Minimum Glucose of the Day in People with Type 2 Diabetes on Long-acting insulin

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BACKGROUND

- Morning fasting glucose (FG) monitoring using traditional fingerstick measurements remains the standard practice for adjusting long-acting insulin (LAI) doses. Main objective of LAI dose adjustments is to gradually and safely lower FG levels while minimizing the risk of hypoglycemia. Since FG levels in the morning are often assumed to be the lowest of the day, titrating LAI based on these levels has been thought to reduce the risk of hypoglycemia throughout the day.
- However, various factors such as the Dawn phenomena, Somogyi effect, concurrent medications, nighttime snacks, and physical activity can influence FG levels, potentially shifting the minimum glucose point to other times, including overnight or during the day. As a result, relying solely on morning FG measurements may overlook episodes of hypoglycemia at other times, and adjusting LAI doses based only on morning FG could inadvertently increase the risk of hypoglycemia.
- Continuous Glucose Monitoring (CGM) offers a more comprehensive view of glucose trends by identifying true minimum glucose levels across the entire day and night. This broader perspective can enhance the safety and effectiveness of LAI therapy by informing more precise and individualized dose adjustments.

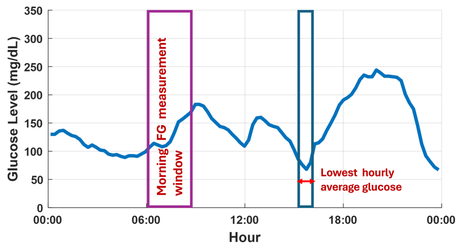
OBJECTIVE

- Determine the distribution of CGM-derived minimum glucose of the day (MGD) times in the real-world data.

METHODS

- De-identified glucose data from FreeStyle Libre 2 (FSL2) CGM system from people with Type 2 diabetes (pwT2D) on LAI therapy were analyzed .
- MGD was defined as the lowest one-hour average glucose level derived from daily CGM data.
- The figure below shows a 24-hour CGM glucose profile where MGD occurs during non-fasting hours.

Figure 1. CGM glucose profile

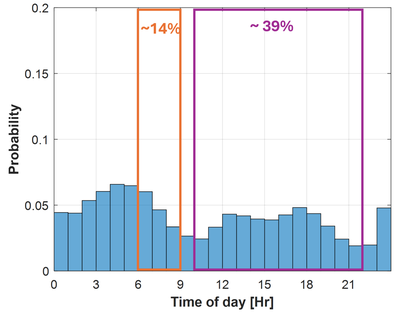


- To ensure data sufficiency, only days with at least 70% CGM data coverage were included. For each user, 15 days with valid MGD values were randomly selected to standardize comparisons across the cohort.
- 3,137 pwT2D on LAI were identified.
- The distribution of MGD timings was analyzed to assess: (1) the frequency of daytime (10am - 10pm) MGD occurrences, (2) the probability of MGD events aligning with the typical self-monitoring window for morning FG (6am - 9am), and (3) the potential influence of oral medications (sulfonylurea (SU) and meglitinide (Meg)) on the MGD timings.

RESULTS

- Analysis of the MGD timings (figure 2) showed that:
  - 39% of the MGD events occurred during the daytime.
  - About 14% of the MGD events occurred during the typical self-monitoring window for morning FG.

Figure 2. Distribution of MGD timings



- The distribution of MGD timings remained similar in the cohort on SU and/or Meg (901 subjects) with similar patterns observed on both medication and non-medication days (table 1).

Table 1. Daytime frequency of MGD in SU/Meg cohort

Cohort	Daytime MDG frequency
All subjects (N = 3137)	39%
Subjects on SU/Meg (N = 901)	
• Days when SU/Meg was taken	39%
• Days when SU/Meg was not taken	38%

CONCLUSION

- While it is commonly believed that the lowest glucose of the day typically occurs during the morning fasting period for pwT2D on LAI therapy, our analysis revealed that a substantial number of MGDs occur during the daytime, regardless of the use of secretagogues.
- Using morning FG to titrate LAI can miss capturing the MGD. As a result, adjusting LAI doses solely on morning FG may increase the risk of hypoglycemia.
- MGD may be identified using CGM and may be considered for LAI dose adjustments.

CGM can provide a tool for identifying minimum glucose of the day, which may be used to titrate long-acting insulin .

REFERENCES

- Tinna B Aradóttir, Henrik Bengtsson, Morten L Jensen, Niels K Poulsen, Dimitri Boiroux , Lea L Jensen, Signe Schmidt, Kirsten Nørgaard, “Feasibility of a New Approach to Initiate Insulin in Type 2 Diabetes”, Clin Diabetes 14 October 2022; 40 (4): 489–497.

DISCLOSURE

This study was funded by Abbott Diabetes Care. The authors are employees of Abbott Diabetes Care.

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