

# Project Requirements Document, Version 1

**Project:** Improving Clinical Quality of Telehealth Consults

**Team Name:** SALT

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## Intro

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### Background

Doctors are working in an increasingly virtual environment and need to adapt quickly to the use of telehealth consults. The current telehealth consultation process is intensive for the physician as they need to fill the role of both a doctor and scribe. This makes it difficult for physicians to keep track of patient symptoms and medical information. Additionally, clinics have a hard time maintaining and improving the clinical quality of these telehealth consults-- Teladoc facilitates over 10 million of these virtual medical consultations annually. In addition, the emergence of the novel coronavirus is causing this number to rise. Thus, we are introducing a platform that proactively identifies problematic consults and enables clinics to identify causes for aggressive consults and/or malpractice. The platform's function is twofold: serve as a telescribe and provide doctors with a report of conditions, as well as underlying symptoms commonly associated with these conditions.

### Problem

Building trustful relationships between doctors and patients is one of the most integral problems in telehealth consults -- in order to make medical consultations more trustworthy, it becomes crucial to identify problematic consultations, defined as consultations with cases of malpractice or toxicity in the conversation. There are not many of these cases, so finding a consultation with these qualities is like finding a needle in a haystack. Currently, nurses are the ones who go through the consultations, but this is a time consuming process that may not find every instance of problematic consultations.

Clinics want to prevent unreasonable/unwarranted ratings for their doctors but are unable to identify malpractice automatically.

Another problem is making sure doctors ask the right questions. During telehealth consultations, doctors might have limited time to meet with patients and thoroughly study patient data. Consequently, doctors may have a hard time asking about the patients' symptoms in depth within the provided time constraint.

## Why is this problem important?

Being able to identify problematic consultations will greatly improve the respective quality of said consultations for both the doctor and patient. Particularly In the patient's case, he or she will benefit from doctors being held accountable for malpractice such as bad drug or operation recommendations. Furthermore, patients will also benefit from doctors being held accountable for overt aggression in a consultation. In the doctor's case, they will benefit from the identification of a patient who berates a doctor by asking for a drug and subsequently giving the doctor a bad rating after not receiving that drug.

If a doctor doesn't ask the right questions, they may prematurely prescribe a certain drug or make an incorrect recommendation -- if we can make sure that the doctor is asking the right questions based on a patient's information, we can increase certainty that the patient is getting the best recommendation.

## How is this problem addressed today?

Currently nurses manually review a subset of telehealth consultations. This causes many problematic consultations to go unnoticed by auditors. Clinics are unable to reflect on potential improvements that can be made to improve the clinical quality of telehealth consultations. Furthermore, telemedicine services are still maturing and doctors are unable to rely on human scribes during telehealth consultations. The result of this is additional work for physicians as they need to ask questions and question the patient to better understand the medical history. As a result, doctors may miss key information provided during the consultation due to a lack of records. This leaves patients frustrated with the subpar clinical care received during telehealth consultations.

