DIABETES AND TECHNOLOGY

The future is here

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WHEN I WAS A YOUNG MD….

Here are some examples of the prehistoric tech I had to work with. I thought it was great at the time….


B-D INSULIN SYRINGE
For use with
20 OR 40 UNIT INSULIN
BECTON, DICKINSON & CO.
RUTHERFORD, N. J.
DR. BUSHER'S
AUTOMATIC
INJECTOR

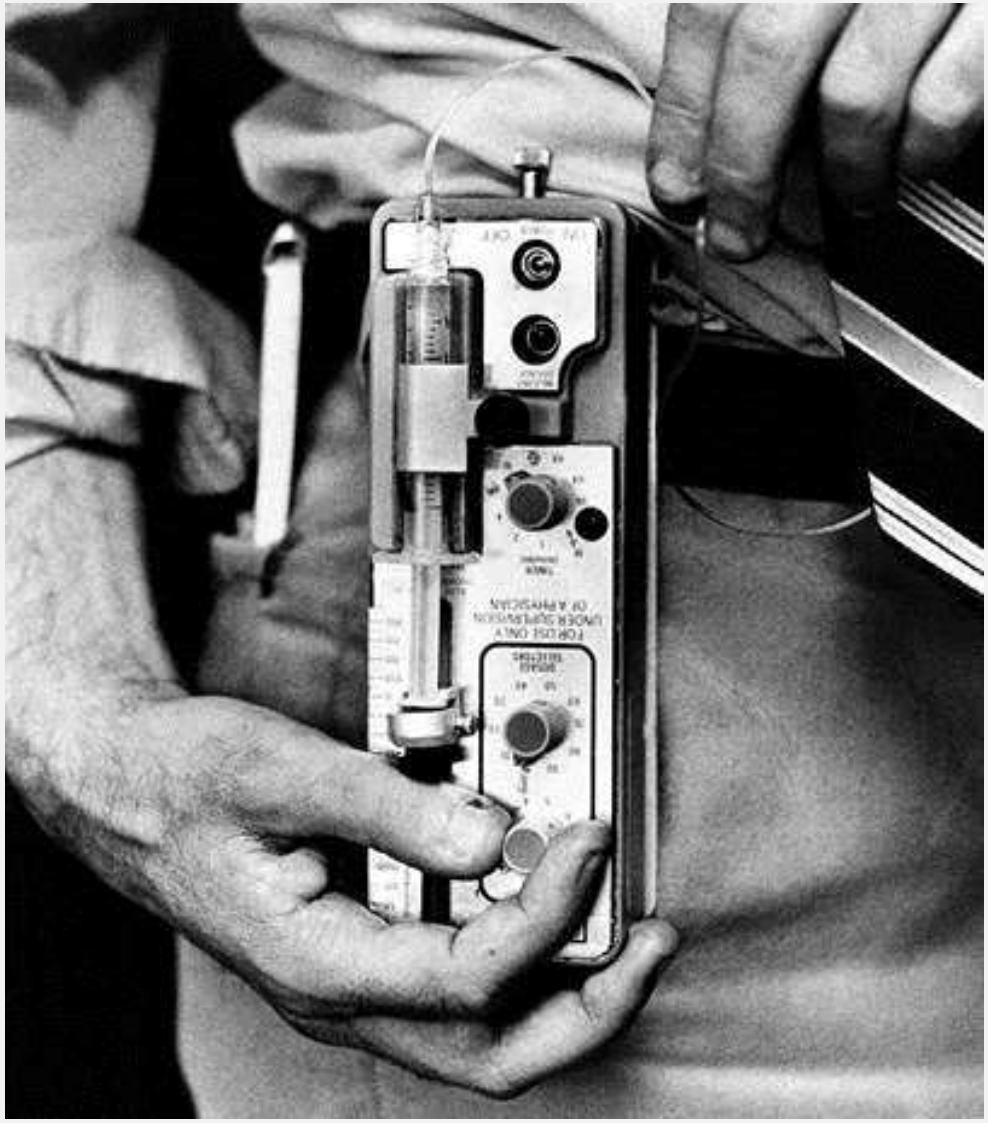

1978
AS 6MP
1983
C.P.I.
9100
1982
Travenol
Eugly
1984
C.P.I.
Betatron II
1983
MiniMed Technologies
Model 504-S 1987

Early Insulin Pumps (early 1970s)

