

Ambulatory Glucose Profile (AGP)



Case Study of Mr. H

Introduction



Mr. H's Profile

- ❧ 31 year-old gentleman
- ❧ Married with 1 kid
- ❧ Work in Corporate Communication Department in public sector
- ❧ Weight 65.8kg, BMI 25.7

Introduction



Medical History:

- ❧ Hypothyroidism
- ❧ T1DM since 1994, attended an structured education program for type 1 diabetes management in year 2012

Medications

- ❧ Lantus 19 units at 7am and 8pm
- ❧ Novorapid 10 unit TDS
- ❧ Levethyroxine 75mg OM

Issues and Concerns



- ❧ Seldom checks BG
- ❧ Missed pre-meal insulin injection at times, does not cover for snack
- ❧ High HbA1c: 9.1-9.8%
- ❧ Hypoglycemia overnight
- ❧ Mr. H's concerns :
 - ❧ High HbA1c
 - ❧ Fear of hypoglycemia overnight
 - ❧ Keen to improve his glycemic control
- ❧ Flash glucometer was recommended to help him to understand his glucose trend and to improve self management of diabetes

Baseline AGP

Measured Hba1c 8.6%

Glucose

Estimated A1c **8.3%** or 67 mmol/mol

AVERAGE GLUCOSE

10.6 mmol/L

% above target	65 %
% in target	25 %
% below target	10 %

LOW-GLUCOSE EVENTS

59

Average duration	145 Min
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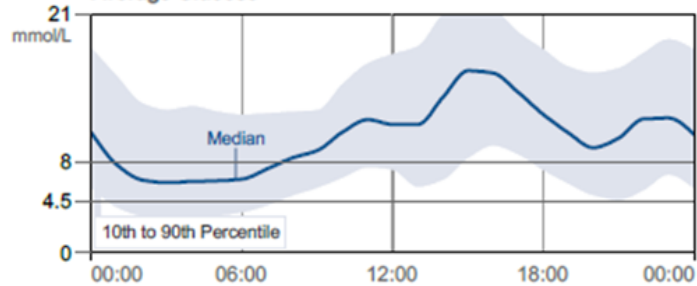
Sensor Usage

SENSOR DATA CAPTURED

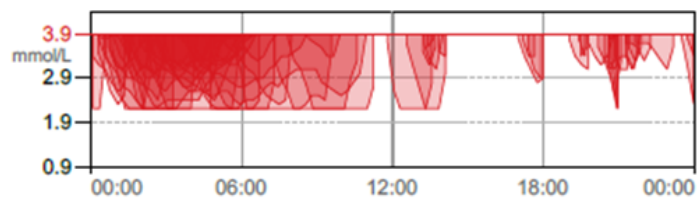
98 %

Daily scans	12
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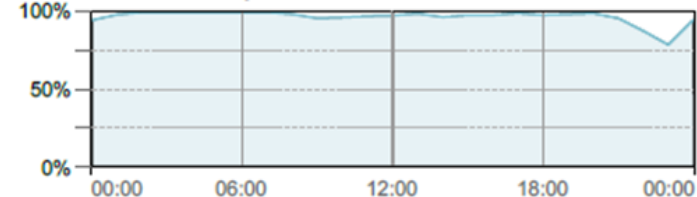
Average Glucose



