ECEN 403
Electrical Design Laboratory I
GlycoTrem: Customer Needs Analysis

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"An Aggie does not lie, cheat or steal or tolerate those who do."

Contents

1 Introduction

New products get released into the market on a daily basis, some succeed and receive a lot of attention, and some don't. A lot of factors come into play when differentiating between what's worthwhile and what isn't. One of the most prominent factors is a proper analysis of the audience. Understanding this audience's needs allows innovators to come up with better ways to design their product, in such a manner that makes it more distinguishable than other alternatives.

One of GlycoTrem's main objectives is to provide diabetic patients with a helpful and convenient tool. These traits are subjective to the users, and cannot be achieved without inquiring them about their opinions. For this purpose, a customer analysis study is being conducted to better integrate the people's needs and preferences into GlycoTrem. This report will explain the means through which the study was done, as well as present its results' analysis and evaluation. Additionally, recommendations to improve the shortcomings of this survey would be outlined and discussed.

2 Methods

The nature of GlycoTrem's audience hinders the ability to directly interview them. As patients, their rights to privacy must be protected, and therefore no direct contact is to be made with them without an approval by the Institutional Review Board (IRB). Obtaining this approval is a lengthy process, which leads to resorting to a different approach, a survey.

2.1 Survey Composition

The survey was built in such a manner that the participants are informed that the answers they provide will be used for data analysis. Following that, the participants are asked for some of their demographic data. The main demographic parameters focused on are the birth year and the gender. The birth year is especially important, as some tremors occurring in older people may be a symptom of Parkinson's disease rather than hypoglycemia. Thus, a relation between the frequency and severity of tremors and the age will be looked into later on in the study. Towards the end of the survey, the participants are asked whether they own a smartwatch or are open to using one. This information is crucial to the development of GlycoTrem since it relies on a smartwatch for accelerometer data collection.

2.2 Survey Distribution

The survey was distributed by finding diabetic community groups on different social media such as Instagram, WhatsApp, and Facebook. Moreover, the survey was sent to friends who were then asked to distribute it to friends or relatives who have or may know someone diagnosed with diabetes.

3 Customer Needs Analysis

3.1 Results

The survey yielded data from **206** participants, of which **184** were considered valid after sanitizing and scrubbing invalid entries. The following results and analysis will be using this sample size of **184**.

3.1.1 Quantitative Results

Q: What is your gender?

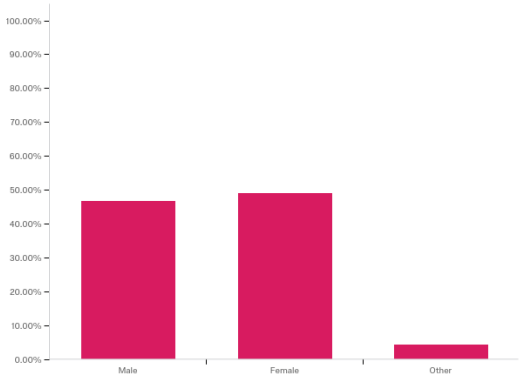

Figure 1: Gender Distribution

The gender distribution in Figure 1 shows that the survey was able to target both genders effectively. There is a slightly higher number of females (48.94%) who undertook the survey compared to men (46.81%). A small number of participants selected other (4.26%).

Q: Are you or do you know someone who is diabetic?

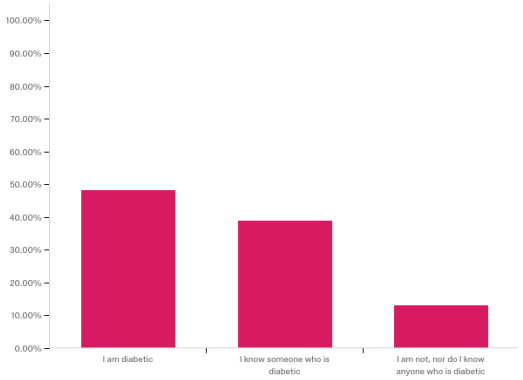

Figure 2: Are you or do you know someone who is diabetic?

The percentage of diabetic patients forms almost half the population at 48.15%, whereas that of participants who know somebody diagnosed with diabetes is 38.89%. The reason behind the inclusion of people who aren't personally diabetic but know someone who is is due to the presence of younger or older patients who are unable to take the survey themselves. Those who answered that they don't have or don't know anyone who has diabetes (12.96%) were redirected to the end of the survey.

Q: What type of diabetes do you have?

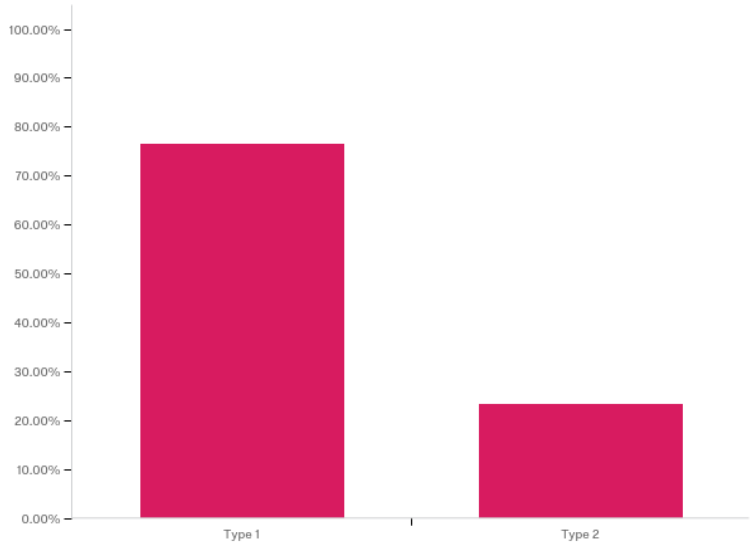

Figure 3: What type of diabetes do you have?

