Are customers satisfied with current available CGMs?
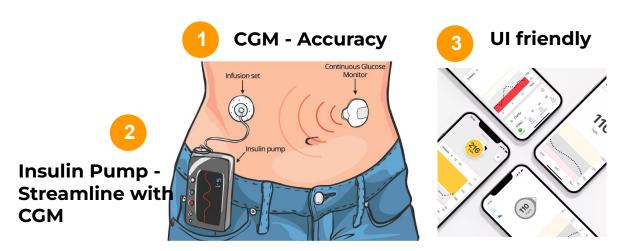
Xi Yan (xiyan)

Wanying Zhang (wanyingz)

Tiffany Huang (thhuang)

Executive Summary

Three products are important for diabetes patient to manage their disease status: Continuous Glucose Monitor, Insulin Pump (Closed Loop System), Data-Recording/Reading APP
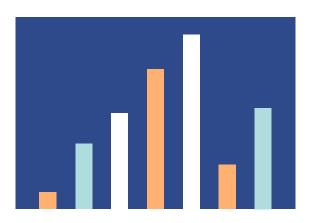
Key factors to meet patient satisfaction

1 **CGM - Accuracy**

3 **UI friendly**

user expectation Apple Watch

2

Insulin Pump - Streamline with CGM

Infusion set

Continuous Glucose Monitor

Insulin pump

10:09

TABLE OF CONTENTS

01.

Background

DIABETES

37 Million
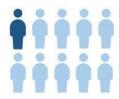
37 million people **have diabetes**
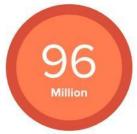
That's about **1 in every 10** people

1 in 5 people **don't know they have it**

PREDIABETES

96 Million

96 million American adults—**more than 1 in 3**—have prediabetes

More than 8 in 10 adults with prediabetes **don't know they have it**

Why CGMs?

CONTINUOUS GLUCOSE MONITORS ADVANTAGES

Real-time insight on blood sugar

Monitor all 24 hours

Capture data while sleeping
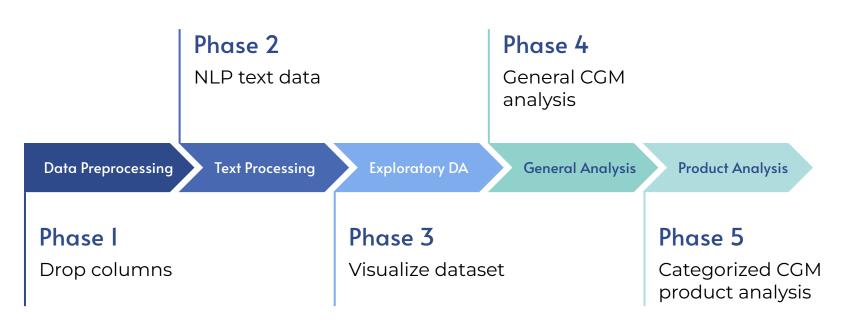
Identify specific foods and habits that spike blood sugar

Receiver/reader

App

02.
Project Workflow & Data

Project Workflow

Phase 2
NLP text data

Phase 4
General CGM analysis

Data Preprocessing

Text Processing

Exploratory DA

General Analysis

Product Analysis

Phase 1
Drop columns

Phase 3
Visualize dataset

Phase 5
Categorized CGM product analysis

Raw Data

63 Columns

37,844 Rows

4/1/2021 - 9/2/2022

42 Columns containing > 90% missing value

Imbalanced Source Type

Forums occupies 92% data

Social media posts contain emojis, hashtags and links

Pre-processing

Analysis Methods

Text Processing

Handle missing data / columns

Remove links/punctuations emojis

Tokenize text

Remove stopwords

Lemmatization

Words Frequence Analysis → **Business Insight** ← Topic Modeling
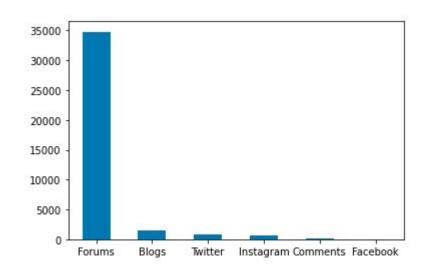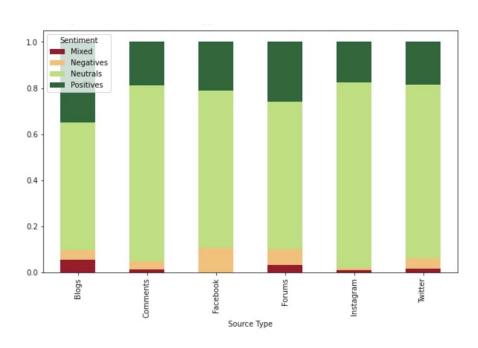
Exploratory Data Analysis

Imbalanced number of posts across sources

Distribution of sentiments across data sources

03.

Results

- General Analysis
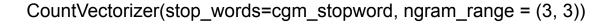- Product Analysis

General Product Analysis… Initially

1. Single word does not provide insights
2. Of course we know "blood", "good", "want" we be on the cloud!

General Product Analysis... Then

cgm_stopword = ['good', 'blood', 'glucose'.......]

