



Insulin Wizard Smartphone App

The "Bolus Wizard®" and its imitators are a wonderful help for type 1 patients who use an insulin pump that includes one, but such Wizards could do more than just give bolus advice, and the benefit pump-based Wizards do provide is unavailable to those who administer Multiple Daily Injections (MDI) by insulin pen or syringe.

This smartphone app goes well beyond bolus advice to provide all the assistance type 1 patients need to manage their blood glucose: from establishing their true basal insulin dose and establishing their personal carb / glucose / insulin conversion factors, to evaluating each bolus / meal / snack after the fact. By testing BG a couple of hours after each bolus, users are advised how much carb the previous meal really contained, how much insulin they should have taken, and hence whether their bolus was high, low, or just right. The benefit: If low, they are told how big an insulin supplement to take, and if high, how much more carb to eat to keep hypoglycemia at bay (and even how much time they have before losing the mental capacity to do so). Using this strategy, users will come into the next meal or bedtime with normal glucose no matter what, enabling those for whom the cost of BG tests is an issue to avoid the usual BG test made before eating.

For those who do use a pump, it can do so automatically with pumps that

are controlled by a meter (such as Animas), inserting itself between the meter and the pump. For those on MDI, it can get the glucose from meters that communicate, or if not by manual entry.

Either way, it starts by leading users through the tricky process of establishing their true, fasting, basal insulin need. Pump users are advised which hour's basal rate to adjust for each hourly BG reading, and MDI users are advised how to adjust their basal dose, from insulin type to timing and amount, also based on BG readings throughout the day.

Once the true basal dose has been established, the app can help determine the bolus to give for meals with a built-in food database, while taking pre-meal BG (and any Bolus on Board) into account. And in a special feature for those on MDI; because it knows the not-quite-perfect MDI basal insulin profile, the app can adjust for that imperfection when it calculates mealtime bolus insulin, as well as the actual mealtime carb, bolus and supplemental insulin / carb values determined from the BG measured a couple of hours after the bolus, including the hypoglycemia prediction mentioned above.

The test-after-bolus control strategy facilitated by this app can thereby minimize high BG, both in degree and duration, which will ultimately be reflected in a reduced HbA1c. And it can do so entirely without hypoglycemia, thanks to its hypoglycemia prediction and consequent carb supplement timing and amount advice.

Moreover, because it knows both the insulin input and glucose output for the user's endocrine system over time, it can keep track of how well the internal models and parameters are working and adaptively optimize them continuously, thereby automatically tracking users even as they change in age, weight or fitness.

And because smartphones are really computers, it can display all that data in many ways: over any time interval, with modal day plots for weekday or weekend periods, or comparing results before and after exercise. For that matter, it can compute any other statistic desired, including an estimate of the user's expected HbA1c. And, of course, it can communicate all its data to the user's PC, as well as to physicians for further analysis.

Full technical details are available at synergistic.co/Diabetes.