



# Ligence Heart

## USER MANUAL

English

CE  
0197

	Name	Role	Date	Signature
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Specifications due to technical developments are subject to change. This user`s manual is not subject to the revision service. Please contact the manufacturer or authorized dealer to request the latest edition of the manual.

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# 1. READ THIS FIRST

The Ligence Heart user manual describes product's functionalities and is intended to guide and assist you with the safe and effective operation of the product. Before using the product, please read the user manual carefully and thoroughly observe all warnings and cautions.

This user manual describes the most extensive configuration of Ligence Heart with the maximum number of functions. Some functions described may be unavailable on your product's configuration.

Ligence Heart does not replace medical professionals and could be used only as an additional support tool. No special facilities or special training (for medical specialists who are certified to perform echocardiographic examination) are required for the use of Ligence Heart.

Please note that the quality of medical images, sharpness, accuracy, and other parameters, relevant to the users, directly depend on the technical capabilities of medical device, which is generating medical images, on the monitor and printer (if images are printed out) technical capabilities.

UAB Ligence provides this document without warranty of any kind, implied or expressed, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

UAB Ligence takes no liability for errors or omissions in this document and reserves the right to make changes without further notice to improve the Ligence Heart product. UAB Ligence may decide to make improvements or changes in the product described in this document at any time.

## 1. About the User Manual

IMPORTANT

READ CAREFULLY BEFORE USE

KEEP IT FOR FUTURE REFERENCE

Ligence Heart User Manual in PDF format is available on the internet website: <https://www.ligence.io/user-manual-3-3>

You can open the file using a PDF reader application. If you do not have a PDF reader application installed, you can download Adobe Reader from the following website: [www.adobe.com](http://www.adobe.com)

Please contact UAB Ligence or its affiliates for technical support.

Software Installation Manual is added as a separate document to the User Manual.

If You require paper version of User Manual, please ask us by email: [support@ligence.io](mailto:support@ligence.io). Paper version of User Manual will be sent not later than in 7 days after receiving Your request (to the address You specify).

## 2. Symbols

The following symbols may appear in the product documentation or on the labels attached to the product.

Symbol	Description
	<b>Warning.</b> Warnings highlight information to avoid a hazardous situation, which could cause death or serious injury.

Symbol	Description
	<b>Caution.</b> Cautions highlight information to avoid a hazardous situation, which could cause minor or moderate injury or equipment damage.
	<b>Note.</b> Notes bring your attention to information that will help you operate the product more effectively.
	<b>Manufacturer.</b> Indicates the name and address of the manufacturer.
	<b>Medical device.</b> Indicates that the product is a medical device.
	<b>Read the user manual.</b> Indicates the need for the user to consult the user manual.
	<b>CE Marking of Conformity.</b>

### 3. Markets and foreign language support

With the CE mark, Ligence Heart software will be sold in the EU, where English language is supported. It can be translated upon request of customers. Currently, Ligence Heart supports the English language.

### 4. Reporting security issues

If you believe you have discovered a vulnerability in our medical software or have a security incident to report, please contact us:

Ligence, UAB CPO who is responsible for data protection (contacts are public and available at <https://www.ligence.io/>).

Name, Surname: Antanas Kiziela

Tel. +37062760039

Mail: a.kiziela@ligence.io

Reports should include:

- Description of the local and potential impact of the vulnerability;
- A detailed description of the steps required to reproduce the vulnerability. Proof of concept scripts, screenshots, and screen captures are all helpful. Please use extreme care to properly label and protect any exploit code;
- Any technical information and related materials we would need to reproduce the issue.

Once we have received a vulnerability report, Ligence, UAB takes a series of steps to address the issue:

1. Ligence, UAB requests the reporter to keep communicating regarding the vulnerability Confidentially.
2. Ligence, UAB investigates and verifies the vulnerability.
3. Ligence, UAB addresses the vulnerability and releases an update or patch to the software. If for some reason this cannot be done quickly or at all, Ligence, UAB will provide information on recommended mitigations.
4. Release notes include a reference to the vulnerability case.

Ligence, UAB will endeavour to keep the reporter apprised of every step in this process as it occurs.

We greatly appreciate the efforts of security researchers and discoverers who share information on security issues with us, giving us a chance to improve our software and better protect personal health data. Thank you for working with us through the above process.

We'll do our best to acknowledge your emailed report, assign resources to investigate the issue, and fix problems as quickly as possible.

## 5. Intended use

Ligence Heart is a software used to detect, measure, and calculate various specifications of structure and function of the heart and great vessels by analyzing echocardiographic images.

The device is intended to be used, when the patient is not in a life-threatening state of health, time is not critical for medical decisions and no major therapeutic interventions are required.

## 6. General description

In order to better understand the method of working of the software, it is convenient to separate the process of echocardiography exam into two steps:

1. Data acquisition. During the first step, the operator of an ultrasound machine manipulates a probe interacting with the patient in order to produce the echocardiographic images of the heart. The images are then saved and stored digitally in DICOM format.
2. Data analysis. Using medical image viewing software the acquired echocardiography images are opened, annotated, measured and clinical conclusions are drawn based on the generated data.

Having established these steps, it is important to identify how the process of echocardiography exam takes place in the specific case of using Ligence Heart. The first step (data acquisition) remains the same as a regular echocardiography exam in accordance with standard clinical setting and is in no way affected using Ligence Heart software. Ligence Heart software is used to perform the entirety of the second step. To fulfill its intended purpose, the software Ligence Heart is used as a postprocessing tool that is accessible via the sonographer's/physician's workstation in the office or any other dedicated area for patient's clinical data analysis.

Ligence Heart is used as a postprocessing tool to perform the second step (data analysis), during which the following processes take place:

1. Echocardiography images are loaded to the Ligence Heart software via integration to PACS or manual study DICOM files upload.
2. The analysis phase:
  - a) **Manual functionalities** - user of the software manually identifies the relevant structures or features, annotates them, measurement results are displayed in the viewer.
  - b) **Automatic functionalities** - the software has algorithms implemented, that allow automatic identification, annotation, and calculation of a number of relevant heart parameters. These algorithms are based on deep learning technology. The results provided by these algorithms must be reviewed and approved by a clinician.

3. A report is generated. The results of the whole study analysis process are summarized in a report. The report document provides a table of measurements performed, a summary template, an illustrations list of measurements made.

The automatically generated measurements and the finalized report must be approved by a medical professional who is certified and eligible to conduct echocardiography examinations and formulate a report without the use of Ligence Heart automatic functions. The automatically generated and physician approved report of echocardiogram analysis serves only as a decision support tool. The conclusion of diagnosis always must be taken by the physician.

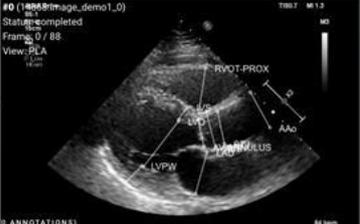
*A complete list of Manual functionalities and Automatic functionalities can be found in the User Manual and System requirement specification.*

## 7. Marketing brochure





→



Cardiovascular disease (CVD)

- CVDs account for **37%** of disease related deaths globally;
- Over **6M new cases** in EU alone;
- Cost over **210B EUR** for EU economy alone;
- World Health Organisation (WHO) predicts obesity pandemic which is a **major risk factor for CVD**.

Ligence Heart

- Deep learning solution for **cardiac ultrasound analysis**;
- Mimics the steps performed by a cardiologist;
- Automated** morphometric measurements;
- PLA, A4CH, A2CH and even more;
- Easy integration** to PACS;

Echocardiography

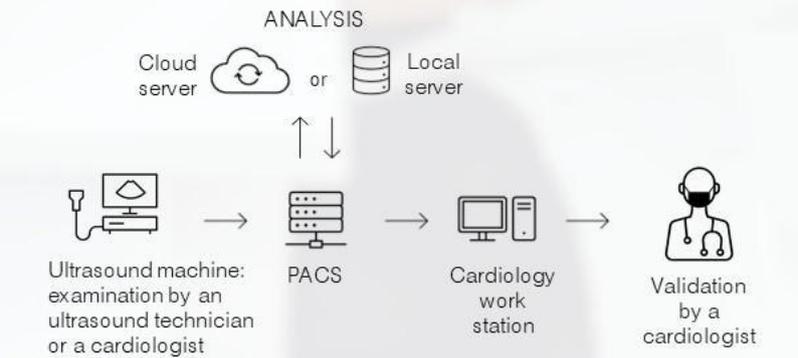
- Transthoracic echocardiography (2D TTE) is the **first choice method** for CVD diagnosis;
- Highly **subjective** (variability up to 30%);
- Up to 85% of examination is **manual and repetitive work**.

Value proposition\*

- Accuracy up to 94% (non-inferior to a cardiologist)**;
- Reduced intra-rater variability**;
- Up to 4x faster study evaluation time for certain measurements\*\***;
- Retrospective analysis** of large cohorts;
- Standardised reporting;

How it works

ANALYSIS



\*Data from clinical trial  
 \*\*Data from clinical trial for selected measurements



Created for doctors by doctors



Interested? Contact us:  
[info@ligence.io](mailto:info@ligence.io)



## 8. User groups

There are 2 groups of users that can work with Ligence Heart:

1. **Sonographer/physician.** Ligence Heart can be used by medical professionals that are certified and eligible by local legislation to conduct regular echocardiography examinations in a clinical setting. The automatically generated measurements and the finalized report have to be approved by a medical professional who is certified and eligible by local legislation to conduct echocardiography examinations and formulate a report.
2. **Administrator.** Ligence Heart can be used by client's system administrators that are not medical practitioners for the purpose of system administration, but not for clinical purposes.

## 9. Indications and contraindications

### Indications

The software is intended to be used in analysis of echocardiography images acquired from patients that are of any gender and race in accordance with the latest guidelines for echocardiography examination. Automatic functionalities should be used in adults with sinus rhythm.

### Contraindications

The automatic functionalities should not be used to analyze echocardiography images of patients younger than 18 years old. Also, automatic functionalities should not be used to analyze images of patients with heart diseases/procedures done that significantly alter heart anatomy or geometry that significantly distort the echocardiography images. A list of contraindications for automatic functionalities is provided in the table below:

Contraindications for automatic functionalities
Isolated congenital aortic valve disease and bicuspid aortic disease
Isolated congenital mitral valve disease (except parachute valve, cleft leaflet)
Mild isolated pulmonary stenosis (infundibular, valvular, supra-ventricular)
Isolated ventricular septal defect, or patent ductus arteriosus
Sinus venosus defect, ventricular septal defect, or patent ductus arteriosus without residue or sequellae, such as chamber enlargement, ventricular dysfunction, or elevated pulmonary artery pressure.
Anomalous pulmonary venous connection (partial or total)
Anomalous coronary artery arising from the pulmonary artery
Anomalous coronary artery arising from the opposite sinus
Congenital aortic stenosis - subvalvular or supra-ventricular
Atrioventricular septal defect, partial or complete, including primum atrial septal defect (excluding pulmonary vascular disease)

<b>Contraindications for automatic functionalities</b>
Coarctation of the aorta
Double chambered right ventricle
Ebstein anomaly
Marfan syndrome and related heritable thoracic aortic disease, Turner Syndrome, congenital connective tissue disorders with heart or major vessel involvement
Patent ductus arteriosus, moderate or large unrepaired (excluding pulmonary vascular disease)
Peripheral pulmonary stenosis
Pulmonary stenosis (infundibular, valvular, supra-valvular), moderate or severe
Sinus of Valsalva aneurysm/fistula
Sinus venosus defect
Tetralogy of Fallot repaired
Transposition of the great arteries after arterial switch operation
Ventricular septal defect with associated abnormalities (excluding pulmonary vascular disease) and/or moderate or greater shunt.
Any Congenital Heart Disease (repaired or unrepaired) associated with pulmonary vascular disease (including Eisenmenger syndrome)
Any cyanotic Congenital Heart Disease (unoperated or palliated)
Double-outlet ventricle
Fontan circulation
Interrupted aortic arch
Pulmonary atresia (all forms)
Transposition of the great arteries (except for patients with arterial switch operation)
Univentricular heart (including double inlet left/right ventricle, tricuspid/mitral atresia, hypoplastic left heart syndrome, any other anatomic abnormality with a functionally single ventricle)
Truncus arteriosus

Contraindications for automatic functionalities
Other complex abnormalities of atrioventricular and ventriculoarterial connection (i.e. crisscross heart, heterotaxy syndromes, ventricular inversion).
Congenital tricuspid and pulmonary valve disease
Situs inversus or dextrocardia
Heart tumors
Prosthetic valves, post-operative heart valves, cardiac geometry changing cardiothoracic surgeries
Implanted dual-chamber or ventricular pacemaker
Bi-ventricular resynchronizator
Cardioverter-defibrillator
Left ventricle assisting device, Right ventricular assisting device
Heart arrhythmias

## 10. Principles of operation of the device

### Manual functionalities

The device visualizes echocardiography imaging data in a web browser and allows inspecting the imaging data and performing measurements by drawing annotations superimposed on the visualized data. The annotations are then used to calculate the relevant geometric and functional heart parameters.