The percentage of participants being type 1 diabetic is 76.6%, while that of type 2 diabetic participants is 23.4%. This question was asked in order to see if a correlation between the type of diabetes and the tremors was important; however, upon closer inspection of this survey's results, no direct correlation was deduced.

Q: How many times a day do you measure?

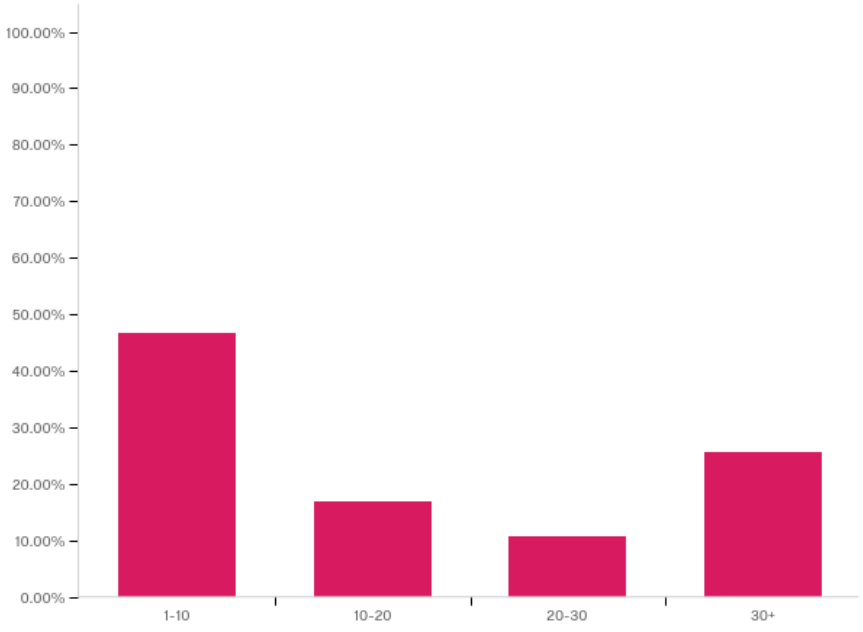

Figure 4: How many times a day do you measure?

Most participants (46.81%) measure only between 1-10 times a day. This is followed by those that measure more than 30 times a day (25.53%). Less participants measure 10-20 times a day and 20-30 times a day (17.02% and 10.64% respectively).

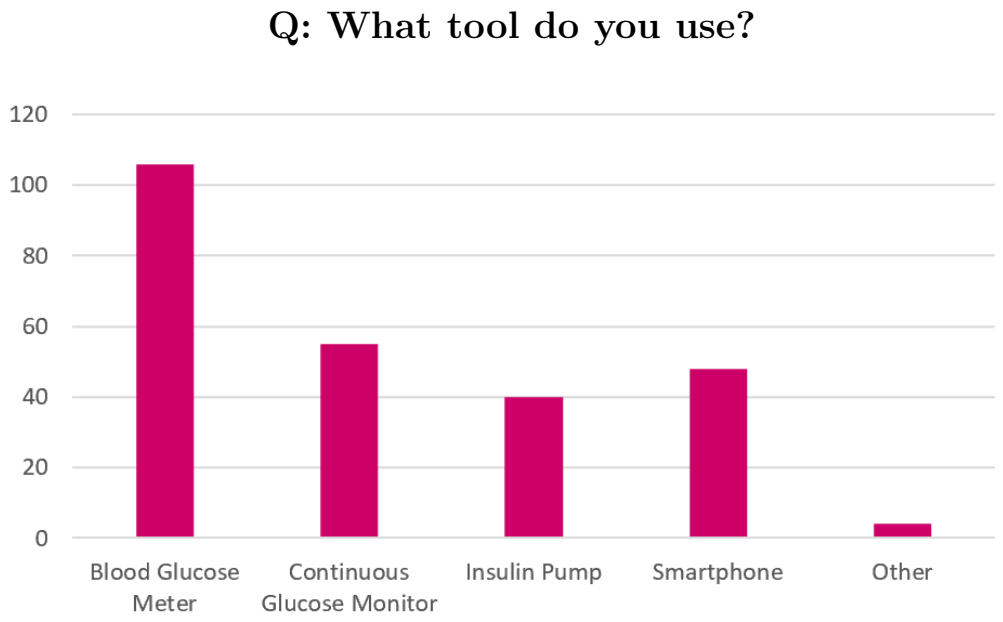

Figure 5: What tool do you use?

Participants could select more than one option in this section of the survey. The majority of participants (106/184) use Blood Glucose Meters. This is followed by Continuous Glucose Monitors (55/184) and Smartphone applications (48/184). Insulin Pumps are used by the least amount of participants along with "other" solutions. (40/184 and 4/184 respectively).