## Team Goals/Objectives

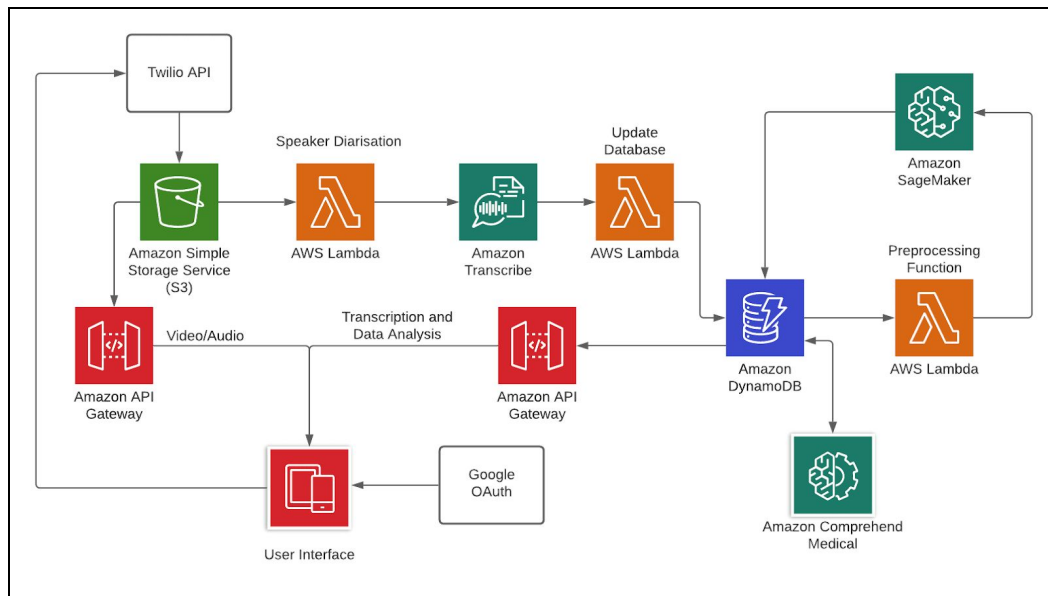
Our goal is to create an application that doctors, patients, and auditors can use. The third-party analysis tool that objectively identifies malpractice or anomalies in consults

could enable clinics to provide more reliable services. It could transcribe patient symptoms, suggest relevant symptoms to doctors, and provide additional information to the patients. Doctors could benefit from diagnostic assistance in analyzing symptoms and conduct more effective consultation for patients.

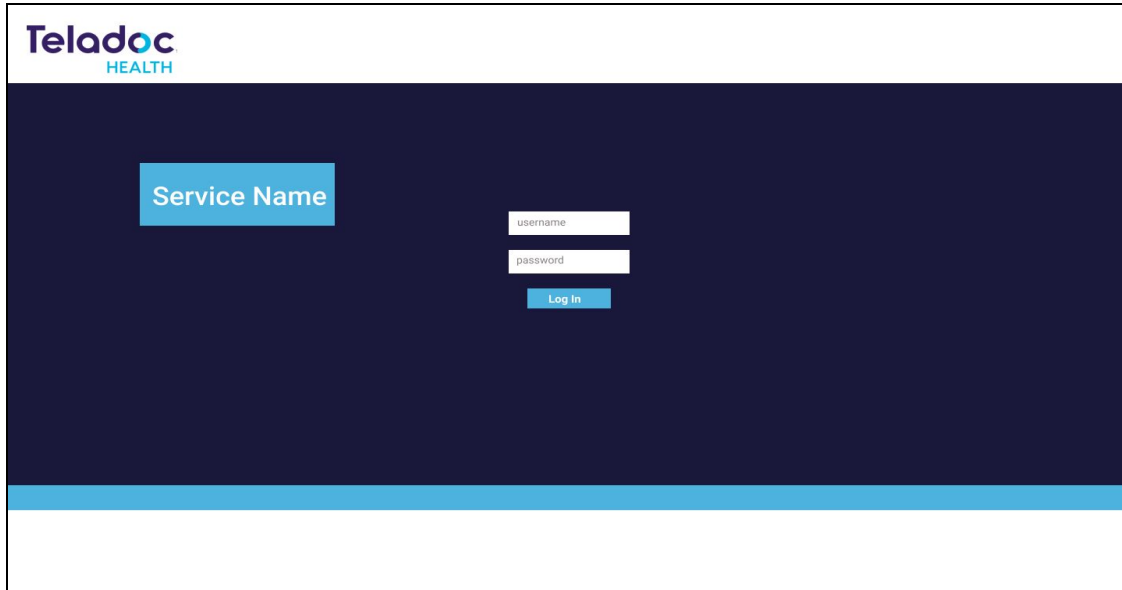
For patients, this will show them the transcript of the consultation and any diagnosis/recommendation. For doctors, this will show them a real time analysis of the consultation for instances of toxicity in the conversation. It will also show them potential conditions associated with symptoms given by the patient so the doctor can ask relevant questions. After the consultation, the doctor will be able to see the full transcript of the conversation and be able to search for specific keywords and be taken to instances of those keywords within the transcript. The doctor's view will still show potential conditions associated with the symptoms. For auditors, this will show them consultations in a ranked list in order of most problematic to least problematic. Therefore, an auditor can click on a flagged conversation and be shown the instances in the transcript where there may be malpractice or aggression.

