

CONGRESSO

SID-AMD
Regione Abruzzo

Diabete di tipo 1: Gli strumenti di cura più aggiornati ad oggi

Giorgio Grassi

Endocrinologia Diabetologia

Città della Salute e della Scienza

Torino

Children as young as seven mining cobalt used in smartphones, says Amnesty

Children as young as seven are working in perilous conditions in the Democratic Republic of the Congo to mine cobalt that ends up in smartphones, cars and computers sold to millions across the world, by household brands including Apple, Microsoft and Vodafone, according to a new investigation by [Amnesty International](#).



Annie Kelly is an award-winning human rights journalist for the Guardian and Observer. She is editor of the Guardian's [Modern-day slavery in focus](#) series



L'attenzione e alla cura

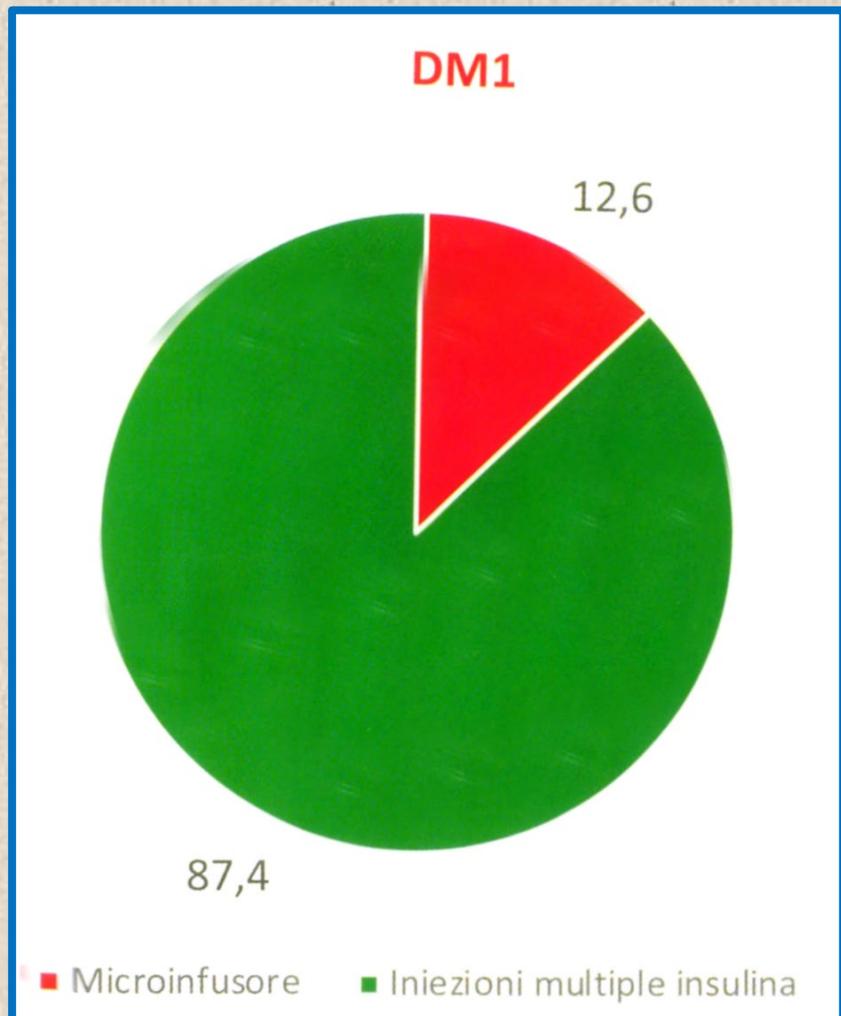
	LUNEDÌ	MARTEDÌ	MERCOLEDÌ	GIOVEDÌ	VENERDÌ	SABATO	DOMENICA
COLAZIONE	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - NITROGLICERINA (CEROTTO) - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - NITROGLICERINA (CEROTTO) - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - CEROTTO - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - CEROTTO - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - CEROTTO - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - CEROTTO - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- LOBIVON - PLAVIX - TRIATEC - PANTOPRAZOLO - CEROTTO - INSULINA 14 UNITÀ MARRONE - 1 GOCCIA ALCON (SU OCCHIO GONFIO)
5.	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN	- LASIX (UN GIORNO SÌ E UNO NO VEDI CALENDARIO) - GABAPENTIN
	<p>PRIMA DI PRANZO</p> <p>- 18 UNITÀ INSULINA MARRONE</p> <p>DOPO PRANZO</p> <p>- CARDIOASPIRINA</p> <p>- OLMESARTAN</p> <p>(IL KANRENOLO SÌ DA QUANDO LA MATTINA SÌ DA IL LASIX VEDI CALENDARIO)</p> <p>MENTRE MANGIA</p> <p>- 18-20 UNITÀ DI INSULINA MARRONE</p> <p>- OMNIC - SIVASTIN - GABAPENTIN</p> <p>PRIMA DI CORICARSI</p> <p>- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)</p>						
6.	- 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)	- 1 GOCCIA DI ALCON (SU OCCHIO GONFIO)
7.	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)	- 22 UNITÀ DI INSULINA VERDE (SE MANGIA TANTO 25 UNITÀ)

MARRONE NO

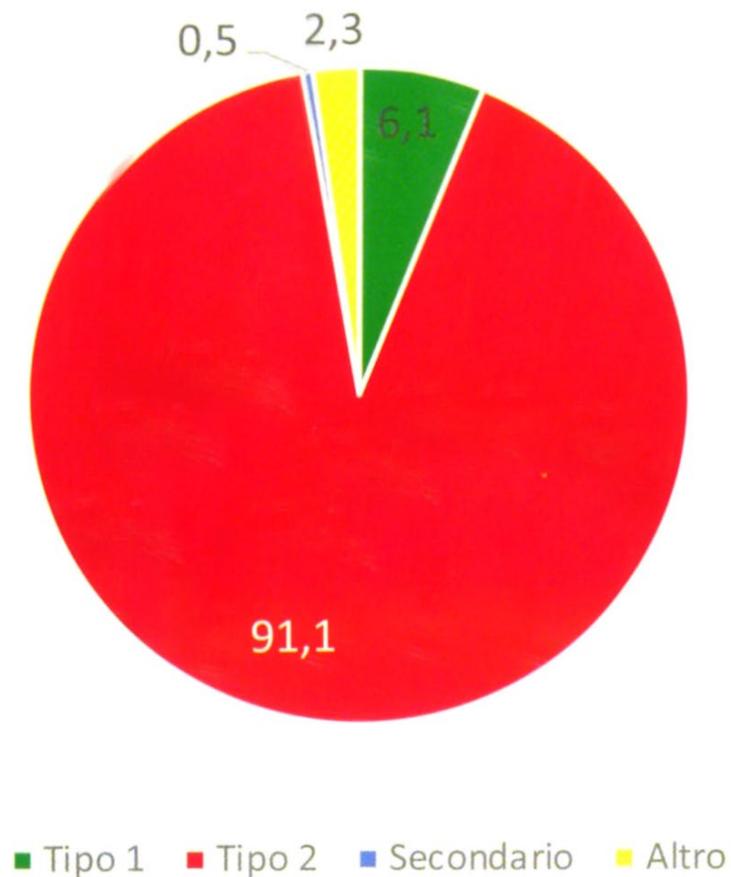


La cura della sedia a sdraio all'aria aperta, alla *Casa dei Diabetici Tedeschi* di Garz (Rügen)

Per chi la tecnologia ?



Distribuzione per tipo di diabete (%)



Technology availability
In a near future
Already used by
patients with diabetes

Smart contact lenses
(glucose level)

Smart Blood Pressure Monitor

Smart Watch
(activity, sleep, glucose level, heart rate, geolocation)

Artificial Pancreas

Smart Socks
(temperature, inflammation, infection and amputation prevention)

Flash or Continuous Glucose Monitor
(glucose level, hyper- & hypoglycemia, time in range...)

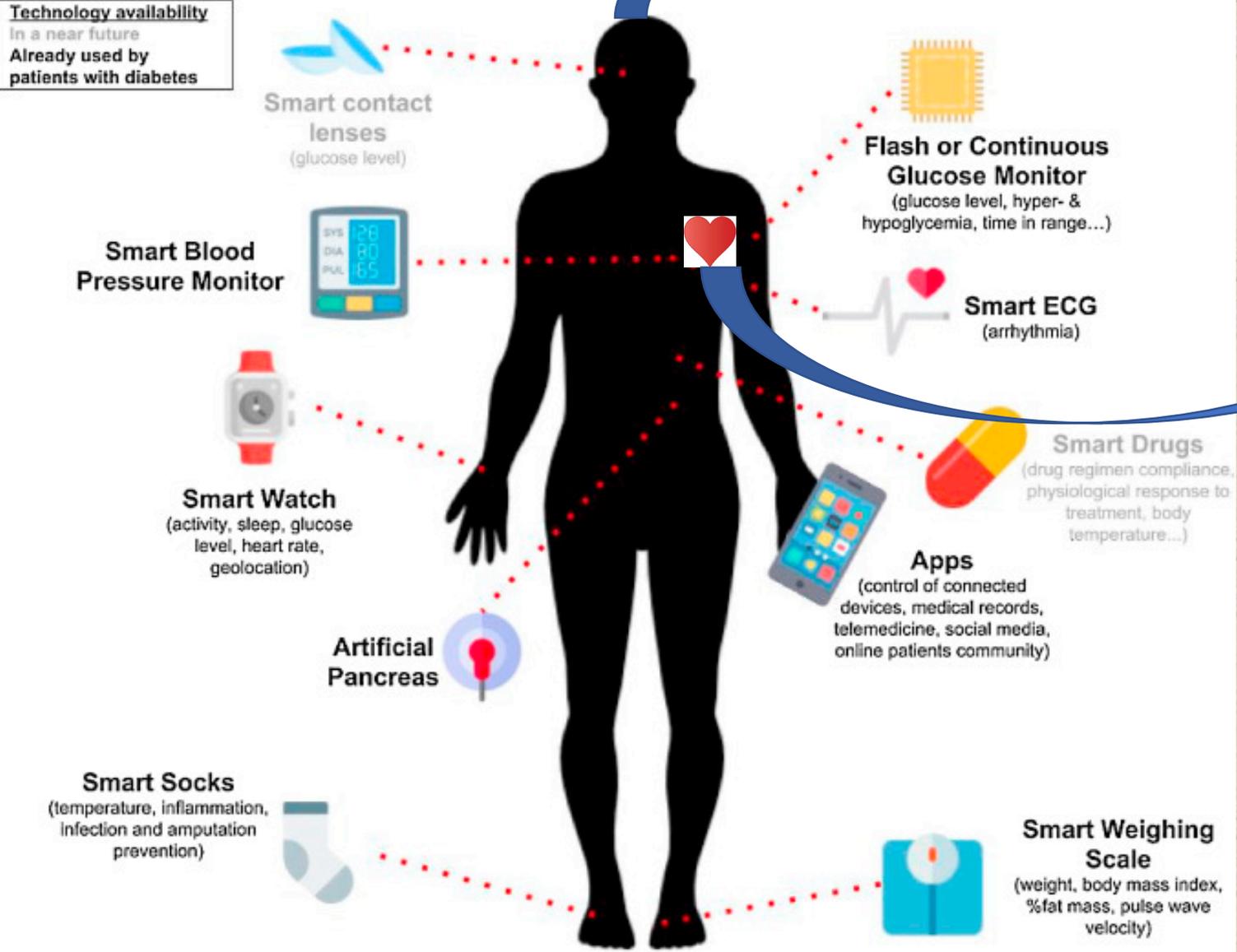
Smart ECG
(arrhythmia)

Smart Drugs
(drug regimen compliance, physiological response to treatment, body temperature...)

Apps
(control of connected devices, medical records, telemedicine, social media, online patients community)

Smart Weighing Scale
(weight, body mass index, %fat mass, pulse wave velocity)

Human factor





JDRF IMPROVING
LIVES.
CURING
TYPE 1
DIABETES.

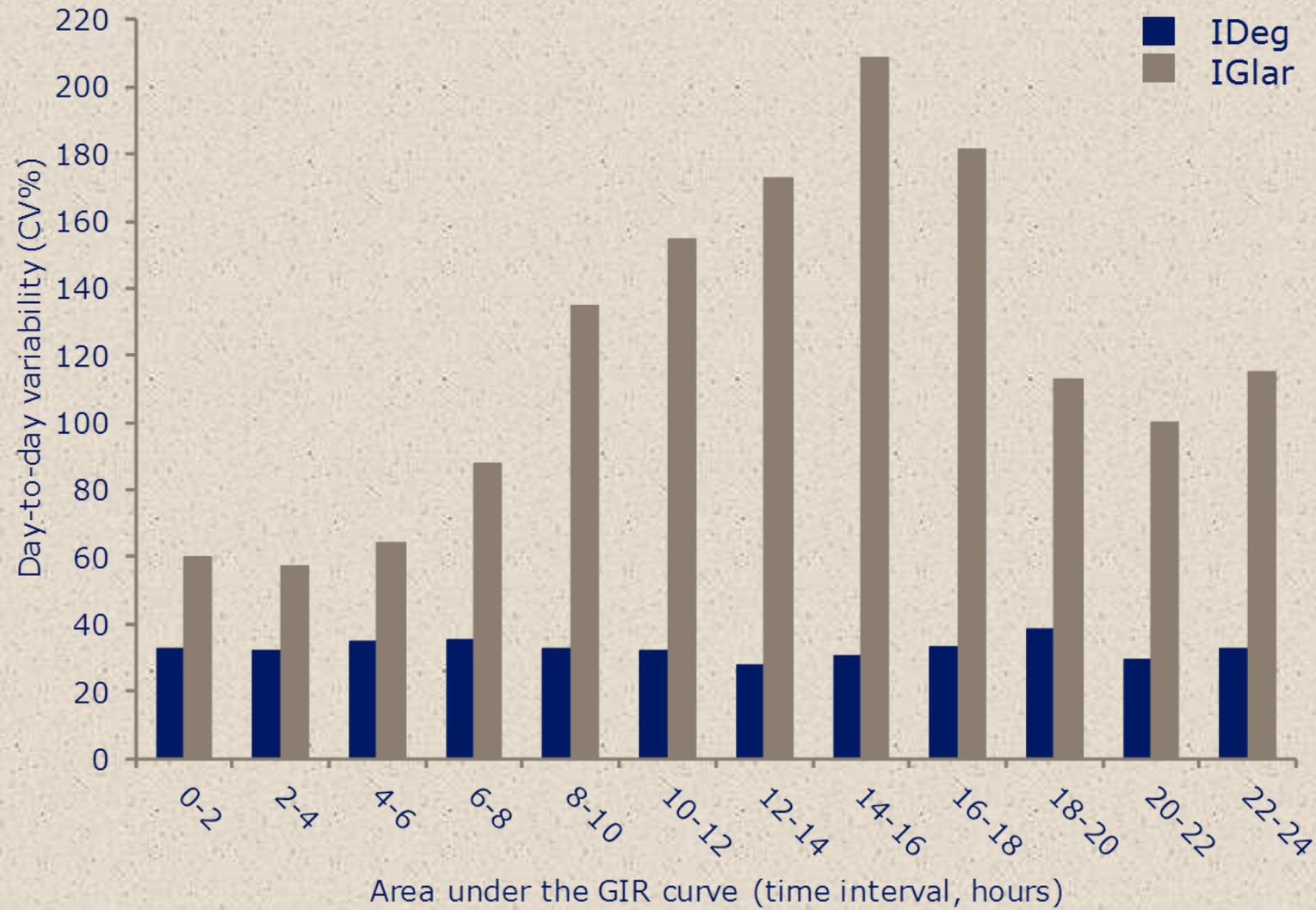
DONATE

BE A TYPE 1 SUPERHERO FOR WORLD DIABETES DAY 2018

“Every year, since she was diagnosed, Anya has benefited from a breakthrough in type 1 research. Last May, Anya started using an insulin pump [instead of injecting four times a day], giving her – and us – much more freedom and peace of mind.” ~ Anya’s dad, Sunil

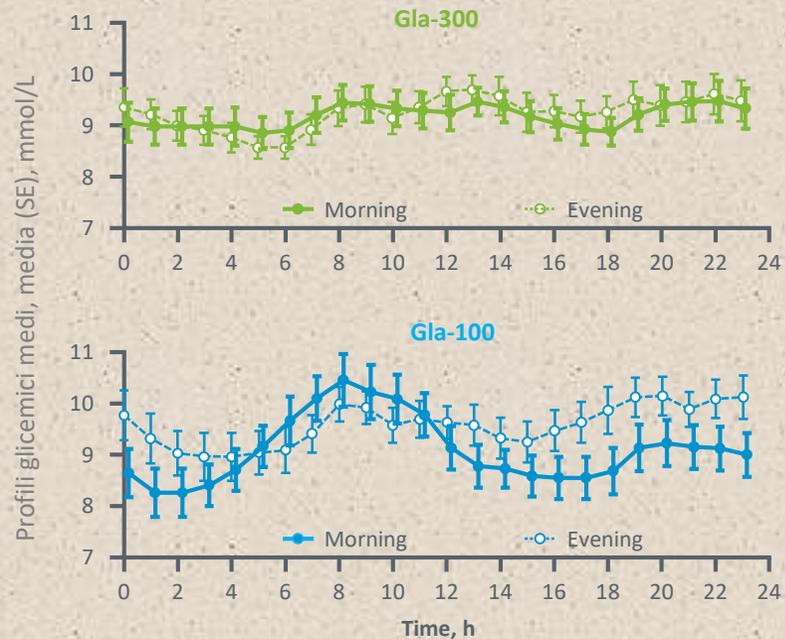
INSULINE BASALI

Day-to-day variability Degludec



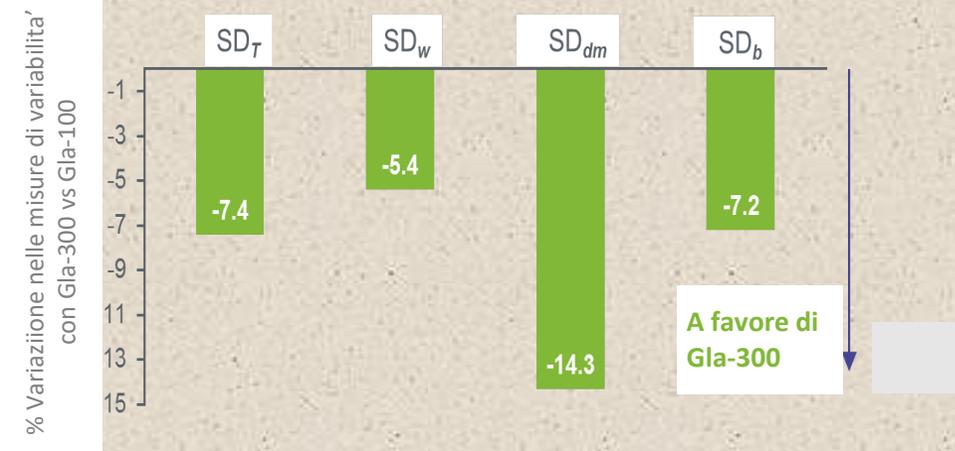
Glargine U300

Profili glicemici con Gla-300 vs Gla-100, indipendentemente dal momento di iniezione (mattina o sera)



Average 24-h glucose profiles during the last 2 weeks of each treatment period (continuous glucose monitoring population; pooled data period A + B).

Tutte le misure di variabilità intra-soggetto intra-giornaliere e tra-giorni risultano numericamente inferiori per i soggetti trattati con Gla-300 vs Gla-100



Valori assoluti; media(SE) (mg/dL)	SD_T Variabilità deviazione standard totale	SD_w Variabilità intra-giornaliera	SD_{dm} Variabilità tra le medie giornaliere	SD_b Variabilità tra giorni (stessa ora)
Gla-100	76.1 (2.7)	61.4 (1.8)	41.4 (2.5)	71.3 (2.9)
Gla-300	70.5 (2.4)	58.1 (2.1)	35.5 (1.7)	66.2 (2.3)
P-value	0.1259	0.2286	0.052	0.1568

- Studio CGM di fase II, a gruppi paralleli, corssover con Gla-300 vs Gla-100 somministrata la mattina o la sera in 59 soggetti con DMT1

MY INSULIN DOSE

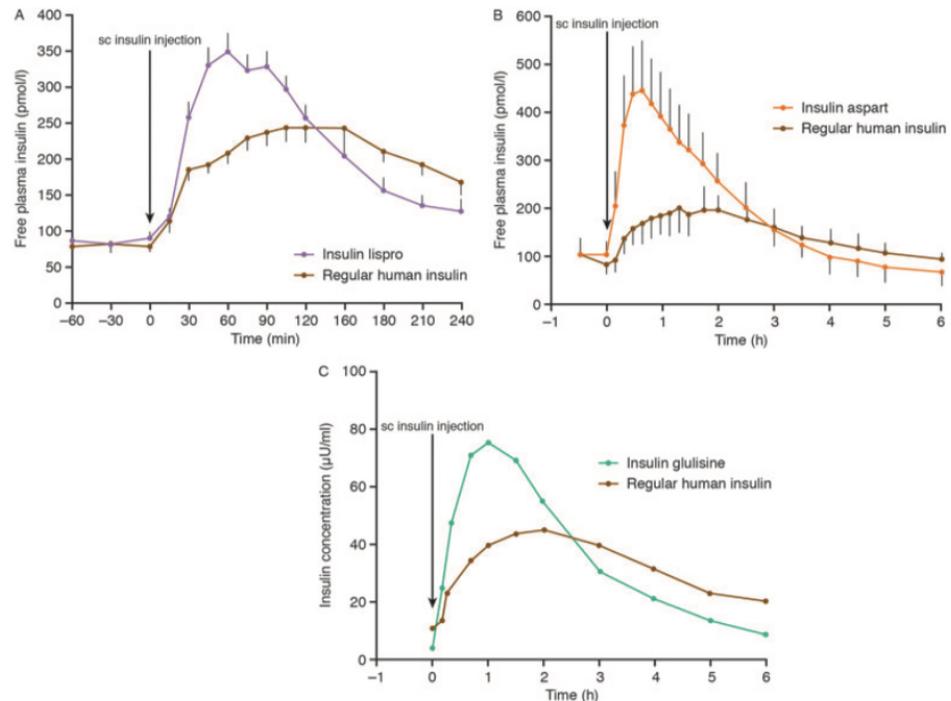
AFTER ITALIAN FOOD

memegenerator.net

INSULINA RAPIDE

The pharmacokinetics and pharmacodynamics of rapid-acting insulin analogues and their clinical consequences

P. D. Home Newcastle Diabetes Centre and Newcastle University, Newcastle upon Tyne, UK



- In most published PK/PD studies comparing insulin glulisine with either insulin lispro or insulin aspart, insulin glulisine has appeared to have a faster onset of action than the two other analogues, especially in obese patients [body mass index (BMI) 30 – 40 kg/m²]. However, the overall plasma glucose profiles of insulin glulisine and the two other rapid-acting analogues in the published studies again appear to be similar.