### Automatic functionalities

The device performs a series of steps that involve automated recognition of the echocardiography imaging data, recognition of echocardiographic probe position and detecting a set of anatomical (e.g. heart chamber borders, landmarks). The automated functionalities rely on the predictions made by deep neural networks from the echocardiographic images (e.g. echocardiographic probe position recognition, heart chamber border, landmark detection).

To summarize, the input to the device is an echocardiography DICOM image. After the image is analyzed using automated and/or manual functionalities, a finalized report is generated, which is the output of the software.

## 11. Explanation of any novel features

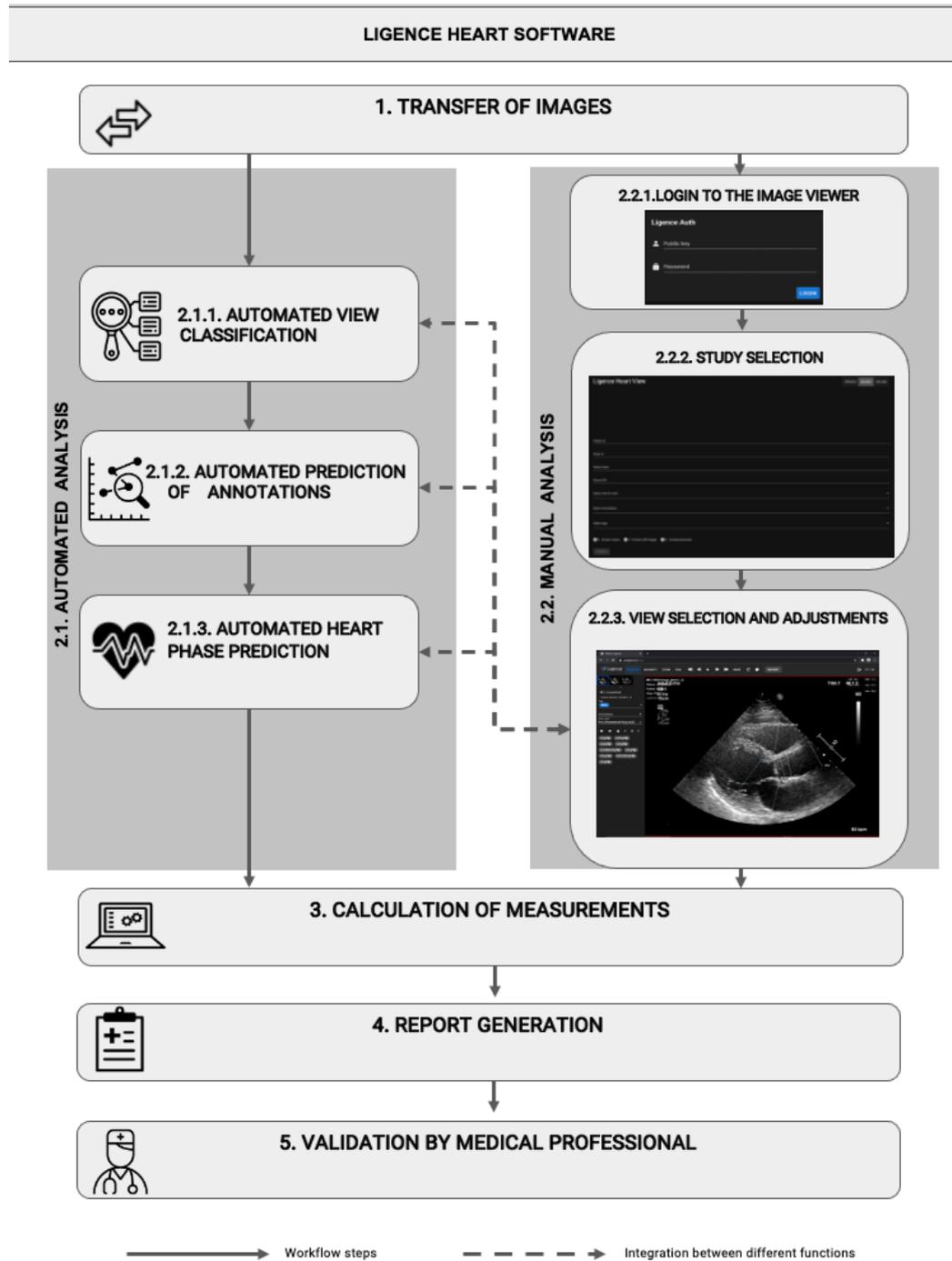
Ligence Heart offers novel functionality that allows automatic analysis of a number of heart structure and function parameters. Therefore, the parameters that are analyzed themselves are not novel, but the automation of some of these measurements is novel (none of the manual functionalities are novel). The automatic functionalities are based on Deep Learning technologies. These automatic functionalities offer the ability to automate activities that are usually performed manually during regular echocardiographic image analysis.

## **12. Description of all configurations/variants of the product**

There is a possibility, on the request of the customer, to have different functionalities of Ligence Heart turned on/off for each customer via the manufacturers control mechanisms. The product basic package will always allow to manually annotate images and receive calculations of measurements. The algorithms to automatically perform some of these manual tasks will be turned on/off depending on the customer needs and sale agreement.

# 13. General description of key functional elements

Functional elements scheme.



Explanation of the functional elements

Key function	Description
1. <i>Transfer of echocardiography images</i>	echocardiography images have personal data removed and transferred from hospital PACS to Ligence Heart software

Key function	Description
2. Analysis	echocardiography images analysis step using automated or manual analysis
2.1. Automated analysis	
2.1.1. Automated view classification	An Automated system is trained to determine view mode of echocardiography image. This step is needed for further analysis of images
2.1.2. Automated prediction of annotations	Automated system is trained to predict annotations that are used to measure heart anatomy based on the view mode of echocardiography DICOM image
2.1.3. Automated heart phase prediction	Automated system tracks cardiac cycle and identifies the frames that are crucial for the analysis of echocardiography images, e.g. end-systolic and end-diastolic
2.2. Manual analysis	
2.2.1. Login to the image viewer	Authentication/authorization to the software step needed to be able to access studies
2.2.2. Study selection	Selection of accessible study by filtering/searching step
2.2.3. View selection and adjustments	Study analysis step, physician sets the view mode of echocardiography image, performs annotations, or adjusts measurements already made by automated analysis
3. Calculation of measurements	Calculation of measurements based on the annotations on echocardiography image performed by the combination of manual and automatic functions
4. Report generation	Study analysis report, which consists of all annotations, measurements made along with automated suggested diagnosis text, is generated for review and approval of physician
5. Validation by medical professional	Medical professional validates all annotations and measurements made and adjusts the annotations if needed, updating the report respectively

## 14. Benefits of using Ligence Heart

The use of Ligence Heart software brings a modern, quicker, and precise way for understanding visual ultrasound data. In addition to manual analysis of ultrasound images, Ligence Heart allows the user to automatically perform parts of the echocardiography image evaluation with non-inferior accuracy compared to cardiologists, reducing the variability of measurements, and reducing the time needed for analysis.

## 15. Clinical Benefits

Performance of manual functionalities:

- The manual functionalities of Ligence Heart are provide equally accurate and reliable tools for echocardiography evaluation compared to other state of the art CE marked medical software.

Performance of automated functionalities:

- Ligence Heart performs automated measurements with non-inferior accuracy compared to a cardiologist;
- Automatic functionalities perform echocardiographic measurements with lower intra-rater variability than a cardiologist;
- On average automatic functionalities perform the evaluation of echocardiographic images faster than a cardiologist.

## 16. Commencement and Termination of Use

The provision for use begins upon delivery and / or installation of the Software on your computer and/or workstation. The provision for use is for the period specified in the agreement with your institution, unless you are using a trial or demo version.

The termination of use comes to effect when the period specified on the agreement with your institution comes to an end or when the user violates terms of end-user license agreement or other terms specified in the agreement. Upon such an event, the user must cease all use of the software and delete the unique login credentials assigned to the user. The use of the software will then be automatically terminated, and the user does not have to take any other measures to safely terminate the use.

## 17. Customer Service

Ligence representatives are available to answer questions and to provide maintenance and service.

Contact details:

E-Mail: [support@ligence.io](mailto:support@ligence.io)

Support Hotline: +37064550126

You can also submit an issue or question using our website: <https://www.ligence.io/submit-issue>

## 2. SAFETY

### WARNING



Do not use this software product for any application until you have read, understood and know all the safety information, and safety procedures contained in this SAFETY chapter. Use of this software product without a proper awareness of how to use it safely could lead to fatal or serious injury, clinical misdiagnosis, and/or loss/damage of patient-related data.



### CAUTION

Only persons described in the "Intended User Group" shall use the product.



### CAUTION

According to common medical sense and the principles of differential diagnosis any diagnostic finding derived from usage of this product must be confirmed by additional diagnostic investigations prior

diagnosis performed by a physician. Not obviously incorrect behavior could lead to conflicting information.

#### CAUTION



This product is not intended to be used for emergency diagnosis.

## 1. Summary of Clinical Evaluation Report

The device's risks were managed according to UAB Ligence internal risk management work instruction, which is based on the ISO 14971:2019 standard. During the risk management activities, the device was:

1. Classified according to the Medical Device Regulation EU 2017/745 directive's Annex VIII as a CLASS IIa medical device according to the rule 11;
2. Identified according to the Medical Device Regulation EU 2017/745 and requirements defined in the ISO 14971:2019 standard's Appendix C;
3. Risks managed (analyzed, mitigated, verified for residual risks). There are no additional measures for risk control identified that have not been implemented and the device is considered safe to use according to its intended purpose.
4. All the risk management activities were carried out by the risk management team.
5. All the testing activities were carried out by the testing team.

UAB Ligence gathers production and post-production information using the following Quality management system's areas:

1. Product realization;
2. Measurements analysis and improvement;
3. Change and problem management;
4. Auditing;
5. Post market follow-up.

The above mentioned activities ensure that internal and external views (in which the product exists) are constantly monitored and if changes occur all associated risks are re-managed.

