Feasibility Analysis: Diabetic Management Through Integration of CGM and EHR

Executive Summary:

Integration of diabetic health data collected from a continuous glucose monitor into electronic health records (EHRs) allows healthcare providers to monitor diabetic patients in real-time. The goal of this project is to develop a successful integration of diabetic health data into EHR for healthcare providers to visualize and act upon as needed for better chronic disease management. Our target audience is healthcare providers and diabetic patients. Integrating the glucose monitor data into EHR promotes interoperability, as this integration aims to improve the quality, safety, and efficiency of care for diabetic patients (*Integrated EHR,* pg 23).

Technical Feasibility:

Our project will first require an understanding of existing technologies. To achieve a better understanding, we need to look at popular modern CGM devices like the Dexcom G6 and the recently released G7, as well as the FreeStyle Libre, which provide APIs that enable real-time access to glucose readings and other data. These APIs will be essential for our team to access realistic data for the development process of our interface.

Our project intends to implement HL7 FHIR standards wherever possible to ensure consistent and secure data exchange between different systems. Data standardization from CGM devices, BP monitors, and Kaggle demographic data likely exceeds our project scope but could be handled either in-house or by a data transformation service. Google Sites will serve as the development platform for the

initial prototype, and we hope to bring the interface to life with custom JavaScript implementation for data visualization pages.

Security implementation will focus on HIPAA compliance through encryption for data transmission. Secure API communications will not be necessary within the scope of our project due to the restrictive access to full access CGM data. For example, Dexcom API full access is only granted after an application process and a technical review meeting[4]. Due to this fact, our project will utilize “sandbox” data, allowing the project to continue on the assumption of the availability of secure database infrastructure and sufficient network bandwidth while in our production environment. Key technical challenges include data transformation for interoperability between different data systems which we intend to address through a standardized HL7 FHIR structure.

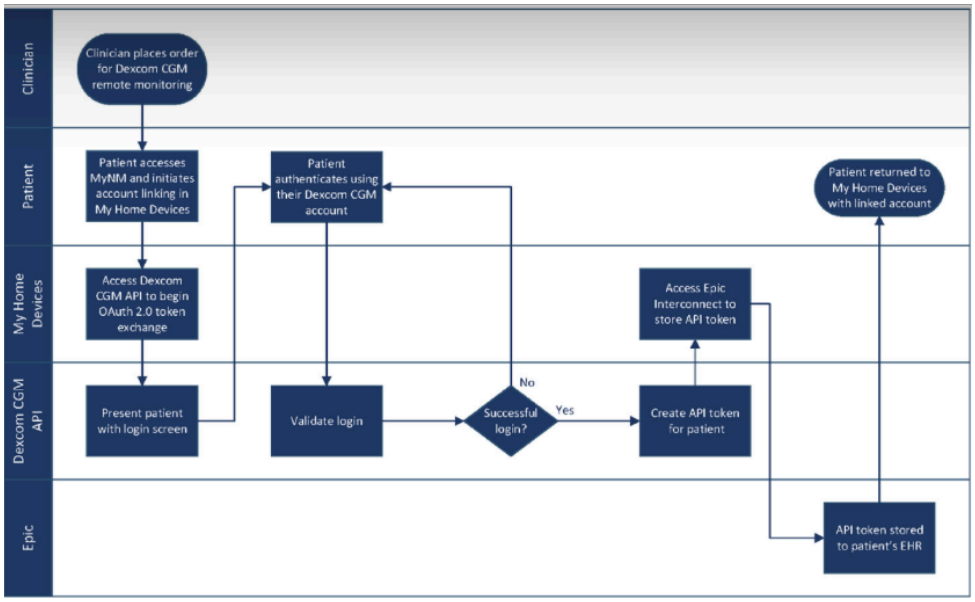
While there are technical challenges in combining multiple data sources while ensuring security and interoperability, the project is technically feasible using existing technology. Existing CGM technology and CGM device APIs make glucose level data acquisition and integration feasible. The primary technical risks of data interoperability and security can be effectively mitigated through the implementation of common security practices if necessary.

Operational Feasibility:

For the integration of a CGM device into an EHR, we worked with the assumption that it would align with the wants and needs of healthcare providers and integrate seamlessly into patients' daily routines. Several components of CGM-EHR integration would drastically improve workflows. The primary benefit of this integration is the ability of healthcare providers to observe and respond to a patient’s glucose levels in real time.

