



CARDIOMETABOLIC HEALTH CONGRESS

March 4-5, 2016 • San Francisco, CA

# Novel Technologies, Apps, and Innovations in Diabetes Management

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*Professor, Keck School of Medicine*

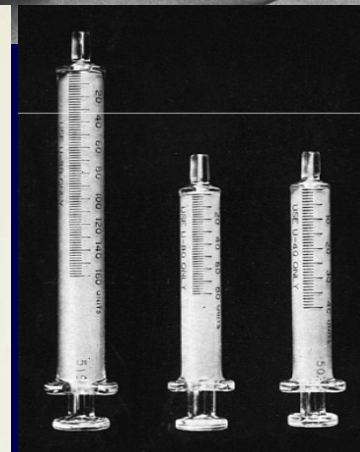
*University of Southern California, Los Angeles, CA*

# Key Points

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- Technology ever increasing
- Pace always far slower than any of us desire
- Each device approved is still one or two or three versions behind what is possible
- Tools are only as good as the user can use them—  
education/follow-up/realtime and retrospective interpretation  
vital elements

# Diabetes Care in the 1970s



# Diabetes Care in 2016



# Monitoring





# Abbott Freestyle Libre\*

How to use the FreeStyle Libre System



1. **Apply sensor**  
with applicator

2. **Scan sensor**  
using FreeStyle Libre  
Reader

3. **Get reading**  
on the reader

FOR FULL INSTRUCTIONS  
[www.freestylelibre.co.uk](http://www.freestylelibre.co.uk) >

OVERVIEW  
HOW TO USE  
FIND OUT MORE

\*Not FDA approved

# Abbott Freestyle Libre\*



The advertisement features a person's arm with a small white sensor patch applied. A hand holds a smartphone, and a white circular icon with a sensor symbol is shown with orange motion lines pointing towards a larger FreeStyle Libre device. The device's screen displays a glucose reading of 112 mg/dL, a trend arrow pointing up, and a graph of glucose levels over time. The background is a warm yellow gradient.

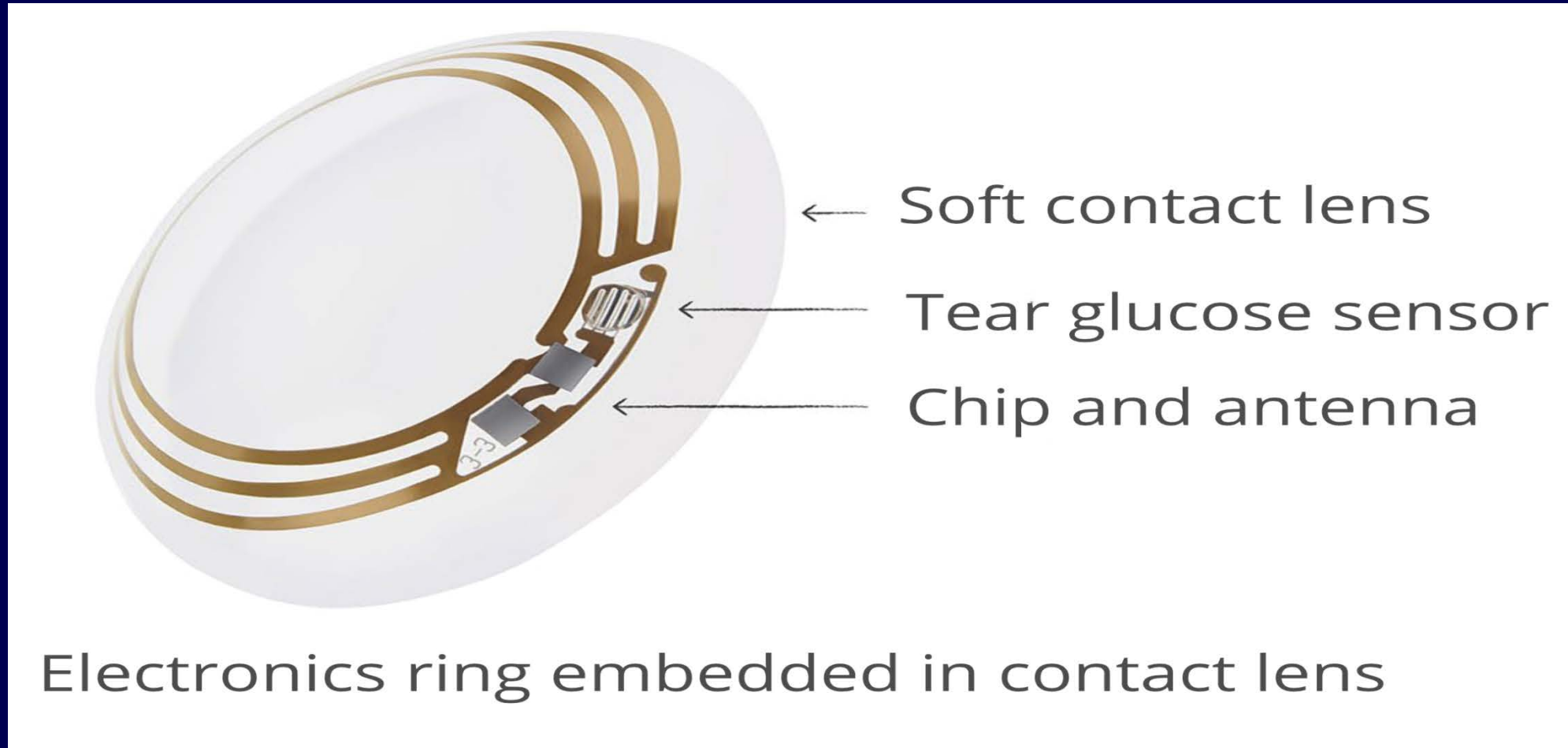
**DU**  
**KANNST DAS**  
**OHNE LANZETTEN<sup>1</sup>**

**FreeStyle**  
**Libre**  
FLASH-SYSTEM ZUR GLUKOSEMESSUNG

\*Not FDA approved

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# Glucose Measuring Contact Lens\*



