

Additional materials for professionals.

StethoMe Platform.

The materials below regard the elements of the StethoMe application for users with medical education and having an account with the “Doctor” attribute at the StethoMe Platform. The above mentioned functions are elements of the official StethoMe application, available at [Google Play](#) and [App Store](#).



- The StethoMe Platform is a place where we can analyse in detail all the lung and heart recordings made using the StethoMe application and stethoscope.
- The StethoMe Platform is a tool intended for work on a computer. Using it on a mobile phone is significantly more difficult..

1. Signing in to the StethoMe Platform.

In order to sign in to the StethoMe Platform, enter the <https://platform.stethome.com> website and sign in using the e-mail address and password that you use in the StethoMe application.



The login form consists of two input fields: one for 'e-mail' and one for 'password'. Below the fields is a blue 'SIGN IN' button and a link for 'Password recovery'.

2. List of result.

After signing in you will see the list of all the examinations carried out using the StethoMe application and stethoscope.

Each examination features data such as:

- examination date and time,
- patient’s first and last name,
- patient’s age,
- auscultation result determined using predictions of StethoMe AI artificial intelligence,
- patient’s chronic diseases (if they were specified when the patient was added to the StethoMe system),
- number of points recorded during the examination,

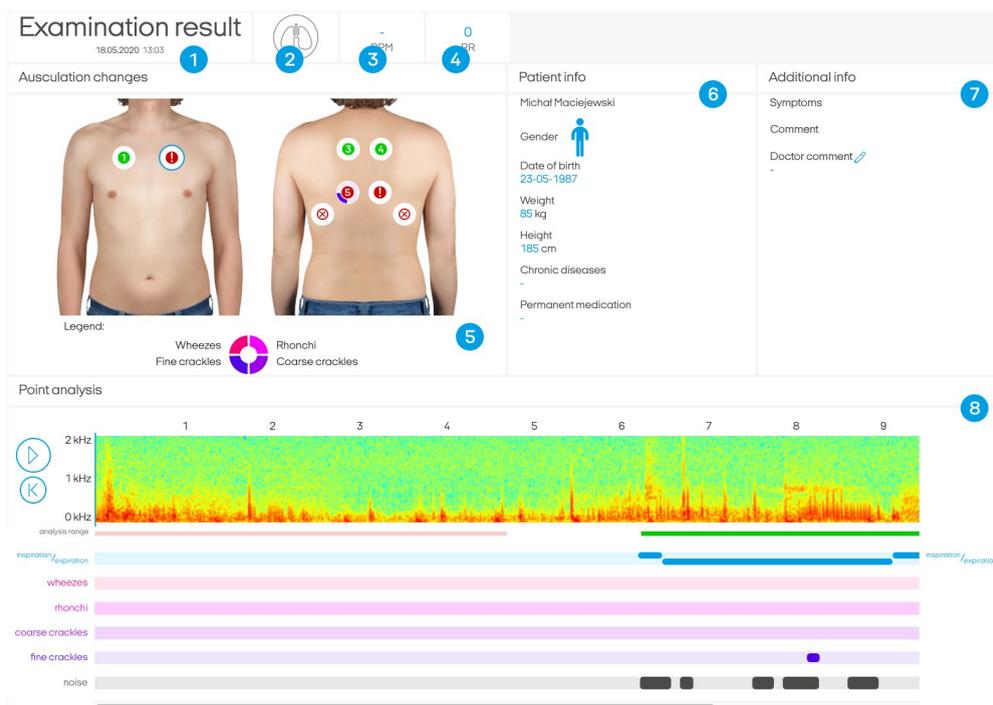
- first and last name of the person who conducted the examination.

3. Result view.

After signing in to the StethoMe Platform you will see the list of all the examinations carried out using the StethoMe application and stethoscope.

The result view consists of:

- 1 Examination date and time.
- 2 General result of the examination (obtained using predictions of StethoMe AI artificial intelligence).
- 3 Heart rate values (if audible during examination).
- 4 Respiratory rate [number of breaths per minute] - average value for correctly recorded points.
- 5 Silhouettes with imposed symbols of results at examination points - [by clicking on the points you can switch between the player and the tagged spectrogram view for a given point](#) (see Item 8).
- 6 Patient's data.
- 7 Comments field - here you can write your observations and notes.
- 8 Spectrogram with player of recorded sounds and artificial intelligence prediction tags.



3.1. Possible designations for a visit:

-  No abnormal auscultation sounds detected.
-  Few abnormal auscultation sounds detected.
-  Abnormal auscultation sounds detected.
-  Examination result cannot be determined (It is necessary to record at least 4 points correctly in order for a result to be determined).

3.2. Result of analysis for a single point.

The template of result for a single point is represented on the silhouette by a round icon in appropriate colour



(green, orange, red, cross in a circle, or an exclamation mark), surrounded by four quadrants (with each of the quadrants corresponding to a different pathological phenomenon).

Possible designations:

-  No abnormal auscultation sounds detected.
-  Few abnormal auscultation sounds detected.
-  Abnormal auscultation sounds detected.
-  Point not recorded.
-  Unable to perform analysis. No breathing detected or ambient noise too high..

