

## Tailoring PASTA for US audience

Jenny Hong, JinHee Son, Kenia Rivas, Sai Sree Kotari

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## Executive Summary

The current system for managing diabetes in the United States faces challenges in providing comprehensive support and personalized care to patients. While various tools and resources exist, there is a need for more integrated solutions that people with diabetes and their caregivers can use from the comfort of their own home. The Korean diabetes management app PASTA offers a promising model for diabetes management with its intuitive interface, personalized features, and comprehensive support in the U.S for patients.

To enhance diabetes management in the U.S., we recommend integrating PASTA into the existing U.S EHR system, integrating the U.S food database, and connecting U.S users to diabetes community support forums. This integration will involve adapting the app to meet the specific needs of U.S. patients and healthcare providers while maintaining its core functionalities which include AI-based food tracking, food databases, an enhanced alert system, and community support forums to improve the well-being of diabetes patients and their caregivers.

The implementation plan will involve collaboration between app developers, healthcare professionals, and patients. Healthcare providers will be trained to recommend and utilize the app as part of diabetes care. Patients will receive education and support on using the app effectively to manage their diabetes. Additionally, feedback mechanisms will be established to continuously improve the app based on user experiences and evolving healthcare needs. Through this integration and implementation plan, the new U.S. version of PASTA aims to revolutionize diabetes management and improve outcomes for patients across the country. In our report, we explore how decision point models, sequence models, and persona models can effectively communicate the goal of improving outcomes for diabetes patients in the long-run and help providers accurately track the health data of patients over the years.

### Tailoring PASTA for US audience

In the rapidly evolving landscape of diabetes management, Kakao Healthcare's AI-based blood sugar management service, "pasta", is gearing up for a U.S. launch. This move is prompted by the alarming projections that the global diabetes population will reach 642 million people by 2030, accompanied by an estimated economic burden of \$2.3 trillion (about \$7,100 per person in the US). As diabetes knows no borders, the imperative to effectively manage this escalating challenge demands a global and interoperable approach. The unique healthcare ecosystem, cultural nuances, and patient needs in the U.S. pose challenges that underscore the necessity for pasta's adaptation. Beyond catering to U.S. requirements, this project serves as a strategic endeavor to pave the way for a globally interoperable healthcare solution. 'pasta', with its integration potential with Electronic Health Record (EHR) systems, has the power to unify patient data across borders, offering a tailored and connected approach to diabetes care.

#### **Why 'pasta'?**

The imminent launch of 'pasta', in the United States poses a significant challenge rooted in the difference between the healthcare landscapes of South Korea and the U.S. While 'pasta' might prove successful in its original Korean context, the diverse dietary preferences, cultural nuances, and distinct regulatory frameworks in the U.S. present obstacles that demand attention. The symptoms of this misalignment become clear when considering the potential inefficiency and suboptimal user experience resulting from a non-adapted application. Without customization, 'pasta' risks being less effective and less accepted by the U.S. user base, hindering its potential to make a significant impact in improving diabetes management outcomes in the U.S. healthcare landscape. Therefore, the project's primary aim is to address disparities, ensuring that 'pasta' is

not only relevant but also surpasses industry standards in the U.S., ultimately improving the accessibility and effectiveness of diabetes management for a broader audience.

### **Understanding Diabetes Management Market and Dynamics**

The team made some observations of the current 'pasta' app to identify potential areas for improvements.

- The 'pasta' app has the feature to find and enter the nutritional value of the food the patient ate by scanning the food snapshot or the barcode on the food product via AI functionality. However, the database is heavily limited to the data on Korean foods. Our team would like to explore the possibility of the U.S. version of the 'pasta' app partnering with American supermarket apps or American food database to begin building a database for dietary information in the U.S.
- The 'pasta' app currently allows only the friends added in the Kakao Talk messenger app to be added as friends in the PASTA app. Additionally, these friends can receive automatic alert messages when a patient reaches an out-of-range glucose level, but only if they download the PASTA app. Revising this feature to allow alert messaging for family or friends who are non-Kakao users will enhance the app's inclusivity and functionality.

### Market Search

Then our team conducted some market research to understand the dynamics of the diabetes management market in the U.S. By delving into market insights, we gained a comprehensive understanding of the unique challenges and opportunities present in the market. The following are the four major factors that we focused on for this project:

1. AI-Based Food Tracking Functionality
2. Diabetes Online Support Group Forum and Website Integration
3. Alert System to Authorized Personnel
4. Integration of Collected Data to widely used EHR in U.S. (e.g., Epic, Cerner, etc.)

### 1) AI-based food tracking

MyFitnessPal, Lose It!, Lifesum → weight loss, fitness apps  
utilizing AI-based food tracking  
not for diabetes management

- Image recognition  
take photos → algorithms recognize  
variations in portion size  
Image quality
- barcode scanning  
convenient & accurate for packaged goods  
may not be applicable to fresh produce OR homemade meals
- manual entry  
can specify portion size & home-made meals  
AI algorithm provide suggestion & autocomplete  
relies on user accuracy & consistency → Time Consuming

### Food Database Coverage

- Target, Wholefoods (Amazon)?
- maybe integrate w/ recipes, too?

### 2) Online Support Group

A: active HA: highly active LA: lower activity

(A) TuDiabetes - discussion forums, blogs, resources

(HA) Diabetes Daily - forums, articles, recipes, expert advice discussion  
thousands of daily visitors, active participation social media

(LA) American Diabetes Association (ADA) community

- not as active as prior 2
- but provide reputable resources & support

(HA) Reddit (r/diabetes) - sharing personal experiences & advice  
-thousands of subscribers & regular engagement

3) Alert System

some diabetes management apps in US already have alert system incorporated.

- Dexcom G6 : notify caregivers or family members when level  $\uparrow$   $\downarrow$   
alerts can be customized
- Nightscout : open-source platform enables remote monitoring  
of CGM data from various devices (Dexcom & Medtronics ...)  
- authorized pp can receive alerts &  
access real-time glucose data
- Medtronic Guardian Connect : predictive alerts of impending  $\uparrow$  or  $\downarrow$   
up to 60mins in advance.

timely notification, customizable notification, user-friendly interface.

- EHR and app
  - Carbon Health - diabetes management program
    - Worked w/ Abbott and Dexcom (CGM manufacturers) to integrate data collected from device to Carbon's EMR
    - Possible bc had control over their own EMR
      - Difficulty
  - Efforts of integrating CGM data to EHR existent
  - FHIR standards
  - APIs
  - SMART App Launch connecting third party app w/ EHR - Cerner

After conducting extensive market research, we've gained crucial insights that are pivotal in refining our project objectives. Our in-depth analysis of AI-based food tracking apps has unveiled many approaches concerning meal logging and the structure of food databases. This comprehension serves as a foundation for our own strategic enhancements. We've discerned a pressing need for a food database that is intricately tailored to the unique preferences and requirements of individuals living in the USA. Our investigation into support groups within the diabetes community has underscored a palpable desire for connection and the exchange of experiences among users. However, it's clear that there is significant potential for raising awareness and fostering education about these invaluable support networks. Our overarching aim

is to streamline access to these groups and offer educational resources to amplify community support and engagement.

Furthermore, we've noted that numerous diabetic management apps already boast features such as alert systems and predictive analysis, empowering users with real-time monitoring capabilities for their blood glucose levels. In tandem with this, we've meticulously evaluated user interfaces to pinpoint areas ripe for improvement, ensuring a seamless and intuitive user experience.

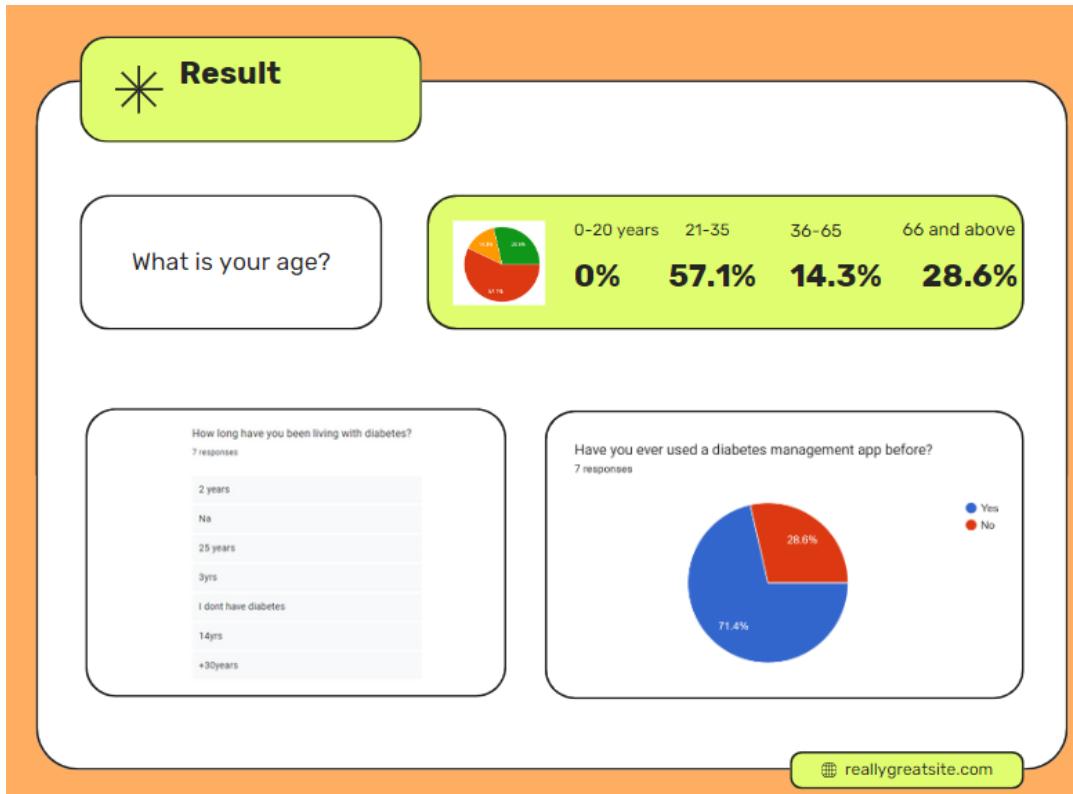
Moreover, we've observed successful examples like Carbon Health, which have adeptly integrated data from Continuous Glucose Monitoring (CGM) devices into their Electronic Medical Records (EMR) systems. While this integration is feasible for proprietary EHR systems, navigating the complexities of centralized or intricate systems like EPIC necessitates a more nuanced and sophisticated approach.