Placing insulin-pump needle under skin

Puzzling Ailment

Hope for juvenile diabetics

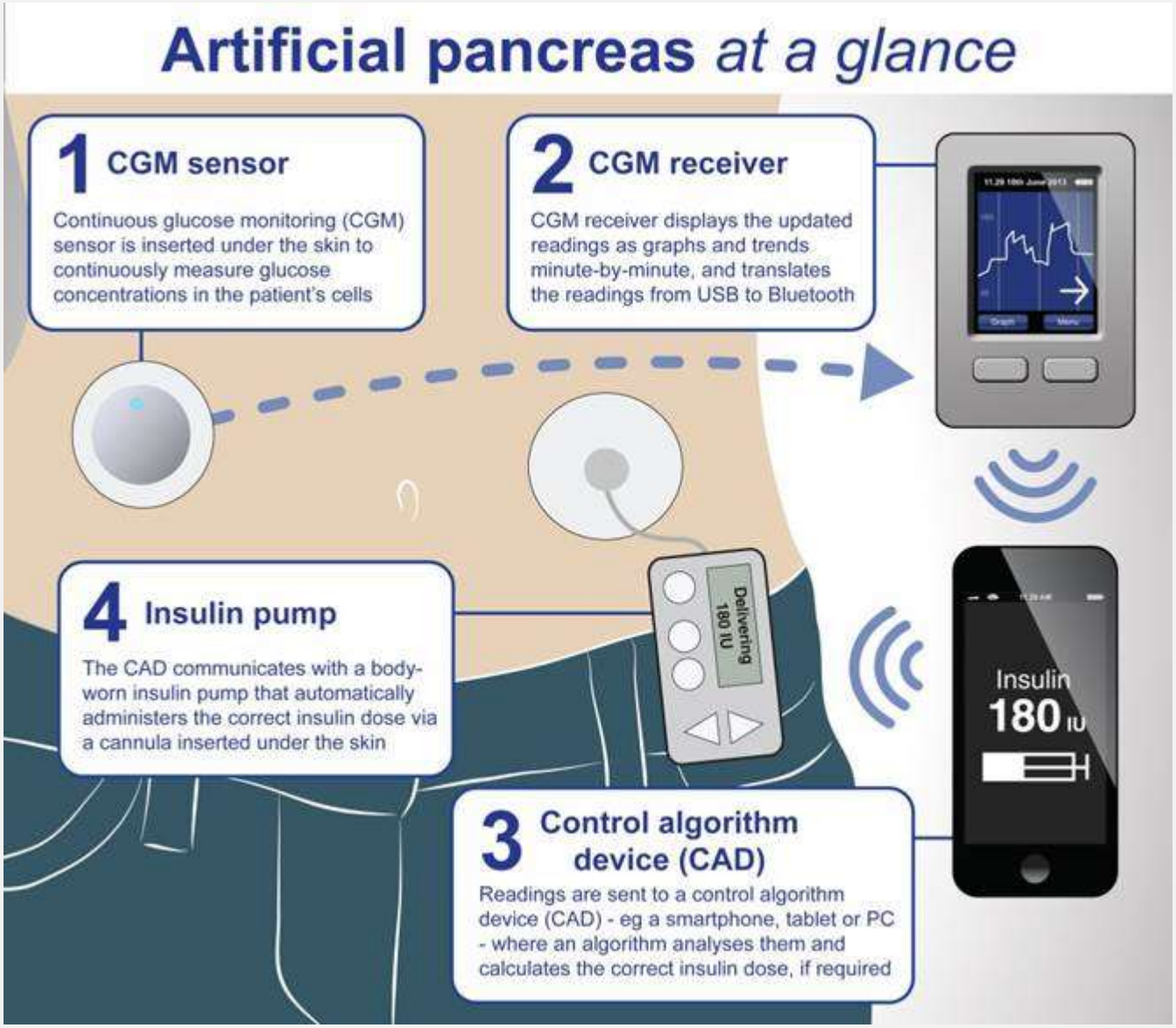


THE LAST DECADE HAS SEEN MANY NEW INNOVATIONS IN DIABETES MANAGEMENT.

THE NEXT DECADE PROMISES EVEN MORE CHANGE AND BETTER CARE OF DIABETES.

HERE ARE A FEW EXAMPLES OF WHAT WE HAVE AND WHAT'S IN STORE.