Each of the diagram quadrants may displays one of the three states, e.g.:

 pale colour means that a given pathology, in this case - wheezes, has not been detected



a half-filled quadrant means that a small intensity of a given pathology's sounds has been detected, in this case - a small number of wheezes

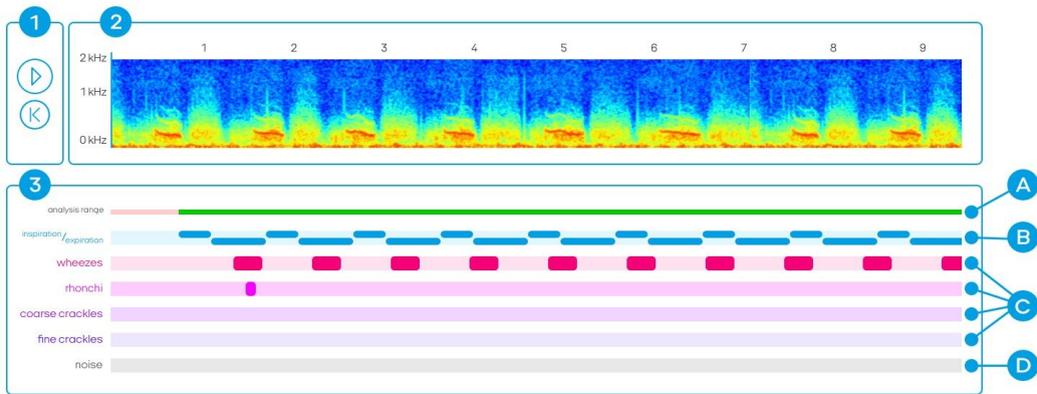


a filled quadrant means that the sounds of a given pathology, in this case - wheezes, are very clearly audible.

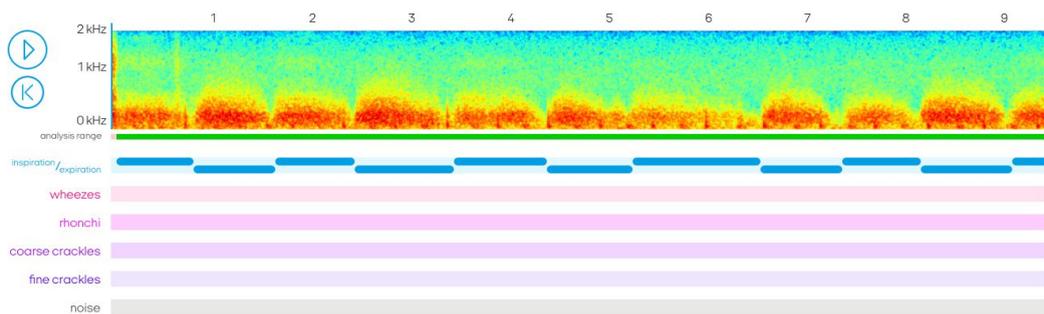
3.2. Detailed analysis result for a single auscultation point.

The template of detailed result description presented extended information on the results of analysis of a single recording from a visit. This view includes:

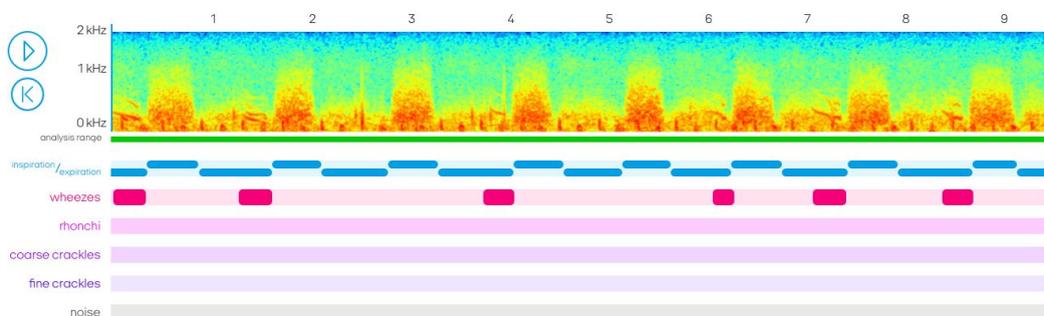
- 1  Player of the sounds recorded. You can connect earphones to your computer and listen to the sound by pressing the play icon
-  You should **ALWAYS** listen to the sounds through earphones. Never listen to sounds using computer speakers - they do not play back auscultation sounds with sufficient quality
- 2 Spectrogram - a presentation of sound in the form of an image, where the X (horizontal) axis represents time and the Y (vertical) axis represents the frequency/pitch of the sound, while the level/loudness of sound is represented by colour (with the least loud being blue, through yellow, to the loudest being red).
As a result, respiratory sound will have the form of larger red areas, continuous sounds (such as wheezes, rhonchi, or voice) will have the form of horizontal lines, while non-continuous sounds (such as crackles and heart beat) will have the form of vertical lines.
- 3 Markings of artificial intelligence predictions in time:
 - A analysis area - it is the area of the recording marked with a green line, which was subjected to analysis by artificial intelligence algorithms,
 - B point of occurrence of inhalations and exhalations,
 - C points of occurrence of pathological phenomena (the height of markers corresponds to intensity of a given pathology in the whole fragment analysed, using a two-level scale),
 - D interference detected that may have impact on result of AI predictions.



