# Continuous Glucose Monitoring και Διατροφική διαχείριση στον Σακχαρώδη Διαβήτη τύπου 2

INTERNAL MEDICINE SOCIETY OF GREECE

4th SCIENTIFIC MEETING

**CURRENT ISSUES IN DIABETES. THERAPEUTIC TREATMENT WITH THE LATEST TECHNOLOGY – PUMPS, INSULIN, GLUCOSE RECORDING SYSTEMS**

**APRIL 11-13, 2024**

ARISTOTLE UNIVERSITY RESEARCH DISSEMINATION CENTER (KEDEA)

**THESSALONIKI**

In cooperation with the **1st Dept of Propaedeutic Internal Medicine and Diabetes Center, AHEPA University General Hospital of Thessaloniki**


**Εβελίνα Κοτζακιουλάφη**

*Διαιτολόγος Διατροφολόγος M.Sc.*

*Επιστημονική συνεργάτης ΠΜΣ Νεότερες τεχνολογίες και μέθοδοι στην θεραπευτική αντιμετώπιση του ΣΔ και του Διαβητολογικού κέντρου Α'ΠΡΠ ΠΓΝΘ ΑΧΕΠΑ*

*Nestle Research Switzerland*

# Disclosures

- Η ομιλήτρια είναι εργαζόμενη στη Nestle Research Switzerland

# Περίγραμμα

Γιατί είναι σημαντικο το CGM για τα άτομα με ΣΔ2?

CGM και οφέλη στην υγεία

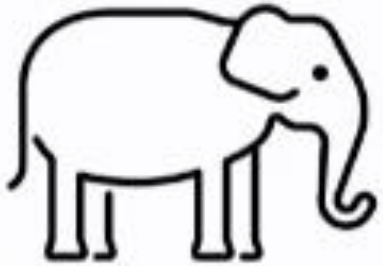
CGM και συμπεριφορική αλλαγή

# Ποιοι χρειάζονται το CGM? Και γιατί?

## Diabetes Management 2024

**T1D: 5-10% of diabetes population**

- CGM upfront
- Automated insulin delivery as a destination
- ?Prevention
- ?beta cell replacement
- ?SGLT-2i and GLP-1RA therapy for comorbidities



**T2D: 90-95% of diabetes population**

**T2D Non-insulin (75%)**

- ASCVD/CHF/CKD = GLP-1RA or SGLT2i therapy
- Beyond that, therapy based on weight and glycemic goals
- GLP-1RA as first injectable
- Insulin = last resort

**T2D on insulin ± non-insulin therapies (25%)**

- More advanced co-morbidities
- Worse outcomes
- 69% unable to get A1C <7% (American data)

**In the beginning, There was No Data**

**Then CGM said “Let There Be Data”**

- Η δυνατότητα παρακολούθησης των αλλαγών στη γλυκόζη έχει τη δυνατότητα να παρέχει άμεση ανατροφοδότηση στους χρήστες σχετικά με τις επιλογές τροφίμων και τη σωματική δραστηριότητα.
- The National Diabetes Prevention Program is currently the only reimbursable intervention for diabetes prevention and weight loss
- Στις Ηνωμένες Πολιτείες, περισσότεροι από 30,3 εκατομμύρια άνθρωποι πάσχουν από διαβήτη και 84,1 εκατομμύρια ενήλικες έχουν προδιαβήτη.
- Οι ετήσιες ιατρικές δαπάνες για τα άτομα με διαγνωσμένο διαβήτη ανέρχονται κατά μέσο όρο σε 13 700 δολάρια.
- Πολλά ολοκληρωμένα προγράμματα παρέμβασης στον τρόπο ζωής, όπως το Πρόγραμμα Πρόληψης του Διαβήτη (DPP)3 και στρατηγικές αλλαγής συμπεριφοράς (μόνες τους ή σε συνδυασμό) έχουν χρησιμοποιηθεί για την προώθηση της απώλειας βάρους σε άτομα που ζουν με παχυσαρκία ή είναι υψηλού κινδύνου με ποικίλα αποτελέσματα.
- Οι στρατηγικές αυτές περιλαμβάνουν τη συνέντευξη με κίνητρα(motivational interviewing), accountability / αυτοπαρακολούθηση, ημερολόγια διατροφής, βηματόμετρα και εφαρμογές κινητών τηλεφώνων για την απώλεια βάρους.
- DPP: έδειξε ότι οι αλλαγές στον τρόπο ζωής (διατροφή και σωματική δραστηριότητα με στόχο την απώλεια βάρους) ήταν πιο αποτελεσματικές από τις μετρήσεις στην πρόληψη του διαβήτη μεταξύ των ατόμων με προδιαβήτη- ωστόσο, η παρέμβαση στον τρόπο ζωής DPP περιελάμβανε συχνές επισκέψεις και καθοδήγηση για αρκετά χρόνια, γεγονός που είναι δαπανηρό και χρήζει ανθρώπινων πόρων.
- A meta-analysis conducted in 2012 reviewing 28 National DPP translational interventions showed an average weight loss of 4%.
- However, the attrition rate or drop-out rate was as high as 50% in some programs.
- The weight loss achieved in these interventions was highly dependent on number of core sessions attended, highlighting the challenges of engaging patients in ongoing weekly group sessions and the need to evaluate alternative, self-directed behavioral change methods to promote weight loss and glycemic management.

American Diabetes Association®

From: **Comparing Continuous Glucose Monitoring and Blood Glucose Monitoring in Adults With Inadequately Controlled, Insulin-Treated Type 2 Diabetes (Steno2tech Study): A 12-Month, Single-Center, Randomized Controlled Trial**

Diabetes Care. Published online March 15, 2024. doi:10.2337/dc23-2194

# CONTINUOUS GLUCOSE MONITORING FOR ADULTS WITH INSULIN-TREATED TYPE 2 DIABETES

## AIM

To evaluate the long-term effect of CGM versus BGM in adults with inadequately controlled, insulin-treated type 2 diabetes

## METHODS

12-month single-center, open-label, parallel, RCT


76 participants randomized to 12 months of CGM or BGM

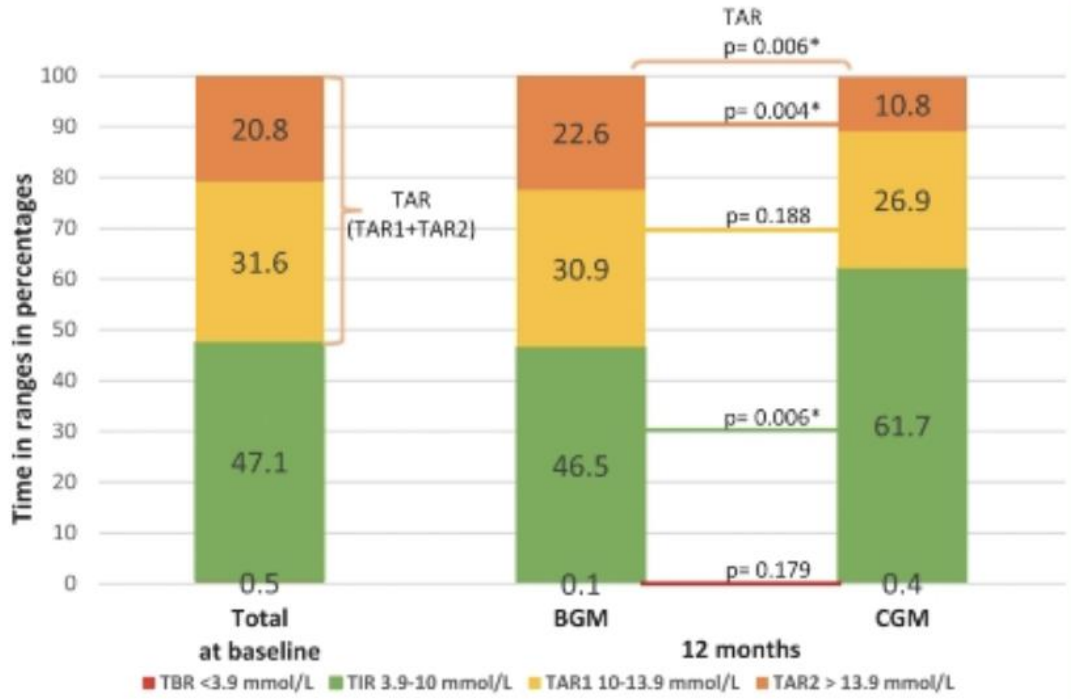



Figure 1: CGM-derived metrics at baseline and 12-month follow-up.

## MAIN RESULTS

(BETWEEN-GROUP DIFFERENCE IN CHANGE)

↑ 15.2% TIR (3 h 39 min)
↓ 15.5% TAR
↓ 0.9% (9.4 mmol/mol) in $HbA_{1c}$
↓ 10.6 units of insulin/day
↓ 3.3 kg in body weight

↑ Self-rated treatment and glucose monitoring satisfaction
↑ Self-rated general and diabetes-related health
↑ Self-rated health behavior

# Significant Improvement in Glycemic Outcomes in Type 2 Diabetes Patients: The Impact of 14-D Personalized Coaching and Continuous Glucose Monitoring on Glycemic Variations

Dr Manoj Chawla, Annie Mattilda Raymond, Shivtosh Kumar, Dr Chhavi Mehra
Ragus Healthcare Pvt Ltd

## Background:

Continuous Glucose Monitoring (CGM) is a revolution in diabetes management as it helps provide continuous insights into glycemic variability (GV) including hypo- and hyperglycemic episodes. The aim of this study was to observe if CGM-directed personalized nutrition, progressive fitness, and mindfulness coaching, improved glycemic parameters in patients with T2D.

## Methodology:

In this retrospective study, we analyzed data obtained from 2860 participants diagnosed with type 2 diabetes (T2D) who enrolled in Sugarfit's Diabetes Reversal and Management Program (SDRMP). These participants completed a 14-day continuous glucose monitoring (CGM) period. The average CGM readings for the initial 3 days (days 2,3,4) and the last 3 days (day-12,13,14) gathered with the help of the Sugarfit app. In this duration coaches effectively implemented personalized changes such as dietary modifications and introduced fitness and mindfulness activities. Importantly, no medication adjustments were made for the duration of 14 days.

## Results:

Of the 2,860 participants, 2,078 were males (72.63%) and 782 were females (27.34%). The mean age of participants was 46.5±10.7 years. The CGM captured one reading every 15 minutes, resulting in a total of 96 glucose readings every day for up to 14 days. A significant increase in Time in Range (TIR) of 22.01% ($p<0.001$) was observed from days 2, 3, and 4 to days 12, 13, and 14. Moreover, there was a notable reduction in Time Above Range (TAR) by 28.21% and an improvement in Time Below Range (TBR) by 78.63% ($p<0.001$ for both).

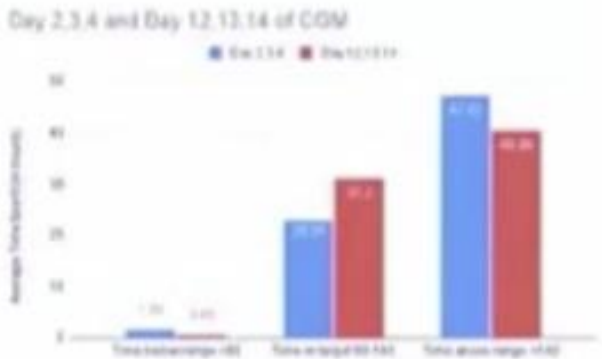



Figure 1 – CGM metrics at day 1 to day 14 of follow-up

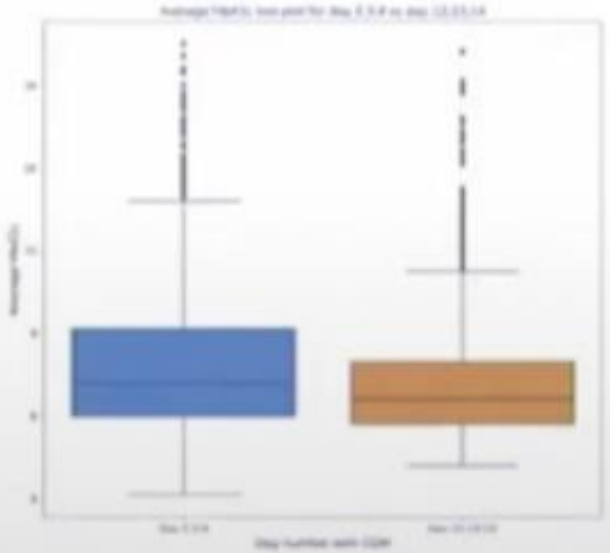


Figure 2 – The average HbA1c in CGM period (day 1 to day 14)

These findings un effectiveness of conti monitoring combined w interventions in optim control.

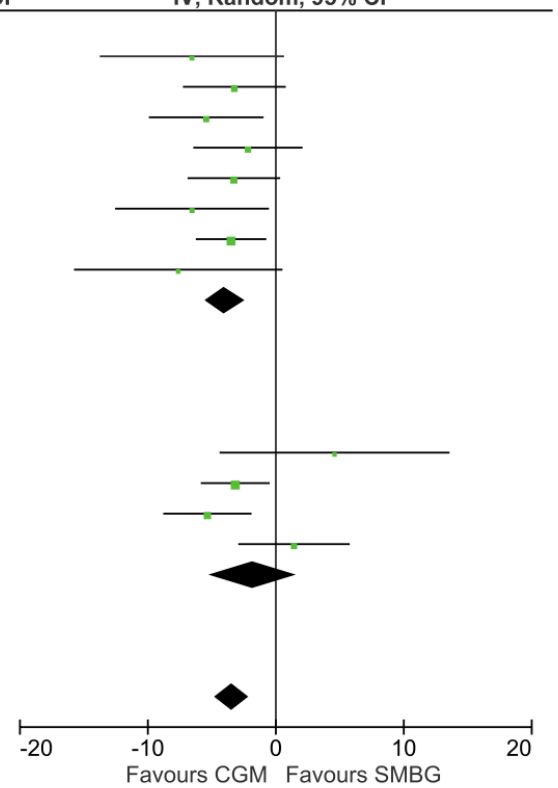
## Conclusion:

Observation of glycem variability using CGM personalized lifestyle in shown improved Time Technological advance CGM, provide valuabl inter and intra-day glyc for participants. Th understanding prom adherence to lifestyle ultimately leading outcomes and reduced in diabetes. The SDRM advancements to deliv interventions that effe glycemic control and outcomes in a short peri

# Continuous glucose monitoring in adults with type 2 diabetes: a systematic review and meta-analysis

Milena Jancev[1] · Tessa A. C. M. Vissers[1] · Frank L. J. Visseren[1] · Arianne C. van Bon[2] · Erik H. Serné[3] · J. Hans DeVries[3] · Harold W. de Valk[1] · Thomas T. van Sloten[1]

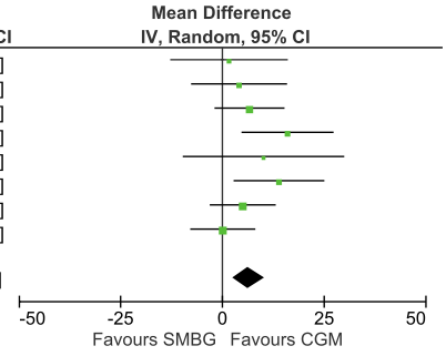
| | CGM | | | SMBG | | | | Mean Difference | Mean Difference |
|---|---|---|---|---|---|---|---|---|---|
| Study or Subgroup | Mean | SD | Total | Mean | SD | Total | Weight | IV, Random, 95% CI | IV, Random, 95% CI |
| **1.1.1 rtCGM vs SMBG** | | | | | | | | | |
| Moon (2023) [32] | -6.56 | 7.65 | 15 | 0 | 12 | 15 | 3.2% | -6.56 [-13.76, 0.64] | |
| Bergenstal (2022) [26] | -12.2 | 12 | 59 | -8.96 | 9.84 | 55 | 9.0% | -3.24 [-7.26, 0.78] | |
| Martens (2021) [28] | -12 | 16.4 | 116 | -6.56 | 13.1 | 59 | 7.5% | -5.44 [-9.92, -0.96] | |
| Price (2021) [29] | -5.46 | 9.84 | 44 | -3.28 | 7.65 | 23 | 8.1% | -2.18 [-6.45, 2.09] | |
| Beck (2017) [22] | -8.74 | 10.1 | 77 | -5.46 | 12.5 | 75 | 10.7% | -3.28 [-6.90, 0.34] | |
| Vigersky (2012) [30] | -8.74 | 16.4 | 50 | -2.19 | 14.2 | 50 | 4.4% | -6.55 [-12.56, -0.54] | |
| Cosson (2009) [27] | -6.89 | 3.72 | 11 | -3.39 | 3.17 | 14 | 16.3% | -3.50 [-6.25, -0.75] | |
| Yoo (2008) [31] | -12 | 17.1 | 29 | -4.37 | 14.2 | 28 | 2.5% | -7.63 [-15.78, 0.52] | |
| **Subtotal (95% CI)** | | | **401** | | | **319** | **61.7%** | **-3.95 [-5.46, -2.44]** | |
| Heterogeneity: Tau² = 0.00; Chi² = 3.45, df = 7 (P = 0.84); I² = 0% | | | | | | | | | |
| Test for overall effect: Z = 5.12 (P < 0.00001) | | | | | | | | | |
| **1.1.2 isCGM vs SMBG** | | | | | | | | | |
| Ajjan (2023) [21] | -5.36 | 21.3 | 55 | -9.95 | 26.5 | 55 | 2.1% | 4.59 [-4.40, 13.58] | |
| Wada (2020) [24] | -5.03 | 5.14 | 48 | -1.86 | 7.76 | 45 | 16.8% | -3.17 [-5.86, -0.48] | |
| Yaron (2019) [25] | -8.96 | 9.18 | 53 | -3.61 | 8.52 | 48 | 11.6% | -5.35 [-8.80, -1.90] | |
| Haak (2017) [23] | -3.06 | 14.2 | 149 | -4.48 | 16.4 | 75 | 7.9% | 1.42 [-2.94, 5.78] | |
| **Subtotal (95% CI)** | | | **305** | | | **223** | **38.3%** | **-1.79 [-5.28, 1.69]** | |
| Heterogeneity: Tau² = 7.48; Chi² = 8.34, df = 3 (P = 0.04); I² = 64% | | | | | | | | | |
| Test for overall effect: Z = 1.01 (P = 0.31) | | | | | | | | | |
| **Total (95% CI)** | | | **706** | | | **542** | **100.0%** | **-3.43 [-4.75, -2.11]** | |
| Heterogeneity: Tau² = 0.80; Chi² = 12.95, df = 11 (P = 0.30); I² = 15% | | | | | | | | | |
| Test for overall effect: Z = 5.11 (P < 0.00001) | | | | | | | | | |
| Test for subgroup differences: Chi² = 1.24, df = 1 (P = 0.27), I² = 19.3% | | | | | | | | | |



**a**

| Study or Subgroup | CGM Mean | CGM SD | CGM Total | SMBG Mean | SMBG SD | SMBG Total | Weight | Mean Difference IV, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Ajjan (2023) [21] | 8.73 | 38.57 | 54 | 7.1 | 36.57 | 50 | 6.9% | 1.63 [-12.81, 16.07] |
| Moon (2023) [32] | 3.1 | 17.9 | 15 | -1 | 14.9 | 15 | 10.0% | 4.10 [-7.69, 15.89] |
| Bergenstal (2022) [26] | 18.21 | 23.3 | 59 | 11.55 | 23.5 | 55 | 17.7% | 6.66 [-1.94, 15.26] |
| Martens (2021) [28] | 19 | 36.07 | 116 | 3 | 36.07 | 59 | 10.8% | 16.00 [4.70, 27.30] |
| Price (2021) [29] | -3.2 | 35.36 | 42 | -13.3 | 37.15 | 19 | 3.7% | 10.10 [-9.73, 29.93] |
| Wada (2020) [24] | 18.2 | 23.89 | 41 | 4.3 | 25.4 | 35 | 11.1% | 13.90 [2.75, 25.05] |
| Beck (2017) [22] | 4 | 24.83 | 78 | -1 | 26.25 | 75 | 19.6% | 5.00 [-3.10, 13.10] |
| Haak (2017) [23] | -1.2 | 26.82 | 149 | -1.3 | 29.77 | 75 | 20.1% | 0.10 [-7.90, 8.10] |
| **Total (95% CI)** | | | **554** | | | **383** | **100.0%** | **6.36 [2.48, 10.24]** |

Heterogeneity: Tau² = 2.90; Chi² = 7.70, df = 7 (P = 0.36); I² = 9%
Test for overall effect: Z = 3.21 (P = 0.001)