Low-Glucose Events



Sensor Data Captured



Logged Carbs

DAILY CARBS

grams/day

Logged Insulin

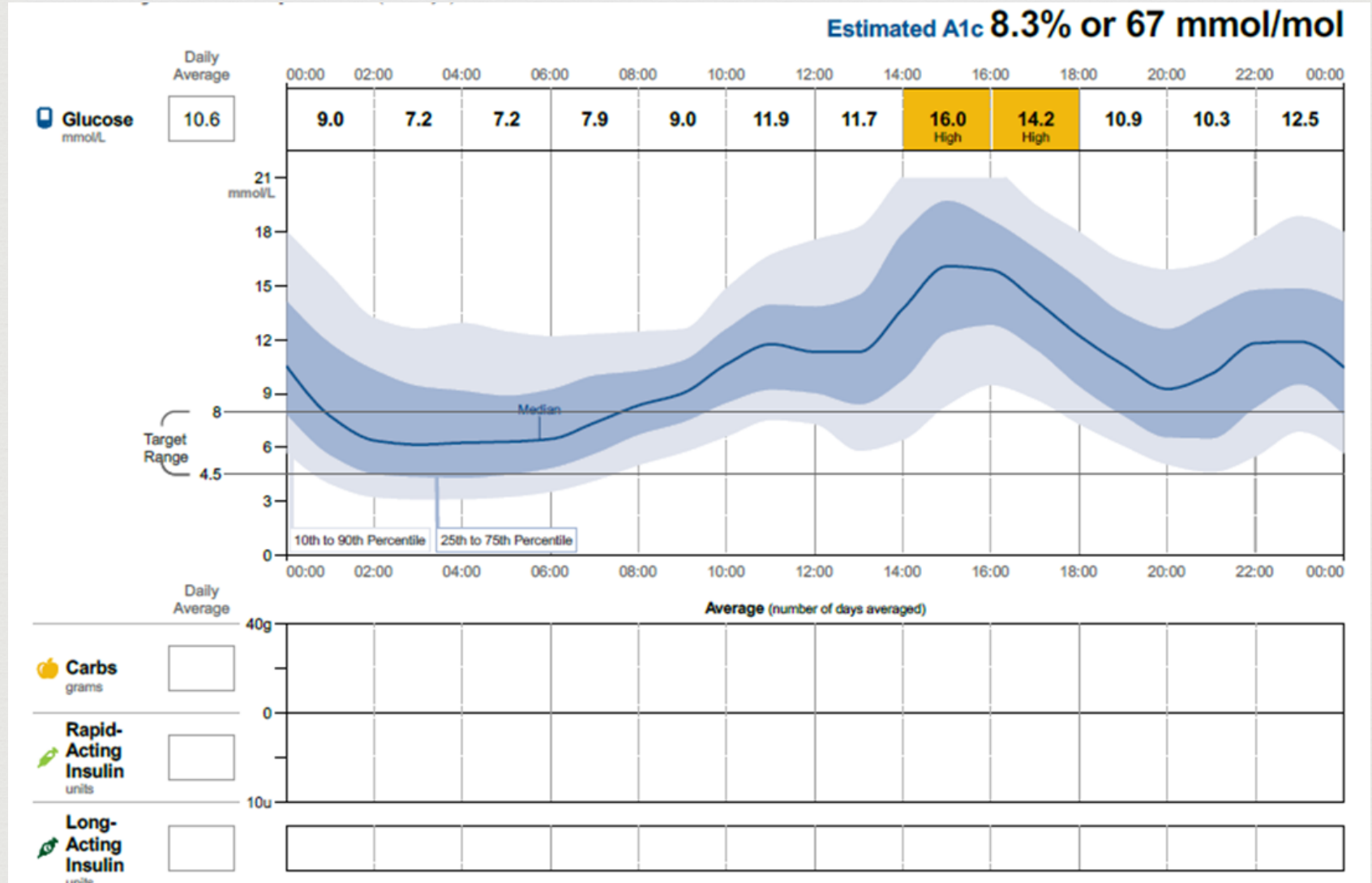
Rapid-Acting Insulin units/day

Long-Acting Insulin units/day

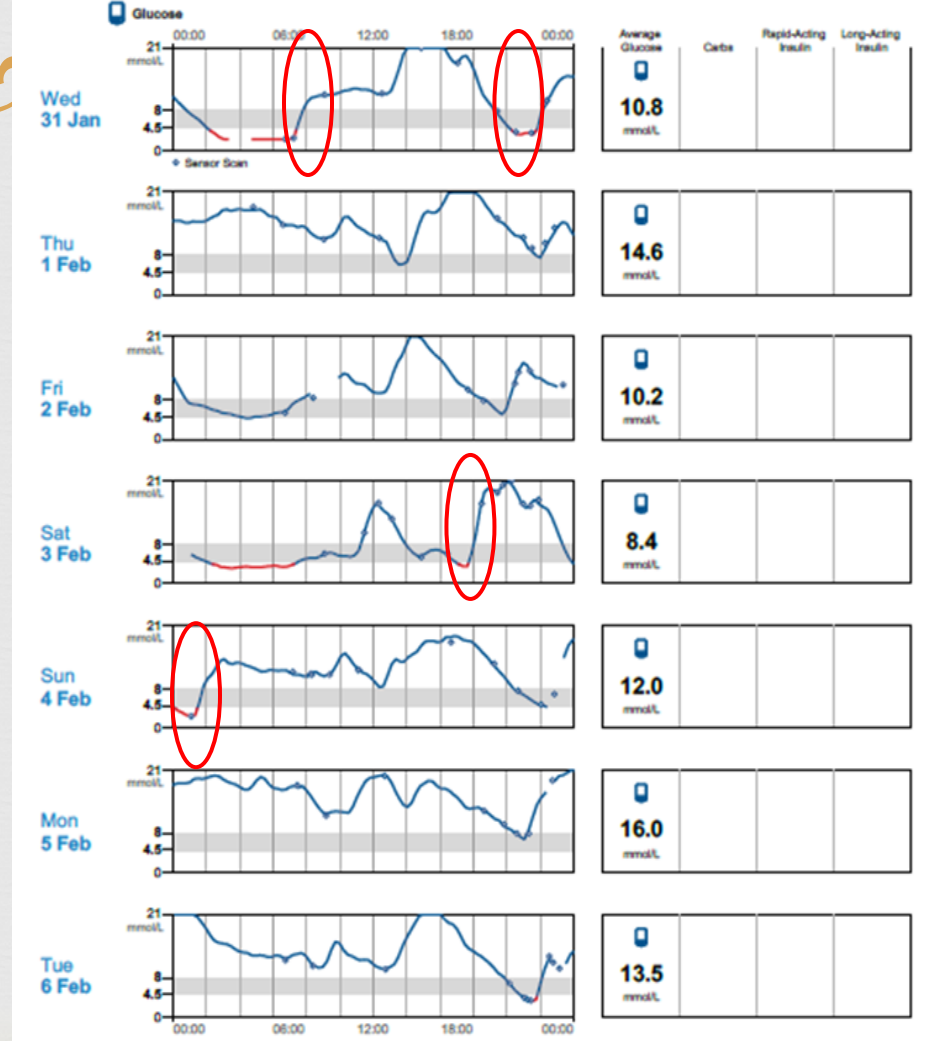
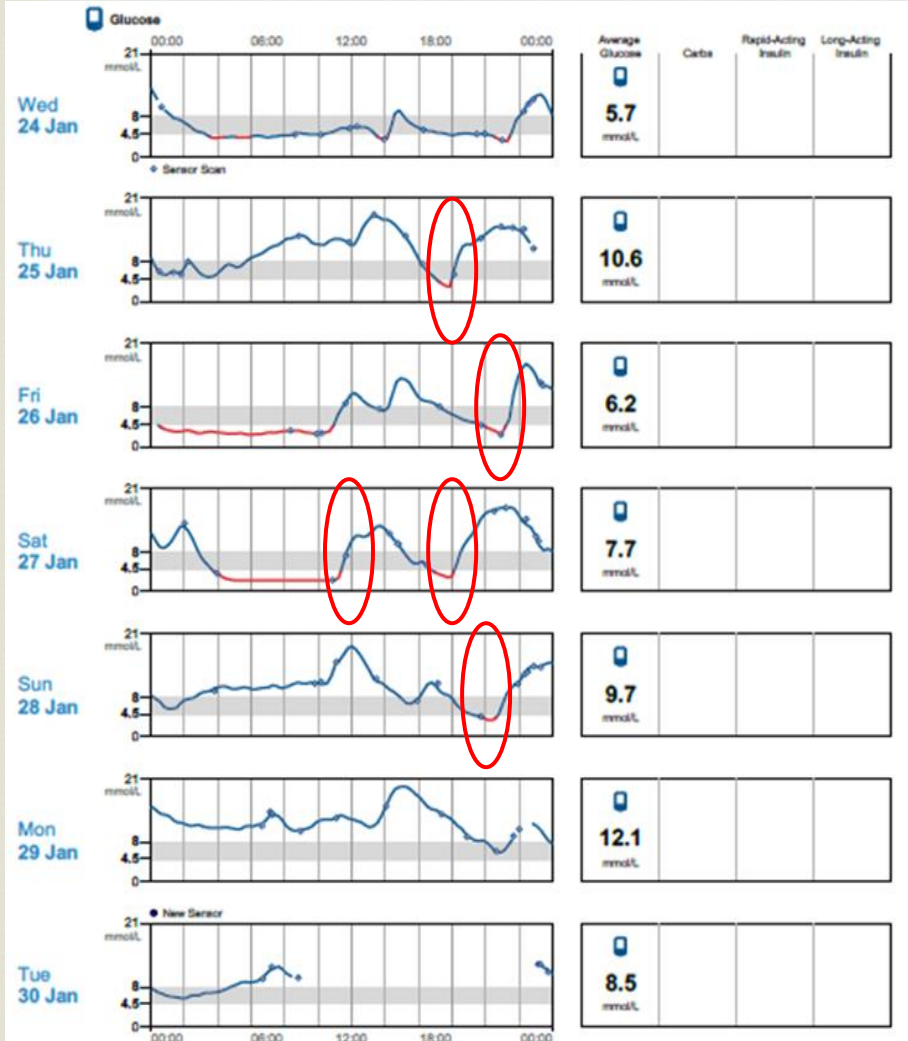
TOTAL DAILY INSULIN

