

BACKGROUND

- Continuous glucose monitoring (CGM) use has demonstrated improved glucose control.
- Greater engagement (scanning frequency) with CGM is associated with greater glucose control.¹
- More recently, Novopen 6, which records insulin dosing, was integrated with LibreView allowing CGM and insulin dose data into the same electronic database.²

Objectives:

- This study aims to examine the relative impacts of CGM engagement (scans / day) and insulin engagement (boluses / day) on CGM Metrics

METHODS

- Sensor glucose and integrated insulin pen data were collected from LibreView users during the period of March – June 2023.
- Users' most recent sensor with both glucose and rapid acting doses logged on at least 10 wear days were selected to allow representative analysis
- CGM engagement was categorized as low, medium, and high based on <8, 8-15, and >15 daily scans
- Insulin engagement was categorized as low, medium, and high based on <3, 3-7, and >7 daily bolus doses
- Mean time-in-range 70-180 mg/dL (TIR) and time-above-range 180 mg/dL (TA180), as well as median time-below-range 70 mg/dL (TB70) were evaluated for each of the 9 analyzed groups.

RESULTS

- A total of 277,197 bolus doses spanning 152.2 patient years of data were analyzed for 4,082 users.
- The average amount of data analyzed for each user was 13.6 days of sensor data
- The 25th percentile, median, and 75th percentile of daily scans were 6.9, 10.3, and 15.4 daily scans, respectively.
- The 25th percentile, median, and 75th percentile of bolus dose frequency were 3.2, 4.6, and 6.8 bolus/day, respectively.