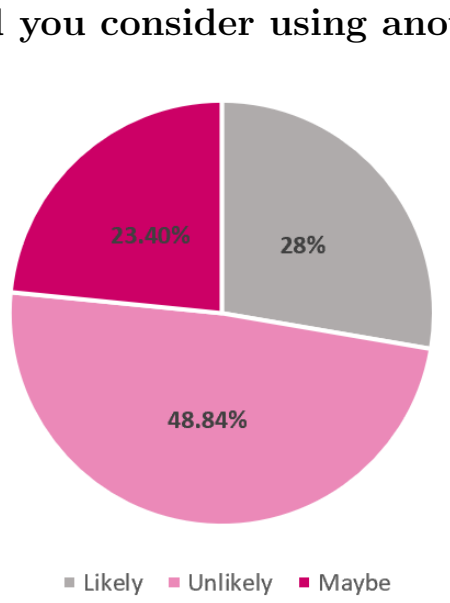

Figure 6: Would you consider using another tool?

The participants were asked to rate on a scale from 1 to 10 how likely they are to consider a new tool. As shown on the chart, almost half the population isn't open to the idea of trying out a new product for diabetes management. Further studying of the data, however, showed that 83.2% of those who chose a rating less than 5 were in fact part of the older population (more than 60 years of age) and the younger population (less than 20 years of age).

Q: What are the desired features of such tool?

#	Field	Mean	Std Deviation	Variance
1	Aesthetics	2.68	1.34	1.79
2	Battery life	4.45	0.77	0.59
3	Cost	4.23	1.11	1.24
4	Size	3.70	1.17	1.36
5	Insulin log	3.26	1.73	3.00

Table 1: Desired Features

When it comes to desired features of any replacement tool, the participants were asked to rate the importance of each feature from 1 to 5. The two critical features were battery life (4.45/5) and cost (4.23/5). The least important aspect of the product was aesthetics (2.68/5) followed by insulin logging and size (3.26/5 and 3.70/5 respectively).

Q: Are you familiar with hypoglycemic tremors?

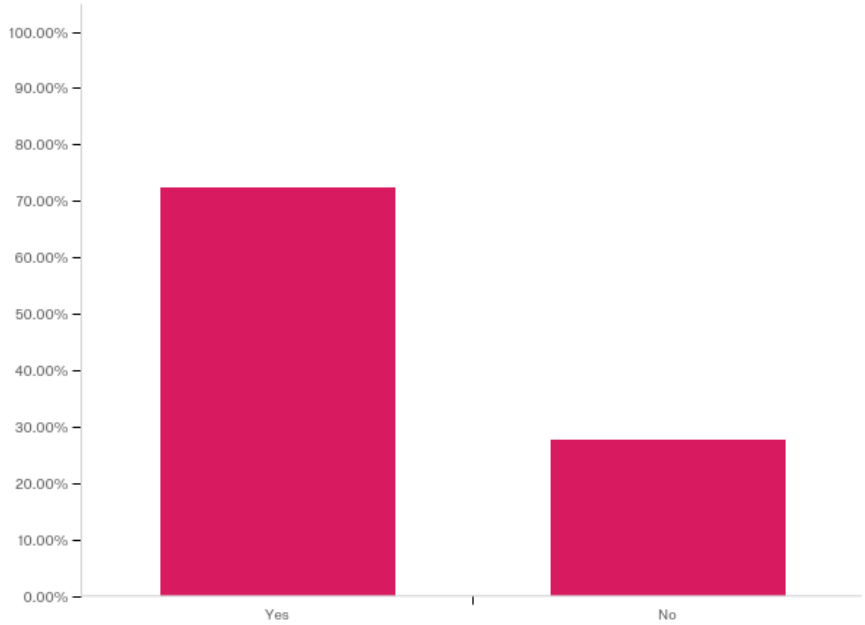

Figure 7: Are you familiar with hypoglycemic tremors?

Participants were asked whether they knew what hypoglycemic tremors are. The 27.66% that didn't know were presented with a brief definition of this symptom.

Q: Have you experienced such tremors before?