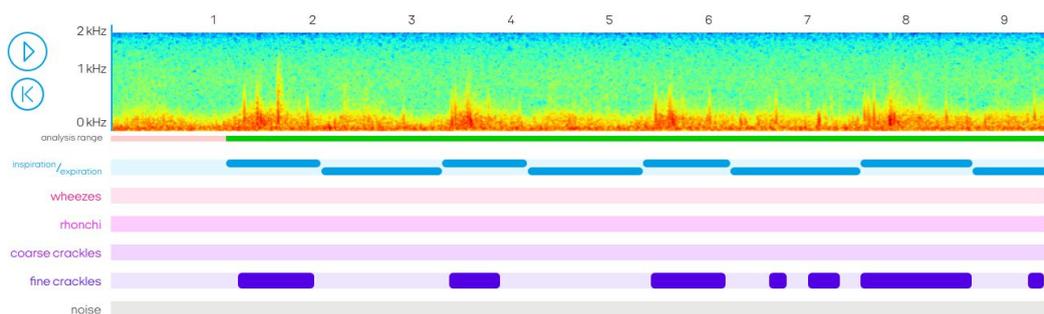
Elements of detailed analysis of a point.



Example spectrogram for a recording without pathologies.



Example spectrogram for a recording that includes wheezes (red markings).



Example spectrogram for a recording that includes fine crackles (violet markings).

Recording examples and classification thereof

Normal breathing (no pathological sounds)

Below you can find examples of recordings that present normal breathing. These examples are recordings that do not include any additional pathological sounds.

<https://www.youtube.com/watch?v=PdoYq098uF4>

<https://www.youtube.com/watch?v=ozGHnUi9AhA>

<https://www.youtube.com/watch?v=fkNfGMBABn0>

<https://www.youtube.com/watch?v=W9PueJhEdVE>

Additional abnormal auscultation sounds have been divided into 4 classes in line with the most recent guidelines of ERS into:

1. Wheezes

Wheezes are continuous tonal sounds that appear during obstruction.. They usually appear during expirations, but in case of strong obstruction they are audible during both inhalations and exhalations. On a spectrogram they are represented in the form of vertical lines. They sound similar to whistles, squeaks, and sometimes voice.

Examples:

- <https://www.youtube.com/watch?v=qI1r6hDYFis>
- <https://www.youtube.com/watch?v=N8O1U7dSnLo>
- <https://www.youtube.com/watch?v=pfbn18P8ti4>
- <https://www.youtube.com/watch?v=iXuRnKHiY68>

2. Rhonchi

Rhonchi are continuous tonal sounds that appear during obstruction caused by mucus. They appear during both inspirations and expirations. On a spectrogram they are visible as vertical lines and increased intensity of sound for lower frequencies (higher saturation in the lower part of the spectrogram). They sound similar to snoring, low frequency whistles, and sometimes voice.

Examples:

- https://www.youtube.com/watch?v=Xz2rDhA_eaM
- <https://www.youtube.com/watch?v=HfPZXS2k2b4>
- https://www.youtube.com/watch?v=qlsXpIFn_Sk

- <https://www.youtube.com/watch?v=7dWbay-fi9Y>

3. Fine crackles

Fine crackles are non-continuous, transient sounds that appear during sudden opening or closing of the respiratory tract. They usually appear during inhalations, but in case of higher intensity they may occur during both inhalations and exhalations. Fine crackles occur mainly in groups and are visible as a series of vertical lines on a spectrogram. This group of sounds includes also the sounds referred to as crepitations and other crackles that are not classified as coarse crackles. These sounds can be confused with the interference resulting from improper execution of recording. They sounds similar to bursting bubbles or walking on wet snow.

Examples:

- https://www.youtube.com/watch?v=0_SFqHjn8vY
- <https://www.youtube.com/watch?v=4afUkbpUpdY>
- https://www.youtube.com/watch?v=oXfO_CGcL9A
- <https://www.youtube.com/watch?v=0fAFrShoRVk>

4. Coarse crackles

Coarse crackles are non-continuous, transient sounds that appear during sudden opening or closing of the respiratory tract. They usually appear at the end of expirations, but in case of higher intensity they may occur during both inspirations and expirations. Similarly to fine crackles, they occur in groups and are represented on spectrograms as series of vertical lines. They sound similar to snoring and gurgling, and sometimes they are similar to rhonchi.

Examples:

- <https://www.youtube.com/watch?v=-9SOEMMkTrc>
- <https://www.youtube.com/watch?v=4afUkbpUpdY>
- https://www.youtube.com/watch?v=oXfO_CGcL9A