ELS Voice Store

Introduction

The ELS Voice Store is a tool to allow ELS specialists to record patient voice files that contribute to a shared library of standardized voice recordings.

This document captures the requirements and use cases for this tool and also documents the design for the tool based on a prototype available at https://elsvoicesore.org/.

Requirements

1. Easily operated using a smartphone
2. Can also operate on a PC or Mac
3. Patient data kept anonymously in a secure shared store
4. Guide specialists and patients through a standard sequence of tests
5. Record audio files for each test and upload them to the secure shared store
6. Allow specialists to access previous recordings and to download them for further analysis
7. Multi-lingual interface and guides.

Use Cases / User Stories

Story 1: Connect and login

I. The specialist goes to the ELS Voice Store web on their smartphone.
II. They are presented with a login screen.
III. They login using their ELS user and password.

Story 2: Initiate Voice Recording Session with a Patient

I. This story continues from Story 1.
II. The specialist directs their smartphone microphone towards the patient (for most smartphones this means turning the lower front edge of the phone towards the patient).
III. The specialist presses the “Start Session” button on the screen.
IV. The screen displays instructions for the patient and the patient reads them, guided by the specialist where necessary.
V. Once the patient has read the screen instructions, they indicate to the specialist they are ready.
VI. The specialist starts the recording and the patient completes the task.
VII. The specialist stops recording and the guide moves to the next step.
VIII. Return to step III. and repeat the process until the guide has completed all steps.

Story 3: Voice Recording Guide Completed

I. This story continues from Story 2.
II. The specialist reviews the audio recordings for the session checking their quality.
III. If any recordings are incorrect the specialist can repeat the step and re-record the audio for just that step.
IV. The specialist takes note in their patient medical record system of any relevant measurements the app has made (phonation duration, CPPs etc.) along with the date and time of the session.

V. The specialist presses the button to send the session to the cloud storage system.
VI. The session has completed. The specialist may logout, close the browser, or close the smartphone without logging out in order to be ready to record the next patient.

Story 4: Review Previous Recording Sessions

I. This story continues from Story 3.
II. At some future date the specialist enters the ELS Voice Store web and logs in as with Story1.
III. The specialist scrolls down the page to see the list of all their recording sessions.
IV. They search for a specific session on a specific date and at a specific time (noted in the patient records in step IV of Story 3)
V. They select the session and all recordings are displayed.
VI. The specialist selects the recording for review and playback.
VII. The specialist may choose to download recordings in order to process the audio in a specific application of their choice.

ELS Voice Store Design

Design Principles

The ELS Voice Store tool resides on a secure dedicated server in the google application cloud. It can be accessed by any web browser on any device. No software or app installation is required. It uses encrypted protocols (https) for communication.

The voice files are stored in the Google cloud in an account controlled by ELS administrators. This offers a low-cost high-security flexible storage solution that requires minimal maintenance.

Files are stored in such a way that users can only access their own recording sessions. Only ELS administrators will have access to all recordings.

Users are authenticated against the existing ELS user database which will rely on there being an authentication API already available.

The server will be built in python on linux, and client will be built using React.

User Interface

The user interface will have two main modes of operation:

1. Review mode, where the specialist will be able to search, listen to, and download previous recordings
2. Session mode, where the specialist will be following a session guide and recording patient voice samples for storage.

Review Mode

In Review mode all past recording sessions the specialist has made are presented and listed in a timeline. The specialist can search for specific date and time ranges until the specific session is located.

The specialist can then select the session and review the individual recordings that comprise the session.

The recordings can be loaded and reproduced freely, and if required, downloaded for use in audio analysis programs.

Session Mode

In Session mode the specialist is with a patient with the intention of running a voice recording session.

The specialist presses the “Start Session” button and the user interface switches to show only the guide. This guide instructs the patient what they are required to do, and when they are ready the specialist presses the “Next” button.

As the guide progresses instructions change and recording starts and stops as required. Each recording is added to the session files until the full session is complete and all recordings are listed.

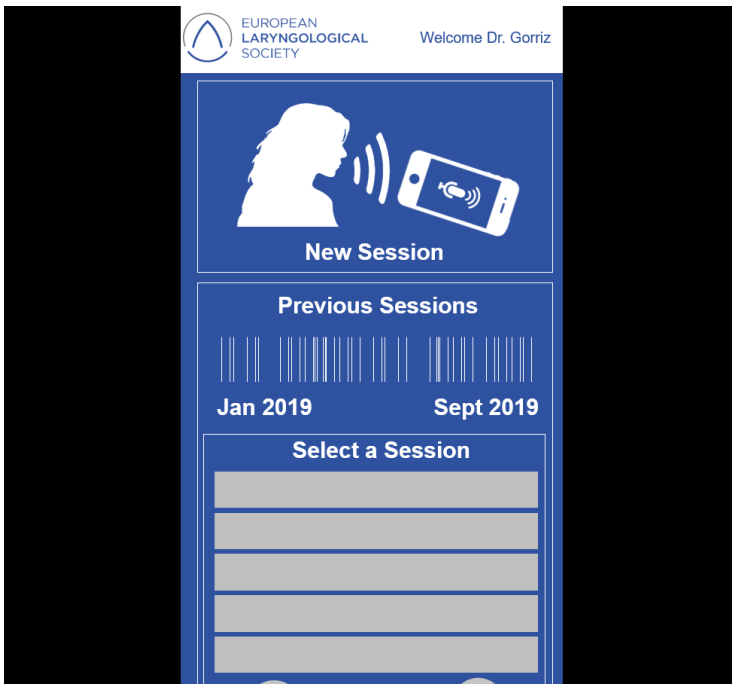
The specialist then may review the files to check for quality, and re-record any as required.