CountVectorizer(stop_words=cgm_stopword, ngram_range = (3, 3))

```
[('close loop system', 78),
 ('durable medical equipment', 30),
 ('14 day sensor', 24),
 ('multiple daily injection', 23),
 ('insurance doesnt cover', 20),
 ('start new sensor', 20),
 ('apple watch series', 19),
 ('feel like shit', 19),
 ('hybrid close loop', 19),
 ('wake middle night', 19),
 ('prick finger time', 17),
 ('a1cs guess want', 16),
 ('app update base', 16),
 ('base version update', 16),
 ('build app update', 16),
 ('decade good a1c', 16),
 ('doesnt require finger', 16),
 ('good a1c secret', 16),
 ('lot people a1cs', 16),
 ('oc build app', 16),
 ('people a1cs guess', 16),
 ('reddit decade good', 16),
 ('require finger prick', 16),
 ('update base version', 16),
 ('finally get tandem', 15)]
```

General Product Analysis Result

['expect', 'want', 'need','look', 'forward', 'require', 'anticipate', 'desire', 'prefer', 'hope', 'wish', 'envision', 'imagine', 'plan', 'consider', 'suggest'...]

Evaluation:
1. Close Loop System : Want to know more about the Closed Loop System
2. Durable Medical Equipment: Want to know which suppliers covers CGM as DME so patients' insurance will cover it
3. Apple Watch Series: Hoping for future roll out of CGM app compatibility / blood sugar monitor on next generation Apple Watch

EXPECTATION

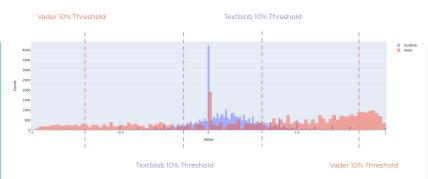Close Loop System

Durable Medical Equipment

Apple Watch Series

General Product Analysis Result

UNMET NEEDS

Base Version Update

Low Blood Sugar

High Blood Sugar

BENEFIT

Continuous Glucose Monitor

Does't Require Finger

Evaluation:
Unmet Needs:
1. Version Update Slow, People develop software themselves
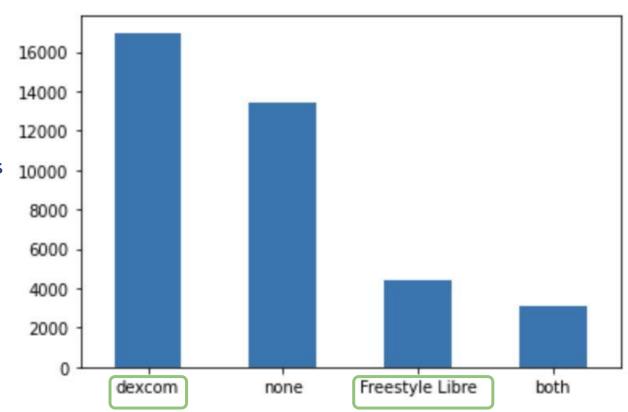2. Blood Sugar monitor inaccurate, false low or false high

Benefit:
1. CGM itself
2. No finger pricking

Product Analysis

Dexcom has about 4 times more posts than Freestyle Libre

Product Analysis – Dexcom

Features

- Closed loop system (Compatible with Tandem tslim x2 insulin pump)
- Blood sugar warning system
- Dexcom App

Word Frequency Analysis

```
'continuous glucose monitor', 237),
('close loop system', 92),
('tslim x2 dexcom', 44),
('dexcom g6 app', 23),
('low warn system', 4),
```

Verification

If you get a good closed loop system, adding a sensor to your pump can make managing blood sugars a lot less work imo. When I switched to a tslim + Dexcom with control IQ, I noticed I was doing a lot less manual correction boluses because the system did it for me (more or less), and I was spending less time waiting for my blood sugar to come down because I'm in range more of the time. So in that sense having another device could actually be easier.

Product Analysis – Dexcom

Praises

- Allow users to manage their health better and easier

- Set users free from abusing fingers

- Easy to use and adjust products

Word Frequency Analysis

```
('highly recommend get', 11),
('make life easy', 11),
('22 year battle finally feel free', 7),
('good continue monitor tire abuse finger', 5),
('dont people have hard time adjust', 5),
```

Verification

Diagnosed 2018 in my twenties. I use a tandem pump and dexcom G6. I can't express how much it has changed my life for the better. SIGNIFICANTLY helped to lower my A1c and just made my overall life easier.

Product Analysis – Dexcom

Complaints

- App not user friendly

- Cost

- Unstable Bluetooth

- Compatible issue with Android

- Inaccurate reading (false low)

Word Frequency Analysis

('app update base', 9)   ('sensor bluetooth issue', 4),

('app issue connect', 5),   ('bad experience sensor', 5),

('cant find widget', 3),   ('galaxy note issue', 4),

('insurance wont cover', 6),   [('give false low', 8),

Verification

I'll make this quick as I can- we have a iPhone 12 mini that we use for my sons Dexcom G6. We loose Bluetooth connection ALL THE TIME. We have to constantly toggle the Bluetooth off and on to get it to reconnect. 5-10 times per day. So sick of it. So for my question and TLDR: What phone do you use with your Dexcom G6 and how reliable is the Bluetooth connection? Thanks in advance!