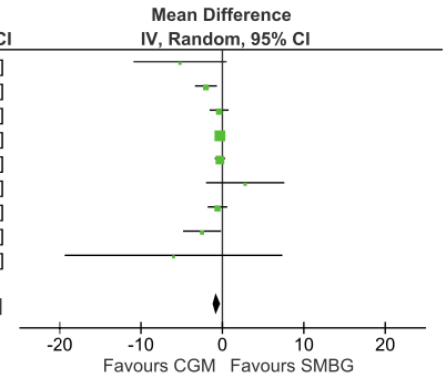



TIR

**b**

| Study or Subgroup | CGM Mean | CGM SD | CGM Total | SMBG Mean | SMBG SD | SMBG Total | Weight | Mean Difference IV, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Ajjan (2023) [21] | -3.91 | 11.92 | 54 | 1.29 | 17.15 | 50 | 0.9% | -5.20 [-10.92, 0.52] |
| Bergenstal (2022) [26] | -0.8 | 4.4 | 59 | 1.22 | 2.8 | 55 | 11.2% | -2.02 [-3.36, -0.68] |
| Moon (2023) [32] | -0.4 | 2.3 | 15 | 0 | 0.2 | 15 | 13.4% | -0.40 [-1.57, 0.77] |
| Martens (2021) [28] | -0.1 | 0.64 | 116 | 0.2 | 1 | 59 | 32.0% | -0.30 [-0.58, -0.02] |
| Price (2021) [29] | -0.3 | 1.62 | 42 | 0 | 0.92 | 19 | 23.6% | -0.30 [-0.94, 0.34] |
| Wada (2020) [24] | 1.2 | 4.9 | 41 | -1.6 | 13.78 | 35 | 1.2% | 2.80 [-2.01, 7.61] |
| Beck (2017) [22] | -0.9 | 3.9 | 78 | -0.3 | 3.72 | 75 | 12.8% | -0.60 [-1.81, 0.61] |
| Haak (2017) [23] | -2.9 | 8.17 | 149 | -0.4 | 8.5 | 75 | 4.7% | -2.50 [-4.83, -0.17] |
| Cosson (2009) [27] | -4 | 15.52 | 7 | 2 | 12.04 | 12 | 0.2% | -6.00 [-19.36, 7.36] |
| **Total (95% CI)** | | | **561** | | | **395** | **100.0%** | **-0.66 [-1.21, -0.12]** |

Heterogeneity: Tau² = 0.22; Chi² = 14.47, df = 8 (P = 0.07); I² = 45%
Test for overall effect: Z = 2.39 (P = 0.02)

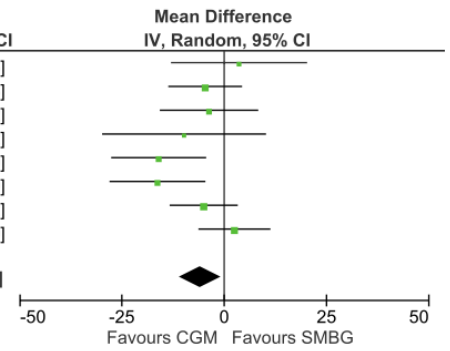



TBR

**c**

| Study or Subgroup | CGM Mean | CGM SD | CGM Total | SMBG Mean | SMBG SD | SMBG Total | Weight | Mean Difference IV, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Ajjan (2023) [21] | -5 | 42.92 | 54 | -8.63 | 43.5 | 50 | 7.2% | 3.63 [-13.00, 20.26] |
| Bergenstal (2022) [26] | -17.41 | 24.9 | 59 | -12.77 | 24.2 | 55 | 16.5% | -4.64 [-13.66, 4.38] |
| Moon (2023) [32] | -2.7 | 18.5 | 15 | 1 | 14.9 | 15 | 11.7% | -3.70 [-15.72, 8.32] |
| Price (2021) [29] | 3.4 | 35.78 | 42 | 13.2 | 37.46 | 19 | 5.3% | -9.80 [-29.82, 10.22] |
| Martens (2021) [28] | -18 | 36.07 | 116 | -2 | 37.48 | 59 | 12.2% | -16.00 [-27.60, -4.40] |
| Wada (2020) [24] | -19.1 | 24.53 | 41 | -2.8 | 27.12 | 35 | 12.1% | -16.30 [-28.01, -4.59] |
| Beck (2017) [22] | -4 | 25.46 | 78 | 1 | 26.97 | 75 | 17.9% | -5.00 [-13.32, 3.32] |
| Haak (2017) [23] | 4.1 | 28.88 | 149 | 1.6 | 33.02 | 75 | 17.0% | 2.50 [-6.29, 11.29] |
| **Total (95% CI)** | | | **554** | | | **383** | **100.0%** | **-5.86 [-10.88, -0.84]** |

Heterogeneity: Tau² = 18.56; Chi² = 11.06, df = 7 (P = 0.14); I² = 37%
Test for overall effect: Z = 2.29 (P = 0.02)




TAR

**.3** Forest plot of pooled analysis of change in TIR (**a**) TBR (**b**) and TAR (**c**) in individuals with type 2 diabetes using rtCGM or isCGM
npared with SMBG

# Efficacy and Safety of Continuous Glucose Monitoring and Intermittently Scanned Continuous Glucose Monitoring in Patients With Type 2 Diabetes: A Systematic Review and Meta-analysis of Interventional Evidence

Samuel Seidu ; Setor K. Kunutsor; Ramzi A. Ajjan; Pratik Choudhary

We included **26 RCTs (17 CGM and 9 isCGM)** involving **2,783 patients with T2D** (CGM 632 vs. usual care/SMBG 514 and isCGM 871 vs. usual care/SMBG 766). **CGM reduced $HbA_{1c}$ (mean difference −0.19%** [95% CI −0.34, −0.04]) and **glycemic medication effect score (−0.67 [**−1.20 to −0.13]), **reduced user satisfaction (−0.54** [−0.98, −0.11]), and **increased the risk of adverse events (relative risk [RR] 1.22 [**95% CI 1.01, 1.47]).

isCGM reduced $HbA_{1c}$ by −0.31% (−0.46, −0.17), increased user satisfaction (0.44 [0.29, 0.59]), improved CGM metrics, and increased the risk of adverse events (RR 1.30 [0.05, 1.62]).

**Neither CGM nor isCGM had a significant impact on body composition, blood pressure, or lipid levels**.

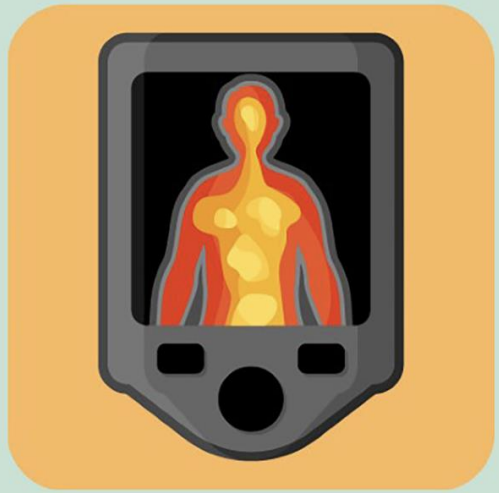
**LIMITATIONS**

Limitations include small samples, single-study outcomes, population variations, and uncertainty for younger adults. Additionally, inclusion of <10 studies for most end points restricted comprehensive analysis, and technological advancements over time need to be considered.

**CONCLUSIONS**

Both CGM and isCGM demonstrated a reduction in $HbA_{1c}$ levels in individuals with T2D, and unlike CGM, isCGM use was associated with improved user satisfaction. The impact of these devices on body composition, blood pressure, and lipid levels remains unclear, while both CGM and isCGM use were associated with increased risk of adverse events.

**Both** continuous glucose monitoring and intermittently scanned continuous glucose monitoring demonstrated a reduction in $HbA_{1c}$ levels.



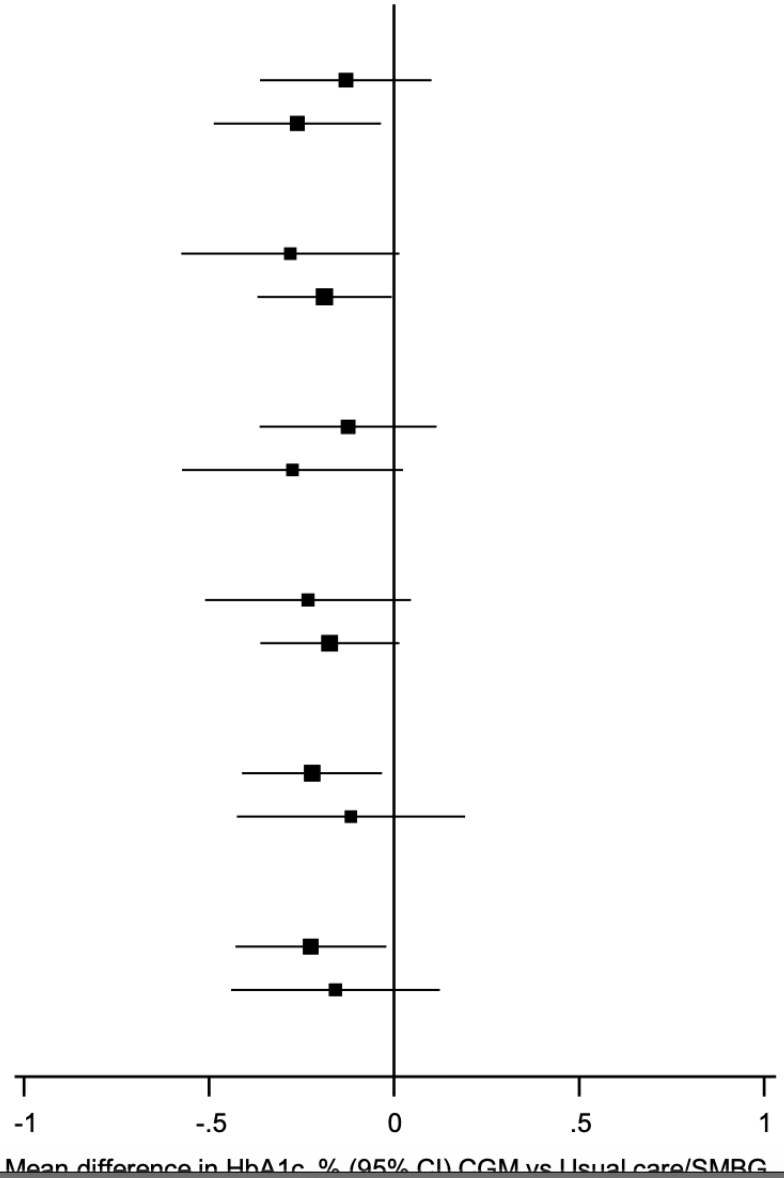
**Neither** continuous glucose monitoring nor intermittently scanned continuous glucose monitoring had a significant impact on body composition, blood pressure, or lipid levels.

**Use of** continuous glucose monitoring and intermittently scanned continuous glucose monitoring was associated with increased risk of adverse events, with no impact on hypoglycemia.

# Subgroup Analyses

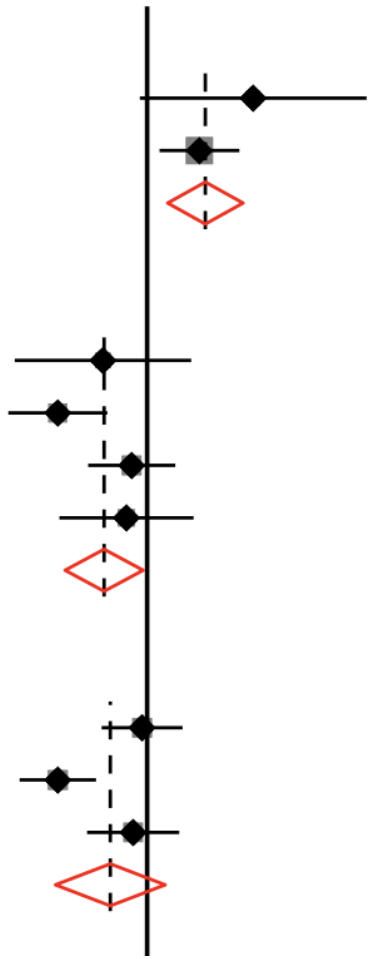
Παροτι οι διαφορες δεν είναι σημαντικες παρατηρουμε οτι υπαρχει εντονη ταση βελτιωσης της HbA1c ανεξάρτητα από τα χαρακτηριστικα των ατόμων

| Subgroup | No. of studies | CGM N | Usual care/SMBG N | Mean Difference (95% CI) | *p*-value* |
|---|---|---|---|---|---|
| **Age at baseline, yrs** | | | | | |
| ≥60 | 7 | 228 | 211 | -0.13 (-0.36, 0.10) | .43 |
| <60 | 7 | 299 | 234 | -0.26 (-0.49, -0.04) | |
| **T2D treatment** | | | | | |
| No insulin | 6 | 169 | 138 | -0.28 (-0.57, 0.01) | .68 |
| With insulin | 8 | 358 | 307 | -0.19 (-0.37, -0.01) | |
| **T2D duration, yrs** | | | | | |
| ≥13.0 | 6 | 309 | 236 | -0.12 (-0.36, 0.12) | .46 |
| <13.0 | 6 | 158 | 149 | -0.27 (-0.57, 0.02) | |
| **Baseline HbA1c, %** | | | | | |
| ≥8.6 | 7 | 253 | 196 | -0.23 (-0.51, 0.05) | .74 |
| <8.6 | 7 | 274 | 249 | -0.17 (-0.36, 0.01) | |
| **CGM type** | | | | | |
| Real-time | 10 | 426 | 338 | -0.22 (-0.41, -0.03) | .61 |
| Retrospective | 4 | 101 | 107 | -0.12 (-0.42, 0.19) | |
| **CGM use** | | | | | |
| Intermittent short-term use | 9 | 259 | 233 | -0.23 (-0.43, -0.02) | .66 |
| Long-term continuous use | 5 | 268 | 212 | -0.16 (-0.44, 0.12) | |

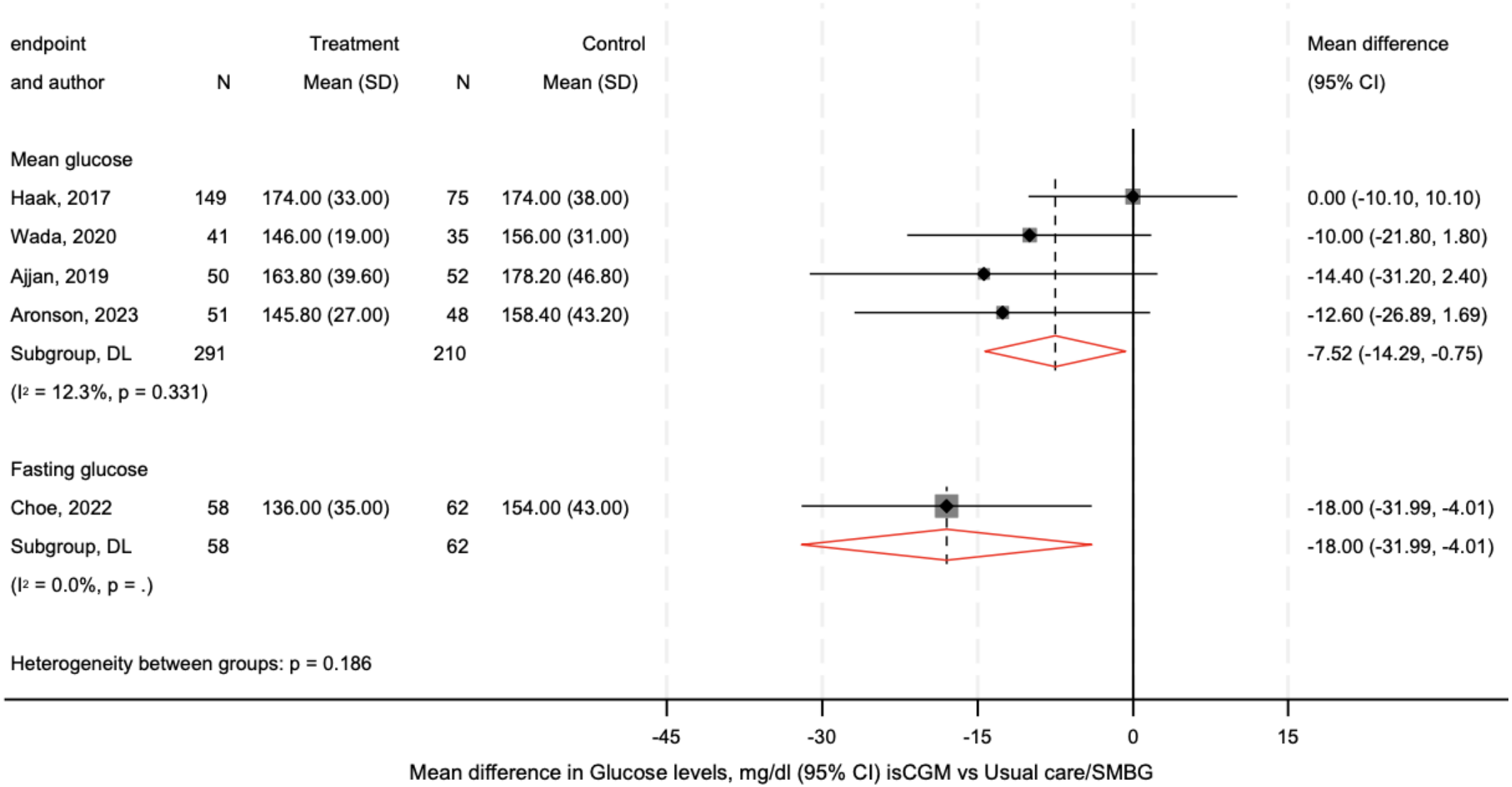


**Appendix 12:** Changes in TAR measures comparing CGM with usual care/SMBG

| endpoint and author | N | Treatment Mean (SD) | N | Control Mean (SD) | Mean difference (95% CI) |
|---|---|---|---|---|---|
| % Time >140 mg/dl | | | | | |
| Cosson, 2009 | 11 | 58.00 (27.00) | 14 | 39.00 (24.00) | 19.00 (-1.31, 39.31) |
| Sato, 2016 | 17 | 61.00 (12.50) | 17 | 51.63 (8.38) | 9.37 (2.22, 16.52) |
| Subgroup, DL | 28 | | 31 | | 10.43 (3.69, 17.18) |
| % Time >180 mg/dl | | | | | |
| Price, 2021 | 42 | 36.70 (25.70) | 19 | 44.60 (30.60) | -7.90 (-23.70, 7.90) |
| Martens, 2021 | 93 | 41.00 (25.00) | 53 | 57.00 (27.00) | -16.00 (-24.87, -7.13) |
| Bergenstal, 2022 | 59 | 28.47 (21.20) | 55 | 31.23 (21.30) | -2.76 (-10.57, 5.05) |
| Moon, 2023 | 15 | -2.70 (18.50) | 15 | 1.00 (14.90) | -3.70 (-15.72, 8.32) |
| Subgroup, DL | 209 | | 142 | | -7.70 (-14.70, -0.70) |
| % Time >250 mg/dl | | | | | |
| Moon, 2023 | 15 | 1.80 (8.80) | 15 | 2.70 (11.30) | -0.90 (-8.15, 6.35) |
| Martens, 2021 | 93 | 11.00 (11.00) | 53 | 27.00 (24.00) | -16.00 (-22.84, -9.16) |
| Price, 2021 | 42 | 9.40 (15.10) | 19 | 11.90 (15.30) | -2.50 (-10.76, 5.76) |
| Subgroup, DL | 150 | | 87 | | -6.60 (-16.43, 3.23) |



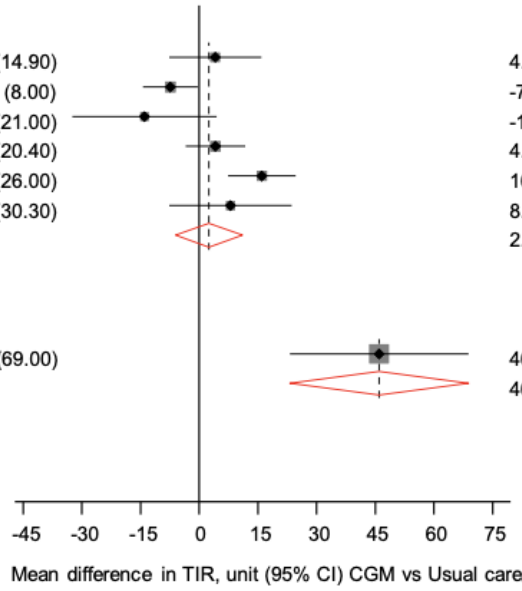
**Appendix 8:** Changes in glucose concentrations comparing isCGM with usual care/SMBG



**Appendix 9:** Change in TIR metrics comparing CGM and isCGM with usual care/SMBG

A.