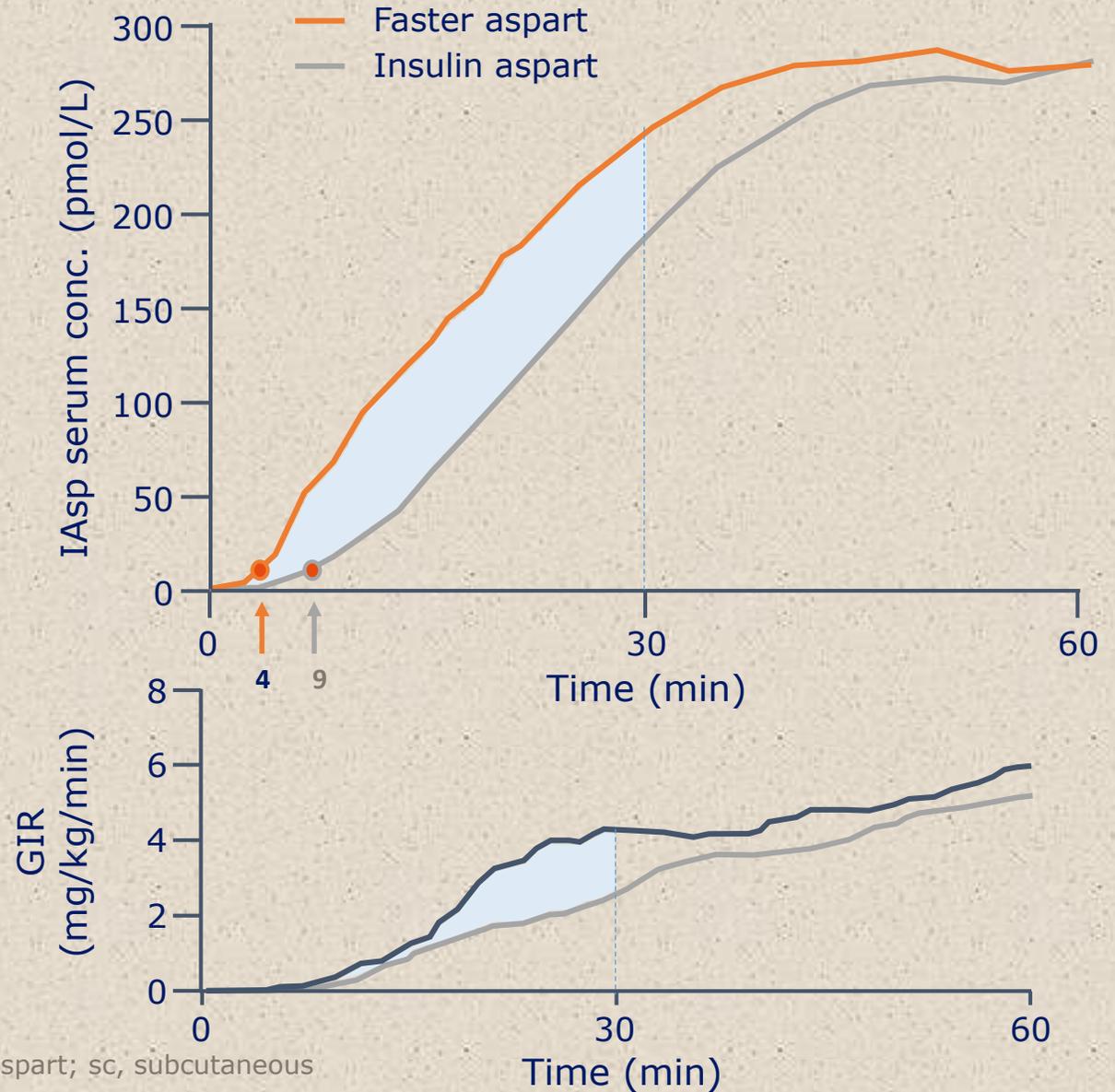
Faster aspart vs. insulin aspart via sc injection

Compared with insulin aspart, faster aspart has:

Twice as fast onset of appearance in the bloodstream

Two-fold higher insulin exposure within the first 30 min

74% greater insulin action within the first 30 min



Rethinking the Viability and Utility of Inhaled Insulin in Clinical Practice

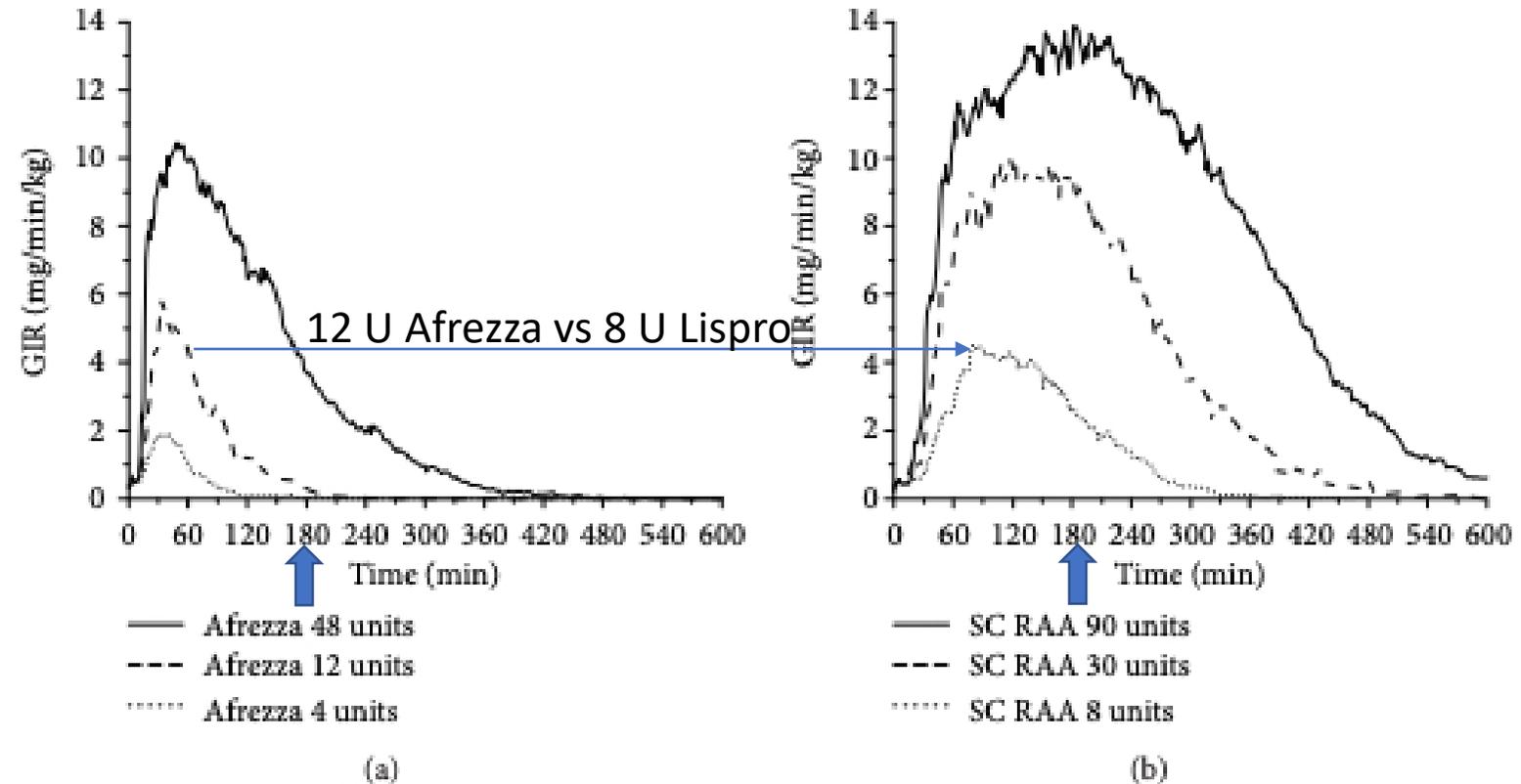


FIGURE 2: Peak glucose lowering effect of TI (Afrezza) after inhalation of 12 units (a) is similar to 8 units SC applied insulin lispro (RAA) (b) but with faster onset and shorter duration of action.



Recommendations for Initiating Use of Afrezza Inhaled Insulin in Individuals with Type 1 Diabetes

TABLE 1. CONVERSION FROM RAPID-ACTING INSULIN TO AFREZZA: INSULIN SENSITIVITY FACTORS AND INSULIN-TO-CARBOHYDRATE RATIOS

<i>Current ISF</i>	<i>Afrezza ISF</i>	<i>Current I:CHO</i>	<i>Afrezza I:CHO</i>
1:20	4 U dose will <i>lower</i> BG by 30 mg/dL	1:5	4 U per 7.5 g
1:25	4 U dose will <i>lower</i> BG by 37.5 mg/dL	1:10	4 U per 15 g
1:30	4 U dose will <i>lower</i> BG by 45 mg/dL	1:15	4 U per 22.5 g
1:35	4 U dose will <i>lower</i> BG by 52.5 mg/dL	1:20	4 U per 30 g
1:40	4 U dose will <i>lower</i> BG by 60 mg/dL	1:25	4 U per 37.5 g
1:45	4 U dose will <i>lower</i> BG by 67.5 mg/dL	1:30	4 U per 45 g

Note the table uses a consistent 1.5× multiplier when converting from injected RAI analogs to Afrezza. BG, blood glucose; I:CHO, insulin-to-carbohydrate; ISF, insulin sensitivity factor; RAI, rapid-acting insulin.



spray nasale di glucagone



- NG showed real-world effectiveness when to treat moderate or severe HE in pts with T1D. For most HEs (96.2%), pts recovered within 30 minutes and there were no emergency calls. The majority of CGs were satisfied with NG. NG is a potential alternative to currently available injectable recombinant glucagon.

Sequist E. R. et al. Nasal Glucagon for the Treatment of Moderate-to-Severe Hypoglycemic Episodes in Real-World Settings in Adults with Type 1 Diabetes. American Diabetes Association (ADA) 2017 Scientific Sessions.

FARMACI ORALI

METFORMINA

SGLT2

GLP1

Efficacy and safety of liraglutide for overweight adult patients with type 1 diabetes and insufficient glycaemic control (Lira-1): a randomised, double-blind, placebo-controlled trial.

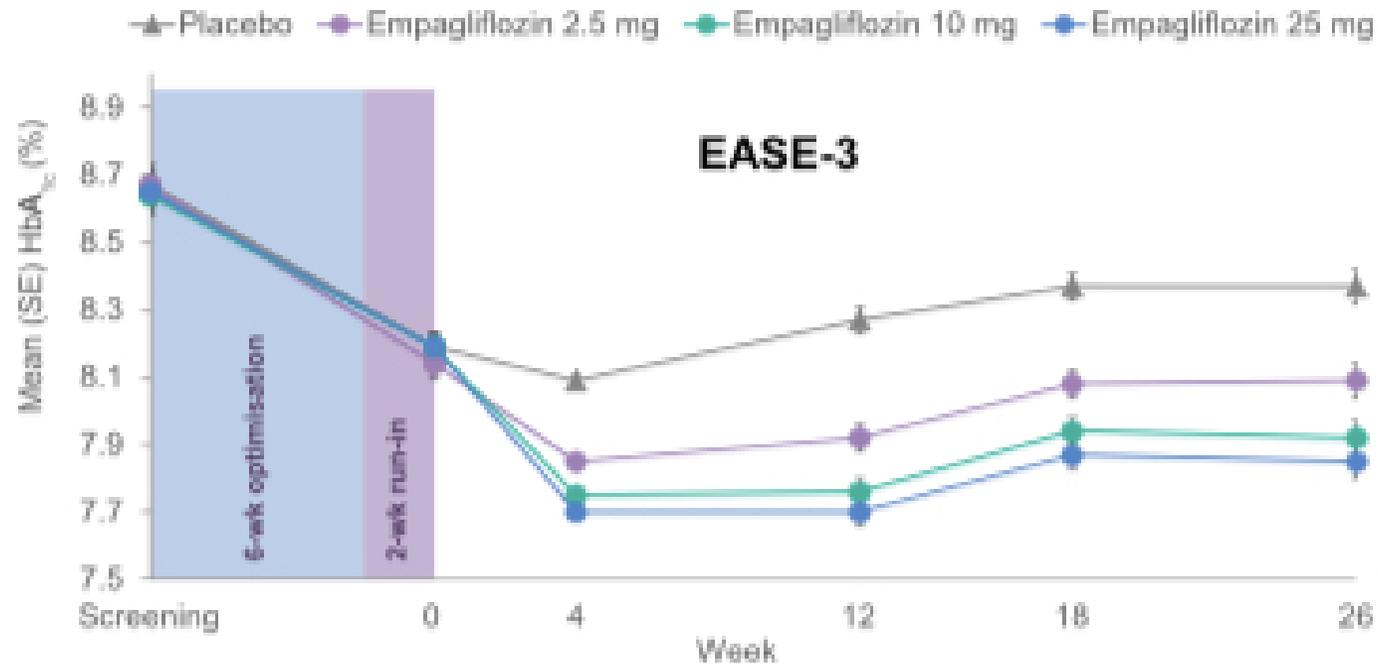
- In patients with type 1 diabetes, overweight, and insufficient glycaemic control, the reduction in HbA1c did not differ between insulin plus placebo and insulin plus liraglutide treatment. Liraglutide was associated with reductions in hypoglycaemic events, bolus and total insulin dose, and bodyweight, and increased heart rate.

Cardiovascular and metabolic effects of metformin in patients with type 1 diabetes (REMOVAL): a double-blind, randomised, placebo-controlled trial.

- These data do not support use of metformin to improve glycaemic control in adults with long-standing type 1 diabetes as suggested by current guidelines, but suggest that it might have a wider role in cardiovascular risk management.

Empagliflozin as Adjunctive to Insulin Therapy in Type 1 Diabetes: The EASE Trials

• **CONCLUSIONS:** Empagliflozin improved glycemic control and weight in T1D without increasing hypoglycemia. Ketoacidosis rate was comparable between empagliflozin 2.5 mg and placebo but increased with 10 mg and 25 mg. Ketone monitoring for early ketoacidosis detection and intervention and lower empagliflozin doses may help to reduce this risk.

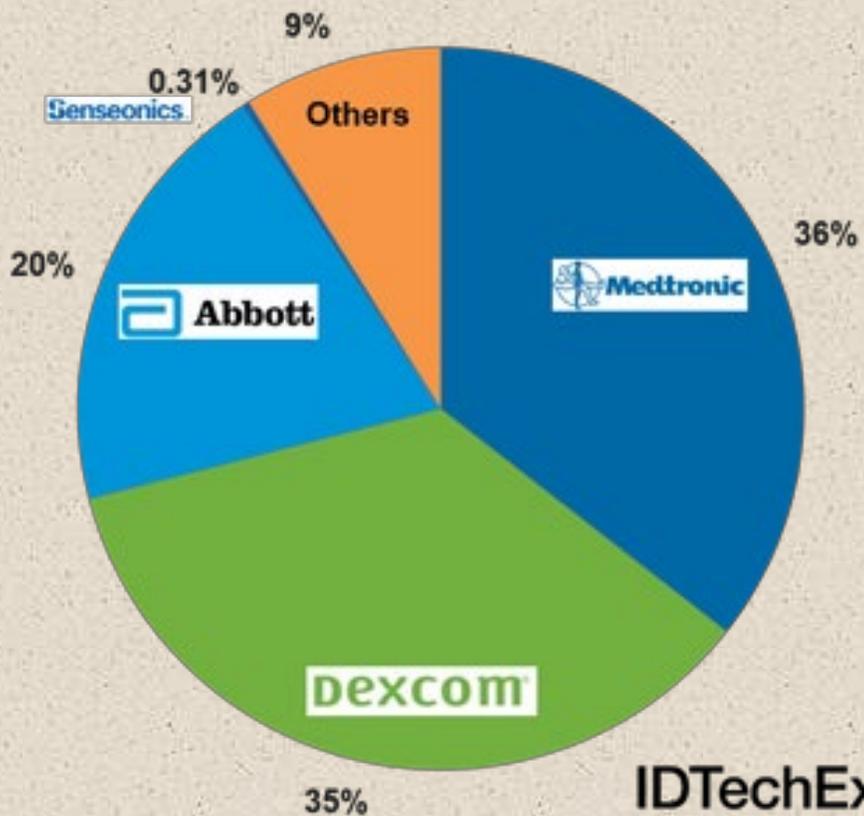


n with data at visit	Screening	0	4	12	18	26
Placebo	238	238	236	227	222	217
Empagliflozin 2.5 mg	237	237	237	234	228	225
Empagliflozin 10 mg	244	244	243	234	225	225
Empagliflozin 25 mg	242	242	241	231	226	221

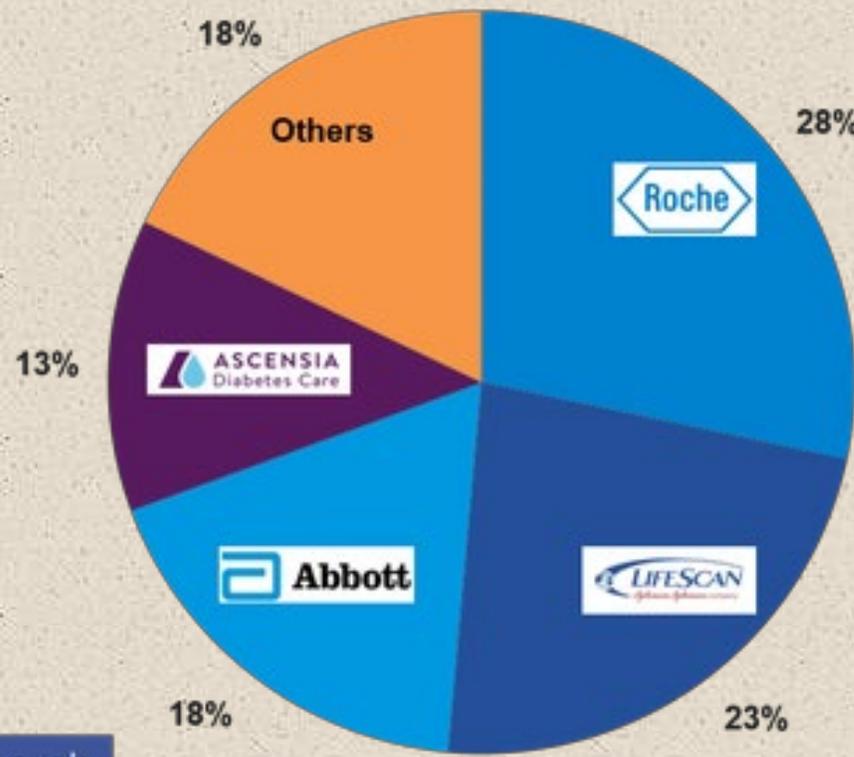
Tecnologie

- CSII
- SAP
- Sistemi Ibridi
- Sistemi ad ansa Chiusa
- HBGM
- CGM
- FGM
- Comunicazione
- Tecnologia per il controllo del DM in ospedale

CGM in 2017:
Market share by company



SMBG (test strips & glucometers) 2017:
Market share by company

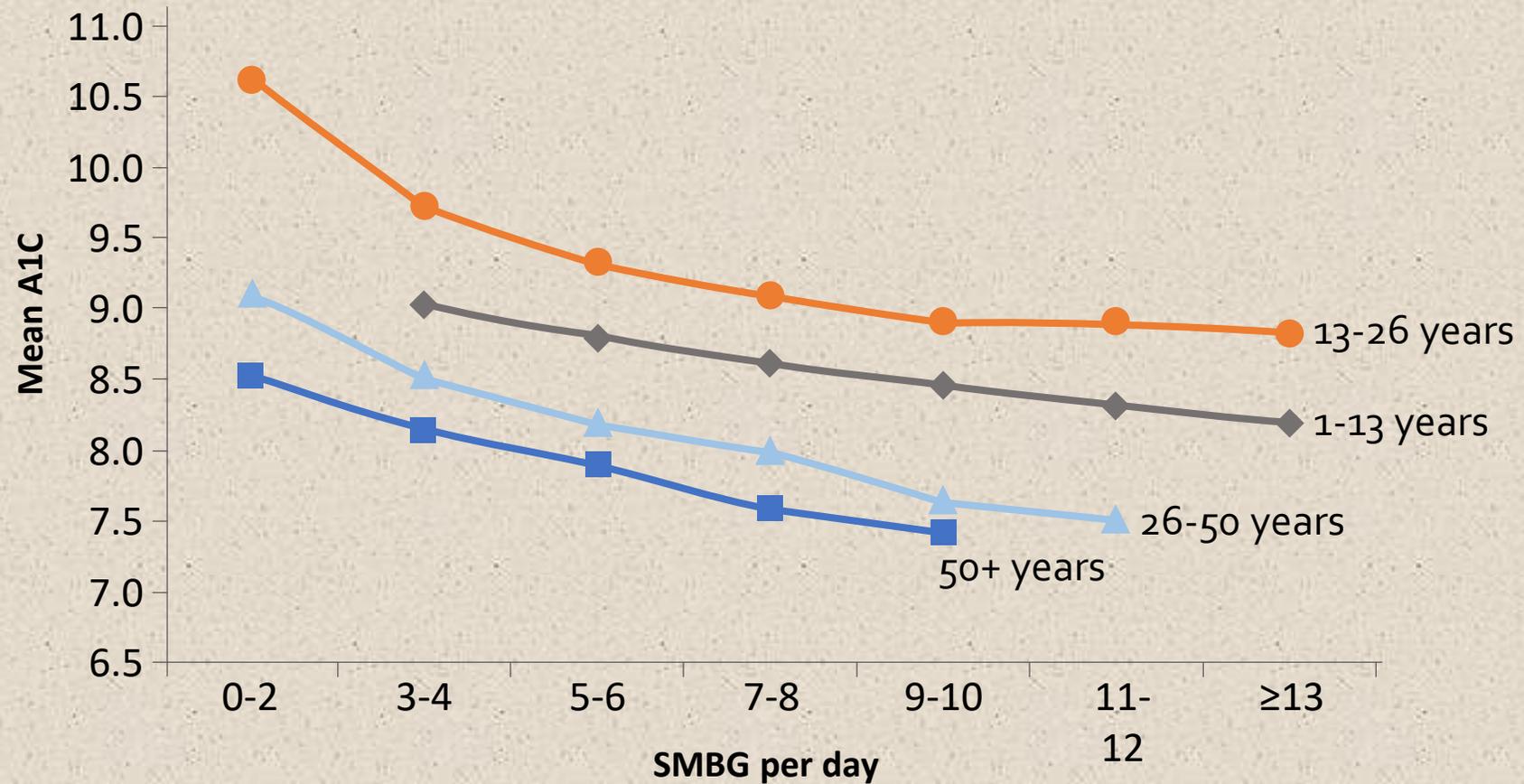


IDTechEx Research

IDTechEx
Read more at: <https://www.idtechex.com/contact/about-us.asp>

Q18. When and how should glucose monitoring be used?