### User Interview

The next step after market research was to conduct a user interview. In our case, we utilized Google Forms to gain user feedback on current U.S. diabetes management apps and online diabetes communities, along with the preferences and values the users might have when choosing the app.

Our team was able to gain responses from the users across various age groups and with differing years of living with diabetes, and the majority of the interviewees answered that they use a diabetes management app. They used different CGM devices, with Dexcom being the most used, followed by Abbott, Medtronic, Nutrisense, and Zoe. The app's key features that they found useful were food tracking and reminders for medications, appointments, and tasks related to diabetes. In contrast, many of the users responded that they have not utilized the emergency

feature or data sharing feature. When we asked the users which aspect of the app that they find challenging to use, two prominent responses were the manual entry required for the food log and concerns about the app's formatting. We became more convinced that the users have a high preference for the app that is easier to use and that allows for seamless navigation.



**What apps do you use currently? How satisfied are you?**

What kind of CGM device (glucose monitor) are you using?

CGM Device	Count	Percentage
Dexcom	3	60%
Nutrisense	1	20%
Abbott	2	40%
Medtronic	1	20%
Zoe	1	20%

Do you feel that the app adequately educates and informs you about diabetes management and related topics?

Response	Percentage
Yes	40%
No	20%
Not Sure	40%

Do you use any features within the app to set reminders for medication, appointments, or other diabetes-related tasks?

Response	Percentage
Yes	60%
No	20%
My app do not have such functionality	20%

How does the app help you track and manage your dietary habits and physical activity?

Gives me calorie counts, minutes of physical exercise, reminder to get steps in

I don't believe it has such functionality

I input food details that I eat.

I've used multiple apps and cgm devices from various companies. Some apps collect my dietary habits some apps don't. For those that collects data, it asks me to log what I ate and snacked on.

Has separate page to enter those activities. food log and exercise log

[reallygreatsite.com](http://reallygreatsite.com)

**What apps do you use currently? How satisfied are you?**

Have you shared your app data with healthcare provider? If so, how did this information help to support your care?

I have not

When I'm scheduled to visit my provider, I would just review the glucose level (gathered since last visit) and tell (if any) abnormal trends or changes.

Not really; I use it to support my healthy life style.

No

Yes, I share my gl with nurses and they know what is going on with me.

Have you utilized any emergency features within the app, such as alerting contacts in case of severe hypoglycemia or hyperglycemia events?

Response	Percentage
Yes	40%
No	60%
My app do not have such functionality	0%

Does the app provide any personalized recommendations or insights based on your individual health data and trends?

Response	Percentage
Yes	60%
No	40%

Are there any aspects of the app that you find challenging or difficult to use?

Format

I feel like I only use the very basic functions. I'm not one of those tech-savvy person so I just like to use what's easy and straightforward. I only use this app to just track and see my glucose level.

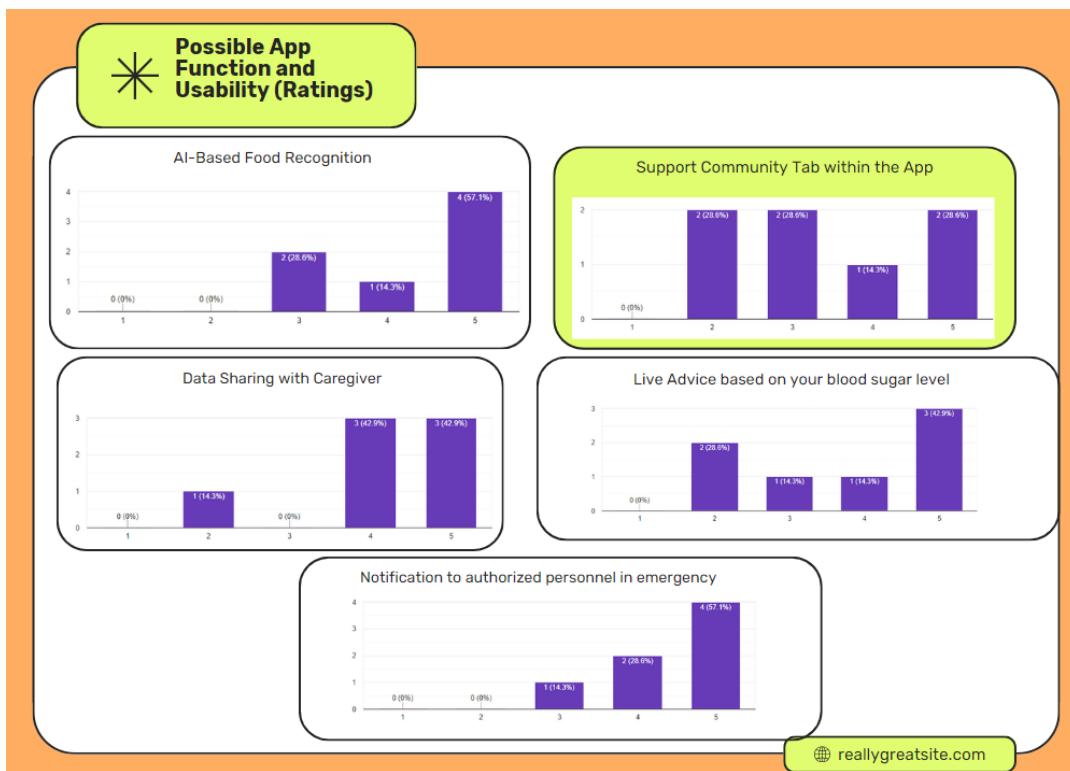
no

logging my diet manually after every meal or every snack I eat is too bothersome and time consuming. I don't use that function as often anymore

I got used to using my apps so I'm good

[reallygreatsite.com](http://reallygreatsite.com)

Based on the rankings provided by the users on the features contributing to the usability of the app, the users considered the AI-based food tracking and notification to authorized personnel in emergencies the most useful. Following these were features for data sharing with caregiver, live advice based on blood glucose level, and then the community support tap within the app. Many of the users stated that they have not used an online community support group before, while a few said that they used the American Diabetes Association community and Reddit Diabetes community. They usually gained information, including tips and resources, from their healthcare provider or Google. We observed their interest in the idea of adding functionalities, such as AI food tracking, to advance the diabetes management app.



**Online Community Support Group for diabetes management**

Have you ever used any of the online community support groups?

Response	Count (%)
TuDiabetes	0 (0%)
Diabetes Daily	0 (0%)
American Diabetes Association (ADA) Community	1 (14.3%)
Reddit (r/diabetes)	1 (14.3%)
I have not	6 (85.7%)

If you have answered 'I have not' from the above question, where do you usually get information (tips, resources) about diabetes?

- Doctor
- Google
- My doctor, friends with diabetes
- google, or directly from my provider
- N/A

If you have any suggestions or thoughts regarding diabetes management app, please share them

Incorporate goals and achievements

I only chose this app because dexcom is the device I use and it comes with this app. I personally never had a chance to review other apps, but sounds like some of them might have some more functionality that might help me manage my diabetes. Maybe I'll look into using other apps.

N/A

One of the suggestion - ai based food recognition - sounds great. As a person who's been living with diabetes for a decade, the app is my life and I hope there are better ways to capture my daily life including my diet and exercise habits more seamlessly without having to take up a lot of my time and effort.

reallygreatsite.com

### Physician Interview

In addition to user interviews, we recruited a physician for an interview which allowed our team to gain insights about physician perspectives on diabetes management apps and how they utilize data gathered from CGM devices.

The physician interview took place over a 30-minute phone call with Dr. Kohei Saito, a Japanese physician who specialized in diabetes research and is currently in the CHIP program with us. He was a useful contact who helped provide insight into the benefits of diabetes management apps in his practice and a walk-through of his routine as a full-time international student and physician. A clinician's perspective is gold as many clinicians are not trained to input data electronically or to navigate health information technology in their practices, and as we move forward in an AI-savvy world more clinicians are seeing the usefulness of apps like PASTA and EHR integration. He provided insight into the impact that diabetes management apps have on the daily well-being of his patients and how they allow for more effective data analysis when evaluating health trends for individual patients and his practice.

### Draft Models

Based on these results obtained through the interviews, our team created some draft models to help us brainstorm for the suggested solutions. The models that we used are as follows:

***Persona Models*****John Adams**

| Male (62 yrs old)  
| Realtor Agent

John is a 62-year-old realtor agent who leads an active lifestyle despite living with type 2 diabetes for over 30 years. He oversees multiple properties and is constantly on the move, meeting with clients, showing properties, and negotiating deals. Despite his busy schedule, John prioritizes his health and is diligent about managing his diabetes through regular monitoring, medication, and lifestyle adjustments. He's comfortable with technology and sees the value in using digital tools to streamline his health management, especially given his hectic professional life. John wishes that diabetes management app can help him monitor his food intake, activity levels, and blood glucose readings seamlessly, without adding unnecessary complexity to his already busy schedule.

**Personality Trait**

- Values efficiency and practicality in all aspects of his life
- Comfortable with technology and open to using digital solutions to improve his health

**Goals and Needs**

- Simplify the process of tracking his food intake, insulin doses, and blood glucose level while managing his real estate business
- Monitor his diabetes effectively without disrupting his daily workflow or routine
- Feel confident and empowered in managing his health while balancing his professional responsibilities

**Challenges**

- Ensuring consistent and accurate data entry despite his busy schedule

**Ellie Thompson**

| Female (18 yrs old)  
| Fitness and Health Influencer  
| 8K followers on TikTok

Ellie is an 18-year-old fitness and health influencer who has a passion for promoting wellness and positive body image on social media. With over 8k followers on platforms like Instagram and TikTok, she's known for sharing her journey towards a healthy lifestyle, including her workout routines, meal prep ideas, and body-positive messages. Ellie is committed to maintaining a balanced diet and staying active, but she's also aware of the pressures and expectations that come with being a social media influencer. While she doesn't have any medical conditions like diabetes, Ellie is eager to deepen her understanding of how her diet and activity levels impact her overall health and well-being.