\*Investigational



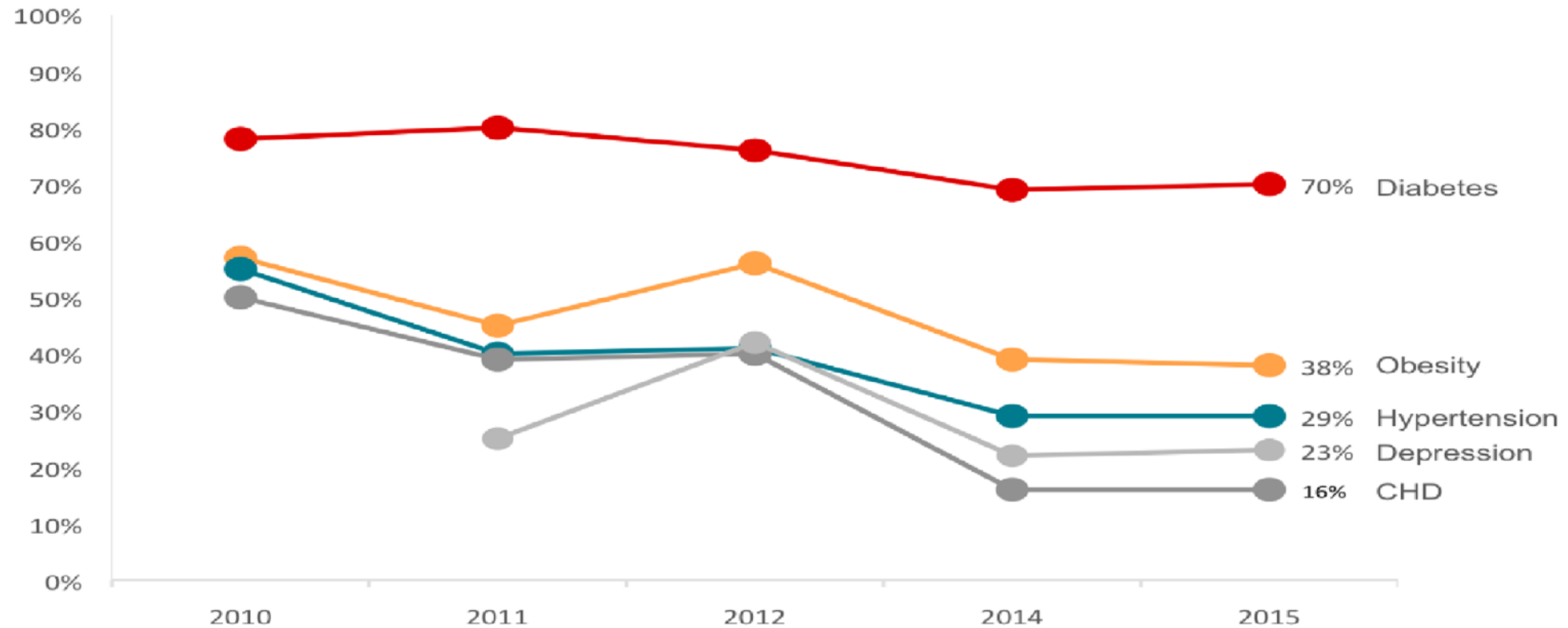
# Easier Communication



# Many Diabetes Apps...

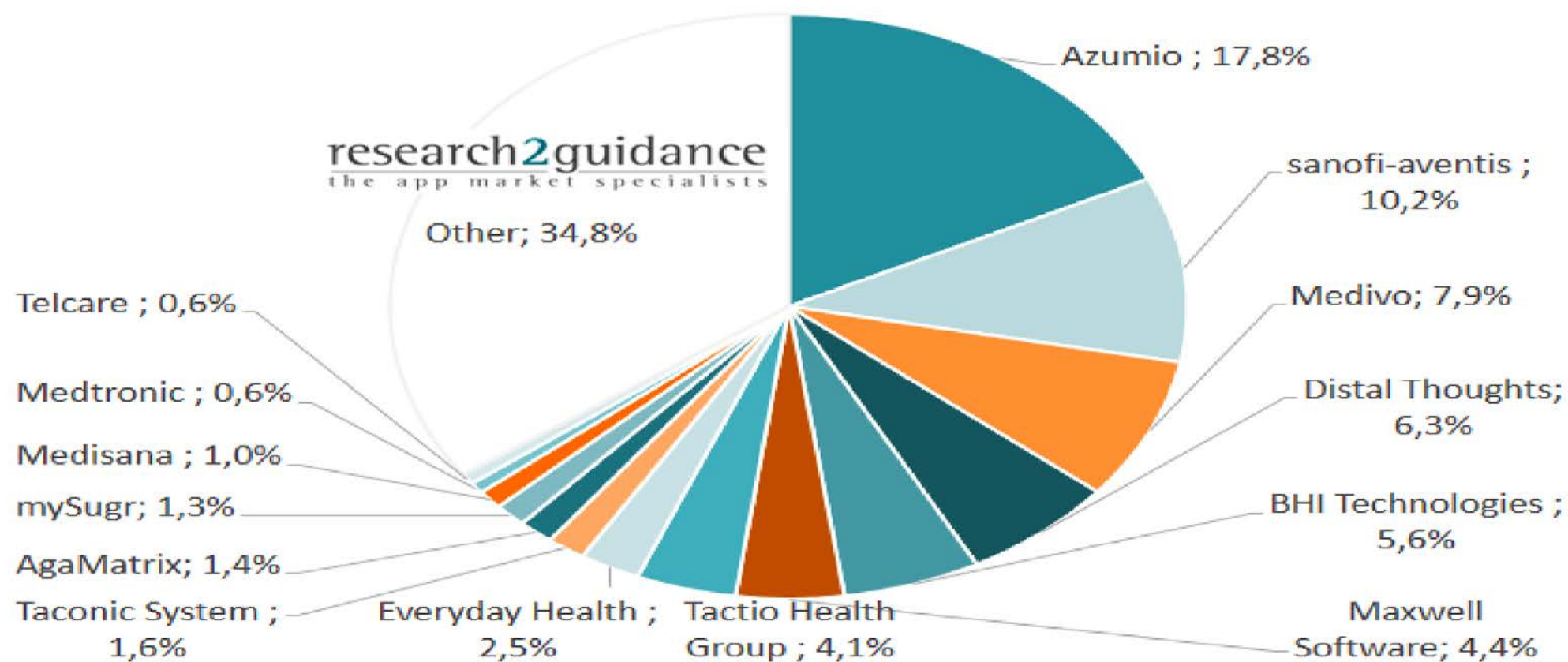


# Which Therapy Fields Offer the Best Market Potential for mHealth in the Next 5 Years?



©research2guidance 2015

# 2013: 14 apps = 65% Market Share





# Global Penetration of Diabetes App Users Who Have a Capable Device



# Limits to Apps

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- Many require manual data entry
- Lack tools for behavioral modification (lack gamification)
- Many unproven in terms of sustained outcomes improvements
- No reimbursement to providers for monitoring/use