SMBG Frequency vs A1C



Continuous Glucose Monitoring (CGM)

Uses

- Consider for T1D patients (and insulin-using T2D patients) to improve A1C and reduce hypoglycemia
- Features
 - “Real-time” glucose values (but 7- to 15-minute lag between plasma and interstitial glucose and receiver display)
 - Hypo- and hyperglycemia alarms
 - Wireless interfaces with downloadable/printable data

Limitations

- Invasive (worn like a pump)
- Requires daily calibration with fingerstick SMBG
- Lengthy data download time
- Requires highly motivated/informed patients and healthcare support team
 - Must be able to interpret data trends rather than data points

Glucose Monitoring: Recommendations

- Most patients using intensive insulin regimens (multiple-dose insulin or insulin pump therapy) should perform SMBG: **B**
 - Prior to meals and snacks
 - At bedtime
 - Occasionally postprandially
 - Prior to exercise
 - When they suspect low blood glucose
 - After treating low blood glucose until they are normoglycemic
 - Prior to critical tasks such as driving

Glucose Monitoring: Recommendations (3)

- When used properly, CGM in conjunction with intensive insulin regimens is a useful tool to lower A1C in adults with type 1 diabetes who are not meeting glycemic targets. **A**
- CGM may be a useful tool in those with hypoglycemia unawareness and/or frequent hypoglycemic episodes. **C**
- Given the variable adherence to CGM, assess individual readiness for continuing CGM use prior to prescribing. **E**

Practical Considerations on the Use of Continuous Glucose Monitoring in Pediatrics and Older Adults and Nonadjunctive Use

CGM users or parents/caregivers: How often do you correct a high based on a CGM reading without verifying a result with a glucose meter, assuming the CGM is calibrated?

CGM users or parents/caregivers: How often do you correct a low based on a CGM reading without verifying a result with a glucose meter, assuming the CGM is calibrated?

Percent Responses, n= 422

Percent Responses, n = 505

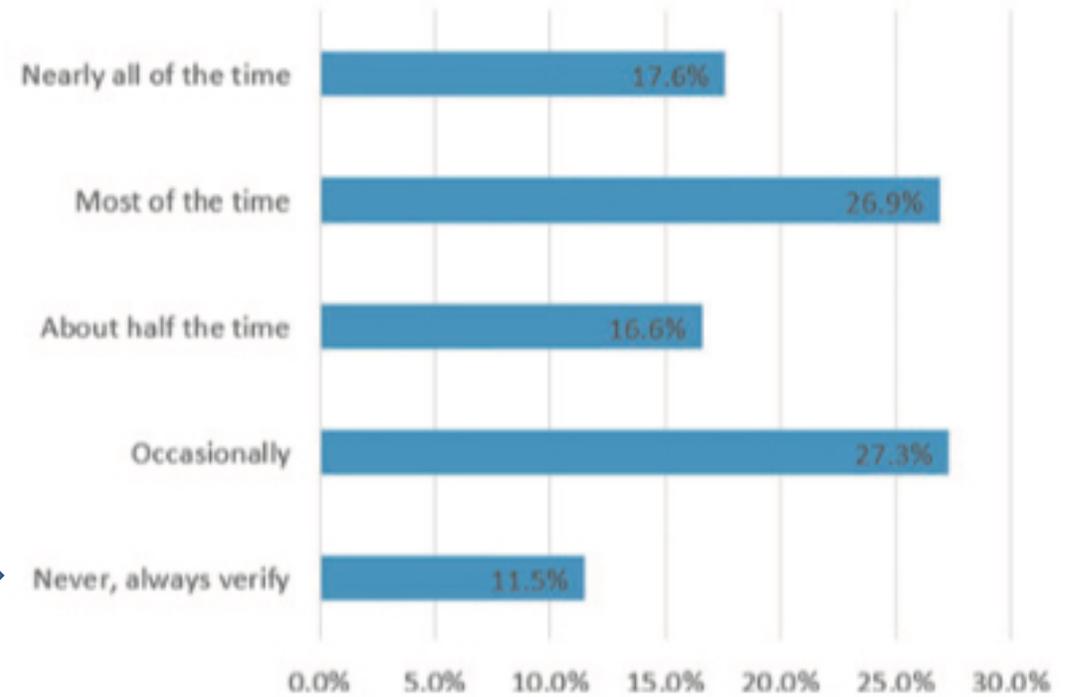
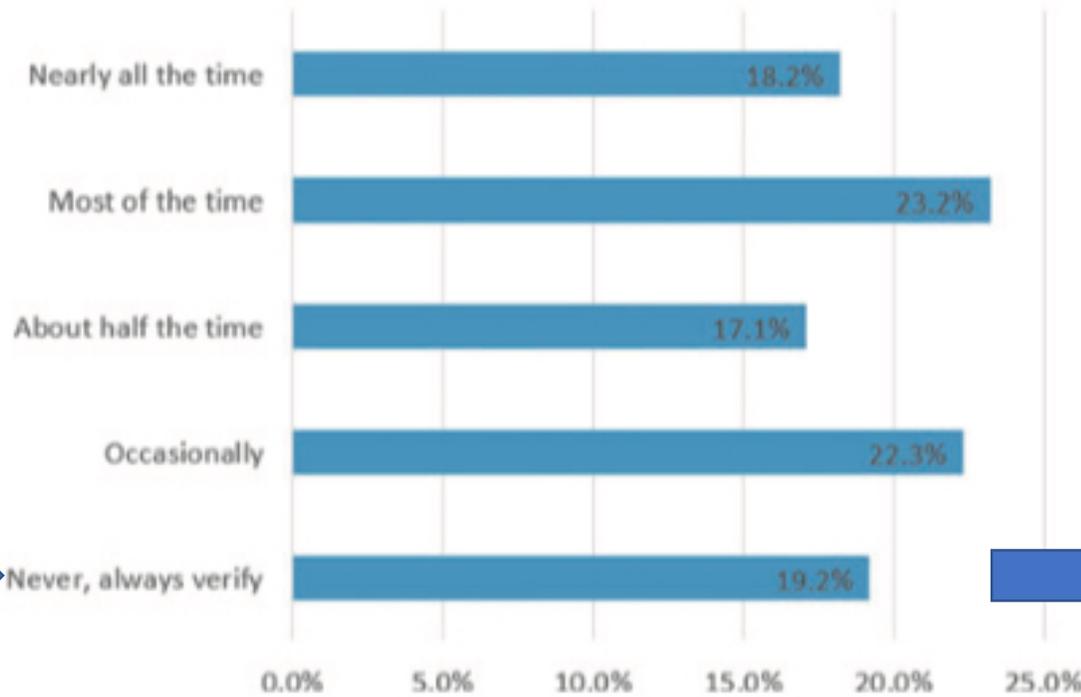
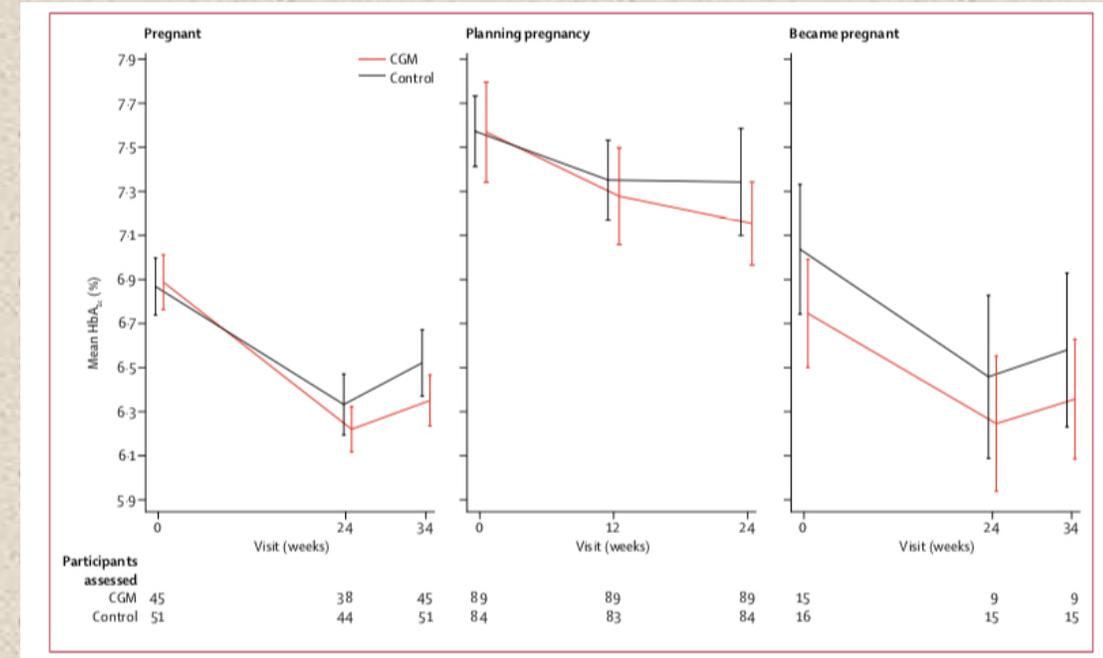


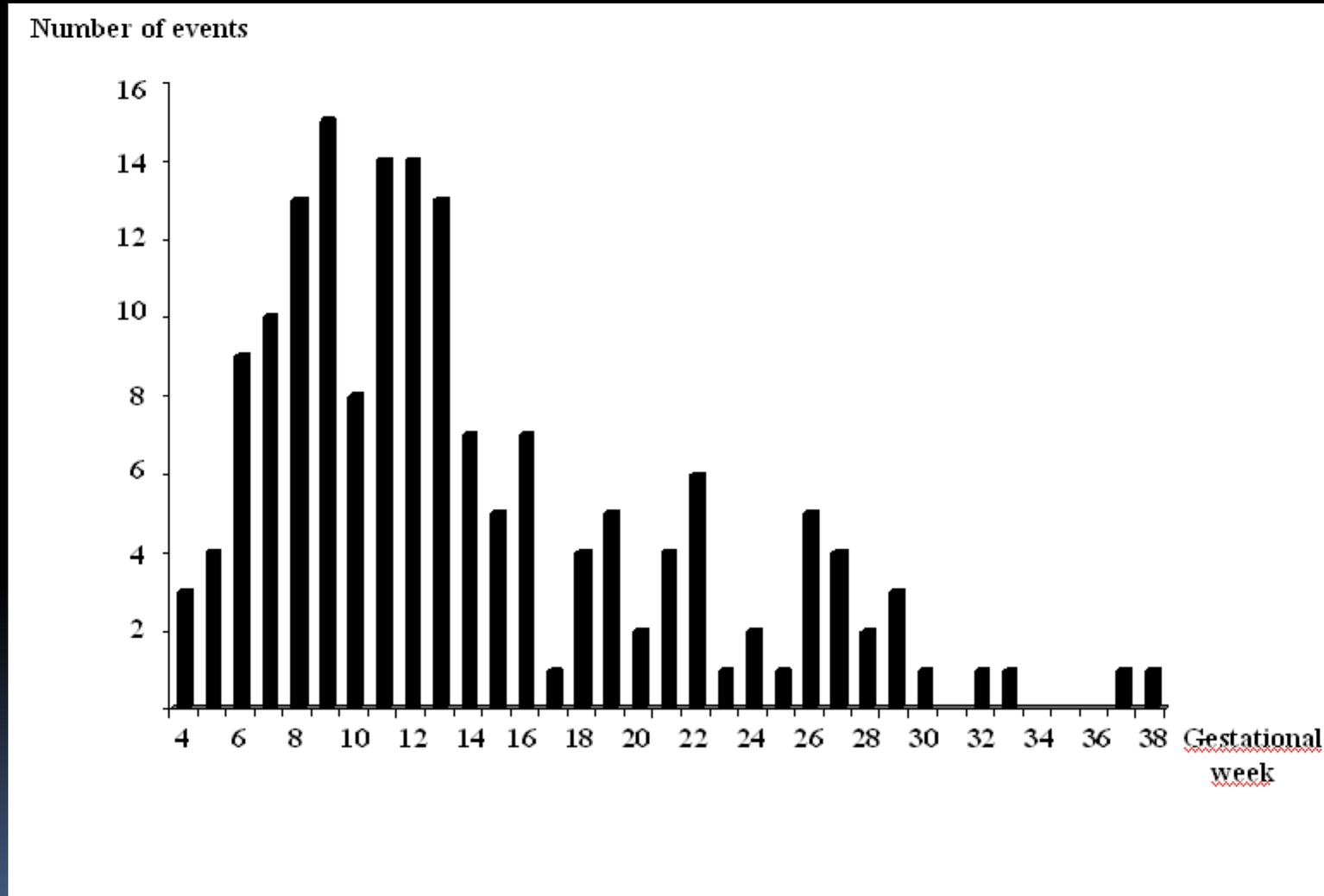
FIG. 1. myglu.org Surveys of Current CGM Users or Parent/Caregivers December 6, 2016, and December 8, 2016. CGM, continuous glucose monitoring.

Il controllo glicemico in Gravidanza: dallo studio Connect

- We found a small but significant reduction in HbA1c levels at 34 weeks' gestation, accompanied by an increased time in target (63-140 mg/dl), reduced hyperglycaemia, and less glycaemic variability.
- This was accompanied by reductions in neonatal outcomes in the proportion of infants large for gestational age, neonatal hypoglycaemia, admission to neonatal intensive care for more than 24 h, and a 1-day shorter hospital stay among infants of mothers randomly assigned to CGM during the first trimester.



Hypoglycemia in Pregnant Women With Type 1 Diabetes

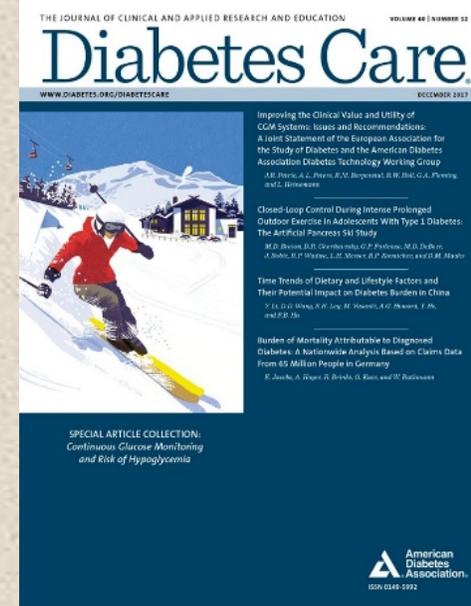


Gravidanza: SMBG, CGM.....

- CGM use appears to be safe and effective in pregnancies complicated by diabetes. CGMs can help identify glycemic patterns in pregnancy, obtain and maintain glucose targets, and reduce hypoglycemia.
- CGM helps with treatment adjustments in pregnancies associated with diabetes. Using CSII in conjunction with rtCGM (SAPT) may improve outcomes in pregnancies associated with diabetes.
- CGM is not a substitute for standard clinical care, such as adhering to carbohydrate intake goals, **collecting seven-point profiles, and filling in log sheets (MDI patients)**.

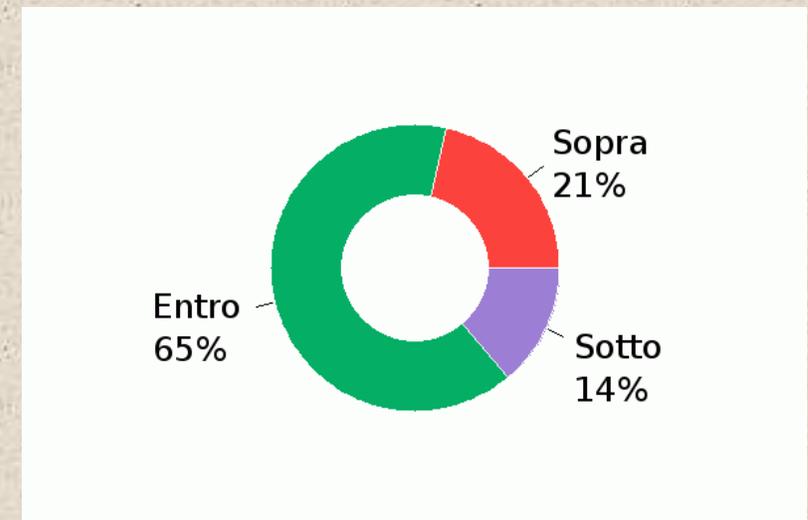
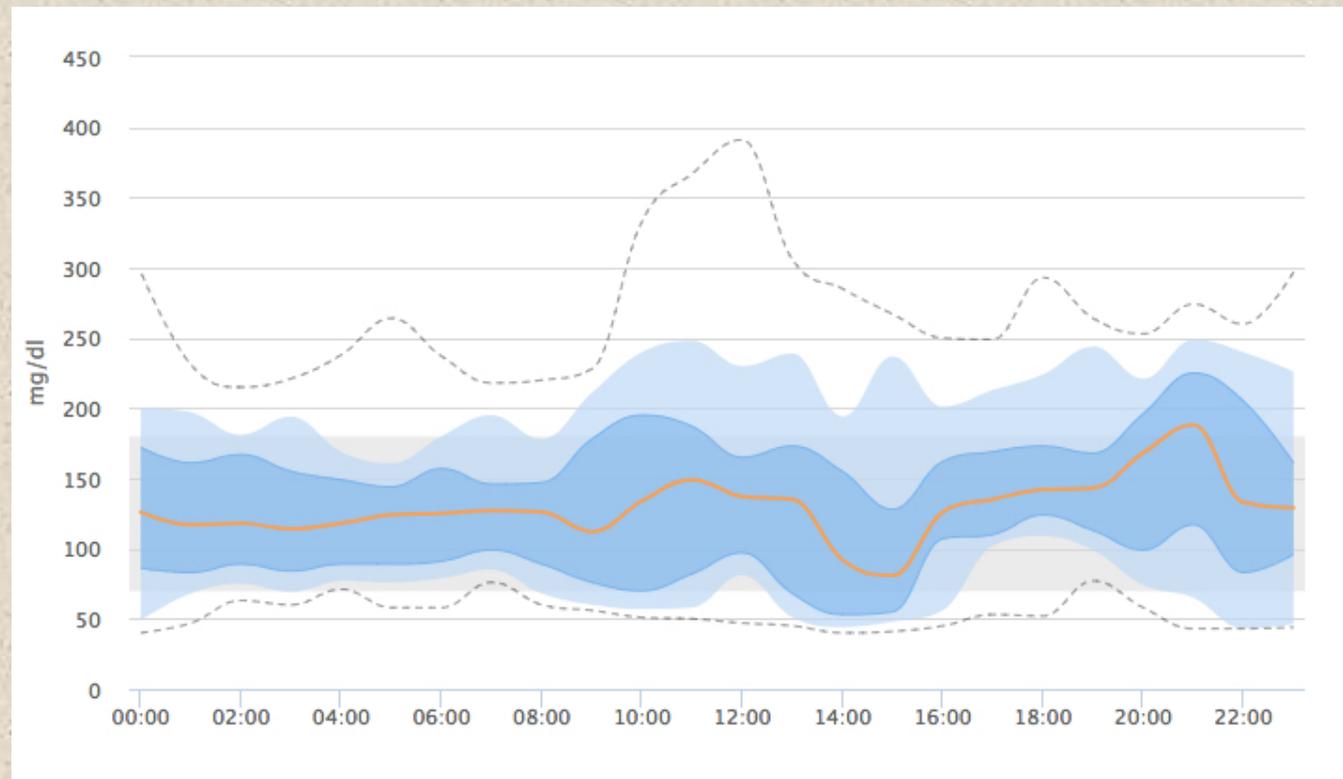
CGM: le nuove MISURE