units/day

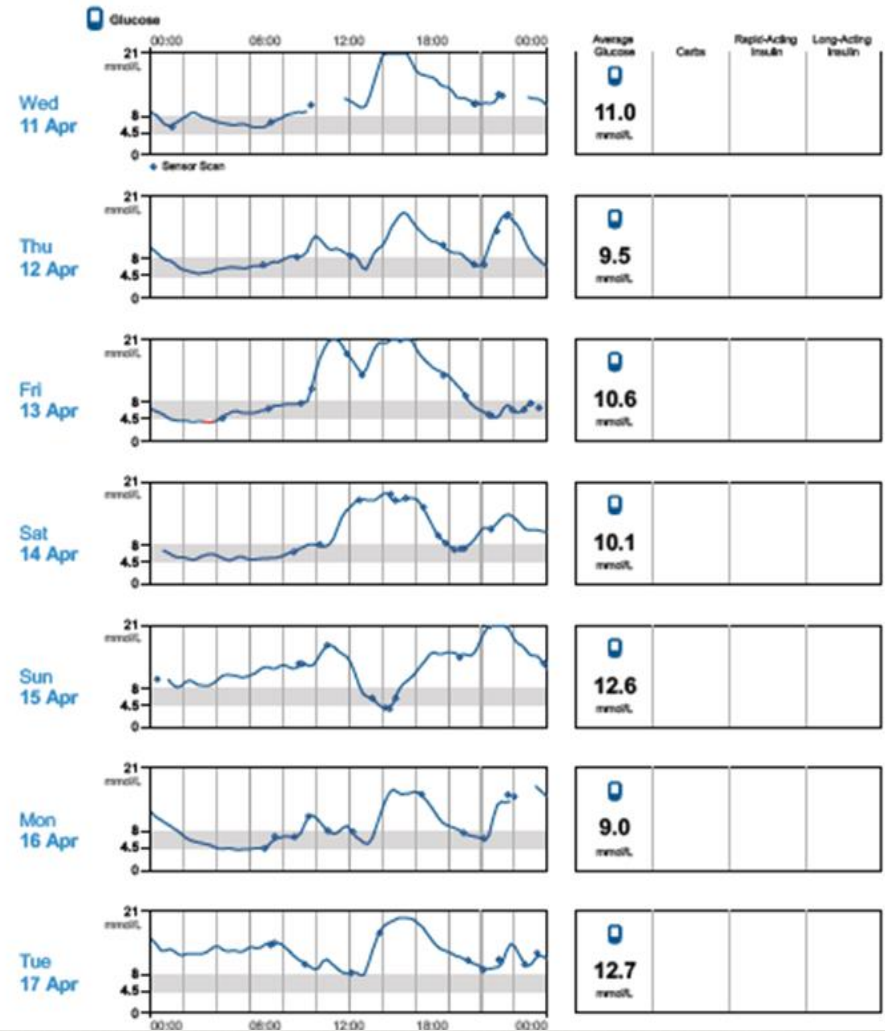
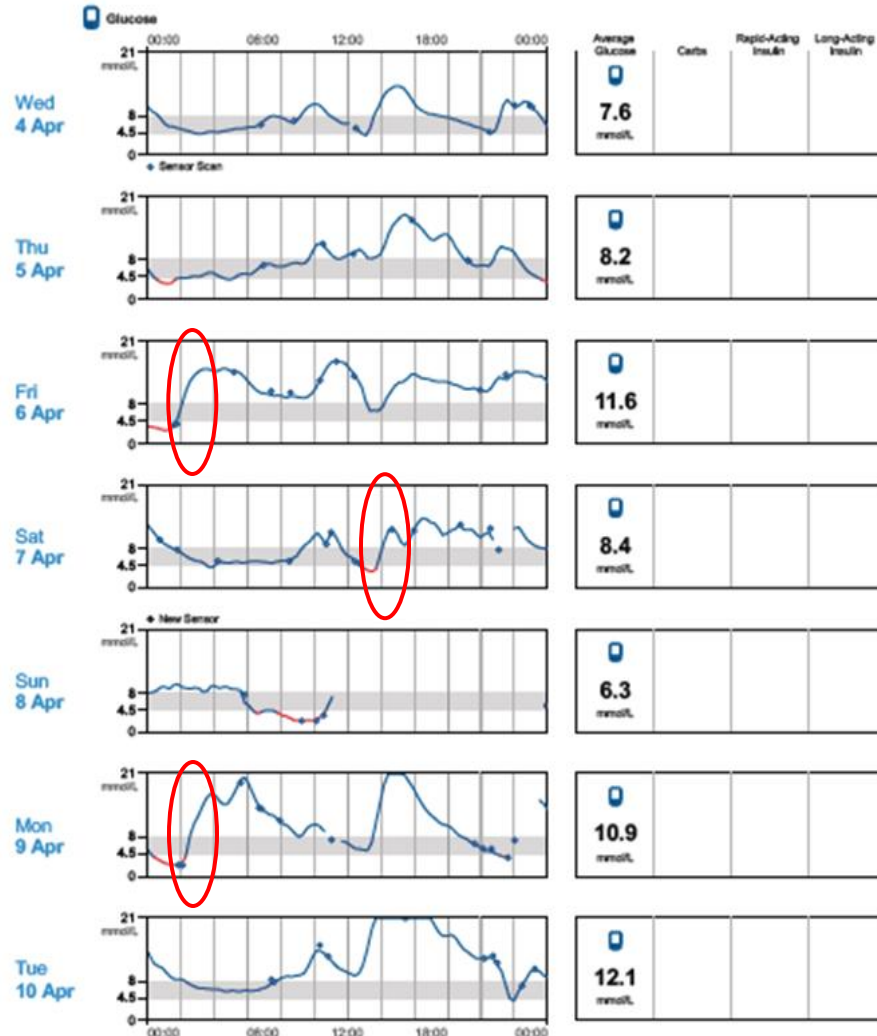
Baseline AGP