Risk management report and related documents in the risk management file are updated when needed.

## 18. Residual Risks

No residual risks were identified.

## 19. Personal Data Security Breach

In case of personal data breach (including but not limited to cybersecurity breach) please immediately (but not later than in 24 hours) inform medical software Manufacturer UAB Ligence by using below mentioned contacts:

UAB Ligence Data Protection Officer

(Contacts of Data Protection Officer are publicly available at [www.Ligence.io](http://www.Ligence.io)).

Name, Surname: Antanas Kiziela

Tel. +370 627 60 039

Mail: [dpo@ligence.io](mailto:dpo@ligence.io)

## 20. Serious Incidents Reporting

Any serious incident or that has occurred in relation to the device should be immediately reported to the manufacturer (via website: <https://www.ligence.io/submit-issue> or email [support@ligence.io](mailto:support@ligence.io)) and to the competent authority of the country in which the user and/or patient is established.

## 21. Data Handling

Data formats which can be read by this product include the following DICOM classes:

- 1.2.840.10008.5.1.4.1.1.6 - Ultrasound Image Storage (retired)
- 1.2.840.10008.5.1.4.1.1.6.1 - Ultrasound Image Storage
- 1.2.840.10008.5.1.4.1.1.7 - Secondary Capture Image Storage
- 1.2.840.10008.5.1.4.1.1.3 - Ultrasound Multiframe Image Storage (retired)
- 1.2.840.10008.5.1.4.1.1.3.1 - Ultrasound Multiframe Image Storage

JPEG-Baseline-1 data compression is used for storing images from this product



### WARNING

Before saving, editing, or reviewing the data of a patient, ensure that its contents correspond to the patient name. This provides additional assurance that the stored data correspond to the correct patient. Not obviously incorrect behavior could lead to conflicting information.



### CAUTION

The user is responsible for the content of reports, findings records and other patient information.



### CAUTION

The displayed DICOM image information in Ligence Heart software comes from your DICOM producing device such as Ultrasound machine. UAB Ligence is not responsible for any incorrect or missing information due to a use error or device malfunction on the device itself that was used to produce DICOM images.



### NOTE

The quality of any exported object highly depends on the settings performed to the exporting file formats (e.g. compression of images). Keep this fact in mind that information can be lost that way. The physician has to decide whether the information contained in an exported object can be used for making diagnostic decisions.

## 22. Installation, Maintenance

Installation should be performed in accordance with the Installation Manual, which is provided as a separate document.



### CAUTION

Only persons according to the Intended User Group may perform installation, setup and upgrade.

Service and any configuration of this product shall be performed only by UAB Ligence or your local representative.



### CAUTION

UAB Ligence assumes no liability for problems attributable to unauthorized modifications, additions, or deletions to this product, or unauthorized installation of third party software.



### CAUTION

As manufacturer and distributor of this product, UAB Ligence is not responsible for safety, reliability and performance of the system if:

- installation, configuration or modifications are performed by persons, who are not authorized by UAB Ligence;
- the product is not operated in accordance with the manual;
- the product is operated outside of its operating conditions.



#### CAUTION

The hardware this product is running on has to be maintained regularly by the user.



#### CAUTION

The user is responsible for all changes to the system settings. This can lead to system damage and software life-cycle support void.



#### NOTE

If this product is correctly installed and further used on a system respecting the specified client-side and/or server-side system requirements and if no unexpected errors are upcoming, this product is maintenance-free.

## 23. User Views



#### CAUTION

Ligence Heart is not intended for diagnostic purposes on mobile devices with screen resolution less than 960 px.

## 24. Patient/User Safety



#### CAUTION

The user must be satisfied with the suitability and completeness of a study for an analysis with this product. If not, the acquisition has to be repeated. For information about performing an acquisition, which is suitable for an analysis with this product, please refer to the operating instructions provided by the manufacturer of your ultrasound equipment.

## 25. Measurements



#### WARNING

Ligence Heart is intended to provide image and related information that is interpreted by a trained professional to render findings and/or diagnosis, but it does not directly generate any diagnosis.

The product is not developed to be an automatic diagnostic tool. The automatically generated annotations, measurements and the finalized report must be approved by a medical professional who is certified and eligible to conduct echocardiography examinations and formulate a report without the use of Ligence Heart automatic functions. The automatically generated and physician approved report of echocardiogram analysis serves only as a decision support tool. The conclusion of diagnosis always must be taken by the physician.



#### WARNING

The device is intended to be used, when the patient is not in a life-threatening state of health, time is not critical for medical decisions and no major therapeutic interventions are required.



#### CAUTION

Ligence Heart shall not be used with any unverified and unvalidated modalities, view modes, or patient populations described in more detail below. UAB Ligence does not carry responsibility for any harm resulting from an inappropriate usage of the software.



#### CAUTION

The complete anatomy of the structure that is being evaluated with Ligence Heart has to be visible in the datasets.



#### CAUTION

The user is responsible for determining if artifactual characteristics exist. Artifacts can severely affect the image quality and require a reacquisition. Examples of artifacts are:

- Obvious discontinuity due to a jerky motion during acquisition or because the acquisition range was left.
- Excess shadowing of images.
- Poorly defined anatomy or evidence of distorted anatomical representation.



#### CAUTION

In the case of a poor image quality, as determined by the above criteria or by the user's clinical experience and training, measurements should not be made. If for any reason measurements are made using a poorly reconstructed image, these measurements should not be used for making diagnostic decisions.

The user must be committed to the accuracy of the existing images and measurement results. Image scans should be repeated if there is the slightest doubt as to the accuracy of images and measurements.



#### CAUTION

Some patient data contains ECG data, which is not intended for diagnostic purposes.



#### CAUTION

The user is responsible for determining if the desired measurement is suitable for the corresponding dataset and for determining if the measurement results are applicable for diagnostic decisions. In case of incorrect usage incorrect results may occur.



#### CAUTION

The measurement accuracy of any measurement function is only as precise as the maximum acquired resolution in the screen projection of an image. The accuracy depends mainly on the acquisition method and the operator skills. For detailed information about acquisition methods and accuracies, refer to the manual of the acquiring device. All measurements are calculated from the relative positions of on-screen graphic symbols superimposed on an over the ultrasound image. Therefore, the validity of the measurements with respect to the ultrasound image depends directly on the operator skills in positioning the graphic symbols over features of interest in the image. When performing measurements, always be aware of this source of human error.

### Safety of Manual Functionalities



#### CAUTION

Manual functionalities have been validated and verified on 2-dimensional transthoracic echocardiography images of adults up to now.



#### CAUTION

Manual functionalities have been validated and verified in the following modes:

- B-mode
- M-mode
- PW-Doppler
- CW-Doppler

- Tissue Doppler

## Safety of Automatic Functionalities



### CAUTION

Automatic functionalities are validated and verified only to be used with 2-dimensional transthoracic echocardiographic B-mode images and with patients that do not have previously stated contraindications.



### CAUTION

Automatic functionalities have not yet been validated and verified for patients who have:

- Atrial flutter
- Atrial fibrillation
- Acute and subacute endocarditis
- Aortic dissection

## 26. IT security measures

The “Security requirements” section in the Installation Manual details the required security measures that have to be implemented by the hospital (client). Recommendations on how to install and configure the Ligence Heart software in order to ensure the system security can also be found in the Installation Manual.

Current section describes actions, that should be taken by the user, in order to secure his or her workplace and user’s account against unauthorized access:

It is highly recommended to run Ligence Heart only from the devices and accounts, that are authorized for the user by company’s security policy. Company’s security policy should ensure, that work network and user’s workplace is secure – servers and workplaces have on time security patches and updates, required antivirus software, firewalls and other protection means.

### WARNING



Running Ligence Heart software on a shared account can lead to unauthorized access to patient’s medical data.

- It is recommended to use a browser, that is authorized according to the company's security policy, and is compatible with Ligence Heart software. If the company's security policy does not give any recommendations for browsers, we would recommend considering Google Chrome, Mozilla Firefox or Apple Safari as the most secure browser alternatives in the market at the moment.
- An authentication is required for Ligence Heart software. However, the authentication ways may vary. If you are using login and password authentication, keep the password safe from unauthorized access:
  - do not expose the password to other persons.
  - do not allow the browser to save the password.
- Use Ligence Heart log off function, after finishing your work and before closing the browser window. Closing the program without Log Off (using browser window close ‘x’ button) is not safe and may lead to unauthorized access to medical data.



### NOTE

for users who share the computer and user’s account. Ligence Heart is designed with “zero footprint” concept, meaning that no patient data is left on a customer’s device: after the end user logs out from Ligence Heart, its cache does not contain any server responses with patient data. However, there are known browser’s security bug’s that allow to extract potentially sensitive data from the browser’s memory cache after the user logs out and doesn’t close the entire browser application. Therefore, it is

recommended to also close the entire browser (not just a particular tab or one of the windows) after logout.

## 27. List of known bugs

#	Name	Description
1	JPEG2000 not supported	DICOM files with transfer syntax of JPEG2000 cannot be decompressed.
2	Auto measure duplication	Using auto measure function on images that were already auto-measured may cause auto measurement function not to perform measures

# 3. REQUIREMENTS AND INSTALLATION

Detailed information is provided in the Installation Manual document.

## 3.1. USER INTERFACE ELEMENTS

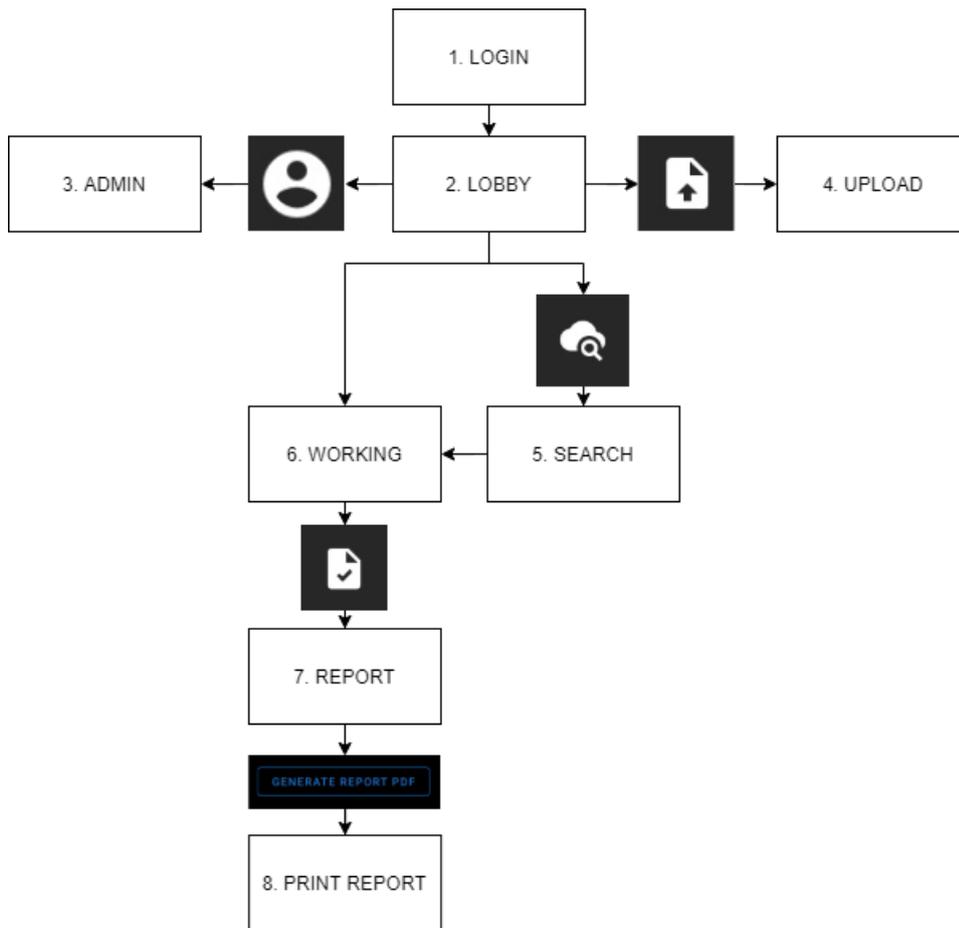
### 1. User Views

This section presents the main user views of Ligence Heart and explains the navigation tree.