## System Architecture

### High Level Diagram

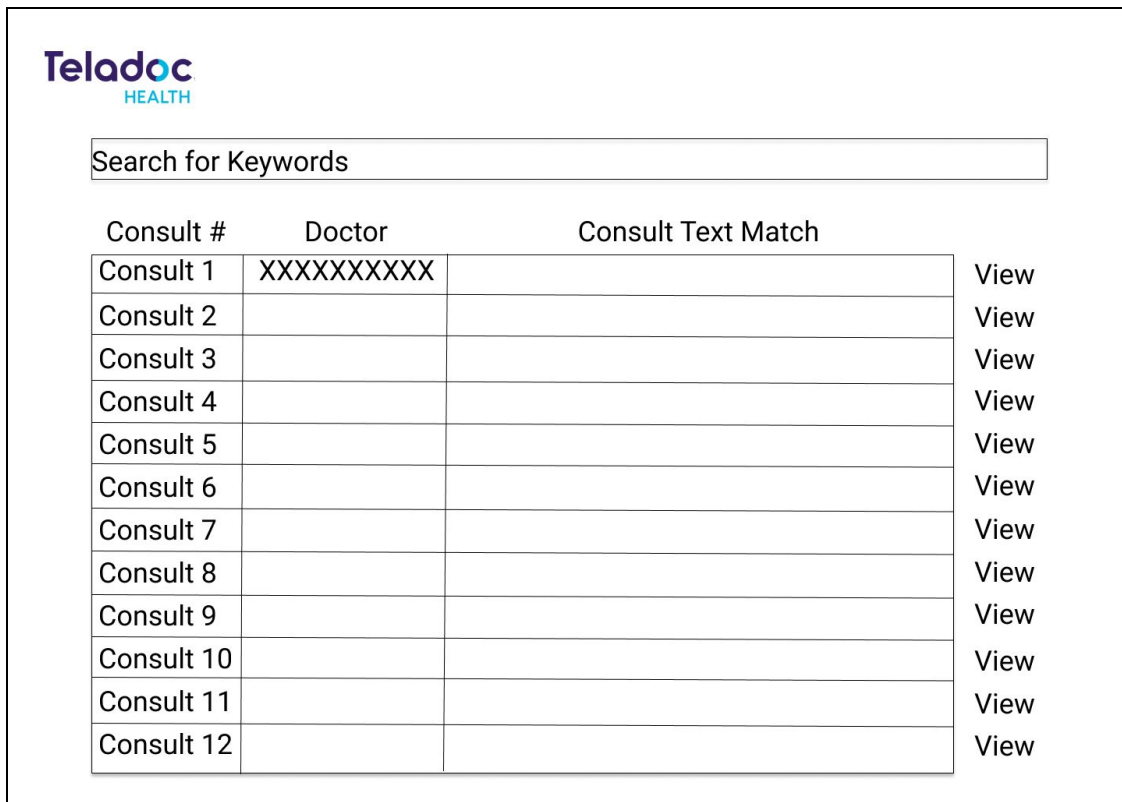


## Login Page



The login page features the Teladoc Health logo in the top left corner. A light blue box labeled "Service Name" is positioned on the left. In the center, there are two input fields: "username" and "password", each with a small eye icon to toggle visibility. Below these fields is a blue "Log In" button. The background is a dark blue gradient with a light blue horizontal bar at the bottom.