First Two Week



Two Weeks Prior to Appointment



Analysis



- 1) Suboptimal HbA1c
- 2) Hyperglycemia
 - ✧ Mostly in daytime , post meals
- 3) Hypoglycemia overnight from 1am-8am
- 4) Raised in BG after hypoglycemia on some of the days
- 5) Wide IDR
 - ✧ Large variability from day to day
 - ✧ Suggesting behavioral element is the key

Discussion



⌘ What changes did Mr. H do that leads to the improvement in HbA1c (from 9.3% to 8.6%)?

Snacking daily → Less snack/ CHO free snack

More conscious about food choice

Discussion



❧ Diabetes team analyzed the AGP together with patient and wife

❧ Problem identified:

- Did not perform CHO counting
- Has been injecting fix dosage of prandial insulin (10 unit TDS)
- Hypoglycemia 2-3 hours post bedtime correction
- Lack of confidence in adjusting insulin dosage as he has forgotten the principle of dose adjustment for insulin
- Missed some of his prandial insulin, especially for lunch as he dine out for lunch
- Over treated hypoglycemia and leading to hyperglycemia
- Lipodystrophy seen at abdomen, re-use needle for 2-3 days
- Patient appeared lack of motivation for self diabetes management

Interventions

Holistic Approach

Patient & Wife

- Wife expressed her willingness to participate in Mr. H's diabetes care

Doctor

- Revised on principle of insulin dosage adjustment
- ↑ basal insulin to 20 unit
- ↑ prandial to 12 unit TDS
- Suggested to re-learn CHO counting
- Encouraged to continue with flash glucose monitoring

Dietitian

- Revised with Mr. H and taught wife on CHO counting
- Encouraged to have meal at home for breakfast and dinner. Wife can help in meal preparation and she is willing to help in the weighing of CHO if there is a need.

Diabetes Nurse Educator

- Motivated Mr. H to have better self management by exploring the barriers and his strength
- Advised on insulin adherence and insulin injection site rotation
- Advised on single use of insulin needle
- Revised on proper hypoglycemia management

3 months later...