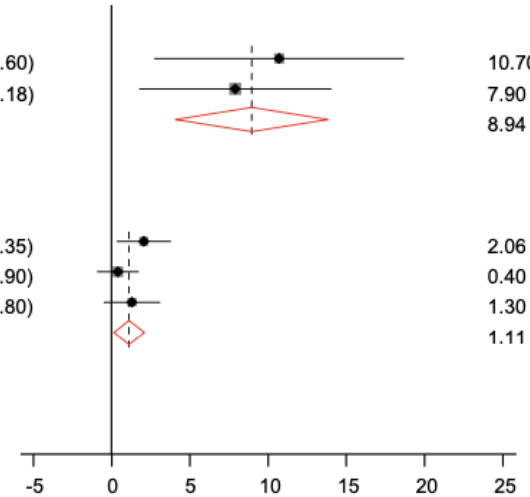
| Author, year of publication | CGM N | CGM Mean (SD) | Usual care/SMBG N | Usual care/SMBG Mean (SD) | Mean difference (95% CI) |
|---|---|---|---|---|---|
| **% Time in range of 70-180 mg/dl** | | | | | |
| Moon, 2023 | 15 | 3.10 (17.90) | 15 | -1.00 (14.90) | 4.10 (-7.69, 15.89) |
| Sato, 2016 | 17 | 39.13 (12.38) | 17 | 46.50 (8.00) | -7.37 (-14.38, -0.36) |
| Cosson, 2009 | 11 | 39.00 (25.00) | 14 | 53.00 (21.00) | -14.00 (-32.42, 4.42) |
| Bergenstal, 2022 | 59 | 70.65 (21.00) | 55 | 66.51 (20.40) | 4.14 (-3.46, 11.74) |
| Martens, 2021 | 93 | 59.00 (25.00) | 53 | 43.00 (26.00) | 16.00 (7.35, 24.65) |
| Price, 2021 | 42 | 63.10 (25.50) | 19 | 55.10 (30.30) | 8.00 (-7.66, 23.66) |
| Subgroup, DL | 237 | | 173 | | 2.51 (-6.08, 11.09) |
| *($I^2$= 75.9%, p = 0.001)* | | | | | |
| **Time/day in glucose range of 70-180 mg/dl** | | | | | |
| Beck, 2017 | 74 | 882.00 (71.67) | 72 | 836.00 (69.00) | 46.00 (23.18, 68.82) |
| Subgroup, DL | 74 | | 72 | | 46.00 (23.18, 68.82) |




Mean difference in TIR, unit (95% CI) CGM vs Usual care/SMBG

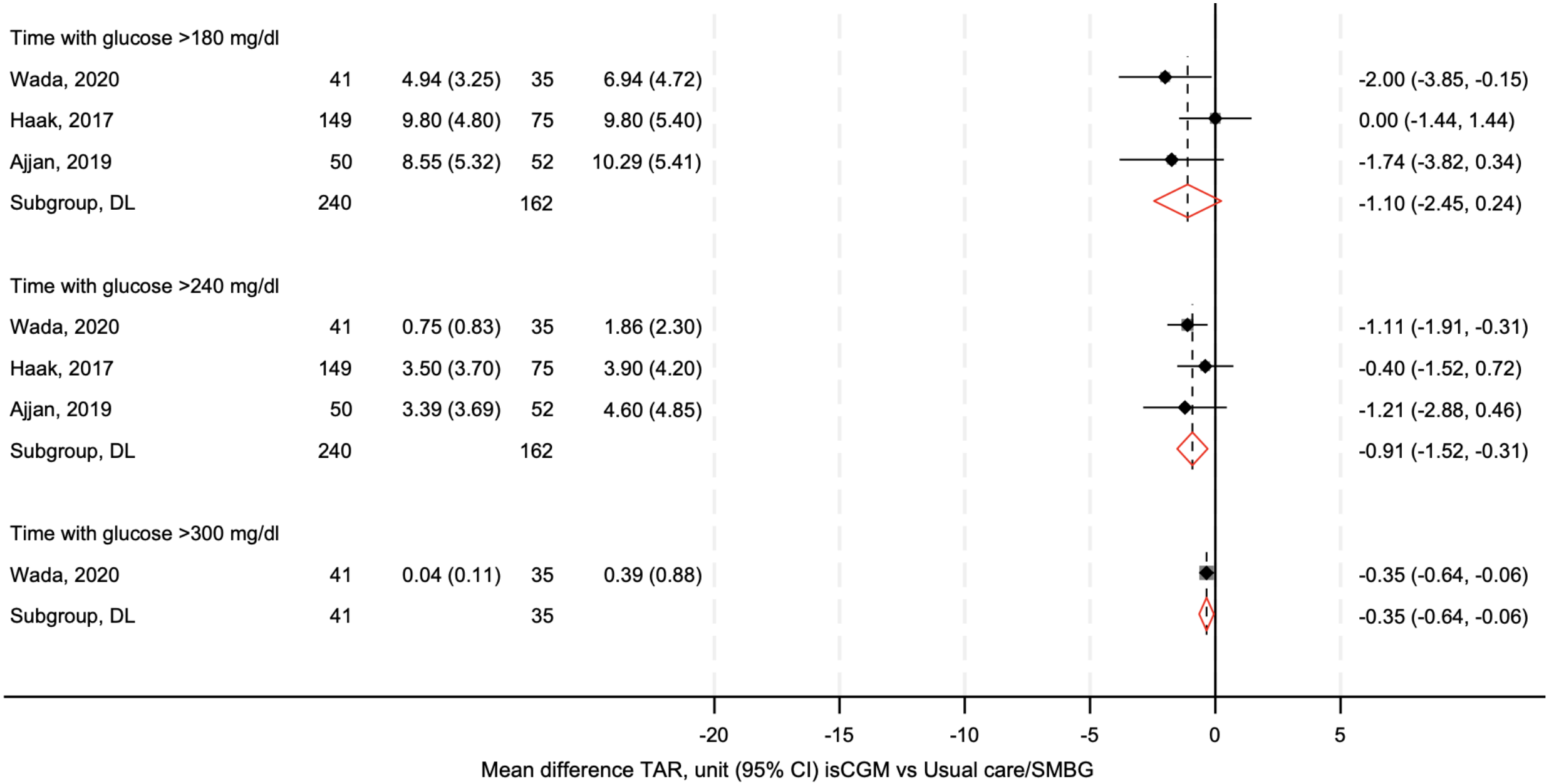
B.

| Author, year of publication | isCGM N | isCGM Mean (SD) | Usual care/SMBG N | Usual care/SMBG Mean (SD) | Mean difference (95% CI) |
|---|---|---|---|---|---|
| **% Time in range of 70-180 mg/dl** | | | | | |
| Aronson, 2023 | 51 | 76.30 (17.40) | 48 | 65.60 (22.60) | 10.70 (2.72, 18.68) |
| Furler, 2020 | 149 | 54.80 (27.09) | 150 | 46.90 (27.18) | 7.90 (1.75, 14.05) |
| Subgroup, DL | 200 | | 198 | | 8.94 (4.07, 13.82) |
| ($I^2$= *0.0%*, p = 0.586) | | | | | |
| **Time with glucose range 70-180 mg/dl** | | | | | |
| Wada, 2020 | 41 | 18.71 (3.15) | 35 | 16.65 (4.35) | 2.06 (0.33, 3.79) |
| Haak, 2017 | 149 | 13.60 (4.60) | 75 | 13.20 (4.90) | 0.40 (-0.93, 1.73) |
| Ajjan, 2019 | 50 | 13.70 (4.50) | 52 | 12.40 (4.80) | 1.30 (-0.50, 3.10) |
| Subgroup, DL | 240 | | 162 | | 1.11 (0.13, 2.09) |
| ($I^2$= *12.4%*, p = 0.319) | | | | | |




Mean difference in TIR, unit (95% CI) isCGM vs Usual care/SMBG

Παρατηρουμε ότι τα ατομα που ηταν στην ομαδα των αισθητηρων περνουν περισσοτερο χρονο της ημερας τους ΕΝΤΟΣ στοχου (70-180) σε σχεση με τα ατομα που μετρουσαν με το δακτυλο


Time with glucose >180 mg/dl
Wada, 2020 41 4.94 (3.25) 35 6.94 (4.72) -2.00 (-3.85, -0.15)
Haak, 2017 149 9.80 (4.80) 75 9.80 (5.40) 0.00 (-1.44, 1.44)
Ajjan, 2019 50 8.55 (5.32) 52 10.29 (5.41) -1.74 (-3.82, 0.34)
Subgroup, DL 240 162 -1.10 (-2.45, 0.24)
Time with glucose >240 mg/dl
Wada, 2020 41 0.75 (0.83) 35 1.86 (2.30) -1.11 (-1.91, -0.31)
Haak, 2017 149 3.50 (3.70) 75 3.90 (4.20) -0.40 (-1.52, 0.72)
Ajjan, 2019 50 3.39 (3.69) 52 4.60 (4.85) -1.21 (-2.88, 0.46)
Subgroup, DL 240 162 -0.91 (-1.52, -0.31)
Time with glucose >300 mg/dl
Wada, 2020 41 0.04 (0.11) 35 0.39 (0.88) -0.35 (-0.64, -0.06)
Subgroup, DL 41 35 -0.35 (-0.64, -0.06)
-20
-15
-10
-5
0
5
Mean difference TAR, unit (95% CI) isCGM vs Usual care/SMBG

| Outcomes | № of participants (studies) Follow-up | Certainty of the evidence (GRADE) | Relative effect (95% CI) | Anticipated absolute effects | |
|---|---|---|---|---|---|
| | | | | Risk with Usual care/SMBG | Risk difference with intervention |
| Change in HbA1c for CGM vs usual care/SMBG | 972 (19 RCTs) | ⊕⊕⊕◯ Moderate[a] | - | The mean change in HbA1c for CGM vs usual care/SMBG was **0** % | MD **0.19 % lower** (0.34 lower to 0.04 lower) |
| Time in range for CGM vs usual care/SMBG | 410 (6 RCTs) | ⊕◯◯◯ Very low[a,b,c] | - | The mean time in range for CGM vs usual care/SMBG was **0** % | MD **2.51 % higher** (6.08 lower to 11.09 higher) |
| Body mass index for CGM vs usual care/SMBG | 362 (5 RCTs) | ⊕⊕⊕◯ Moderate[a] | - | The mean body mass index for CGM vs usual care/SMBG was **0** kg/m2 | MD **0.3 kg/m2 higher** (1.18 lower to 1.79 higher) |
| Any adverse event for CGM vs usual care/SMBG | 429 (5 RCTs) | ⊕⊕⊕◯ Moderate[a] | **RR 1.22** (1.01 to 1.47) | 384 per 1,000 | **85 more per 1,000** (4 more to 181 more) |
| Satisfaction score for CGM vs usual care/SMBG | 96 (3 RCTs) | ⊕◯◯◯ Very low[a,d] | - | - | SMD **0.54 SD lower** (0.98 lower to 0.11 lower) |
| Change in HbA1c for isCGM vs usual care/SMBG | 1269 (8 RCTs) | ⊕⊕⊕◯ Moderate[a] | - | The mean change in HbA1c for FGM vs usual care/SMBG was **0** % | MD **0.31 % lower** (0.46 lower to 0.17 lower) |
| Satisfaction score for isCGM vs usual care/SMBG | 723 (5 RCTs) | ⊕◯◯◯ Very low[a,e] | - | - | SMD **0.44 SD higher** (0.29 higher to 0.59 higher) |

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group

# Όμως ποιο είναι το κόστος?

- Intermittent RT-CGM use would make the cost more affordable.
- It is difficult to assess/compare costs but translational DPP group classes median cost was $424 per person for a year-long intervention and as high as $5881 per person for individual programs.
- Intensive lifestyle intervention (ILI) with a target of 7% weight loss in patients with diabetes did decrease medical costs and hospitalizations in the LOOK AHEAD study but the cost per person was $2864 per ILI participant compared with $202 per control/traditional diabetes support and education (DSE) in the first year.
- A large part of the cost was the ILI meal replacement which were $798 per participant in the first year. Estimated costs of individual sessions, group intervention, meal replacement for lifestyle changes, and weight loss are not directly comparable to medical device cost but rather used as a broad comparison since Medicare is currently reimbursing for DPP group intervention.
- For gross comparison, cash cost of the personal CGM sensors range from approximately $35.99-43.00 for one FreeStyle Libre sensor and $87.25 for Dexcom G5-G6 for 7-10 days of use
- Medicare reimbursement per CGM session with insertion currently averages $157.77 for health care providers.
- So if two to four sessions were performed assuming average sensor cost of $63.13, the potential cost would be $442.79 for 2 educational sessions and 2 sensors and $883.60 for four sessions with 4 CGM sensors.
- Although it is unknown if long-term behavior change will occur with intermittent short-term CGM coupled to nutrition and physical activity counseling, the cost would be comparable to other lifestyle interventions for diabetes and prediabetes and less time intensive for the patients

# Multicenter Randomized Trial of Intermittently Scanned Continuous Glucose Monitoring Versus Self-Monitoring of Blood Glucose in Individuals With Type 2 Diabetes and Recent-Onset Acute Myocardial Infarction: Results of the LIBERATES Trial

Ramzi A. Ajjan, Simon R. Heller, Colin C. Everett, Armando Vargas-Palacios, Ruchi Higham, Linda Sharples, Diana A. Gorog, Alice Rogers, Catherine Reynolds, Catherine Fernandez, Pedro Rodrigues, Thozhukat Sathyapalan, Robert F. Storey, and Deborah D. Stocken

Of 141 participants randomly assigned (median age 63 years; interquartile range 53, 70), 73% of whom were men**, isCGM was associated with increased TIR by 17 min/day (95% credible interval 2105 to +153 min/day), with 59% probability of benefit.**

Users of isCGM showed **lower hypoglycemic exposure (<3.9 mmol/L) at days 76–90 (**280 min/day; 95% CI 2118, 243), also evident at days 16–30 (228 min/day; 95% CI 292, 2).

**Compared with baseline, HbA1c showed similar reductions of 7 mmol/mol at 3 months in both study arms. Combined glycemic emergencies and mortality occurred in four isCGM and seven SMBG study participants**.
QOL measures marginally favored isCGM, and the intervention proved to be cost effective

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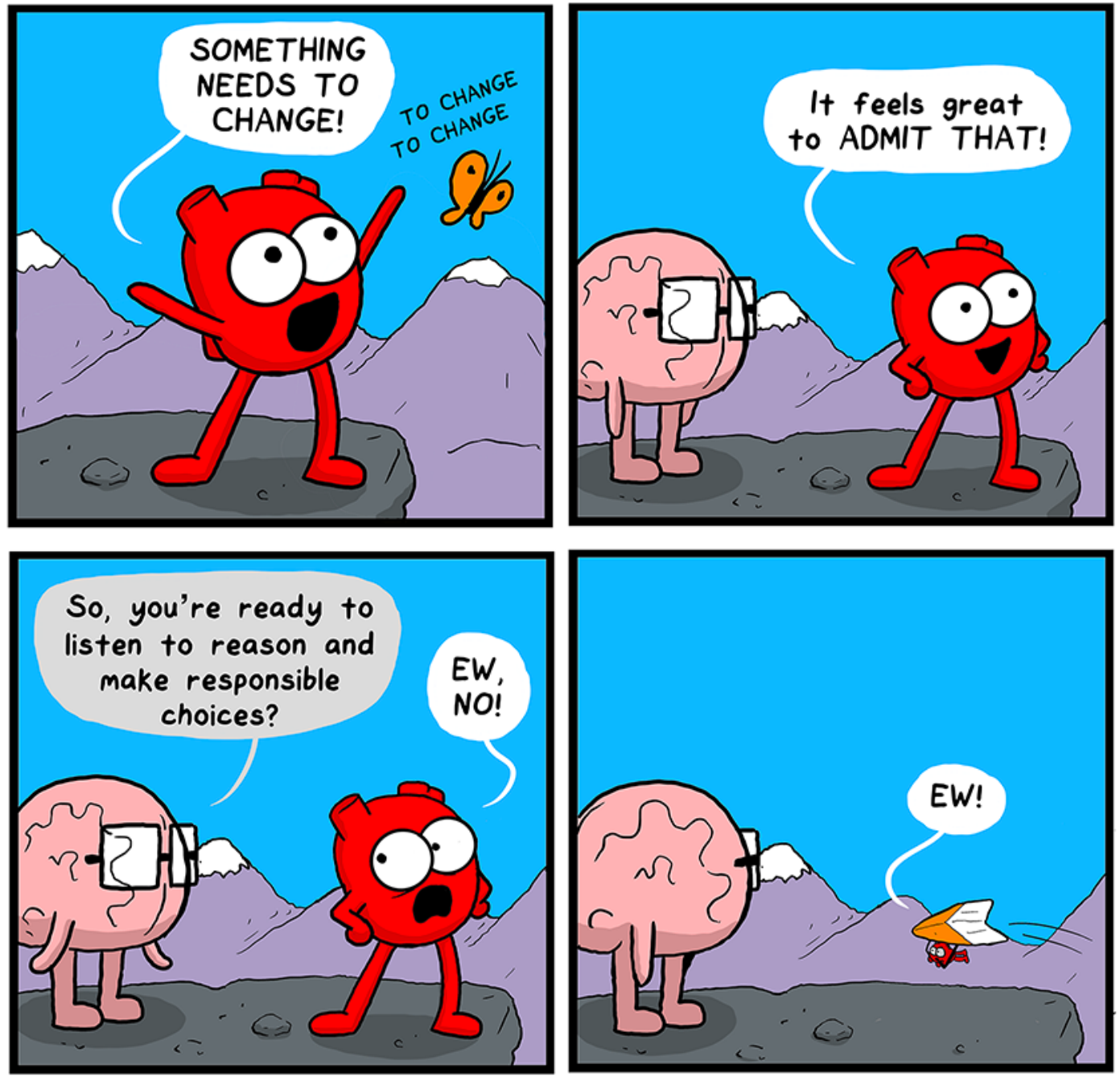
- By combining the UKPDS and hypoglycemia models, estimated costs for **isCGM were £10,993 and QALYs were 8.497, whereas estimated SMBG costs were £11,258 and QALYs were 8.494**.
- This indicates that isCGM is a cost-effective strategy, because it dominates SMBG, given the former is less costly and more effective.
- Further analysis using cost-effectiveness acceptability curves demonstrated that isCGM has 100% probability of being cost effective at a threshold of 20,000/QALY, with an incremental NMB of £318

# FDA Clears New OTC Stelo Continuous Glucose Monitor for Type 2 Diabetes

Updated: 3/6/24 10:55 amPublished: 6/27/23 11:16 am

- Stelo: Created with a broader customer base in mind
- The launch of Stelo reflects **a growing trend toward expanding access to diabetes technologies such as CGMs and automated insulin delivery systems, both to more people with diabetes and pre-diabetes as well as to a broader customer base.**

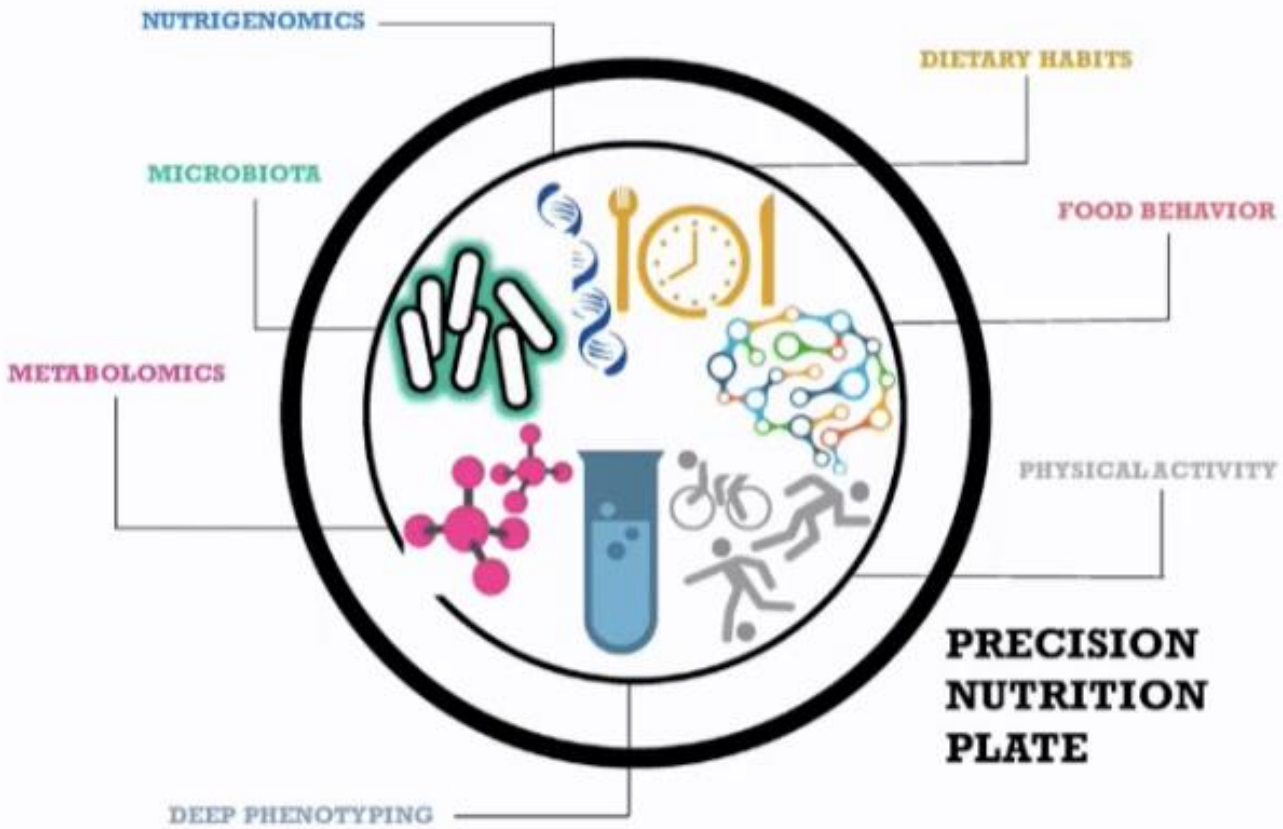
- Stelo by Dexcom glucose monitor
- In **2023, Medicare expanded CGM coverage for people with type 2 diabetes** the biggest private insurer in the U.S., followed suit several months later.
- Last year, the FDA also cleared Omnipod GO, a wearable basal insulin delivery device designed specifically for adults with type 2 diabetes.