## Consult Dashboard




The dashboard includes the Teladoc Health logo and a search bar labeled "Search for Keywords". Below the search bar is a table with three columns: "Consult #", "Doctor", and "Consult Text Match". The first row shows "Consult 1" with "XXXXXXXXXX" in the Doctor column. Each row has a "View" link on the right side.

Consult #	Doctor	Consult Text Match	
Consult 1	XXXXXXXXXX		<a href="#">View</a>
Consult 2			<a href="#">View</a>
Consult 3			<a href="#">View</a>
Consult 4			<a href="#">View</a>
Consult 5			<a href="#">View</a>
Consult 6			<a href="#">View</a>
Consult 7			<a href="#">View</a>
Consult 8			<a href="#">View</a>
Consult 9			<a href="#">View</a>
Consult 10			<a href="#">View</a>
Consult 11			<a href="#">View</a>
Consult 12			<a href="#">View</a>

# UI Design (Doctor and Auditor View)

Service name Home Log Out

 Patient Jane  
Past Record

Dr. John  
Hi Jane, how are you today?

Patient Jane  
I felt asthenia in the past few days but today I even got slight pain in my chest. I'm worried if I need to take any subscription for it.

Dr. John  
I'm sorry to hear that, but take it easy. Let's go step by step. Did anything happen lately?

Patient Jane

Dr. John

Patient Jane


Results Symptoms Emotion

Keywords: pain chest asthenia orthopnea  
nightmare agitation cough

search

This is a search result. Click on me and I will take to that instance in the text.

Service name Home Log Out

 Patient Jane  
Past Record

Dr. John  
Hi Jane, how are you today?