There are eight different user views in Ligence Heart:

1. Login View
2. Lobby View
3. Administrator Panel View
4. Registration View (only in demo mode)
5. Upload View
6. Search View
7. Workspace View
8. Report View
9. Print View

The whole user view architecture is summarized in the diagram below.



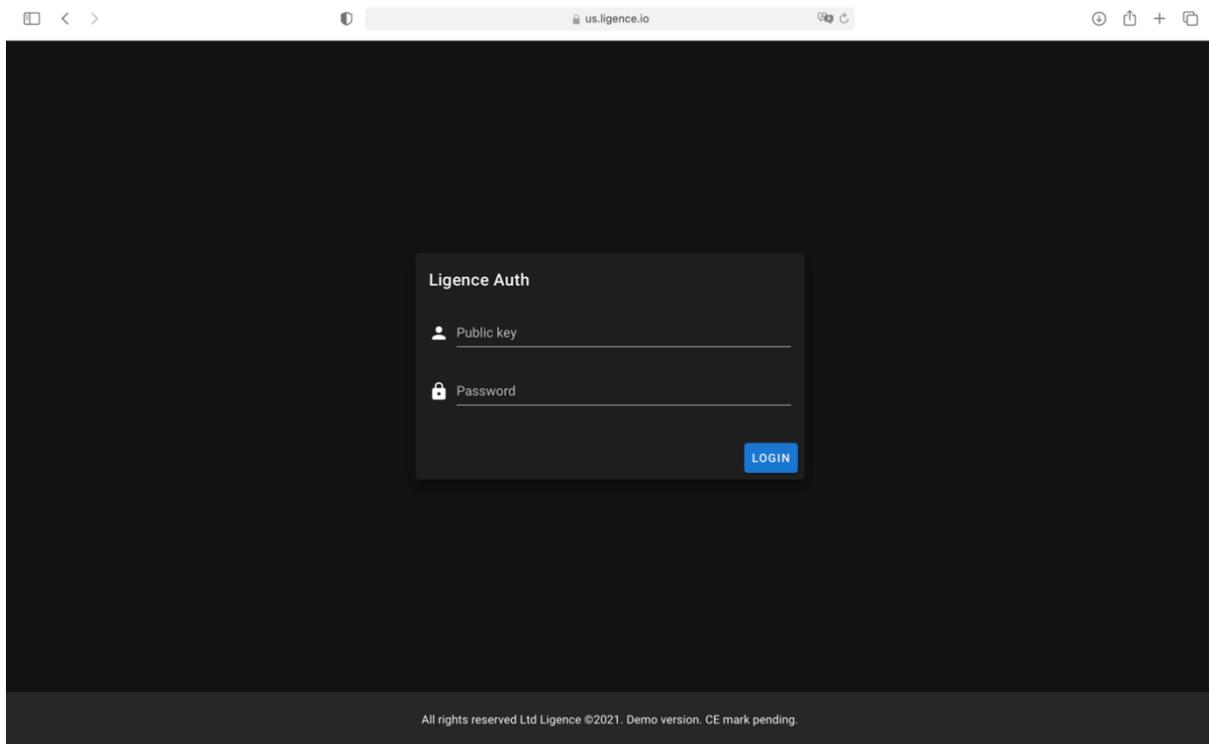
**NOTE**

Administrator Panel View may not be available depending on your user rights.

The appearance of each view is presented in the pictures below along with descriptions of what can be found in each of them.

## 1. Login View

The Login View is where you must enter your login credentials in order to start using Ligence Heart image viewer.



### NOTE

Ligence Heart image viewer cannot be accessed without login credentials i.e. a Public Key and a Password.

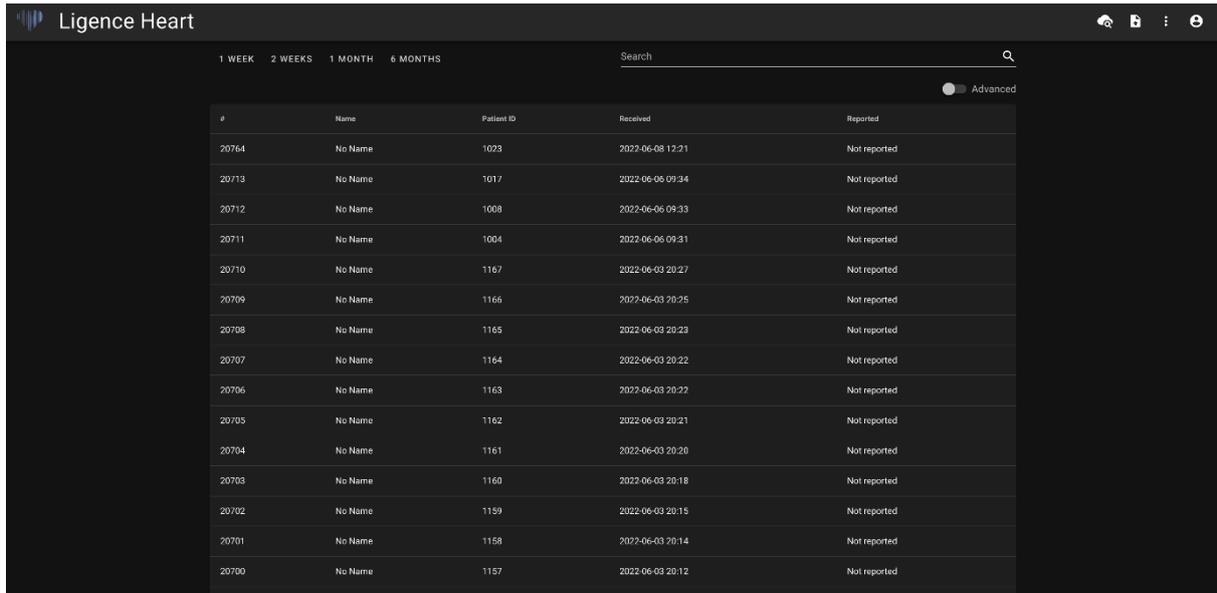


### CAUTION

Ligence holds no liability on the safety of your account if you share this information with other people. You must not share your unique credentials with anyone ever.

## 2. Lobby View

The Lobby View is where you can find all of your most recently received studies.

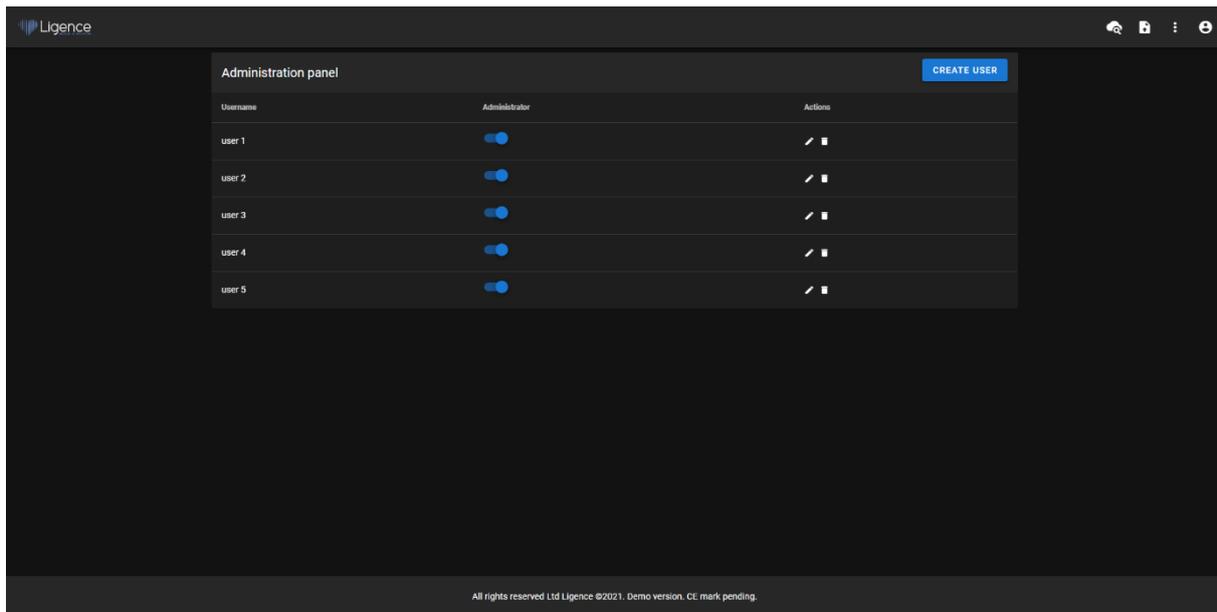


The screenshot shows the Ligence Heart interface with a table of patient data. The table has columns for ID, Name, Patient ID, Received, and Reported. The data is as follows:

ID	Name	Patient ID	Received	Reported
20764	No Name	1023	2022-06-08 12:21	Not reported
20713	No Name	1017	2022-06-06 09:34	Not reported
20712	No Name	1008	2022-06-06 09:33	Not reported
20711	No Name	1004	2022-06-06 09:31	Not reported
20710	No Name	1167	2022-06-03 20:27	Not reported
20709	No Name	1166	2022-06-03 20:25	Not reported
20708	No Name	1165	2022-06-03 20:23	Not reported
20707	No Name	1164	2022-06-03 20:22	Not reported
20706	No Name	1163	2022-06-03 20:22	Not reported
20705	No Name	1162	2022-06-03 20:21	Not reported
20704	No Name	1161	2022-06-03 20:20	Not reported
20703	No Name	1160	2022-06-03 20:18	Not reported
20702	No Name	1159	2022-06-03 20:15	Not reported
20701	No Name	1158	2022-06-03 20:14	Not reported
20700	No Name	1157	2022-06-03 20:12	Not reported

### 3. Administrator Panel View

The Administrator Panel View is where you can check users registered with Ligence Heart. You can also modify their Administrator rights, change login credentials of each of users and delete users.



The screenshot shows the Ligence Administrator Panel. It features a table with columns for Username, Administrator, and Actions. There is a 'CREATE USER' button in the top right corner. The data is as follows:

Username	Administrator	Actions
user 1	<input checked="" type="checkbox"/>	 
user 2	<input checked="" type="checkbox"/>	 
user 3	<input checked="" type="checkbox"/>	 
user 4	<input checked="" type="checkbox"/>	 
user 5	<input checked="" type="checkbox"/>	 

All rights reserved Ltd Ligence ©2021. Demo version. CE mark pending.