- ❑ GLUCOSIO MEDIO, eA1c (HbA1c stimata)
- ❑ Glucose Management Indicator
- ❑ Time in Range
- ❑ Time in Target Range (70-180)
- ❑ Time Above Target & Time Below Target
- ❑ Glucose Variability (COEFFICIENTE VARIAZIONE)
- ❑ Episodi di IPO IPERGLICEMIA (durata minima 15')
- ❑ Blocchi Temporal (sonno veglia)
- ❑ Criteri per avere dati sufficienti _2 weeks of Collection, 70% of possible CGM
- ❑ Modalità di visualizzazione STANDARD (AGP)
- ❑ Area sotto/sopra la curva (high and low)
- ❑ Rischio IPO IPERglicemia– (LBGI & HBGI)



DMT1 in MDI

- Time in range = 64,68%
- Time \leq 70 mg/dl 13,84%
- Time \geq 180 21,48%
- Glicemia media = 136 mg/dl
- Dev. St. = 59
- mHba1c = 6,2 (ma 30 gg prima circa)
- eHba1c = 6,61%



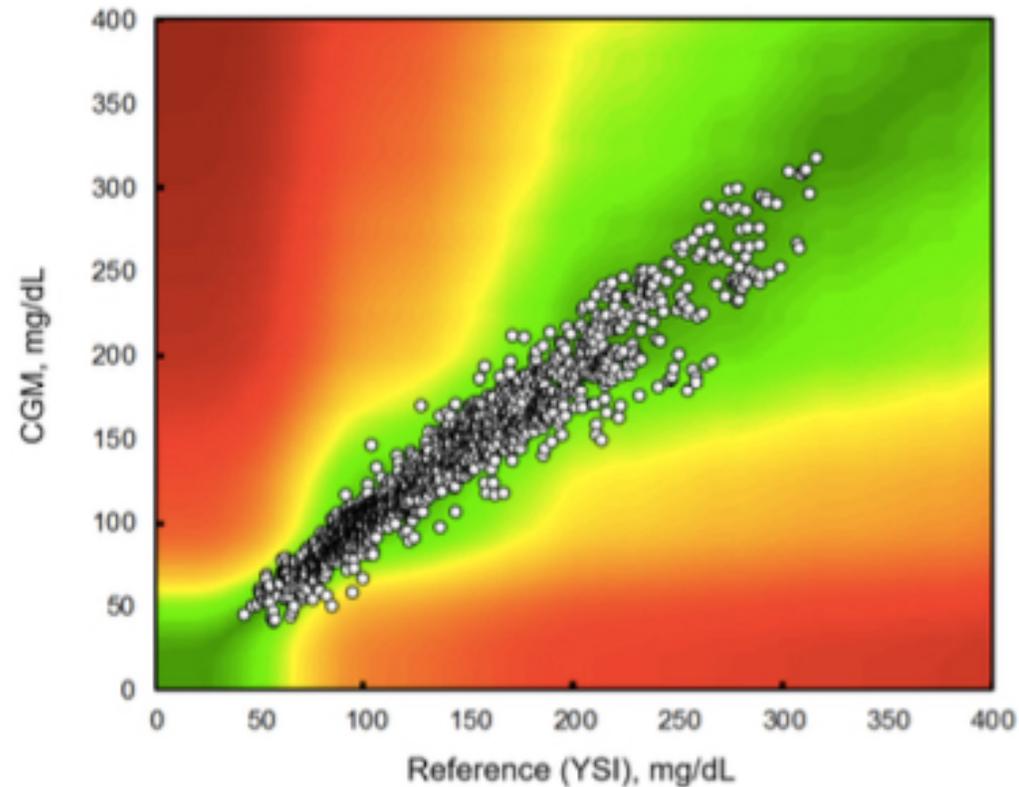
Hypoglycemia: International Hypoglycaemia Study Group. Glucose concentrations of less than 3.0 mmol/L (54 mg/dL) should be reported in clinical trials: a joint position statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2017;40: 155–157

Proposed glucose levels when reporting hypoglycemia in clinical trials

Level 1
A glucose alert value of 3.9 mmol/L (70 mg/dL) or less. This need not be reported routinely in clinical studies, although this would depend on the purpose of the study
Level 2
A glucose level of <3.0 mmol/L (<54 mg/dL) is sufficiently low to indicate serious, clinically important hypoglycemia
Level 3
Severe hypoglycemia, as defined by the ADA (6,7), denotes severe cognitive impairment requiring external assistance for recovery



CGM: Performance of a Factory-Calibrated, Real-Time Continuous Glucose Monitoring System in Pediatric Participants With Type 1 Diabetes



Risk Category and Color	Number	%
None	1276	92.0%
Slight, Lower	106	7.6%
Slight, Higher	4	0.3%
Moderate, Lower	1	0.1%
Moderate, Higher	0	0.0%
Great, Lower	0	0.0%
Great, Higher	0	0.0%
Extreme	0	0.0%

Welsh JB et al. Performance of a Factory-Calibrated, Real-Time Continuous Glucose Monitoring System in Pediatric Participants With Type 1 Diabetes. J Diabetes Sci Technol. 2018 Sep 10:1932296818798816

CGM: Performance of a Factory-Calibrated, Real-Time Continuous Glucose Monitoring System in Pediatric Participants With Type 1 Diabetes

Table 1. Point and Percentage Accuracy in Pediatric Participants Overall and by Clinic Session Day.

Clinic session day	Matched pairs (n)	%15/15 (%)	%20/20 (%)	%30/30 (%)	%40/40 (%)	MAD (mg/dL)	MARD (%)
Overall	1387	91.1	96.2	99.6	99.9	11.1	7.7
Day 1	253	78.3	92.1	98.8	100.0	15.8	10.5
Day 2	260	94.2	100.0	100.0	100.0	13.4	7.8
Days 4-5	322	95.7	98.8	99.7	99.7	8.8	7.2
Day 7	253	97.2	99.2	100.0	100.0	7.9	6.2
Day 10	299	89.3	91.0	99.3	100.0	10.5	7.1

Table 2. Point and Percentage Accuracy by Glucose Concentration Range.

CGM glucose range (mg/dL)	Matched pairs (N)	%15/15	%20/20	%30/30	MAD (mg/dL)	MARD (%)
<70	81	81.5	92.6	96.3	9.1	13.3
70-180	1017	91.9	96.6	99.7	9.7	7.4
181-250	245	89.8	95.1	100.0	17.4	7.7
>250	44	97.7	100.0	100.0	12.7	4.5

CGM: Performance of a Factory-Calibrated, Real-Time Continuous Glucose Monitoring System in Pediatric Participants With Type 1 Diabetes

Table 3. Trend Accuracy.

CGM rate ranges (mg/(dL·min)) N Row %	YSI rate ranges (mg/dL/min)						Number of paired CGM-YSI
	<-2	[-2,-1)	[-1,-0)	[0,1]	(1,2]	>2	
<-2	11 (50.0%)	6 (27.3%)	5 (22.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	22
[-2,-1)	4 (2.9%)	83 (60.6%)	46 (33.6%)	4 (2.9%)	0 (0.0%)	0 (0.0%)	137
[-1,0)	2 (0.4%)	37 (6.6%)	432 (77.0%)	88 (15.7%)	2 (0.4%)	0 (0.0%)	561
[0,1]	0 (0.0%)	1 (0.2%)	112 (24.9%)	292 (64.9%)	42 (9.3%)	3 (0.7%)	450
(1,2]	0 (0.0%)	0 (0.0%)	4 (3.7%)	46 (42.6%)	48 (44.4%)	10 (9.3%)	108
>2	0 (0.0%)	0 (0.0%)	1 (1.4%)	5 (7.2%)	17 (24.6%)	46 (66.7%)	69
Total	17	127	600	435	109	59	1347

CGM: Performance of a Factory-Calibrated, Real-Time Continuous Glucose Monitoring System in Pediatric Participants With Type 1 Diabetes

Table 4. Point and Percentage Accuracy by CGM Rate of Change.

CGM rate ranges (mg/(dL·min))	Matched pairs (n)	%20/20 (%)	MARD (%)
<-2	22	81.8	11.9
[-2,-1)	137	97.1	7.8
[-1,0)	561	96.3	7.8
[0,1]	450	96.9	7.3
(1,2]	108	96.3	7.8
>2	69	94.2	7.7

NONADJUNCTIVE FLASH GLUCOSE MONITORING SYSTEM USE DURING SUMMER-CAMP IN CHILDREN WITH TYPE 1 DIABETES – THE FREE-SUMMER STUDY

- For paired results at lower glucose concentrations (< 4.4 mmol/l (80 mg/dl), $n= 396$), MAD was 1.8 mmol/l (33.2 mg/dl) for paired results with blood glucose;
- for paired results at glucose concentrations ≥ 4.4 mmol/l (80 mg/dL) ($n= 2392$), MARD was - 6.4.
- **The percentage of isCGM results within the range ± 2 mmol/l (36 mg/dl) of capillary results was 82.4% ($n=2297$)**
- with 50.7% of the sensor values outside this range been found for reference glucose below 4.4 mmol/l (80 mg/dl).

The percentage of isCGM results within and outside the range ± 2 mmol/l of SMBG.

	Number	%
Results outside range ± 2 mmol/l (36 mg/dl)		
All	491	17.6
< 4.4 mmol/l (80 mg/dl)	249	8.9
Result within range ± 2 mmol/l (36 mg/dl)	2297	82.4
Total	2788	100

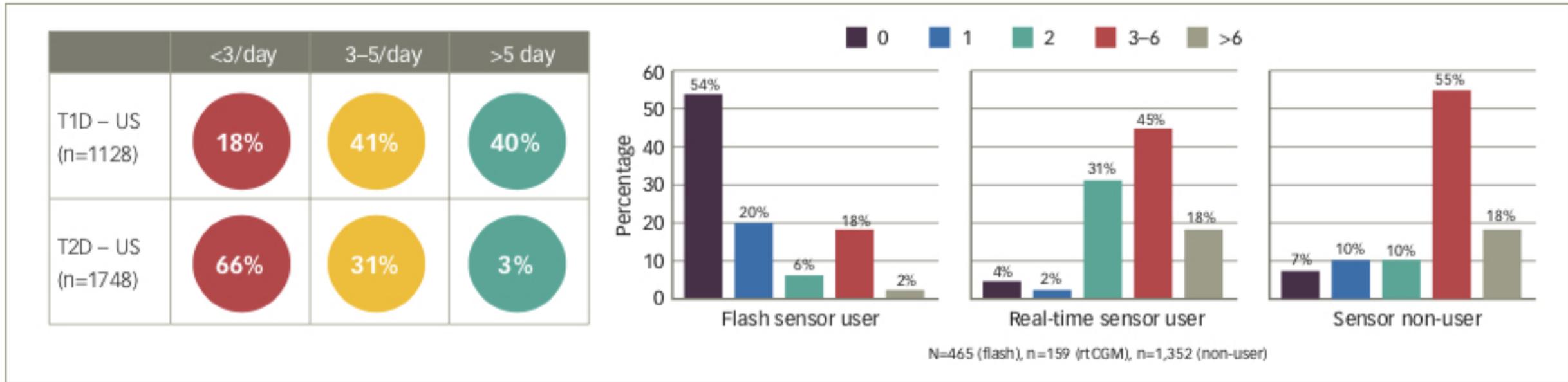
REPLACE-BG: A Randomized Trial Comparing Continuous Glucose Monitoring With and Without Routine Blood Glucose Monitoring in Adults With Well-Controlled Type 1 Diabetes

- **circumstances that required BGM testing:**

- 1) for 12 h after insertion of a new sensor,
- 2) on a sick day (e.g., nausea, vomiting),
- 3) for 4 h after taking acetaminophen,
- 4) for symptoms suggestive of hypoglycemia but the CGM sensor glucose concentration was not hypoglycemic or dropping rapidly,
- 5) for 20 min after treating a low CGM sensor glucose concentration if the CGM sensor glucose level had not begun to rise,
- 6) before administering an insulin bolus when the CGM sensor glucose concentration was >250 mg/dL,
- 7) for a fasting CGM glucose >300 mg/dL or CGM glucose concentration during the day >300 mg/dL for 1 h.

Self-measurement of Blood Glucose and Continuous Glucose Monitoring – Is There Only One Future?

Figure 1: Daily blood glucose testing frequency for the US and EU



EU = European Union; rtCGM = real-time continuous glucose monitoring; T1D = type 1 diabetes; T2D = type 2 diabetes; US = United States. Source: dQ&A Market Research.⁴

Pazienti intervistati

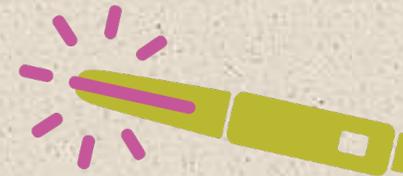
41 pazienti

M/F = 14/27

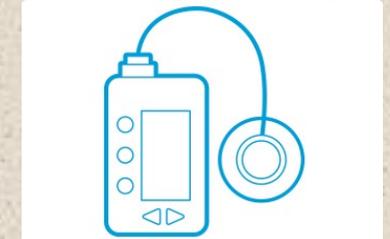
Età media = 39 ± 14 anni

Durata di malattia media = 20 ± 13 anni

TERAPIE



23



18 (3 SAP)

SENSORI



23



14



4 (3 SAP)

Percezione di affidabilità

Ha rilevato episodi di discrepanza vs dato glicemico acquisito con glucometro? (anche più di 1 risposta)

Mai/pochi episodi: **9**

Nei primi giorni di avvio/ultimi giorni di vita del sensore: **9**

Durante ipoglicemia o per valori estremi (sia ipo/iper): **19**

Durante rapide variazioni della glicemia (sbalzi glicemici): **4**

Nelle ore notturne: **3**

In condizioni climatiche particolari (ad es. montagna): **1**

solo 10 pazienti su 41
utilizzano il glucometro
per determinare la glicemia **pre-prandiale**



Percezione di utilità

Quali informazioni ritengono utili? (anche più di 1 risposta)

Freccia di tendenza: **34**

Grafico dell'andamento: **28**

**< 6 mesi
di utilizzo**

80%

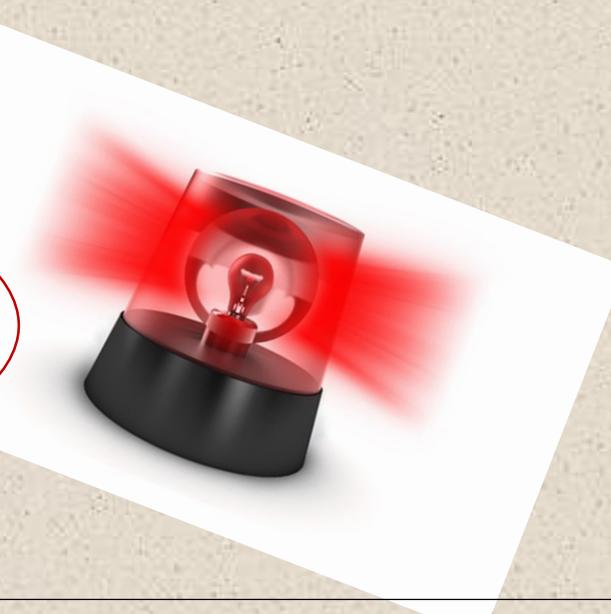
50%

**≥ 6 mesi
di utilizzo**

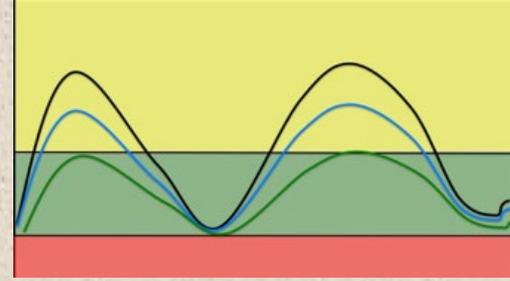
87%

77%

solo 9 pazienti su 41
utilizzano unicamente il valore di glucosio interstiziale
per la gestione quotidiana di attività e terapie

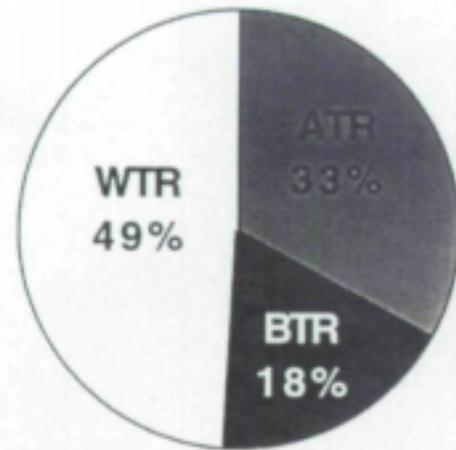


Target range and time in range

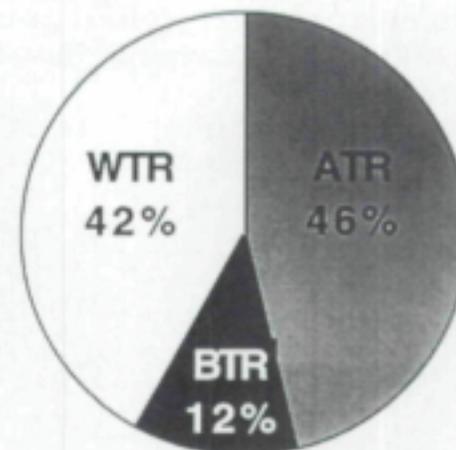


- Target range and time in range can be expressed either as “% of glucose readings” or “hours per day.” The proposed target range of 70–180 mg/ dL was considered acceptable for clinical practice, as it has been observed that if 50% of the SMBG readings are in such range, A1C would be around 7% (Brewer KW, Chase HP, Owen S, Garg SK: Slicing the pie. Correlating HbA_{1c} values with average blood glucose values in a pie chart form. Diabetes Care 1998;21:209–212)

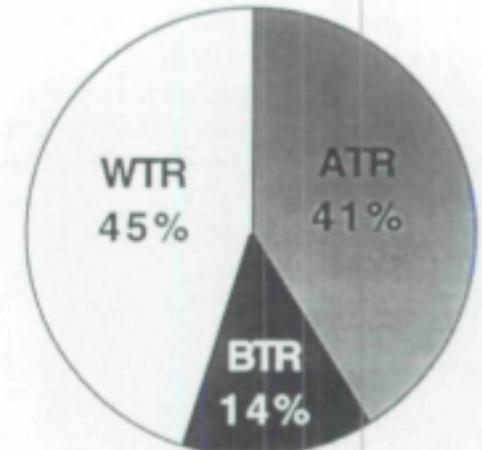
“No more than 3% of the day (43 minutes) less than 70 mg/dl, and no more than 1% of the day (14 minutes) less than 54 mg/dl.”