Patient Jane  
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Patient Jane

Dr. John

Patient Jane

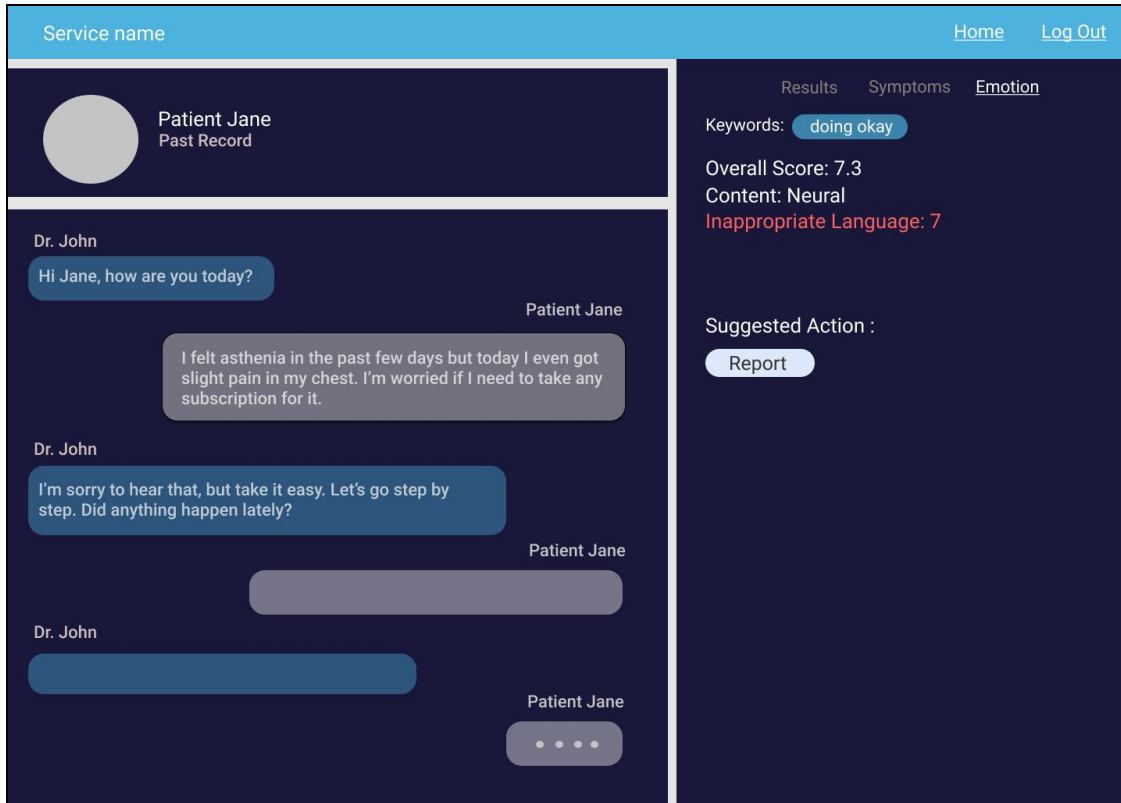
Results Symptoms Emotion

Keywords: pain chest asthenia orthopnea  
nightmare agitation cough

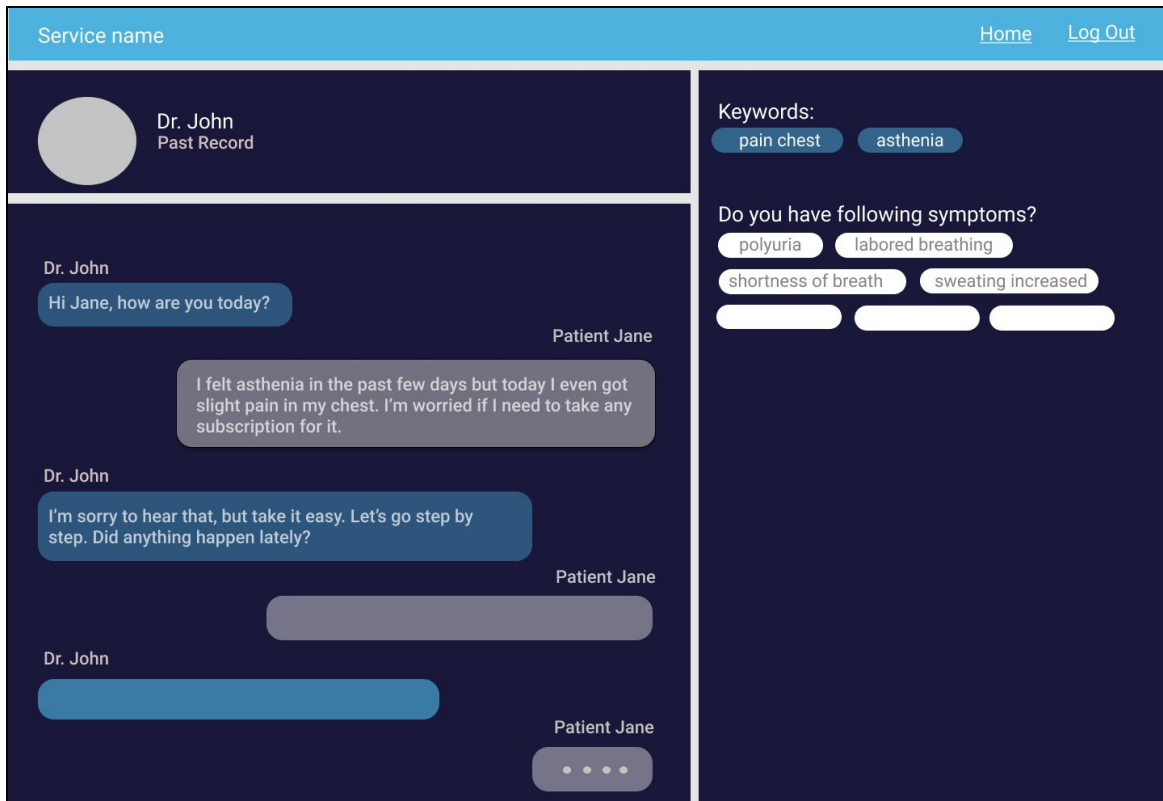
x | pain chest | x | orthopnea | x | asthenia

