Solution: **Watson Health**   Industry: **Healthcare**

Medtronic

A cognitive mobile assistant app helps with daily diabetes management

Diabetes dramatically impacts people's lives, and managing it successfully requires constant vigilance. Medtronic harnessed the IBM® Streams platform to help people manage their diabetes, building a mobile personal assistant app that facilitates diabetes management by providing actionable* glucose insights and predictions.

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Business challenge

With worldwide diagnoses of diabetes on the rise (external link), how can Medtronic help people with diabetes more easily monitor their condition and help them avoid severe and costly health complications?

Transformation

Medtronic and the IBM Watson Health® team built the Sugar.IQ with Watson[1] solution, a cognitive mobile personal assistant app that provides real-time actionable glucose insights and predictions.

Results

Predicts within a 1 – 4-hour window[2]

and with high accuracy if patients are at risk of low glucose excursions

~39 more minutes each day[3]

spent in a healthy glucose range by diabetes patients who used the app

Helps enable more informed decision-making

by patients around insulin management and diet

Business challenge story

Tackling a worldwide health epidemic

By 2040, the International Diabetes Federation anticipates that more than 642 million people will be living with diabetes (external link).

Pratik Agrawal, Director of Data Science & Informatics Innovation in the Diabetes Group at Medtronic, explains: "Type 1 diabetes is an autoimmune disorder where insulin production in the pancreas is inhibited, whereas type 2 diabetes inhibits the body's ability to effectively

metabolize glucose. Both conditions lead to glycemic variability. To avoid serious consequences, people with diabetes must regularly monitor their glucose levels and take action when necessary to maintain glucose control."

People with diabetes generally want to be able to manage their condition independently, and to live their lives to the fullest without risking a visit to the emergency room. With cases of both type 1 and type 2 diabetes rising, Medtronic recognized the need to create a new generation of glucose monitoring solutions that would give people the tools to help manage their diabetes more easily, in combination with routine support from healthcare professionals.

"Traditionally, Medtronic has provided systems such as continuous glucose monitors and insulin pumps, which are physical devices used predominantly by people on insulin therapy to monitor glucose levels and administer insulin directly to the body. We knew that if we could harness these devices and provide continuous feedback on individuals' glucose levels, the potential existed to support millions of people in the daily management of their condition," Agrawal says.

"The growing popularity of wearable technology also meant that all-important biometric data on diet, exercise, sleep and medication was becoming easier to capture," he continues. "The challenge was to gain actionable insight from this massive volume of data, and deliver it to users quickly enough for them to make appropriate decisions."

> **"The Sugar.IQ with Watson app gives people the insight to help manage their diabetes."**
>
> **— Pratik Agrawal, Director of Data Science & Informatics Innovation, Diabetes Group, Medtronic**

Transformation story

Insights to help reduce the burden of diabetes

To bring its new solution to market rapidly, Medtronic worked with the IBM Analytics and Watson Health teams to develop the Sugar.IQ with Watson solution, a cognitive mobile personal assistant app available exclusively with the Guardian Connect CGM (Continuous

Glucose Monitoring) system.[4] The Sugar.IQ with Watson app provides real-time actionable glucose insights and predictions for individuals with diabetes, helping to make daily diabetes management easier.

Agrawal says: "Without the right monitoring tools, people with diabetes are left in the dark. They struggle to reduce glucose variability because glucose levels depend on so many factors — medication and insulin intake, meal content, size and timing, activity type and intensity, sleep, stress, weather and location, among other factors. They can't always predict when they are heading towards a low glucose episode. The Sugar.IQ with Watson app can shine a light on these factors, helping them see their glucose in a contextually relevant setting.

"But it's not just about enlightening people about their current glucose status — we are also working on using IBM cognitive analytics to personalize these insights, based on each individual's behavior patterns and the history of their glucose levels.

"For example, we designed the solution so that it can process certain factors that affect each individual's personal glucose levels — food, sleep, stress and so on. The app helps users by letting them make more informed glucose-related decisions, for example by identifying patients' food choices or other habits in ways that tend to work better for them, so that they can live their lives to the fullest."

Amit Singh, IT Director of Digital Platforms at Medtronic, continues: "Before we started the development of the Sugar.IQ with Watson app, we correlated anonymized data from users' insulin pumps and glucose monitors with their history of hypoglycemic [low glucose level] episodes.

"To provide insights that can really help people with diabetes, we needed a way to generalize and personalize the model, and process data at real-time speed and scale," Singh explains. "Our insulin pumps send us data every 24 hours, and wearable continuous glucose monitors send data every 5 minutes, so we expected to have millions of data points to analyze."