**Personality Trait**

- Health-conscious and committed to maintaining a balanced lifestyle
- Tech-savvy and comfortable using various social media platforms and smartphone apps

**Goals and Needs**

- Enhance her knowledge of nutrition and fitness to provide valuable insights to her followers
- Monitor her dietary habits and physical activity more effectively to optimize her own health and well-being

**Challenges**

- Limited understanding of the lived experiences and needs of individuals with diabetes
- Although Ellie herself understands the importance of communication, she is also young and can be swayed by unreliable information and need credible source to manage her healthy lifestyle

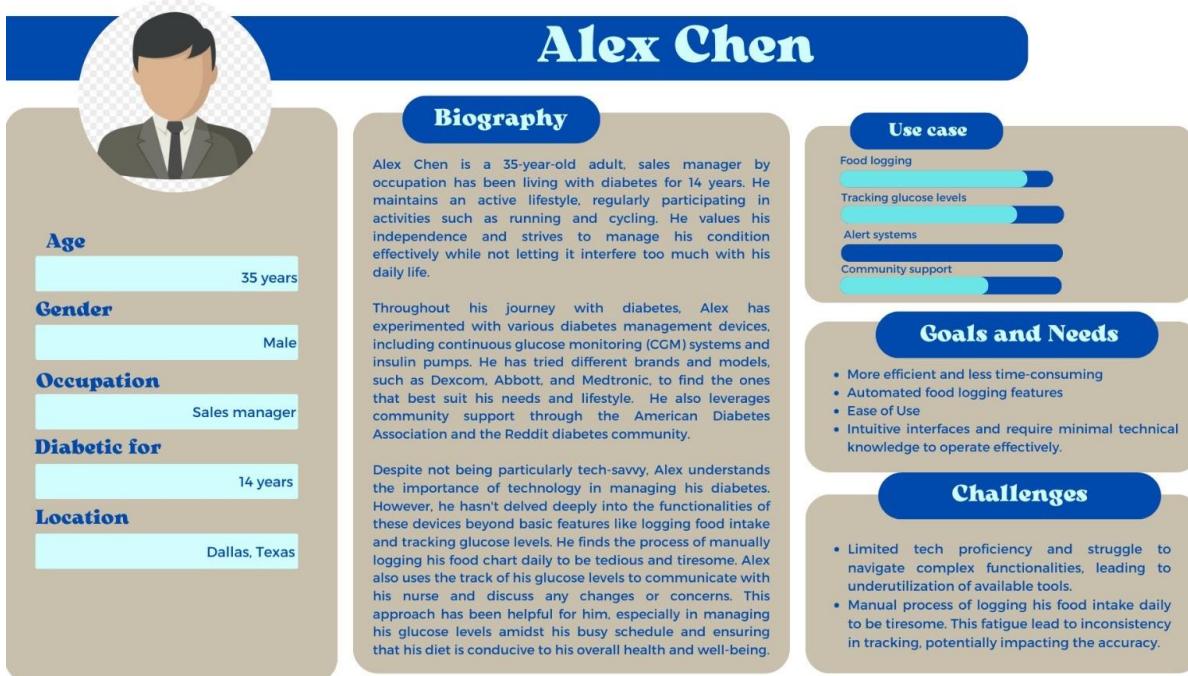
These two user personas, Ellie and John, offer valuable insights into diverse needs and perspectives within the target user base for the PASTA app project. They were developed based

on information gathered from user interviews conducted through a Google Survey Form. By synthesizing common user needs and preferences from the survey responses, these personas were created to represent users of the app. This model is a proposed system, reflecting the envisioned design and functionality of the PASTA app tailored to meet user needs. It is considered final, as it encapsulates the key characteristics and requirements identified during the research and design phases.

Ellie, the health-conscious influencer, represents a younger demographic with a strong focus on wellness and fitness. Her tech-savvy nature and social media presence make her an ideal candidate for engaging with digital health tools like PASTA. By understanding Ellie's goals of enhancing her knowledge of nutrition and fitness while monitoring her own health, the project team can tailor features to meet her needs and preferences, ultimately leveraging her influence to reach a broader audience.

On the other hand, John the busy realtor managing type 2 diabetes, highlights the importance of simplicity and efficiency in health management tools. His comfort with technology and desire for seamless integration into his daily routine present an opportunity to design PASTA with user-friendly interfaces and time-saving functionalities. Addressing John's challenges of consistent data entry amidst his hectic schedule can lead to the development of automated features and reminders, enhancing the app's usability for users like him.

Overall, by considering the unique goals, needs, and challenges of both Ellie and John, the project team can ensure that PASTA caters to a diverse user base, empowering individuals of all ages and lifestyles to manage their diabetes effectively while promoting overall health and well-being.



Alex Chen, a 35-year-old adult, was diagnosed with diabetes 14 years ago and has since been utilizing a diabetic management app. His profile was crafted based on insights gathered from user interviews conducted through a Google Survey Form. This persona aids the PASTA project in comprehending the perspective of a young individual who is not particularly tech-savvy yet leads an active lifestyle while juggling demanding work and responsibilities. Alex's portrayal mirrors most of the population who may not be well-versed with technology. This realization underscores the importance of prioritizing user understanding over technical prowess in app development. Emphasizing user-friendliness becomes paramount, as the main goal of a diabetes management app is to enhance user experience; neglecting this aspect would render the entire endeavor futile.

# Physician Persona

**Customer Profile**



**Dr. Satoshi Tanaka, 52**

Archetype	The Caregiver
Gender	Male
Years of experience	26
Education	Medical degree from Kyushu University
Occupation	Medical doctor, specializing in internal medicine
Location	Tokyo, Japan and RDU, North Carolina

**Biography**

Dr. Satoshi Tanaka is a highly respected physician who recently moved to the RDU area from Tokyo, Japan. He specialized in internal medicine and conducts research in diabetes management. With over 20 years of experience, Dr. Tanaka is known for his dedication to providing the highest quality care to his patients and staying at the forefront of medical advancements. He aims to use diabetes management apps for their ease-of-use, evidence-based treatment plans, and for patient engagement.

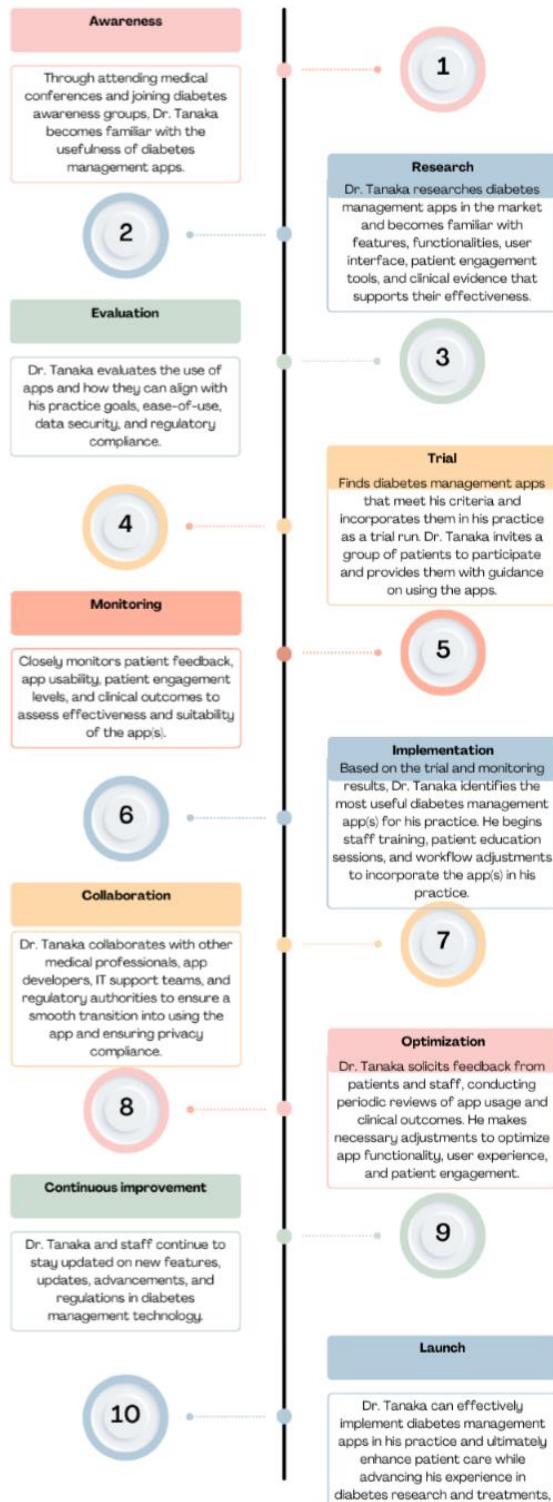
**Goals and Objectives**

- 1- **Enhance patient care.** Improve patient outcomes with diabetes management apps and discover innovative tools.
- 2- **Stay informed.** Dr. Tanaka aims to stay updated on the latest developments in diabetes management and in digital health solutions.
- 3- **Empower patients.** Diabetes management apps can help patients gain knowledge and effectively self-manage to lead healthier lives.