HbA_{1c} = 7.0%



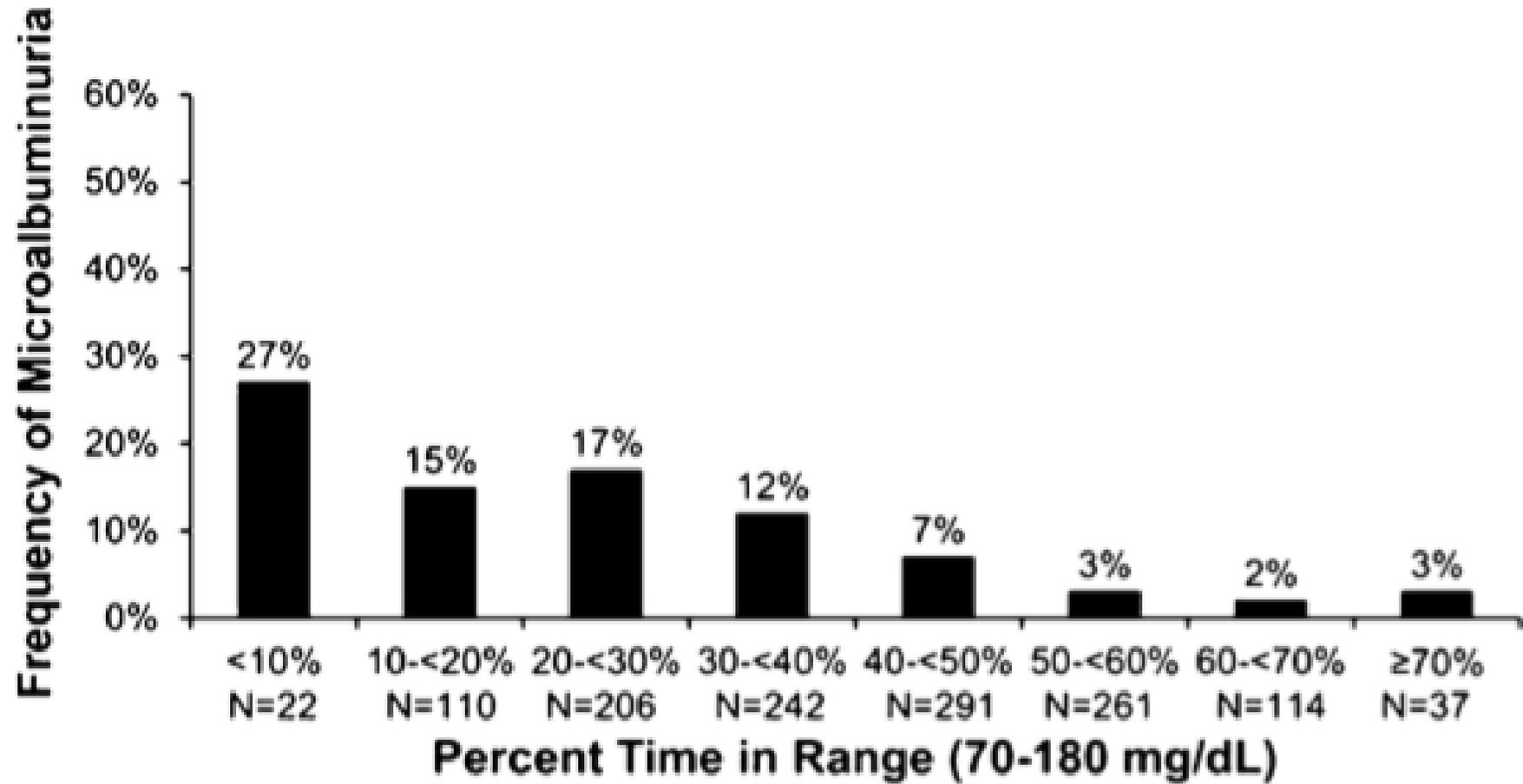
HbA_{1c} = 8.5



HbA_{1c} = 8.0%

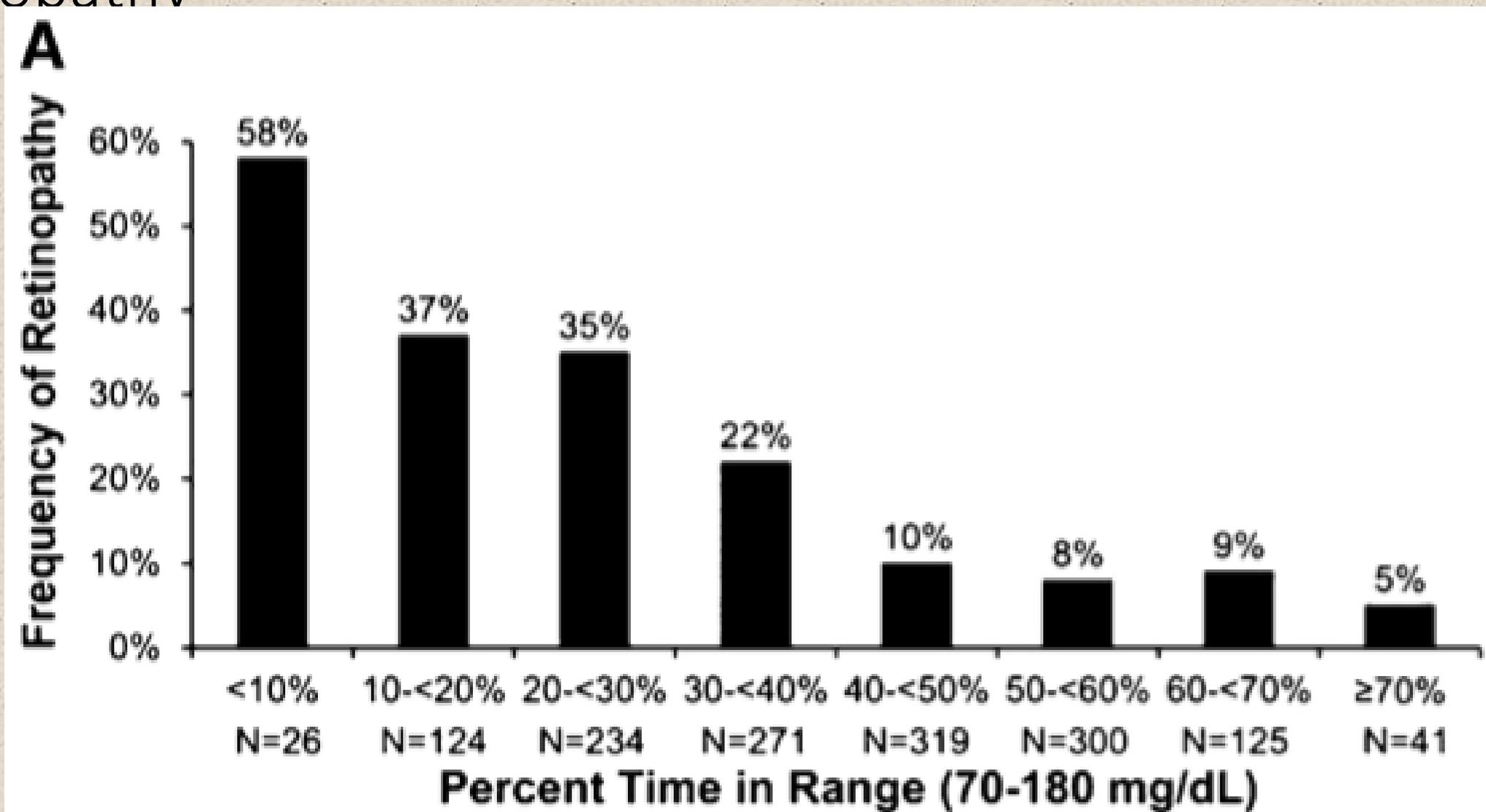
Figure 1—Percentages of blood glucose values needed to be above target range (ATR), within target range (WTR), or below target range (BTR) to attain different HbA_{1c} values for children ages 5–12 years.

TIR during DCCT
and
Microalbuminuria



TIR during DCCI and retinopathy

retinopathy



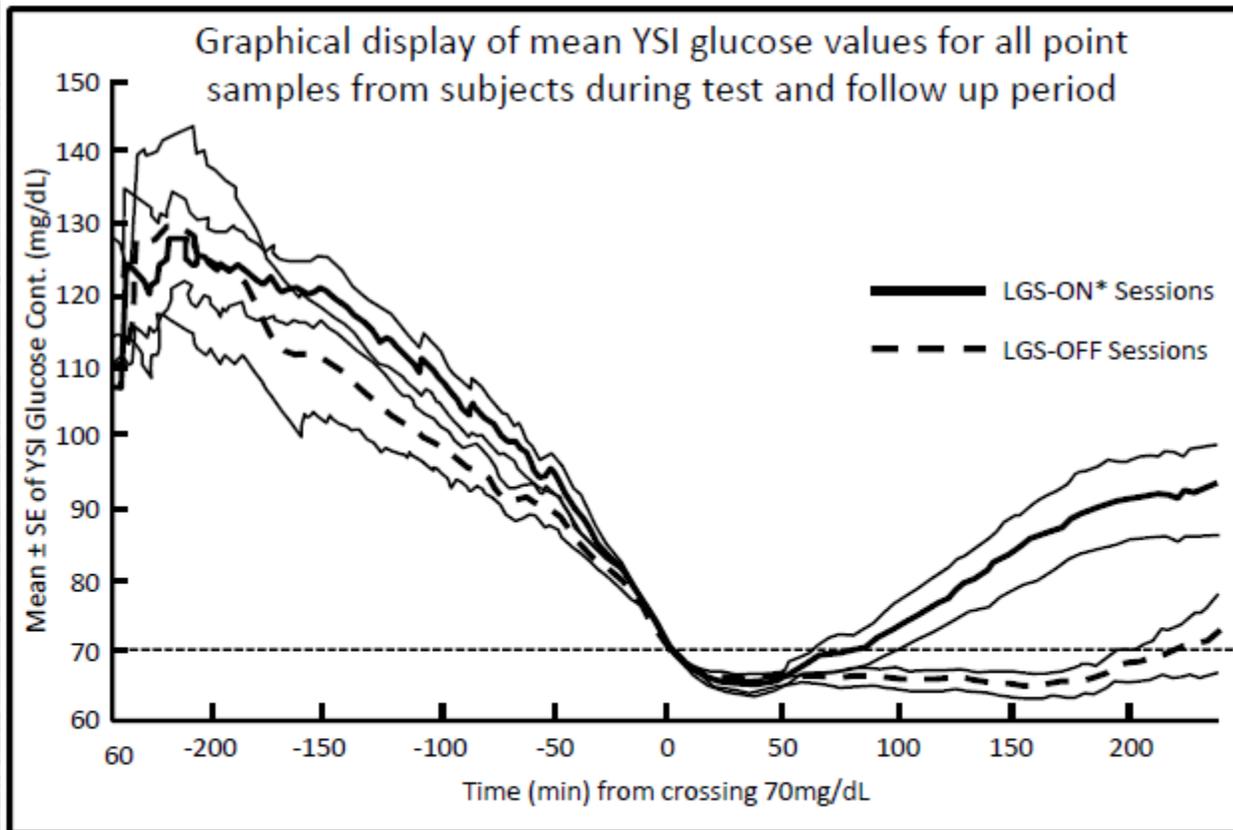
SAP

Automatic suspension of insulin delivery: the in-clinic ASPIRE study

A multi-centre randomised cross-over study assessing the efficacy of the low glucose suspend (LGS) feature of the sensor-augmented pump (SAP) to stop insulin delivery in induced hypoglycaemia among adult subjects (n=50) with Type 1 diabetes

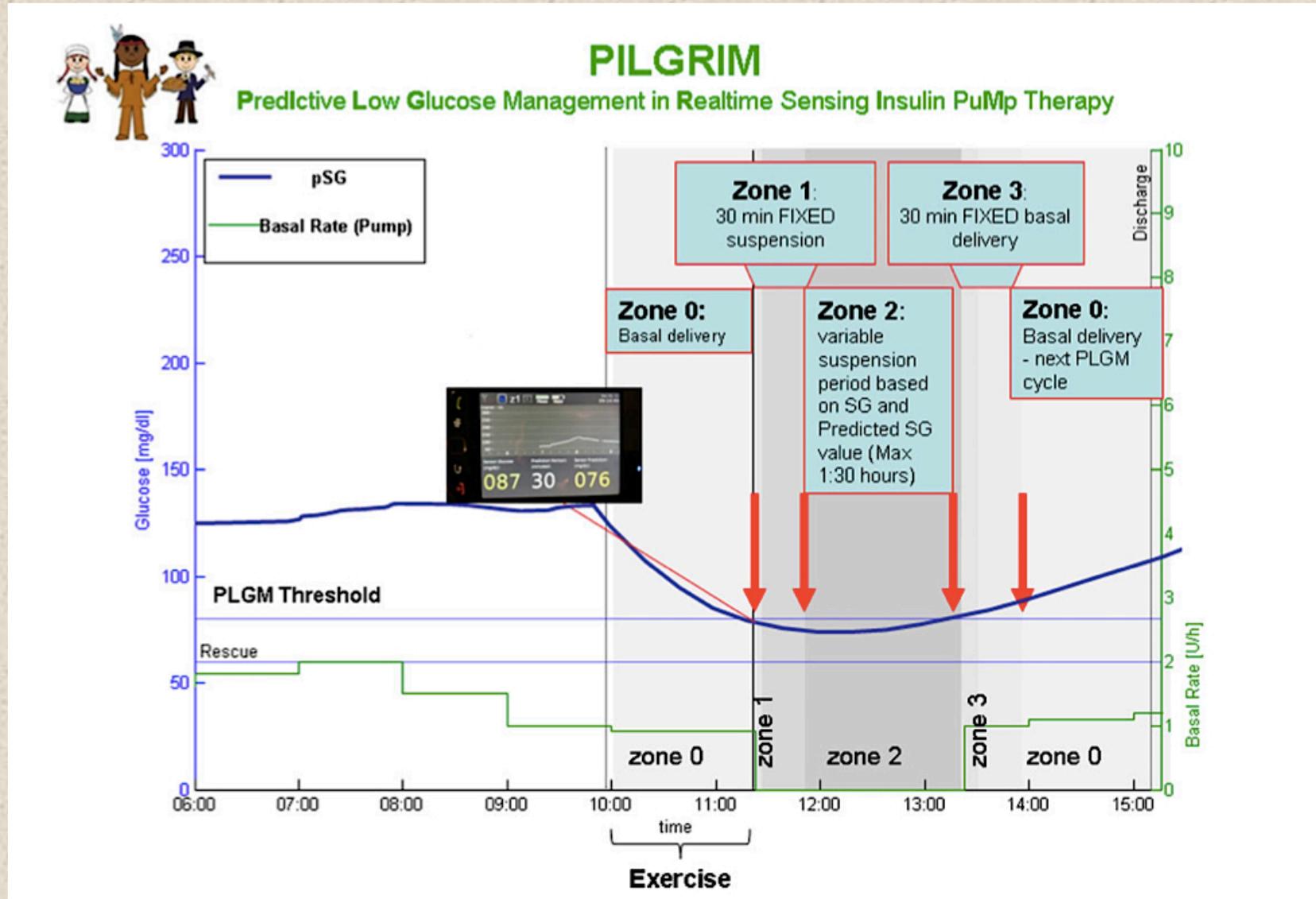
Garg S et al. *Diabetes Technol Ther* 2012;14:205–209

PRIMARY END POINT: COMPARISON OF THE DURATION AND SEVERITY OF HYPOGLYCAEMIA MEASURED BY PLASMA GLUCOSE DURING SUCCESSFUL LGS-ON AND LGS-OFF SESSIONS

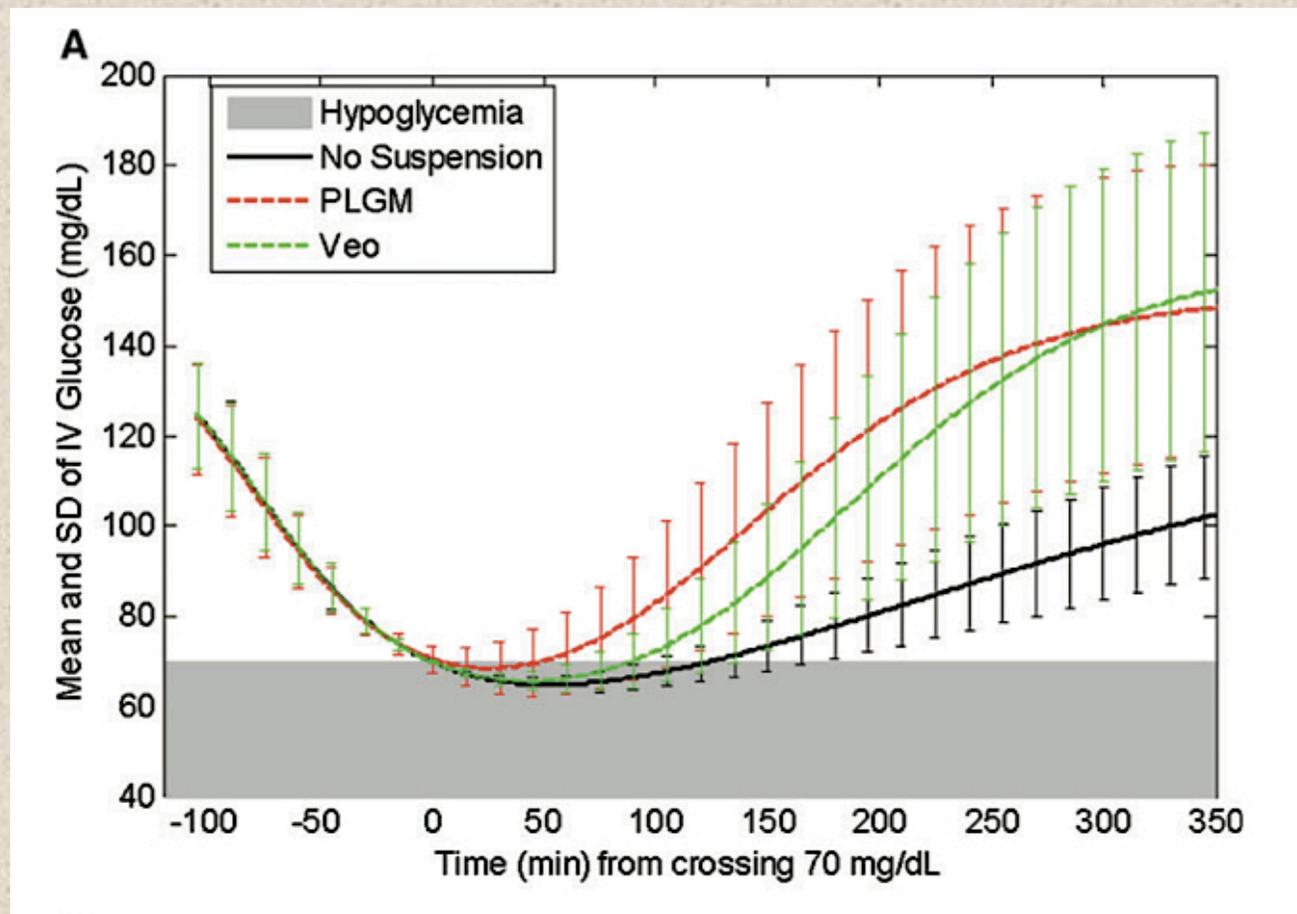


The LGS feature can significantly reduce the duration and severity of hypoglycaemia without causing significant rebound hyperglycaemia

PLGS

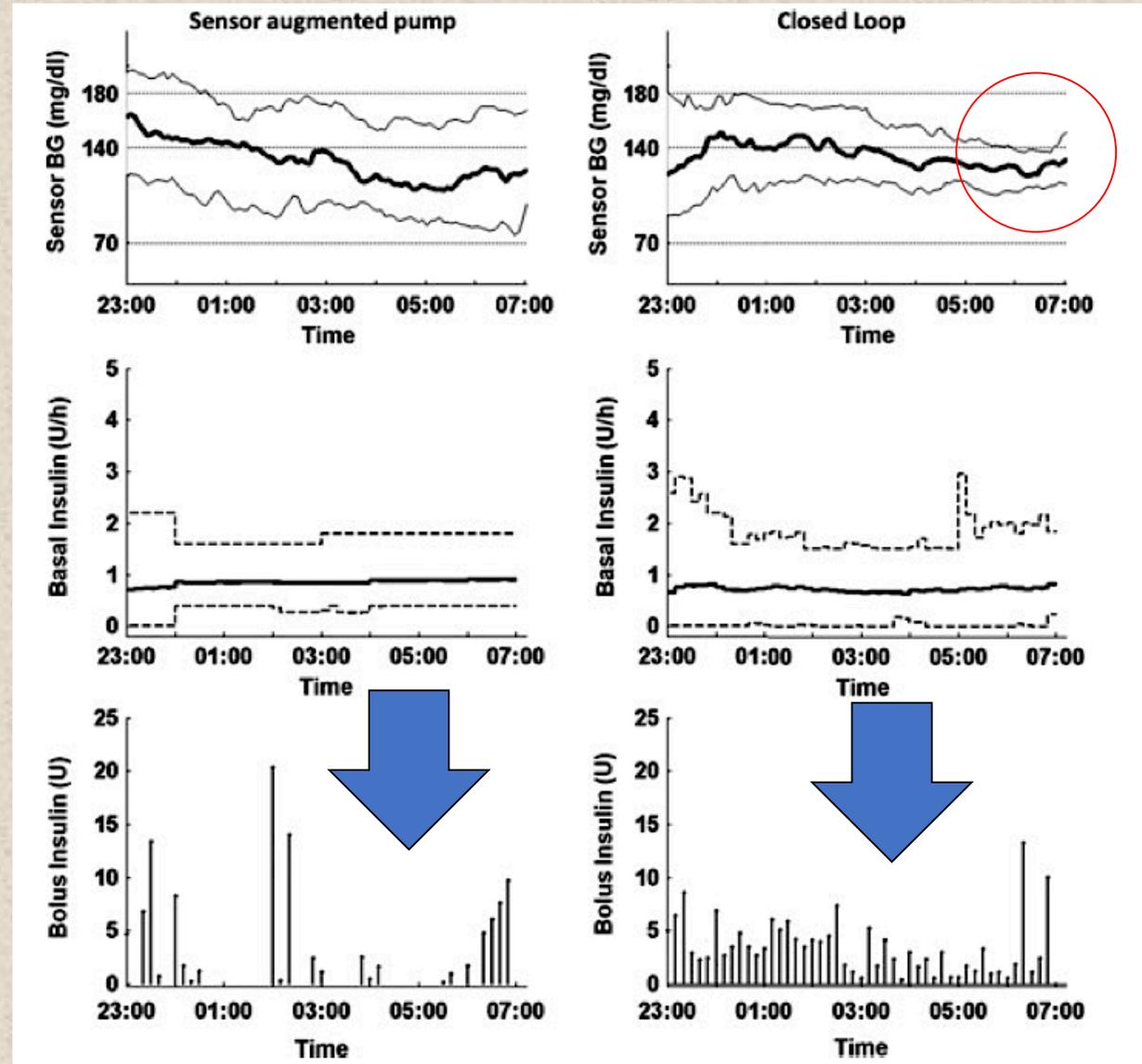


PLGS



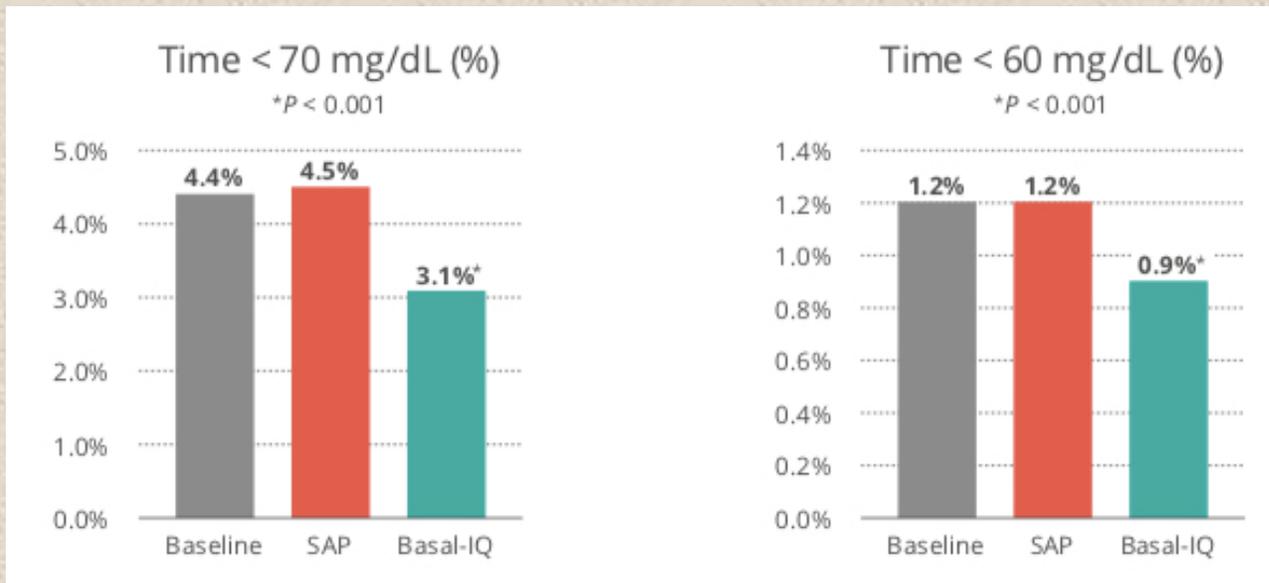
The mean (\pm SD) sensor glucose at predictive suspension was 92 \pm 7mg/dL, resulting in a postsuspension nadir (by HemoCue) of 77 \pm 22mg/dL. The suspension lasted for 90 \pm 35 (range, 30 \pm 120) min, resulting in a sensor glucose level at insulin resumption of 97 \pm 19 mg/dL.