Diabetes looking for this? ☆

polyuria pain chest asthenia  
shortness of breath sweating increased  
orthopnea labored breathing



## UI Design (Patient View)



# User Interaction and Design

## All Users

The first instance of interaction on our web application is the user authentication. Users will be able to sign in with their Gmail credentials. Upon doing so, that user will be created as a patient account. Admin users will be able to promote new users to a different type of user (Doctor or Administrator). After logging in, users will be able to gain access to user specific features tied to their account.

## Admin Users

Admin users will be able to view and query all of the telehealth consults on the platform. They will be able to search for keywords or sort consults by a toxicity rating. Admin users will be able to view individual consults to investigate potential issues within each consultation. Each consult will list transcripts of the telehealth consult as well as symptoms identified during the consultation. The Admin would also be able to view the reasons the consult was classified as problematic and query the transcript to find potential problems.

## Doctor Users

Doctor users will be able to view and query all of their past telehealth consults on the platform. They will be able to search the transcripts for keywords and look up patient records. Doctors will be able to view individual consults in order to reference a list of the patient's symptoms. Each consult will also list potential conditions along with potential symptoms to prompt the physician's line of questioning. The doctor would also be warned if the consult becomes aggressive or results in malpractice.

## Patient Users

Patients would be able to view and query all of their past telehealth consults on the platform. They would be able to query the transcripts and view individual consults. Patients would also be able to view the list of the symptoms discussed during the consultation.

# Requirements

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As a User, I can visit the web application and log in via Google OAuth so that I can access all past consultations.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/1>

- Scenario 1: User enters the wrong username or password
  - "Incorrect username/password" message will be displayed
  - User will be prompted to enter their username/password again
- Scenario 2: User enters the wrong username and password multiple times over a small time interval
  - "Too many attempts to login" message will be displayed
  - User will be temporarily barred from logging in for a certain time interval
- Scenario 3: User enters the correct username/password
  - Account info page will be displayed

As a Doctor/Patient, I can search keywords over past transcriptions, view matched context and listen to consultation records only of my past consultations so that I can review past consult records and find key information.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/3>

- Scenario 1: Keyword does not appear in any transcription
  - "Your query "[insert query]" did not yield any results" message will be displayed
- Scenario 2: Keyword appears in text for transcription (search by occurrence of word)
  - Number of instances per transcription will be displayed alongside each transcription, which will be shown in chronological order (for the doctor, the option to sort by patient will also be provided)

As an Admin I can search keywords over past transcriptions, view matched context and listen to consultation records of all past consultations so that I can review past consult records and find key information for the audit purpose.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/3>

- Scenario 1: Keyword does not appear in any transcription
  - "Your query "[insert query]" did not yield any results" message will be displayed
- Scenario 2: Keyword appears in transcriptions



- Number of instances per transcription will be displayed alongside each transcription, which will be sorted by chronological order

As a User, I can see the web page for individual consultations with the other speaker's profile and a conversation view so that I can interact with another user, and communicate with them more effectively.

- Scenario 1: The consultation is live.
  - The conversation view will keep updating as the call goes on.
- Scenario 2: The consultation is finished.
  - The conversation view is unchanged.

As a Doctor/Admin, I can see the evaluation score of the toxicity of the consults based on content (if there're inappropriate languages) for myself and patient respectively during and after each session. If the score is high I will be alerted so that I can identify misconduct accordingly.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/9>

- Scenario 1: Score of consult is below threshold
  - Score will be displayed in red next to the consult along with a tag. Doctors can hover over the tag to see a brief reason for why the consult was singled out.
- Scenario 2: Score of consult is above threshold
  - Score will be displayed alongside the consultation in question.