# Bolus Calculator

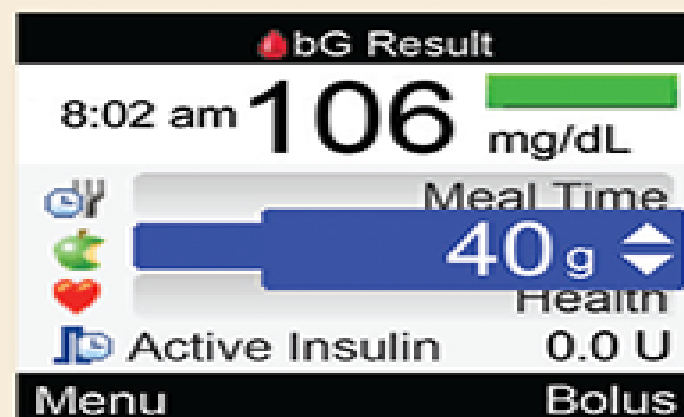
1

## Test Blood Sugar



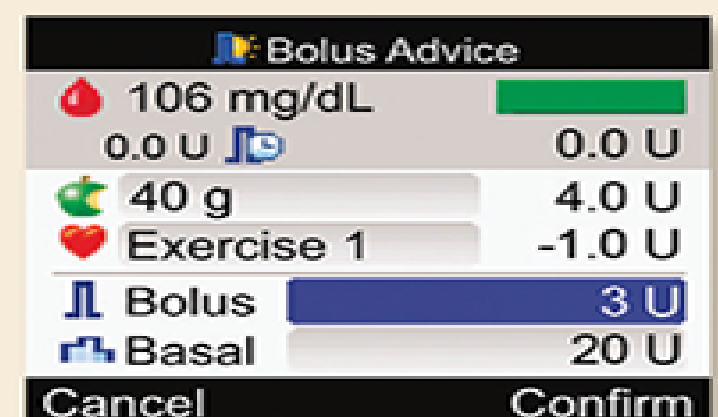
2

## Enter Carbs



3

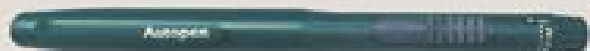
## Confirm Advice



# Pen Delivery of Injectables



Apidra® SoloStar



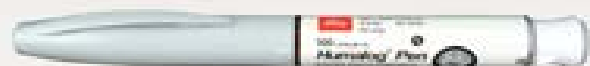
AutoPen®



Byetta® exenatide injection 10mcg



Byetta® exenatide injection 5mcg



Humalog® Pen  
Humalog® Mix 75/25® Pen  
Humalog® Mix 50/50® Pen



Humalog® KwikPen™  
Humalog® Mix 75/25® KwikPen™  
Humalog® Mix 50/50® KwikPen™



HumaPen® LUXURA™ HD



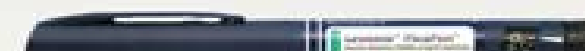
HumaPen® MEMOIR™



Humulin® N Pen  
Humulin® 70/30 Pen



Lantus® SoloStar®



Levemir FlexPen®



NovoPen® 3



NovoPen® Junior



NovoLog® FlexPen®  
NovoLog® Mix 70/30 FlexPen®



OptiClik® for Lantus® and Apidra®



SymlinPen® 60  
