UNIVERSITY of WASHINGTON
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Chrononutrition and Continuous Glucose Monitoring in Type 2 Diabetes: a Case Study

Aimee Allen, MS candidate and Dietetic Intern
Preceptor: Karen Munger, MS, RD, CDCES, UW Medicine Diabetes Institute & Northwest Kidney Stone Center

BETTER GLYCEMIC CONTROL

Chrononutrition and continuous glucose monitor (CGM) use show promise in improving glycemic control in patients with type 2 diabetes.

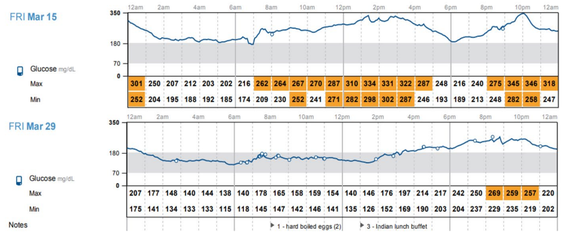
Co-ingestion of a protein or fat-containing food with a carbohydrate food can delay time to peak glucose and lower overall postprandial glucose rise.[1-3] Eating protein foods and non-starchy vegetables before carbohydrate foods results in the slowest glucose rise.[1] CGM use can reduce hypoglycemic episodes,[4] improve A1C, and improve **time in range (TIR), which indicates the percentage of time blood glucose was within 70-180 mg/dL.**[4-7]

CASE PRESENTATION

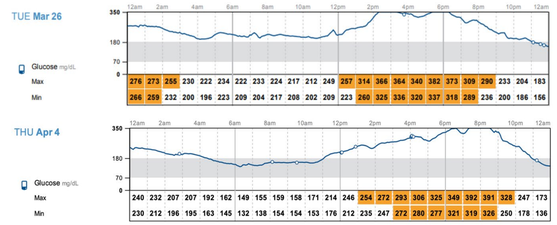
The patient is a 55-year-old male who was diagnosed with type 2 diabetes at age 41. Comorbidities included hypertension, hyperlipidemia, and obstructive sleep apnea. Medications included metformin, glargine, and Moujaro. Prior to the appointment, the patient's TIR was 4% and the glucose management indicator, an estimate of A1C, was 10.2%. This aligns closely with the true A1C, which was 10.4%. The patient's physical activity was low, and he reported eating mostly packaged and prepared foods. Irregular meal patterns and varied carbohydrate intake were likely contributors to the high blood glucose.

Initial diagnosis: "Physical inactivity related to busy lifestyle as evidenced by self-report."

Best & Worst Days: before and after RD visit



Best days: the patient began to log foods in the CGM app. There were 12 fewer hours in which blood glucose exceeded 250 mg/dL on the best day after the RD visit as compared to the best day before.



Worst days: even though both examples demonstrate elevated glucose, there are still three fewer hours spent above 250 mg/dL and fewer rapid rises. Time in range was substantially improved in the second graph.

Notable Differences

> TIR increased by **41** percentage points
  • This is more than 9 fewer hours spent each day between 70 and 180 mg/dL
> Average glucose decreased by **87** mg/dL (30%)
> GMI (an estimate of A1C) decreased by **2.1** percentage points
> There were 12 fewer hours each day in which the patient's blood glucose was higher than **250** mg/dL
> The number of hours in which the mean was greater than 300 mg/dL fell from **10** hours per day to **0**.

MANAGEMENT & OUTCOME

Lifestyle adjustment recommendations:

> Eat every 2-4 hours to prevent gluconeogenesis from occurring and raising blood glucose once glycogen stores are depleted.

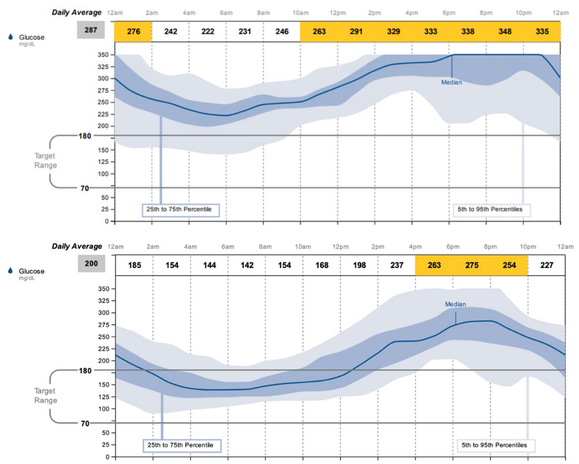
> Use the CGM app to watch for patterns after foods and meals.

> Pair each carbohydrate food with a protein food.

> Observe effects on blood glucose from varying food orders: protein and non-starchy vegetable first and carbohydrate last should facilitate the best response.

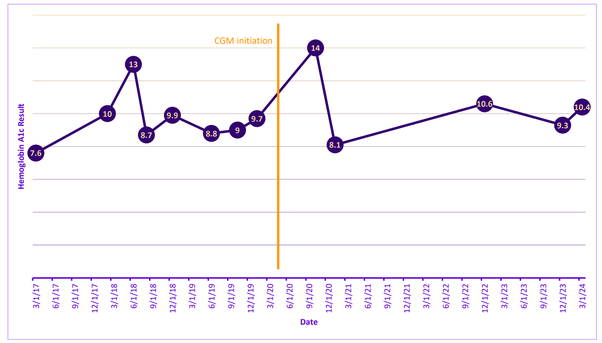
> A rise of 40 mg/dL is the goal from pre- to postprandial glucose level. 50 mg/dL is okay. 70 mg/dL or more: adjustment is needed.

Period overviews with 2 hour means



Perhaps the most impressive improvement is shown above: the number of hours where the mean glucose was over 300 mg/dL decreased from 10 hours per day to 0, while hours with mean glucose over 250 mg/dL per day (highlighted above) decreased from 16 to just 6.

HbA1c before and after CGM initiation



DISCUSSION & CONCLUSION

All measured metrics for this patient's glycemic control except glucose variability improved in the two weeks following the appointment with the RD. Using the app to observe trends demonstrated how foods affected blood glucose. A decrease in A1C (or GMI) of 2.1 percentage points is clinically significant and results in decreased risk of many common complications of diabetes,[6] compared with non-insulin diabetes medications which reduce A1C by ≤1.24 percentage points.[8]

While not seen in this case, research demonstrates the benefits of CGM use in improvement of glycemic control and in providing new insight into glucose trends.

The role of the diabetes educator combines the provider's professional role in addition to educating on medications, calculating insulin dosing and insulin to carbohydrate ratios, and aiding with diabetes technology like CGM or insulin pumps.

Combining CGM and nutrition counseling improves glycemic management. Diabetes treatment requires an interdisciplinary approach to support patients in their glycemic goals.

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