@theAwkwardYeti

# Precision Nutrition: Future of Plate




de Toro-Martin J. et al., Nutrients 2018.

# Future of Food: The Fascinating World of Food Scanners

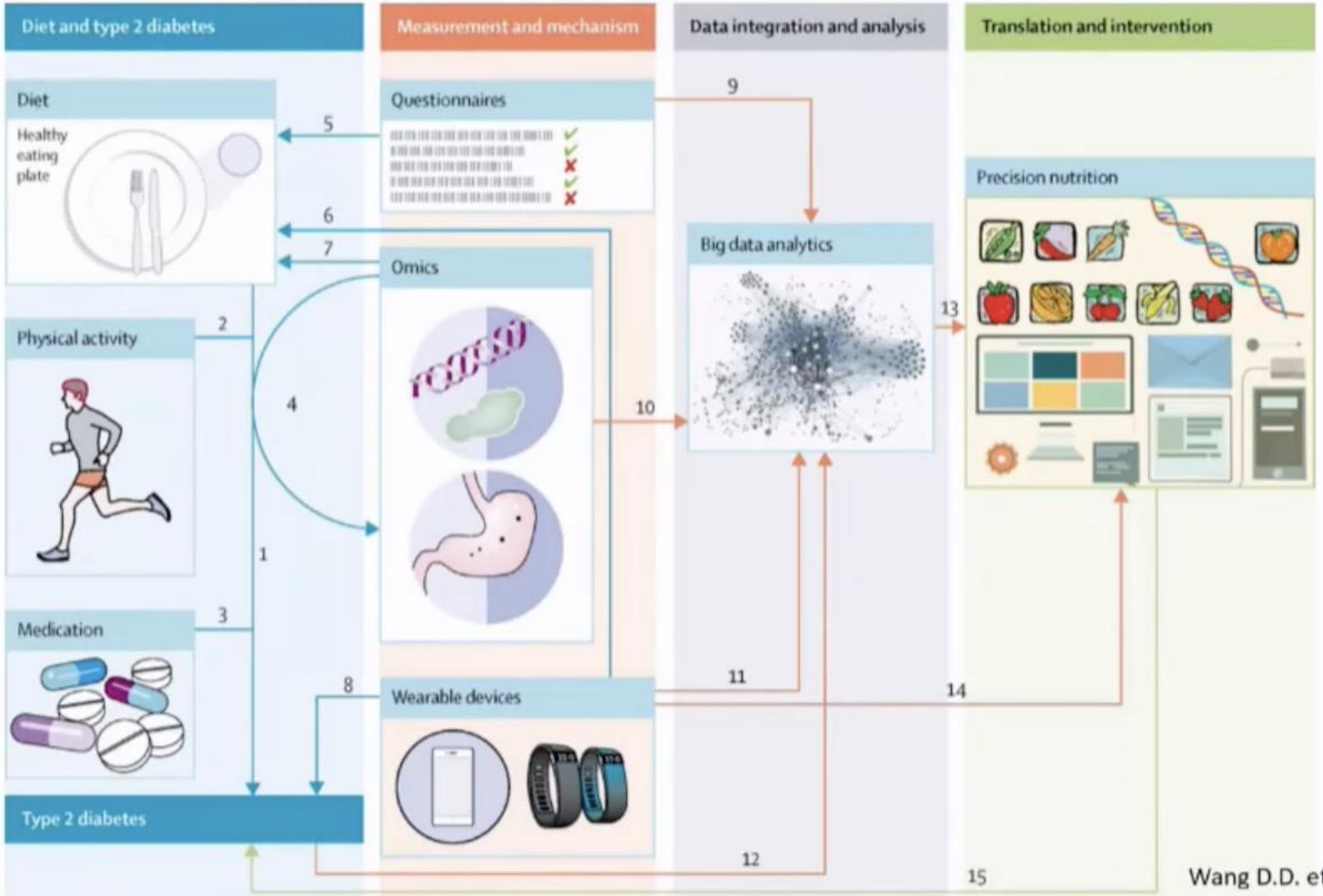
European Commission

**Horizon prize for a food scanner**

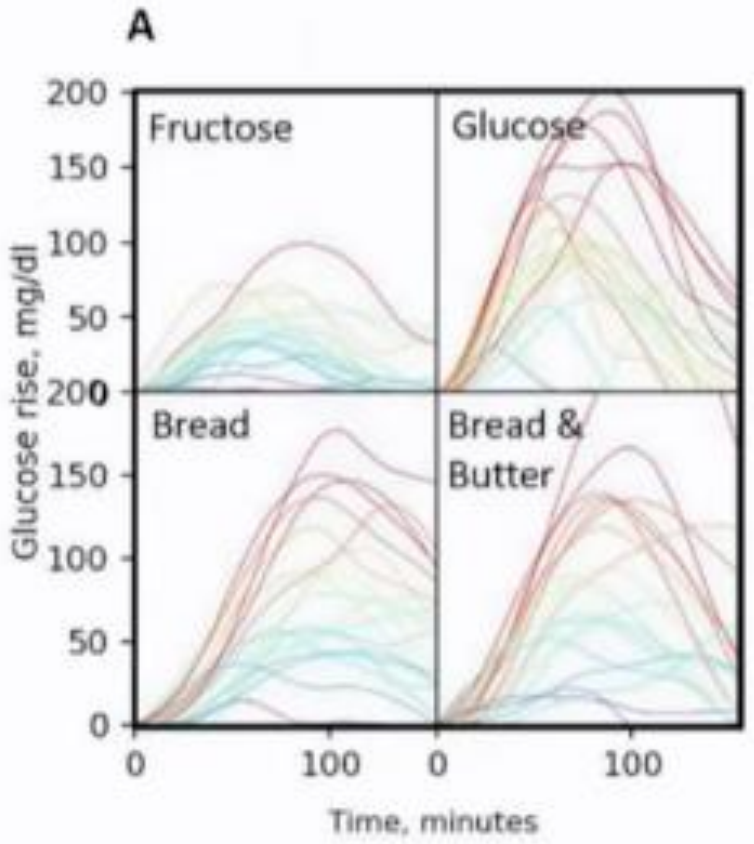
Food-related health problems such as food allergies, obesity, diabetes and cardiovascular disease have grown to epidemic proportions and are taking a heavy toll on our society and our health systems.

https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/horizon-prizes/food-scanner_en

# Precision nutrition for prevention and management of type 2 diabetes




Wang D.D. et al., Lancet 2018.

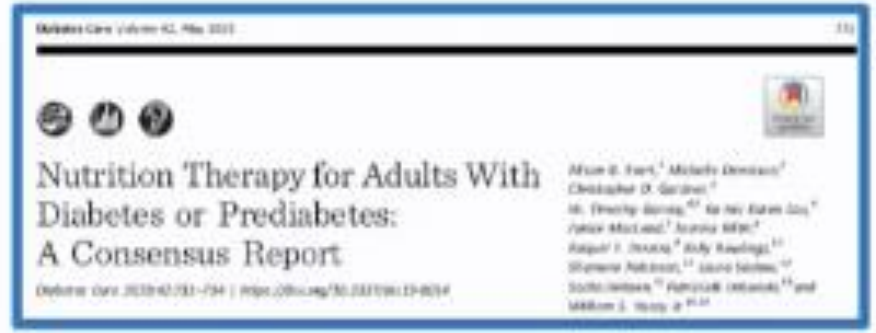



- Rein et al
- Analyzed postprandial glucose responses
  - 4 standardized meals: 50 gm carb
- 23 adults with newly diagnosed T2DM
  - Each colored line represents a unique participant
- Results show high interpersonal variability in postprandial glucose responses among subjects with T2DM

Rein et al. Effects of personalized diets by prediction of glycemic responses on glycemic contro and metabolic health in newly diagnosed T2DM: a reandomized dietary intervention pilot trial. BMC Medicine (2022) 20:56

# ADA Nutrition Therapy Consensus Report

- Summarizes latest and greatest nutrition research (600+ publications!)
- Part of the ADA Standards of Care in Diabetes


Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report

**GOAL:** provide nutrition recommendations that **promote ideal health outcomes, reduce complications, and improve QOL** for all PWD

**Many eating patterns can work! No one-size-fits-all eating pattern. Individualize!**

# Behavior Modification in Prediabetes and Diabetes: Potential Use of Real-Time Continuous Glucose Monitoring

Journal of Diabetes Science and Technology
2019, Vol. 13(2) 271–275

DOI: 10.1177/1932296818790994
journals.sagepub.com/home/dst
SAGE

**Table 1.** Changes in HbA1c, Body Mass Index (BMI), and CGM Intervention for Behavioral Changes.

| Study | Duration | Control (n) | Intervention (n) | CGM intervention | Initial HbA1c (%) | HbA1c change (%) | BMI change (Kg/m$^2$) |
|---|---|---|---|---|---|---|---|
| Yoo et al[23] | 3 months | n = 28 (SMBG) | n = 29 | 3 days RT-CGM, monthly for 3 months | 9.1 ± 1.0% | −1.0 ± 1.2%, $P$ = .004 | 0.7 ± 0.35, $P$ = .008 |
| Allen et al[24] | 2 months | n = 25 (education) | n = 21 | 3 days retrospective CGM, 1 session | 8.7 ± 1.15% | −1.16 ± 1.4%, $P$ < .05 | −0.53 ± 0.75, $P$ < .05 |
| Allen et al[28] | 3 months | N/A | n = 29[a]<br>Group 1 = 14<br>Group 2 = 15 | 3 day retrospective CGM, 1 session | Group 1 = 8.4 ± 1.3%<br>Group 2 = 8.7 ± 1.4% | Group 1 = 0.7 ± 2.2%<br>Group 2 = 0.5 ± 0.9% | Weight (kg)[b]<br>Group 1 = −6.2 ± 7.2<br>Group 2 = 2.4 ± 4.0 |
| Mohan et al[26] | 3 months | N/A | n = 148 | 3 days retrospective CGM, 2 sessions | 8.6 ± 1.14% | −0.6 ± 1.11% | Not reported |
| Cox et al[25] | 3 months | N/A | n = 4 | RT-CGM 3 months | 7.8 ± 0.5% | −1.1 ± 0.5% | Weight (kg)[b] −7.2 kg |
| Bailey et al[c27] | 3 months | n = 6 (8-week exercise program) | n = 7 | RT-CGM | Prediabetes/T2D | Not reported | Not reported |

[a]Group 1: CGM + DM education, Group 2: CGM + problem-solving skills and DM education.
[b]BMI change not reported.
[c]Only published study prediabetes/T2DM: outcome was exercise adherence and participation during intervention and 1 month after completion.

# CGM driven changes

- Yoo et al did show that intermittent use (3 days of RT- CGM every month for 12 weeks) produced a significant decrease in calorie consumption, increase in physical activity, improvement of weight, and a 1% decrease in HbA1c in poorly controlled patients with T2D.
- Allen et al found that the data from a single three-day session of blinded CGM when combined with subsequent counseling and review of the CGM glucose data with the patient resulted in an increase in physical activity and a decrease in HbA1c by 1.2% and BMI by 0.5 kg/m2.
- A recent small pilot study by Cox et al25 that focused on glycemic index reduction using RT-CGM and newly diagnosed T2D not on insulin showed decrease in HbA1c by 1% over 3 months.
- They reported average weight loss of 7.2 kilograms, decreased intake in high glycemic index food, total carbohydrate intake, and increase in fiber.
- There has been only one community-based study looking at CGM. This study using retrospective CGM with two sessions over 3 months in 181 T2D at 11 health clinics in India showed improvement of HbA1c by 0.6% and noted that in their participants 67.6% made dietary and 48.6% made exercise changes although specifics of these changes were not qualified

# CGM driven changes

- The one pilot RT-CGM study on exercise which included both participants with prediabetes and diabetes did not report HbA1c but not only showed positive changes in body composition and increased fitness but also assessed and showed improved ability for goal setting, self-efficacy to self-monitor, higher attendance, and more registration for additional exercise sessions than those in the standard exercise group.
- Interestingly, in the second pilot in T2D which attempted to assess CGM as a tool for theory-based behavioral counseling, both groups received CGM and counseling on CGM.
- However, one group received only diabetes education and the other received additional problem-solving skills. Both groups had improvement in physical activity, HbA1c, and weight but the CGM/problem solving skills group's results were slightly although not statistically better.

# Η διατροφική θεραπεία μπορεί να μειώσει την HbA1c κατά 2%

Γιατι να χρησιμοποιήσουμε CGM στα άτομα με ΣΔ?
Γιατι επιθυμουν να γνωρίζουν τι τρώνε!
Συνήθως αυτό που κάνουν τα περισσότερα άτομα στην διάγνωση

# Effects of Patient-Driven Lifestyle Modification Using Intermittently Scanned Continuous Glucose Monitoring in Patients With Type 2 Diabetes: Results From the Randomized Open-label PDF Study

Hun Jee Choe,[1,2] Eun-Jung Rhee,[3] Jong Chul Won,[4] Kyong Soo Park,[1,2] Won-Young Lee,[3] and Young Min Cho[1,2]


## OBJECTIVE

To investigate the effects of patient-driven lifestyle modification using intermittently scanned continuous glucose monitoring (isCGM) in patients with type 2 diabetes (T2D).

## RESEARCH DESIGN AND METHODS

We conducted a 12-week, open-label, randomized controlled trial. A total of 126 participants were 1:1 randomized to either the intervention group (structured education + isCGM) or the control group (standard care with blood glucose monitoring). The Self-Evaluation Of Unhealthy foods by Looking at postprandial glucose (SEOUL) algorithm was developed and applied to aid structured education in guiding patients to follow healthy eating behavior depending on the postprandial glycemic response. The primary end point was the change in $HbA_{1c}$ level from baseline.


*Diabetes Care 2022;45:2224–2230 | https://doi.org/10.2337/dc22-0764*

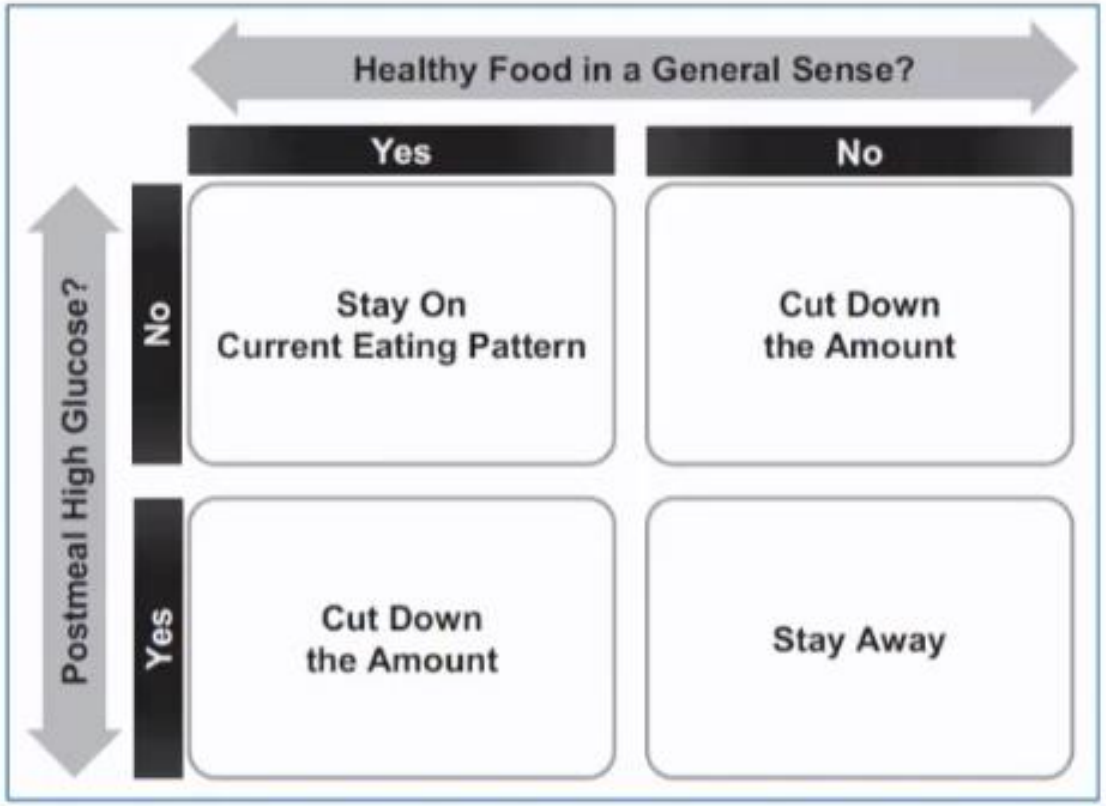


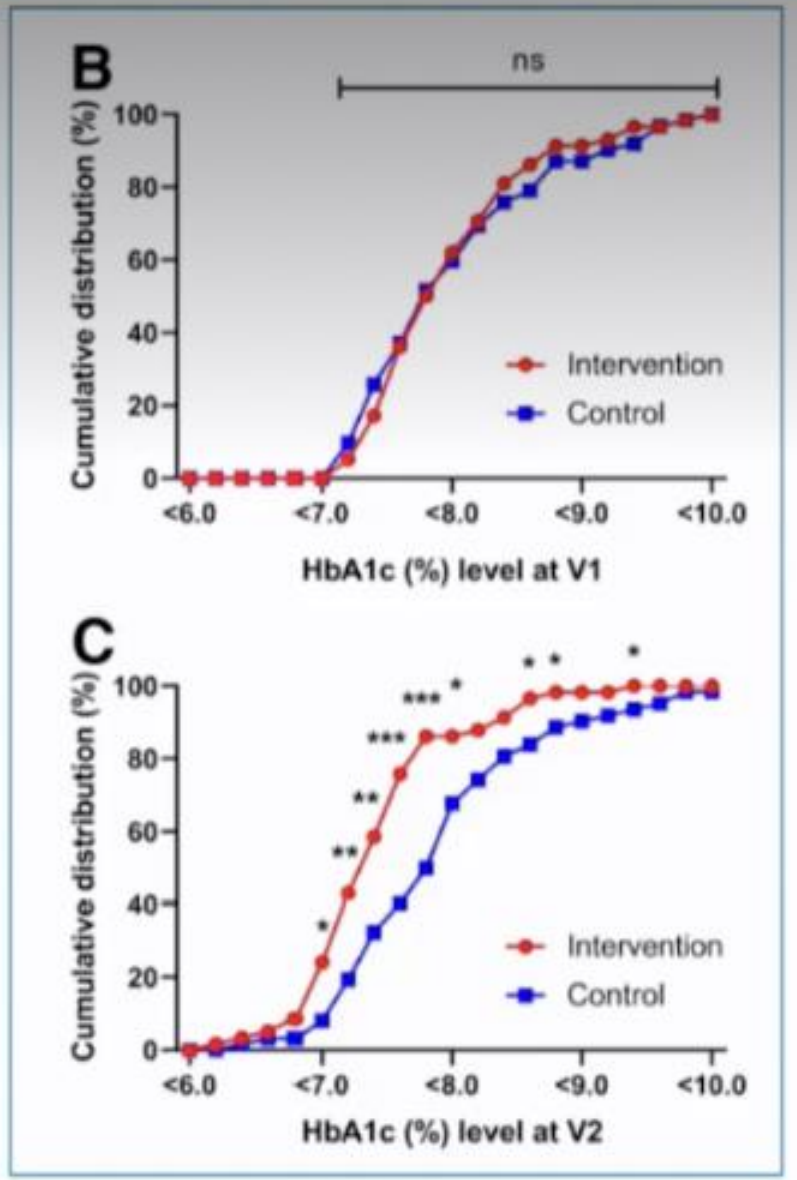

**Figure 1**—The SEOUL algorithm. Participants are encouraged to continue eating a healthy meal with tolerable glycemic response after consuming the food and should avoid an unhealthy meal that provokes postprandial hyperglycemia. If hyperglycemia is detected after consuming a meal that is generally considered to be healthy, reducing the amount of food is recommended; the amount of unhealthy food should also be reduced even if it does not generate hyperglycemia on ingestion. Decisions on lifestyle modification will be made on an individual basis according to the SEOUL algorithm.