(pramlintide acetate) pen injector



SymlinPen® 120  
(pramlintide acetate) pen injector



Victoza® liraglutide injection

## For Osteoporosis



Forteo® teriparatide (rDNA origin) injection



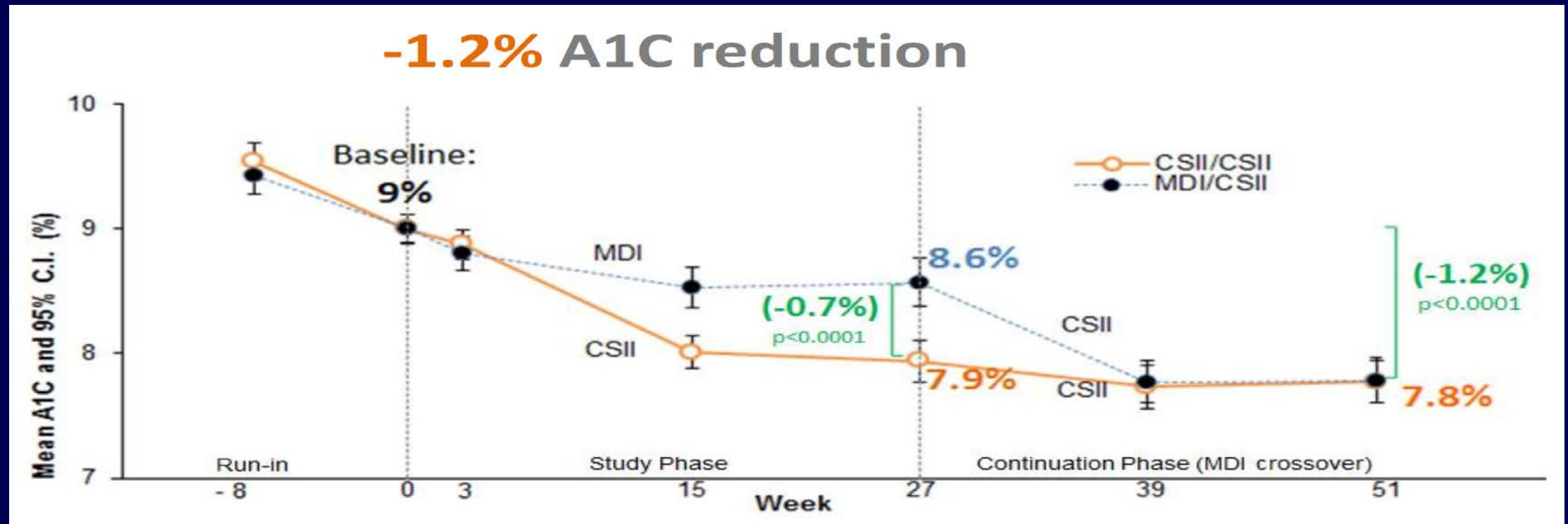
# Caps for Pens



# Medtronic Pump



# Efficacy and Safety of Insulin Pump Therapy in Type 2 Diabetes: The OpT2mise Study (n=331)



# TSlim





# Pumps: Omnipod



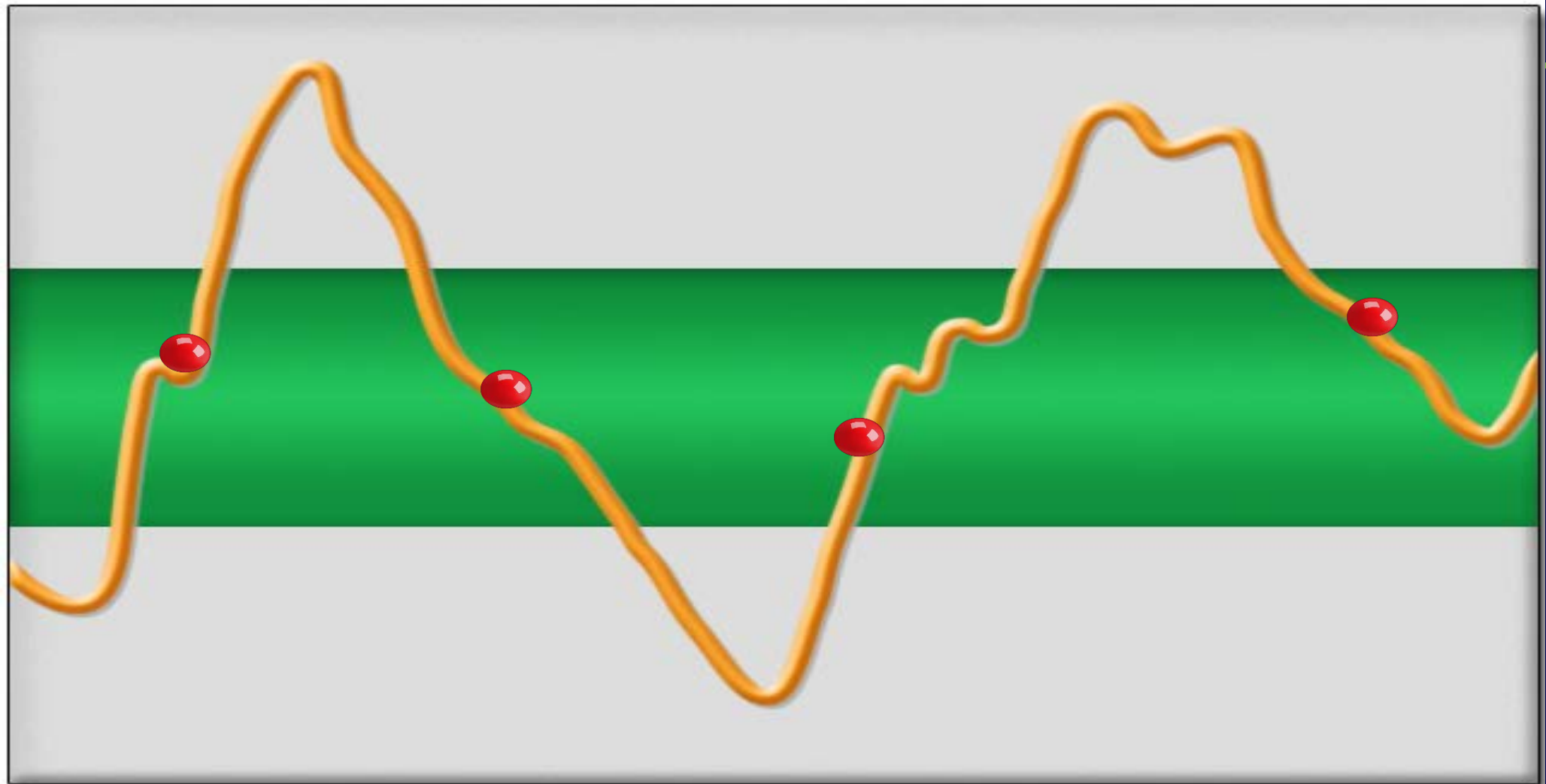
# Patch Pumps



# Patch Pumps



# The Value of Continuous Glucose Monitoring



# CGM: Dexcom Gen 5



# Minimed Connect

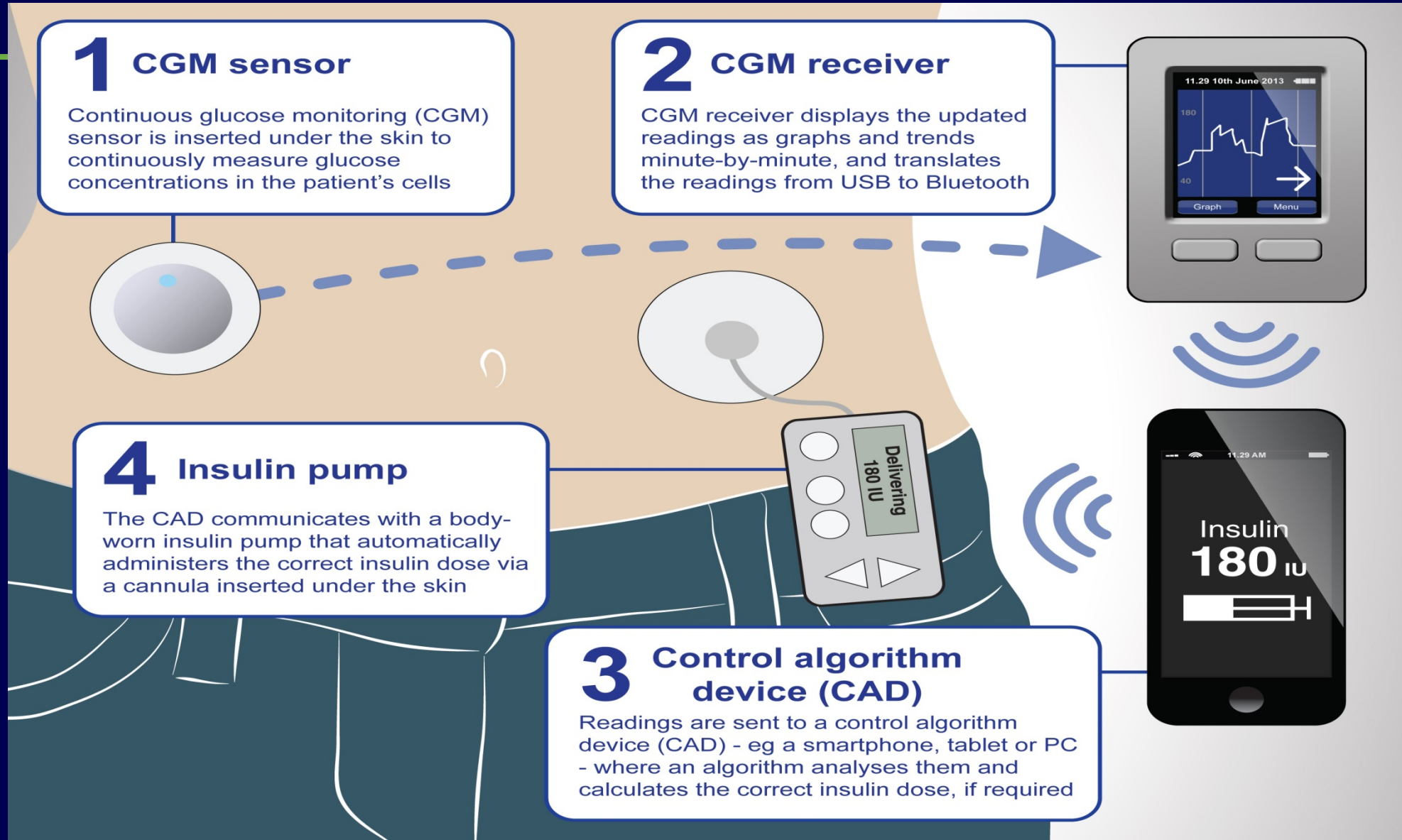
## How MiniMed Connect Works

For patients, with  
discreet mobile display  
of pump and CGM data





# Diabetes Care in 2016



ORIGINAL ARTICLE

# Threshold-Based Insulin-Pump Interruption for Reduction of Hypoglycemia

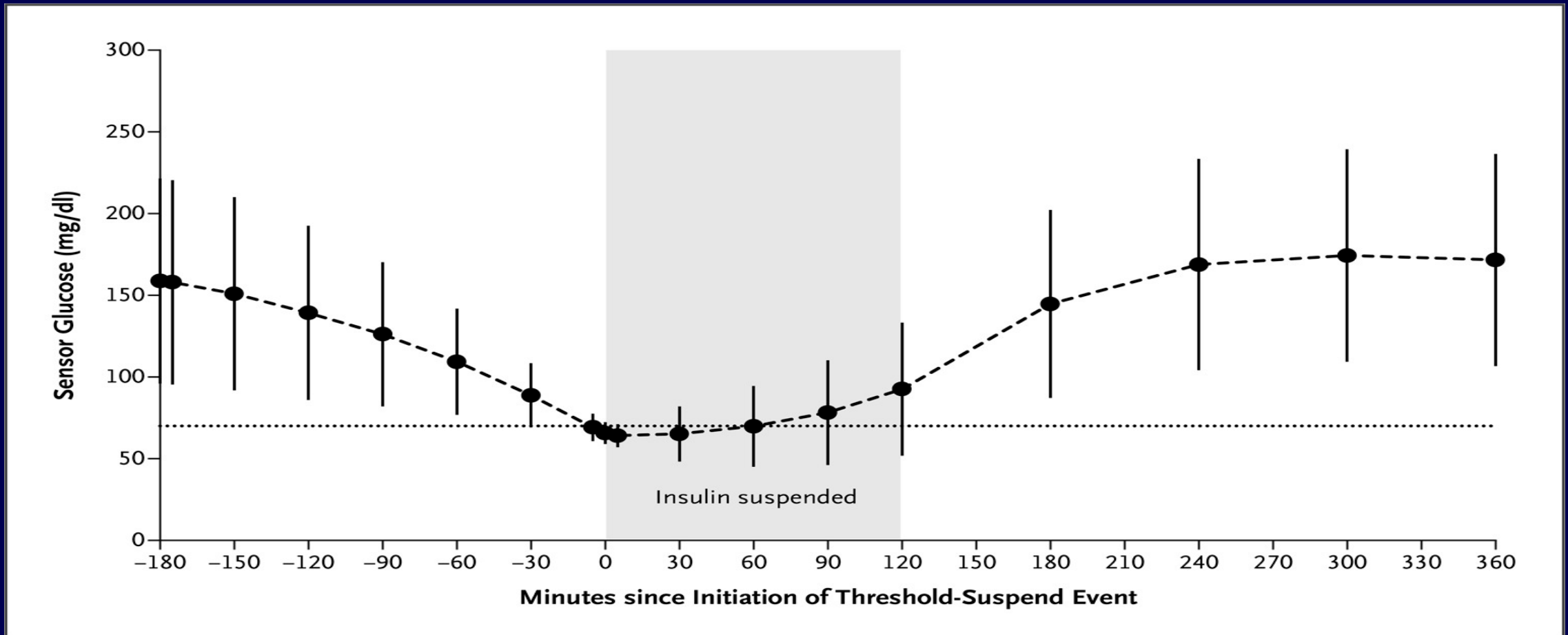
