**Analyzing the Effect of a Structured Daily Schedule on Blood Sugar Control for a Type 1 Diabetic**

**Introduction and Background**

There is a great deal of learning and daily struggle for a person dealing with Type 1 Diabetes. It can be particularly more challenging when going through body changes and the desire to fit in and be ‘normal’. Patients with diabetes are encouraged to meet with their endocrinologist on a quarterly basis to review their health and make needed corrections as they grow and as the disease progresses. Common adjustments needed include the insulin basal rate (the amount the body needs, even without food), the bolus amount (insulin to carbohydrate ratio), and the correction bolus rate (amount of insulin needed to lower a high blood sugar level). These adjustments also need to account for the time of day, as insulin needs vary based on time of day or night. In addition to all of this, a diabetic needs to be aware of the effects of exercise (or lack thereof), stress, hormonal changes, and sickness on their blood sugar levels.

As a parent of multiple diabetics, I have observed that often the lack of a structured daily schedule can hinder efforts for healthy blood sugar control. Access to food at all times of the day (and night), varying times for meals and inconsistent serving size and composition of nutritional makeup of a meal can all affect their blood sugar levels.

I have heard great advice from my son’s endocrinologists over the years and have also read many great articles from reliable sources about strategies for better blood glucose control. My own observations and perceptions about the benefit of a structured daily schedule and availability of too much junk food leads me to question if blood sugar control is better when the diabetic is in a school or at work environment versus when they are at home.

**Why it is important**

Having a good understanding of the effects of a structured schedule on blood sugar control will help my sons and our family to better plan and prepare our home environment to achieve that important control. This can also be used as a starting point for discussions with their endocrinologist for good strategies to improve their daily health habits. It may also help in clinical practice settings for other patients as they visit with their practitioners and jointly discuss ways to achieve better outcomes.

**What is already being done**

Most continuous blood sugar monitors do a pretty good job with alerting high and low blood sugar levels. They also can use the information from the monitor to create graphical time series graphs and detect patterns based on time of day. These are very useful to help in the understanding and correction of trends for those times of day experiencing high or low levels of blood glucose.

There are also great applications and ways to help diabetics understand the nutritional information in food products, especially in the grams of carbohydrate which is critical to the calculation of insulin needed. Individual serving sizes of common snacks is also helpful to maintain consistent portion sizes, which is important for understanding insulin needs.

**Objective and Hypothesis**

The objective of this project will be to determine if a consistent daily schedule has a positive impact on maintaining blood glucose levels. The hypothesis is percent of the time in the target blood glucose range is higher during the times of the day and days of the week when the diabetic is in school or at work versus the times away from school or work.

**Data Description**

The data for this analysis will come from the information uploaded from my son’s T-Slim insulin pumps over the period of the last 2-3 months.

The data contains the measurement of blood glucose levels every 5 minutes -- assuming the pump is operating as it should. The data also contains events associated with the delivery of insulin amounts at meal and bolus correction times.

**Methodology**

The data will need to have some categories built to create groupings used for the analysis. Identifying which days were school days and times of day in school (or work) is being held will be derived. It will also be important to perform exploratory statistics on the key variables to understand distributions and potential outliers and any missing data.

**Statistical tests and outcomes**

As the hypothesis can be expressed as either a continuous variable (percent of time in target range), or as a binary variable (in target range or not), there are at least a couple of different statistical tests I could perform on the data. I could try a paired t-test or z-test and could also do a Chi-squared test. It will be interesting to see the differences from those, or possibly other methods to test the hypothesis.

**Expected Outcomes**

I would like to see if there is a significant difference in blood glucose control on weekends versus weekdays and school hours versus evening hours. I expect there to be a fairly strong association as I feel like too often the weekend and evening hours are harder for them to maintain the same level of control they have while at school or work.

**Timeline**

I expect to be able to begin doing the exploratory analysis on the data during the first couple of weeks of February. Then work on the hypothesis in the later half of the month. In March I plan to do the write up of the findings and have it reviewed.

**References**

**https://www.mayoclinic.org/diseases-conditions/diabetes/in-depth/diabetes-management/art-20047963**

[**https://peaqmedical.com/daily-routines-for-managing-diabetes-a-step-by-step-guide/**](https://peaqmedical.com/daily-routines-for-managing-diabetes-a-step-by-step-guide/)

**https://www.tandemdiabetes.com/products/software-apps/mobile-apps**