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Is T1-Diabetic Data Driving you and your Doc Crazy??

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James Hirsch in the book *Cheating Destiny, Living with Diabetes* wrote the following:

It's clear that many providers will never offer the care that diabetics need without significant financial incentives. The current system has failed because diabetes is a disease of detail. Patient failure has been researched and can be blamed on a host of factors. The time has come for the diabetic community to consider macro management perspectives with data mining capabilities to assist type 1 diabetes, T1D, in our quest to optimize the control of our condition and drastically reduce the manual and time consuming intensity of data collection. Charles Duhigg has written a book entitled, *The Power of Habit Why We Do What We Do in Life*. It is Duhigg's position that the basis for every habit consists of a cue, a routine and a reward. Well established behaviors can be hard to change. The book presents examples that the ability does exist to change our habits after we have diagnosed our habit(s). We can change habits for the better. The identification of rewards is important success factor. The ability does exist to view a video by Duhigg on this important topic.

The biggest challenge facing any T1D is the opportunity to have a restful night's sleep. We desire to retire with a normal blood glucose level and awaken with normal blood glucose levels. However, many T1D's find that sleep is froth with worries, concerns and fear of hypoglycemia. This position is supported by the surveys performed by the website Children with Diabetes. The undesirable episodes during sleep periods have two different descriptive diagnoses. One is a Somogyi effect and the second is a Dawn Phenomenon. An excellent description of the two diagnoses is available at the website dlife. As a *disease of detail*, what information could be retrieved and demonstrate the ability to minimize the effect of glycemic episodes during a period when the collection of data and our acumen is at the lowest point during a 24/7 period.

The author prepared a three minute video which was submitted to 2013 Diabetes Mine Patient Scholarship Program. The video was selected as a first runner-up. The video focused on the lack of integration and automation of diabetic equipment. The intensity and the size of that detail data was documented during the initial implementation of a Dexcom G4 Platinum continuous glucose meter, CGM. A rather serendipity effect, the author discovered a linkage between two sets of data fields. Currently, the specific pieces of equipment do not share data. One is data contained within an insulin pump and the second is the data output from the Dexcom Studio software. The linkage of the applicable data fields could facilitate the ability for T1D's to sleep through the night with normal glucose ranges. This has the benefit of a major current reward which keeps on giving.

This potential can lead to a greater utilization of diabetic management and software for the patient and the physician to maintain preventive actions and block the expression of undesired glycemic effects during sleep. What follows are four graphic presentation to support the finding of a specific data relationship to minimize hypoglycemic episodes (Figures 1-4).

To assist with this review the time period was reduced to a seven (7) day period for greater clarity and corresponds to the data in the video presentation. An important point is the fact that a sleep period of 6-8 hours represents 25-33% of a 24 hour day. What is interesting about the above graph is the stability of four nights with no indicated Somogyi or Dawn Phenomenon effect. The period 10:00 pm through 12:00 am indicate other waking hour factors preceding sleep.

This leads to a key question. How was this obtained during sleep periods with no indication of an episode Somogyi or Dawn Phenomenon effect? The three major variables for good management control of T1D are insulin, food and exercise. During a sleeping period only insulin is present. The flow of insulin is regulated by an insulin pump with assigned basal rate profiles. The numbers of detailed variables are reduced during a sleep period.

Does a detailed data relationship exist and can it be managed to reduce and minimize any glycemic effect? The comparison of the Daily Trends when linked to changes of the profiles of the basal rate flow during the sleeping can be viewed as a major component to reduce the diagnosis of any descriptive Glycemic effect. Basal profile rates were change three (3) times during the sleep period. Minimize Somogyi by decreased basal flows from 2:00 am through 5:00 am. Minimize Dawn Phenomenon by increased basal flows at 5:00 am.

Conclusion

This anecdotal report has demonstrated that the management of basal rate profiles is an important component to stabilize glucose control during a sleeping period. The reduction of sleeping and morning glycemic episodes after sleep cannot be understated. An additional thought for consideration is the possible combinations of Somogyi and Dawn Phenomenon issues with the current aid of a Dexcom Gr Platinum continuous glucose meter and Dexcom Studio software with the ability to retrieve the insulin pump basal rate flows.

- No graphic indication of either diagnosis.
- A graphic indication of a Somogyi effect.
- A graphic indication of a Dawn Phenomenon.
- A graphic indication of both effects.

Whether one is a non-diabetic or a T1D the importance of a restful night's sleep cannot be minimized. The approach presented in this report has the potential to reduce overnight hypoglycemic episodes, which is the greater of the two issues, and bring a greater comfort to T1D's. The analysis and changes to an individual's particular profile insulin pump basal rates should be done in counsel with our diabetic medical team on a regular basis to determine the specifics of our particular challenges. The insight reported could be introduced into a revised study regarding the utilization of continual glucose meters and the addition of the monitoring of insulin pump basal rates to reduce hypoglycemic episodes.