Richard M. Bergenstal, M.D., David C. Klonoff, M.D., Satish K. Garg, M.D., Bruce W. Bode, M.D., Melissa Meredith, M.D., Robert H. Slover, M.D., Andrew J. Ahmann, M.D., John B. Welsh, M.D., Ph.D., Scott W. Lee, M.D., and Francine R. Kaufman, M.D., for the ASPIRE In-Home Study Group\*

## ABSTRACT

### BACKGROUND

The threshold-suspend feature of sensor-augmented insulin pumps is designed to minimize the risk of hypoglycemia by interrupting insulin delivery at a preset sensor glucose value. We evaluated sensor-augmented insulin-pump therapy with and without the threshold-suspend feature in patients with nocturnal hypoglycemia.

# Sensor Glucose Values During Threshold-Suspend Events



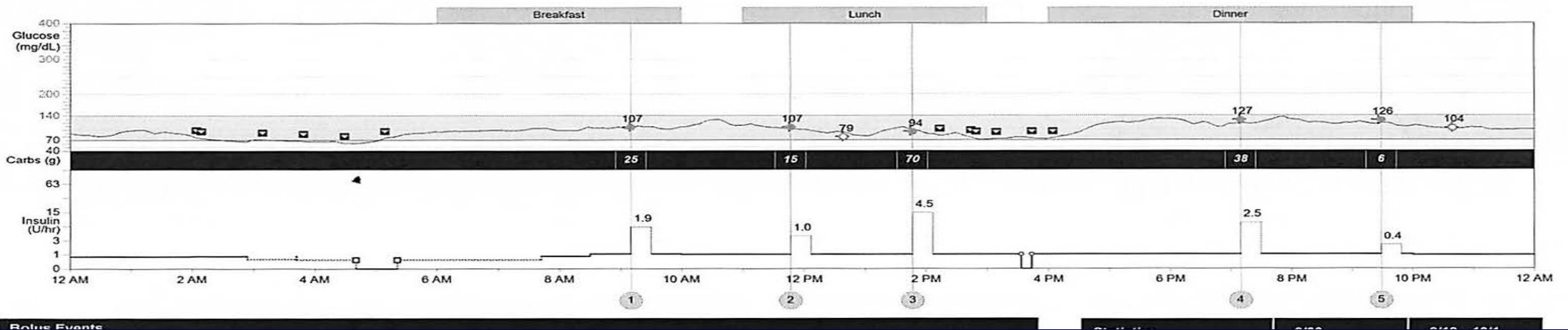
Bergental RM et al. N Engl J Med 2013;369:224-232  
Bergental RM et al. N Engl J Med 2013;369:224-232