*Diabetes Care 2022;45:2224–2230*

Effects of Patient-Driven Lifestyle Modification Using Intermittently Scanned Continuous Glucose Monitoring in Patients With Type 2 Diabetes: Results From the Randomized Open-label PDF Study

Hun Jee Choe,[1,2] Eun-Jung Rhee,[3] Jong Chul Won,[4] Kyong Soo Park,[1,2] Won-Young Lee,[3] and Young Min Cho[1,2]

Study demonstrated that the patient-centered approach of isCGM with the SEOUL algorithm, focused mainly on eating behavior, was highly effective in reducing HbA1c and facilitating behavior change to improve general diabetes care in patients with T2D who are not on prandial insulin.




*Diabetes Care 2022;45:2224–2230*

| | V1 | | | V2 | | | Risk-adjusted difference | |
|---|---|---|---|---|---|---|---|---|
| | Intervention | Control | *P* | Intervention | Control | *P* | (95% CI) | *P** |
| *N* | 58 | 62 | | 58 | 62 | | | |
| Primary outcome | | | | | | | | |
| $HbA_{1c}$ (%) | 7.9 ± 0.6 | 7.9 ± 0.7 | 0.808 | 7.3 ± 0.6 | 7.8 ± 0.9 | <0.001 | −0.50 (−0.74 to −0.26) | <0.001 |
| Secondary outcome | | | | | | | | |
| Fasting glucose (mg/dL) | 142 ± 27 | 147 ± 36 | 0.420 | 136 ± 35 | 154 ± 43 | 0.013 | −16.5 (−30.0 to −3.0) | 0.017 |
| Body weight (kg) | 70.5 ± 11.7 | 72.7 ± 12.5 | 0.331 | 69.1 ± 11.3 | 72.8 ± 12.8 | 0.105 | −1.5 (−2.7 to −0.3) | 0.013 |
| Waist circumference (cm) | 87.7 ± 8.1 | 91.8 ± 10.2 | 0.018 | 87.4 ± 8.8 | 92.1 ± 10.6 | 0.010 | −0.6 (−1.7 to 0.5) | 0.262 |
| SBP (mmHg) | 133 ± 16 | 126 ± 16 | 0.022 | 134 ± 14 | 124 ± 21 | 0.003 | 7.7 (1.3–14.1) | 0.019 |
| DBP (mmHg) | 79 ± 10 | 77 ± 10 | 0.153 | 78 ± 9 | 79 ± 9 | 0.530 | −2.3 (−5.0 to 0.4) | 0.100 |
| Total cholesterol (mg/dL) | 138 ± 29 | 140 ± 25 | 0.707 | 136 ± 34 | 140 ± 28 | 0.565 | −1.5 (−9.1 to 6.0) | 0.690 |
| Triglyceride (mg/dL) | 131 ± 68 | 153 ± 73 | 0.094 | 149 ± 197 | 141 ± 72 | 0.761 | 33.9 (13.6 to 79.4) | 0.164 |
| HDL-C (mg/dL) | 48 ± 13 | 48 ± 17 | 0.965 | 47 ± 12 | 48 ± 15 | 0.627 | −1.3 (−4.5 to 1.9) | 0.415 |
| LDL-C (mg/dL) | 74 ± 22 | 75 ± 20 | 0.852 | 70 ± 25 | 74 ± 25 | 0.487 | −2.4 (−8.3 to 3.6) | 0.432 |
| SDSCA-K total score | 26.6 ± 13.6 | 25.1 ± 12.8 | 0.533 | 44.4 ± 9.2 | 39.2 ± 10.1 | 0.005 | 4.8 (1.7 to 8.0) | 0.003 |

*Diabetes Care 2022;45:2224–2230*

Original Paper

# Fitterfly Diabetes CGM Digital Therapeutics Program for Glycemic Control and Weight Management in People With Type 2 Diabetes Mellitus: Real-world Effectiveness Evaluation

**Background:** Digital therapeutic platforms facilitate health care through patient-centered strategies based on multidisciplinary teams and shared decision-making. Such platforms can be used for developing a dynamic model of diabetes care delivery, which can help in improving glycemic control by promoting long-term behavior changes in people with diabetes.

**Objective:** This study aims to evaluate the real-world effectiveness of the Fitterfly Diabetes CGM digital therapeutics program for improving glycemic control in people with type 2 diabetes (T2D) after the completion of 90 days in the program.

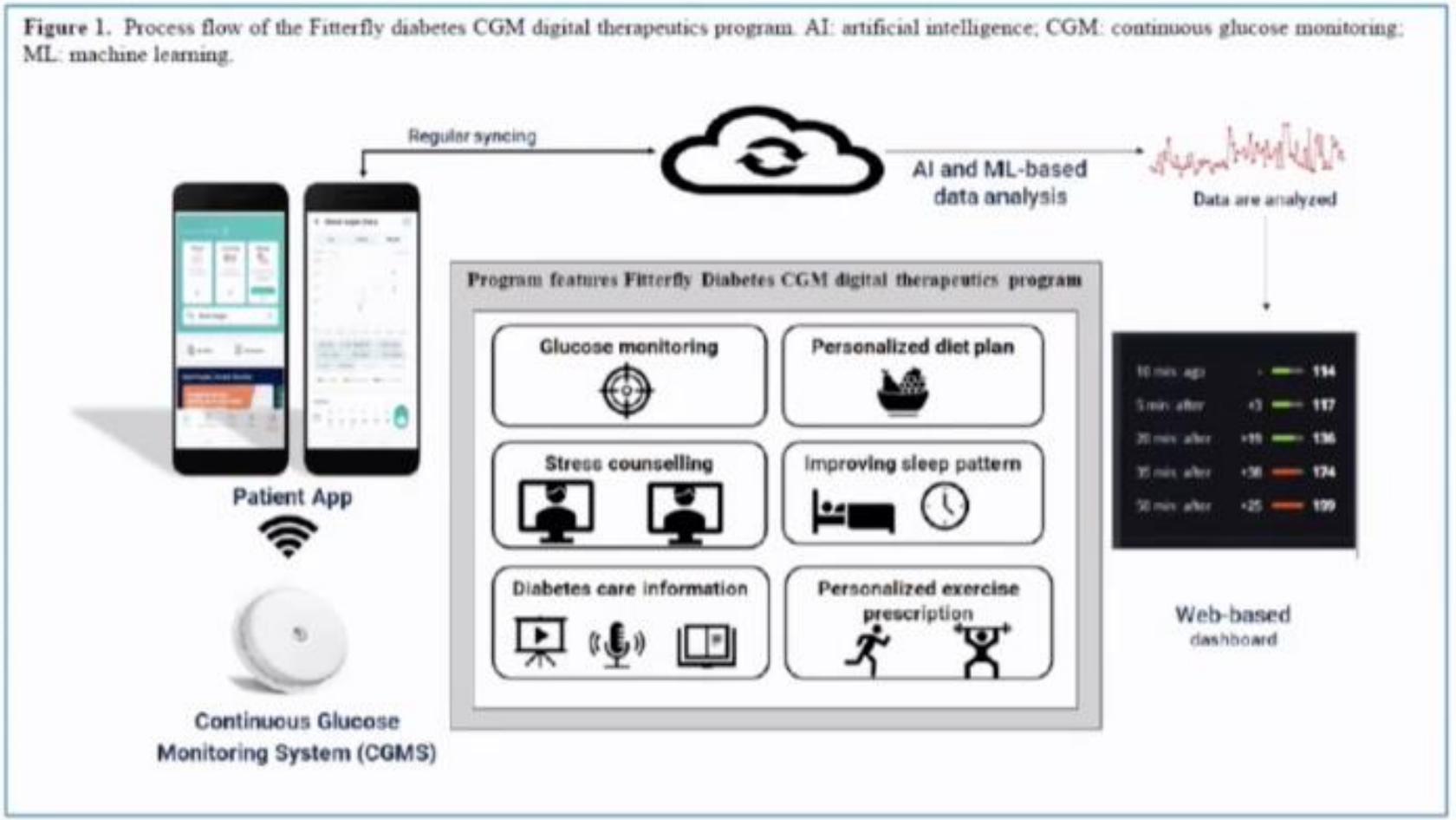



**Figure 1.** Process flow of the Fitterfly diabetes CGM digital therapeutics program. AI: artificial intelligence; CGM: continuous glucose monitoring; ML: machine learning.

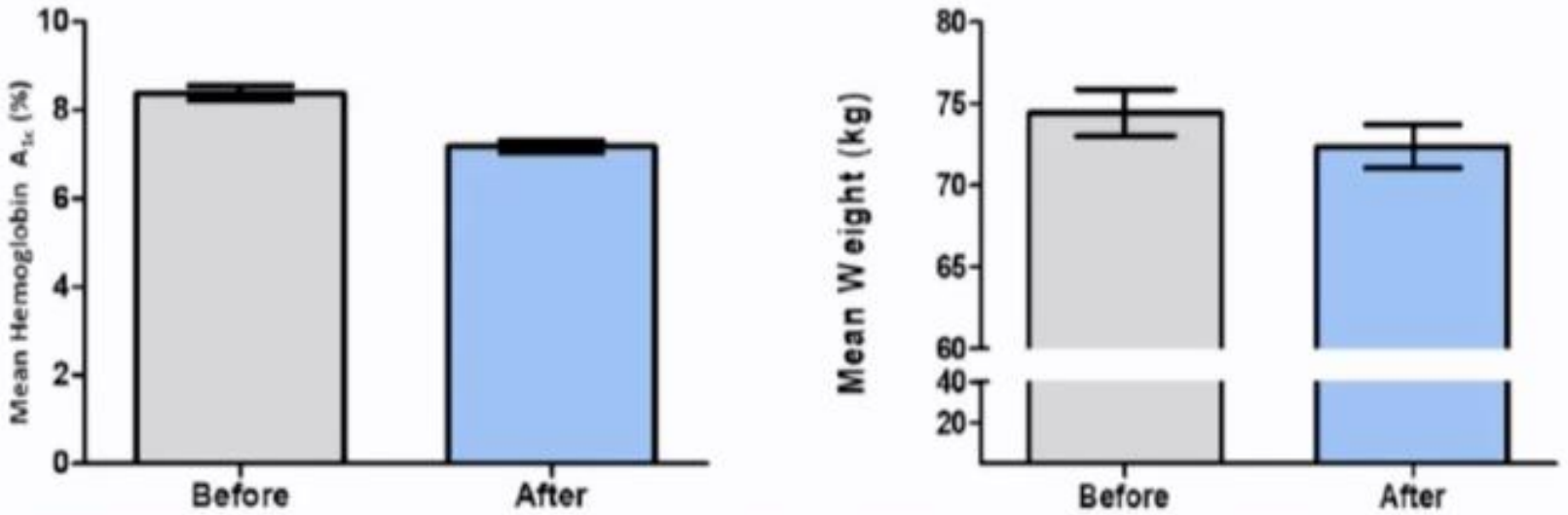
The Fitterfly Diabetes CGM program uses machine learning and artificial intelligence models to integrate and correlate the data collected from the CGM device and the mobile app to create a personalized lifestyle plan based on an individual's glycemic response

*JMIR Diabetes 2023;8:e43292*

Original Paper

# Fitterfly Diabetes CGM Digital Therapeutics Program for Glycemic Control and Weight Management in People With Type 2 Diabetes Mellitus: Real-world Effectiveness Evaluation

**Figure 2.** Changes in (A) hemoglobin A1c level and (B) weight before and after the program.



Original Paper

# Fitterfly Diabetes CGM Digital Therapeutics Program for Glycemic Control and Weight Management in People With Type 2 Diabetes Mellitus: Real-world Effectiveness Evaluation

**Table 2.** Summary of the parameters in the participants before and after the Fitterfly Diabetes continuous glucose monitoring intervention program.

| Parameters | Preintervention, mean (SD), median (IQR) | Postintervention, mean (SD), median (IQR) | Change in parameters, mean (SD), median (IQR) | *P* value[a] |
|---|---|---|---|---|
| Hemoglobin $A_{1c}$ (%) | 8.4 (1.7), 8.1 (7.0 to 9.1) | 7.2 (1.4), 7.1 (6.4 to 7.8) | −1.2 (1.6), −0.9 (−1.9 to −0.3) | <.001 |
| Weight (kg) | 74.45 (14.96), 73.0 (64.50 to 82.50) | 72.40 (13.92), 71.0 (64.0 to 80.0) | −2.05 (2.84), −1.40 (−4.0 to 0) | <.001 |
| BMI ($kg/m^2$) | 27.44 (4.69), 26.50 (23.85 to 30.35) | 26.70 (4.41), 25.98 (23.43 to 29.53) | −0.74 (1.02), −0.55 (−1.41 to 0) | <.001 |
| ABG[b] (mg/dL) | 152.90 (51.63), 139.00 (120.0 to 171.50) | 136.50 (44.26), 125.00 (108.0 to 155.50) | −16.44 (32.05), −10.00 (−22.50 to −1.50) | <.001 |
| TIR[c] (%) | 57.5 (25.0), 61.0 (45.1 to 75.0) | 64.6 (26.0), 72.0 (48.0 to 83.5) | 7.1 (16.7), 6.0 (−0.2 to 16.1) | <.001 |
| TAR[d] (%) | 36.7 (28.4), 32.7 (13.8 to 51.7) | 28.1 (28.1), 16.9 (6.3 to 41.2) | −8.7 (17.1), −5.2 (−16.8 to 0.0) | <.001 |
| TBR[e] (%) | 6.0 (11.8), 1.1 (0.0 to 5.6) | 7.5 (13.3), 0.9 (0.0 to 8.7) | 1.5 (11.2), 0 (−1.3 to 1.0) | .86 |

[a]Wilcoxon signed-rank test

Original Paper

# An Innovative, Paradigm-Shifting Lifestyle Intervention to Reduce Glucose Excursions With the Use of Continuous Glucose Monitoring to Educate, Motivate, and Activate Adults With Newly Diagnosed Type 2 Diabetes: Pilot Feasibility Study

Glycemic excursion minimization (GEM) is an alternative lifestyle treatment option focused on reducing postnutrient glucose excursions rather than reducing weight.

Original Paper

# An Innovative, Paradigm-Shifting Lifestyle Intervention to Reduce Glucose Excursions With the Use of Continuous Glucose Monitoring to Educate, Motivate, and Activate Adults With Newly Diagnosed Type 2 Diabetes: Pilot Feasibility Study

**Objective:** This pilot study evaluated the feasibility of a self-administered version of GEM, augmented with continuous glucose monitoring (CGM), to improve metabolic control (hemoglobin $A_{1c}$ [$HbA_{1c}$]) while diminishing or delaying the need for diabetes medications in adults recently diagnosed with T2D. These primary objectives were hypothesized to be achieved by reducing carbohydrate intake and increasing physical activity to diminish CGM glucose excursions, leading to the secondary benefits of an increase in diabetes empowerment and reduced diabetes distress, depressive symptoms, and BMI.

GEM was self-administered by 17 adults recently diagnosed with T2D (mean age 52 years, SD 11.6 years; mean T2D duration 3.9 months, SD 2.5 months; mean HbA1c levels 8.0%, SD 1.6%; 40% female; 33.3% non-White), with the aid of a 4-chapter pocket guide and diary, automated motivational text messaging, and feedback from an activity monitor, along with CGM and supplies for the 6-week intervention and the 3-month follow-up.

**Table 1.** Variables, pretreatment, and 3 months post–glycemic excursion minimization intervention.

| Variable | Pretreatment | 3 months post–glycemic excursion minimization | *P* value | Baseline correlation with change in hemoglobin $A_{1c}$ levels | Change in correlation with change in hemoglobin $A_{1c}$ levels |
|---|---|---|---|---|---|
| **Primary outcome variables, mean (SD)** | | | | | |
| Hemoglobin $A_{1c}$ levels (%) | 8.0 (1.6) | 6.2 (1.1) | <.001[a] | –0.755[b] | |
| Metformin (mg/day) | 0 (0) | 133 (516) | .33 | | –0.219 |
| **Mechanism variables** | | | | | |
| **Continuous glucose monitoring data, unblinded weeks 1 and 18, mean (SD)** | | | | | |
| Percentage of time when continuous glucose monitoring values were >140 mg/dL | 23.9 (28.9) | 14.5 (22) | .03 | –0.012 | –0.086 |
| Glucose variability | 22.4 (10.1) | 20.2 (8.3) | .08 | 0.132 | –0.208 |
| High-carbohydrate foods | 39.6 (21.9) | 10.3 (6.8) | <.001[a] | –0.243 | 0.238 |
| Low-carbohydrate foods | 50.2 (20.8) | 48.6 (20.0) | .69 | –0.413 | 0.635[c] |

# Nutrition Matters for More than just Glucose


Journal of the Academy of Nutrition and Dietetics

Diet Quality and Glycemic Control in Patients with Type 2 Diabetes

## The Best Diet: Quality Counts

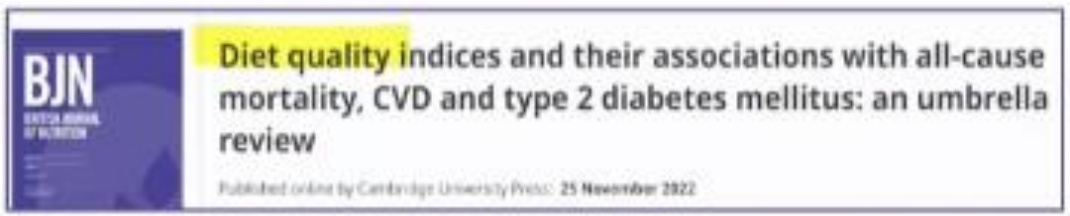
**Lowers HbA1c**

**Improves Heart Health**

**Weight Loss**

**Reduces Cancer Risk**

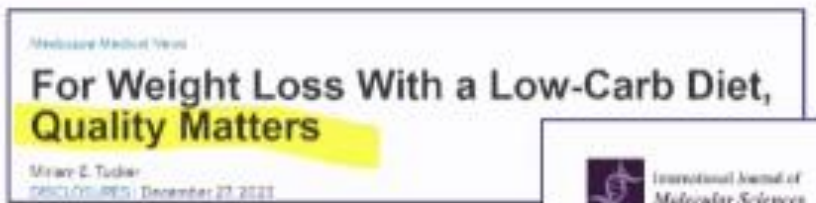
**Increases Life Expectancy**


BJN

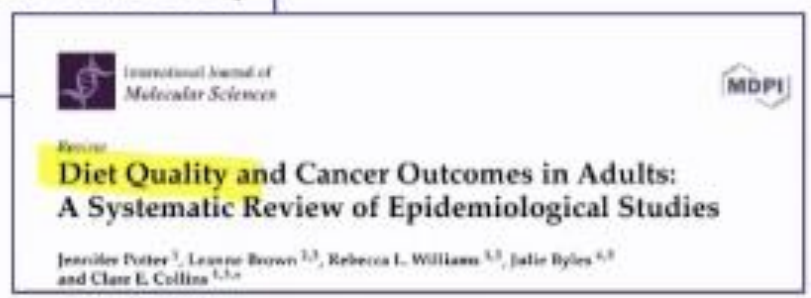
Diet quality indices and their associations with all-cause mortality, CVD and type 2 diabetes mellitus: an umbrella review