Night glucose control with MD-Logic artificial pancreas in home setting: a single blind, randomized crossover trial – interim analysis



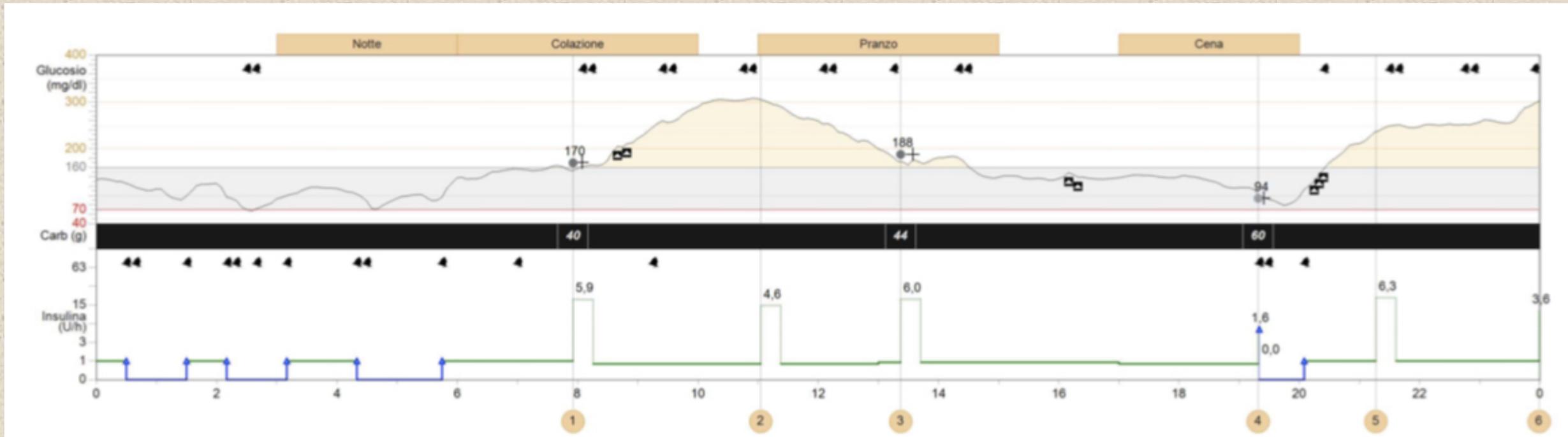
Predictive Low-Glucose Suspend Reduces Hypoglycemia in Adults, Adolescents, and Children With Type 1 Diabetes in an At-Home Randomized Crossover Study: Results of the PROLOG Trial

Time < 70 mg/dL



- Mean time in range (70-180 mg/dL) improved in the Basal-IQ arm by 2%, which equates to 30 more minutes per day of time spent in the target range. Additionally, there was no difference in the mean glucose concentration between the Basal-IQ and SAP arms.

SAP con PLGS LGS



Verso l'ansa chiusa

Sistemi Ibridi

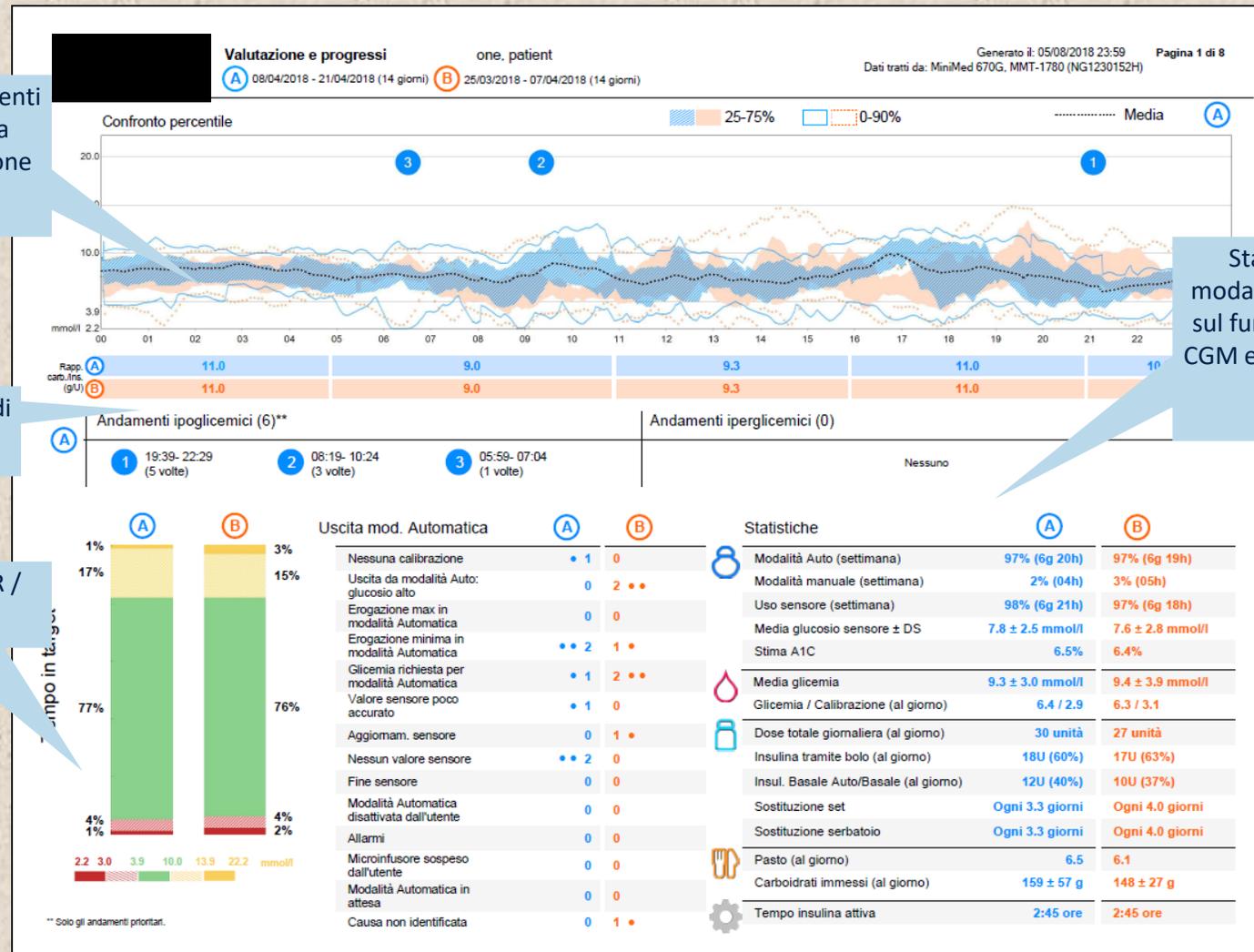


Grafico degli andamenti dei periodi A e B a confront con divisione percentile

Rapporto I/C dei periodi A e B

Visualizzazione TIR / tempo in target

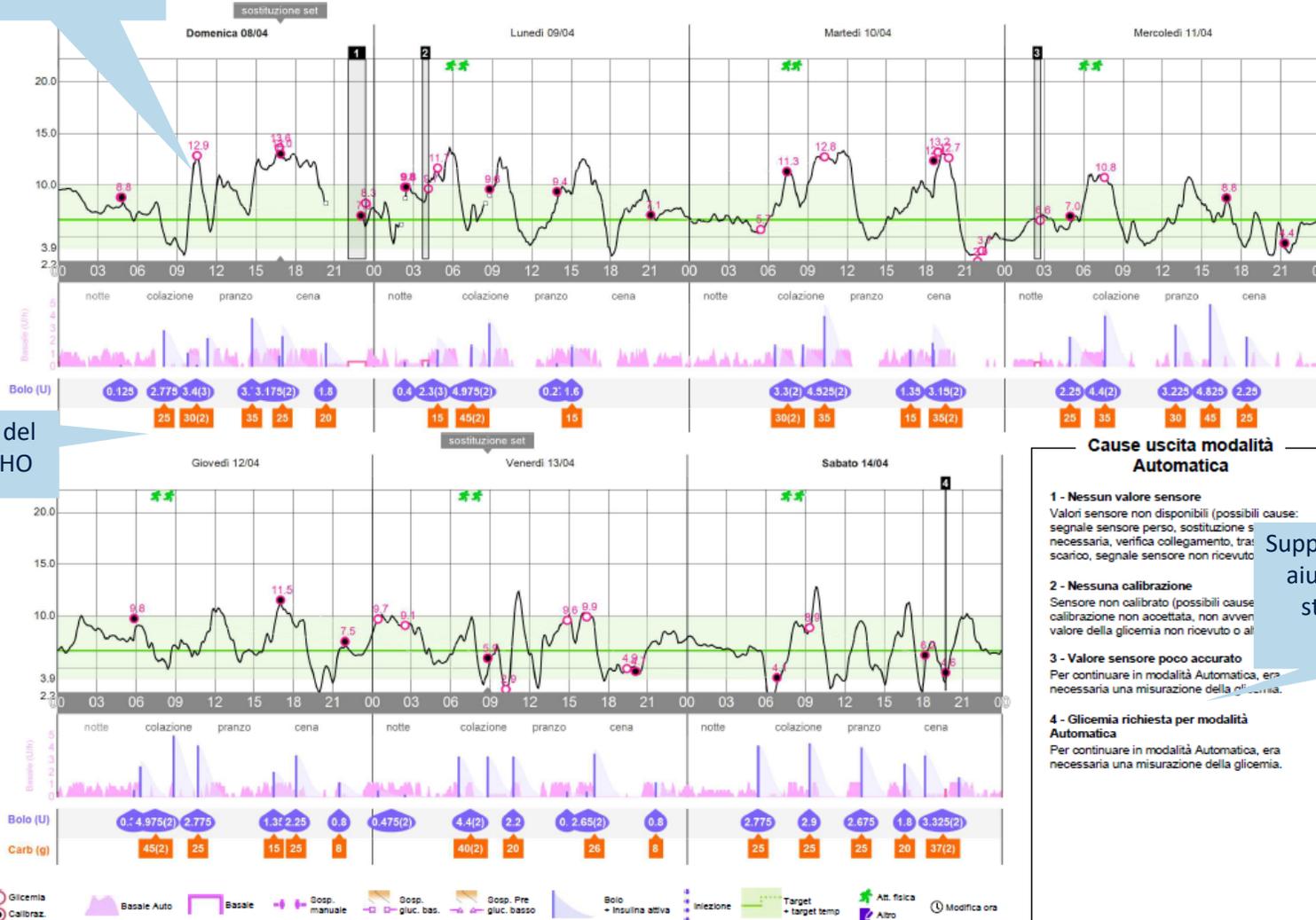
Statistiche sulla modalità automatica e sul funzionamento del CGM e della erogazione di insulina

SCHEDA PAZIENTE – NUOVI REPORT PER MINIMED 670G

Visualizzazione andamenti basale automatica o manual, boli e curva insulina attiva

Revisione settimanale (1 di 2) one. patient
08/04/2018 - 14/04/2018 (7 giorni)

Generato il: 05/08/2018 23:59 Pagina 2 di 8
Dati tratti da: MiniMed 670G, MMT-1780 (NG1230152H)

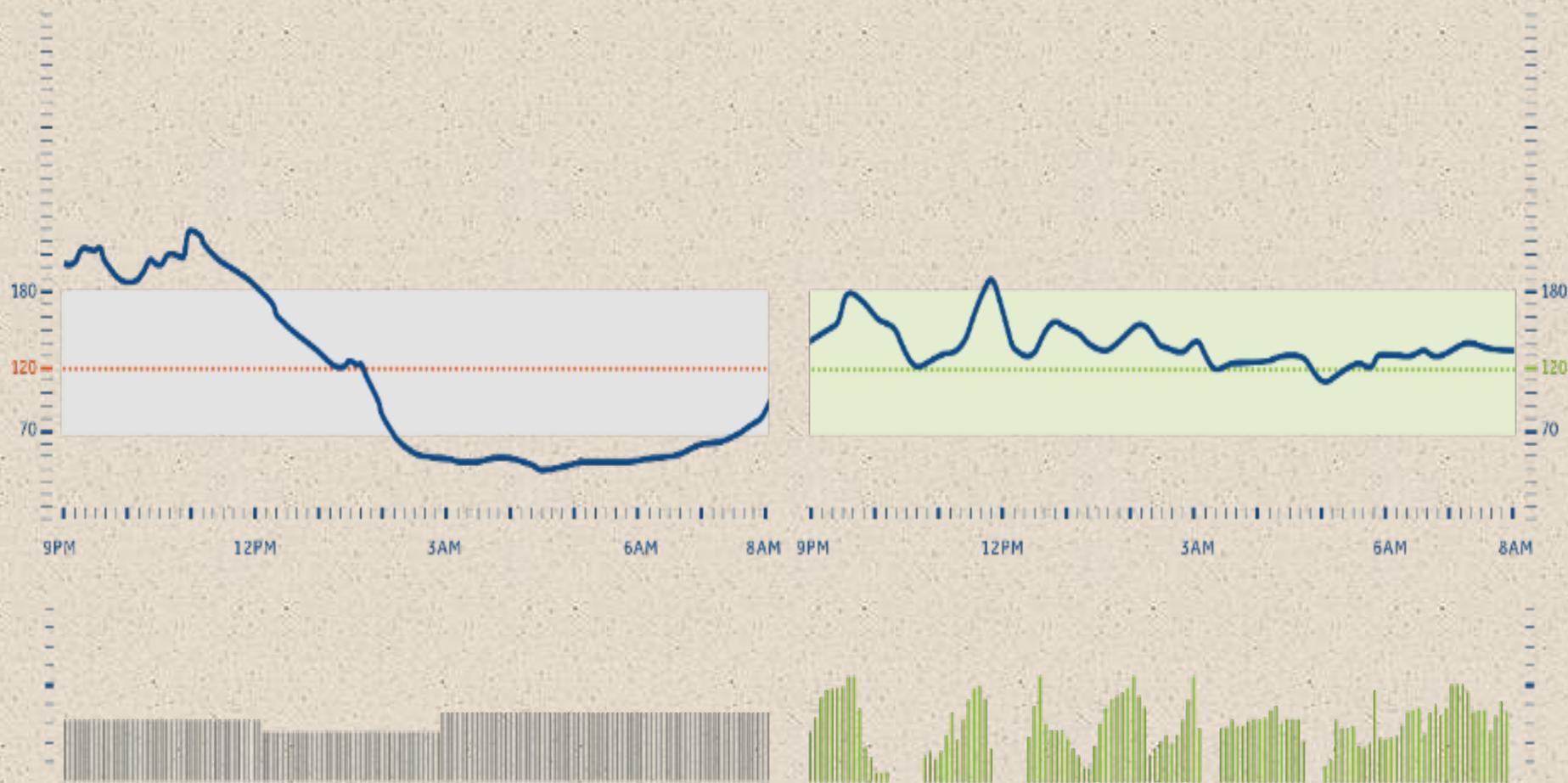


Cause uscita modalità Automatica

- 1 - Nessun valore sensore**
Valori sensore non disponibili (possibili cause: segnale sensore perso, sostituzione necessaria, verifica collegamento, tra scarico, segnale sensore non rievuto)
- 2 - Nessuna calibrazione**
Sensore non calibrato (possibili cause: calibrazione non accettata, non avvenuto valore della glicemia non rievuto o al
- 3 - Valore sensore poco accurato**
Per continuare in modalità Automatica, era necessaria una misurazione della glicemia.
- 4 - Glicemia richiesta per modalità Automatica**
Per continuare in modalità Automatica, era necessaria una misurazione della glicemia.

Supporto educativo per aiutare il paziente a stare in modalità automatica

Profilo Basale !



Sistemi Ibridi avanzati: The Hybrid Closed-Loop System: Evolution Practical Applications Kathryn W. Weaver, MD, and Irl B. Hirsch, MD

- The current HCL system relies on a PID algorithm to make constant small adjustments in basal insulin delivery to target a blood glucose of 120 mg/dL.
- . The utility of this device is limited by blood glucose targets of 120 and 150mg/dL, **that are unacceptably high for some patients**
- Patients must continue to use the bolus calculator by entering a carbohydrate amount to deliver bolus insulin.
- “L'utilizzo richiede una attivo ruolo del paziente che oltre alle indicazioni deve essere fortemente Motivato e attivo nell'utilizzo”

Importance of accurate blood glucose measurements for artificial pancreas

- “Because the accuracy of the BGD [Blood Glucose Device] exerts a tremendous impact on the quality of the calibration and the performance of the APDS [artificial pancreas device system], sponsors are encouraged to consider use of the most accurate BGD devices that are practical for patient use.” (Guidance for Industry and Food and Drug Administration Staff. The Content of Investigational Device Exemption (IDE) and Premarket Approval (PMA) Applications for Artificial Pancreas Device Systems. 9 November. 2012, Available at: www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm259305.pdf)

Importance of accurate blood glucose measurements for artificial pancreas

- In September 2016, a (Hybrid) Closed Loop System became the first AID system to be approved by the FDA. This system requires a minimum of two, and on average four, calibration measurements each day, and has been associated with few serious or device-related adverse events in patients with T1D.
- Guidance for Industry and Food and Drug Administration Staff. The Content of Investigational Device Exemption (IDE) and Premarket Approval (PMA) Applications for Artificial Pancreas Device Systems. 9 November. 2012
- Bergenstal RM, Garg S, Weinzimer SA, et al. Safety of a hybrid closed-loop insulin delivery system in patients with Type 1 Diabetes. *JAMA*. 2016;316:1407–8.

Closed Loop

Individualized Model Predictive Control for the Artificial Pancreas

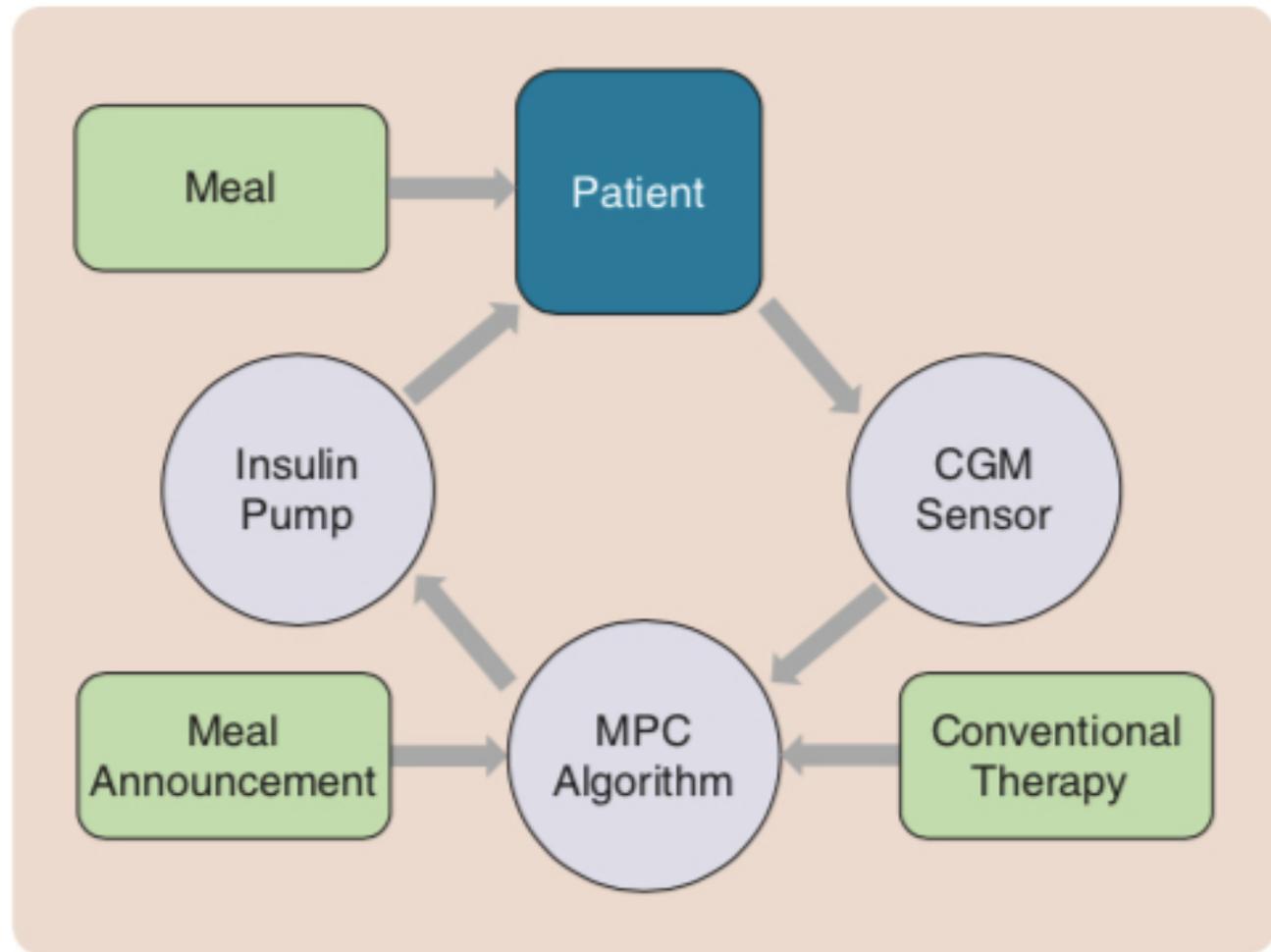


FIGURE 4 A schematic representation of an artificial pancreas. The circled elements represent the main components of the system, which are the continuous glucose monitor (CGM) sensor, the model predictive control (MPC) algorithm, and the subcutaneous insulin pump. The MPC algorithm relies on the patient's conventional therapy and the feedforward action associated with the meal announcement.

