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Data Driven Framework for Actionable Feedback in Insulin Management for Type 1 Diabetic Patients on Artificial Pancreas

With incidences of diabetes on the rise, maintaining glycemic control without increased risk of hypoglycemia is paramount. Closed loop blood glucose control systems (CLCs), e.g. the artificial pancreas, use continuous glucose monitors and an insulin pump to automatically administer insulin to maximize time in an acceptable glucose range (TiR). Despite advances in these CLCs, the average HbA1C level of Type 1 Diabetic (T1D) subjects is greater than 8%. Studies looking at the efficacy of these systems show poor control outcomes largely due to post prandial hyperglycemia and auto mode exits. Thus, customized configurations of control strategy are needed.

Researchers at Arizona State University and a colleague at Mayo Clinic Rochester were able to retrospectively look at and analyze one months' worth of data from 56 Type 1 Diabetics that use the Medtronic Minimed 670G system. From this analysis they developed a novel diagnostic architecture that is able to mine a whole host of medically relevant metrics from operational CLC data and provide actionable feedback for insulin dosage management. This architecture showed that TiR metrics may not be sufficient for insulin management.

This architecture provides finer individualized configuration of controllers for effective insulin management where TiR or other metrics may not be sufficient.

Potential Applications

- Insulin dosage management for T1D patients

Benefits and Advantages

- Individualized configuration of device produces most effective insulin management results
- Considers biochemical hypoglycemic events
- Finer individualized configuration of controllers is essential for effective insulin management where TiR metrics may not be sufficient

- Data science driven framework – mines relevant knowledge from input/output traces of CLC for glycemic control to provide actionable feedback

For more information about the inventor(s) and their research, please see

Dr. Gupta's departmental webpage

Dr. Kudva's Mayo webpage