Published online by Cambridge University Press: 25 November 2022


Life expectancy can increase by up to 10 years following sustained shifts towards healthier diets in the United Kingdom


For Weight Loss With a Low-Carb Diet, Quality Matters

Miriam E. Tucker


International Journal of Molecular Sciences

MDPI

Review

Diet Quality and Cancer Outcomes in Adults: A Systematic Review of Epidemiological Studies

Jennifer Potter, Leanne Brown, Rebecca L. Williams, Julie Byles and Clare E. Collins

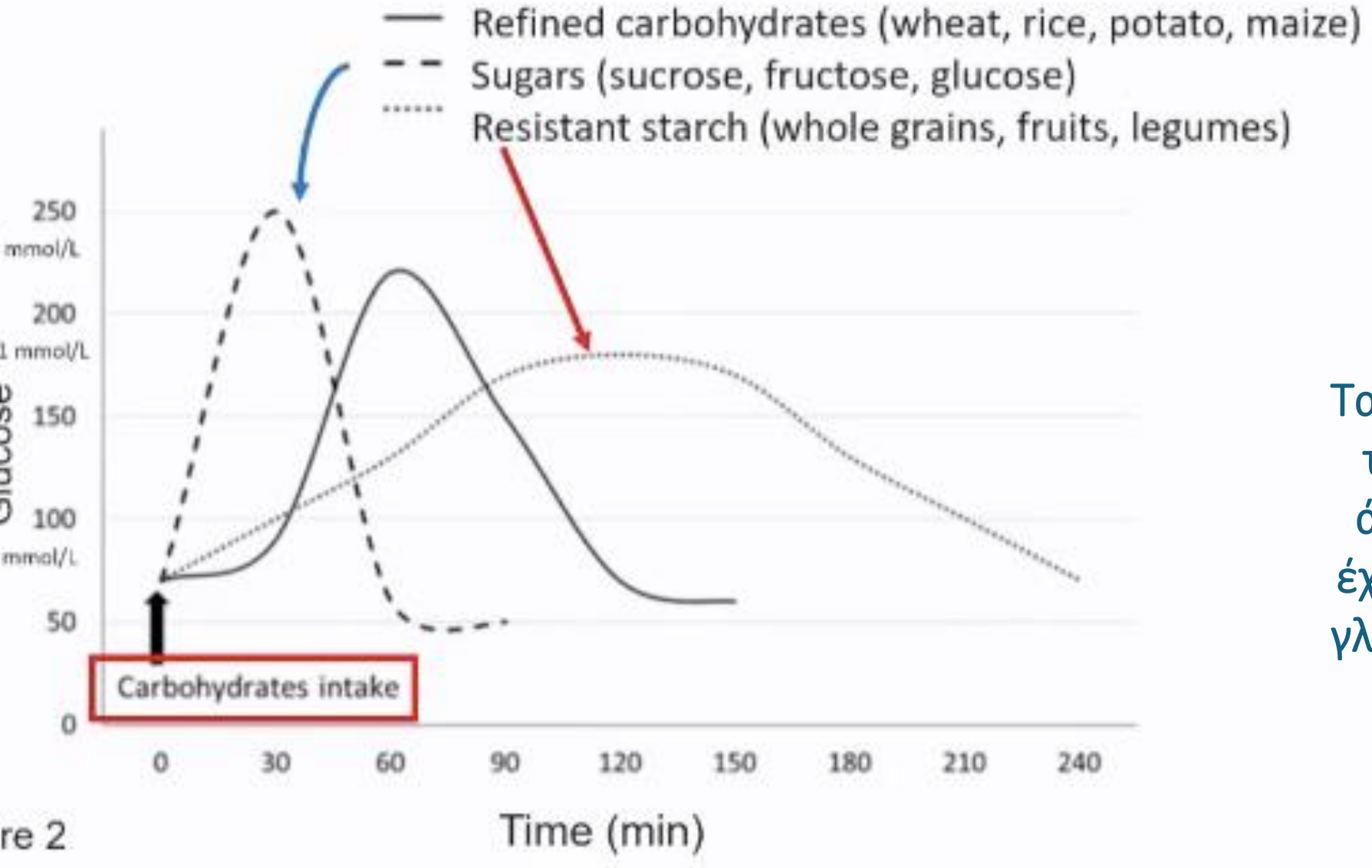
Casas R, et al. Nutrition and Cardiovascular Health. Int J Mol Sci. 2018 Dec 11;19(12):3988.
The Nutrition Source. "The Best Diet: Quality Counts." Harvard T.H. Chan School of Public Health

# Η γνώση που δίνεται στα άτομα μέσω της χρήσης των συστημάτων αυτών βοηθά στην αλλαγή της συμπεριφοράς!

| | Medication | Design | Results |
|---|---|---|---|
| **Cox et al (2020)** | Noninsulin | Routine care vs CGM and lifestyle intervention | CGM arm: HbA1c ↓ 1.3%; ↓ DM distress; ↓ **PPG**; **Improved QOL** and DM knowledge |
| **Majitha et al (2019)** | Insulin and noninsulin | CGM with telemedicine (single arm) and remote lifestyle coaching | HbA1c ↓ 1.6%; ↓ **Weight; TIR↑ 10.2%; BP and Lipid improvement** |
| **Bergenstal et al (2021)** | Insulin and noninsulin | Retrospective analysis evaluated patient satisfaction with CGM use in Onduo participants | HbA1c ↓ 2% (noninsulin with starting HbA1c ≥8%); **Improved understanding of impact of food (97%);** Improved DM management when NOT wearing a sensor (79%) |
| **Porter et al (2022)** | Insulin and noninsulin | Lifestyle counseling; blinded CGM at weeks 0 and 14; randomized to rtCGM (x20d), FFQ to measure diet | **84% excluded certain foods as a result of CGM & ↑PA** (at week 24); ↓ Weight; **92% would like to wear CGM regularly** |

Jackson M. Diabetes Technol Ther. 2021;23(S1):S27-S34
Aleppo G. Diabetes Technol Ther. 2023; Oct; 25(10):741-751

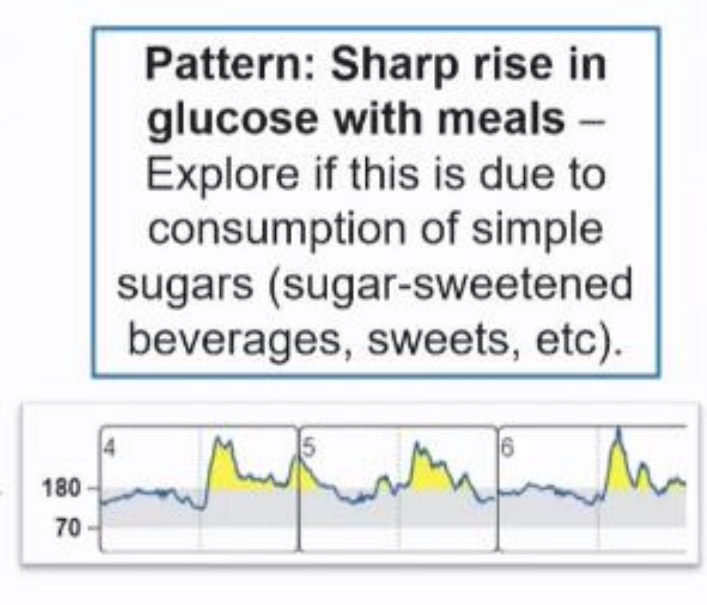
# Carbohydrates are Not All Equal




re 2

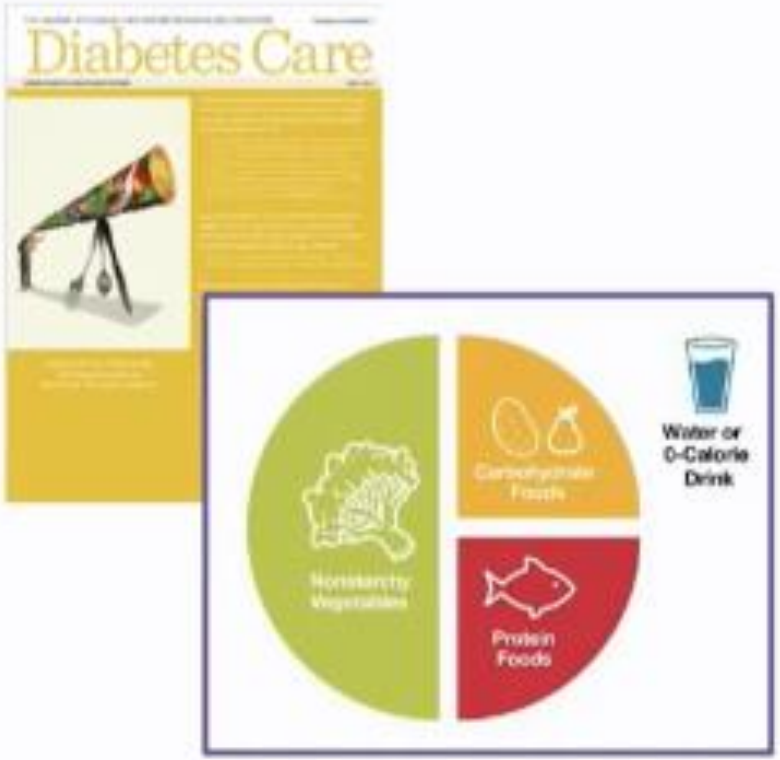
Τα άτομα με διαβήτη έχουν την δυνατότητα να δουν άμεσα την επίδραση που έχουν τα γεύματα τους στο γλυκαιμικό τους προφίλ και αντίστοιχα να δράσουν

# Συνεργασία




**Ο ρόλος του διαιτολόγου και της διεπιστημονικής ομάδας είναι**

1) **Να εκπαιδεύσουμε το άτομο να "διαβάζει" τα δεδομένα**
2) **Να εξηγήσουμε την επίδραση των τροφίμων**
3) **Να προτείνουμε εναλλακτικές πρακτικές και ΥΛΟΠΟΙΗΣΙΜΕΣ λύσεις για το άτομο**




1. Emphasize non-starchy vegetables
2. Minimize added sugars and refined grains
3. More whole foods
4. Replace sugar-sweetened beverages with water as often as possible

**Foundation to ANY eating pattern**

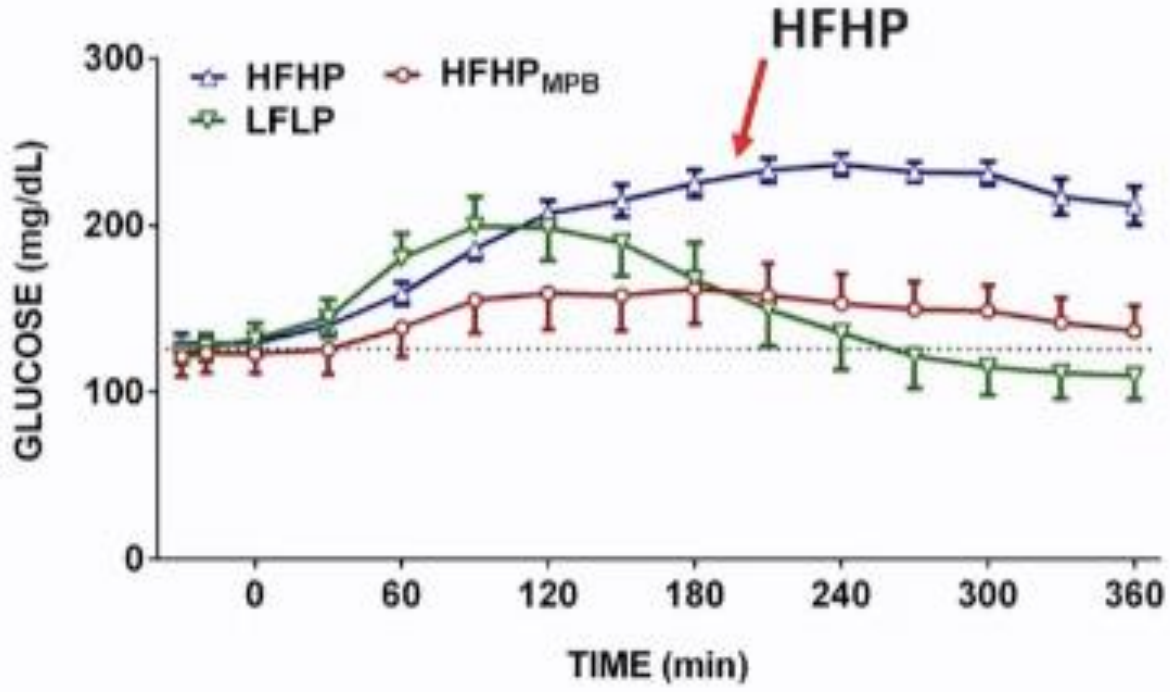
**ALL health care professionals play an important role in guiding nutrition changes that are better for glucose and overall health**

Evert A, et al. Nutrition Therapy for Adults with Diabetes or Prediabetes: A Consensus Report. Diabetes Care 2019;42:731-754.

Είναι δική μας ευθύνη να εξηγήσουμε την ερμηνεία των επιλογών του ατόμου και να το οδηγήσουμε σε καλύτερες επιλογές!

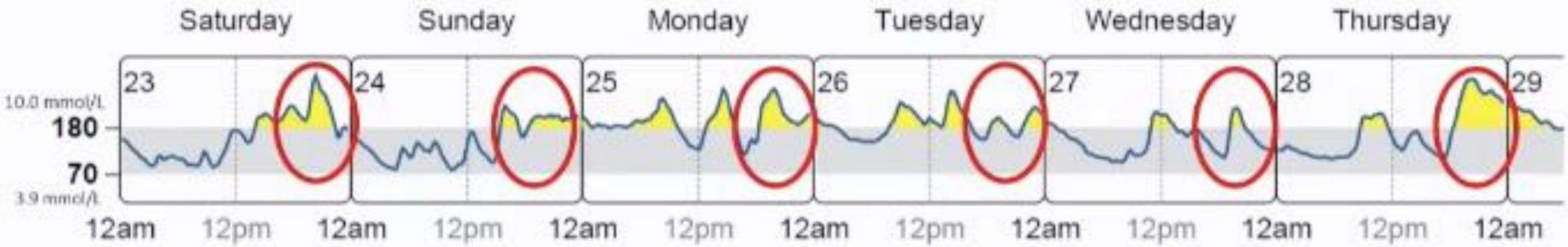
## Meal composition (high fat/high protein vs low fat/low protein) *T1D*

- 2 meals matched for carbohydrate
- Same insulin dose




Diabetes Care 2016;39(9):1631–1634

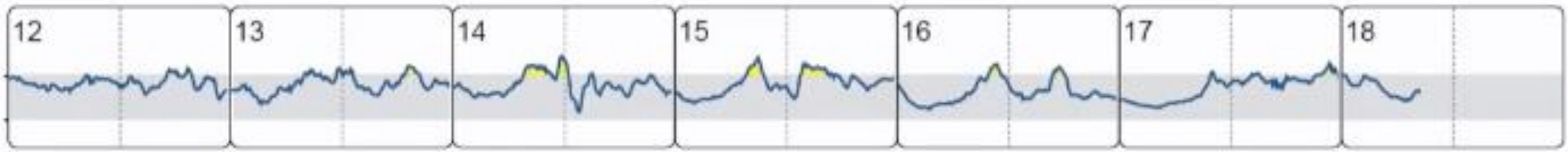
# The Need for Personalized Nutrition




Notable eating habits: rice or noodles at dinner with family each night

Agreed upon trying LESS rice and noodles and MORE vegetables at dinner

**2 weeks later**




**Tip:** Pick one meal at a time to focus on. Ask what changes they are willing to make.

# Impact of Applying the Core Concepts


Blinded CGM Data

57 yo M
T2D
Metformin + Semaglutide

HealthPartners

# Impact of Applying the Core Concepts


2 months later

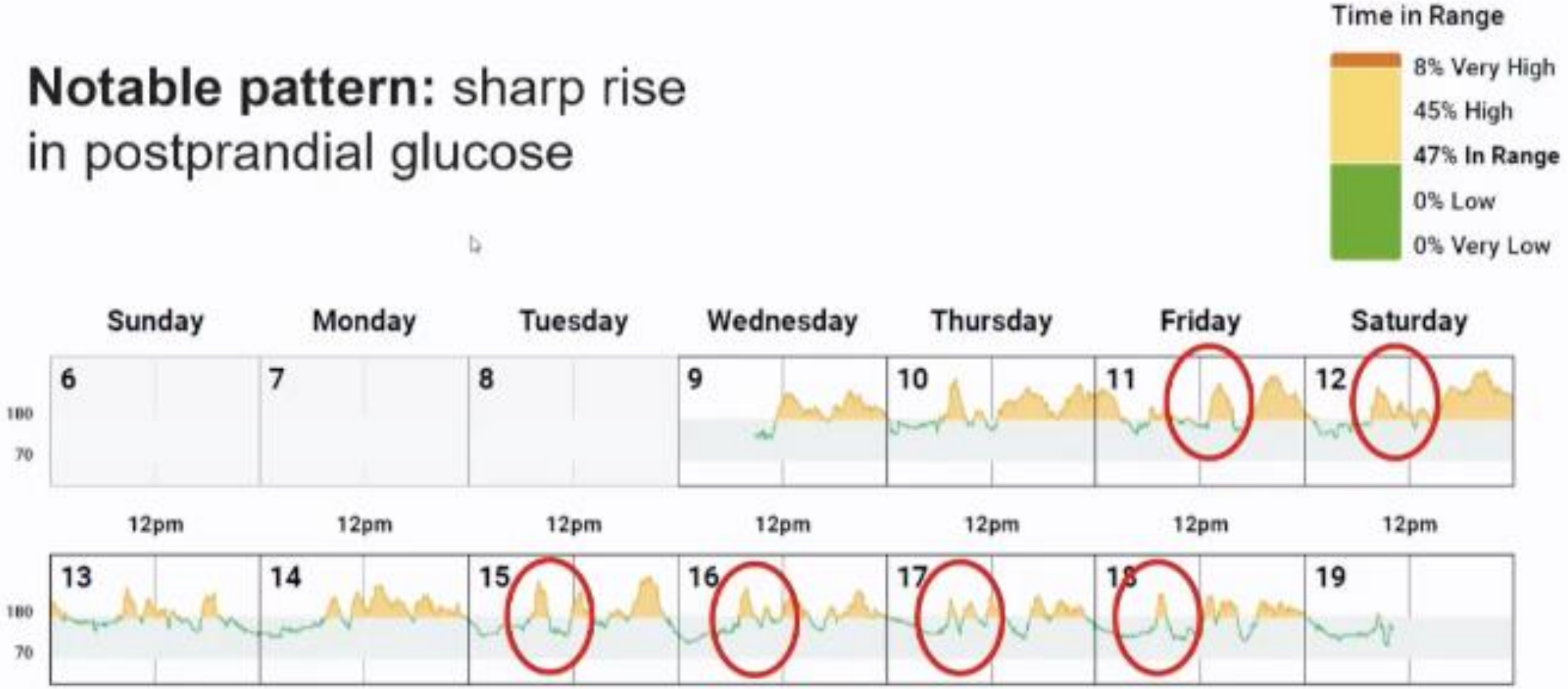
TIR ↑ 47%


**Δημητριακα για πρωινο**

1. Emphasize non-starchy vegetables
2. Minimize added sugars and refined grains
3. More whole foods

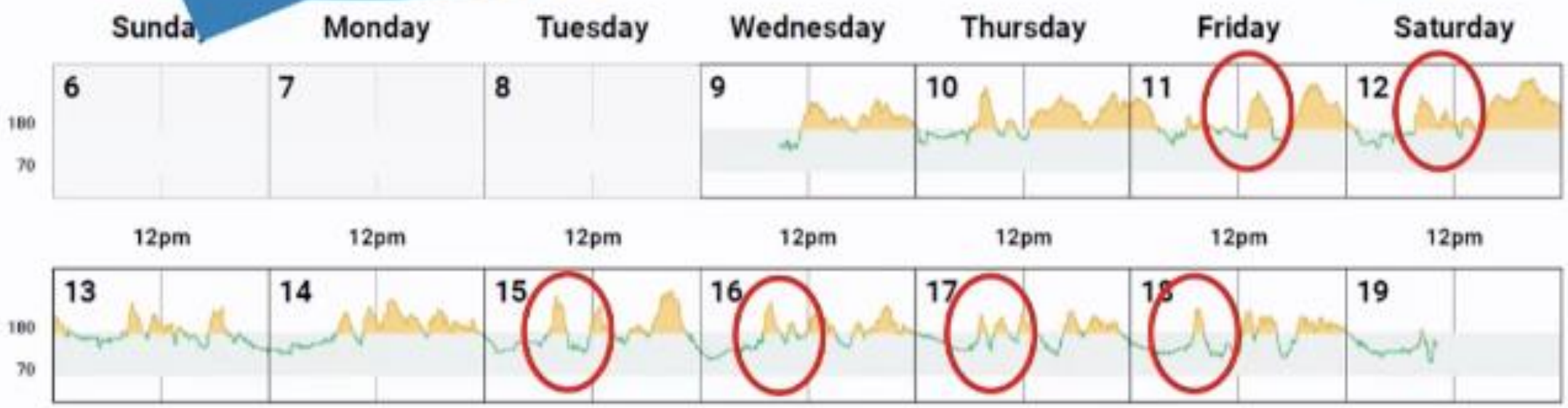
# Applying CGM Guided Nutrition in the Clinic

**Notable pattern:** sharp rise in postprandial glucose



# Applying CGM Guided Nutrition in the Clinic

"Can you tell me more about what you eat and drink for your meals?

