Getting the most out of uploaded glucose data

Maggie McDonald
Diabetes Specialist Nurse
West Hampshire Community Diabetes Service
1. Fear of Flying
2. Public Speaking
3. Fear of Heights
4. The Dark
5. Intimacy
8. Rejection
9. Fear of Spiders
10. Commitment!
6. Fear of Death
7. Fear of Failure
What fears do you have?
What fears do the people with diabetes have?

“Let’s discuss this fear you have of technology.”
West Hampshire Community Diabetes Service
Our aim: West Hampshire Community Diabetes Service

To ensure all people with diabetes have **access** to excellent skills and knowledge so they can **achieve** their individual goals and become **active** participants in their care whenever possible.
Aims:

- Inspire you to review glucose data with your patients
- 4 – STEP guide to reviewing AGP
- Signpost to further learning resources
How do we monitor glucose levels in diabetes?

HbA1c
How sugary your red cells got in 3 months

Blood glucose
What’s happening now

Time in Range (TIR) & glucose goals achieved

Flash glucose monitoring
Interstitial glucose plus trend with element of continuous glucose monitoring

OUR VALUES
Patients & people first
Partnership
Respect
Three key aims of flash glucose/CGM monitoring

- Improve glucose levels
- Limit glucose variability
- Avoid hypoglycaemia

Better outcomes for patients

Our values:
- Patients & people first
- Partnership
- Respect
Review of results from patients using Freestyle Libre device under NHS funding

Since NHS funding for the Libre device became available in 2018, 31 WHCDS patients have used Libre for at least 6 months.

- 13 (42%) were male and 18 (58%) were female, with an average age of 47 years (range 22 to 79 years)

- 27 (87%) of these people have attended formal type 1 education (one of the criteria for accessing this technology)
The average HbA1c among these people fell from 64 mmol/mol at baseline to 59 mmol/mol after 6 months of using Libre.
Reviewing glucose data in your diabetes clinic
Freestyle Libre Reader

- Daily Patterns (mmol/L)
- Time In Target
- Average Glucose

Value: 6.6 mmol/L
Abbott Freestyle Libre

Snapshot
25 May 2017 - 7 June 29 (14 Days)

**Glucose**

- **Average Glucose**: 9.5 mmol/L
  - % above target: 43%
  - % in target: 57%
  - % below target: 9%

- **Low Glucose Events**: 12
  - Average duration: 122 mins

**Sensor Usage**

- **Sensor Data Captured**: 100%
  - Daily score: 27

**Estimated A1c**: 7.6% ± 0.6%

**LibreView**

DAILY CARBS

- Insulin
  - Rapid-Acting Insulin
    - U400
      - User Change
        - Manual
  - Long-Acting Insulin
    - U100

**Comments**

- Cags found in the insulin data. 14 days in
  This reporting period have no recorded insulin
  events.
- Cags found in food data. 14 days in this
  reporting period have no recorded food
  events.

Patients & people first

Partnership

Respect
Glucose Pattern Insights
12 January 2014 - 24 January 2014 (15 days)
LOW-GLUCOSE ALLOWANCE SETTING: Medium
MEDIAN GOALSETTING: 8.6 mmol/L (A1c: 7.0% or 53 mmol/mol)

Estimated A1c 6.2% or 44 mmol/mol

10th to 90th Percentile

25th to 75th Percentile

Low Threshold (2.9)

Median Goal (8.6)

Likelihood of Low Glucose

Medicine

Median Glucose (compared with goal)

Visiability Below Median (median 10 10th percentile)

Variability Below Median I High!
This makes it difficult to achieve the median glucose without increasing the likelihood of low glucose.
Median Line

- $2 + 3 + 4 + 6 + 15 = 30/5 = 6$
- Mean is 6
- Median is 4

- The effect of using a median means that outliers have less of an effect
Weekly Summary

Libre View
Ambulatory Glucose Profile (AGP)

12 September 2014 - 20 September 2014 (9 days)

Estimated A1c 7.5% or 58 mmol/mol

Glucose mmol/L

<table>
<thead>
<tr>
<th>00:00</th>
<th>02:00</th>
<th>04:00</th>
<th>06:00</th>
<th>08:00</th>
<th>10:00</th>
<th>12:00</th>
<th>14:00</th>
<th>16:00</th>
<th>18:00</th>
<th>20:00</th>
<th>22:00</th>
<th>00:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.3</td>
<td>13.4</td>
<td>12.5</td>
<td>9.2</td>
<td>7.4</td>
<td>7.1</td>
<td>7.7</td>
<td>8.9</td>
<td>9.2</td>
<td>9.8</td>
<td>8.8</td>
<td>6.3</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Target Range

25th to 75th Percentile

10th to 90th Percentile

Daily Average

Carbs (grams): 80
Rapid-Acting Insulin units: 9.0
Long-Acting Insulin units:
Ambulatory Glucose Profile
AGP 4 step guide Step 1 – Positive
AGP – 4 step guide Step 2
Low - hypoglycaemia
AGP – 4 step guide Step 3
High - hyperglycaemia