Artificial pancreas *at a glance*



COMPONENTS OF A HYBRID CLOSED LOOP SYSTEM

CONTOUR®NEXT LINK Wireless Blood Glucose Meter

Insulin Pump

4th Generation Sensor

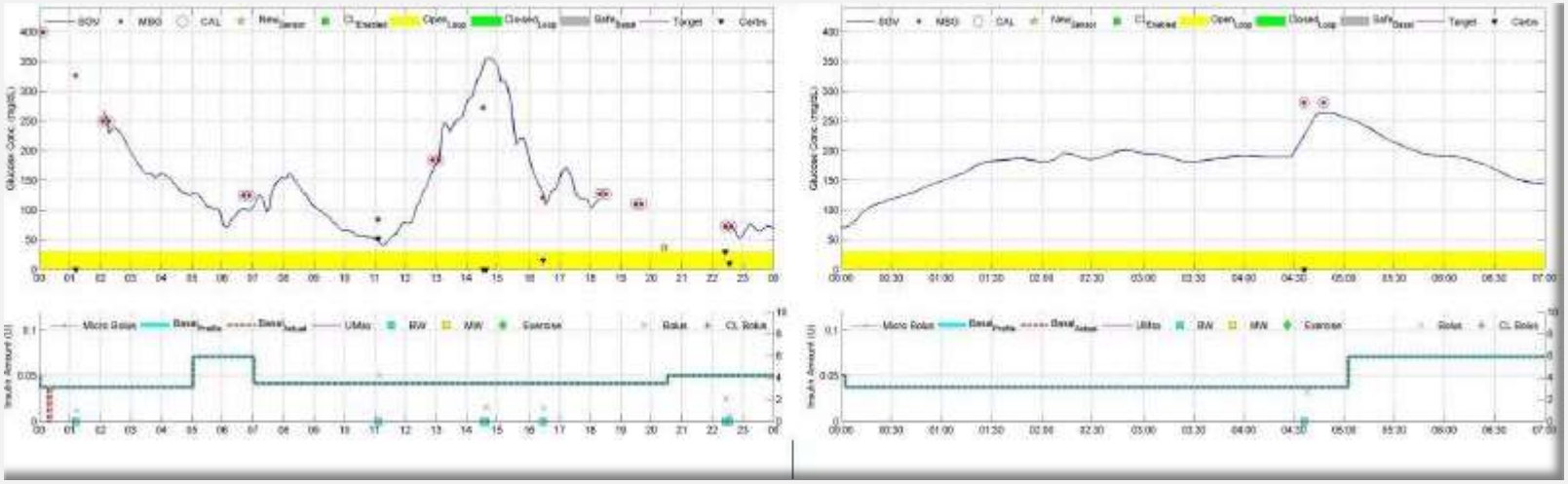
One-press Serter

CareLink™ Software

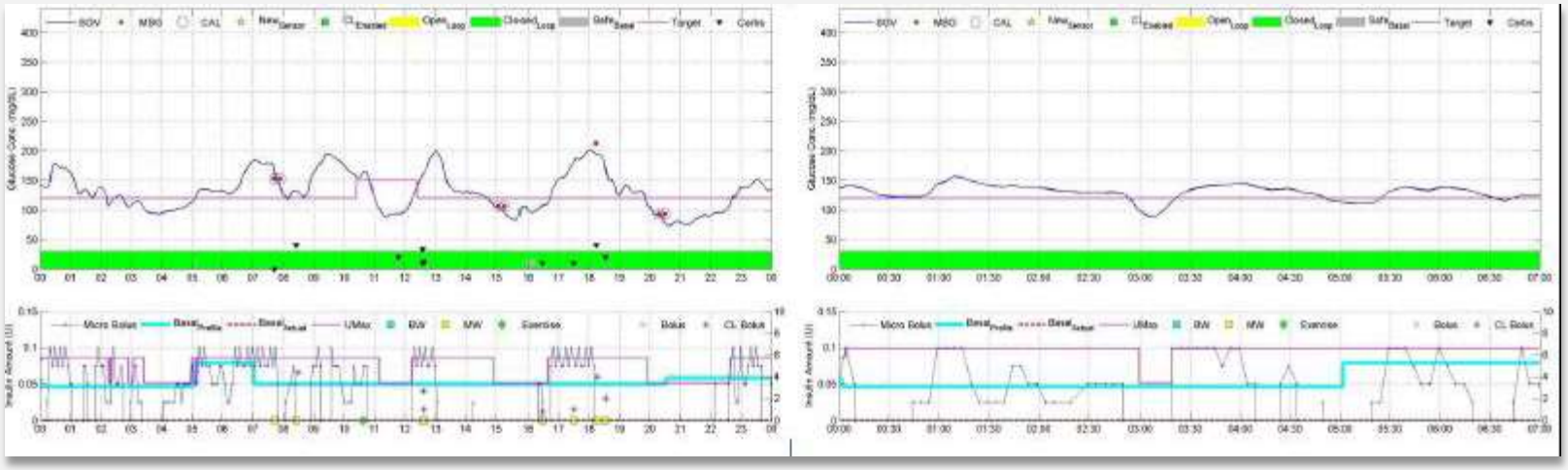
WARNING: Medtronic performed an evaluation of the hybrid closed loop system and determined that it may not be safe for use in children under the age of 7 because of the way that the system is designed and the daily insulin requirements. Therefore, this device should not be used in anyone under the age of 7 years old. This device should also not be used in patients who require less than a total daily insulin does of 8 units per day because the device requires a minimum of 8 units per day to operate safely. 1. Sheer J, et al. ISPAD 2017; ePoster session 1: Technology; eP006

