1. Background

- Diabetes is a pervasive condition affecting around 26 million patients in the United States.
- The global prevalence of diabetes (among adults over 18 years) has risen from 4.7% in 1980 to 8.5% in 2014.
- Diabetes is predicted to be the seventh leading cause of death in 2030.

Texas A&M University at Qatar has partnered with local hospitals, Hamad and Sidra Hospital, to design a diabetic remote healthcare monitoring system that will transfer patients’ diagnostic metric data to an online server in real-time.

How is Diabetes Measured?

HbA1c

A common term used by doctors to give value to the mean blood glucose levels over three to four months.

Why is Hba1c significant?

- Most common form to measure diabetes
- Assist in predicting pre-diabetes and Type-2 diabetes
- Assist in preventing diabetes related complications

HbA1c can be miscalculated

1. Hemoglobin Variants
2. Insufficient glucose level measurements

2. Research Objectives

- Understand relationship between A1c and average glucose (AG)
- Analyze how the estimation error can be reduced

3. Current Implementation

Two Support Web and Mobile Applications were created.

Top functions include
- Support collaboration between patient and doctor
- Generate alarm if complexities occur
- Transfer glucose data to server via CGM

4. Benchmarking Methodologies and Findings

Available literature on estimating A1C do not form a general consensus.

Literature Review Performed

I. MEDLINE and COMPENDEX were searched

A1c Altering Factors Found

- Hemoglobin Variants
- Insufficient glucose level measurements
- Difference in time period frequency between AG measurements

Data/Information Associated Factors Found

- A1c has high prominence in diabetic metrics.
- Preference in data display formats (requiring consistent AG measurements).
- Past CGM platforms memory capacity limitations (eliminated with values transferred to server).

Prediction Altering Factors Found

- Depending on patient location AG measurements differ in frequency.
- Consistency in time period frequency between AG measurements is needed to have a precise graphical representation.

II. Endocrinologist Interviews

III. A Python code was created and used to estimate A1c

5. Work in Progress

Future work in the proposed model includes implementing machine learning methods to eliminate the glucometer used within CGM’s, making the model non-invasive. Additionally, the automatic migration of glucose data to an online server eliminates any CGM memory capacity constraints.

6. Conclusion

The A1c estimation may be improved by aggregating a database of Glucose readings with timestamps for each individual patient, removing case-specific variations. The application of machine learning methods can improve the accuracy of the estimated A1c and in turn CGM accuracy, facilitating immediate action and clinician involvement, when insulin levels are outside normal ranges (hypo/hyper glycemia).