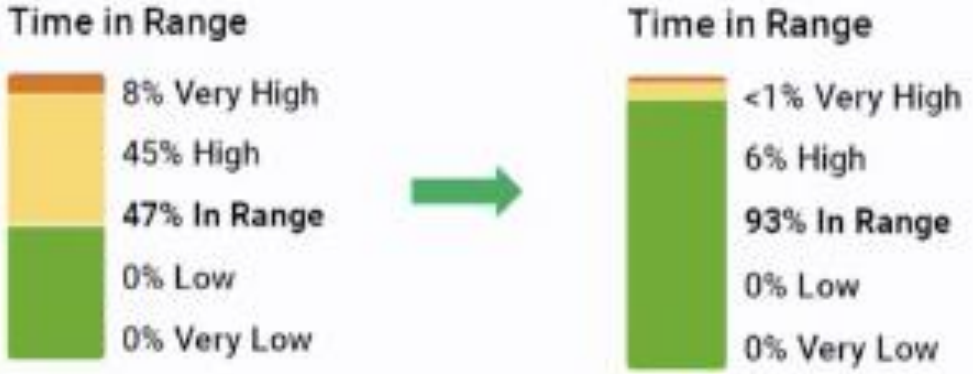



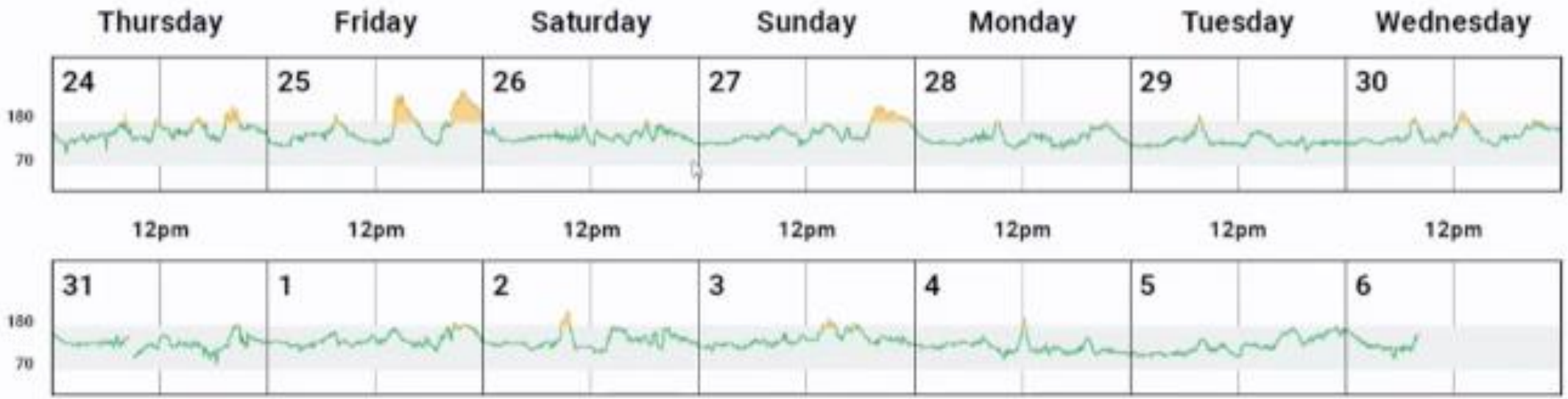

**Tip:** Suggest keeping a food log or tracking meals in the app

HealthPartners

# 3 weeks later

4. Replace sugar-sweetened beverages with water as often as possible

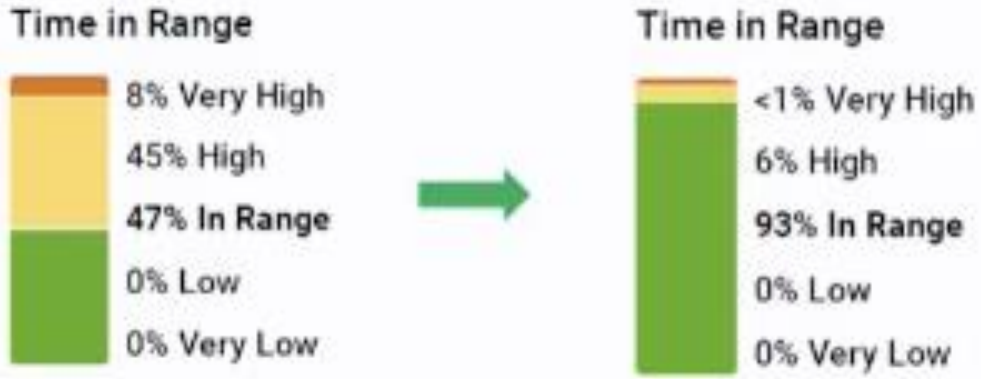



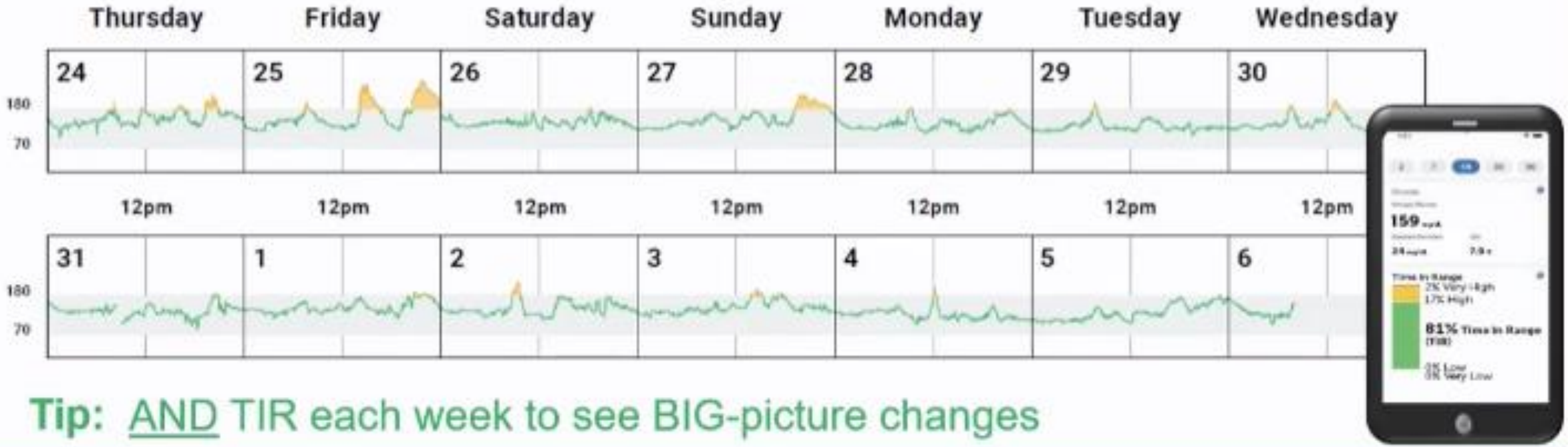

**Tip:** Encourage checking glucose before and 1-2 hours after meals

HealthPartners

# 3 weeks later

4. Replace sugar-sweetened beverages with water as often as possible

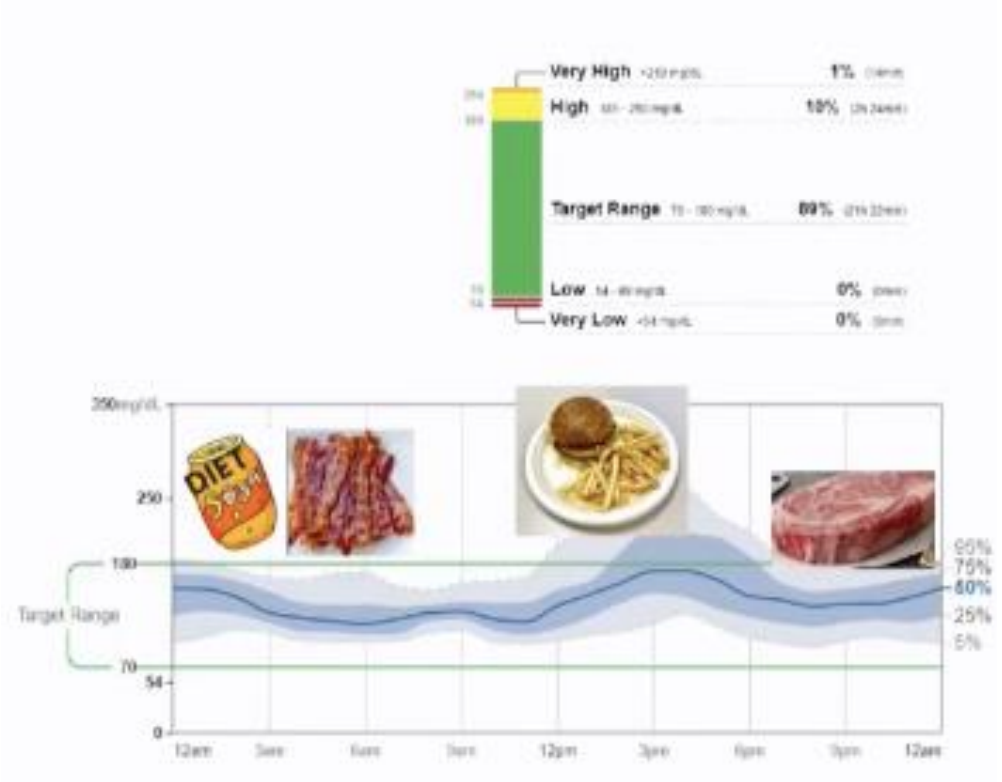




**Tip:** AND TIR each week to see BIG-picture changes

- Μένουμε στα θετικά μηνύματα
- Δεν δαιμονοποιούμε τρόφιμα και ροφήματα
- Τι μαθαίνεις στο πώς τα τρόφιμα και τα ροφήματα επηρεάζουν το σάκχαρο σου?
- Ελέγχουμε ποιότητα διατροφής όχι μονο γλυκαιμικούς στόχους!

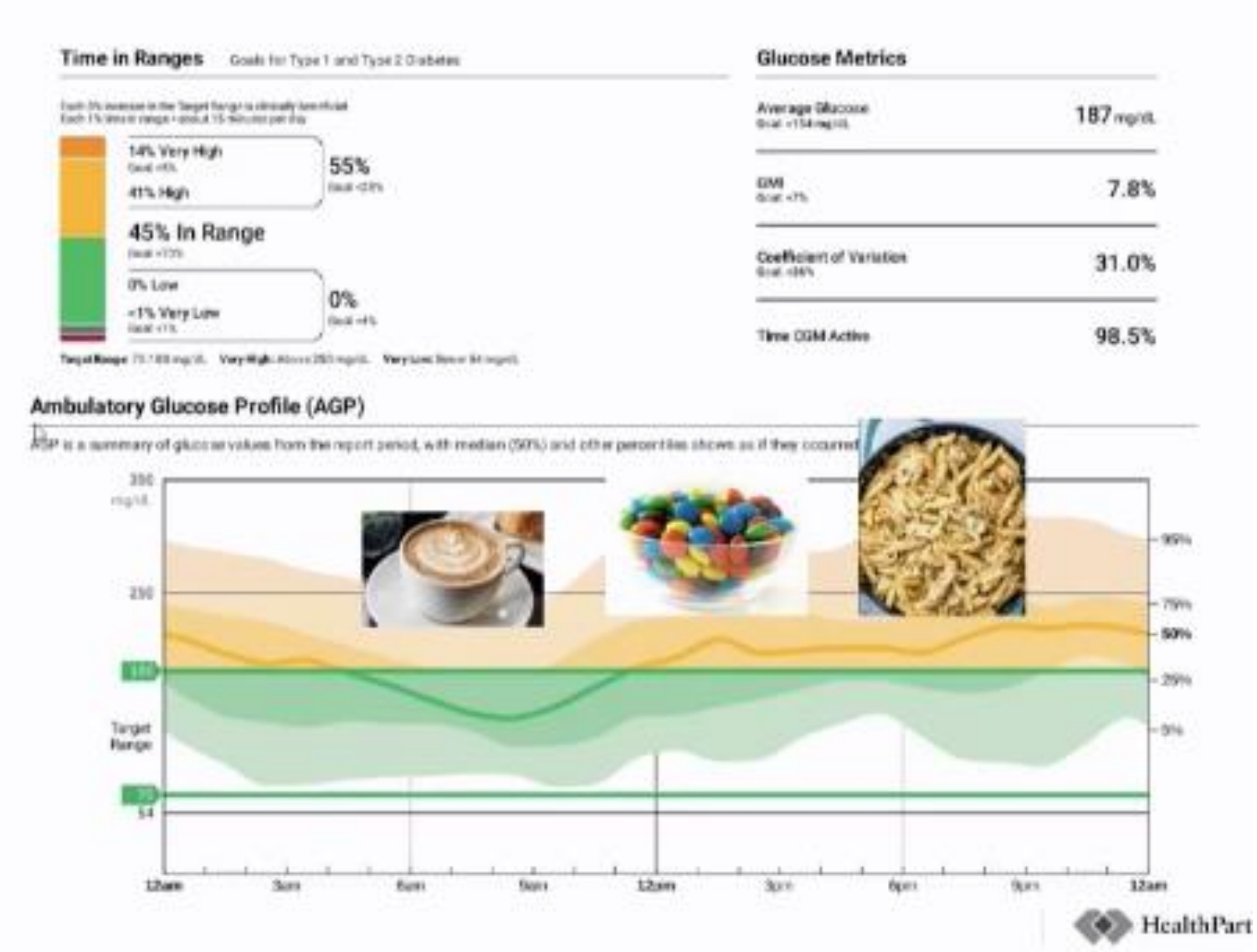
- Ενθαρρύνουμε την περιέργεια

- Προτείνουμε πειράματα!
- (**αλλαγή μερίδων, χρονισμό, σειρά τροφίμων**)

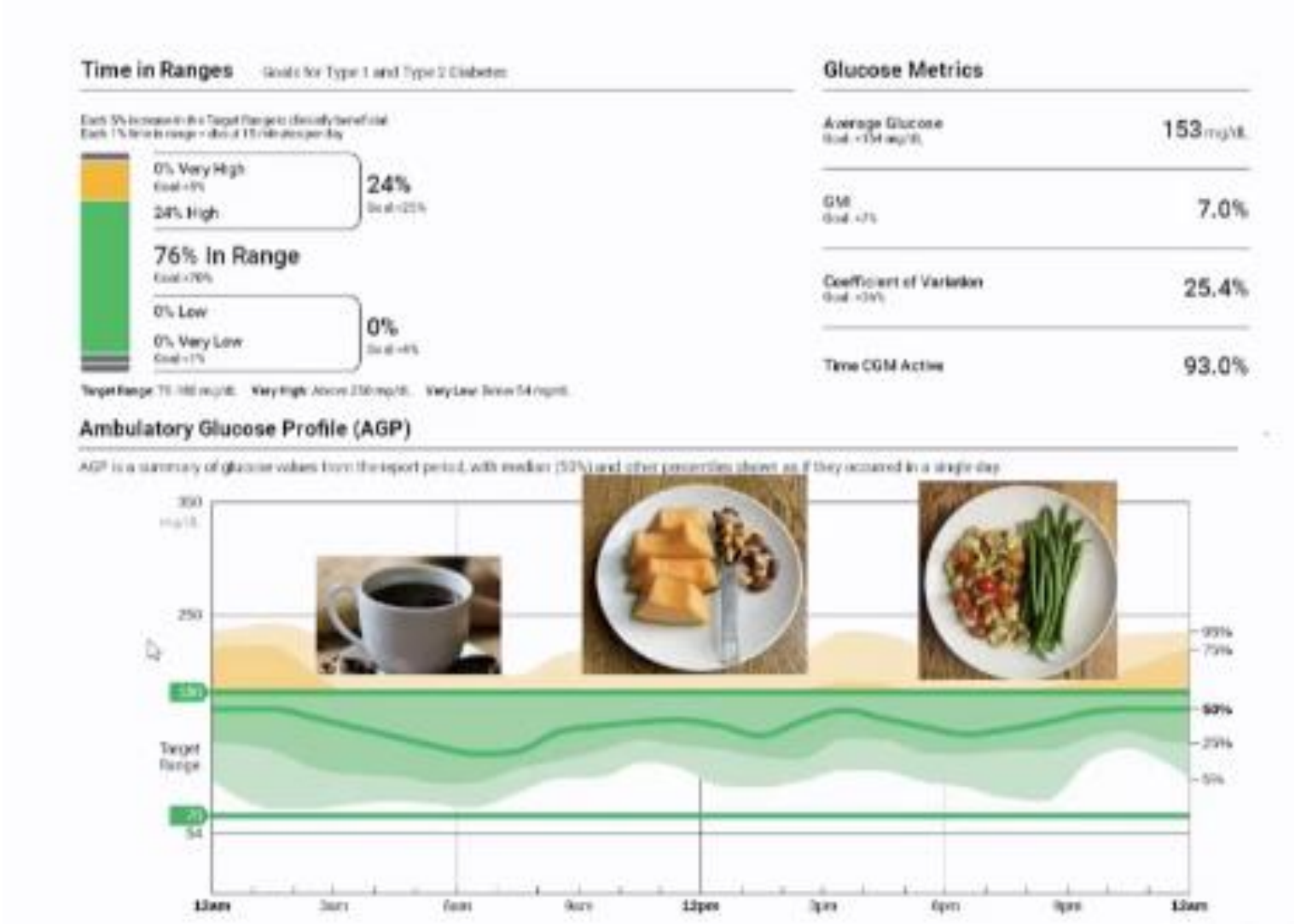


# Ερωτήσεις που δεχόμαστε συχνά από τα άτομα με ΣΔ2

- Μέλι
- Ταχίνι
- Μπάρες
- Σοκολατα στεβια
- Γλυκα στεβια
- Φυτικά τρόφιμα
- Όσπρια
- Γιατι όχι χυμο?????




"Would you be open to an unsweetened drink in the morning? What about exploring a different snack option to see what happens?"