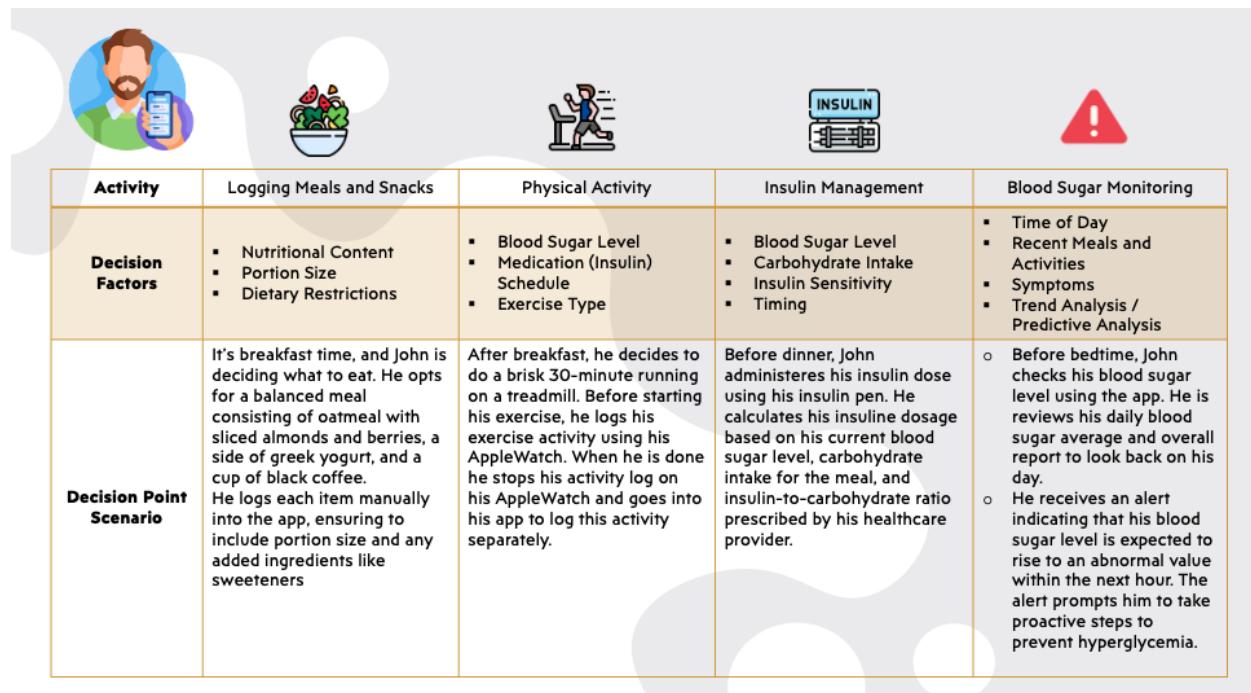
**Challenges**

- 1- **Busy schedule.** His practice is short-staffed and he has many patients seeking care for diabetes and other diseases. This makes it difficult to stay updated on digital health trends and to make time to teach older patients how to navigate diabetes management apps.
- 2- **Language/ cultural barriers.** Dr. Tanaka is fluent in Japanese and English, but encounters difficulties in teaching patients how to navigate apps which are solely in English because he recently moved to NC. Japanese regulations for such apps also differ from U.S regulations.

This physician persona model was developed through the 30-minute phone interview with Dr. Kohei Saito, a Japanese physician who recently moved to NC and specializes in internal medicine and diabetes research. We consider this model to be final and it contributes to the project because it provides a clinician's perspective for the usefulness of diabetes management apps and how integrating digital health trends can improve patient outcomes. It also reveals challenges that medical professionals face as technology becomes an integral part of healthcare approaches. The sequence model below was inspired by Dr. Saito as well and shows a potential sequence of work that a clinician like him could use to effectively incorporate diabetes management technology into their practice and improve patient outcomes in the present and future.

***Sequence Model*****Dr. Satoshi Tanaka Sequence Model**

### Decision Point Model

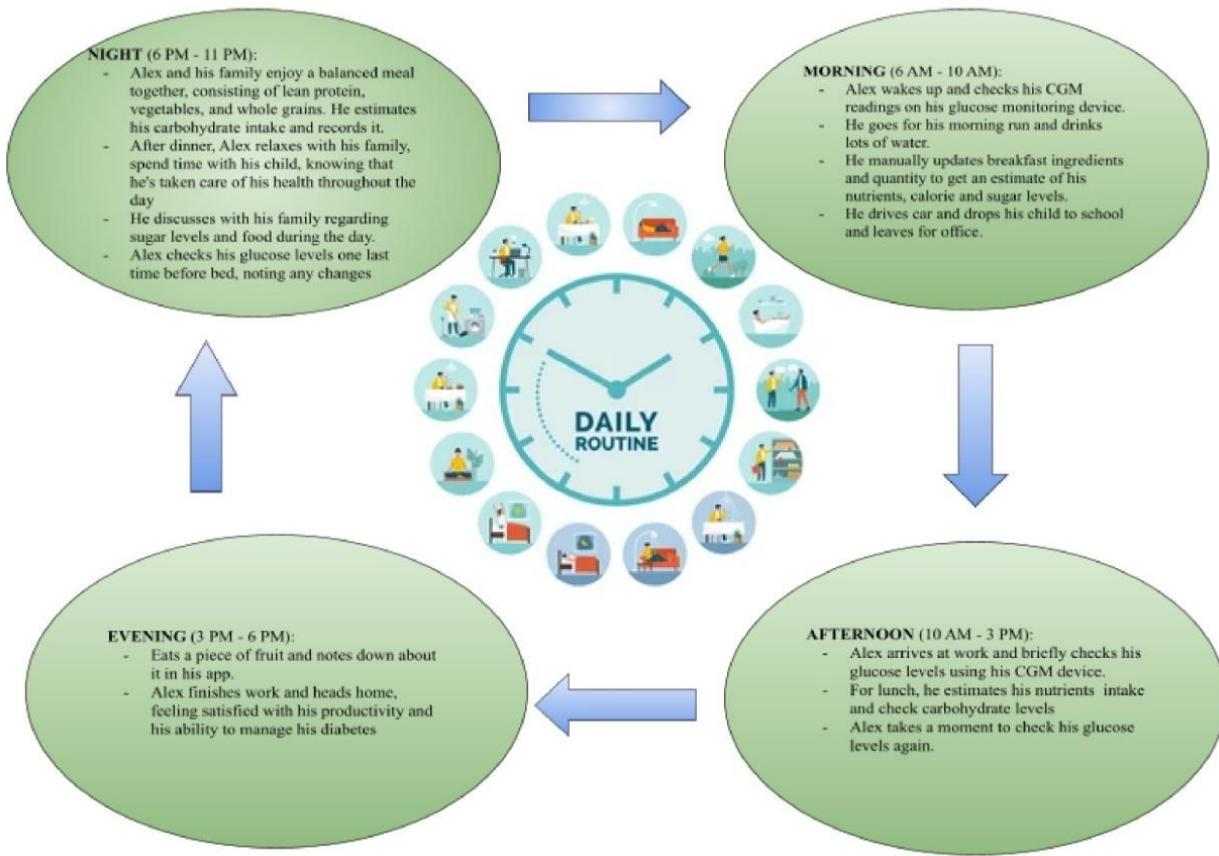


The diagram illustrates the Decision Point Model with five key components arranged horizontally:

- A circular icon of a person holding a smartphone.
- A bowl of salad.
- A person running on a treadmill.
- An insulin pen labeled "INSULIN".
- A red exclamation mark inside a triangle.

Activity	Logging Meals and Snacks	Physical Activity	Insulin Management	Blood Sugar Monitoring
<b>Decision Factors</b>	<ul style="list-style-type: none"> <li>Nutritional Content</li> <li>Portion Size</li> <li>Dietary Restrictions</li> </ul>	<ul style="list-style-type: none"> <li>Blood Sugar Level</li> <li>Medication (Insulin) Schedule</li> <li>Exercise Type</li> </ul>	<ul style="list-style-type: none"> <li>Blood Sugar Level</li> <li>Carbohydrate Intake</li> <li>Insulin Sensitivity</li> <li>Timing</li> </ul>	<ul style="list-style-type: none"> <li>Time of Day</li> <li>Recent Meals and Activities</li> <li>Symptoms</li> <li>Trend Analysis / Predictive Analysis</li> </ul>
<b>Decision Point Scenario</b>	<p>It's breakfast time, and John is deciding what to eat. He opts for a balanced meal consisting of oatmeal with sliced almonds and berries, a side of greek yogurt, and a cup of black coffee. He logs each item manually into the app, ensuring to include portion size and any added ingredients like sweeteners</p>	<p>After breakfast, he decides to do a brisk 30-minute running on a treadmill. Before starting his exercise, he logs his exercise activity using his AppleWatch. When he is done he stops his activity log on his AppleWatch and goes into his app to log this activity separately.</p>	<p>Before dinner, John administers his insulin dose using his insulin pen. He calculates his insulin dosage based on his current blood sugar level, carbohydrate intake for the meal, and insulin-to-carbohydrate ratio prescribed by his healthcare provider.</p>	<ul style="list-style-type: none"> <li>Before bedtime, John checks his blood sugar level using the app. He is reviews his daily blood sugar average and overall report to look back on his day.</li> <li>He receives an alert indicating that his blood sugar level is expected to rise to an abnormal value within the next hour. The alert prompts him to take proactive steps to prevent hyperglycemia.</li> </ul>

Above is the final decision point model of a current system tailored for John, a 62-year-old realtor agent with type 2 diabetes, designed to capture his daily decision-making journey concerning meal logging, physical activity, insulin management, and blood sugar monitoring. The information needed to create this model was gathered from user interviews (Google Form responses) and the persona that was created based on the result of that user interview. This model was selected because of its ability to comprehensively outline John's needs and considerations within the context of his diabetes management routine. By analyzing John's decision points within his current system, our project team gained valuable insights into areas where the app's usability could be enhanced to better suit the preferences and requirements of the users. One of the main lessons learned from this decision-point model is that we identified some pain points of the existing system. By mapping out John's journey, we identified potential pain points, such as the need for more intuitive meal-logging features or activity-logging features.

***Day-in-the-Life Model***

The Day in the Life model is crafted from insights gleaned from user interviews conducted via a Google Survey Form. This model is instrumental in helping our team deeply understand how individuals navigate their days, including their habits, preferences, and challenges, particularly in managing diabetes.

