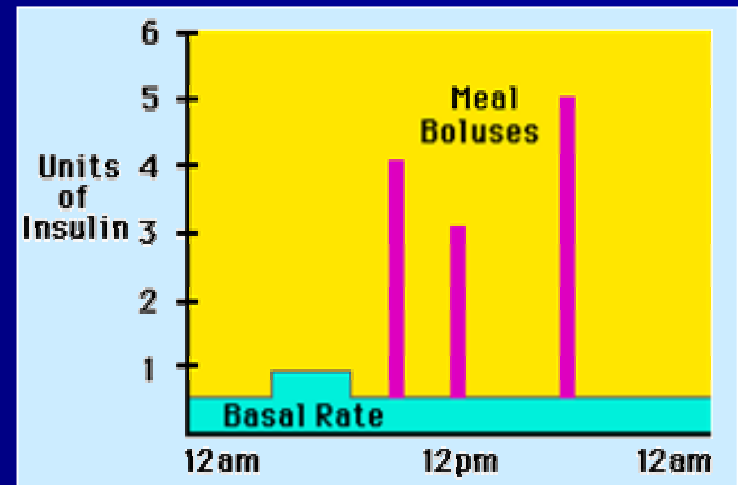
Advantages of Insulin Pump Therapy (cont.)

- Basal rates adjusted to fit individual needs:

- Exercise
- Dawn phenomenon
- Pregnancy



1. Eliminating morning highs
2. Decreasing hypoglycemic events



Disadvantages of Insulin Pump Therapy

- Possible weight gain due to greater flexibility in food intake
- Forgetting a bolus of insulin
- Increased risk of diabetic ketoacidosis (DKA)
- Device attached to patient 24 hrs
- Cost

Initiating Insulin Pump Therapy

■ Patient

- Self-Monitoring Blood Glucose (SMBG)
- Carbohydrate Counting with all meals and snacks

■ Doctor

- BG goal
- Initial basal rates (40-50% of TDD) and boluses (50-60%)
- Initial CHO to insulin ratio (500 Rule), and correction ratio (1800 Rule)

■ Nurse

- Educates patient on safe use of pump, insulin infusion set, and insulin reservoirs

■ Clinical Dietitian

- Carbohydrate Counting Education
- Review of Food and BG logs
- Troubleshooting
- Insulin Pump Features

The Role of the Clinical Dietitian

- Carbohydrate Counting
 - Diabetic Exchanges (American Diabetes Association and American Dietetic Association)
 - Exchanges or Grams of CHO
- Nutrition Label Reading
- Design Meal Plan
 - Flexible vs. Fixed

The Role of the Clinical Dietitian (cont.)

Food/BG Logs:

- Time of meal or snack *
- BG and insulin before each meal, snack, bed *
- Exchanges or grams of carbohydrates*, food/drink description recorded
- Time and type of physical activity

* Information also stored in pump

The Role of the Clinical Dietitian (cont.)

- Review of Food / BG logs enables RD to assess:
 - Patterns of highs and lows
 - Adequacy of CHO to Insulin Ratio
 - Adequacy of Correction Ratio
 - Adequacy of basal rates
 - Knowledge of CHO counting
- Communicate possible needs and recommendations for change to patient's doctor



Troubleshooting - Lows

- When do lows take place?
 - Skipped meal → lower basal rate
 - After meal boluses → change CHO ratio or lower basal rate
 - After correction bolus → change correction ratio
- Too many lows?
 - Basal and boluses may be too high
 - Stacking insulin (not using bolus wizard)
 - Increased activity

Troubleshooting - Highs

- When do highs take place?
 - Skipped meals → increase basal
 - After meals → change CHO ratio or basal
- Too many highs?
 - Possibly growth, puberty, weight gain
 - Problem with CHO counting
 - Forgetting boluses
 - Empty insulin reservoir?
 - Infusion set occlusion?

Insulin Pump Features

- Bolus wizard!!
- Normal meal/snack bolus
- Square wave meal bolus
- Dual wave meal bolus
- Reminders for BG monitoring
- Reminders to give meal bolus

BOLUS WIZARD

Bolus Wizard

Calculates an estimated bolus to support food intake and/or to correct high blood glucose

Insulin pump is preset with:

- CHO to insulin ratio
- Correction ratio
- BG goal
- Insulin on board (active insulin)
- BG # (manually entered)

BOLUS WIZARD (cont.)

BOLUS WIZARD

Estimate Details

Est. total: 3.0 U
Food Intake: 45 gr
BG (meter): 160mg/dL
Food: 3.0 U
Correction: 2.0 U
Active Insulin: 2.0 U *

ACT to proceed

ESC to back up

* Approximately 20% of insulin is used up every hour after a bolus

Unused

INSULIN ON BOARD

Hours after a 10 U bolus

0 hr	1 hr	2 hr	3 hr	4 hr	5 hr
10	8	6	4	2	0

Bolus type

- Normal Bolus

- Meal or Snack bolus bypassing Wizard

- Dual Wave Bolus

- Used with lengthy dinners

Bolus is split up in two, part of it is given immediately for correction or for fast-absorbed CHO's, second part given after a period of time to cover the rest of the meal (high fat, high fiber, etc.)

- Square Wave Bolus

- Used with high fat meals
- Used in gastroparesis

Can set up the pump to deliver a meal bolus over a period of time, e.g. over 2 hrs (w/ pizza)

Activities with the Insulin Pump

- Exercising with the Insulin Pump
 - Suspend or Disconnect
 - Set temporary basal rate
- Bathing, Swimming
 - Pump easily disconnected and reconnected

Concluding Remarks

- Insulin pump improves clinical outcomes (HbA1c) and quality of life
- Insulin pump offers flexibility in lifestyle
- Clinical dietitians play important role in initiating and following insulin pump therapy

References

- Bode B.W. et al. Insulin Pump Therapy in the 21st century. Strategies for successful use in adults, adolescents, and children with diabetes. Postgraduate Medicine May 2002;Vol. 111/No 5
- The Diabetes Control and Complications Trial (DCCT) Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med 1993;329(14):977-86
- Plotnick L.P. et al. Safety and Effectiveness of Insulin Pump Therapy in Children and Adolescents with Type 1 Diabetes. Diabetes Care 2003, 26:1142-1146
- Weissberg-Benchell J. et al. Insulin Pump Therapy. A meta-analysis. Diabetes Care 2003, 26:1079-1087
- Pickup J. et al. Continuous Subcutaneous Insulin Infusion at 25 Years. Diabetes Care 2002, 25:593-598