Product Analysis – Freestyle Libre

Features

- **Continuous glucose monitor**

- **Wearable device**

- **Flash Monitor System**

- **Freestyle Libre APP**

- **Glucose Level Alert**

- **Compatible with insulin pump (Medtronic)**

Word Frequency Analysis

```
[('continuous glucose monitor', 278),
 ('use freestyle libre', 252),
 ('freestyle libre sensor', 165),
 ('libre 14 day', 65),

 ('information device compatibility', 7),
 ('interstitial fluid level', 7),
 ('operate system check', 7),
 ('read phone minute', 7),
 ('alarm level set', 6)]
```

Verification

New sensor day!! I never thought when I was diagnosed 18 years ago that a cgm (continuous glucose monitor) would be a possibility, now I couldn't imagine my day to day life without it☀️and now libre2 sends alerts when going hypo/hyper!!

Product Analysis – Freestyle Libre

Praises

- **Fairly accurate**
- **Painless when insert the sensor**
- **compatible with app, easy for data reading**
- **Good for health management (chronic disease monitoring)**
- **Affordable price!**

Topic Modeling

```
[Topic 0]
easy painless insert : 0.002812069941762995
phobe easy painless : 0.002812069941762995

[Topic 4]
help monitor value : 0.0016847234647457089
help monitor level : 0.001681871805225744
```

Verification

… I've had a Freestyle Libre 2 CGM for a couple of months now and it's been fantastic. Insertion is painless and easy, checking is as simple as tapping it with the reader, …

Product Analysis – Freestyle Libre

Complaint

- **Inaccurate - new sensor replacement**

- **App unresponsive**

- **Non-recyclable material**

- **Medtronic 770G
  - backward technology**

Topic Modeling

```
[Topic 0]
finger prick test : 0.04951628815041799
sensor morning huge : 0.034042933964336435
new sensor morning : 0.034042933964336435
morning huge difference : 0.034042933964336435
huge difference read : 0.034042933964336435
difference read check : 0.034042933964336435
```
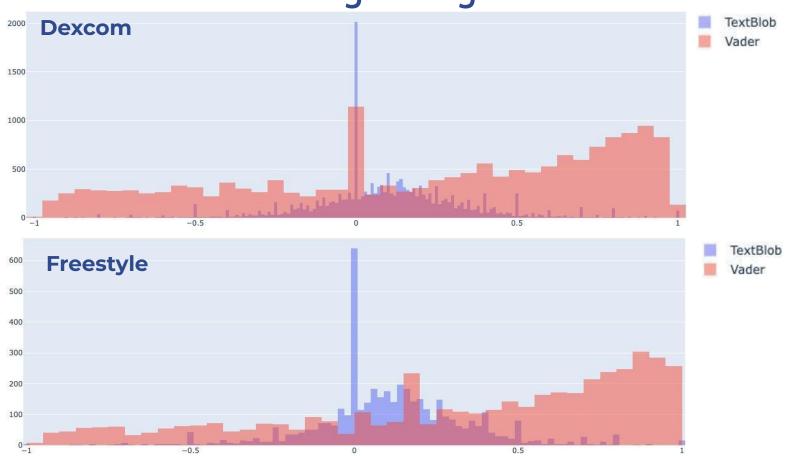
Verification

Freestyle Libre 2 - new sensor this morning HUGE difference between reading and blood check

wow and I thought the freestyle libre has a lot of waste So much trash for just one infusion and cgm change. Anyone else feel bad about the amount of non recyclable trash that comes with trying to stay alive?

Are people satisfied with current available CGMs?

Overall Sentiment Regarding Two Products

Comparison between Dexcom & Freestyle Libre

	Features	Complaint
Dexcom & Freestyle Libre	- Continues Glucose System - Close loop system (Compatible with insulin pump) - Blood sugar warning system - Compatible with App	- App issue - unresponsive - unfriendly UI - Inaccurate reading
Dexcom	-	- Compatible issue with Galaxy Note - cost
Freestyle Libre	-	- Sensor issue - Non-recyclable material - Medtronic 770G - backward technology

Recommendations for CGM companies

1. CGM **Accuracy** is important for diabetes patient to monitor their glucose value
2. APP **design & operation smoothness** affect users' product satisfaction level
3. Users expect to have **closed loop system** cooperate with CGM system. CGM companies should carefully pick their business partner or consider to expand the business into insulin pump market.
4. Challenge or Opportunity? Users expect to see the CGM function on **Apple watch**. CGM companies should focus on their APP design more or consider the opportunity to cooperate with Apple.

For Dexcom

- App User Instructions need to be revised
- Improve Bluetooth connectivity
- Increase compatibility with Android phones

For Freestyle Libre

- Sensor issue to be resolved
- Replace the consumable items with the recyclable material
- Cooperate with other insulin pump company
- Collect more data to do the analysis

FAQ

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