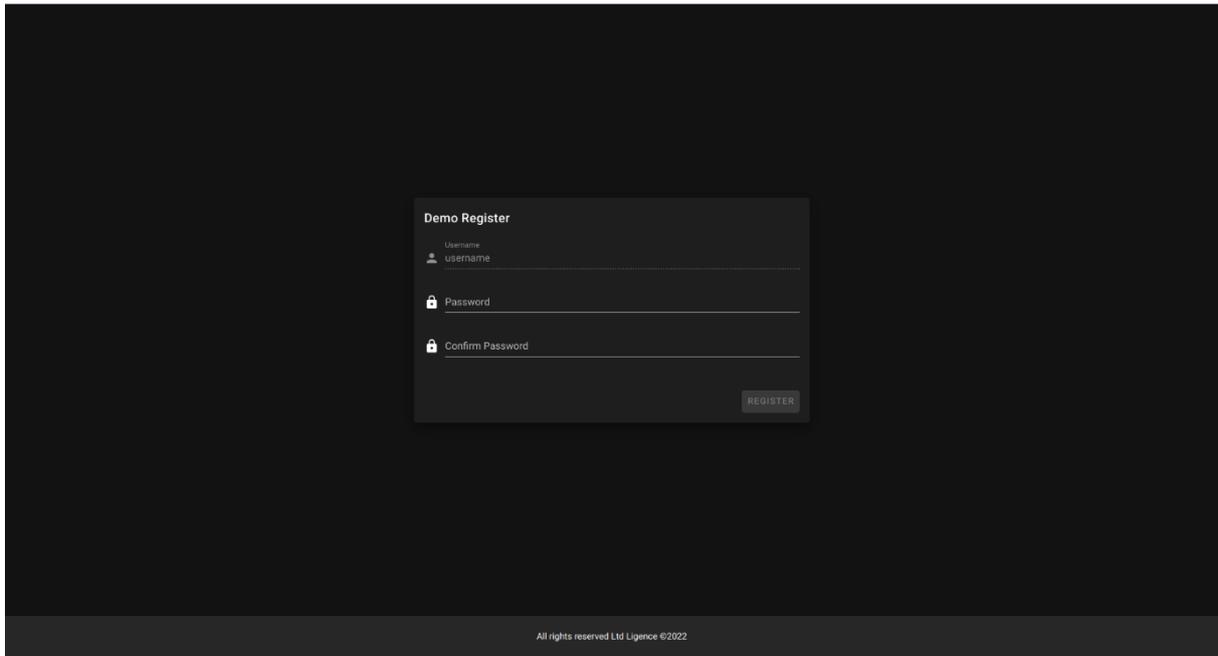


#### NOTE

Not everyone in your institution will be assigned the Administrator rights and therefore will not have access to the Administrator Panel.

### Registration view (demo mode)

This view is only available when the software is running on demo mode.



The client must enter password and then repeat the exact same password. Password must contain at least 8 characters. After that – a new user account is created and the user is redirected to lobby view.

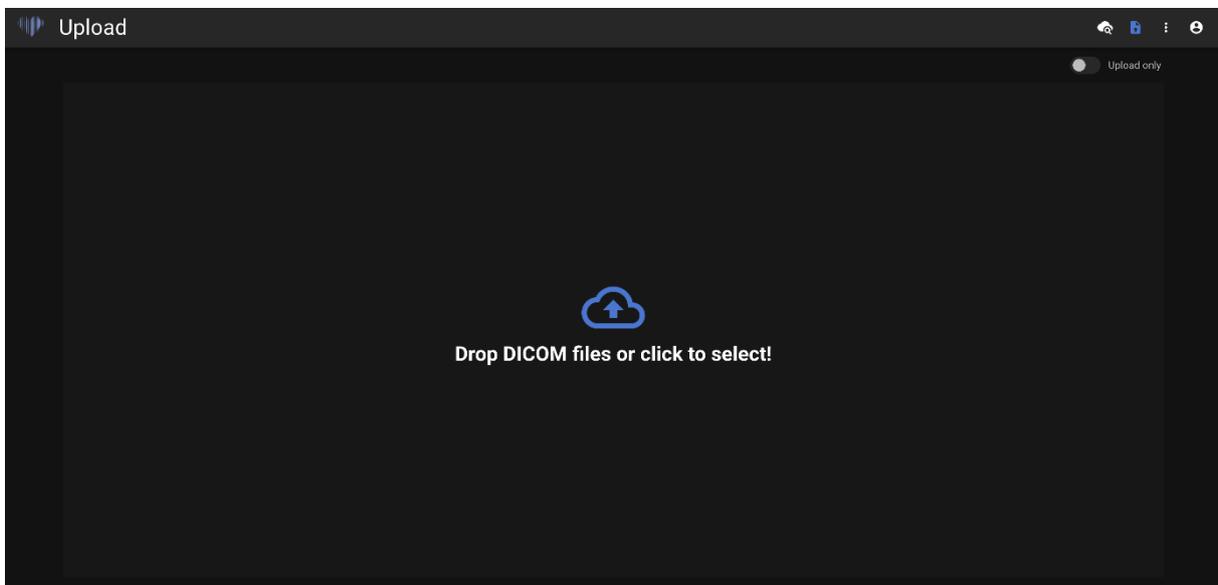
#### 4. Upload View

The Upload View is dedicated for uploading studies into the system.



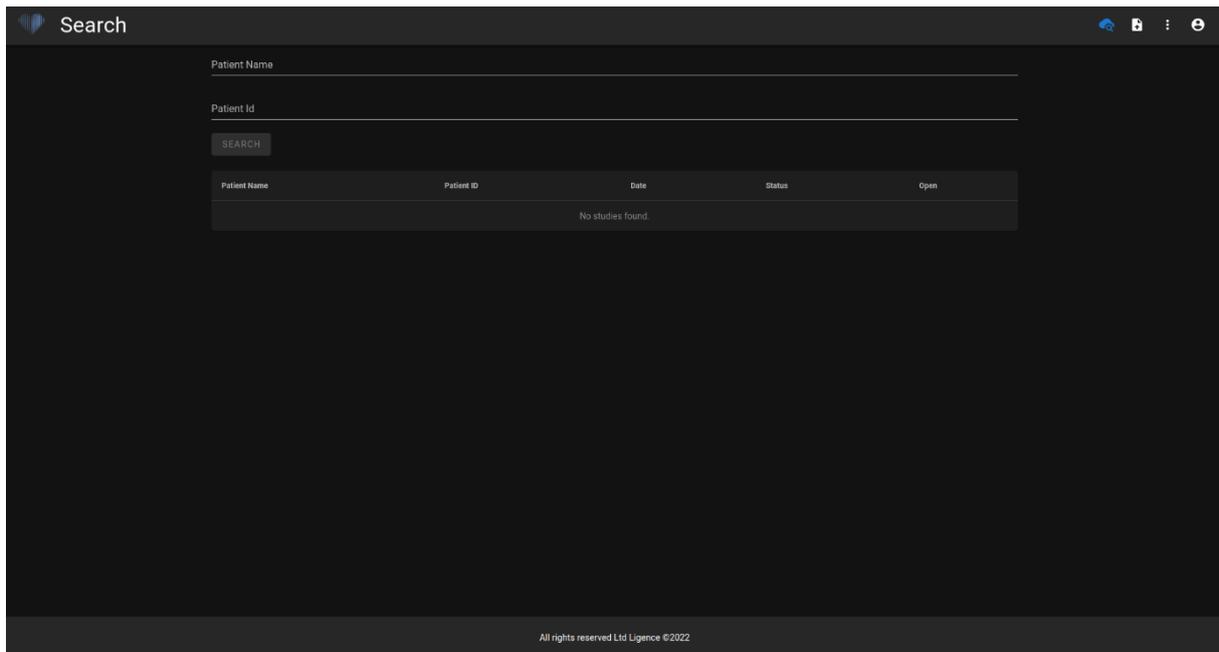
##### NOTE

Only DICOM format studies are supported.



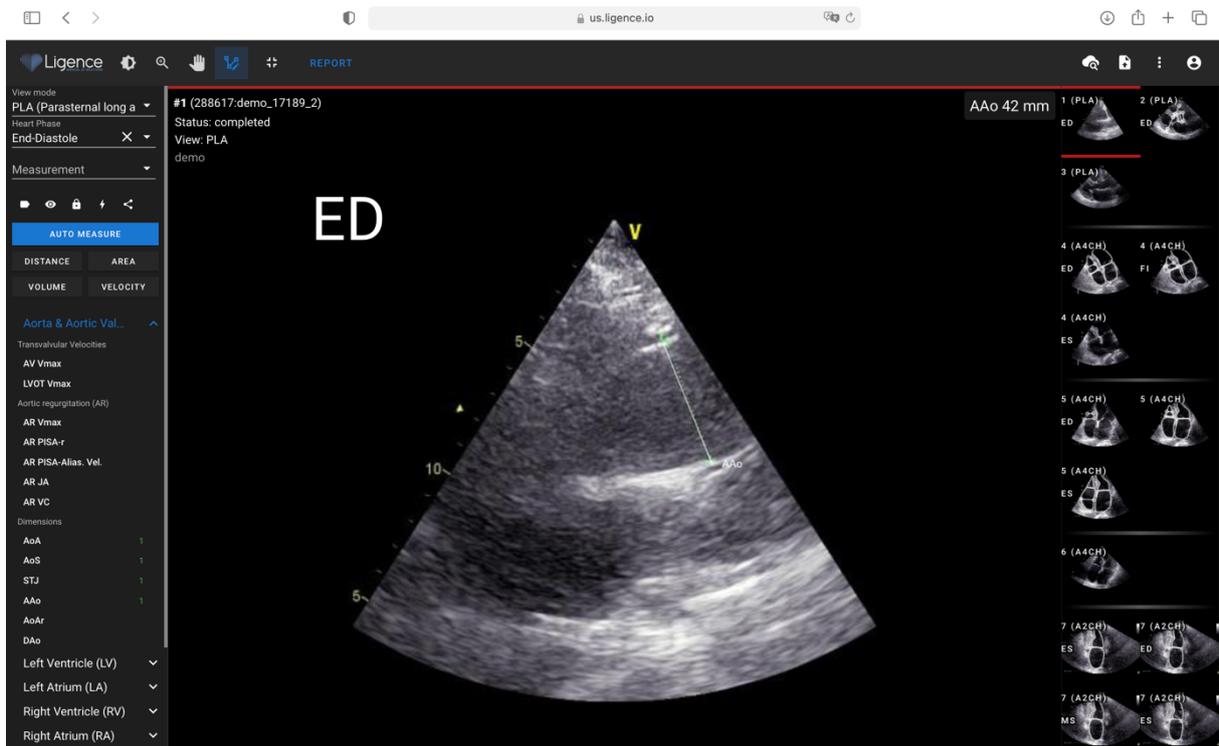
#### 5. Search View

The Search View allows you to effectively search for your studies.



## 5. Workspace View

This view is dedicated for viewing and analyzing studies.



## 6. Report View

The Report View is dedicated for making two-dimensional transthoracic echocardiography reports. This view allows you to compare your measurements against normal values.

