T1D Exchange: Creation of a Diabetes Data Dock to Integrate, Improve, and Analyze Diverse Data Sources and Facilitate Continuous Learning and Improvement

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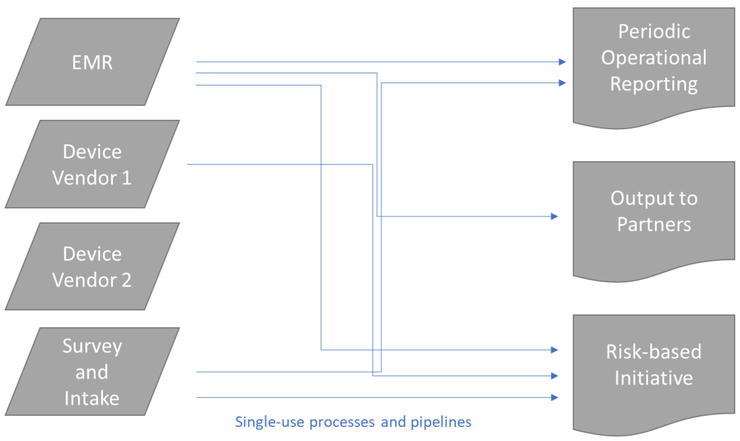
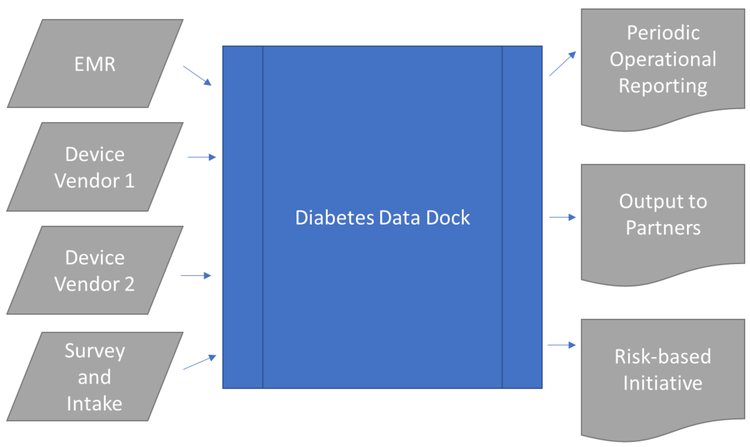
Background

Many diabetes centers within the T1D Exchange Quality Improvement Collaborative aspire to implement risk-based approaches to care, yet they face challenges mapping electronic medical records (EMR) to the T1D Exchange data standard and integrating those data with diabetes self-management device data and other sources of data to track and visualize population risk. Without a systematic approach, output relies on single-use processes that are difficult to maintain.



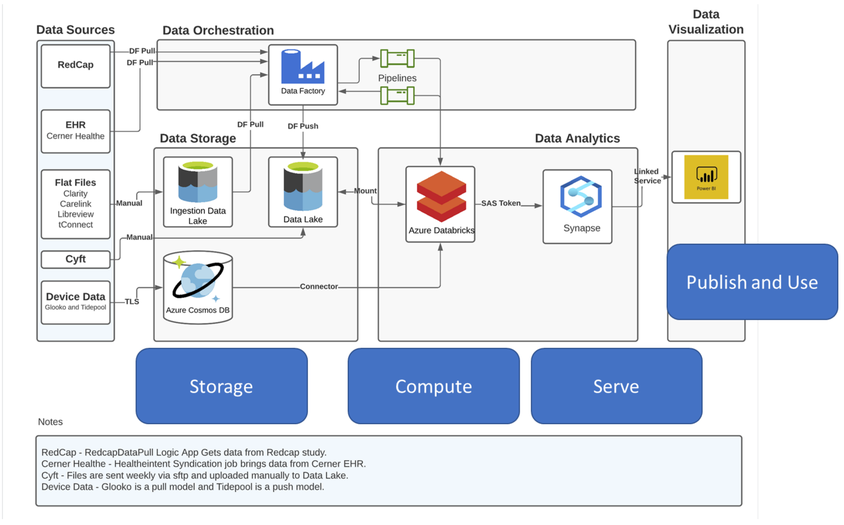
Objective

Our team, the Rising T1DE Alliance, designed and constructed a diabetes clinic-focused cloud data infrastructure (aka, the D-Data Dock) characterized by highly reusable, general data processes that can support the diverse goals of diabetes research and clinical care.