THE PIVOTAL STUDY

Patient with diabetes – open loop insulin delivery system



Patient with diabetes – closed loop insulin delivery system

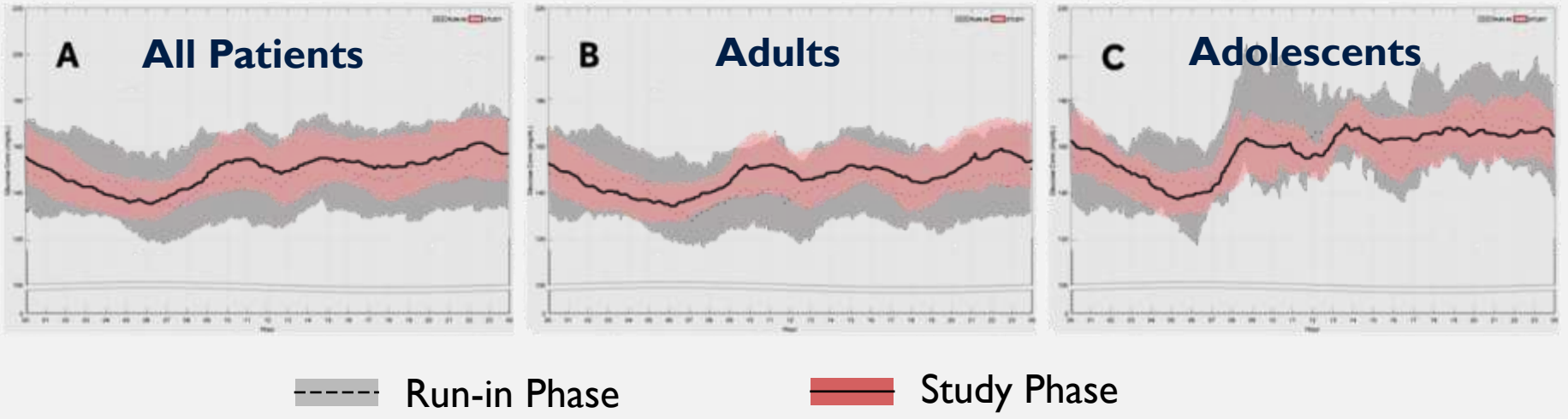


Data on File: Medtronic Confidential February 2016

REDUCED GLYCEMIC VARIABILITY

MODAL DAY SENSOR GLUCOSE TRACINGS

Median and Interquartile Range of SG Values / Day & Night



Hybrid closed loop resulted in:

- Increased time in range
- Reduced time spent low and high
- Reduced variability
- Less post-prandial excursion

Due to inherent study limitations, caution is advised when attempting to extrapolate these results to new patients. There could be significant differences.