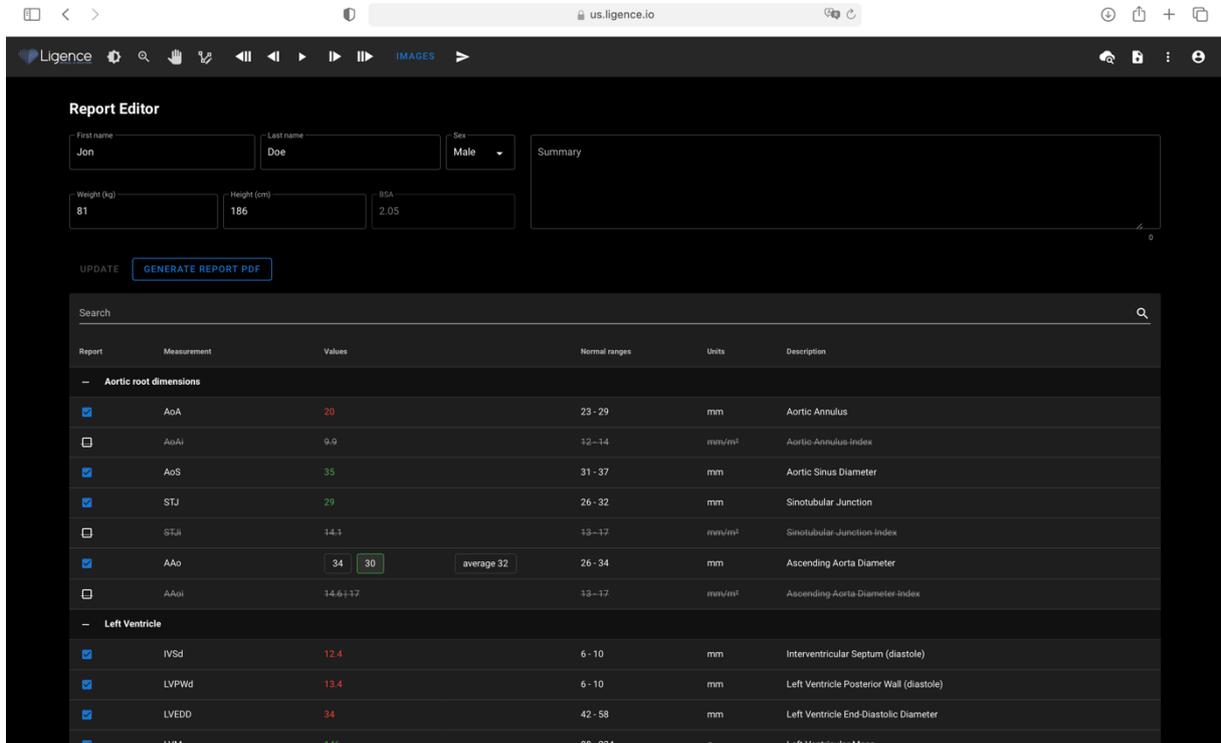


NOTE

Normal values were chosen to accord with the guidelines from European Association of Cardiovascular Imaging (EACVI). Please consult the publication for more information:

“Standardization of adult transthoracic echocardiography reporting in agreement with recent chamber quantification, diastolic function, and heart valve disease recommendations: an expert consensus document of the European Association of Cardiovascular Imaging 2017”

Can be accessed for free here: <https://academic.oup.com/ehjcmaging/article/18/12/1301/4555377>



## 7. Print Report View

The Print Report View is dedicated to review the structured PDF format report once again before printing it. The report can be printed by pressing Print icon on the top right corner. The report can be downloaded to your computer by pressing the Download Report button in blue or on the top right corner. The report, if needed, can be corrected by pressing the Edit Report button in blue. To go back to the images press View Images.

**Echocardiography Report**

Study date: 2020-10-20  
 Sex: Male  
 Weight: 72 (kg)  
 Height: 170 (cm)  
 BSA: 1.84 (Mosteller)

Measurement	Value	Units (normal ranges)	Description
<b>Aortic root dimensions</b>			
AoA	21.4	mm (23 - 29)	Aortic Annulus
AoAI	11.6	mm/m <sup>2</sup> (12 - 14)	Aortic Annulus Index
AoS	34.6	mm (31 - 37)	Aortic Sinus Diameter
AoS <sub>I</sub>	18.8	mm/m <sup>2</sup> (15 - 19)	Aortic Sinus Diameter Index
STJ	28	mm (26 - 32)	Sinotubular junction
STJ <sub>I</sub>	15.2	mm/m <sup>2</sup> (13 - 17)	Sinotubular junction Index
AAo	33.1	mm (26 - 34)	Ascending Aorta Diameter
AAo <sub>I</sub> †	18	mm/m <sup>2</sup> (13 - 17)	Ascending Aorta Diameter Index
<b>Aortic Valve</b>			
AV Vmax	1.13	m/s	Aortic Peak Velocity
APG	5.12	mmHg	Aortic Peak Gradient
AMG	3.07	mmHg	Aortic Mean Gradient
AV VTI	20.3	cm (18 - 25)	Aortic Valve Maximum Velocity Time Integral
<b>Left Ventricle</b>			
IVSd †	12.6	mm (6 - 10)	Interventricular Septum (diastole)
LVPWd †	13.1	mm (6 - 10)	Left Ventricle Posterior Wall (diastole)
LVEDD	34	mm (42 - 58)	Left Ventricle End-Diastolic Diameter
LVEDDi	18.4	mm/m <sup>2</sup> (22 - 30)	Left Ventricle End-Diastolic Diameter Index
LVM	144.5	g (88 - 224)	Left Ventricular Mass
LVMi	78.4	g/m <sup>2</sup> (49 - 115)	Left Ventricle Mass Index
RWT †	0.76	(0.24 - 0.42)	Relative Wall Thickness
LVEDV (4Ch)	123.6	ml	Left Ventricle End Diastolic Volume (A4CH)
LVEDVi (4Ch)	67	ml/m <sup>2</sup>	Left Ventricle End Diastolic Volume Index (A4CH)
LVESV (4Ch)	57	ml	Left Ventricle End Systolic Volume (A4CH)
LVESVi (4Ch)	30.9	ml/m <sup>2</sup>	Left Ventricle End Systolic Volume Index (A4CH)

## 28. Workspace view elements

This section presents a general overview of workspace view elements.

**NAVIGATION BAR** →

**LEFT SIDEBAR** →

**WORKSPACE** ↑

**RIGHT SIDEBAR** ↑

## Navigation Bar

The Navigation bar can be seen throughout all the Views. It provides easy access to the most often used functions on the respective view. Navigation bar buttons and functions vary according to the view the user is in.

## Left Sidebar

The sidebar could be further subdivided into image views area at the top and tools area below.

The thumbnails area displays all objects related to the selected study. Each DICOM object is represented by a dedicated image preview.

The tools area represents the specific area that contains all detailed controls and features useful for a complete analysis on the selected study.

## Workspace

The workspace area displays images of the selected study (depending on the layout organization) within tiles. In case the image is multi-frame, the play of the clip will start automatically.

The filling of the particular tiles within the diagnostic area takes place in a left to right and top to bottom order. Click inside a tile to tag it as your active dataset. Two colored corners indicate the tile as the active one.

## Right Sidebar

The right sidebar shows image views of a particular study.

# 4. WORKING WITH LIGENCE HEART

## 1. How to acquire images

A comprehensive guide on standardized acquisition of 2D TTE image views can be found in the article by the American Society of Echocardiography “Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults: Recommendations from the American Society of Echocardiography 2018”, which can be accessed for free here: <https://www.asecho.org/guideline/guidelines-for-performing-a-comprehensive-transthoracic-echocardiographic-examination-in-adults/>

Please consult the publication for more information.

### CAUTION



Ligence holds no liability for wrongly acquired image views uploaded to the Ligence Heart.

## 29. Logging on

When your system administrator has assigned your Ligence Heart username and password, you can access Ligence Heart. Your Ligence Heart system administrator should ensure you can access the server for your daily routine work.



### NOTE

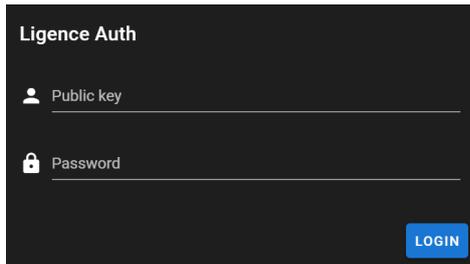
Be aware that Ligence Heart enforces the following password policy:

- Your password must contain at least 8 characters.
- Your password must contain at least one uppercase, or capital, letter (ex: A, B, etc.).
- Your password must contain at least one lowercase letter.

- Your password must contain at least one number digit (ex: 0, 1, 2, 3, etc.) or special character (ex. \$, #, @, !, %, ^, &, \*, (, )).

The following steps should be performed when logging on:

1. Open the application through a supported web browser (Google Chrome, Safari, Microsoft Edge) at [http://local\\_area\\_network\\_ip\\_or\\_name](http://local_area_network_ip_or_name) or any other address as stated by your institution.
2. A user will be directed to the Login Authorisation page. A user is asked to enter login credentials (account name and password) into the relevant fields.
3. Click “Enter” button on your computer or press “Login”.



## 30. Settings Menu

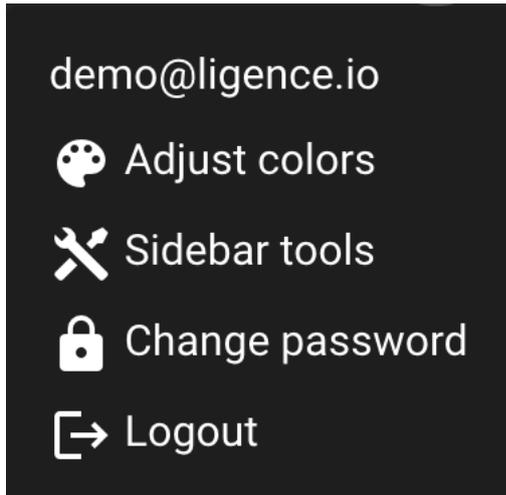
The Settings menu can be accessed by pressing the person icon on the top right corner of the Navigation bar.



Upon pressing the Settings button, a drop-down menu will appear.

The drop-down menu dialogue contains the following items:

- Your username
- Admin Panel
- Adjust colors
- Sidebar tools
- Change password
- Logout



### 31. Admin

This part of the Ligence Heart software is only available to users that have been granted the administrator rights. Please check with your institution's information technology department for more information.

The Admin button takes you to the administrator panel where the list of all registered users within your institution can be found.

You can create a new user of Ligence Heart by pressing the “Create User” button on the top right.

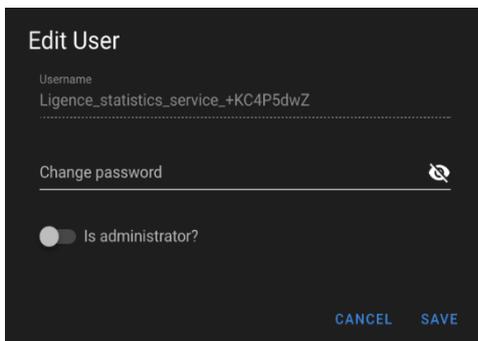


You can enable/disable Administrator rights to each of the users by pressing the slider button.

The information of each user can be corrected by pressing the pencil icon.



The administrator can change the user password for each of the users. Simply enter the new password in the highlighted field and press save to save the changes. If the user is to be made an administrator - press the slider button. If you do not want to make changes - press cancel.



The administrator can delete each of the users by pressing the bin icon button.