Figure 1. Association Between TIR and Scan Frequency

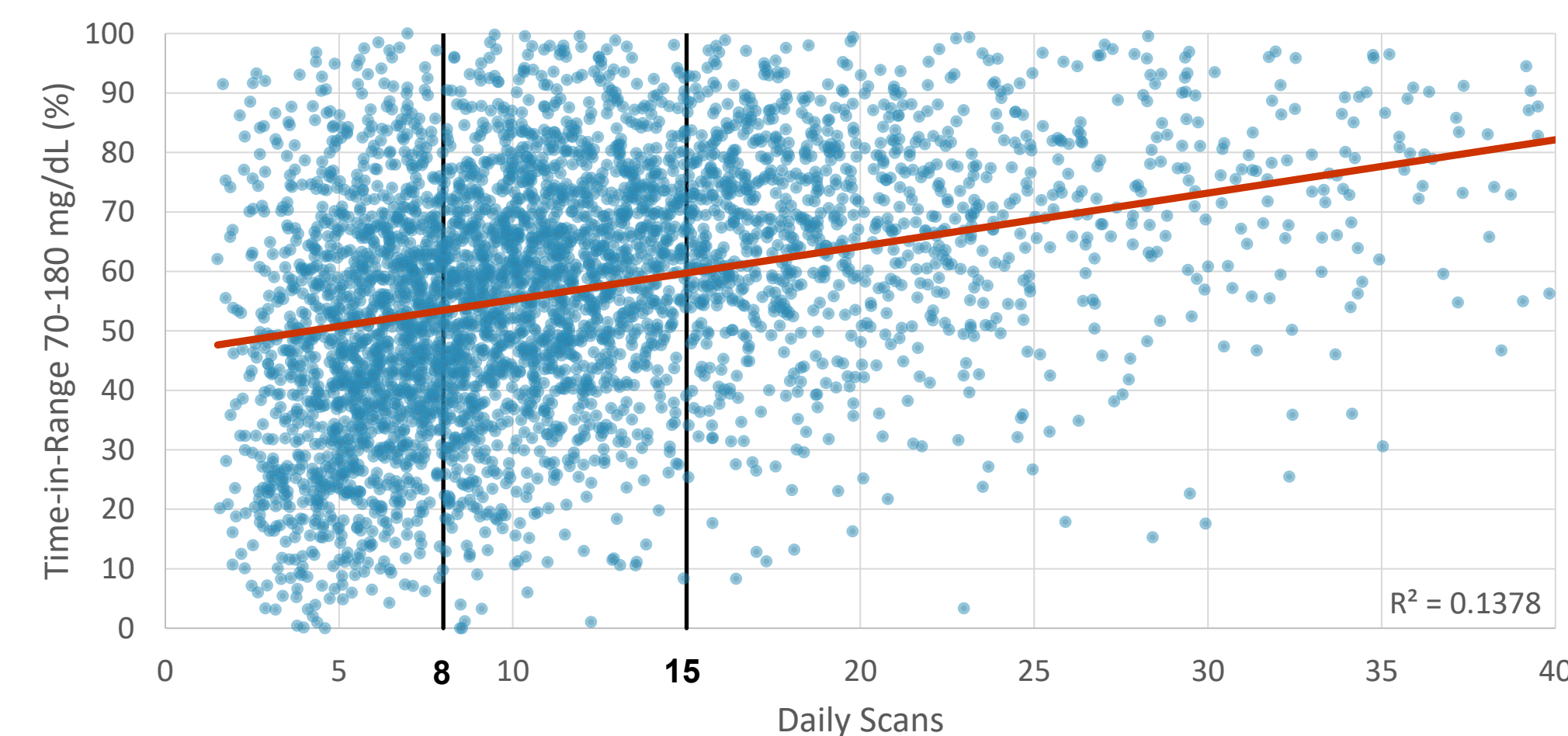


Figure shows each user's scan frequency (x-axis) and TIR (y-axis). The Spearman Correlation Coefficient for this association is 0.43. Darker areas demonstrate a high density of observations (greater occurrence). Plot excludes outlier scan frequencies above 40 daily scans.

Table 1. Sample Size and Proportion of Selected User Segments

User Count	<8 Daily Scans	8-15 Daily Scans	>15 Daily Scans
<3 Daily Bolus	372 (9.1%)	303 (7.4%)	140 (3.4%)
3-7 Daily Bolus	810 (19.8%)	943 (23.1%)	579 (14.2%)
>7 Daily Bolus	187 (4.6%)	392 (9.6%)	356 (8.7%)

Table shows sample size and proportion of total, for each of the engagement categories. Lighter-colored cells indicate a higher count.

Table 2. Mean Time-in-Range 70-180 mg/dL (%)

TIR	<8 Daily Scans	8-15 Daily Scans	>15 Daily Scans
<3 Daily Bolus	45.9%	59.6%	69.8%
3-7 Daily Bolus	47.9%	57.6%	68.6%
>7 Daily Bolus	49.6%	58.6%	67.9%

Table shows mean TIR for each of the engagement categories. Darker-colored cells indicate greater time in range 70-180 mg/dL.

Table 3. Median Time-Below-Range 70 mg/dL (%)

TB70	<8 Daily Scans	8-15 Daily Scans	>15 Daily Scans
<3 Daily Bolus	1.6%	1.7%	1.3%
3-7 Daily Bolus	1.8%	1.8%	1.8%
>7 Daily Bolus	1.9%	2.0%	1.5%

Table shows median TB70 for each of the engagement categories. Darker-colored cells indicate greater time in hypoglycemia.

Table 4. Mean Time-Above-Range 180 mg/dL (%)

TA180	<8 Daily Scans	8-15 Daily Scans	>15 Daily Scans
<3 Daily Bolus	51.1%	37.4%	28.1%
3-7 Daily Bolus	49.1%	39.4%	28.5%
>7 Daily Bolus	47.5%	38.4%	29.5%

Table shows mean TA180 for each of the engagement categories. Darker-colored cells indicate greater time in hyperglycemia.