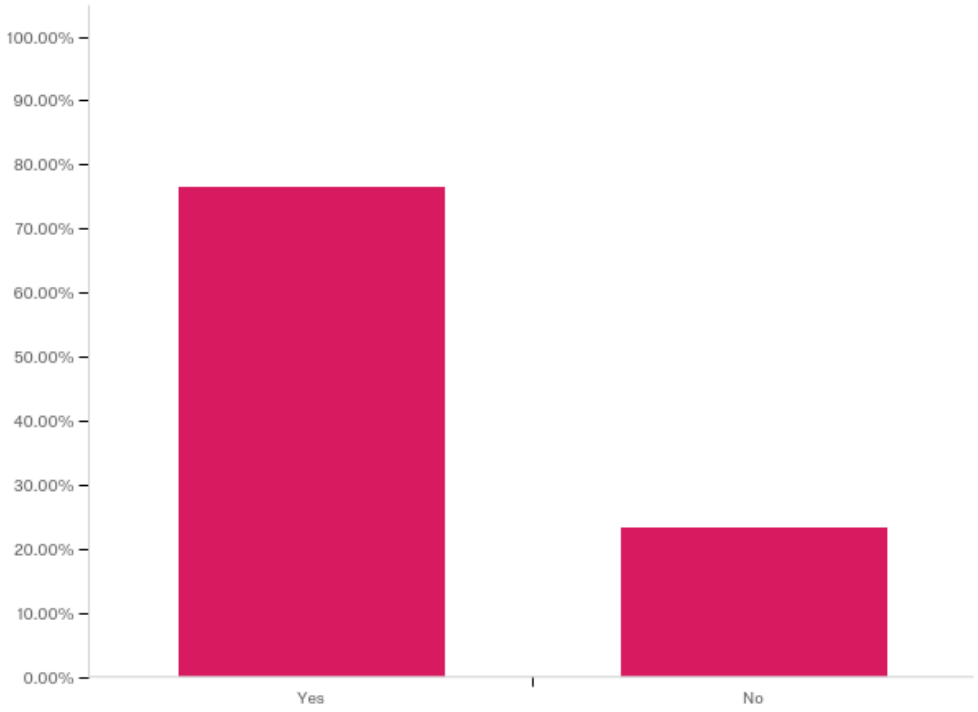

Figure 8: Have you experienced such tremors before?

The overwhelming majority of survey participants report having experienced tremors at some point (76.60%) with only 23.40% reporting that they didn't.

Q: What is the frequency of your tremors?

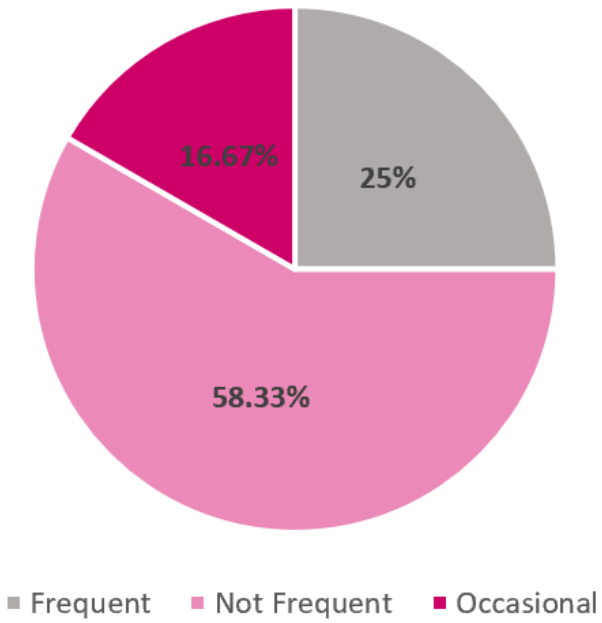

Figure 9: Frequency of tremors

The participants were then asked to rate how frequently they experience noticeable tremors. A little more than half (58.33%) mentioned that they don't notice it as frequently, while quarter of the population mentioned that they do (25%). The remaining 16.67% reported that their tremors are occasional.

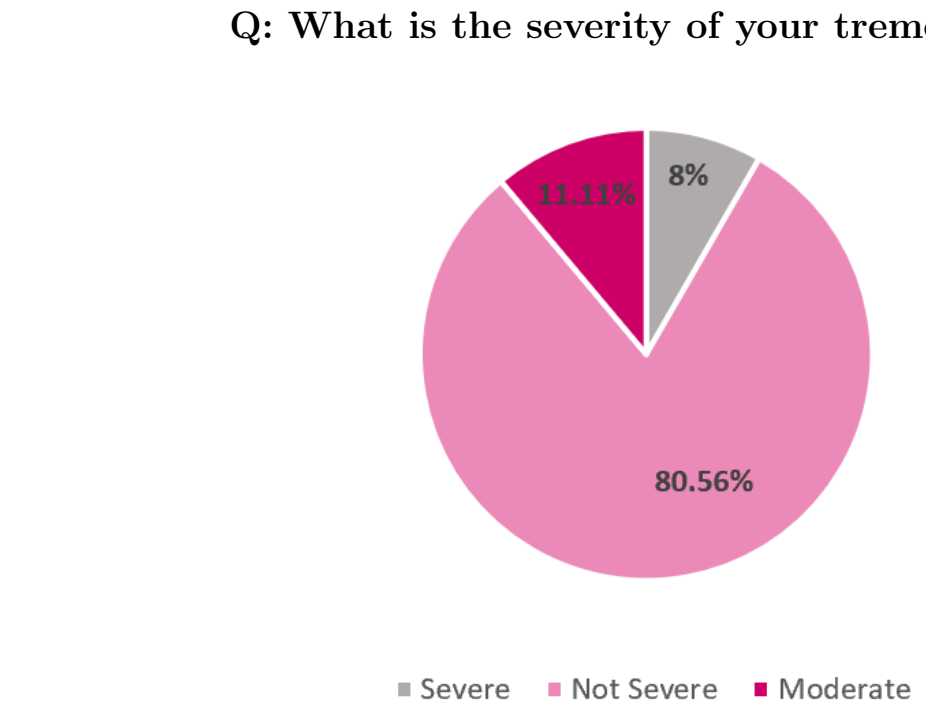

Figure 10: Severity of tremors

The majority of participants (80.56%) report that the severity of their tremors is low. This is followed by those who report that they are moderate (11.11%). Only 8% of participants considered their tremors to be severe.