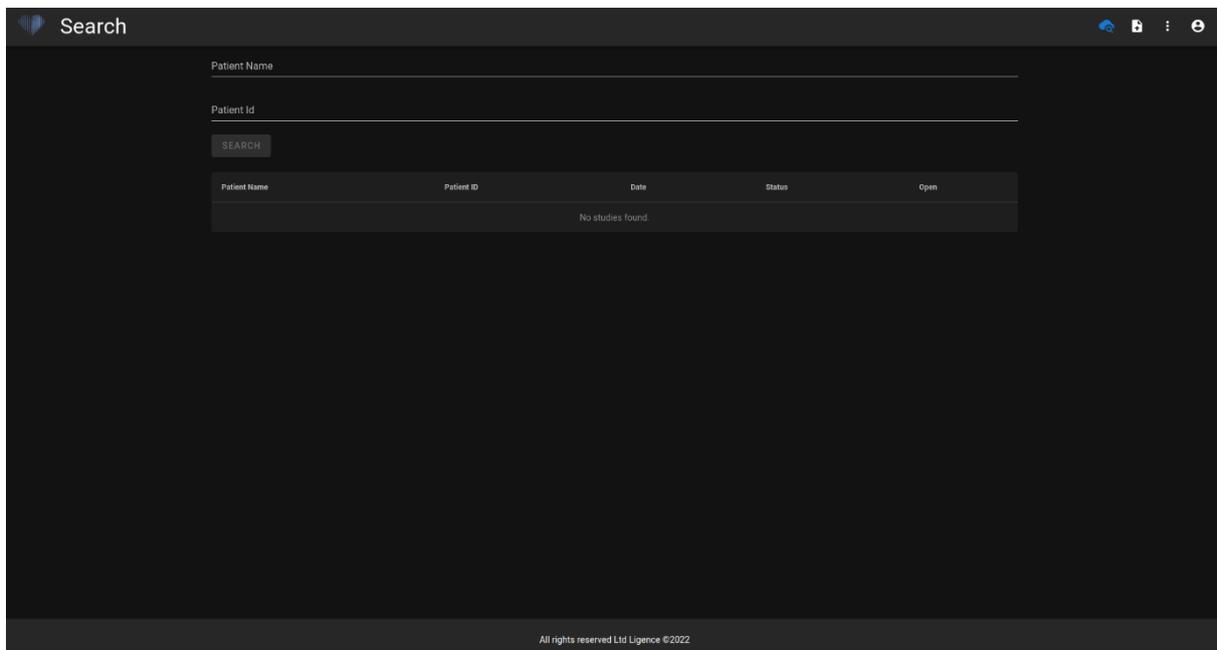
## 32. Detailed search

By pressing the Search button from the Settings drop down menu you will be directed to the Search View.



The Search View contains these fields:

- Patient name: enter patient name to find unique studies of the particular patient.
- Patient ID: enter patient ID to find a particular study of interest.
- .
- Search button: begin the search from the database.



The screenshot shows the Search View interface. It features a dark background with a search form. The form includes two input fields: "Patient Name" and "Patient Id". Below these fields is a "SEARCH" button. Underneath the button is a table with the following columns: "Patient Name", "Patient ID", "Date", "Status", and "Open". The table currently displays the message "No studies found." at the bottom. At the top left of the interface, the word "Search" is displayed. At the bottom of the interface, there is a small copyright notice: "All rights reserved Ltd Ligence ©2022".

If the filtered images belong to more than one different study, the report functionality is not available, because it is not clear to which patient study the report is assigned.

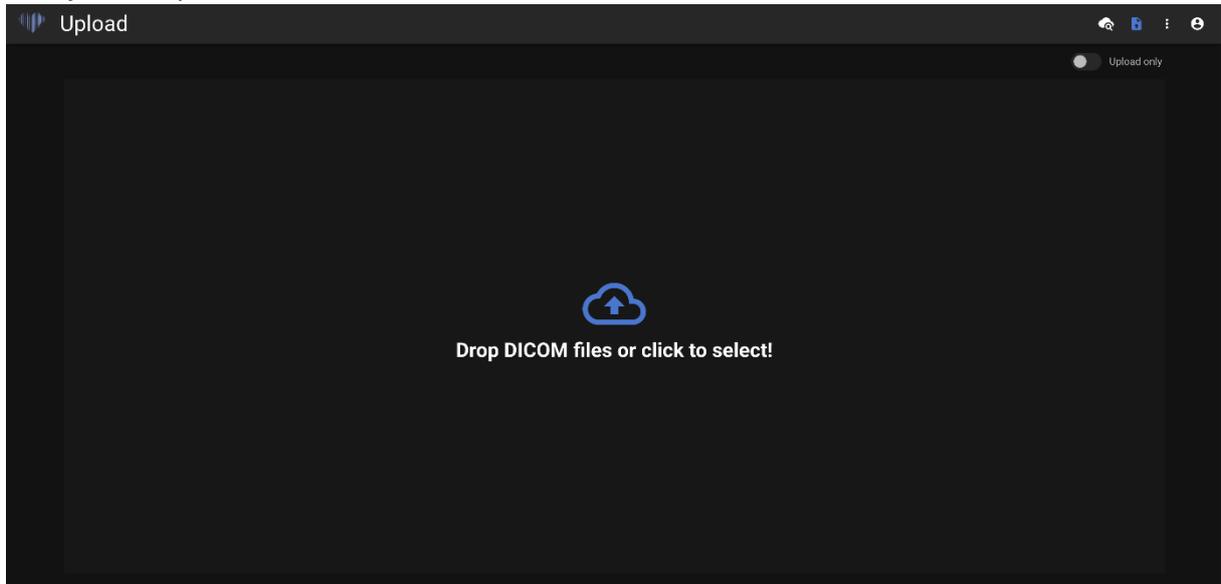
## 33. Upload the study

You can upload DICOM files directly from your computer into the Ligence Heart by pressing the Upload button from the Settings drop down menu. Make sure that the files has .dcm extension.

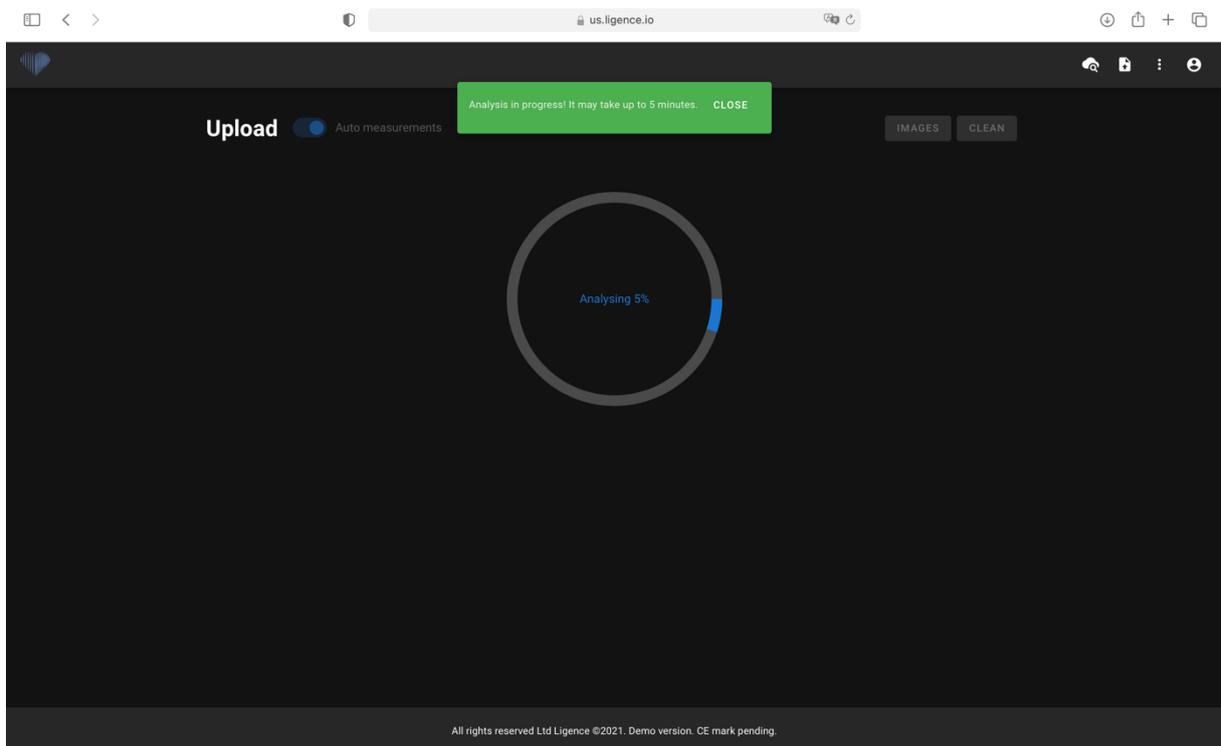


## How to upload a study?

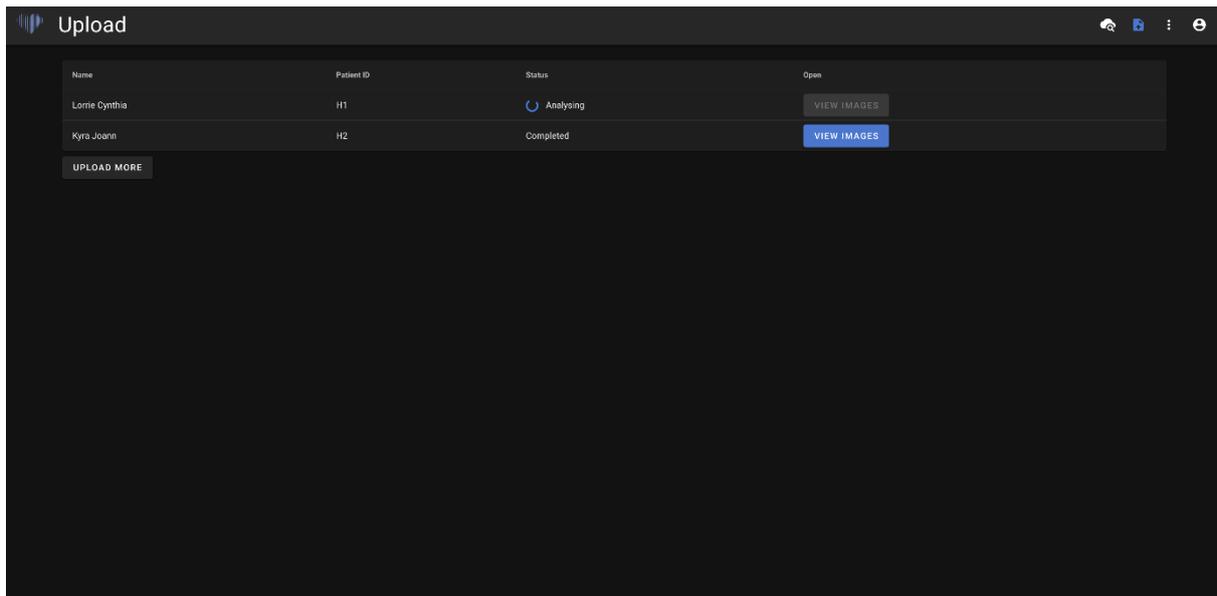
To upload a study simply drag and drop your DICOM format file or press on the blue icon and upload it from your computer.



The upload may take several moments and you should see a screen like the one below.



It is allowed to upload up to 10 studies at once.



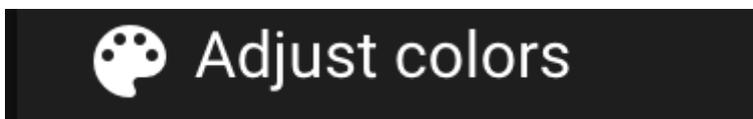
A list of studies uploaded is displayed. Once the study is analysed, you can click “view images” to review.

### 34. Color picker

Ligence Heart allows you to select a color for annotations that will be applied throughout your annotations.

You can select what annotations will have a particular color.

In the settings tab, press “Adjust colors” button.



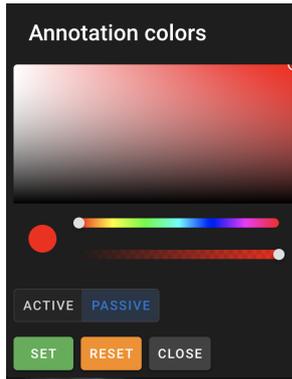
For actively used annotations press “ACTIVE”. This will take effect and all the annotations, upon hovering the mouse cursor on them, will be colored with the color the user has selected.