Combining this with EHR data allows the provider to better manage the patient's diabetes. EHRs promote interoperability for healthcare providers across different clinical systems, ultimately enhancing patient care by reducing the time needed to evaluate a patient's status should a complication arise and expediting the response to address sudden changes in glucose levels. [5]One tangible example of time savings comes from a case study where a clinic switched from a separate CGM data portal to direct data integration for a glucose monitoring dashboard. Their update reduced the time spent reviewing data per patient by 37% and increased the estimated clinic patient capacity by 58%.

Another impact on workflow is the streamlining of the data transfer process through CGM-EHR integration. Working with our assumption, APIs would enable seamless communication between the CGM device and the EHR platform while simultaneously strengthening the relationship between the healthcare provider and the patient. As the healthcare provider will be able to see and respond to updates in real-time through custom data visualizations, the patient can better understand how and why sudden changes in their glucose levels occurred. This enhances patient care by reducing gaps in patient understanding while empowering them to make informed health decisions. [5]The following figure is an example of how patients and providers have setup tasks to initiate CGM-EHR integration with several different CGM devices:



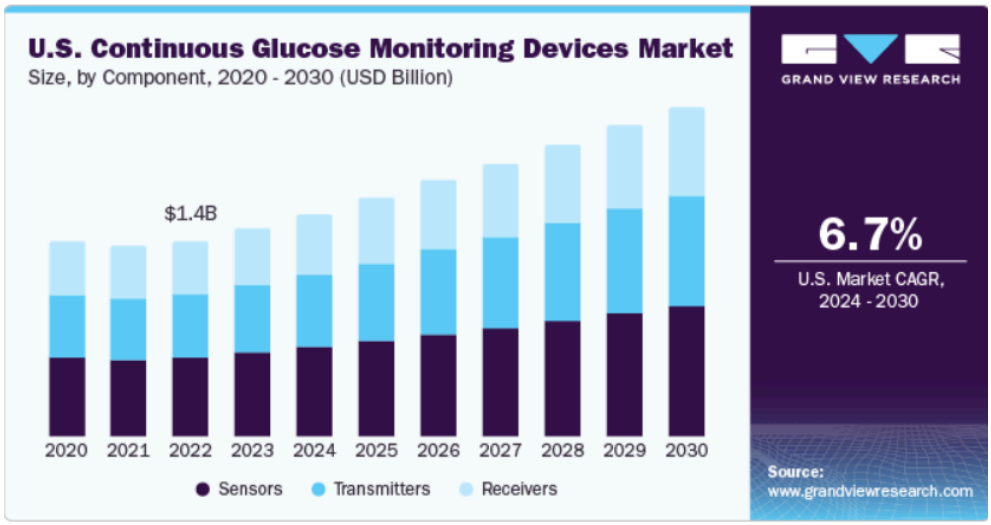
Economic Feasibility:

For the costs and benefits of our project, we have to include the average cost of a continuous glucose monitor (CGM) device. It's difficult to pinpoint the exact cost since there are a few determining factors. The two biggest factors are insurance coverage and the brand of the CGM. CGM systems aren't inexpensive primarily as they're composed of an annual receiver, sensors, and a transmitter if needed. Without insurance, CGM costs range from $2,000 to $7,000 per year. [1,2]According to Forbes Health, with insurance coverage CGM costs can average between $100 to $300 a month which is $1,200 to $3,600 a year. It's worth mentioning here that most health insurance companies will cover a CGM system for both Type I and Type II diabetes. [2]Furthermore, the most affordable CGM devices are Abbott's FreeStyle Libre systems where with commercial health insurance an individual can pay less than $40 a month.

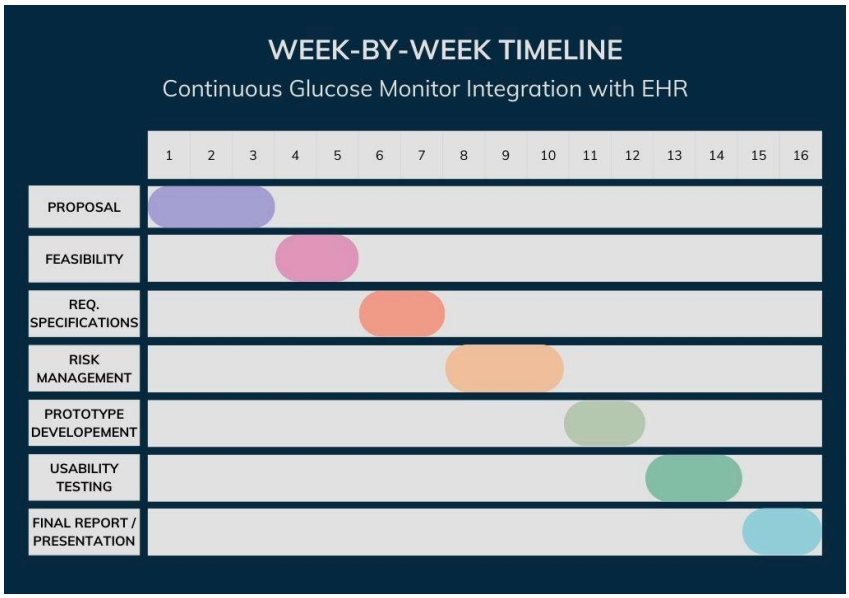
While the costs of CGM devices can vary, the benefits strongly outweigh the costs. [3]CGM devices allow patients to make informed health decisions from real-time insights, ultimately leading to improved adherence. Additionally, effective management