Figure 2. Association Between TIR and Bolus Frequency

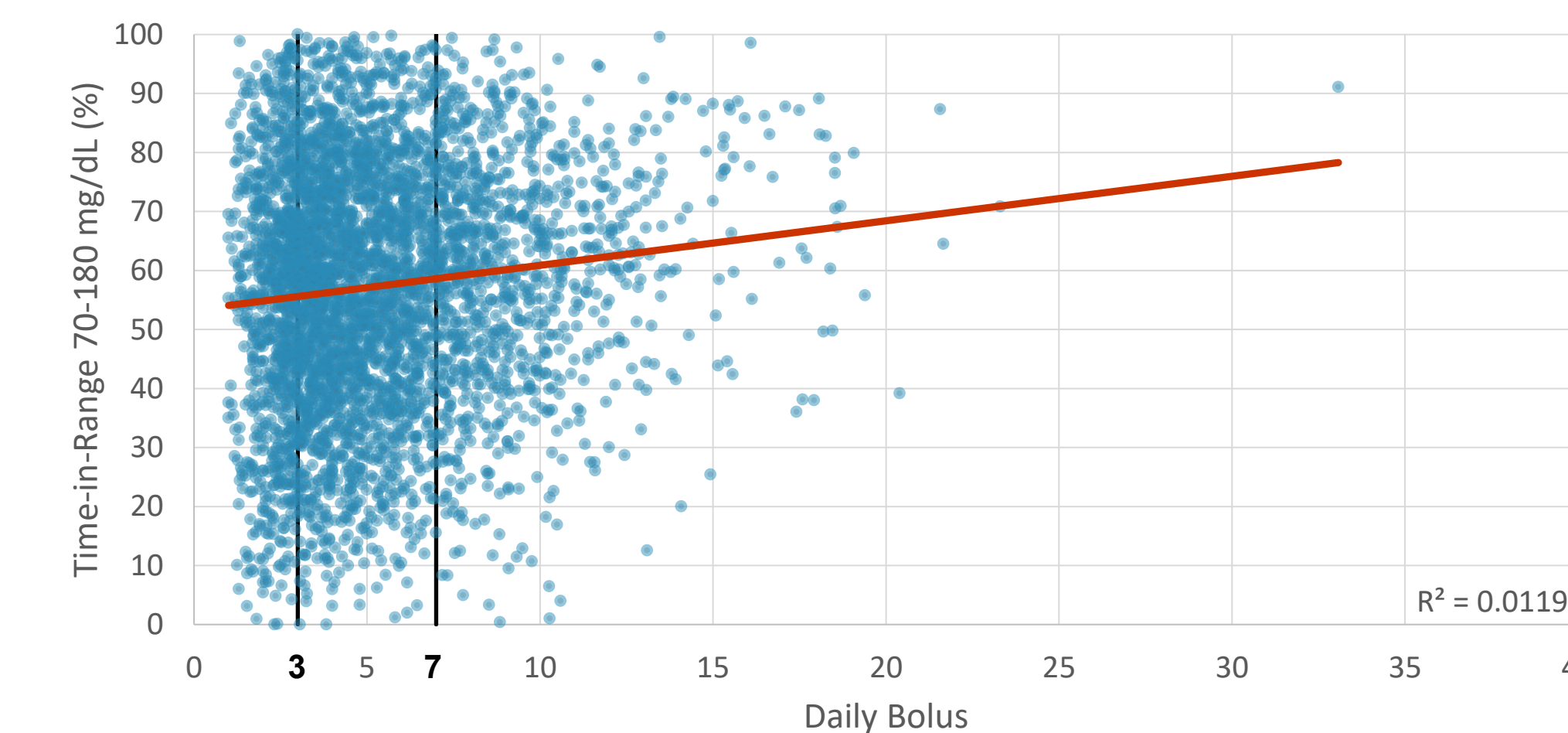


Figure shows each user's bolus frequency (x-axis) and TIR (y-axis). The Spearman Correlation Coefficient for this association is 0.09. Darker areas demonstrate a high density of observations (greater occurrence).

DISCUSSION

- Median scans per day were 10.3 and median bolus per day was 4.6;
- In this large sample of over 4,000 people, time-below-range was reassuringly low, generally below 2%, although it appeared to be slightly higher for a higher bolus dose rate
- The relative frequencies of the user segments indicate a correlation between scan frequency and bolus frequency that may reflect engagement and education
- For the same number of bolus doses, increased scans are associated with up to a 15% increase in TIR, without an associated increase in time-below-range
- For the same number of scans, increasing the daily bolus number does not seem to improve time-in-range
- For those doing less frequent scans, increasing the bolus doses per day increased time in range by ~4%, but in those with more than 15 daily scans, increasing bolus doses reduced time-in-range by ~2%

CONCLUSIONS

- Increased engagement with CGM has a greater impact on glucose control than does more frequent boluses
- This may represent behavioral modifications based on CGM data, or greater anxiety or concern around long-term diabetes outcomes.
- For the same insulin dosage, increased CGM use can support improved glucose control

References:

1. Dunn T, Xu Y, Hayter G, Ajjan R. Real-world flash glucose monitoring patterns and associations between self-monitoring frequency and glycaemic measures: A European analysis of over 60 million glucose tests. *Diabetes Research and Clinical Practice*. Volume 137, 2018, Pages 37-46. doi: <https://doi.org/10.1016/j.diabres.2017.12.015>.
2. "Abbott Launches New Integrated Digital Solution for People with Diabetes in the UK." *Abbott.co.uk*, 20 Nov. 2022. Accessed 10 Jan. 2024.

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