# Patient: Minimed 530G Threshold Suspend



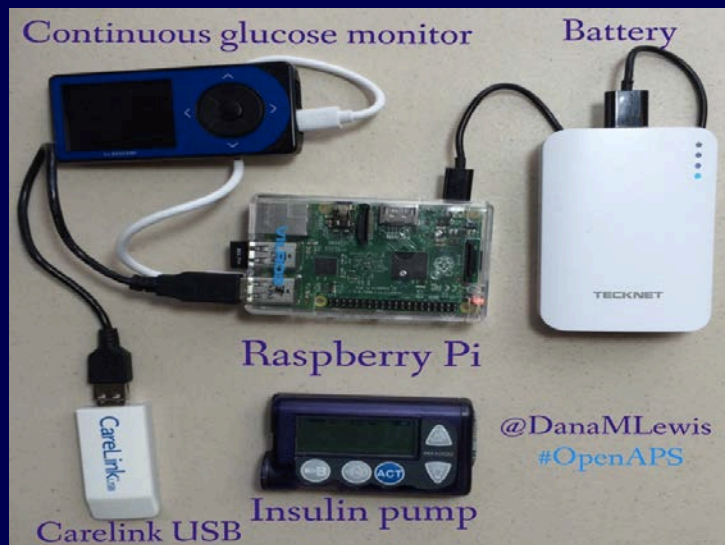
Daily Detail (13 of 14)  
Tuesday 9/30/2014

Generated: 10/2/2014 10:49:13 AM Page 19 of 20  
Data Sources: MiniMed 530G - 551 (458463)