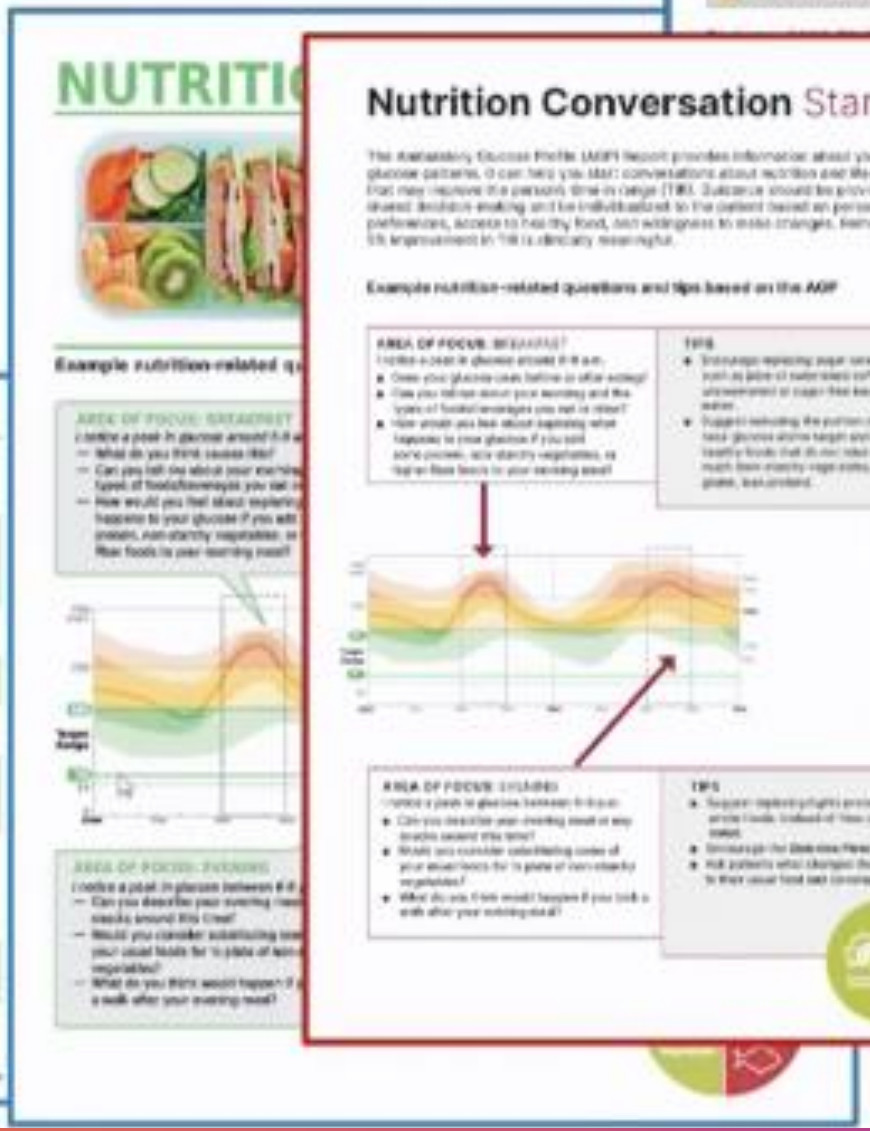



"It was very eye opening to see how high my blood sugar was really getting, especially after eating certain foods. **It [CGM] made me much more conscious about what I was eating as well as how much and when."**

*Quote from real patient*

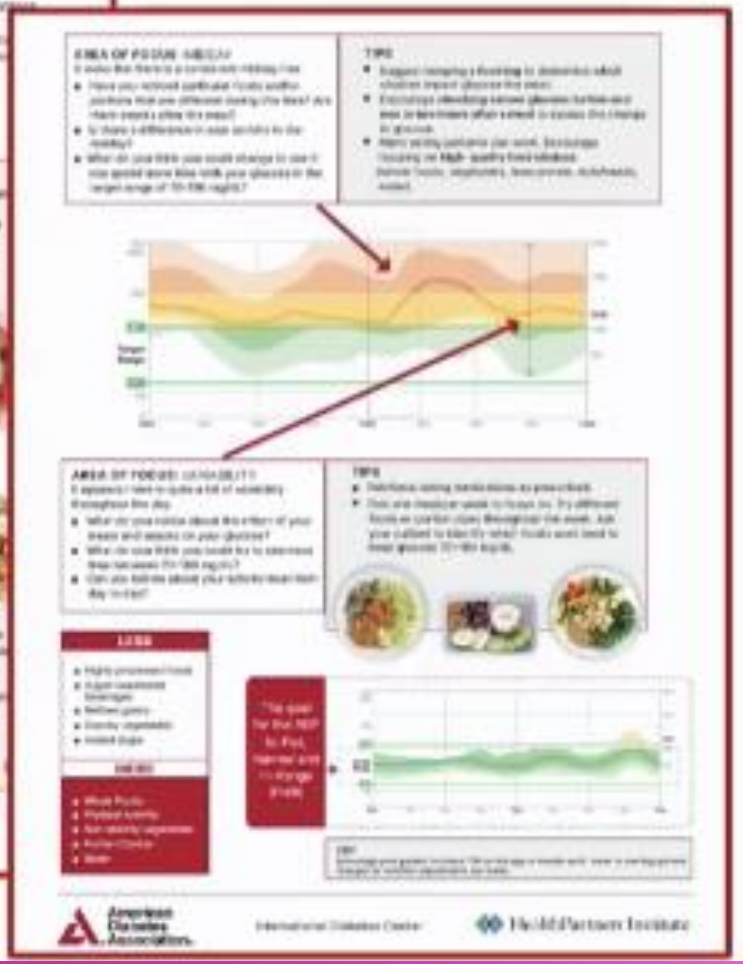
# IDC Nutrition Resources and Research



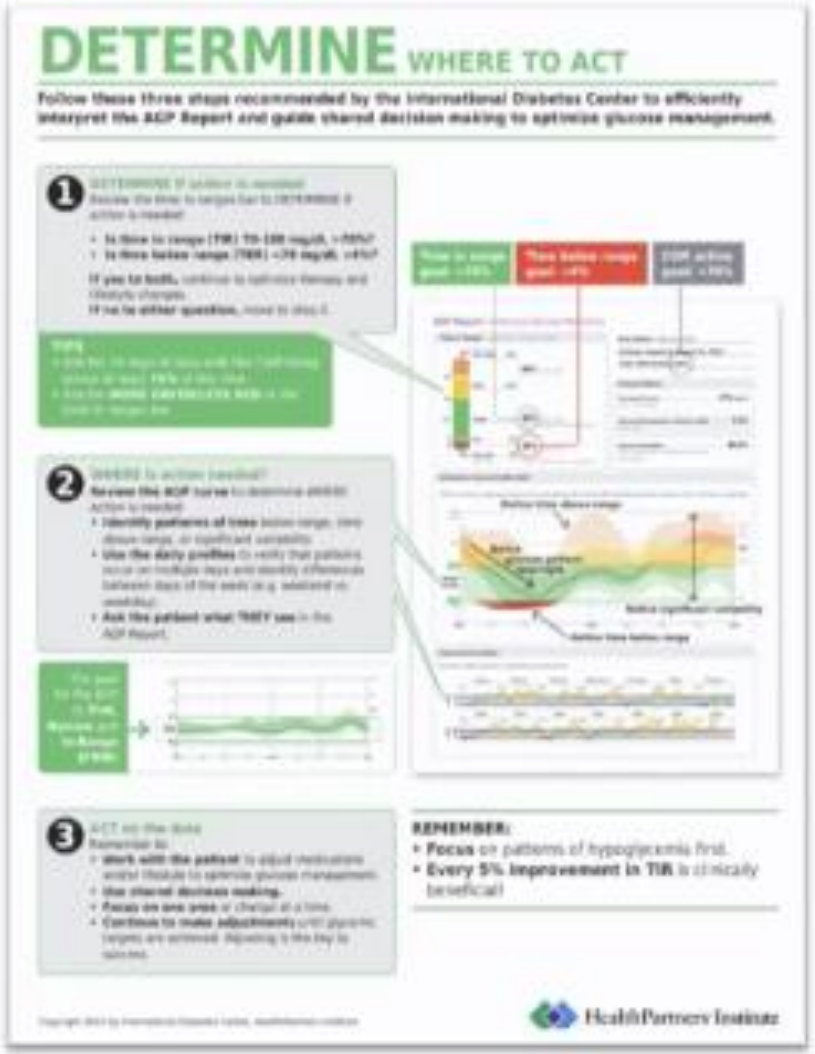






# CGM is available and recommended for T2D on insulin: how do we leverage CGM for precision management?



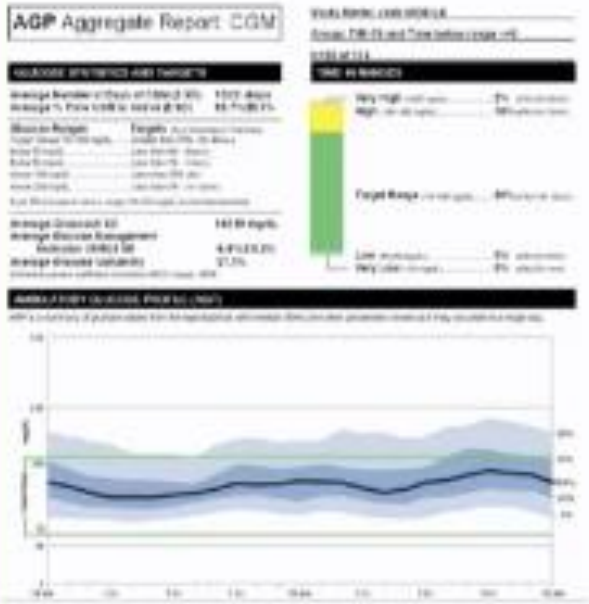

We've worked hard on rapid interpretation for Primary Care . . .

But rapid interpretation really isn't enough . . .

**CCGM: Moving from Interpretation to Action**

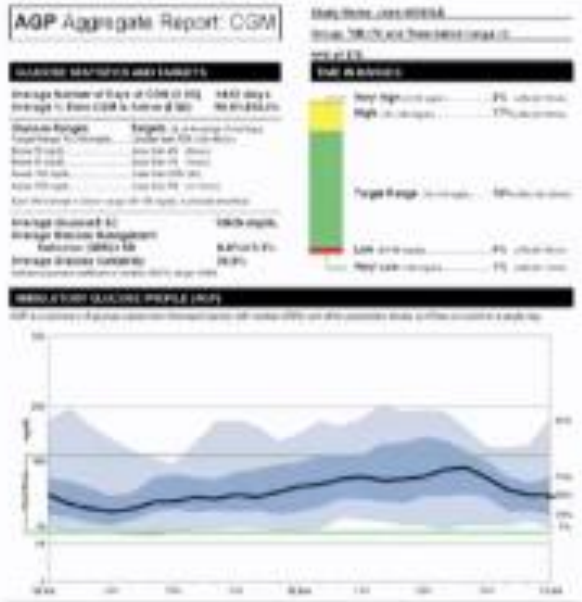
# T2D on Basal Insulin: CCGM TIR/TBR categories

**TIR >70%**
**TBR <3%**
**Category 1**



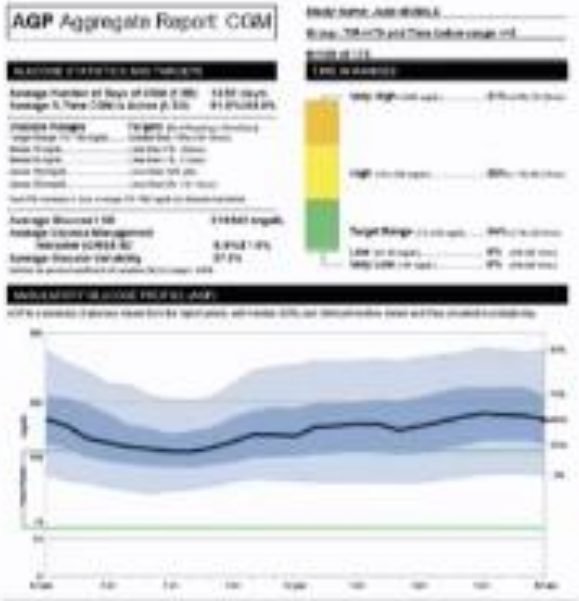

**Doing well- keep going!**

**TIR >70%**
**TBR ≥ 3%**
**Category 2**



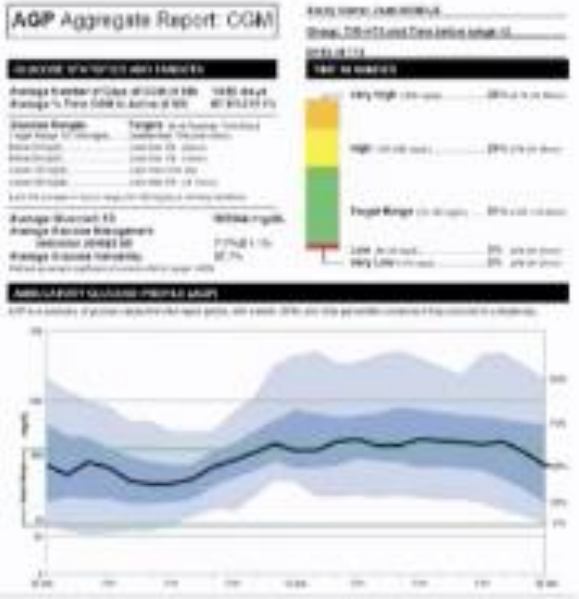

**Too much hypoglycemia- decrease therapy**

**TIR <70%**
**TBR <3%**
**Category 3**




**Too much hyperglycemia- increase therapy**

**TIR <70%**
**TBR ≥ 3%**
**Category 4**



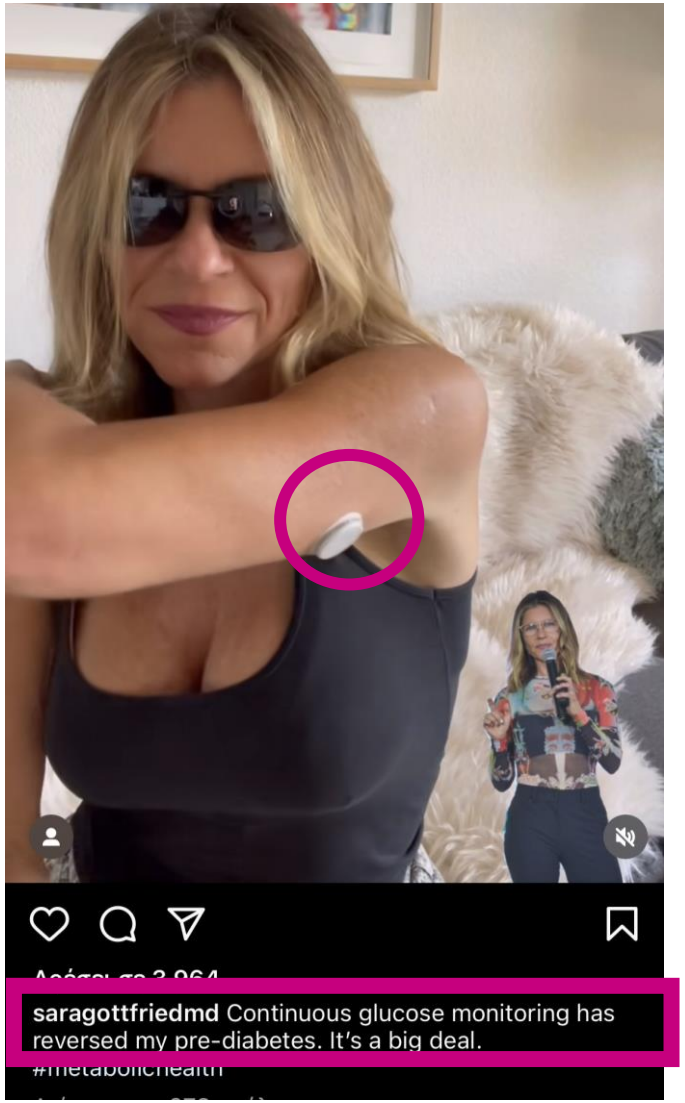

**Too much hypoglycemia AND too much hyperglycemia- fix or advance therapy**

(CCGM) CGM Clinician Guided Management

- Είναι τελικα ένα εργαλειο να βοηθησουμε τα ατομα που ζουν με διαβητη να αλλαξουν και να διατηρησουν τις αλλαγες στον τροπο ζωης τους?
- Τα θεματα προβληματα που θετουν οι μελετες είναι το κοστος και οι ανεπιθυμητες ενεργειες οσον αφορα την χρηση του αισθητηρα
- Είναι σημαντική η επικοινωνία με τα άτομα , να διερευνούμε τις ανάγκες τους, τις συνήθειες τους και να εστιάζουμε σε **ΜΙΚΡΕΣ και ΠΡΑΓΜΑΤΟΠΟΙΗΣΙΜΕΣ ΑΛΛΑΓΕΣ !!!**

# Take home messages

- Οι συστασεις για την διατροφικη θεραπεια πρεπει να προσαρμοζονται τακτικα αναλογα τις αλλαγες στις συνθηκες ζωης του ατομου, τις προτιμησεις και την πορεια της νοσου
- Η τακτικη παρακολουθηση του ατομου από ένα ατομο της διεπιστημονικης ομαδας είναι σημαντικη για την προσαρμογη όλων των πλευρων του θεραπευτικου πλανου
- Πολλα ατομα δεν λαμβανουν διατροφικη θεραπεια η επισημη εκπαιδευση για τον διαβητη
- Τα CGM είναι ένα σημαντικο εργαλειο για να βοηθησουμε την συμπεριφορικη αλλαγη στα ατομα με διαβητη οσον αφορα την γλυκαιμια και τον ελεγχο του βαρους



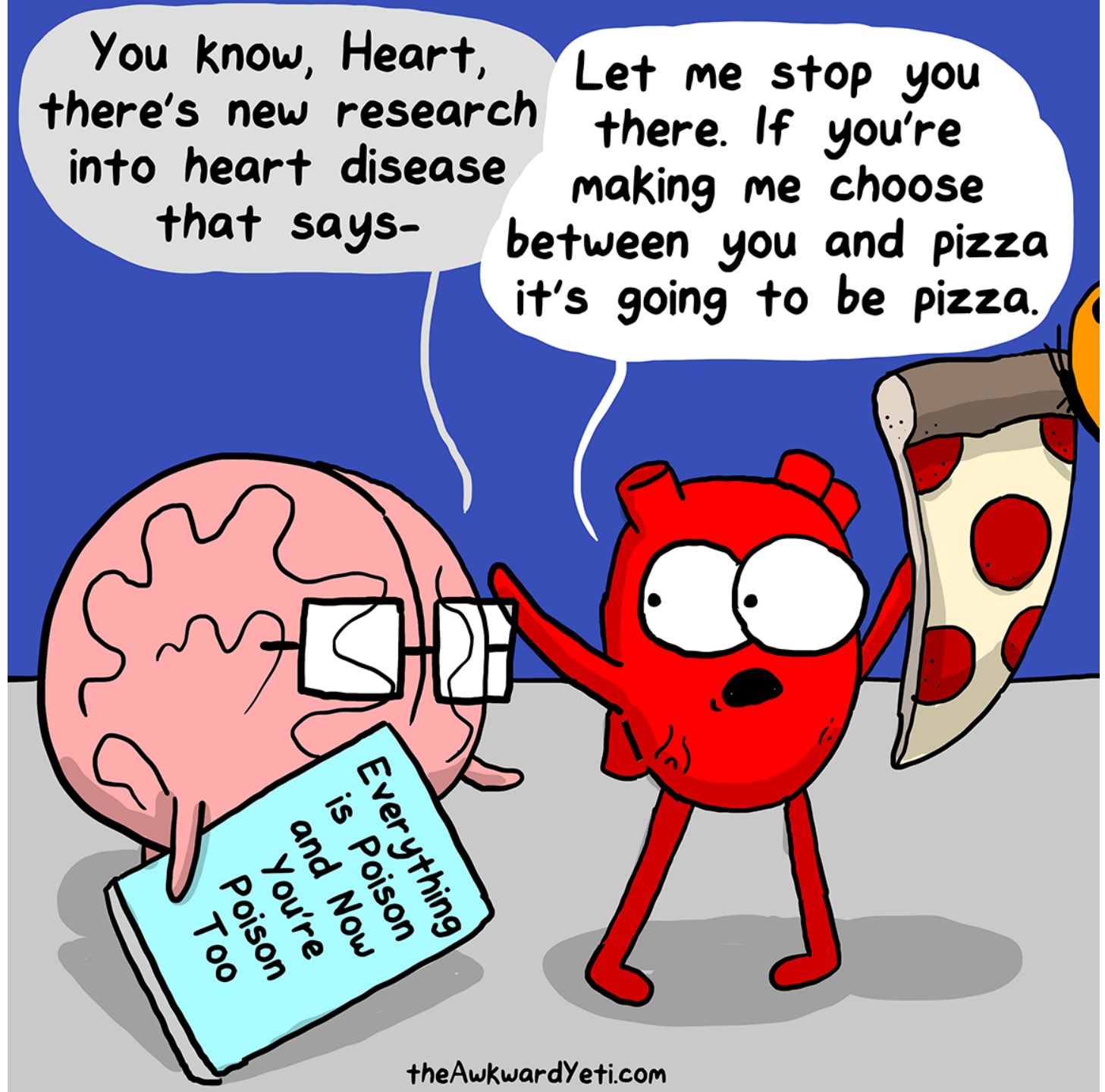

**Δεν είναι η τεχνολογία και η καταγραφή γλυκόζης αυτό που βοηθά**

**ΑΛΛΑ**

**η αλλαγή συμπεριφοράς στην γνώση την οποία λαμβάνει το άτομο!**

*An excellent tool for helping motivated patients improve health and achieve T2DM remission. Relatively simple intervention, although food reintroduction presents numerous challenges which a structured and supportive approach can help overcome.* Participant 4

# ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ !!!


You know, Heart, there's new research into heart disease that says-
Let me stop you there. If you're making me choose between you and pizza it's going to be pizza.
Everything is Poison and Now You're Poison Too
theAwkwardYeti.com