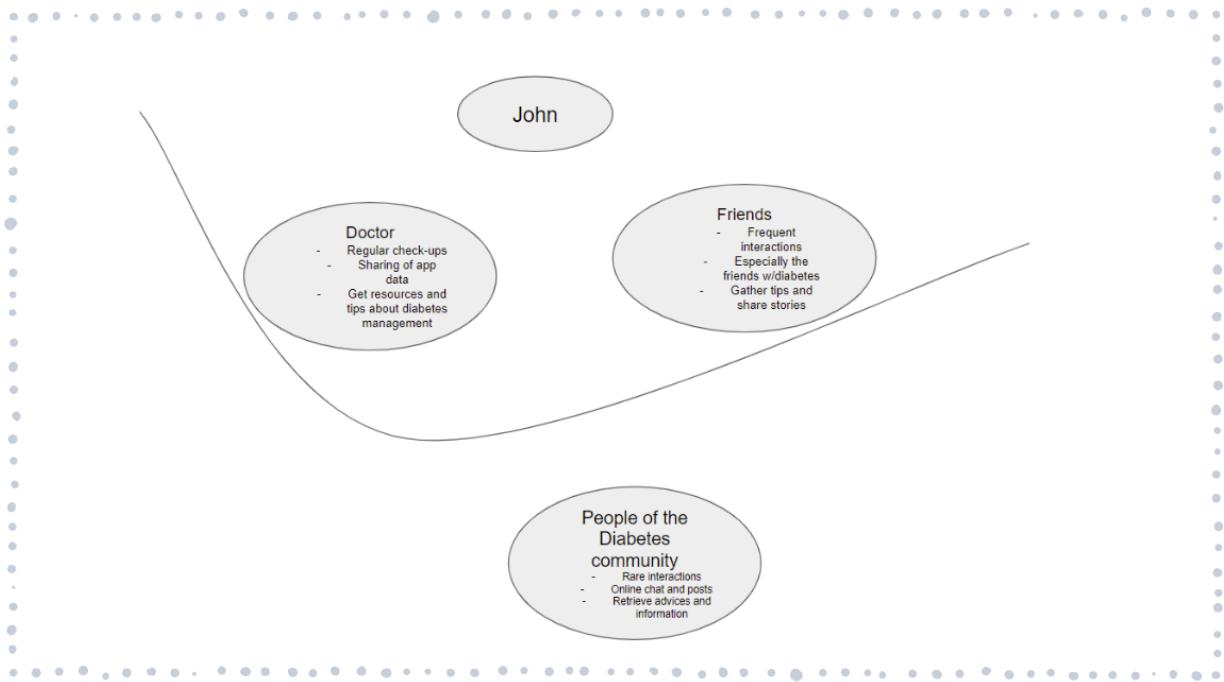
By using this model, we can ensure that our PASTA project aligns seamlessly with users' routines, integrating into their lives without causing disruptions, enhancing their experience by providing subtle support in managing diabetes.

The user primarily relies on the food logging and glucose level tracking features of the app.

However, they express significant difficulty in manually inputting food details such as type, quantity, and ingredients multiple times a day. This process is described as tiresome and demanding, potentially leading to inconsistencies in effectively managing diabetes.

Another key insight from the user interview is the challenge users face in using the app's features due to a lack of technical expertise. This highlights the critical importance of a user-friendly interface or platform, as the absence of such features could pose a significant drawback.

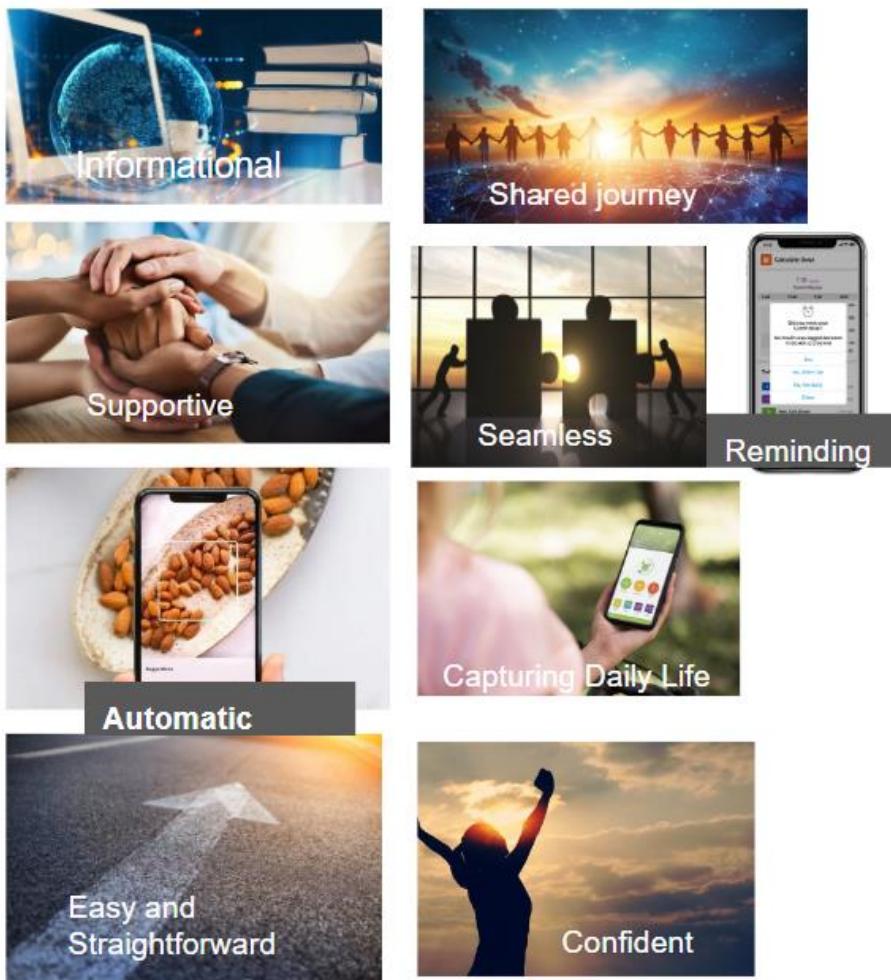
### ***Relationship & Collaboration Model***



The Relationship and Collaboration Model was developed through the information gathered from the user interview, using Google Forms. This model is in a draft stage and represents the current system. While we created a relationship model for initial interpretation of John's interactions with people who influence his journey of diabetes management, not much information could be derived from and for this model. The information found to be useful was that the user seeks a doctor and his friends to get helpful tips and resources. The model,

therefore, contributes to our understanding of the benefits the app will bring when the user interacts with these people for support.

### ***Sensation Board***



(pictures from Google)

The sensation board above was developed based on the information gathered through the user interview (responses from Google Form). It illustrates what the users want to feel or experience while using the diabetes management app. As the model reveals the aesthetic and emotional message that the app must provide, it represents the proposed system. We consider this model to be final, and it will be useful in tailoring the app to user preferences. The main lesson learned from this model is that we gained an insight into users' needs and preferences. By referring to this

Sensation Board, the team can ensure that the 'pasta' app aligns closely with the desires and expectations of the users, fostering a user-centric approach.

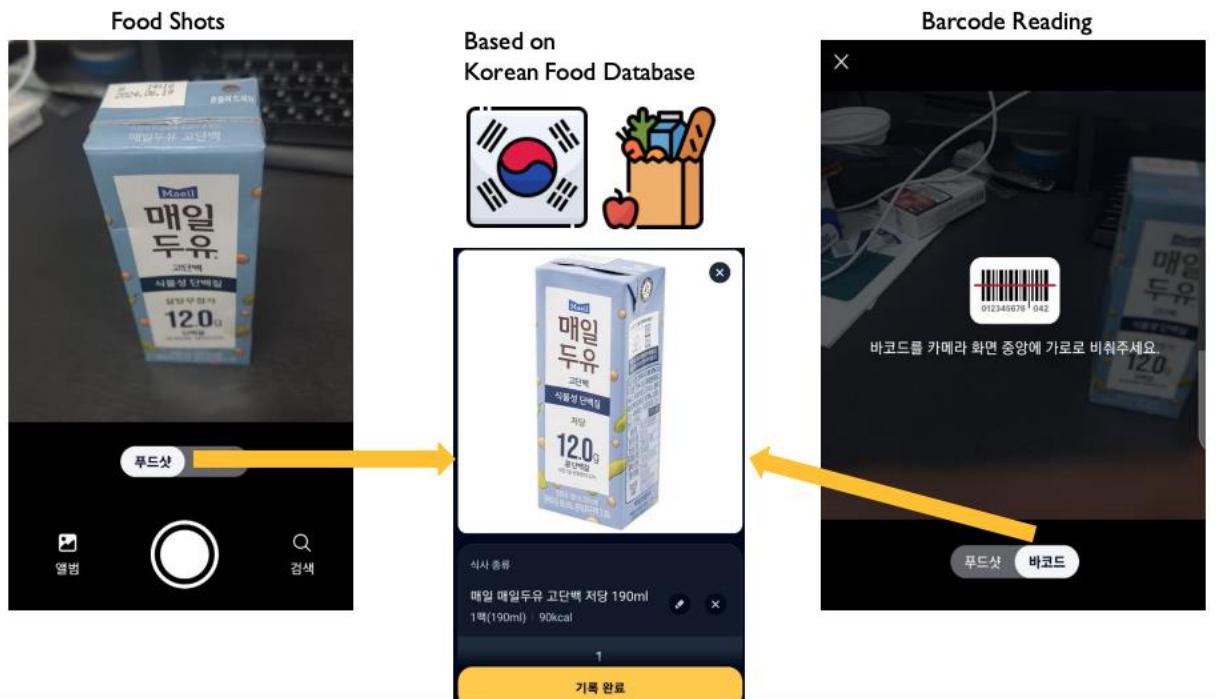
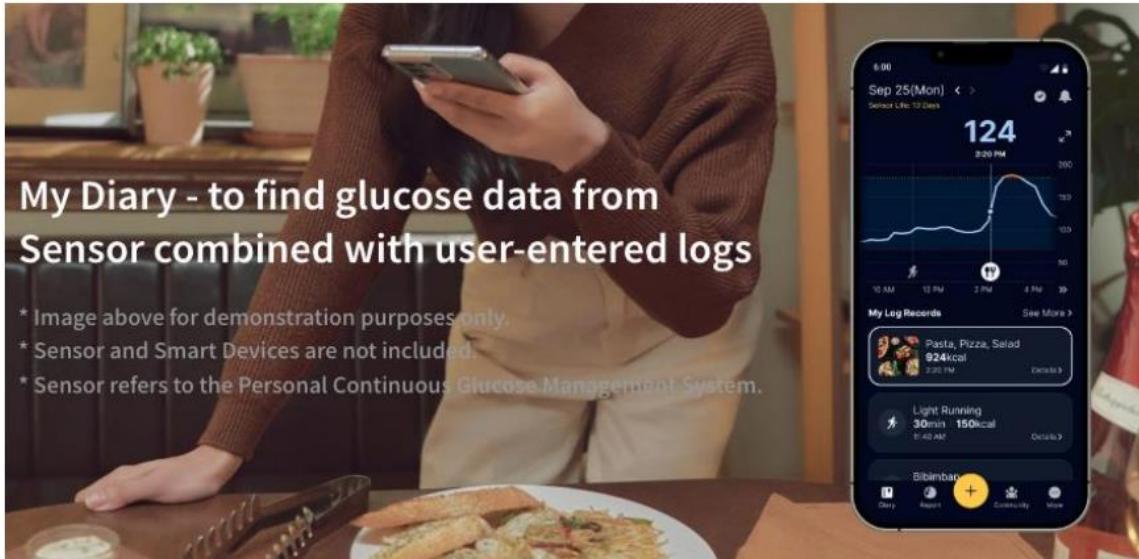
### **Current system & Suggested Solutions**