Excellent Glycemic Control Maintained by Open-Source Hybrid Closed-Loop AndroidAPS During and After Sustained Physical Activity

- OpenAPS is an abbreviation for open-source AP System (OpenAps.org), which belongs to Do-It-Yourself (DIY) AP systems. OpenAPS runs on a small microcontroller (such as Intel Edison/Raspberry Pi) and it works as a hybrid closed-loop system using a model predictive control (MPC)¹¹ algorithm that estimates the glycemia projection every 5 min based on the current glucose levels, insulin doses, carbohydrate consumption, and personal configuration (basic formula: $[\text{current BG} - (\text{ISF} * \text{IOB})] = \text{eventual BG}$) and adjusts the basal rates based on an analysis of these data.
- As a hybrid closed-loop system, they require meal announcements.

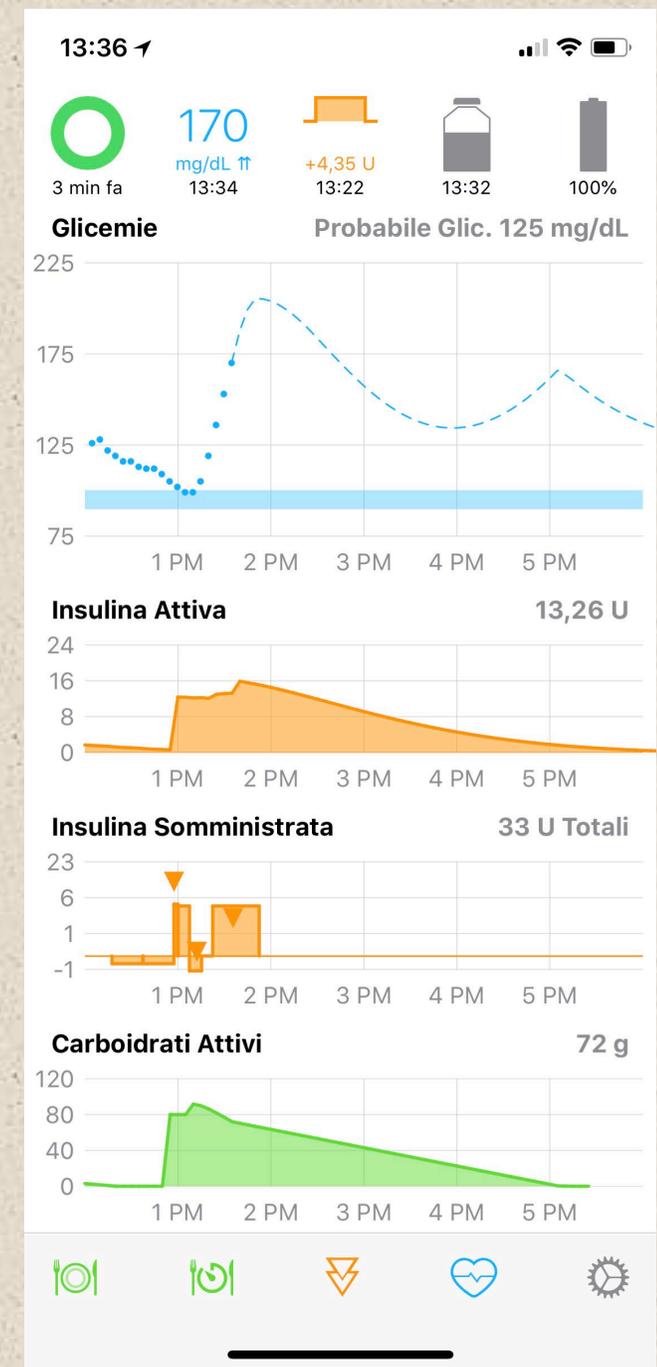
Automatic Estimation of Basals, ISF, and Carb Ratio for Sensor-Augmented Pump and Hybrid Closed Loop Therapy (Autotune) – Poster Presented at American Diabetes Association Scientific Sessions

- The Open Artificial Pancreas System (#OpenAPS) is an open and transparent effort to make safe and effective basic Artificial Pancreas System (APS) technology widely available to more quickly improve and save as many lives as possible and reduce the burden of Type 1 Diabetes. Background on the current state of...



LOOP - SYSTEM EXPLANATION

- CGM (Dexcom G4, G5, G6, Medtronic Enlite, Libre)
- Old generation Medtronic pump
- Radio signal transducer (RileyLink)
- Smartphone with iOs (Apple)
- Mac Computer (Apple) with Developer account
- Nightscout Account (optional)
- Apple Watch (optional)



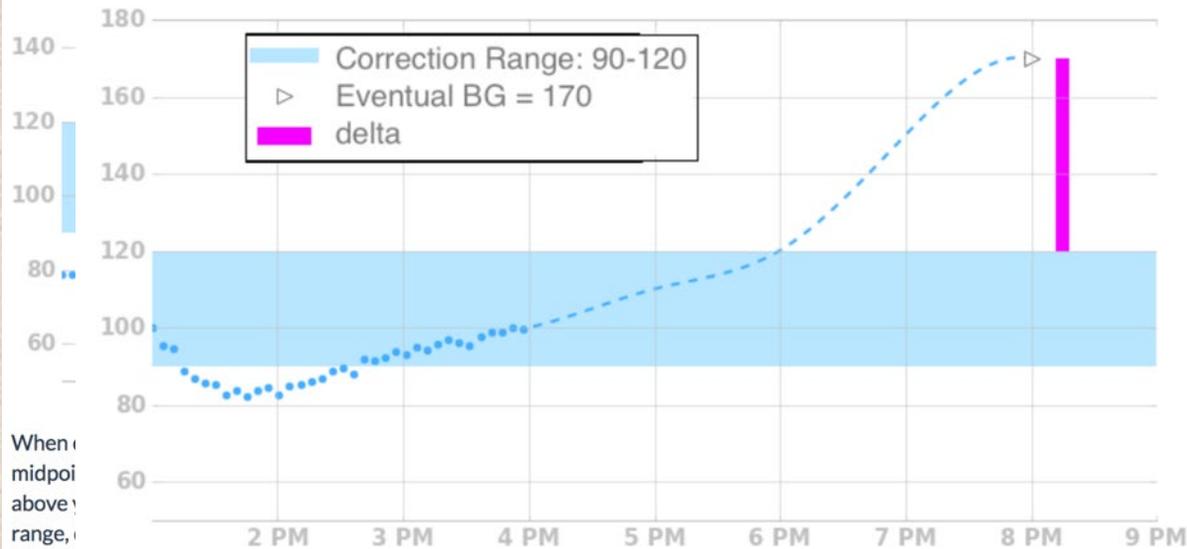
THE ALGORITHM

Bolus Recommendations

Loop also uses the forecast to generate recommendations for bolus amounts. Carbs are not directly used in bolus calculations, but rather indirectly through the forecast. After carbs are entered, the forecast is updated using the carb amounts, and then a recommendation is generated using the forecast.

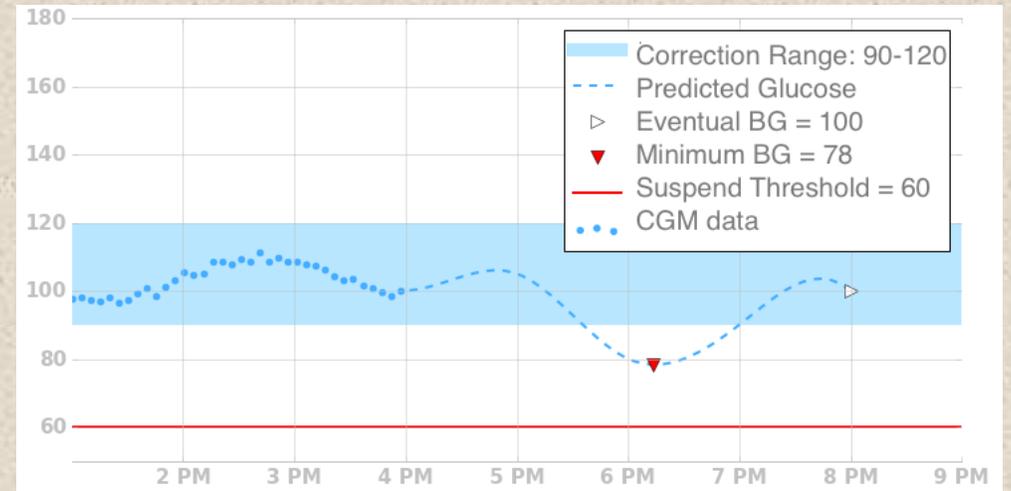
Evening The forecast used for bolusing is slightly different than the forecast used for adjust temp basals in that positive BG momentum is not included.

Eventual BG Above Correction Range

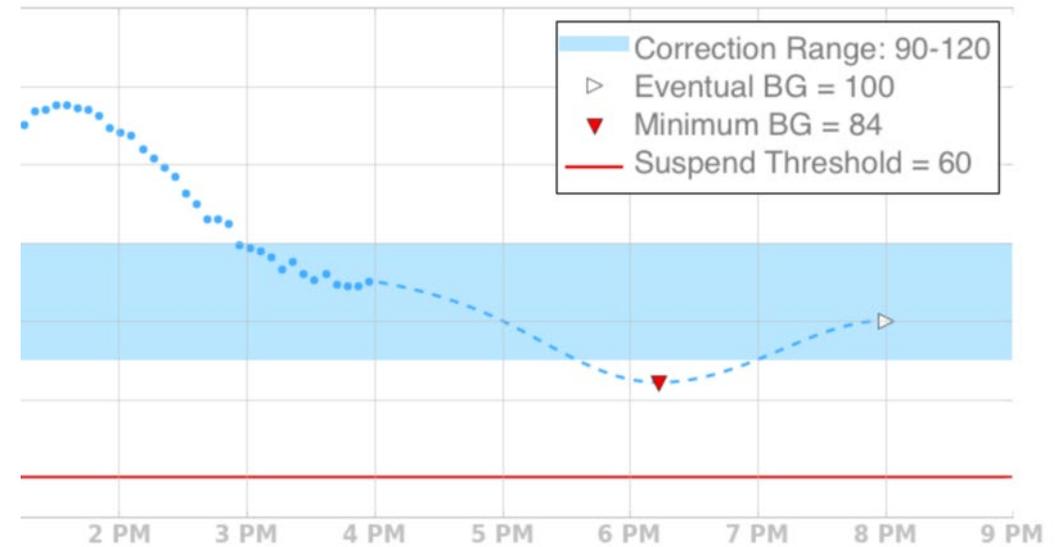


When the midpoint of the correction range is above the range,

A bolus recommendation is given if Eventual BG is above Correction Range. The delta between Eventual BG and the top of the Correction Range is used, along with your current Insulin Sensitivity to calculate the recommendation.



Temporary Excursion Below Range



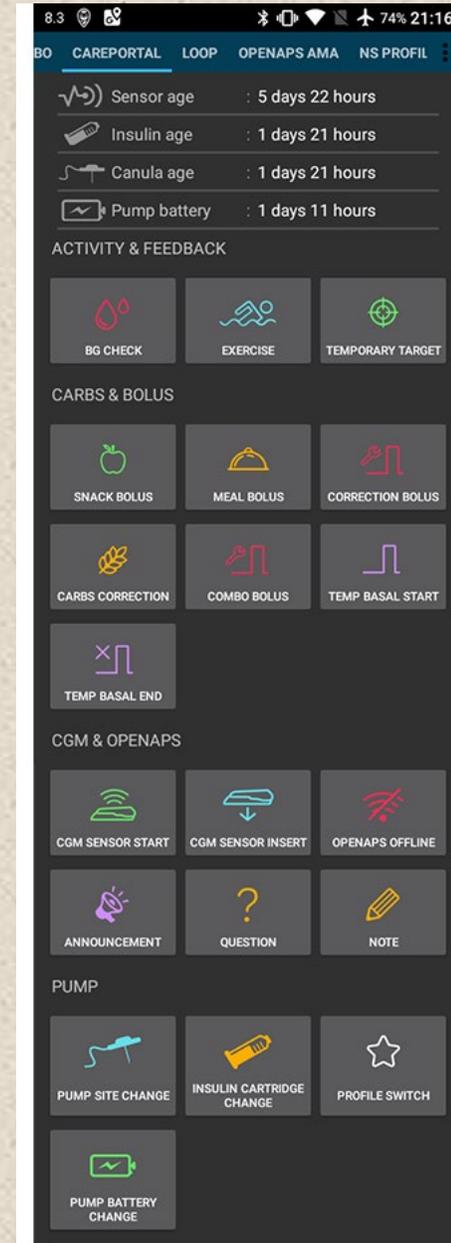
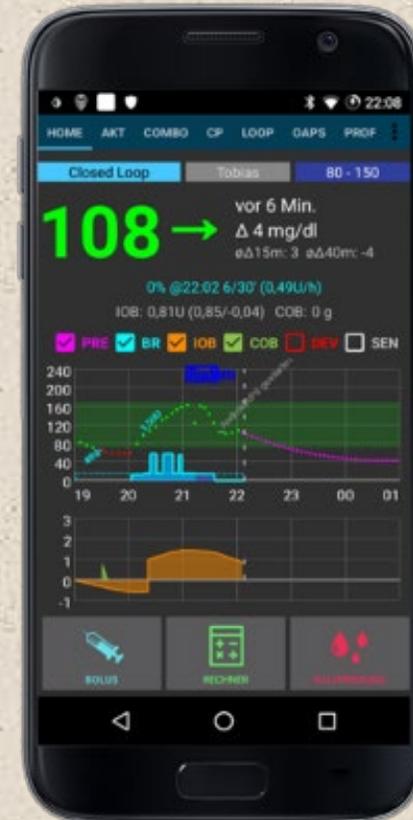
If the prediction has a temporary excursion below range, but Eventual BG is in range, Loop will revert to using your normal basal rate, as long as Minimum BG is above the suspend threshold.

OPENAPS/ANDROIDAPS

- CGM (Dexcom G4, G5, G6, Medtronic Enlite, Libre)
- Roche Spirit Combo, Dana R/RS, Medtronic
- Smartphone with Android
- Raspberry Pi / Intel Edison
- Any computer to build the app
- Nightscout Account (optional)
- Smartwatch (Pebble, optional)

Features:

- Autotune
- Small Correction Boluses



Psychosocial impacts of hybrid closed-loop systems in the management of diabetes: a review

- The contribution of closed-loop technology to diabetes management will depend less on technological factors than on ‘the real-life interactions between people and technology’, including clinicians and family members, as well as people with diabetes themselves
- Existing research identifies both benefits and burdens arising from the use of varied closed-loop systems. Future studies should be carried out with more consistent methodological rigour in addition to exploring psychosocial experiences in more diverse patient groups and in clinicians.

PATCH PUMP



Comparative dose accuracy of durable and patch insulin infusion pumps.

- As all major insulin pump manufacturers comply with the international infusion pump standard EN 60601-2-24:1998, there may be a general assumption that all pumps are equal in insulin-delivery accuracy.
- This research investigates single-dose and averaged-dose accuracy of incremental basal deliveries for one patch model and three durable models of insulin pumps. For each pump model, discrete single doses delivered during 0.5 U/h basal rate infusion over a 20 h period were measured using a time-stamped microgravimetric system.
- Dose accuracy was analyzed by comparing single doses and time-averaged doses to specific accuracy thresholds ($\pm 5\%$ to $\pm 30\%$). The percentage of single doses delivered outside accuracy thresholds of $\pm 5\%$, $\pm 10\%$, and $\pm 20\%$ were as follows: DURABLE A (43.2%, 14.3%, and 1.8%, respectively), DURABLE B (50.6%, 24.4%, and 5.5%), DURABLE C (54.2%, 26.7%, and 6.6%), and PATCH A (79.1%, 60.5%, and 34.9%).
- Differences in dose accuracy were most evident between the patch pump model and the group of durable pump models. 2013 Diabetes Technology Society.

Possiamo trovare un legame tra indicazione e scelta della tipo di Microinfusore ?

- Indicazioni:
- Insufficiente controllo glicemico (resistente all'approccio multiiniettivo intensivo)
- Problematiche legate all'ipoglicemia: Gravi, Frequenti ,Non avvertite (possiamo considerare l'ampia variabilità glicemica ma criterio non formalizzato)
- Elevato fabbisogno insulinico
- ridotto fabbisogno insulinico (SIE/SIEDP 2008)
- Stile di vita: tipo di lavoro, compromissione dello stile di vita con la MDI
- Gravidanza
- Anche nel DMT2 in MDI per i punti citati



Dati di Utilizzo dallo studio IMITA 2

- Irrespective of age, 4,263 (**64.3%**) participants used a **conventional pump** and 2,360 (**35.7%**) used a pump with an associated or integrated CGM system (**SAP**).
- Among participants who used a **SAP**, a glucose sensor was used **15 (17-24) days per month**;
- 785 participants (33.2%) used the sensor less than 10 days per month, 739 (31.3%) 10-19 days per month and 836 (**35.5%**) **20 or more days per month**.
- The rate of sensor use was higher in subjects less than 18 years of age (Table 1), with the highest rate among participants 0-5 years old (median 30 days per month [IQR 25.0-30.0]).

Dati di Utilizzo dallo studio IMITA 2

- Most participants, whether paediatric or adult, took advantage of advanced pump features :
- 81.2% of participants used temporary basal,
- 82.2% bolus options,
- 56.5% the bolus calculator
- 75.9% CHO counting.
- The prevalence was greater among participants who used SAPs than among ones who used a conventional pump (temporary basal 84.2% vs. 79.1%, $p < 0.0001$; bolus options 89.2% vs. 77.8%, $p < 0.0001$; bolus calculator 72.5% vs. 64.3%, $p < 0.0001$; CHO counting 81.8% vs. 72.2%, $p < 0.0001$).



Quanti modelli di Terapia insulinica intensiva possiamo avere a disposizione: *Sensor Augmented Pump Therapy (con LGS/PLGS e con controllo dell'iperglicemia)*

- Indicazione più forte per i pazienti che beneficiano della maggiore riduzione delle ipoglicemie severe passando a CSII:
- Età più avanzata (da uno studio)
- maggiore frequenza di ipoglicemia
- Considerare il modulatore dell'iperglicemiapazienti con fabbisogno insulinico elevato (ipotesi)

Pickup JC, Phil D: Insulin-Pump Therapy for Type 1. N Engl J Med 2012; 366:1616-1624.

Pickup JC, Sutton AJ. Severe hypoglycaemia and glycaemic control in type 1 diabetes: meta-analysis of multiple daily insulin injections versus continuous subcutaneous insulin infusion. Diabet Med 2008; 25: 765–774.

Quale paziente per sistemi integrati o associati ?