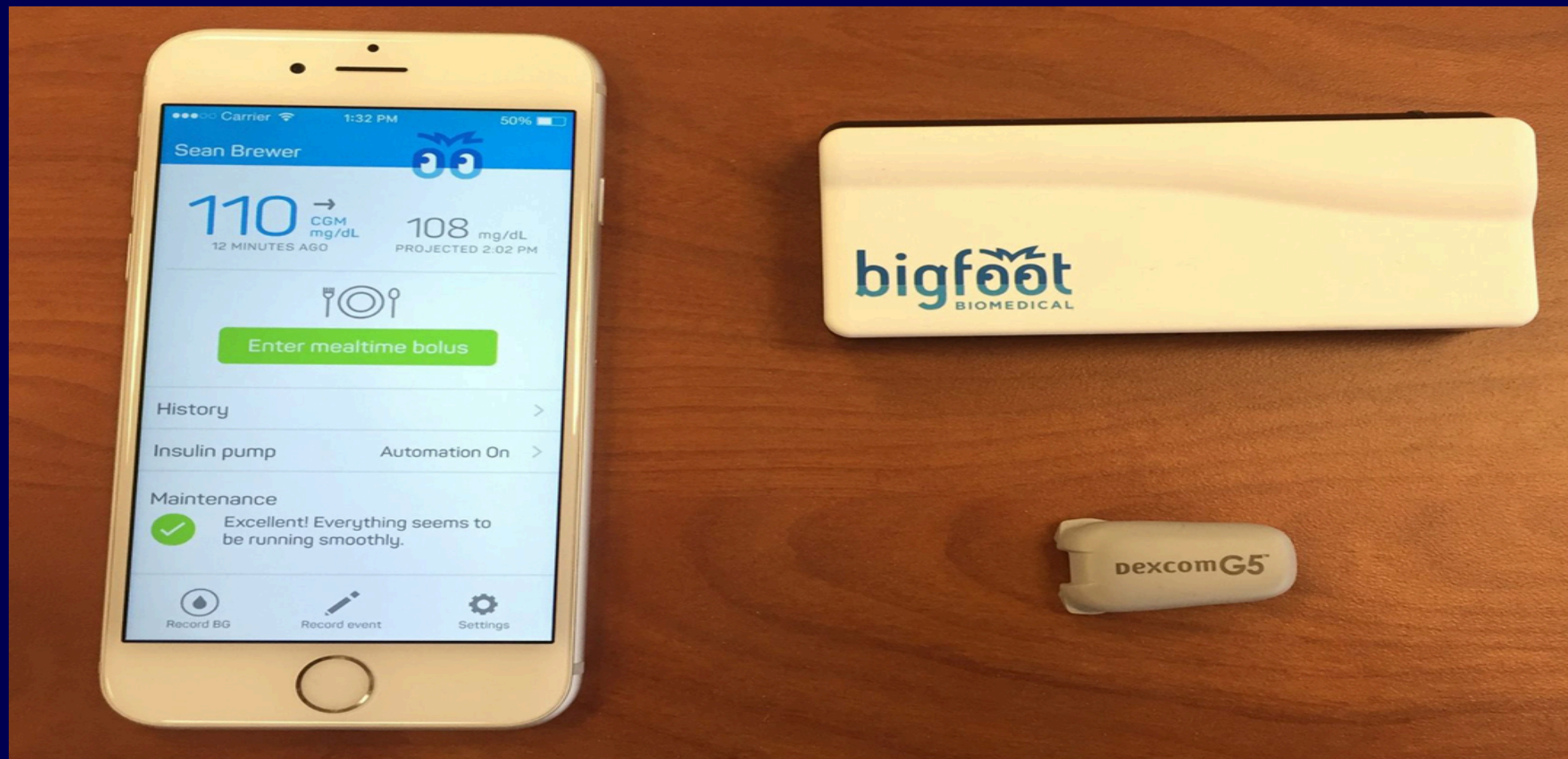




# #WeAreNotWaiting vs Big Pump

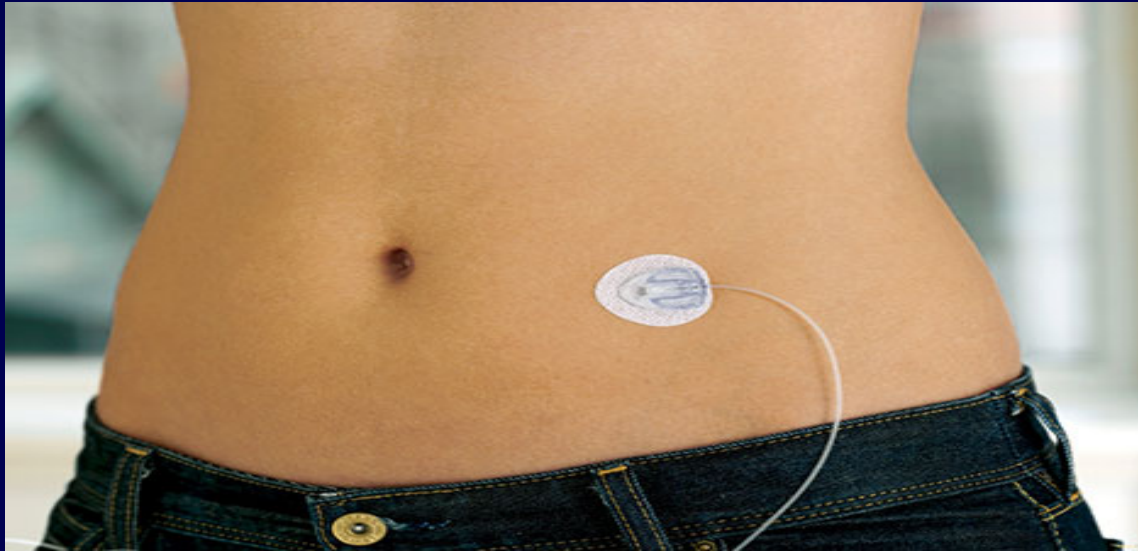


# Bigfoot





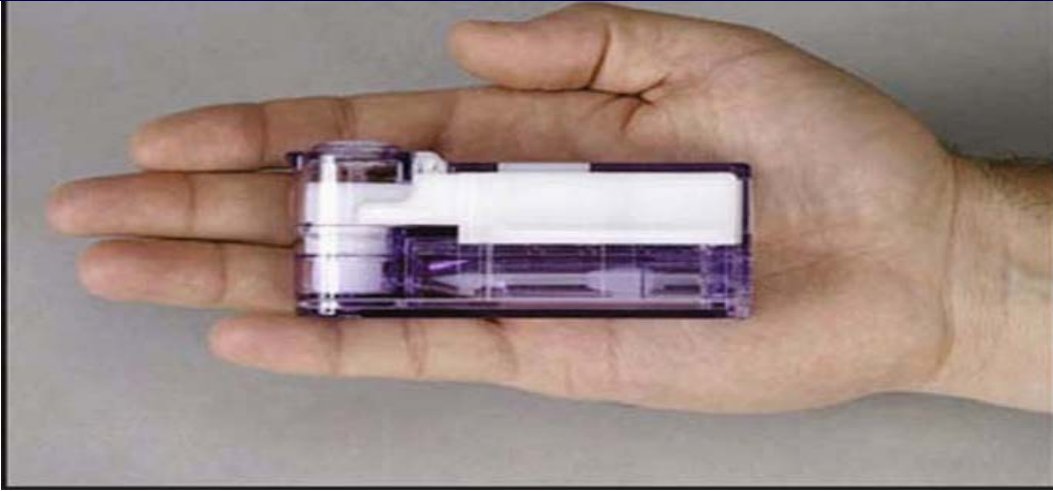
# Infusion Site Issues: Another Understudied Factor



# Infusion Site Issues: Another Understudied Factor




# Technosphere Inhaler: Initial and Gen2 Device



C

D

# Dosing of Inhaled Insulin

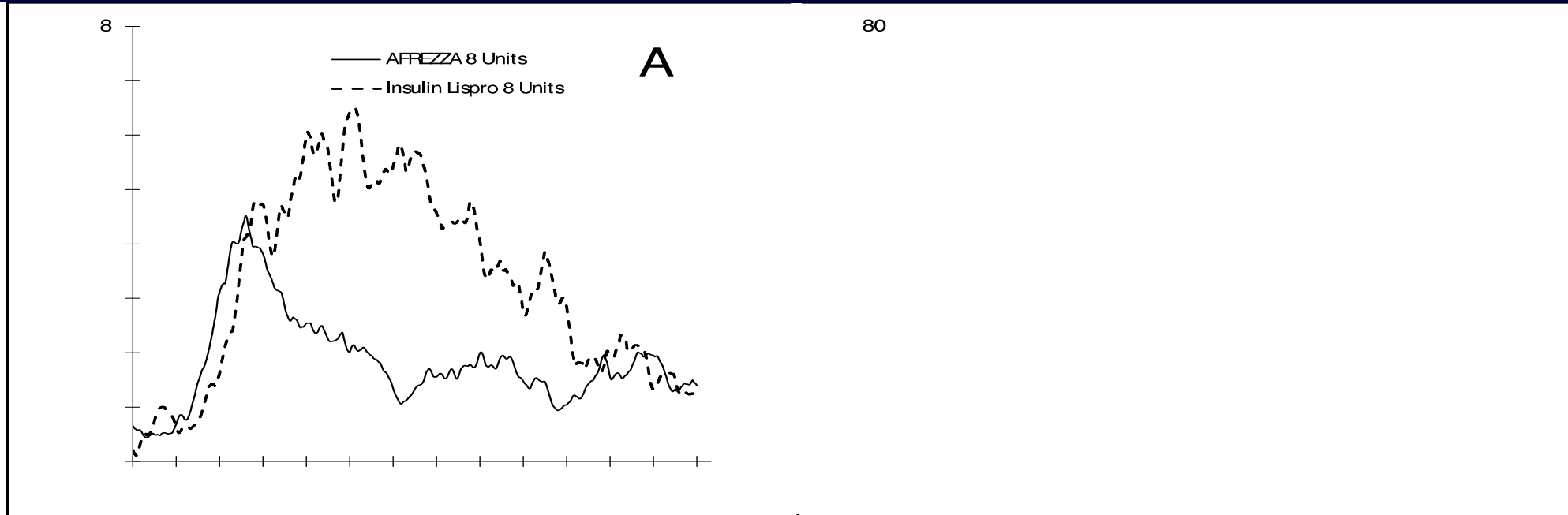
 Injected mealtime insulin dose	 Afrezza® dose	   4 units (blue)      8 units (green)      12 units (yellow) Number of cartridges needed		
Up to 4 units	4 units			
5-8 units	8 units			
9-12 units	12 units	 + 	OR 	
13-16 units	16 units		 	
17-20 units	20 units		 + 	
21-24 units	24 units			 

# Inhaled Insulin Label

## **WARNING: RISK OF ACUTE BRONCHOSPASM IN PATIENTS WITH CHRONIC LUNG DISEASE**

- **Acute bronchospasm has been observed in patients with asthma and COPD using AFREZZA. *[see Warnings and Precautions (5.1)]*.**
- **AFREZZA is contraindicated in patients with chronic lung disease such as asthma or COPD. *[see Contraindications (4)]*.**
- **Before initiating AFREZZA, perform a detailed medical history, physical examination, and spirometry (FEV<sub>1</sub>) to identify potential lung disease in all patients *[see Dosage and Administration (2.5), Warnings and Precautions (5.1)]*.**