After gathering information from thorough market search, interviews, and modeling, our team designed several recommendation ideas to support the 'pasta app in tailoring to the U.S. market. The ideas involve addressing the four ways to enhance the 'pasta app mentioned before: integrating U.S. food databases for food tracking, incorporating already-active online community support, and integrating with the EHR system.

### **AI- Based Food Tracking and Database Integration**

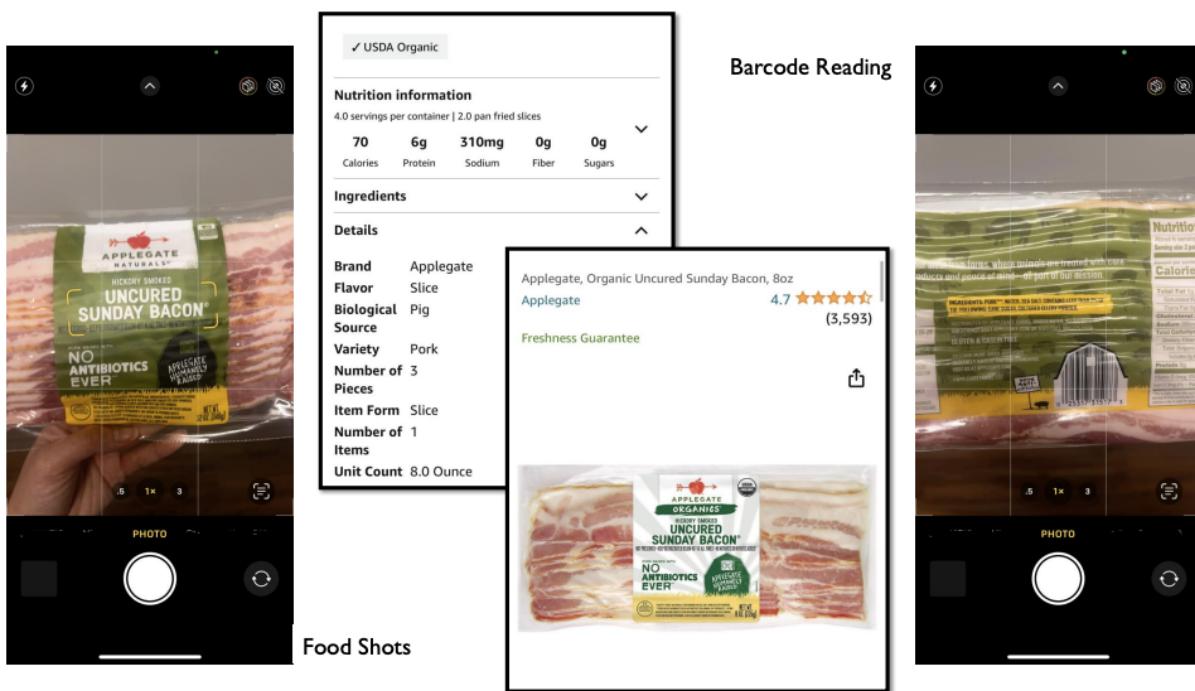
According to the interview and product reviews of other diabetes apps, AI-based food tracking is one of the functions that the users of diabetes management apps find most useful. However, the app currently only has access to the database used in South Korea and yet to implement the U.S. food database.

## Current System: AI-Based Food Tracking



Therefore, the first recommendation involves integrating a USDA food database for AI-based food tracking. The USDA food and nutrient database is an integrated data system that provides expanded nutrient profile data and consists of four distinct data types, including Foundation Foods, Branded foods, Experimental Foods, and SR Legacy. The barcode scanning

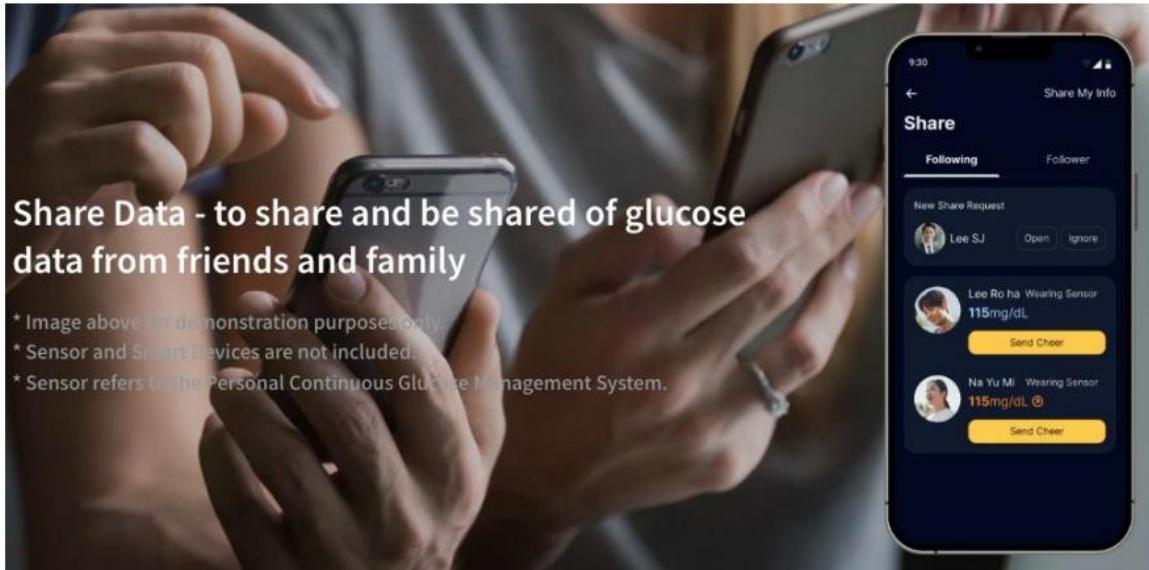
of the U.S. food products will be enabled by extensively using the data of the Branded Foods. The USDA Branded Food Products Database offers comprehensive nutrient composition and ingredient details for branded foods and private label data provided by the food industry. Once the user accesses the app and scans the barcode, the app will provide the user with detailed nutritional information sourced from the USDA Branded Food Products Database, facilitating informed decision-making about their dietary selections.



### **Alert System for Authorized Personnel and Requesting Help**

While studying the current state of the 'pasta app', we found out that the app has the feature to send alert notification to authorized individuals upon emergency situation but lacks other functionalities, including sharing location information and calling the ambulance.

## Current System: Alert system for authorized indiv.



Realizing the need to enhance the app's alert system, we designed a solution that showcases what functionalities the alert system of the app should have. When the patient's blood glucose level reaches out of set range, the app will send an alert and location information to emergency contacts. Simultaneously, the alert from the app in the user's phone will prompt the users to press the button to either call the ambulance immediately or ignore. The user has a time limit of 2 minutes to choose the option. If there is no response, the app will assume it is an

emergency and give an automatic ambulance call along with the update on location information.