Bergenstal RM, et al. JAMA. 2016 Oct 4;316(13):1407-1408. doi: 10.1001/jama.2016.11708.
Bergenstal R, et al. Pivotal Trial of a Hybrid Closed-Loop System in Type 1 Diabetes. ADA 76th Scientific sessions June 10-14, 2016
Garg SK, et al. Diabetes Technol Ther. 2017 Mar;19(3):155-163. doi: 10.1089/dia.2016.0421. Epub 2017 Jan 30

PIVOTAL TRIAL OF A HYBRID CLOSED LOOP SYSTEM

SUMMARY

- Three months of unsupervised at-home use of the hybrid closed loop system resulted in no severe hypoglycemia or DKA.
- The new 4th generation sensor was accurate.
- Study phase vs. run-in results
  - Increased time in target range
  - Decreased glycemic variability (lows and highs)
  - Reduction in HbA1c

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TANDEM T:SLIM X2 INSULIN PUMP

- Coming to Canada mid to late 2018.
- Integrated insulin delivery using Dexcom G5 CGM device operating in hybrid closed loop function.
- In USA, will be using Dexcom G6 CGM with both basal and corrective bolus functions, so called “artificial pancreas”.
- Pump features include Bluetooth connectivity, rechargeable lithium ion battery, USB port, and water tight construction.

OMNIPOD INSULIN PUMP

- New version will work with Dexcom G6; will provide trending data and alerts as well as operating the pump in hybrid closed loop fashion

OMNIPOD FEATURES

No infusion tubing

Built –in 200 unit insulin reservoir

Hand held PDM wirelessly connected to pump with customizable function

Port for remote data downloads

Next iteration (now in US) will integrate with Dexcom G5 or G6 for hybrid closed loop pump function.

MEDTRONIC STAND ALONE CGM DEVICE

- Guardian Connect device designed as a stand alone for MDI or type 2 patients.

- Will transmit data to smart device and will integrate with a number of smart phone apps to enable trending and insulin dose selection, similar to a Freestyle Insulinx device.

GLUCOSE SENSING SKIN PATCH

- University of Bath UK researchers have developed a reliable working prototype of a trans dermal sensor for continuous blood (or rather interstitial fluid) glucose levels.

- Usual 15 minute lag behind plasma glucose levels, similar to other CMG devices

IMPLANTABLE CGM

1

Subcutaneously implanted device with a three month life

2

Transmits to a removable transmitted adherent to the skin just above the device which in turn sends data to a smart phone app.

3

Currently in use in Europe, probably in the US by later this year, FDA willing.

3-D PRINT YOUR OWN ISLET CELLS!

- University of Wollongong in Australia researchers are clinically testing at the Royal Adelaide hospital synthetic, 3-D printed islet cell using a PICT 3D printer.

- We can't wait to see if this is a viable option for insulin replacement therapy.