When the specialist is satisfied with the files, they can save them to the cloud and complete the session. The user interface returns to Review Mode.

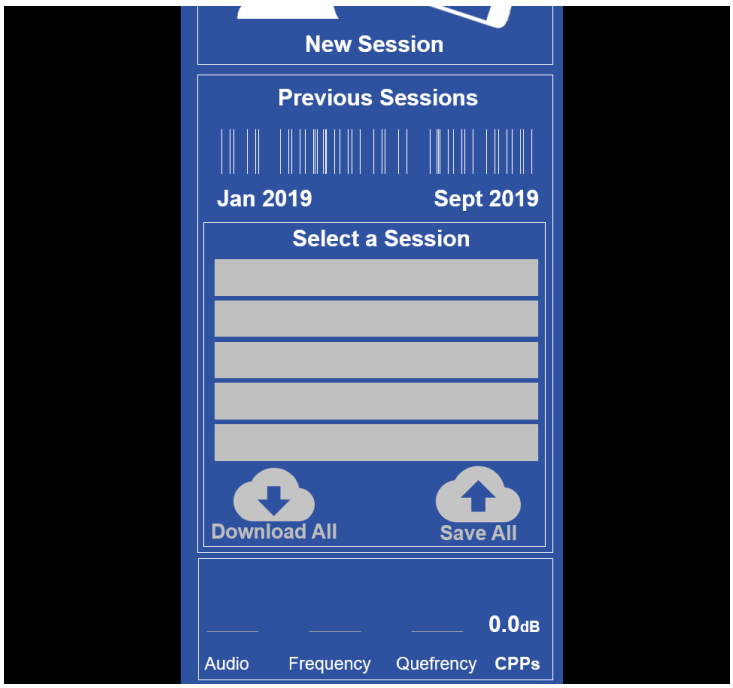
Screenshots

The following pages contain screenshots of the tool during various stages of its use:

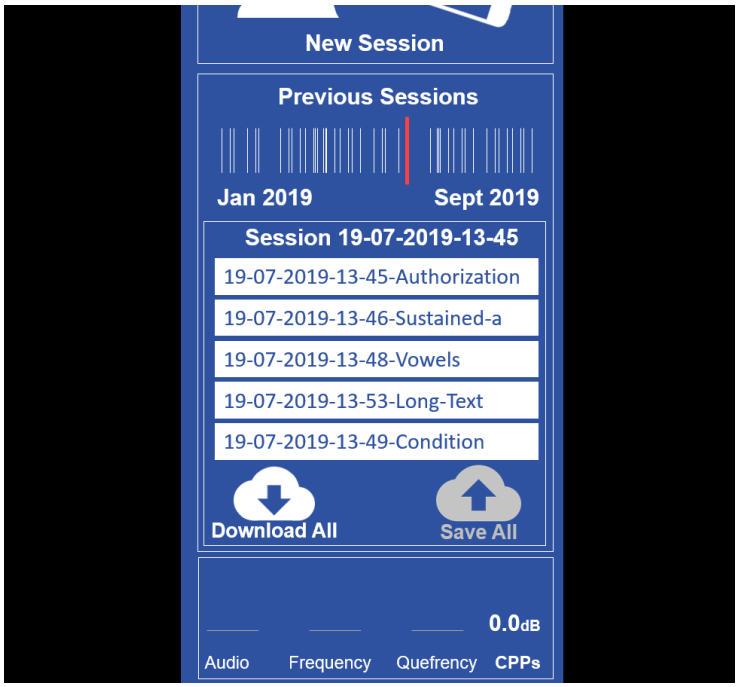
After login the user is presented with the main screen allowing them to start a new session or review their previous sessions. This is the same for smartphone, PC and MAC.



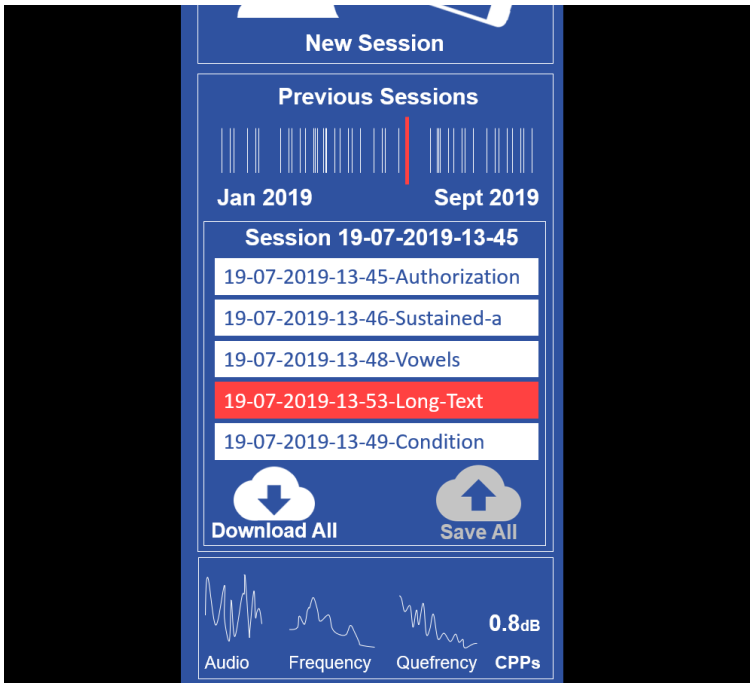
By swiping up on the smartphone, or scrolling on PC and MAC, the lower part of the screen can be seen:



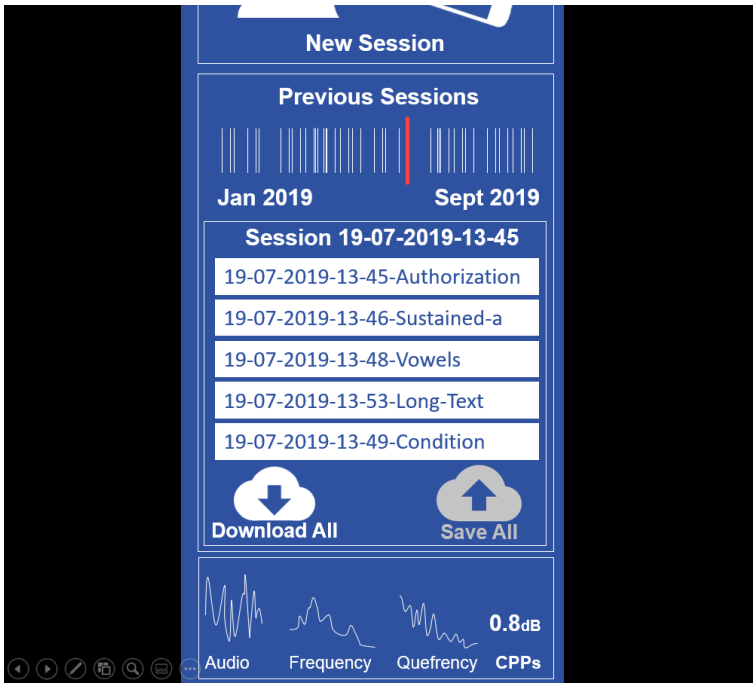
Touching or clicking on one of the vertical lines that represent the specialist's recording session history causes the session recordings to be loaded:



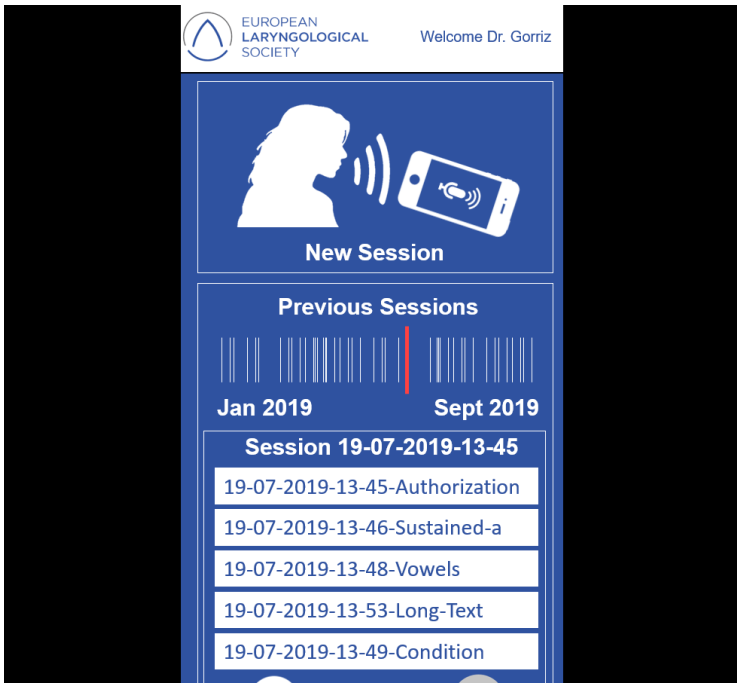
Touching or clicking on one of the recordings starts it playing and runs live analysis on the audio:



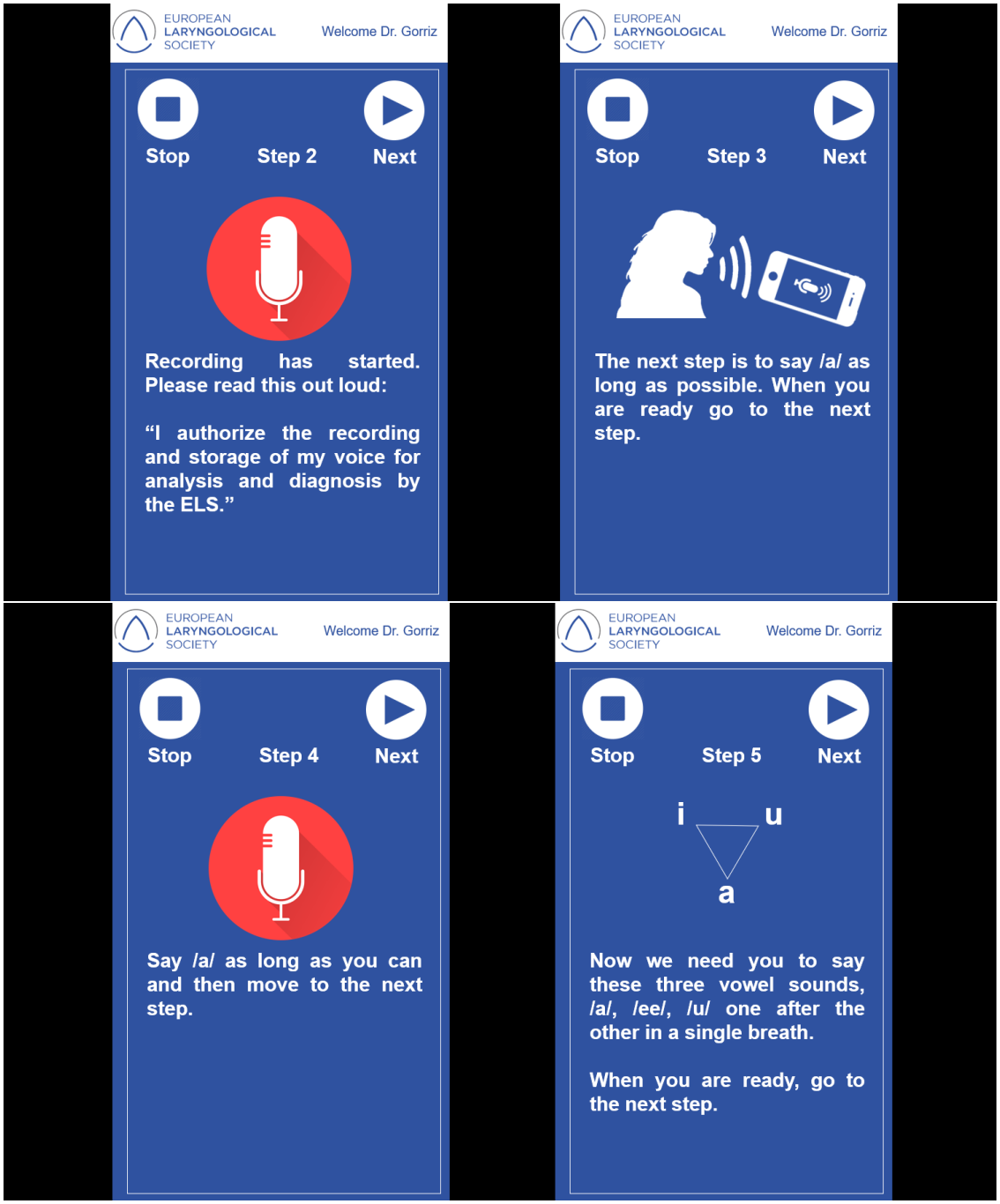
Touching or clicking again stops playback. On screen metrics remain should they wish to be noted down:

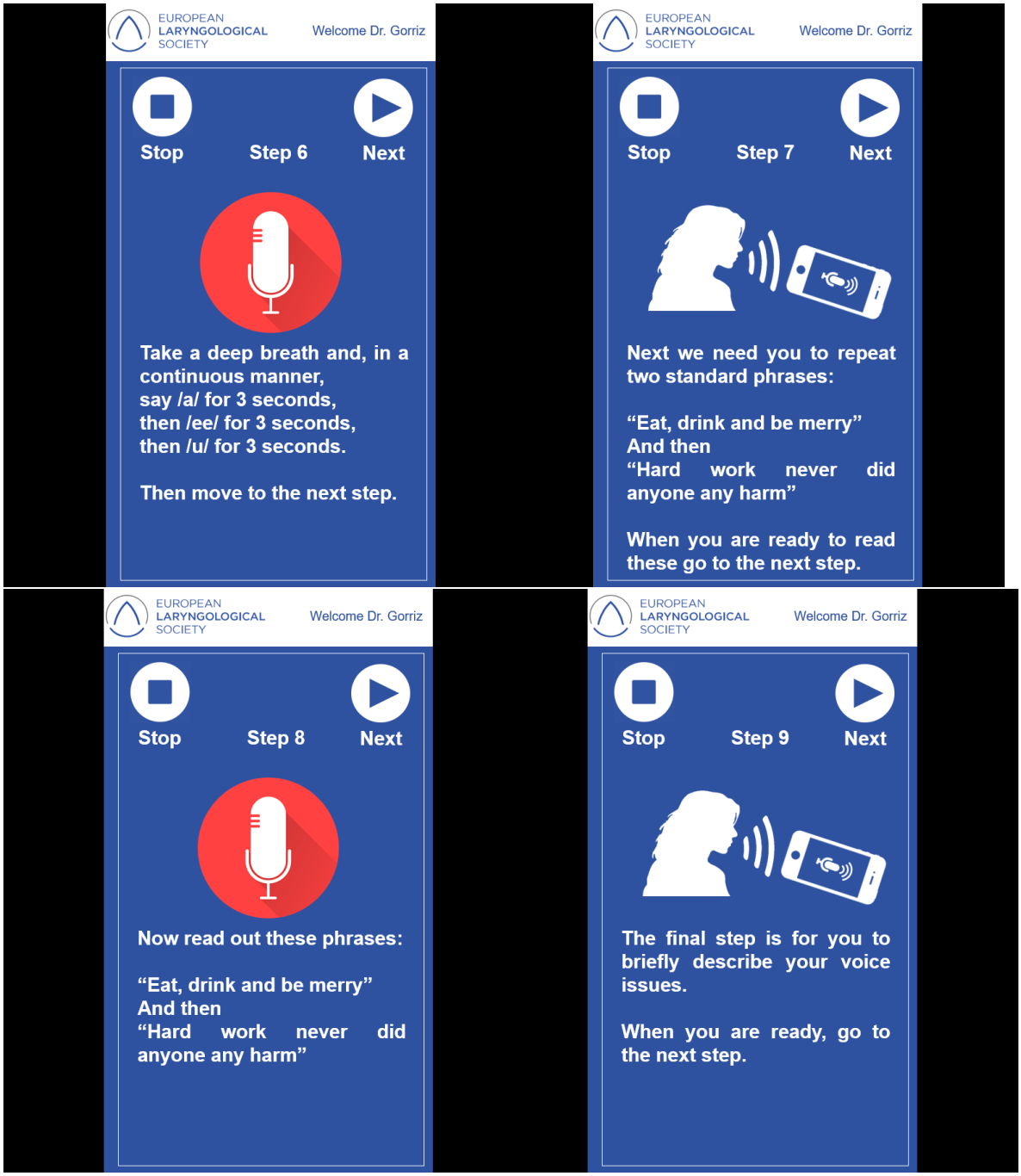


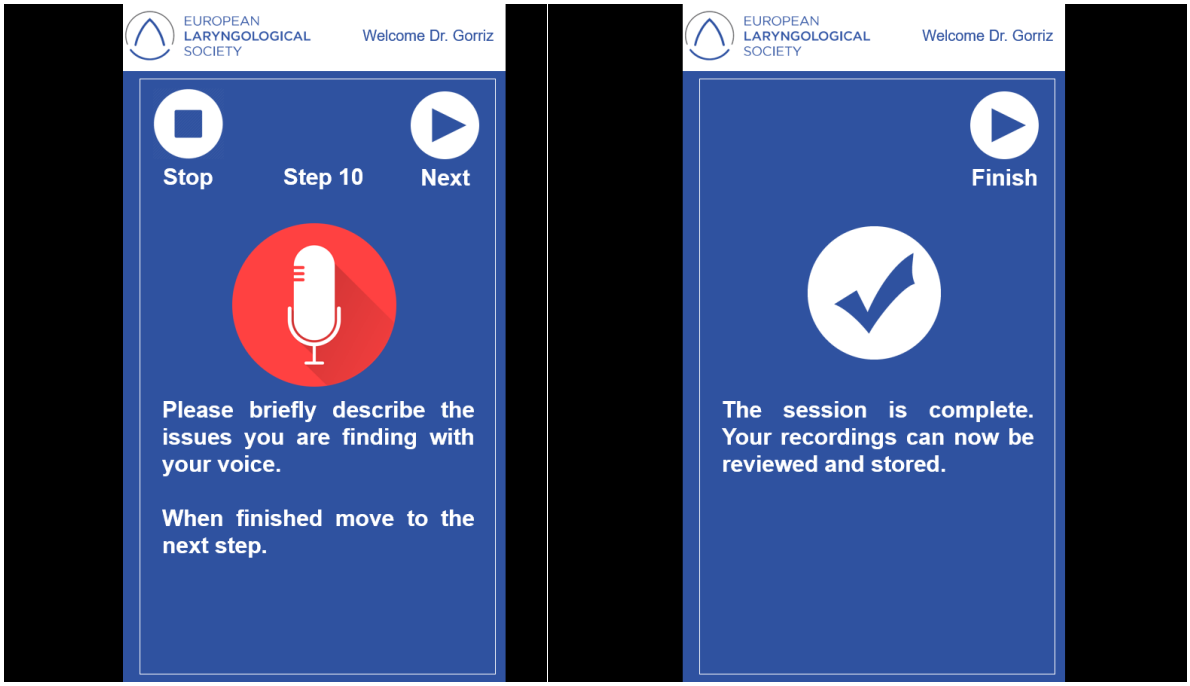
If we scroll or swipe back up to the top we can start a new session with a patient:



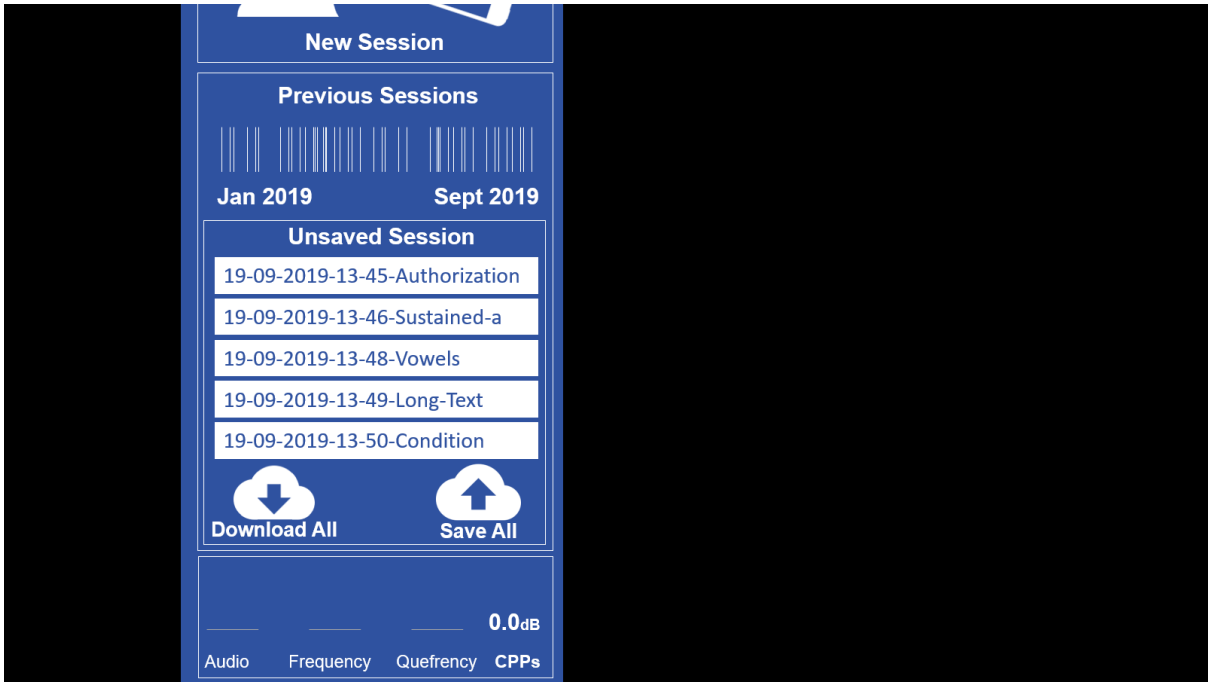
The screen is taken over by the session guide which leads us through the various steps (at any time the session can be stopped by pressing the stop button). Presented here is an example guide in English. The guide text and graphics can be modified and prepared in multiple languages depending on specialist preferences:


EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 2
Next
Recording has started. Please read this out loud:
"I authorize the recording and storage of my voice for analysis and diagnosis by the ELS."
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 3
Next
The next step is to say /a/ as long as possible. When you are ready go to the next step.
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 4
Next
Say /a/ as long as you can and then move to the next step.
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 5
Next
i
u
a
Now we need you to say these three vowel sounds, /a/, /ee/, /u/ one after the other in a single breath.
When you are ready, go to the next step.

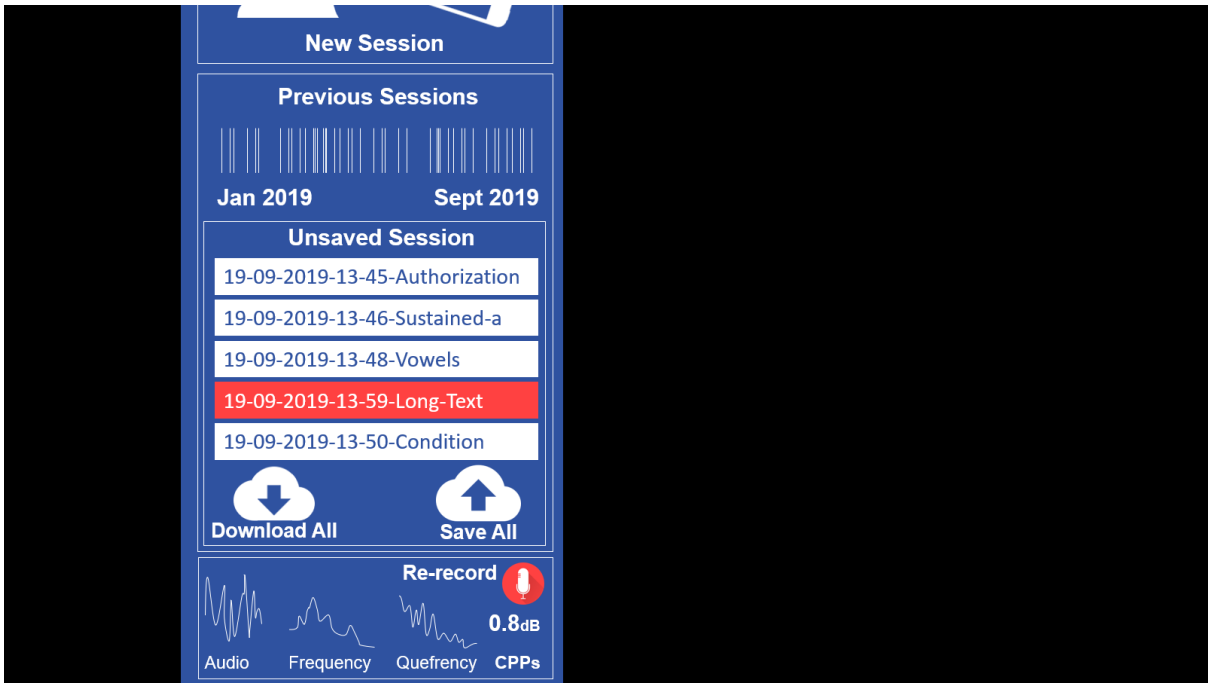

EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 6
Next
Take a deep breath and, in a continuous manner, say /a/ for 3 seconds, then /ee/ for 3 seconds, then /u/ for 3 seconds.
Then move to the next step.
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 7
Next
Next we need you to repeat two standard phrases:
"Eat, drink and be merry"
And then
"Hard work never did anyone any harm"
When you are ready to read these go to the next step.
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 8
Next
Now read out these phrases:
"Eat, drink and be merry"
And then
"Hard work never did anyone any harm"
EUROPEAN LARYNGOLOGICAL SOCIETY
Welcome Dr. Gorriz
Stop
Step 9
Next
The final step is for you to briefly describe your voice issues.
When you are ready, go to the next step.