## Enhanced alert system:

Sends alert & location to emergency contacts for too high/low glucose levels

Option to call ambulance instantly

Automatic ambulance call with update on location after a countdown of 2 minutes

### Community Support Resources in App

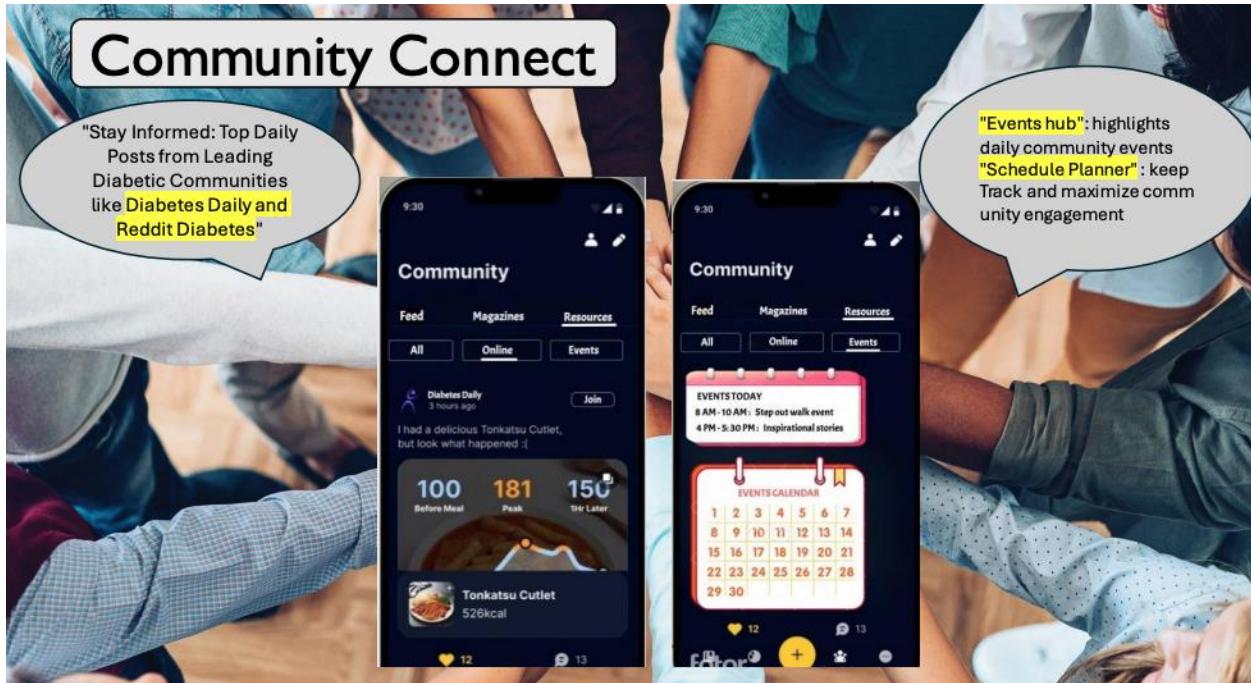
Several studies on diabetes management and the interviews our team conducted highlight the importance of social support and engagement in improving patient outcomes. We would like to witness the app provide the patients with a broader access to different resources, especially the already-active online community group that exists for diabetic patients.

## Current System: Community Support Resources



To integrate an active online community group for diabetic patients in the U.S. into the pasta apps' community tab, we propose that the app include another "Resources" tab within the "Community" page. This tab will contain separate sub tabs for the online community support group and for the information about diabetes events. Selecting the "Online" leads to the page where top daily posts from the leading diabetes community, such as Diabetes Daily and Reddit Diabetes, are located. The posts can also prompt the users to visit the online diabetes support group websites and join the community they prefer. The "Events" tab serves as an event hub where it highlights daily community events. At the top of the page, the upcoming events will appear in a list. The schedule planner located here will assist the users to view, track, and join the

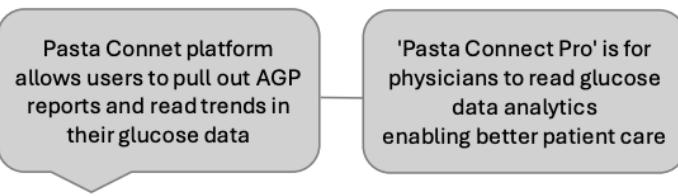
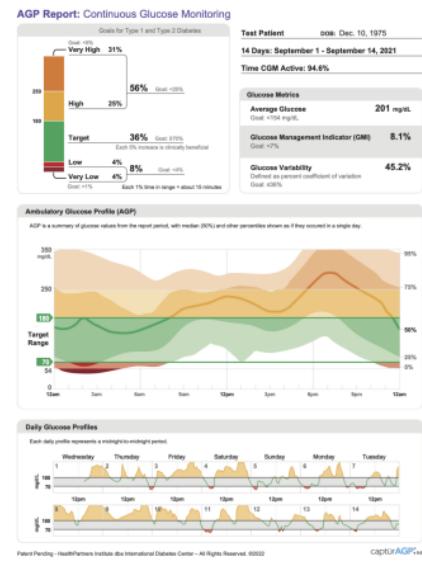
events that engage them with diabetes management.



### Integration with U.S. EHR Systems

As our team reviewed the results from the market search and interviews, it became more evident that the app's usability will significantly improve if the app can easily integrate with the EHR system in the U.S. Patients and physicians see a value in making the process of sharing the data easier and faster. The current system provides the patients access to data analytics and reports through the 'pasta' CONNECT platform, which the patients can manually export and upload to their EHR system.

## Current System: Integration with US EHR system

**pastaCONNECT Menu:**

- Search the menu
- View Care Team
- Communication**
  - Messages
  - Ask a Question
  - Letters
  - Clinic Calls
- My Record**
  - COVID-19
  - To Do
  - Visits
  - Test Results
  - Medications
  - Health Summary
  - My Conditions
  - Plan of Care
  - Preventive Care
  - Questionnaires
  - Medical Alerts
  - Health Records
  - Growth Charts
  - Document Center
  - End-of-Life Planning
- Health Reports**

**MyChart Interface:**

- Menu, Visits, Messages, Test Results, Medications
- Patient-Reported Glucose Tracking
- Health Reports
- Available Reports
- Patient-Reported Glucose Tracking



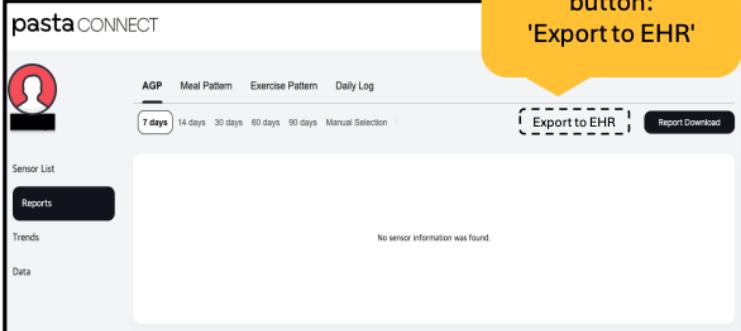
The current system is set up in a way so that 'Pasta Connect' provides access to data analytics and reports. Then patients can manually export their data and upload it to their EHR system in order to integrate this report to their doctor's visits.

However, we'd like to make this an automatic process so the patients don't need to go through these reports manually.

We would like to make this process automatic. Thus, our solution is to create a new button called 'Export to EHR' in the 'pasta' Connect platform. When users click on this button, they will be prompted to select the EHR system that their provider uses then login to their portal to allow access. Once logged in, the patients can then choose to export their glucose data reports to be exported to the portal regularly or at a chosen time. In the case where they are scheduled for a doctor's visit regarding their diabetic condition, the system can generate a report that enables physicians to look at the patients' glucose level and trend briefly. Knowing that the physicians might not be able to read all the reports and data, the report generated should highlight any abnormal incidents and trends in the patients' blood glucose level. Patients can always choose to stop exporting the data reports to portal. They can also add another EHR portal to export reports if their provider or EHR changes – by adding another portal sign in.

**1**

Create this new button: 'Export to EHR'



When users click on this button, they will be prompted to select the EHR system that their provider uses then login to their portal to allow access.

e.g.,



**Login page**

Thanks for using MyChart.  
You have been logged out.

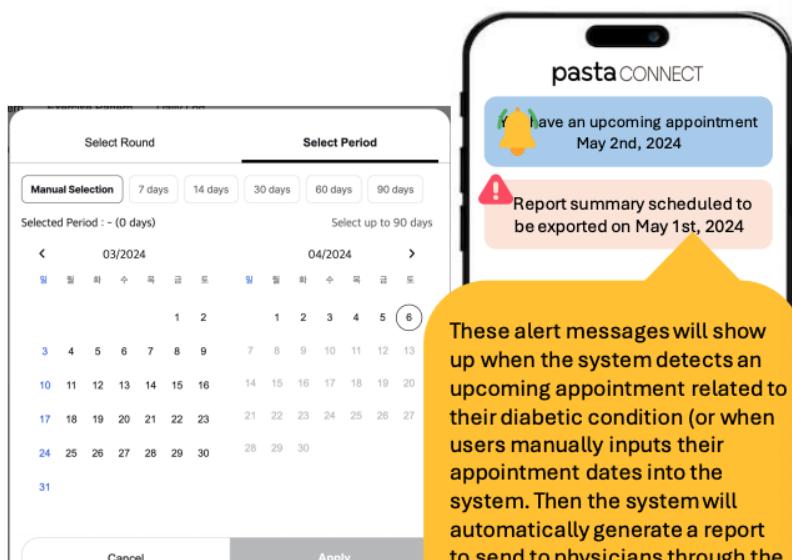
MyChart Username  
Password  
Sign in  
Forgot username?      Forgot password?

**2**

Once they are logged in, patients can then choose to export their glucose data reports to be exported to the portal regularly or at a chosen time (depending on their diabetic conditions).

Suppose they are scheduled for a doctor's visit with the provider regarding their diabetic condition. In that case, the system can generate a report that enables physicians to take a look at the patients' glucose level and trend at a glance.

We understand that physicians will not be able to read through all the reports and data, so the report generated should highlight any abnormal incidents and trends in the patients' blood glucose level.



These alert messages will show up when the system detects an upcoming appointment related to their diabetic condition (or when users manually inputs their appointment dates into the system. Then the system will automatically generate a report to send to physicians through the EHR portal and schedule it to be sent the day before the appointment.

## Implementation Plan

How would we integrate these suggested solutions into the current 'pasta' app to enable a successful U.S.-launch of the app?

Integrating U.S. food database

Access to USDA food databases is required to integrate into the app's existing food tracking functionality. The USDA database provides APIs for accessing this database. Anyone may access and use the API but a data.gov API key must be incorporated into each API request. No licensing or permission is required as the USDA food data are in the public domain and are not copyrighted. Incorporating large and comprehensive databases like that of USDA into the app involves multiple steps, from data acquisition, integration, testing, to refining the AI algorithms to use this data effectively. Hence, implementation of this plan may take several months, about 2 to 3 months.