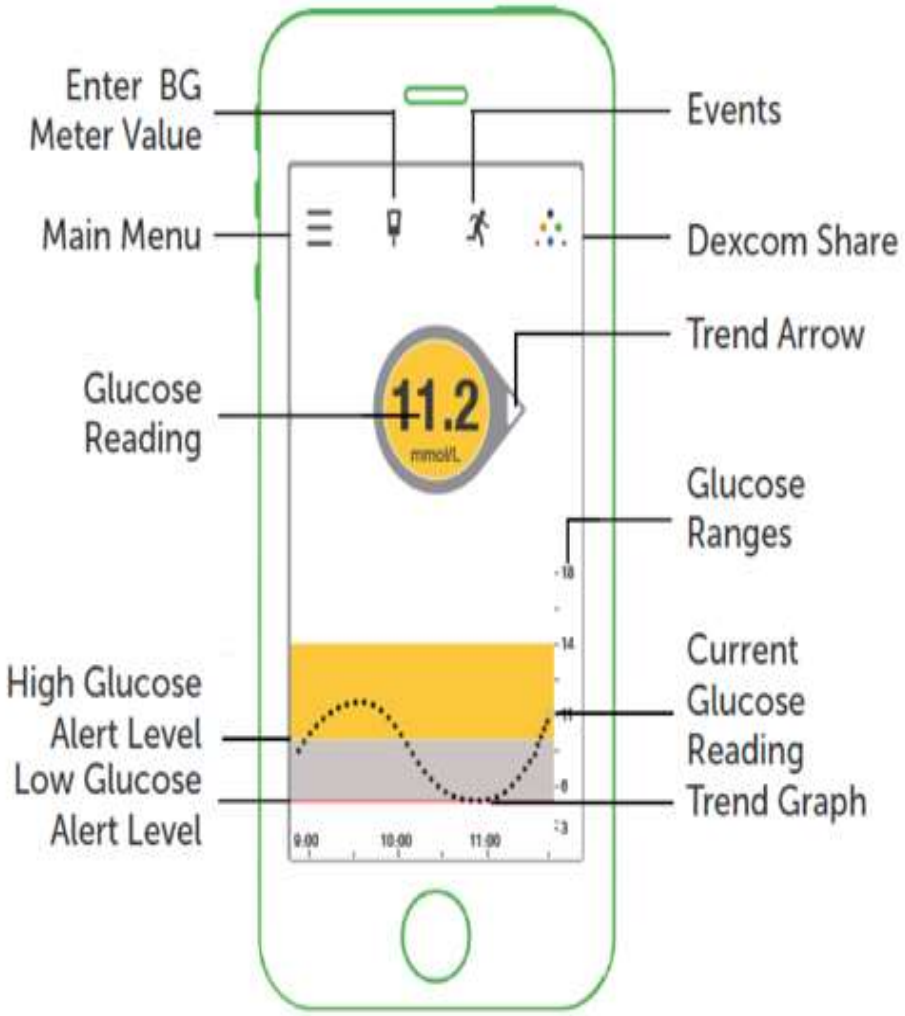
GLOWING CONTACT LENSES

- Worn overnight to reduce risk of retinopathy progression by reducing retinal oxygen uptake, reducing ischemic stress.

CAUTION - Investigational Device. Limited by Federal (or United States) law to investigational use.

Smart phone screen

Dexcom G5 Mobile Si...
Medical



DEXCOM TREND ARROWS REMEMBER TREND ARROWS ARE BRAND SPECIFIC

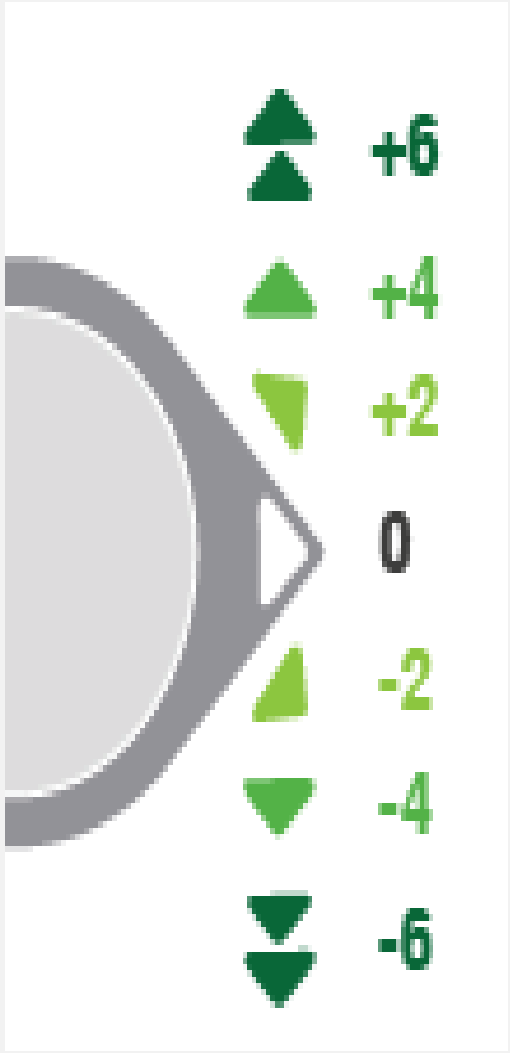
What do the arrows mean?

Glucose rapidly rising
- more than 0.2 mmol/L each minute
- more than 2.5 mmol/L in 15 minutes
- more than 5 mmol/L in 30 minutes

Glucose rising
- 0.1-0.2 mmol/L each minute
- up to 2.5 mmol/L in 15 minutes
- up to 5 mmol/L in 30 minutes