Measured Hba1c 8.1%

Glucose

Estimated A1c 8.2% or 66 mmol/mol

AVERAGE GLUCOSE

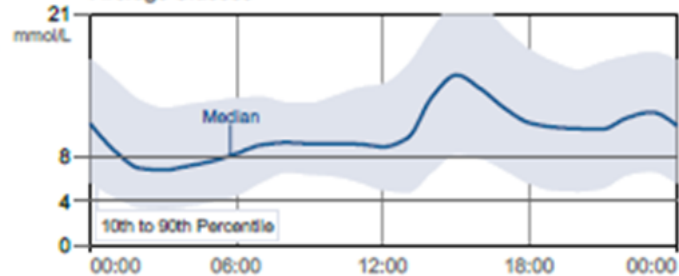
10.5 mmol/L

% above target 67 %

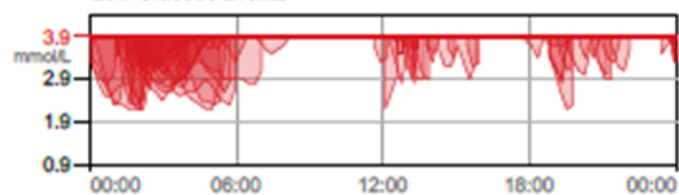
% in target 28 %

% below target 5 %

Average Glucose



Low-Glucose Events

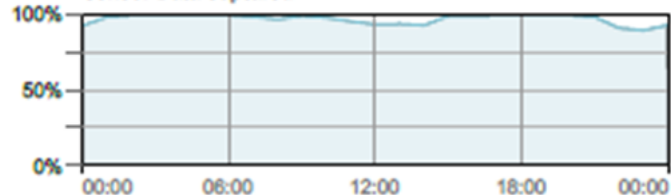


Sensor Usage

SENSOR DATA CAPTURED 98 %

Daily scans 15

Sensor Data Captured



Logged Carbs

DAILY CARBS

grams/day

Logged Insulin

Rapid-Acting Insulin

units/day

Long-Acting Insulin

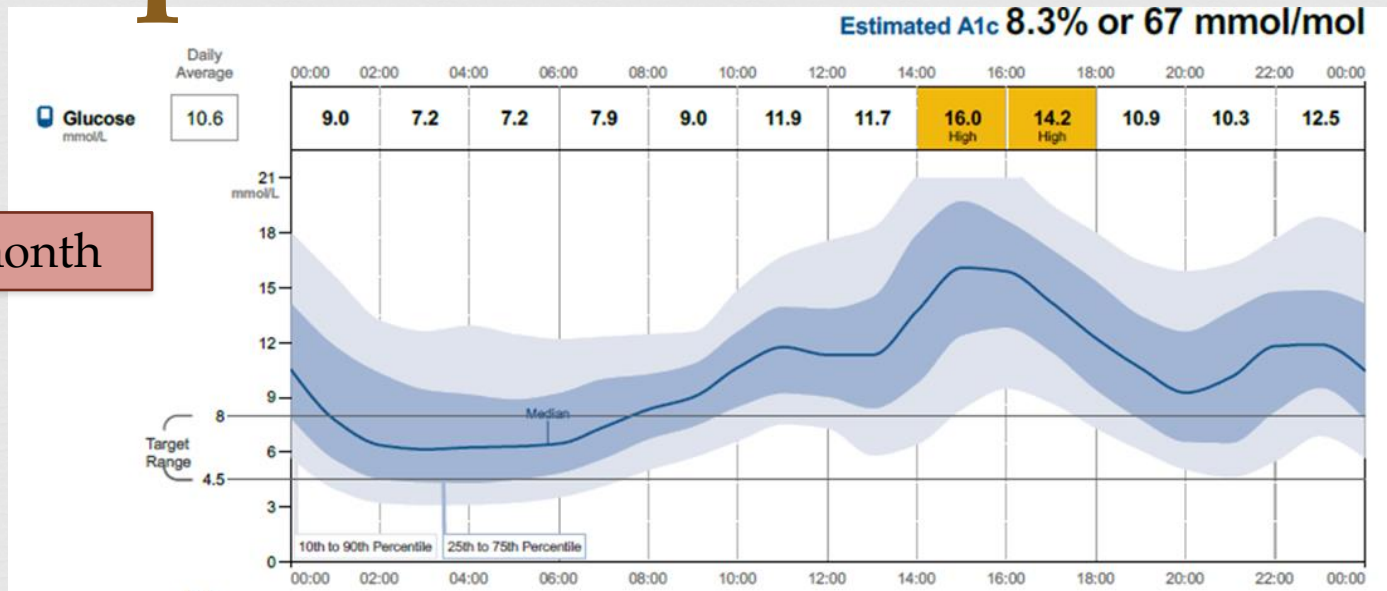
units/day

TOTAL DAILY INSULIN

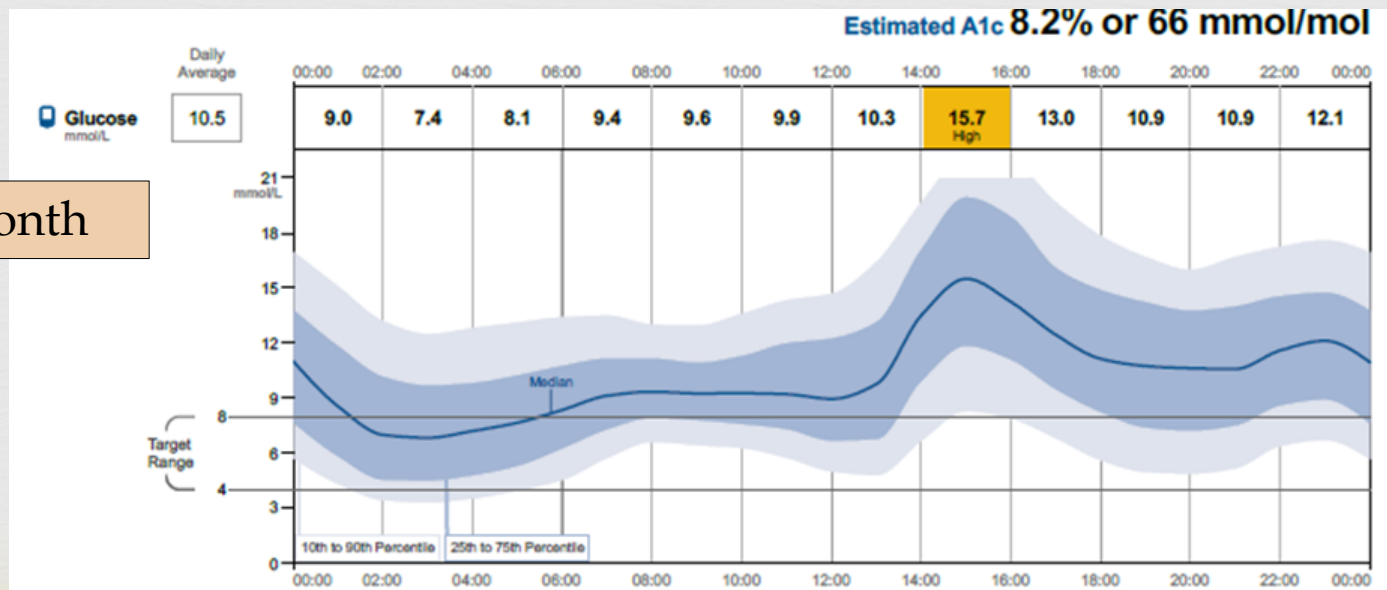
units/day

Comparison...

1st to 3rd month



4th to 6th month



Holistic Approach

Mr. H & Wife

- Better food choice
- Start to do some CHO counting 3 weeks prior to appointment
- Still missing some injection
- Motivated to achieve better control
- Showed some confidence in self management
- Wife remained supportive

Doctor

- Revised on principle of insulin dosage adjustment
- Encouraged to perform self adjustment on insulin dosage , ICR 1:10, ISF 1:3