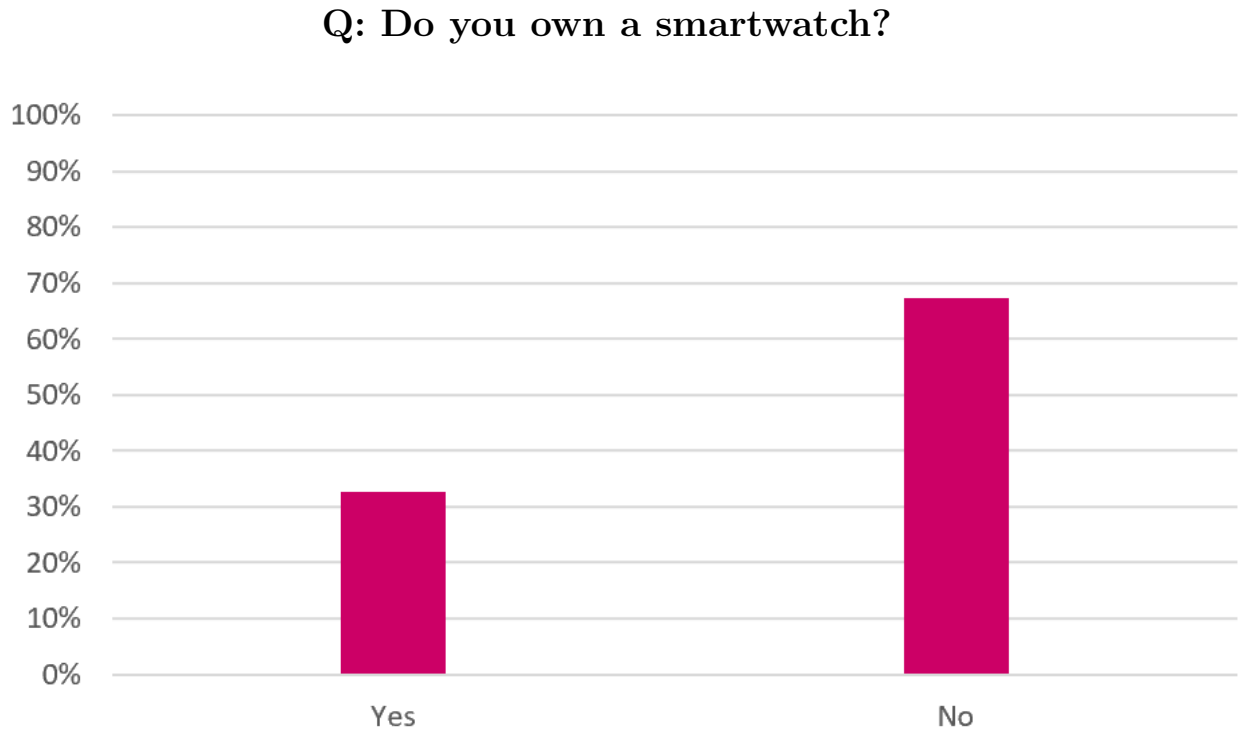

Figure 11: Q: Do you own a smartwatch?

Participants were asked to select if they owned any smartwatch device. The majority of participants answered no (67%). Only 33% reported having a smartwatch device.