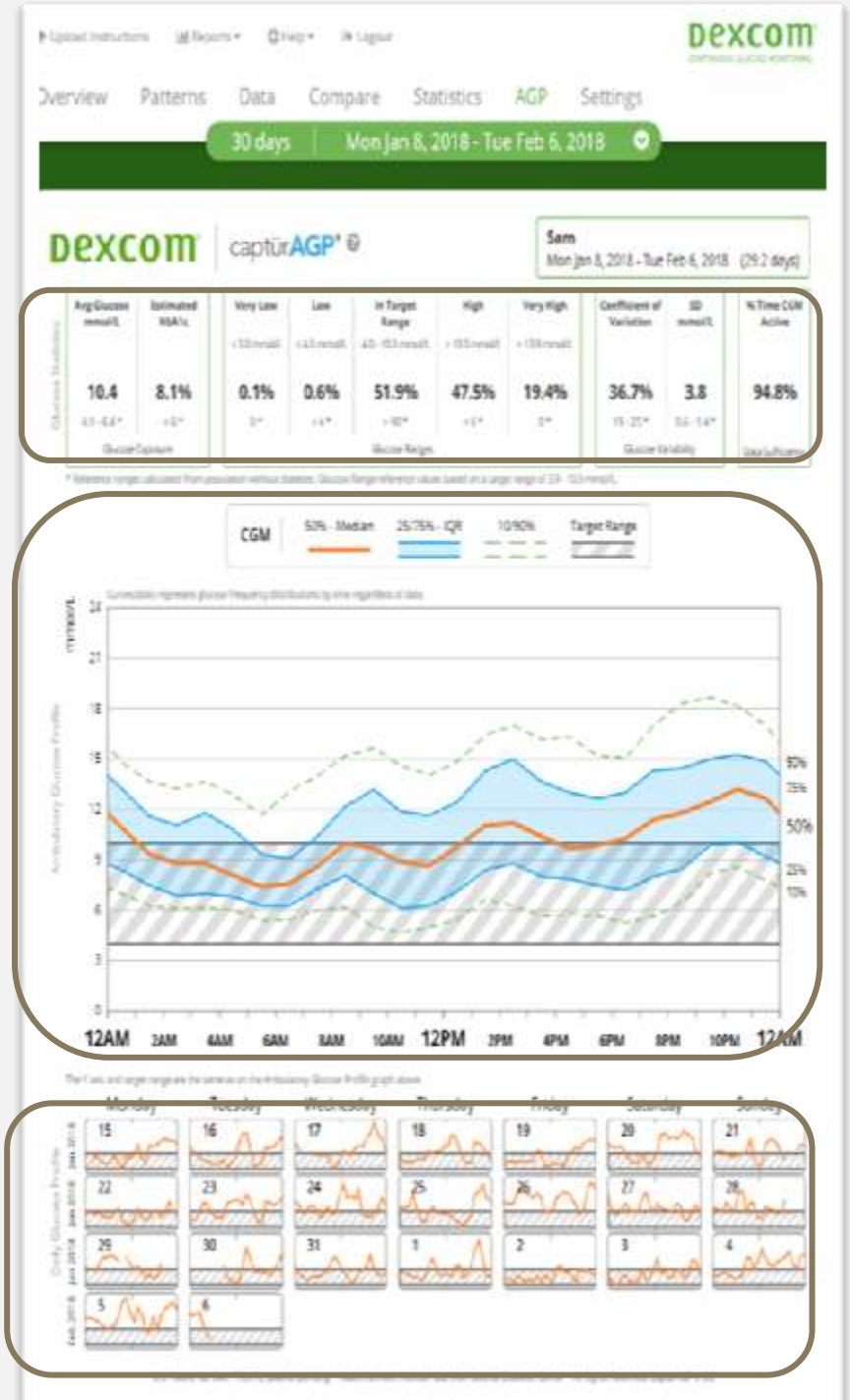
Glucose slowly rising
- 0.06-0.1 mmol/L each minute
- up to 1.7 mmol/L in 15 minutes
- up to 3.4 mmol/L in 30 minutes

Not increasing/decreasing
- more than 0.06 mmol/L per minute
- up to 0.9 mmol/L in 15 minutes
- up to 1.8 mmol/L in 30 minutes



- Statistics Summary
Glucose Profiles
for 24-hour picture
Single-day glucose
charts

7. AGP



FREESTYLE LIBRE/ LIBRE LINK APP

Device links to smart phone, or by Bluetooth to up to 20 other smartphones

Other apps in the offering to provide alerts as well selection of insulin dosages

DEXCOM G6 CGM DEVICE

Dexcom gets better- NO fingersticks, calibrations needed

Transmits directly to smartphone

10 day sensor wear

Trending and predictive alerts for high/low glucose levels

Insulin low suspend feature with pump integration.

QUESTIONS?

THANK YOU