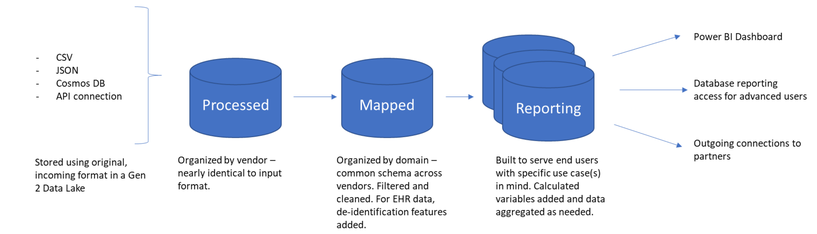


Methods

The D-Data Dock was built using Azure cloud solutions and follows a data lakehouse architecture. The design allows us to scale and adjust processes to meet the volume, variety, velocity, and veracity demands of the data. The capabilities of the Microsoft cloud address the challenges of volume, variety, and velocity.



Data veracity challenges are met by using a multi-hop data pipeline that can be retraced. In addition, we can add data quality checks at multiple points in the process if needed.

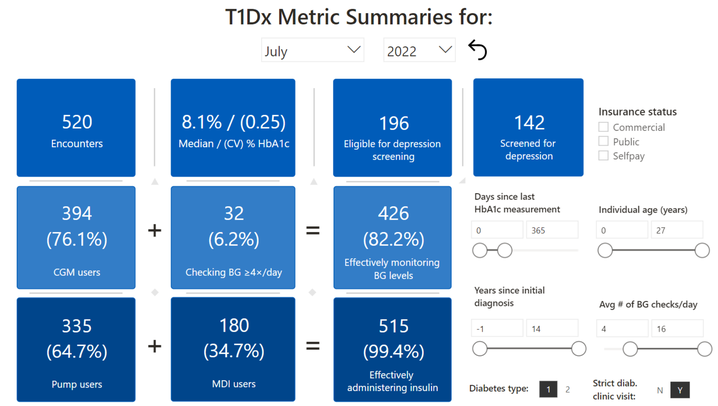


Conclusion

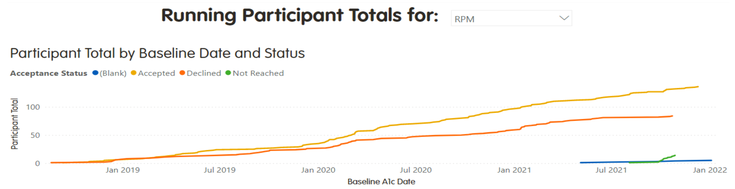
The D-Data Dock is a replicable and scalable resource ready for widespread adoption by T1D Exchange member centers to improve population health management and accelerate clinical research. Children's Mercy Kansas City is committed to making it available for other T1D Exchange members so other centers can experience the benefit of a systematic approach to diabetes data and risk-based population health management.

Results

Automating the data ingestion and mapping process has enabled our team to rapidly integrate novel risk biomarkers (e.g., 6 Habits of diabetes self-management [JAMA Netw Open, 2021 Oct 1;4(10): e2131278] and CGM-based risk biomarkers [Ped Diab, 2021 Nov 22(7):982-991]) into population health dashboards and statistical process control charts to transform clinical care delivery and research. We have used the D-Data Dock to implement AI-driven predictions of near-term outcomes (e.g, hospitalization for ketoacidosis, 90-day change in A1c, 30-day change in Time in Range) and to pilot a remote patient monitoring program among high-risk youth.