of glucose levels can significantly reduce and/or prevent common complications associated with diabetes like hypoglycemia, hyperglycemia, retinopathy, and neuropathy. Lastly, CGM monitoring could potentially lower extended hospital stays and ER visits as a result of more effective diabetic management. For healthcare providers, this may lower hospital admissions, while enhancing the quality of care for the patient.

For our project, we found it reasonable to examine the market demands for CGM devices. The market value of CGM devices has and will continue to experience significant growth. According to a market research report from Grand View Research, the global CGM device market value was estimated to be USD 4.60 billion in 2023 and is forecasted to grow at a compound annual growth rate (CAGR) of 7.19% from 2024 to 2030. Our project is viable considering that within the U.S. market, the CAGR for CGM devices is forecasted at a rate of 6.7% (*Continuous Glucose Monitoring Device Market Report, 2028*, n.d.).



Schedule Feasibility:



Our group will utilize the above timeline to complete the project. We feel this project can realistically be completed within the given 16-week timeframe. The group has stayed on schedule for the first 5 weeks, but busy schedules and time differences between group members are a risk factor for falling behind. We have agreed to meet weekly, even if just briefly to touch base and stay on schedule to meet our milestones.

We completed the first milestone, completing the project proposal, during week 3. The group is on schedule to complete this feasibility analysis by the end of week 5. Our third milestone will be interviewing healthcare professionals and completing the requirements specification by the end of week 7. The fourth milestone will be completed by the end of week 10 involving the creation of a risk management plan. We will create a functional prototype by the end of week 12 to meet the fifth milestone of this project. Next, our sixth milestone is conducting usability testing to be completed by the end of week 14. We will meet our final milestone by the end of week 16 by finalizing our report and presentation. These milestones will be reasonably achievable during the given

timeframe. The risks of falling behind schedule are present but easily manageable by holding each other accountable and meeting regularly.

Individual Contributions:

Our project team consists of Julius Miller, Gabrielle Holmes, and Mario Lloyd Galvão-Wilson. We hold weekly meetings and maintain consistent contact, with each member collaborating on all aspects of the project while dividing the feasibility report workload. Julius handled operational and economic feasibility, analyzing how CGM-EHR integration improves healthcare workflows through real-time monitoring and researching device costs and insurance coverage implications. His analysis showed strong market potential with CGM devices projected at 6.7% CAGR in the US market.

Gabrielle managed schedule feasibility and the executive summary, outlining our aim to integrate diabetic health data into EHR systems for improved disease management and creating a timeline with seven key milestones across the 16-week semester. Mario assessed technical feasibility, analyzing continuous glucose monitoring device APIs and evaluating HIPAA compliance requirements while also documenting the team's individual contributions.

Sources:

1. Silva, L. (2023, April 27). *How Much Does A Continuous Glucose Monitor Cost?* Forbes Health.
2. Watson, A. (2022). *How Much Does a Continuous Glucose Monitor Cost and Will Insurance Pay For It?* Goodrx.com.
3. Sierra, J. A., Shah, M., Gill, M. S., Flores, Z., Chawla, H., Kaufman, F. R., & Vigersky, R. (2017). Clinical and economic benefits of professional CGM among people with

type 2 diabetes in the United States: analysis of claims and lab data. *Journal of Medical Economics*, *21*(3), 225–230.

4. DexCom, Inc. "Scopes & Access." Dexcom Developer Portal. Accessed February 24, 2025. https://developer.dexcom.com/docs/dexcom/scopes-access/.
5. Grazia Aleppo, Chmiel, R., Zurn, A., Bandoske, R., Creamer, P., Neubauer, N., Wong, J., Andrade, S. B., & Hauptman, A. (2023). Integration of Continuous Glucose Monitoring Data into an Electronic Health Record System: Single-Center Implementation. *Journal of Diabetes Science and Technology*.
6. *Integrated Electronic Health Records (Textbook with Connect), 4th Edition.*