Working with the Watson Health team, Medtronic designed an architecture that stores incoming medical device data in a staging area based on IBM Db2® data management software. The solution then passes the data into the security-rich Watson Health environment for analyzing health data and extracting cognitive insights, which are then relayed back to the Sugar.IQ with Watson app for the user.

Singh adds: "IBM Streams analyzes the data as it flows in from the devices, using predictive models to assess each person's current situation and the risk of their glucose levels falling outside safe thresholds. So, we can provide meaningful and personalized tools and insights and create awareness if the models detect significant patterns.

"We wouldn't have been able to make this project a reality without the technology and expertise of IBM. The IBM team delivered a truly end-to-end solution, including experience in design, cognitive computing, mobile app development and quality control."

Results story

Helping make daily diabetes management easier

With the Streams offering at the heart of the Sugar.IQ with Watson solution — and supported by a security-rich, purpose-built cloud from Watson Health — Medtronic and the Watson Health team developed an innovative cognitive mobile app for individuals with diabetes. It provides real-time actionable glucose insights and predictions to help make their daily diabetes management easier.

Agrawal says: "Teaming with IBM, we built a solution that we hope will enhance the lives of people with diabetes everywhere. For example, if a user logs that they are planning to eat a dish of pasta for lunch, our app should be able to combine data from similar meals in the past with current glucose levels, and inform the user whether that meal is likely to be a smart choice — helping them make an informed decision.* Many of our customers have told us that the pressure of continually self-testing* and anticipating the consequences of eating, exercising or sleeping can be a major source of stress. Our hope is that with the Sugar.IQ with Watson solution, they will be able to have much more confidence that they are in a stable condition, and that their lifestyle is keeping them on the right track."

The initial research dataset from Medtronic included data on 10,000 people with diabetes. More recent data revealed that people using the Sugar.IQ with Watson app spent 39 more minutes per day on average in a healthy glucose range compared with the time spent before they used the app. This included 35 minutes less time in high glucose ranges and 4 minutes less time in low glucose ranges, representing more than 9 additional days in a year that a person with diabetes is spending in a healthy glucose range.[3]

In addition, together with the Watson Health team, Medtronic recently launched the Sugar.IQ app's newest feature, the IQcast feature, which is built on AI and machine-learning

models. Demonstrating a high level of accuracy — as measured by Area Under the Curve (AUC)[2] — the models analyze multiple signals to assess when someone with diabetes has a low, medium or high risk of experiencing a low glucose event within an upcoming 1 – 4-hour window. The degree of predictive accuracy that the IQcast feature can achieve increases as a low blood sugar event becomes more imminent.

Agrawal concludes: "Thanks to our IBM solution, we can provide timely insights to help people manage their diabetes."

Medtronic

Medtronic

Medtronic (external link) is a global healthcare solutions company committed to improving people's lives with medical technologies, services and solutions, such as the Sugar.IQ with Watson app. Focusing on the most pertinent health issues worldwide, Medtronic builds technologies and conducts research that will keep the future healthy. Its guiding principle is to contribute to human welfare by applying biomedical engineering to the research, design, manufacture and sale of instruments and devices that alleviate pain, restore health and extend life.

About Watson Health

Watson Health is a data, analytics, and technology partner for the health industry. Supported by the innovation of IBM and intelligence of Watson, we are committed to helping build smarter health ecosystems. Through the combination of our deep industry expertise in health, data and analytics, actionable insights, and reputation for security and trust, Watson Health is working together with its clients and partners to help them achieve simpler processes, better care insights, faster breakthroughs, and improved experiences for people around the world. Learn more at ibm.com/watson/health.

Solution components

- Db2

- Streams

Take the next step

To learn more about the IBM solutions featured in this story, please contact your IBM representative or IBM Business Partner.

1. Read important safety information about the Sugar.IQ with Watson solution here (external link).

2. From Medtronic data on file and clinical observations findings presented at the American Diabetes Association 78th Scientific Sessions in 2018 and the American Diabetes Association 77th Scientific Sessions in 2017.

3. Data on file. Dataset summary from voluntary uploads of Guardian Connect system to CareLink Personal database from June 2018 to February 2019.

4. Read important safety information about the Guardian Connect CGM system here (external link).

*The system is intended to complement, not replace, information obtained from standard blood glucose monitoring devices. All therapy adjustments should be based on measurements obtained from standard blood glucose monitoring devices and not on values provided by the system.

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