The D-Data Dock enables internal dashboards of T1D Exchange metrics (above) and intervention management (below) in addition to many other functions.



Acknowledgements

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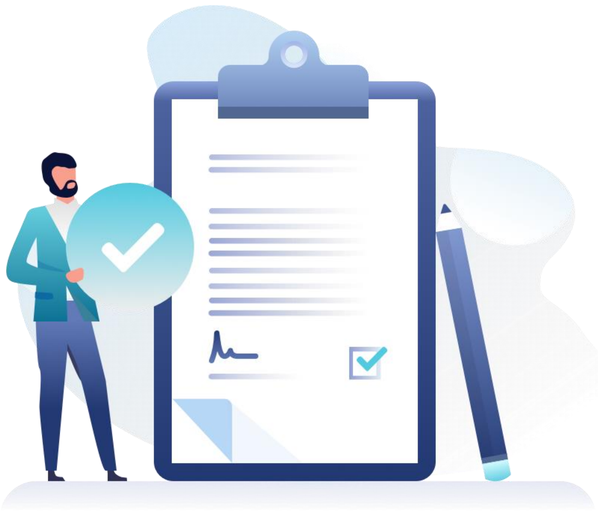
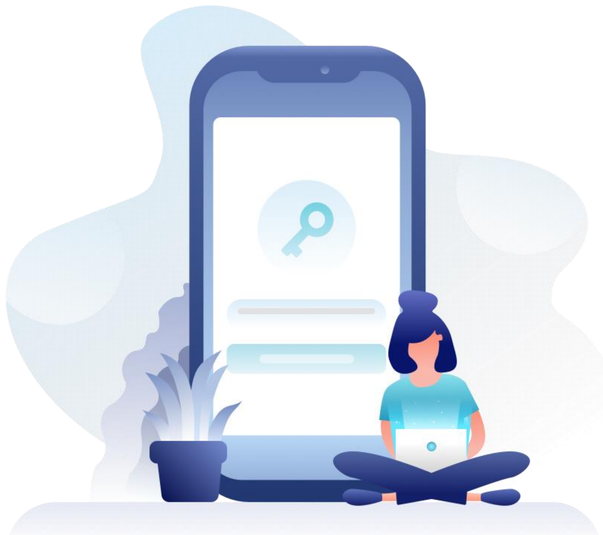
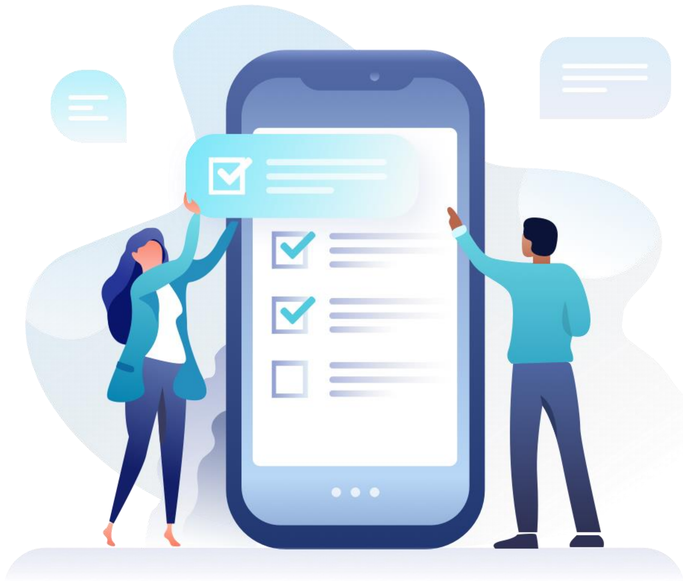
RISING T1DE ALLIANCE







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