# Integrating US food database



## USDA National Nutrient Database

	GTIN/UPC	Description	Branded Food Category	Brand Owner	Brand	Market Country
Foundation Foods	0099447210127	ALL NATURAL GLUTEN FREE CHICKEN NUGGETS	Frozen Poultry, Chicken & Turkey	Golden Platter Foods Inc.	GOLDEN PLATTER	United States
Branded Foods	0838927500101	ALL NATURAL ROSEMARY & OLIVE OIL BASMATI RICE, ROSEMARY: OLIVE OIL	Flavored Rice Dishes	SLT Foods Inc.	HERITAGE SELECT	United States
Experimental Foods	0076808004649	ARTISANAL COLLECTION SPAGHETTI PASTA	Pasta by Shape & Type	Barilla G & R F.Lli S.P.A.	BARILLA	United States
SR Legacy	0852501006001	AUTHENTIC BARREL RIPENED FETA CHEESE	Cheese	Wdh, LLC	APHRODITE	United States
	010300064220	BERRY NUT BLEND BREAKFAST IN THE GO!	Popcorn, Peanuts, Seeds & Related Snacks	Snyder's-Lance, Inc.	EMERALD	United States



Data Type	Release Date	Download File	File Format	Zipped	Unzipped
Foundation Foods	10/2023	<a href="#">October 2023 (JSON)</a> <a href="#">October 2023 (CSV)</a>	JSON CSV	409K 2.9M	5.5M 24M
SR Legacy	4/2018	<a href="#">April 2018 (JSON)</a> <a href="#">April 2018 (CSV)</a>	JSON CSV	12.3M 6.7M	205M 54M
FNDDS	10/2022	<a href="#">FNDDS 2019-2020 (JSON)</a> <a href="#">FNDDS 2019-2020 (CSV)</a>	JSON CSV	3.8M 4.3M	66.8M 41M
Branded	10/2023	<a href="#">October 2023 (JSON)</a> <a href="#">October 2023 (CSV)</a>	JSON CSV	176M 439M	3.1G 3.1G
Full Download of All Data Types	10/2023	<a href="#">October 2023 (CSV)</a>	CSV	417M	2.8G



USDA database provides APIs for accessing this database and are in the public domain (and not copyrighted). Anyone may access and use the API.



A data.gov API key must be incorporated into each API request, which you can get access to when requested online.



There is a limited number of API requests of 1,000 requests per hour per IP address.

## Enhancing Functionalities with Alert System

This recommendation involves adding new functionalities to the alert system within an app. Some necessary steps to carry out the plan includes developing new features, such as a user interface for initiating emergency calls, integrating with emergency services APIs, and ensuring compliance with relevant regulations and standards. Although the plan builds on the existing

system, thorough development, testing, and potentially obtaining necessary approvals requires adequate time, an estimated time of one to two months.

### Integrating Online Community Groups to the App

Our solution, which was to design and implement a new tab within the community page, demands both technical and design considerations. The necessary activities for this solution include ensuring the development of the functionality to display relevant community group and event data, ensuring the seamless navigation for the users through testing, and securing the potential partnerships with online community platforms. Considering such factors, we assume that the implementation of this recommendation will take two to three months.

### Integrating with EHR System

Our recommendation suggested streamlining the data export functionality within the ‘pasta Connect’ platform to enable seamless export of patient’s blood glucose data to external Electronic Health Record (EHR) systems. The tasks to achieve this involve enhancing data formatting and compatibility to facilitate smooth integration with various EHR systems. Then, testing should be conducted to validate the integrity and reliability of the data during export. Additionally, coordination with external EHR system providers is also crucial to facilitate integration and address any technical requirements or compatibility issues. The implementation of this solution is expected to last two to three months.

### Budget and Resource Considerations

We anticipate that each of the recommended solutions will require a budget of several thousand dollars, starting from at least \$3,000. In addition, the project requires collaboration between app developers, healthcare professionals, data analysts, legal team for compliance issues, and patients. Strategic resource allocation is strongly advised for the success of the implementation.

## Client Appendix

### User Survey Form Questions

Section 1 of 4

## Diabetes Management Apps User Feedback

**B** **I** **U** **🔗** **X**

Our team is conducting research for a project aimed at enhancing diabetes management apps with a global perspective. We're gathering general information about diabetes management in the US and seeking user feedback to inform our project.

**Thank You** for taking the time to participate in our survey. Your opinions and insights are invaluable and we sincerely appreciate your contributions!

What is your age? Multiple choice

0 - 20 X

21 - 35 X

36 - 65 X

66 and above X

Add option or [add "Other"](#)

How long have you been living with diabetes? \*

Short answer text

Have you ever used a diabetes management app before? \*

Yes

No

## Section 2 of 4

**What apps do you use currently? How satisfied are you?**

This section asks you about your current choice of diabetes management app and its functionality.

**What kind of CGM device (glucose monitor) are you using? \***

If you are using multiple apps, select all.

If your app is not listed, please manually input them by choosing the last option.

- Dexcom
- Nutrisense
- Abbott
- Medtronic
- Other...

**How does the app help you track and manage your dietary habits and physical activity? \***

Long answer text

**Do you use any features within the app to set reminders for medication, appointments, or other diabetes-related tasks? \***

- Yes
- No
- My app do not have such functionality

Do you feel that the app adequately educates and informs you about diabetes management and related topics? \*

- Yes
- No
- Not Sure

Does the app provide any personalized recommendations or insights based on your individual health data and trends? \*

- Yes
- No

Have you shared your app data with your healthcare provider? If so, how did this information help to support your care? \*

Long answer text

Have you utilized any emergency features within the app, such as alerting contacts in case of severe hypoglycemia or hyperglycemia events? \*

- Yes
- No
- My app do not have such functionality

Are there any aspects of the app that you find challenging or difficult to use?

Long answer text

## Section 3 of 4

**Possible App Functions and their usability**

Imagine following functions are available in your diabetes management app and rate them from 1 (Least Helpful) to 5 (Most Helpful). If your app already offers such functionality, rate them based on your experience.

**AI-Based food recognition \***

Users can simply take a picture of their food, or scan the barcode of the package to easily log their food intake in to the diabetes management app.

1

2

3

4

5

Least Helpful

Most Helpful

**Support community tab within the app \***

The app incorporates the user community section to share tips and information about diabetes.

1

2

3

4

5

Least Helpful

Most Helpful

**Data sharing with caregiver \***

Your authorized caregiver have access to your blood glucose level, enabling easier and better care planning.

1

2

3

4

5

Least Helpful

Most Helpful

**Live advice based on your blood sugar level \***

The app provides advice based on your current blood sugar level (e.g., Your blood sugar seems to be lower than usual. Quick snack (apple or banana) might help increase it!)

**Notification to authorized personnel in emergency situation \***

When your blood sugar level is dangerously low or high, the app sends an alert to authorized person (family members, significant others, caregivers, etc.).



## Section 4 of 4

Online Community Support Group for diabetes management



Description (optional)

Have you ever used any of the online community support groups below? \*

 TuDiabetes Diabetes Daily American Diabetes Association (ADA) Community Reddit (r/diabetes) I have not Other...If you answered '**I have not**' from above question, where do you usually get information (tips, resources) about diabetes?

Long answer text

If you have any suggestions or thoughts regarding diabetes management app, please feel free to share them here:

Long answer text

This is the list of questions that we asked to users. These questions were carefully drafted considering various target groups of users with varying experience levels with diabetes management apps. Capturing various populations' perspectives and their user experiences was the key objective of these survey questions. Initially, our team members directly reached out to people who might be a good fit for this study. However, we realized that this approach would allow limited

user engagement. Therefore, we posted the survey link to LinkedIn to gain diverse groups of users' aspects.

## Team Appendix

### *Plans for presenting to the client*

Throughout the semester, we've maintained consistent communication with our client, providing regular updates on the project's progress via email. Given our client's busy schedule and the time zone difference, with our client located in Korea, we've devised a plan for a succinct presentation meeting lasting approximately about 10-15 minutes. The primary focus of this meeting will be to showcase the solutions we've developed. To facilitate this presentation, we've crafted a comprehensive slide deck, encompassing all key details of our proposed solutions. During the presentation, we'll leverage visual aids to concisely explain our approach, emphasizing the benefits and feasibility of each solution. This streamlined format allows us to effectively communicate the value of our work and encourages meaningful discussions with our client regarding next steps and implementation strategies. Furthermore, we're prepared to answer any questions or concerns our client may have, ensuring a collaborative exchange of ideas and feedback during the presentation.

### *Lingering Issues & Lessons Learned*

Some issues we encountered during the data gathering portion of the project were recruiting users and more physicians to interview. Most of our contacts are graduate students and the interviewing process took place over our week-long spring break. With more time, we would have reached out to more people outside of UNC who are familiar with digital health trends and actual

clinics that utilize Epic, Cerner, or other EHR systems to gather information on back-end infrastructure of diabetes management intervention. We could also perform in-person interviews as our Google survey form and phone-call interview could have allowed for people to fill in answers quickly instead of having a more personable approach to answering.

This project helped us gain insight on building persona models, sequence models, and decision point models. These are useful skills to learn in marketing, project management, and other fields that we are aiming to work in. The ability to convey ideas for users, investors, and other stakeholders in an engaging way is essential and we will use these models beyond this project to engage people and collaborate with stakeholders. The skill of picking out useful questions for interviews is important too, and we made sure to ask straightforward questions that pertain to the goal of analyzing diabetes management apps. It was difficult to not have biased questions as we believe in the usefulness of health management apps, but some users may not find them useful at all and they should include other methods that work for them. Contacting the developer and taking advice from him in a timely manner was another strength of ours that worked well in our favor.

In assessing our team's performance, we recognized our strengths and weaknesses. While communication was a key aspect of our project, we acknowledge that our response times were slow, affecting our overall effectiveness. We would have benefited from better engagement and more proactive communication among team members. Additionally, improved time management would have helped us stay more focused and responsive to project needs. Despite these challenges, we demonstrated strong collaboration and the ability to overcome obstacles, showcasing our determination and commitment to delivering quality results.