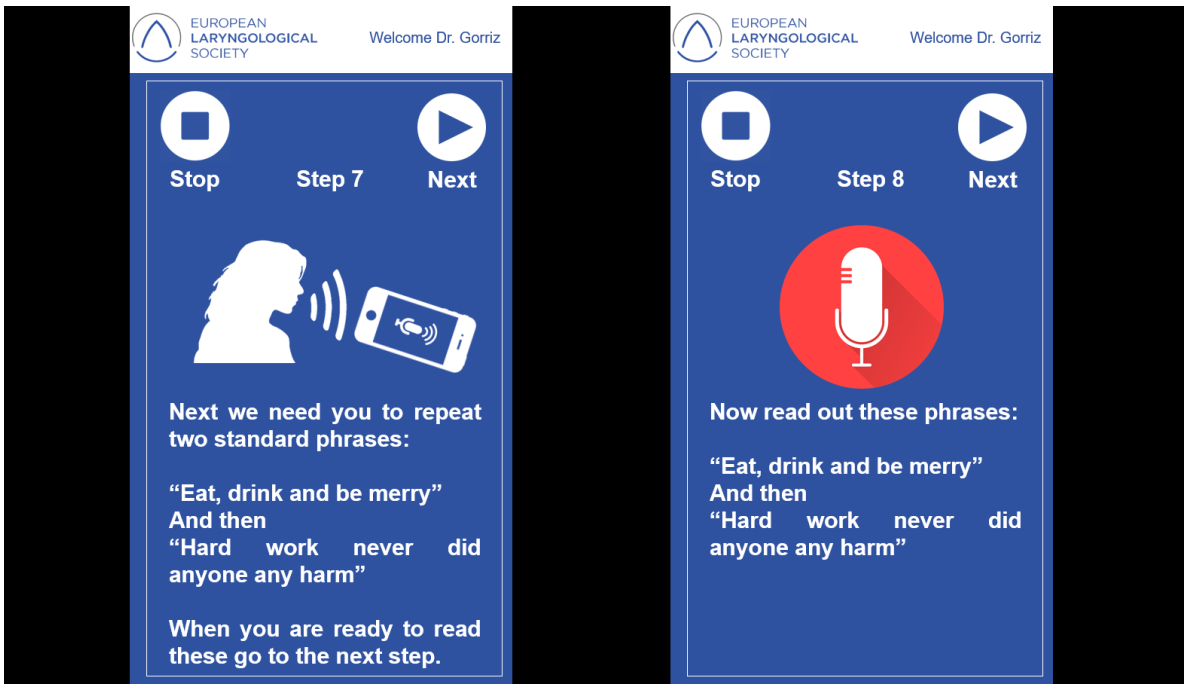
After completing the guide the session recordings are listed with the name “Unsaved Session”:



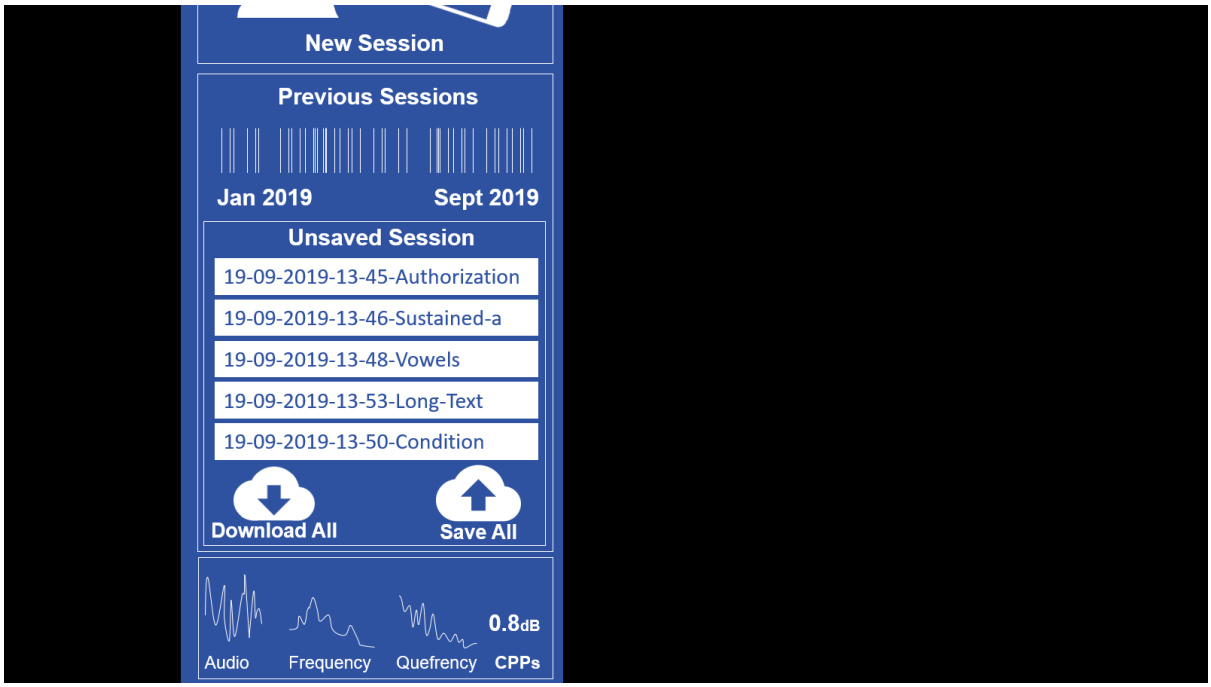
Recordings can be played back to check for quality:



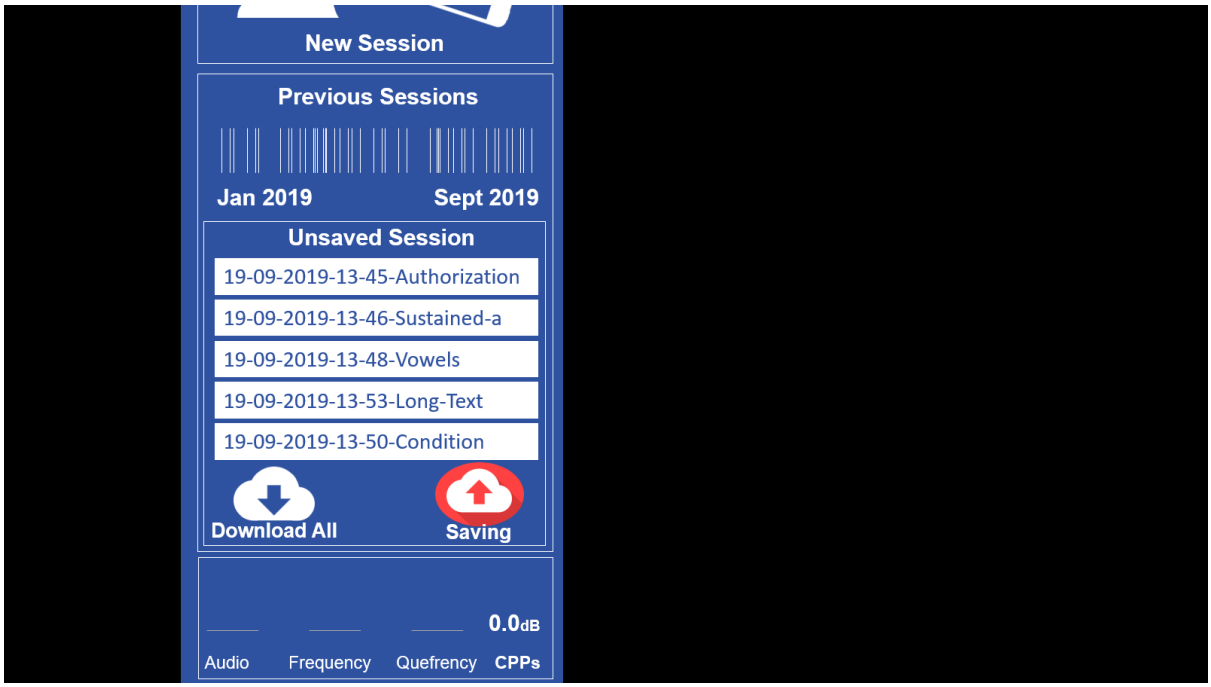
If a recording is unsatisfactory the specialist can press the re-record button and the guide will jump to the appropriate stage and repeat the recording:



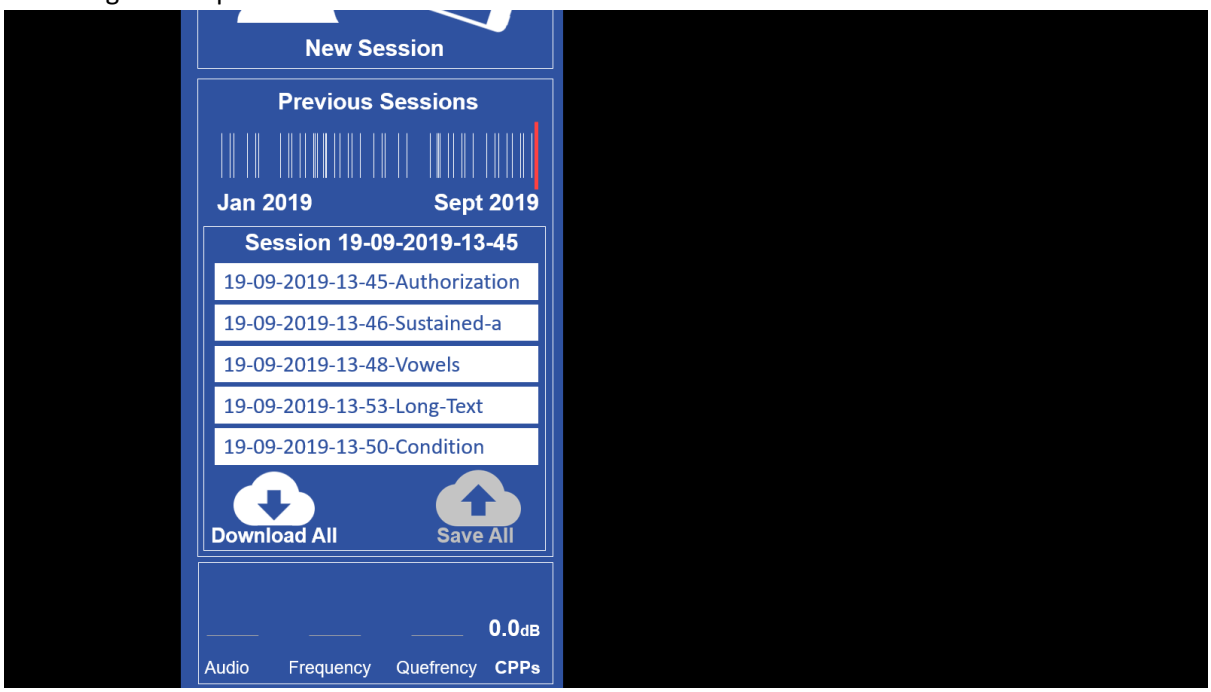
The recordings are updated in the session list:



The session can be saved by pressing the Save All button:



The session is added to the list of previous sessions and it is titled with the current date and time according to the specialist's local time zone:



This completes the walkthrough of the ELS Voice Store application.