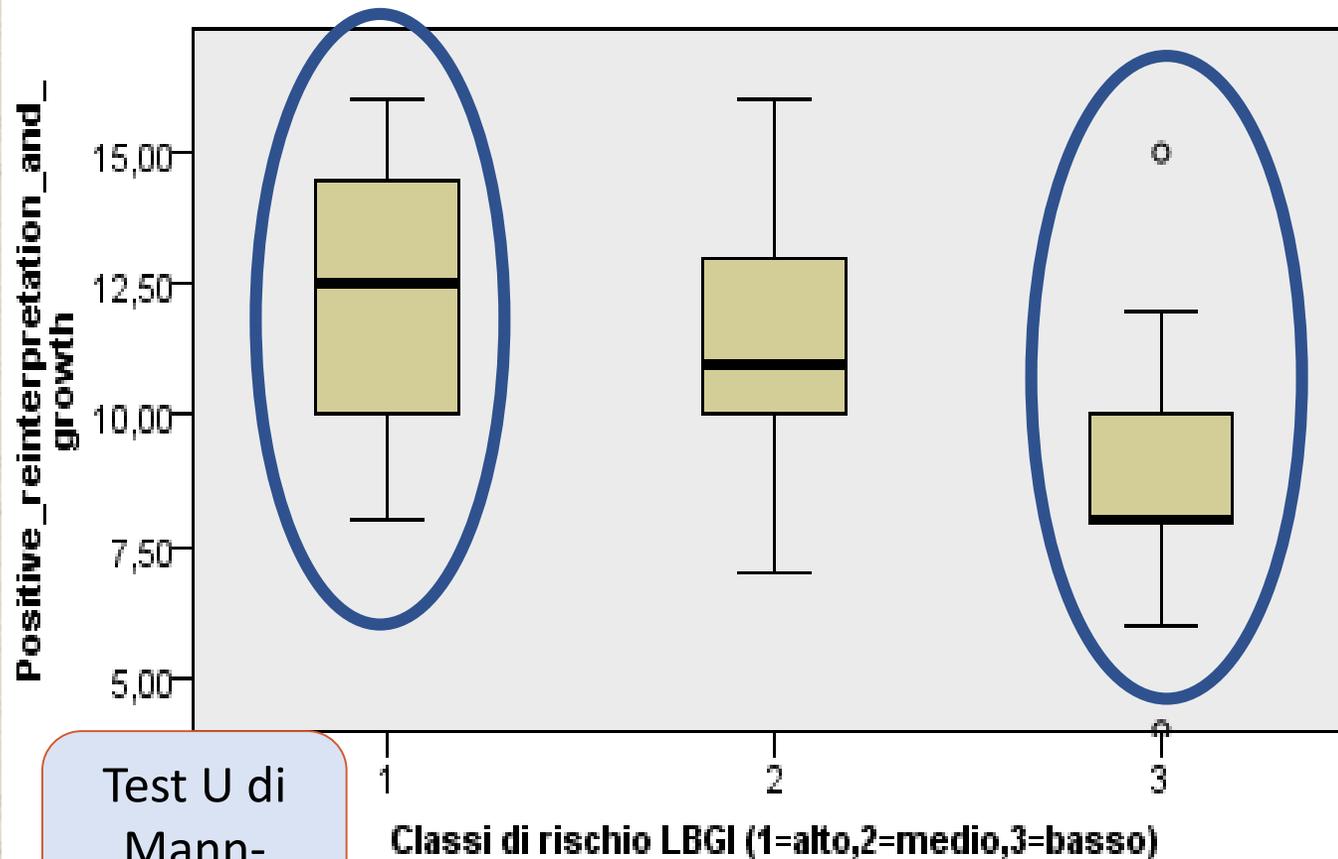


- In grado e disposto a usare il CGM per un tempo $\geq 70\%$ *
- Educato sul significato del “lag-time” e delle frecce di tendenza
- Familiari adeguatamente istruiti per l’utilizzo in età pediatrica

*Lieberman A, Buckingham B; Diabetes Technology and the Human Factor. Diabetes Technol Ther 2016, 18 Suppl 1:S101-111

- Indagine sul Coping in pz in CSII: quali strategie mentali e comportamentali mette in atto per rispondere ad uno stressor acuto o per convivere con uno stress cronico, ovvero le strategie di coping
- Classi di rischio LBGI e “reinterpretazione positiva e crescita” elaborare l’esperienza critica in termini positivi o di crescita umana;

Test di Kruskal-Wallis a campioni indipendenti



Test U di Mann-Whitney

persone con una spiccata attitudine positiva tenderanno ad essere più costanti ed attenti alla gestione del diabete, con un maggiore autocontrollo e maggiori interventi volti al raggiungimento dell’euglicemia

Comparison of different insulin pump makes under routine care conditions in adults with Type 1 diabetes

- Clinical and research implications
- We showed similar HbA1c lowering using different CSII models. Therefore, the choice of CSII make should be made according to the individual patient's preference.
- In addition, new pumps like SAP system with PLGS (predictive low glucose susp.) , which has additional features such as predictive low glucose suspend, **may be more suitable for individuals with problematic hypoglycaemia.**
- **Ed ora sistemi Ibridi e a breve Sistemi Ansa Chiusa.....(ruolo del paziente Attivo !)**

Comunicazione

<https://www.deebie.it/>



Telekom.de 14:20 98%

我的设备 固件

60%
剩余电量

喵喵编号 CEFAFCE6CE05

探头编号 剩余: 2小时10分 >

Telekom.de 23:47 28%

< 03月03日 2018 今天 +

电量80% 23:47 7.7 → -0.04 mmol/L 平均值 6.4 mmol/L 达标率 100%

21 3小时 6小时 12小时

9 3 78 21 28 110 278 74 19 806步/天

Telekom.de 13:36 58%

概况 24小时 每日对比

最近15天

6.6	6.2	5.8	5.8	5.7	7.1	7.0	7.5	6.9	7.3	7.8	7.5
3		3	2	4	1	1	2	1	4		

模拟糖化: 5.9%

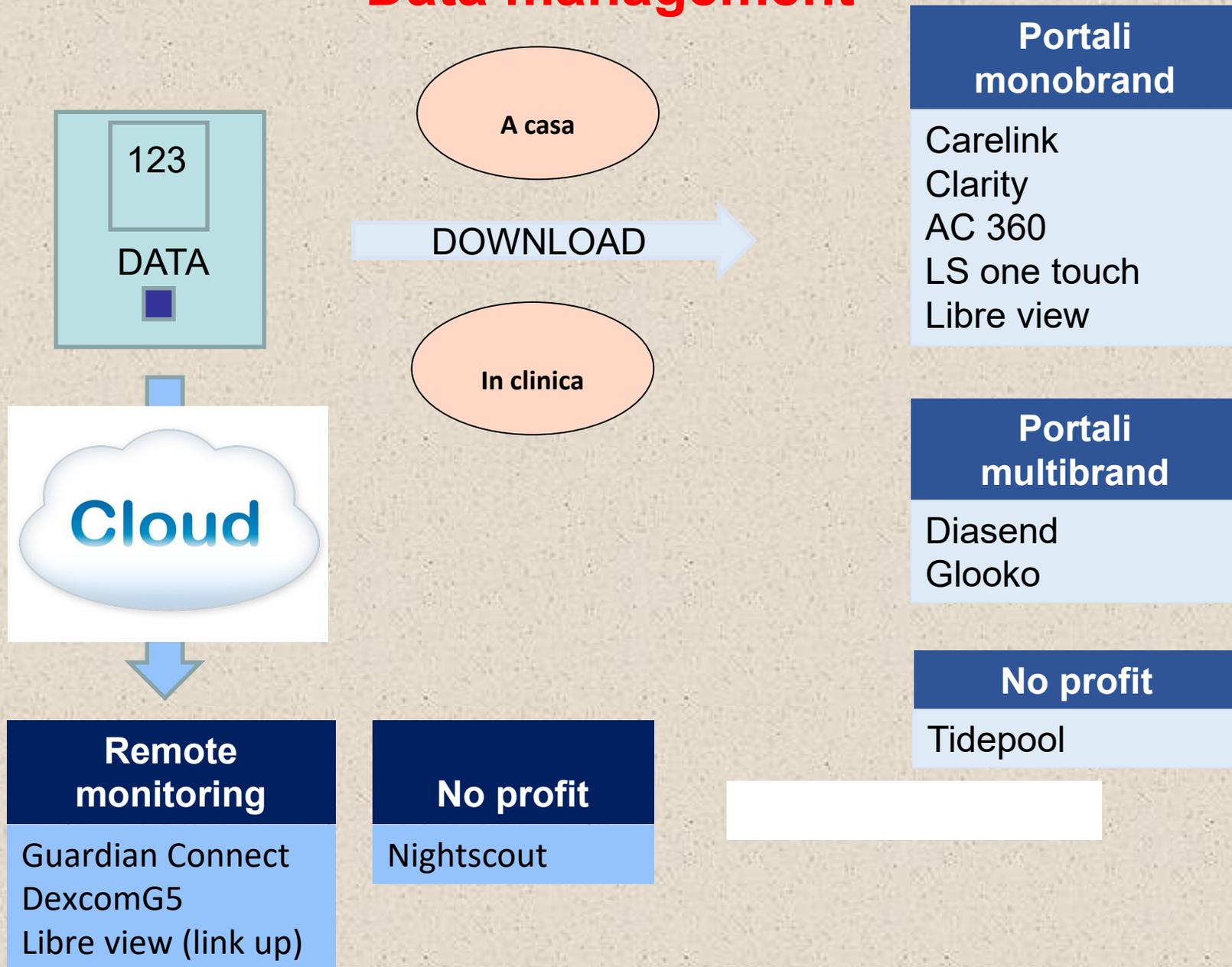
0:00 6:00 12:00 18:00 24:00

步数 1870 步/天

11	52	152	130	389	445	500	115	28	44
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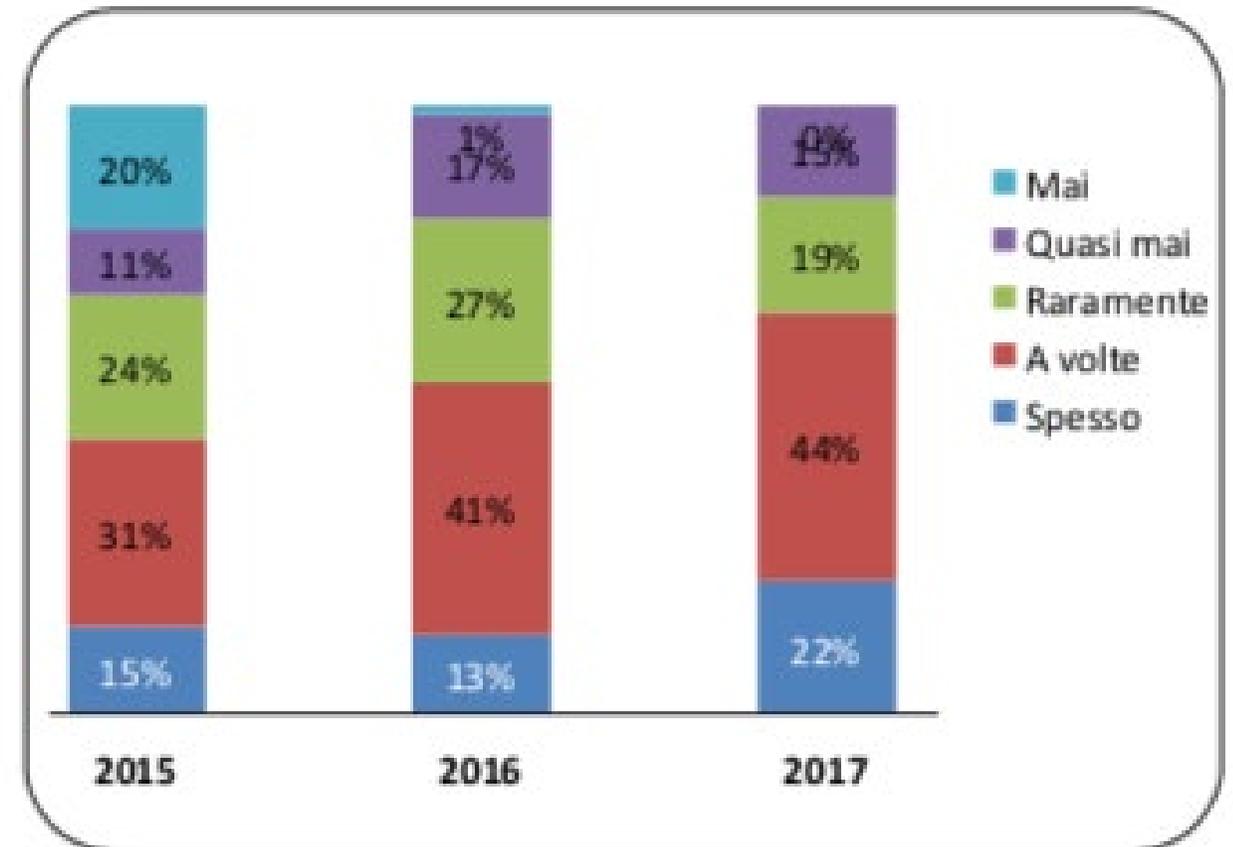
DeeBee.it

Data management



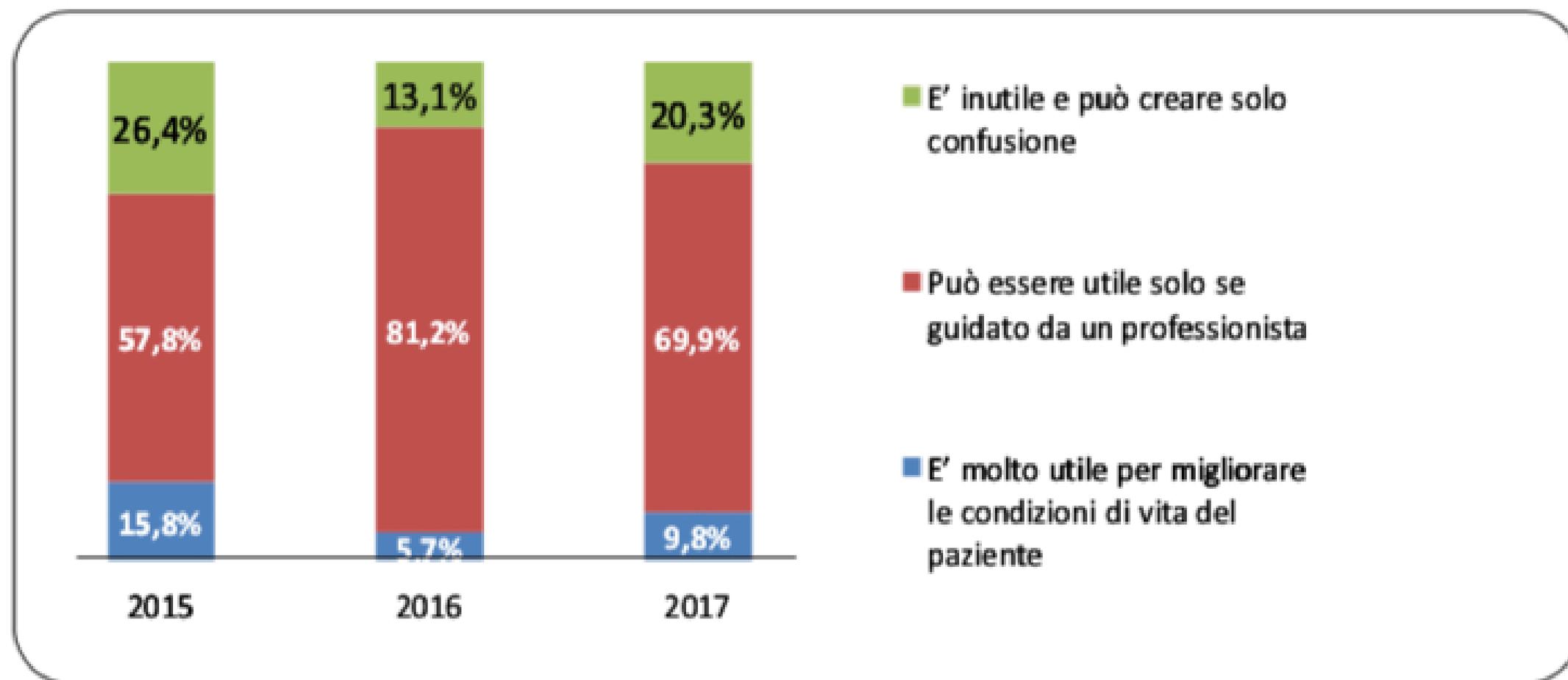
- In base ai dati raccolti presso la popolazione il 57% delle persone con problematiche di salute afferma di rivolgersi a Google come fonte primaria di informazione per la salute, a seguire Bing, i social network, wikipedia e Youtube

Quanto spesso le persone riportano le informazioni ottenute da internet al proprio medico



Fonte Medi-Pragma 2017: Indagine CAWI con 450 medici

Opinione del medico rispetto all'utilizzo di internet per cercare informazioni sul diabete da parte delle persone con diabete



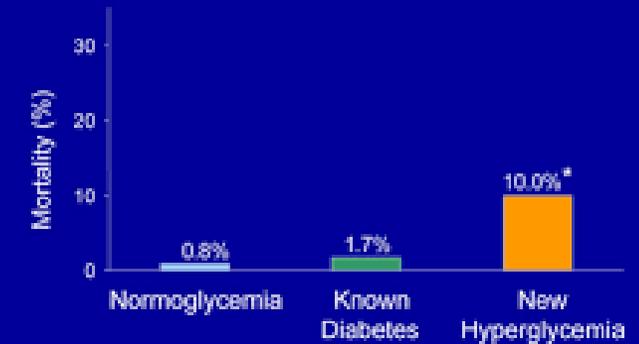
Fonte Medi-Pragma 2017: Indagine CAWI con 450 medici

Diabete in Ospedale

CGM in Hospital

- ↑ × [??] ↓ [??][??][??] +---+---after before before bot centered center G have shown that the inpatient use of CGM is more effective in identifying trends toward hypoglycemia and hyperglycemia compared with standard POC glucose testing. However, these trials used blinded CGM, and therefore interventions to prevent impending hypoglycemia were not performed.
- Another limitation is that although glucose values are captured in the CGM device, results are not transmitted to the nursing station to allow providers to detect and treat impending hypoglycemia.
- ↑ × [??] ↓ [??][??][??] +---+---after before before bot centered center on the feasibility of a continuous glucose telemetry system in high hypoglycemia–risk patients in non-ICU settings (J Diabetes Sci Technol 2018;12:20–25)

Hyperglycemia and Mortality Among Non-ICU Patients



*P<.01.

Umpletz G, et al. J Clin Endocrinol Metab. 2002;87:978-982.



- CGM Use in the ICU: A recent panel of experts concluded that use of CGM now might not be feasible for every ICU patient, but there are populations of high interest who may benefit from further study of CGM owing to their high risk for glucose variability and hypoglycemia.
- These populations include patients receiving intravenous insulin or high-dose glucocorticoids; those undergoing cardiac surgery, transplant, or traumatic or vascular brain surgery; those with end-stage end-stage renal or liver disease or hypoglycemia unawareness; and those in neonatal ICU

Clinical trials of CGM in non-ICU settings

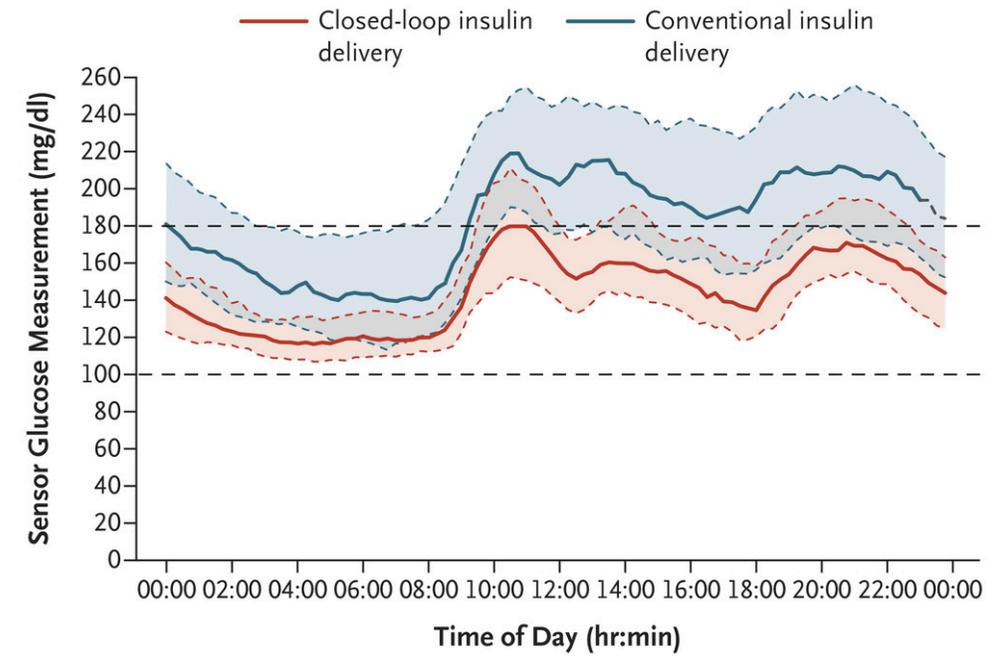
First author, year (ref.)	Population	Sample size	No. of sites	Type of CGM	Performance measurement	Comparator
Burt, 2013 (86)	General ward	26	1	CGM	Accuracy	Capillary BG monitoring
Schaupp, 2015 (87)	General ward	84	1	CGM	Accuracy	Capillary BG monitoring
Gómez, 2015 (88)	General ward	38	1	CGM	Accuracy	Capillary BG monitoring
Gu, 2017 (89)	General ward	81	8	Sensor-augmented pump	Accuracy	MDI with blinded CGM

Monitoraggio glicemico in Ospedale

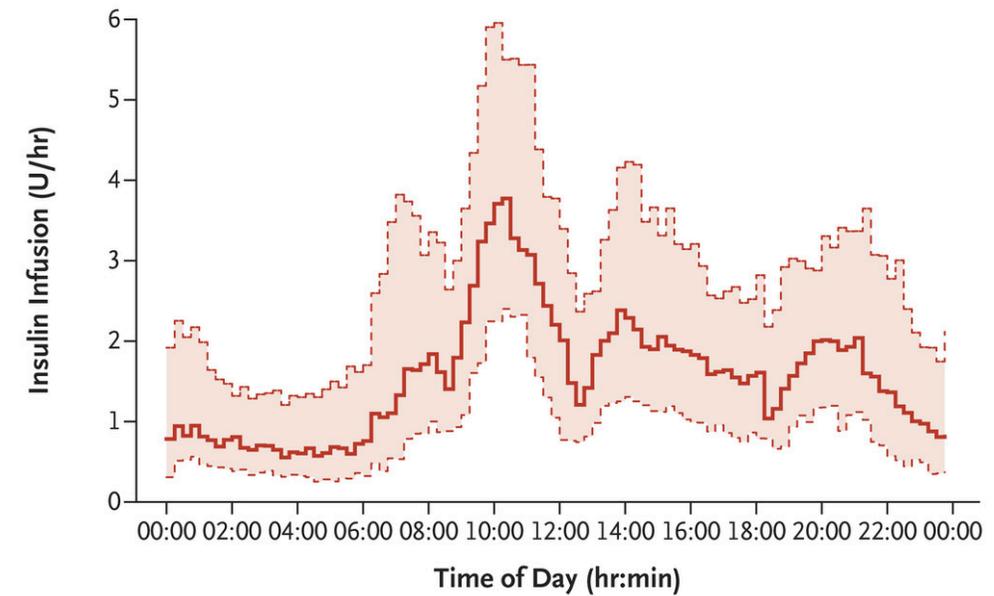
- Fase di transizione dall'uso del controllo della glicemia capillare all'uso dei sistemi di cgm in particolare nelle ICU, per classi di pazienti ad alto rischio ipoglicemico e con la disponibilità di telemetria del dato

Closed loop in Hospital

A Sensor Glucose Measurement



B Closed-Loop Insulin Delivery



The Medical Virtualist

- We propose the concept of a new specialty representing the *medical virtualist*. This term could be used to describe physicians who will spend the majority or all of their time caring for patients using a virtual medium.
- A professional consensus will be needed on a set of core competencies to be further developed over time.

The Medical Virtualist: Critical Success Factors

- The success of technology-based services is not determined by hardware and software alone but by ease of use, perceived value, and workflow optimization.
- Medical virtualists will need specific core competencies and curricula that are beginning to develop at some institutions. In addition to the medical training for a specific discipline, the curriculum for certification should include knowledge of legal and clinical limitations of virtual care, competencies in virtual examination using the patient or families, “virtual visit presence training,” inclusion of on-site clinical measurements, as well as continuing education.