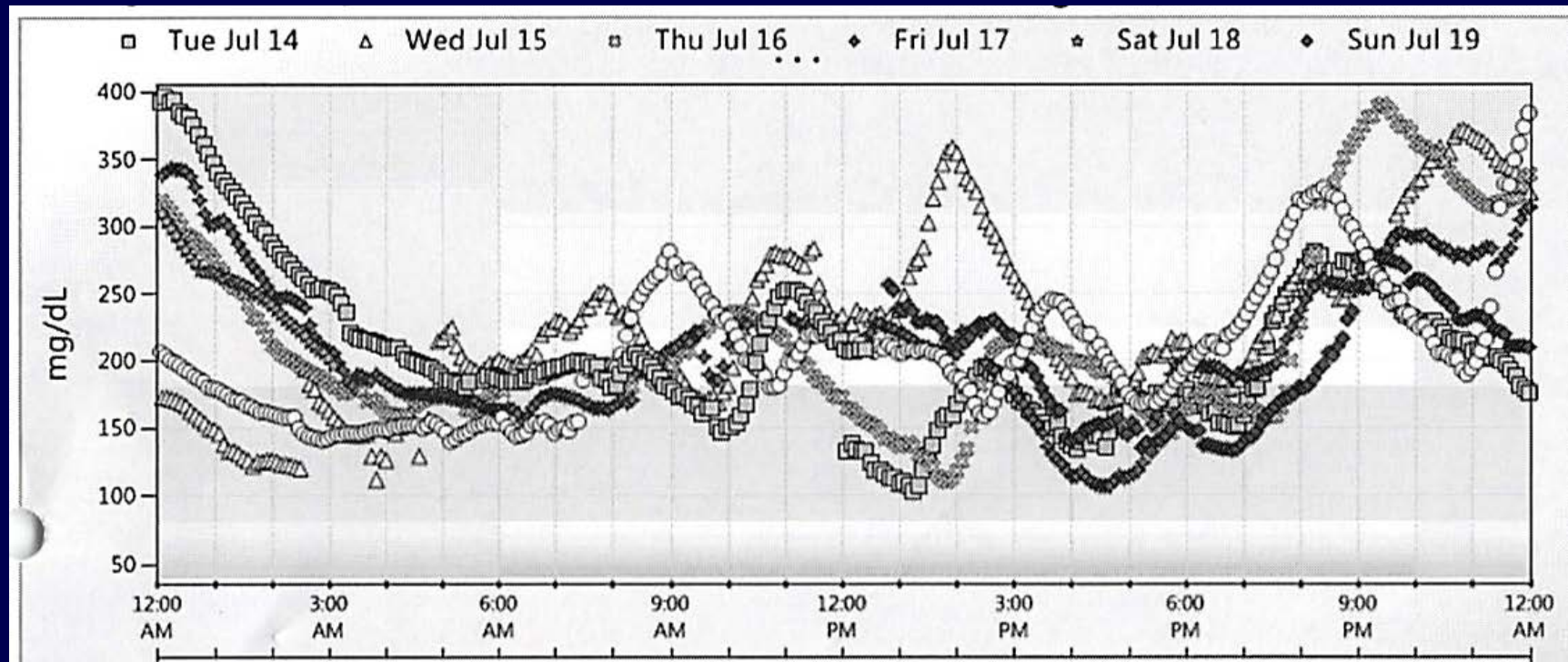
# Glucose-Infusion Rate and Serum Insulin Concentrations in T1D



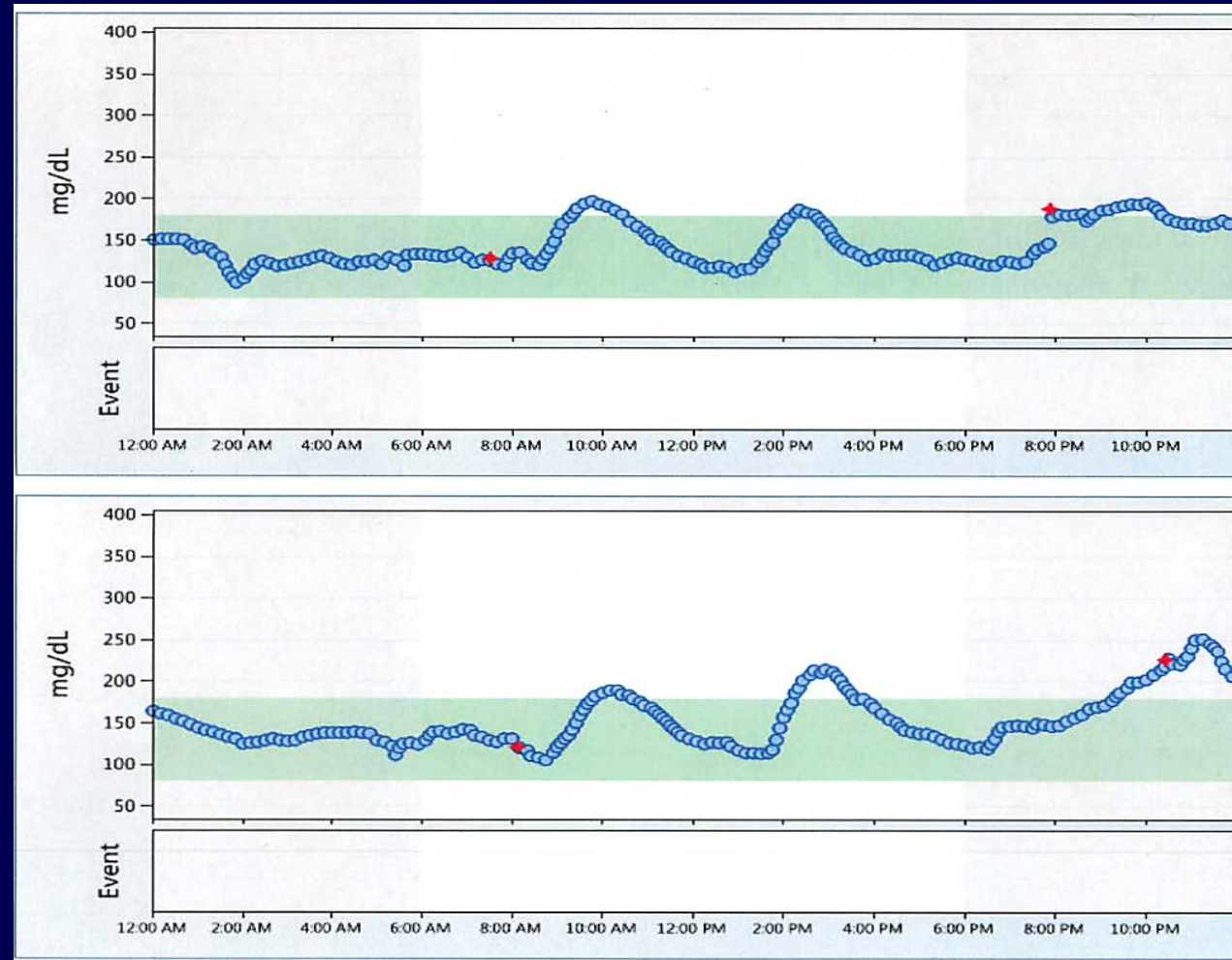
Afrezza Prescribing information.



# Patient Before



# Patient After



Courtesy of Anne L. Peters, MD

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# Conclusions

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- Many opportunities for technology development in the diabetes space
- User/device interface must become effortless and produce meaningful change
- A new system of reimbursement for management will need to be developed
- Provider and patient education vital



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Thank you





# CMHC WEST

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