Dietitian

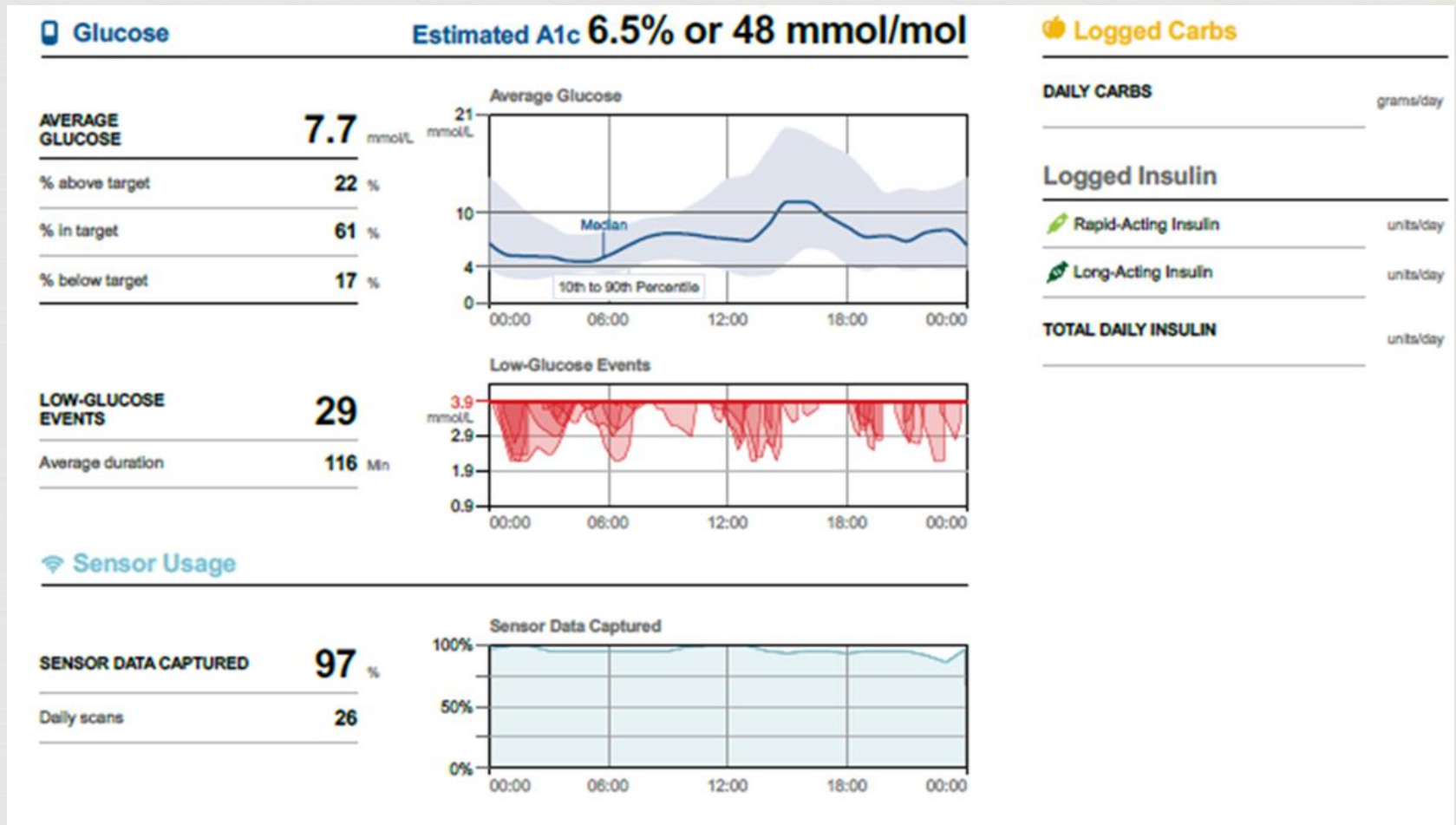
- Revised on CHO counting and provided encouragement

Diabetes Nurse Educator

- Encouraged Mr. H to cover all his meal /snack with prandial insulin
- Identified the barriers for pre-lunch insulin injection and discussed ways to overcome the barriers

Another 3 months later...