- **Glucose**
  - **Average Glucose**: 17.0 mmol/L
  - % above target: 81%
  - % in target: 17%
  - % below target: 2%
  - **Low Glucose Events**: 3
  - Average duration: 167 mins

- **Sensor Usage**
  - **Sensor Data Captured**: 93%
  - Daily scans: 8

- **Daily Carbs**
  - **43 grams**

- **Insulin**
  - **Rapid Acting Insulin**: 11.0 units
  - **Long Acting Insulin**: 11.0 units

- **Notes**
  - Gaps found in insulin data: 12 days in this reporting period have no recorded insulin events.
  - Gaps found in food data: 13 days in this reporting period have no recorded food events.
AGP – 4 step guide    Step 4
Wide - thin snake or fat snake variability throughout day variability day to day
Case Studies
Practical Session
Glucose values summary (capillary glucose testing) April 2019

Average (mmol/L) 6.7
Median (mmol/L) 6.7
Highest value (mmol/L) 14.8
Lowest value (mmol/L) 2.0
Standard deviation (SD) 2.3
Values per day 10.1
Number of values 302
Values above goal (10 mmol/L) 25
Values within goal (4-10 mmol/L) 238
Values below goal (4 mmol/L) 39

Case 1 56 year old woman Type 1 diabetes 38 years HbA1c 47mmol/mol
Impaired hypo awareness
Severe hypo led to loss of driving license.
Basal bolus insulin regimen
Case 1: Now using Dexcom CGM (has alarm)
HbA1c 49mmol/mol  
Average glucose 8.3mmol/l  
CGM >10mmol/l 21%
CGM 4-10mmol/l 79%
CGM <4mmol/l 0%
Case 2
57 year old man
Type 1 diabetes
38 years
HbA1c 64mmol/mol
Basal bolus insulin regimen
2.5unit:10g
1 unit reduces 3 mmol/l.

<table>
<thead>
<tr>
<th>Glucose values summary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average (mmol/L)</td>
<td>10.4</td>
</tr>
<tr>
<td>Median (mmol/L)</td>
<td>9.6</td>
</tr>
<tr>
<td>Highest value (mmol/L)</td>
<td>25.5</td>
</tr>
<tr>
<td>Lowest value (mmol/L)</td>
<td>2.8</td>
</tr>
<tr>
<td>Standard deviation (SD)</td>
<td>4.8</td>
</tr>
<tr>
<td>Values per day</td>
<td>6.1</td>
</tr>
<tr>
<td>Number of values</td>
<td>183</td>
</tr>
<tr>
<td>Values above goal (10 mmol/L)</td>
<td>82</td>
</tr>
<tr>
<td>Values within goal (4-10 mmol/L)</td>
<td>87</td>
</tr>
<tr>
<td>Values below goal (4 mmol/L)</td>
<td>14</td>
</tr>
</tbody>
</table>

>10mmol/l  45%
4-10mmol/l 47%
<4mmol/l  8%
### Glucose Graph

The graph shows the range of glucose levels over a 24-hour period, with the median goal set at 8.6 mmol/L. The 25th to 75th percentile is indicated, and the 10th to 90th percentile is also marked.

#### Likelihood of Low Glucose

- Morning: 
- Afternoon: 
- Evening: 
- Night: 

#### Median Glucose Compared to Goal

- Morning: OK
- Afternoon: 
- Evening: 
- Night: OK

#### Variability Below Median

The median to 10th percentile is highlighted, indicating variability below the median.

#### Variability Below Median is High

This makes it difficult to achieve the median glucose goal without increasing the likelihood of low glucose.

Factors that could contribute to variability below median:

- Erratic diet
- Incorrect or missed medication
- Alcohol consumption
- Variations in activity level
- Illness

#### Settings

- Low Glucose Allowance Setting: Medium
- Median Goal: 8.6 mmol/L (A1c: 7.0%, or 53 mmol/mol)

#### Legend

- OK
- Low
- Moderate
- High
- Meal
- Bedtime
Case 2
57 year old man Type 1 diabetes 38 years
HbA1c 64mmol/mol
Basal bolus insulin regimen
2.5 unit: 10g
1 unit – 3 mmol/l.

HbA1c reduced by 9 mmol/mol
October 2018 64 mmol/mol
April 2019 55 mmol/mol
Reduced test strip usage.

Average glucose 8.7 mmol/l
above 10 mmol/l 35%
4-10 mmol/l 58%
below <4 mmol/l 7%
sensor data captured 86%
daily scans 10
Aims:

- Inspire you to review glucose data with your patients

- 4 – STEP guide to reviewing AGP

- Signpost to further learning resources
Further learning

Association of British Clinical Diabetologists
https://abcd.care/resource/reviewing-data

Abbott Freestyle Academy
https://freestylediabetes.co.uk/health-care-professionals/education

Freestyle Libre Live Webinars – see website to register or watch webinars on demand
https://freestylediabetes.co.uk/health-care-professionals/HCPwebinars
Thank you for listening

Maggie McDonald
Maggie.mcdonald@southernhealth.nhs.uk
West Hampshire Community Diabetes Service
Fenwick LTC
Pikes Hill, Lyndhurst
SO43 7NG
03000030120
SHFT.diabetes@nhs.net