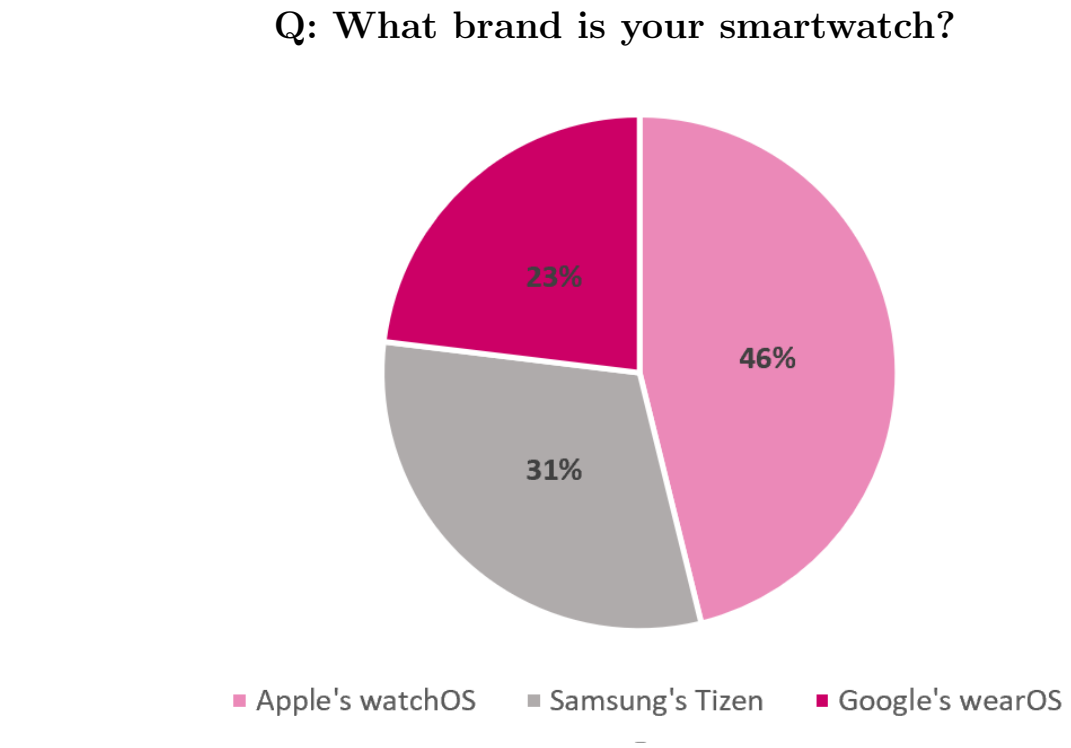

Figure 12: Smartwatch Brand Distribution

Of those that answered yes to having a smartwatch, 46% reported that they have a watchOS powered watch (Apple). This is followed by 31% of participants who own a wearOS powered watch (Google). Only 23% of particiapants reported having a Tizen smartwath (Samsung).

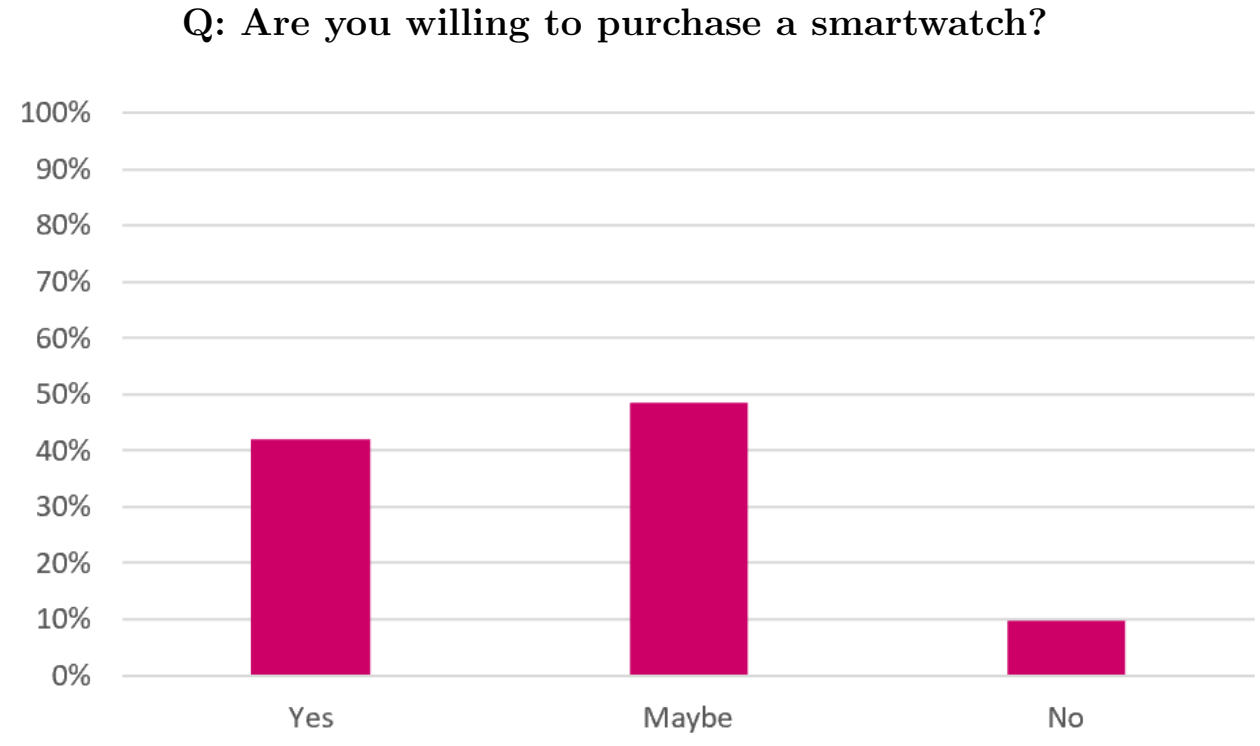

Figure 13: Are you willing to purchase a smartwatch?

The majority of participants were willing (yes and maybe) to purchase a smartwatch (90%) with only 10% of participants saying no.