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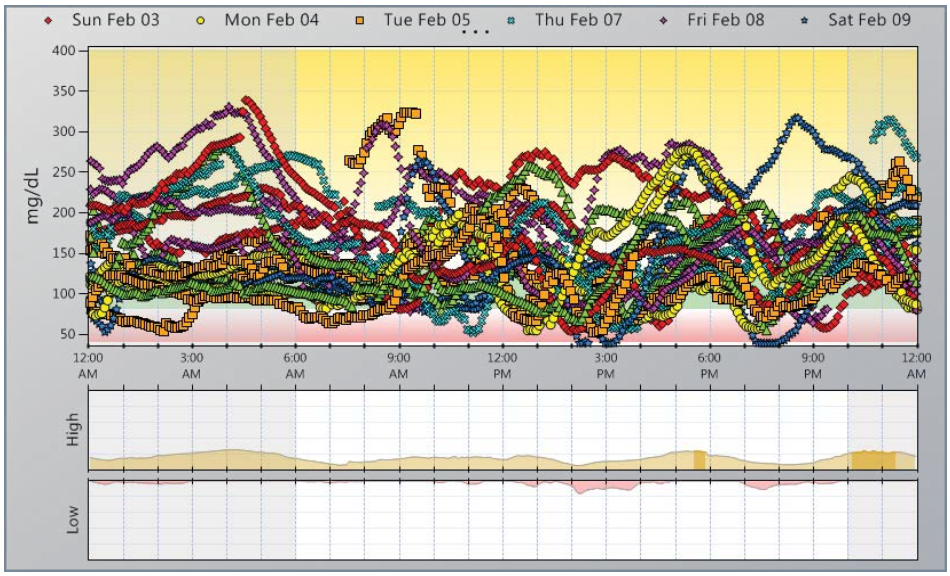

Statistics	
Average Glucose	150 mg/dL
Sensor Usage	24 of 30 Days
Calibrations / day	7.5
Standard Deviation	± 54 mg/dL
	59 % High 35 % Target 6 % Low
Target Range	80 - 130 mg/dL
Nighttime	10:00 PM - 6:00 AM

Interpretation
This is a 30 day report from the Dexcom Software. The time period of 12:00 am Through 6:00 am indicates a Stability during the period of rest.

Note: See above graph for other patterns as well as review any individualized considerations.

Pattern Insights Summary		Some Possible Considerations
Nighttime Lows (0 Found)	No significant patterns detected	
Daytime Lows (0 Found)	No significant patterns detected	
Nighttime Highs (1 Found)	Most significant pattern of highs found between 10:05 PM and 11:25 PM	Adjustment to basal, dinner, or snack insulin Delayed absorption of high fat/protein dinner meal High bedtime glucose range; fear of

Figure 1: Graphic presentation to support the finding of a specific data relationship to minimize hypoglycemic episodes.

Daily Trends from Tuesday, January 29, 2013 to Wednesday, February 27, 2013.
With all days of the week. ## With times of the day Nighttime (>= 10:00 PM and <= 6:00 AM) ## With all glucose values.