Measured Hba1c 7.3%



Logged Carbs

DAILY CARBS grams/day

Logged Insulin

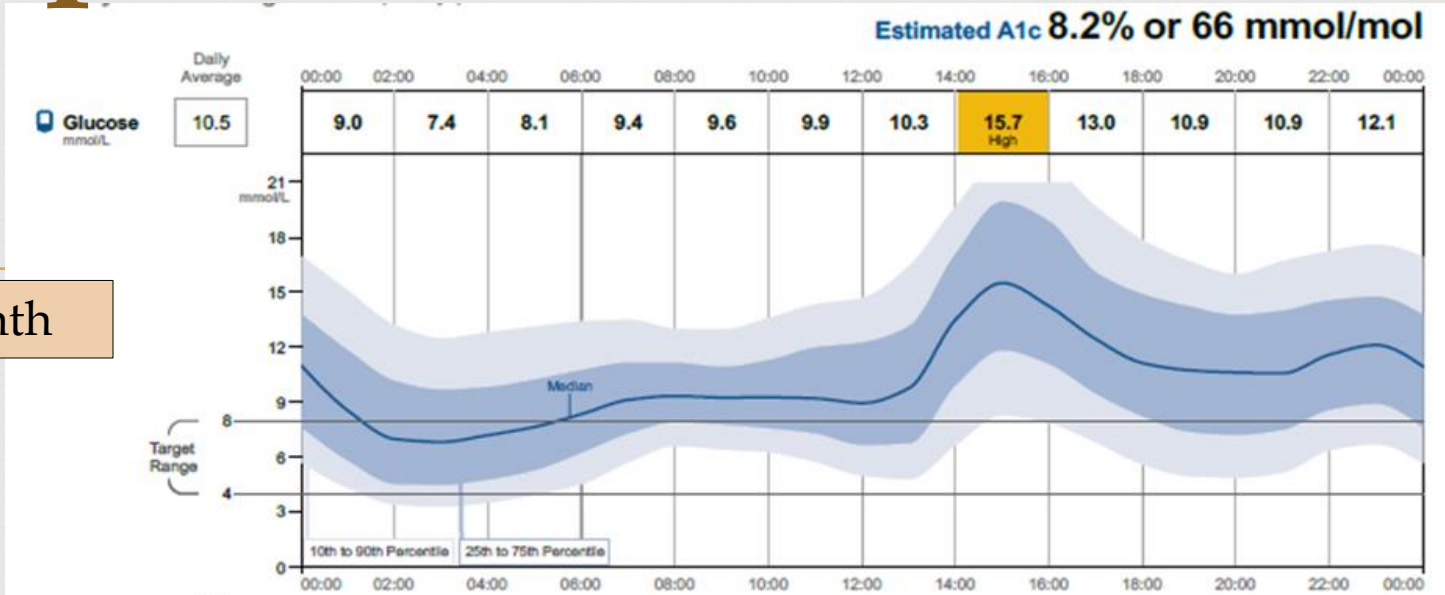
Rapid-Acting Insulin units/day

Long-Acting Insulin units/day

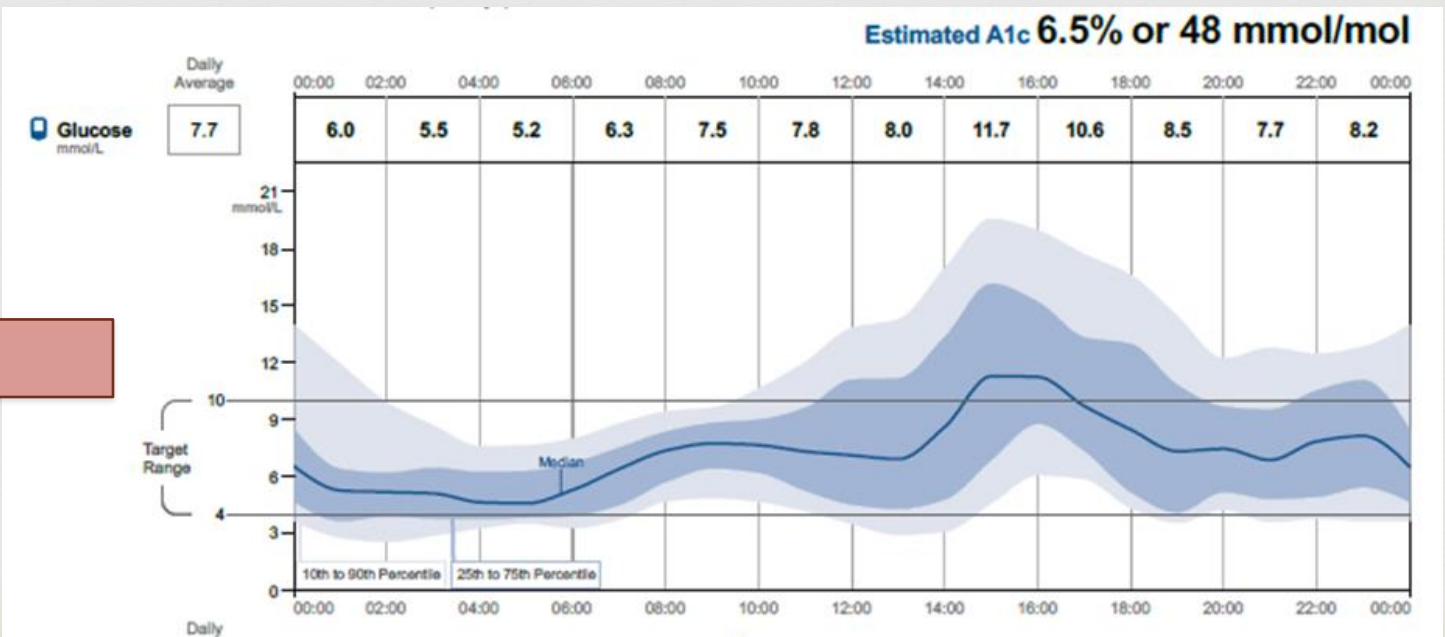
TOTAL DAILY INSULIN units/day

Comparison...