As a Doctor/Admin, I can see the evaluation of consults based on tone and voice volume for myself and patient respectively during and after each session so that I can know if either user is behaving properly.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/9>

- Scenario 1: Score of consult is below threshold
  - Score will be displayed in red next to the consult along with a flag. Doctors can hover over the flag to see a brief reason for why consult was flagged.
- Scenario 2: Score of consult is above threshold
  - Score will be displayed alongside the consultation in question.

As an Admin, I can see whether consultations are toxic in the main search page so that I can identify toxic consultations efficiently.

Github Issues: <https://github.com/tkomarlu/TeladocCapstone/issues/9>

- Scenario 1: Score of consult is below threshold
  - Score will be displayed in red next to the consults along with a flag. Admin can hover over the flag to see a detailed reason and click for more information. Admin can also indicate whether they agree or disagree with the classification.
- Scenario 2: Score of consult is above threshold
  - Score will be displayed alongside the consultation in question.

As a Doctor, I can initiate calls to the patient via Twilio and start a live individual consult page so that I can have a conversation with patients.

Github Issues:

<https://github.com/tkomarlu/TeladocCapstone/issues/7>

- Scenario 1: Call is successfully initialized
  - Users on the call can hear each other's voice. Patient can hear the voice from the phone. Doctors can hear the voice from the browser.
- Scenario 2: Call is not initialized successfully
  - Users on the call cannot hear each other's voice. Either the patient can hear the voice from the phone or the doctor can hear the voice from the browser.
  - Users will see an error image in the conversation view.

As a Doctor/Patient, I can hear the other user's audio via Twilio so that I can communicate with them effectively.

Github Issues:

<https://github.com/tkomarlu/TeladocCapstone/issues/7>

- Scenario 1: Audio is successfully received
  - Both patient and doctor are in the same session
  - The conversation views are the same.

As a User, I can search or select suggested keywords (e.g. diseases, symptoms, conditions) on individual consult pages and see the context of the keywords within the transcript so that I can more efficiently review the consultation.

Github Issues:

<https://github.com/tkomarlu/TeladocCapstone/issues/8>

- Scenario 1: Desired keyword appears in suggestions
  - User selects the respective keyword
- Scenario 2: Desired keyword does not appear in suggestions
  - User selects the Other option and enters an alternate keyword
- Scenario 3: Selected keyword appears in transcription
  - The research results will return in the context of 20-50 words containing the keyword sorted in chronological order by default (other orderings can be selected above in the dashboard).
- Scenario 4: Selected keyword does not appear transcription
  - "Your query "[insert query]" did not yield any results" message will be displayed

As a Doctor/Admin, I can see a ranking of suggested medical conditions associated with the current patient's symptoms so that I can ask if the patient has other symptoms associated with the medical condition to make a more accurate diagnosis.

Github Issues:

<https://github.com/tkomarlu/TeladocCapstone/issues/8>

- Scenario 1: Highlighted symptoms are misidentified.
  - Doctor removes the symptom from the medical report.
- Scenario 2: Non highlighted symptoms have not been discussed yet.
  - Doctor can proceed to ask the patient about the symptoms.
- Scenario 3: Consultation flagged for review
  - Admin can check if the Doctor asked the correct questions.

# Appendices

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## Technologies Employed:

React: Frontend elements, including audio streaming capabilities, powered by Twilio

Tailwind: Styling Frontend elements

AWS/DynamoDB: NoSQL Database for storing user info and sessions

AWS/Amplify: Backend REST API to communicate with Database

Jigsaw/Perspective API: Toxicity Scoring API to

AWS/Amazon Medical Comprehend: NLP service to extract information from transcripts

Auth0/Google OAuth: Authentication service to provide Role-Based Access Control