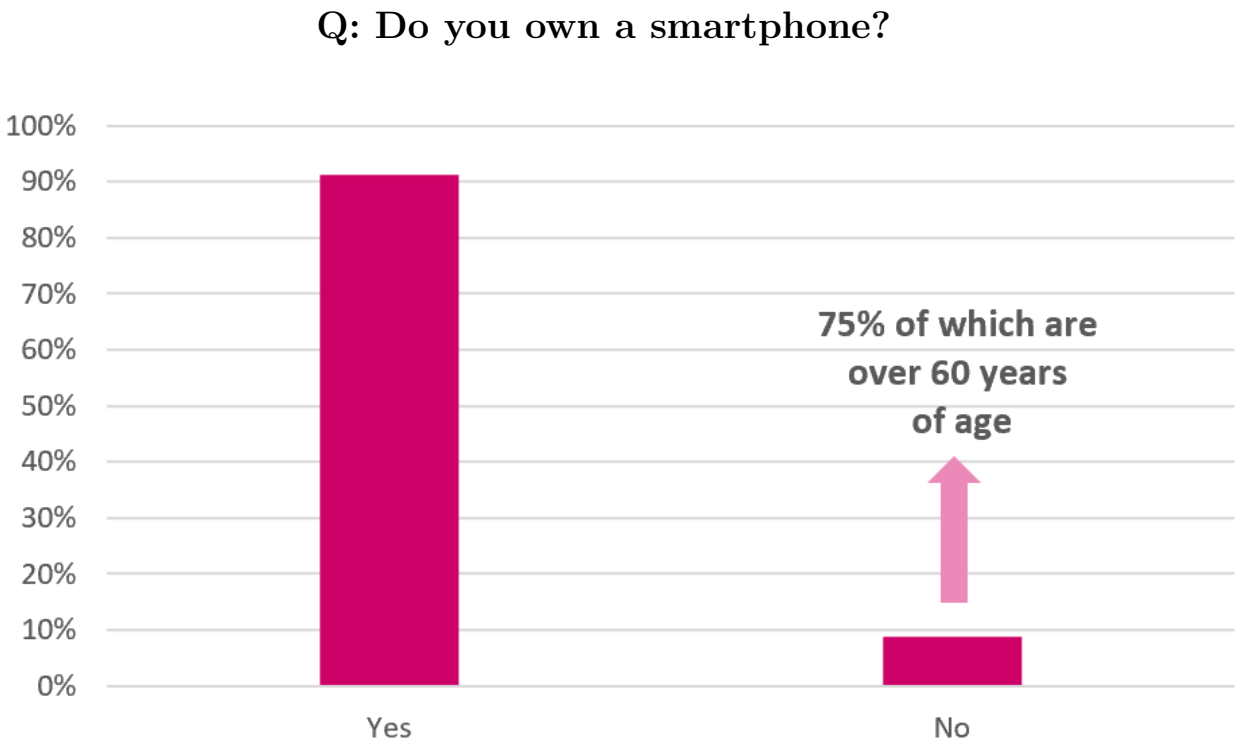

Figure 14: Q: Do you own a smartphone?

The overwhelming majority of participants reported owning a smartphone (91%) with only 9% answering no.

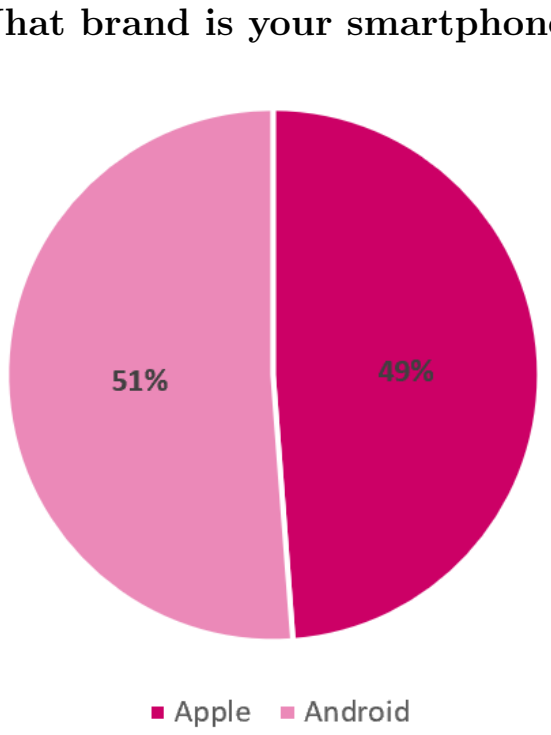

Figure 15: Smartphone Brand Distribution

The percentages of smartphone brand usage is almost equally distributed among Apple and Android. Of those 168 participants who own a smartphone, 82 (49%) use Apple, and 86 (51%) use Android.

3.1.2 Qualitative Results

All participants were asked to comment on what they like and dislike about the tools that they use.

Continuous Glucose Monitor (CGM) users reported that the item is really expensive. Even though the sensor is supposed to stay on for two weeks, patients have a hard time keeping it on for that long and have to change it more frequently. Other cons to using this product are that the reader is easy to lose, sensor application is painful, having to calibrate frequently, and no alerts are given when the sugar levels go out of range. On the other hand, patients appreciate that the reader provides them with trends of their blood sugar levels.

Those using insulin pumps complain about bleeding because of it, and that the calibrations are frequent and necessary. Additionally, the pump is uncomfortable and disturbs their sleep. The patients do appreciate not having to manually take insulin, along with receiving alerts when their levels go out of range.

Blood glucose meter users dislike having to prick their finger every time they need to measure, along with the fact that the results are sometimes erroneous and they have to do it again, thus wasting strips. Users also dislike having to carry the case for it which makes it easy to misplace. On the other hand, users have reported that this is the most accurate tool therefore making it indispensable.

3.2 Evaluation and Analysis

Correlations between the age of participants and their answers outline a few interesting results. The age distribution of participants can be seen in the figure below.