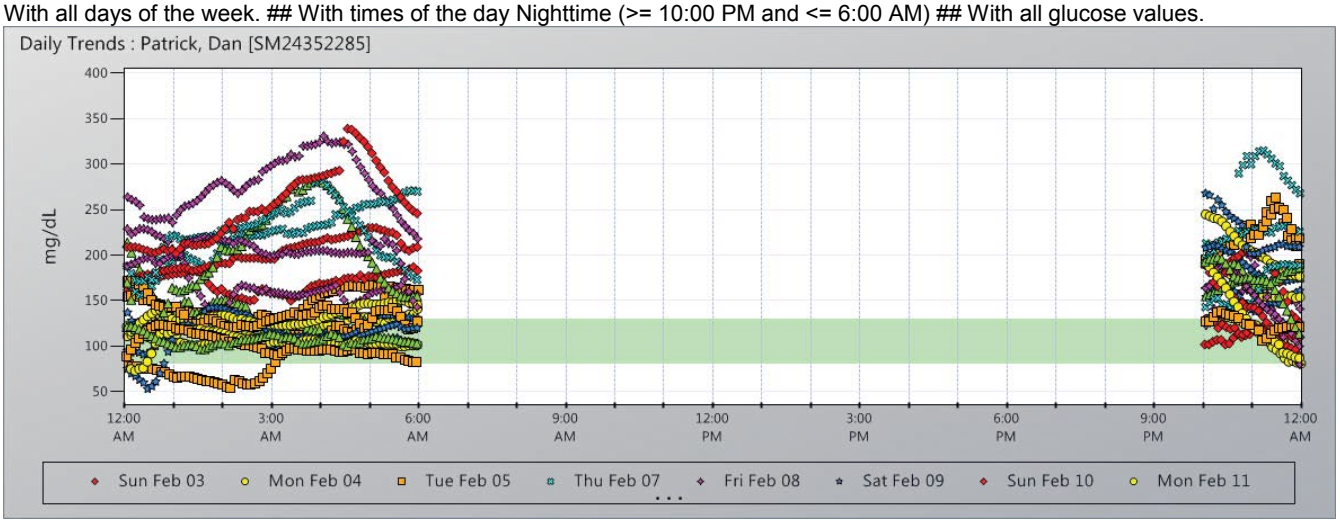

Figure 2: Graphical presentation of first cut into data mining, Daily trends from January 29, 2013 to February 27, 2013.

Daily Trends from Thursday, February 21, 2013 to Wednesday, February 27, 2013.
With all days of the week. ## With times of the day Nighttime (>= 10:00 PM and <= 6:00 AM) ## With all glucose values.

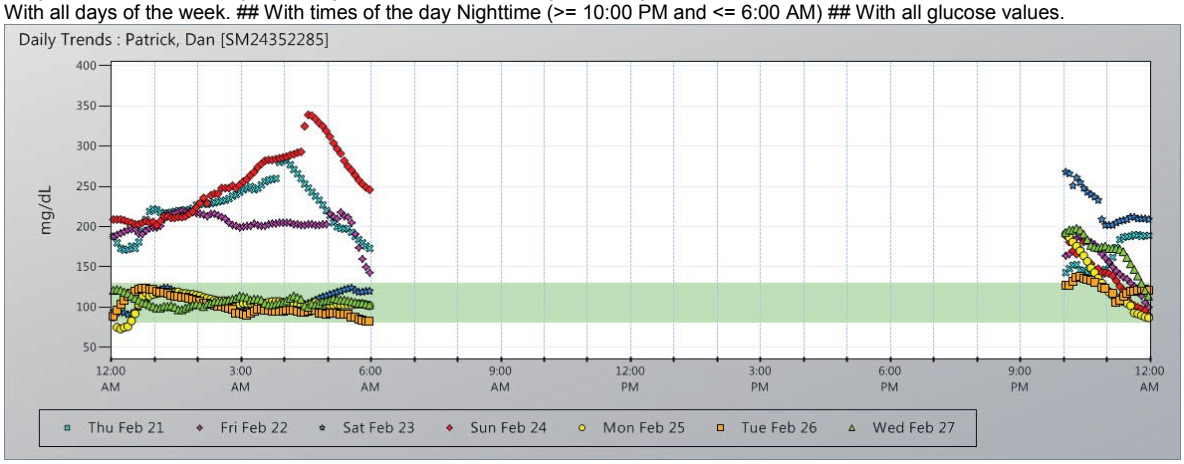

Figure 3: Graphical presentation, showing the daily trends for a week; February 21, 2013 to February 27, 2013.

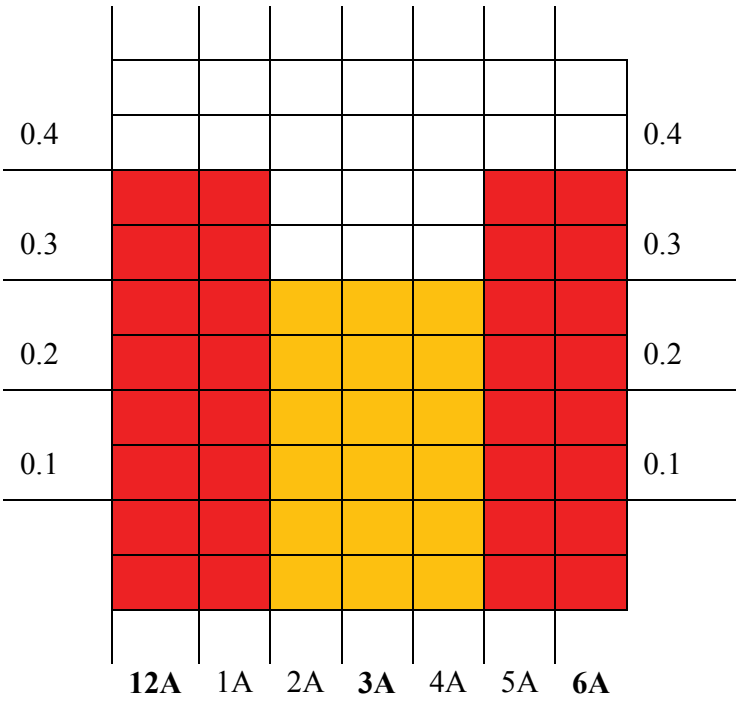

Figure 4: A graph of the pump insulin basal rates in units of insulin verse the time of day in hours.