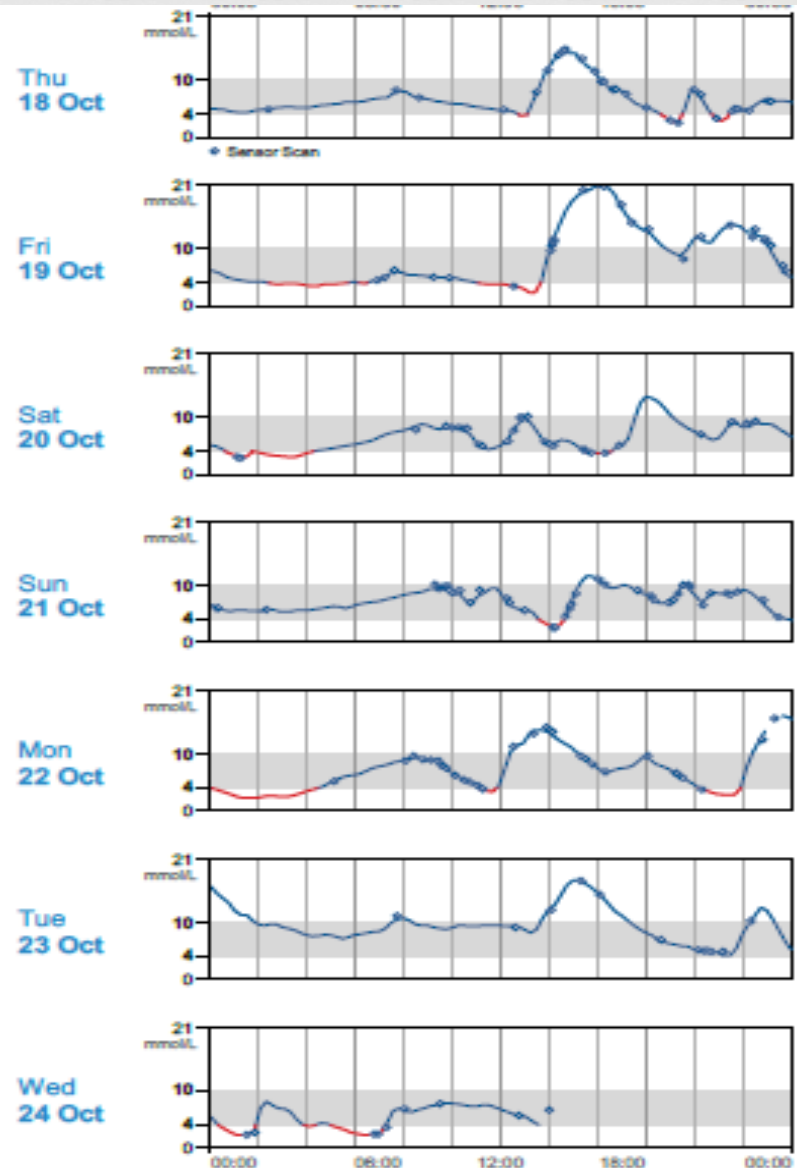
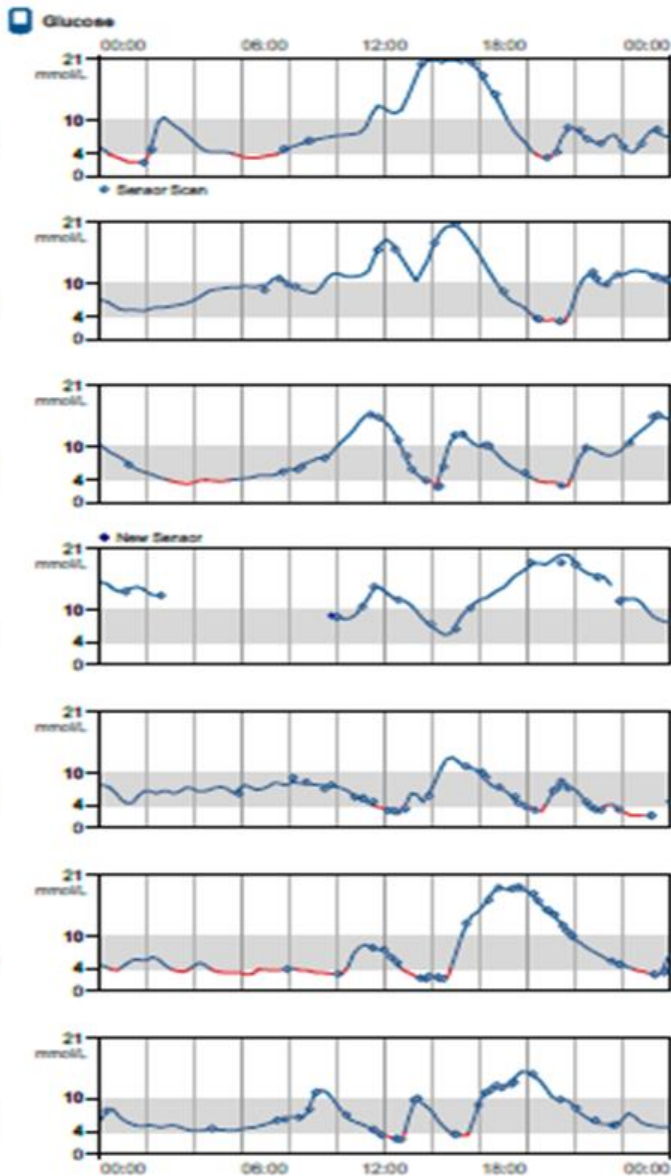
4th to 6th month



Latest AGP



Weekly Summary



Outcome of Intervention



- ❧ Glucose variability particularly accompanied by hypoglycemia may have a deleterious effect in worsening the prognosis for diabetic complications (Ceriello, 2010)
- ❧ Patient has gained awareness on the importance of maintain stability of glucose trend and minimize the variability thru self management with the collaboration of health care providers

Outcome of Intervention

Evaluation of FreeStyle Libre Flash Glucose Monitoring System on Glycemic Control, Health-Related Quality of Life, and Fear of Hypoglycemia in Patients with Type 1 Diabetes

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ABSTRACT

BACKGROUND/OBJECTIVES: In the current era of modern technology and the development of smart devices such as the flash glucose monitoring (FGM) systems, patients can easily monitor their glucose levels more frequently without any inconvenience. In this study, we evaluate the effect of FreeStyle Libre FGM system on glycemic control, hypoglycemia, health-related quality of life (QoL), and the fear of hypoglycemia (FOH) among children and young people with type 1 diabetes (T1D).

DESIGN AND METHODS: A prospective study was conducted at the Diabetes Treatment Center, Prince Sultan Military Medical City, Riyadh, Saudi Arabia, between January 2017 and May 2017 on 47 (aged 13-19 years) registered patients with T1D who used conventional finger-pricking method for self-testing the glucose. At baseline visit, the FGM sensors were placed on each participant by a trained diabetes educator. The data collected from the sensors were computed to generate the respective ambulatory glucose profiles so as to determine the total number of scans conducted during the study period. At the baseline and at 3 months of the experiment, a trained interviewer administered the questionnaire Hypoglycemia Fear Survey-Child Version (HFS-C) and PedsQL 3.0 (QoL questionnaire) to each patient. The age, sex, weight, height, adjusted body mass index, duration of diabetes, treatment modality, and glycosylated hemoglobin A_{1c} (HbA_{1c}) levels of each patient were recorded.

Conclusion



- ❧ Continuous glucose monitoring usage help people with diabetes to understand their glucose trend better
- ❧ This allow them to identify barrier , make appropriate adjustment in lifestyle and treatment regimen in order to achieve an optimal glucose control
- ❧ Continuous glucose monitoring usage with proper education and follow up can help people with diabetes to improve glycemic control and increase their confidence in self diabetes management
- ❧ Holistic approach that involved multidisciplinary team in diabetes management is also a key element to achieve sustainable good outcome

Reference



- Ceriello, A. (2010). Glycemic variability: a new therapeutic challenge in diabetes and the critical care setting. *Diabetic Med*, 27(8), 862-67.
- Danne et al. (2017). International consensus on use of continuous glucose monitoring. *Diabetes Care*, 40(1), 1631-1640.
- Hayek, A.A.A., Robert, A. A., & Dawish, M.A.A. (2017). Evaluation of freestyle libre glucose monitoring system on glycemic control, health-related quality of life, and fear of hypoglycemia in the patients with type 1 diabetes. *Clinical Medicine Insights: Endocrinology and Diabetes*, 10, 1-6.