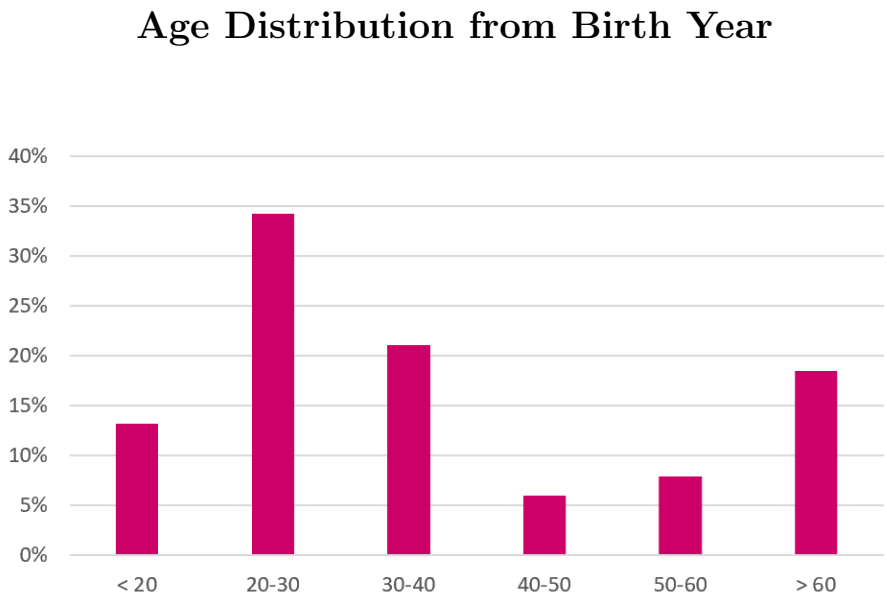

Figure 16: Age Distribution

The majority of users do own smartphones, and are willing to purchase a smartwatch. As expected, most of those who do not own a smartphone (75%) are over 60 years of age as a result of the correlation between Figures 14 and 16.
Additionally, the majority of users that reported their unwillingness to use an alternative tool were over 60 years of age or under 20 years of age. The general consensus in the >20 and <60 age ranged shifts in favor of adopting a new tool.

The results from the survey show that an overwhelming amount of participants are owners of smartphones and willing to adopt smartwatches. This bodes well for the marketability of GlycoTrem.
The features that the participants considered most important (Battery life and cost) are important considerations for GlycoTrem's design constraints and reinforce our assumption that current solutions are a financial burden.

3.3 Future Considerations

Although the survey was very helpful at providing the team with data that is crucial for the development of GlycoTrem, it gave rise to issues that were not considered beforehand. Due to the difficulty in decimating the survey in hospitals and healthcare facilities, the resulting sample size was small which makes it challenging to have any solid deductions. Moreover, the team had to resort to online groups and forums which may be unreliable sources of participants. This also limits our ability to distinguish between different behaviors and outlooks that differ by region.
In addition to that, the percentage of patients having frequent noticeable tremors is less than anticipated, which is something that should be looked into more in future questionnaires.

4 Conclusion

The survey results showed that the implementation of GlycoTrem among patients is likely to succeed due to their inclination to trying new products. These results did show, however, that the older population are less likely to take part in this technology for several reasons such as not being open to wearing a smartwatch.

APPENDIX — NEXT PAGE

5 APPENDIX A

Survey Used in Study

Default Question Block

GlycoTrem aims to provide diabetic patients with a more cost effective and less invasive method of detecting hypoglycemic events. This is to be achieved through a smartwatch application that detects hypoglycemic tremors (when your hands start to shake).

This survey is to be used in a customer needs analysis report. Your identity will remain anonymous. Your answers will help us progress in our senior design project at Texas A&M University.

By proceeding with this survey, you are providing us with your consent to use the data as mentioned above.

Block 1

Do you have or do you know someone who has diabetes?

- I am diabetic
- I know someone who is diabetic
- I am not, nor do I know anyone who is diabetic

What year were you/they born?

What type of diabetes do you/they have?

- Type 1
- Type 2

What is your/their gender?

- Male
- Female
- Other

Are you/they familiar with what hypoglycemic tremors are?

- Yes
- No

When blood sugar levels drop below the normal levels, a patient may experience tremors (shaking) especially in the hands.

Have you/they experienced hypoglycemic tremors before?

- Yes

- ○ No

How often do you/they experience hypoglycemic tremors?

Rarerly										Frequently
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

How severe are those hypoglycemic tremors?

Extremely Mild									Extremely Severe	
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

How many times a day do you/they measure your/their blood sugar levels?

- ○ 1-10
- ○ 10-20
- ○ 20-30
- ○ 30+

What do you/they use to measure your/their blood sugar levels?

- ☐ Blood Glucose Meter
- ☐ Continuous Glucose Monitor
- ☐ Insulin Pump
- ☐ Smartphone Application
- ☐ Other

What do you/they like about this measurement tool?

What do you/they **not** like about this tool?

Approximately how much would these tools cost you/them annually?

How likely are you/they to consider an alternative blood sugar measuring tool?

Not at all likely										Extremely likely
0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Please rate, on a scale of 1 to 5, how important each of the following features are for a blood sugar measuring tool.

	0	1	2	3	4	5
Aesthetics						
Battery life						
Cost						
Size						
Insulin log						

Do you/they own a smartphone?

- Yes
- No

What smartphone brand do you/they use?

- Apple's iPhone
- Android (i.e. Huawei, Samsung, Sony, LG)
- Other

Do you/they own a smartwatch?

- Yes
- No

What smartwatch brand do you/they use?

- Google's wearOS
- Samsung's Tizen
- Apple's watchOS

Are you/they open to the idea of using a smartwatch?

- Yes
- Maybe
- No