For passively used annotations press “PASSIVE”. This will take effect and all the annotations will be colored with the color the user has selected.

To select the color of your preference, simply scroll the color picker and then adjust the black and white balance.

To set color for your annotations, press SET.

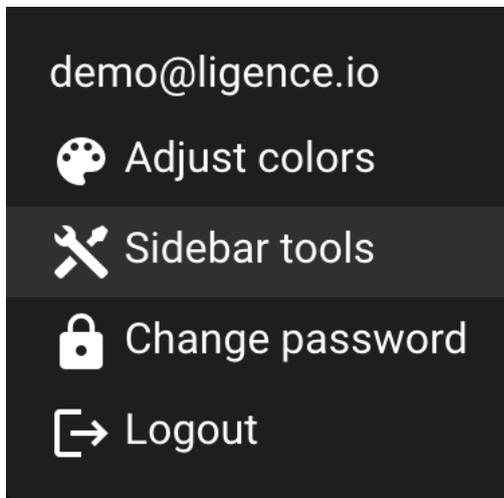
To reset your choice for color for your annotations, press RESET.



Multiple screen work is supported for Ligence Heart.

## 35. Sidebar tools

Input options for sidebar tools can be found in the Settings menu.

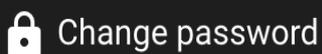


Press the Sidebar tools button and a dialogue window will appear. Check the boxes for inputs to appear in your sidebar in your Working view. The settings are saved locally on your computer and will appear every time you use Ligence Heart.



## 36. Changing Password

Your password can be changed by pressing the settings button on the top right corner of your screen and then pressing on the change password button.

A dark grey rectangular button with a white padlock icon on the left and the text "Change password" in white.

## 37. Logging Off

To log off from the software, simply press the settings button on the top right corner of the screen and the logout button in the pop-out menu.

A dark grey rectangular button with a white icon of a door with an arrow pointing out on the left and the text "Logout" in white.

Use the Log Off option if you have finished working with the program. Logging off from the Search window, closes all the Viewer windows that were opened from the Search window and destroys the browser session data.



**CAUTION!** Please notice, that closing the program without Log Out is not safe and may lead to unauthorized access to medical data.

## 38. Locking the software

When you are done working with the software or have to leave for a short period of time we recommend logging off either way to prevent unwanted use by other people.

## 39. Customization

The main functions for customization can be found on the Settings pop-out menu. To access the settings menu, press on the settings icon on the top right corner of your Ligence Heart viewer.

## 40. Legal and Helpful information

The Legal and Helpful information can be accessed by pressing the triple dot button in the Navigation

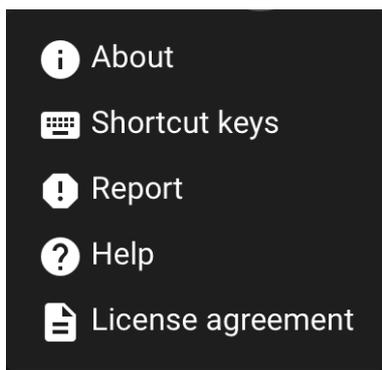


bar.

A menu will appear allowing to choose from the following:

- About: shows the relevant and latest information about the product and manufacturer.
- Shortcut Keys: shows the keyboard shortcuts.
- Report: reports an issue.
- Help: directs a user to the latest version of the User Manual.

- License agreement: directs a user to the End-User License Agreement.

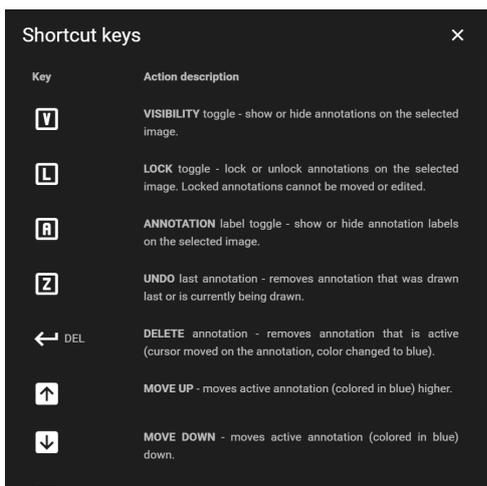


## 41. Keyboard shortcuts

A keyboard shortcuts summary can be found in the Legal and Helpful information system dialogue upon pressing the Shortcut keys button.



Shortcuts menu will display a table with keyboard shortcuts.



A keyboard shortcut is a sequence or combination of keystrokes on a computer keyboard which invokes commands in a software.

The shortcut commands are listed in the table below with the functions they perform.

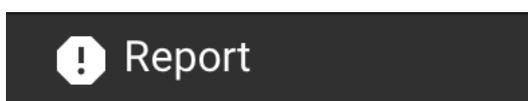
Function	Keyboard shortcut
Hide all annotations	V
Lock all annotation	L
Show/hide labels	A
Delete last annotation	Z
Delete active annotation	Delete, backspace

Function	Keyboard shortcut
Cancel drawing	ESC
Arrow up / down	Moves annotations up or down
Shift + arrow up / down	Moves annotations quicker

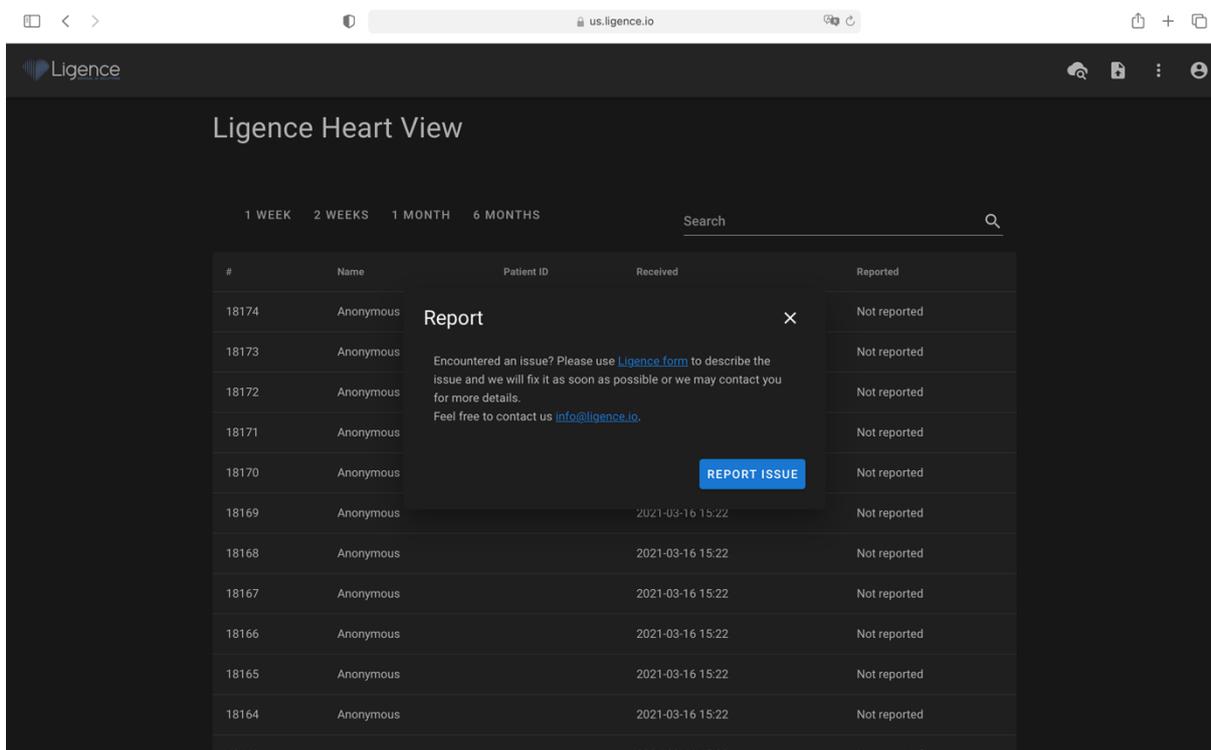
## 42. Report an issue

You can report an issue to Ligence if you meet any inconvenience when using the Ligence Heart image viewer.

To report an issue, press the Legal and Helpful Information button on the top right and press the Report button in the dialogue.



A Report window will appear suggesting possible actions.



Simply press the blue button Report Issue on the bottom right of the pop-up window and you will be directed to <https://www.Ligence.io/submit-issue> website where you can describe your issue and leave your contact details. A representative of Ligence will try to resolve this issue as soon as possible and may contact you in order to understand your issue better.

### Submit an issue

Your email \*

Please enter email

Short description of the problem

Add answer here

Submit

---

#### NOTE

Please check your Service Level Agreement for more information on work hours of Ligence.

#### NOTE

Depending on your issue it may be resolved in varying timeframe. Please consult your Service Level Agreement for more information.

#### WARNING

UAB Ligence holds no liability for the damages caused by the software if a customer fails to report any concerning issues related to the operation of the software.

## 43. Help

If you find trouble using the Ligence Heart image viewer you can always consult the User Manual.

You can find User Manual in the Legal and Helpful Information dialogue in the Navigation bar.

 Help

You will be directed to the website where the latest version of the User Manual can be found. Please consult the User Manual for more information on the functions and how to operate the Ligence Heart image viewer.

# User manual

Ligence Heart



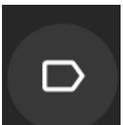
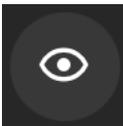
## 44. Navigation Bar buttons and functions

This section covers the Navigation Bar in the Working View. It provides easy access to the most often used functions on the screen

All the buttons and functions are summarized in the picture and table below:



Icon	Name	Function
	Logo	Navigates to landing (lobby) view.
	Windowing	Allows the user to change the brightness and contrast of an ultrasound image. For the function to take effect the user must position the mouse cursor within boundaries of an ultrasound image, press and hold the left mouse button and move the cursor simultaneously in either direction. Moving the cursor along the x-axis causes a change in brightness, whereas moving the cursor in the y-axis causes a change in the contrast

Icon	Name	Function
	Zoom in/out	Allows the user to zoom in/out the selected ultrasound image frame. When toggled, move the mouse cursor onto the frame. Press and hold the left mouse button and move the cursor in the vertical axis. Moving the cursor up zooms in the frame whereas moving it down zooms out the frame.
	Pan	Allows the user to move the ultrasound image frame stack across the screen. Press and hold the image with the left mouse button and move it to any side to move the image stack.
	Exit full screen	Allows to exit full screen and shows four images on the screen.
	Change to full screen	Enters full screen and shows only one image on the screen.
	Toggle label visibility	Enables/disables measurement labels on the measurements (lines, polygons etc.). By default labels are disabled.
	Toggle annotation visibility	Hides/shows annotations on frames.
	Lock/unlock annotations edit	When locked, annotations cannot be made. Edit mode allows annotations to be made.

Icon	Name	Function
	Automated features menu	Allows the user to choose automated features for echocardiography image analysis. When pressed, a dialogue appears allowing to choose from automated features.
<div style="background-color: #333; color: white; padding: 5px;">                     Predict annotations for this frame                      Predict view mode for this frame                      Copy this frame annotations                 </div>	Automated features	<p>Predict annotations for this frame: automatically detects the image view and performs measurements of that frame according to the image view and heart cycle.</p> <p>Predict view mode for this frame: automatically predicts the view mode of the image e.g. parasternal long-axis, apical four chamber or other.</p> <p>Copy this frame annotations: copies annotations from the closest frame before the selected and pastes them into the next frame.</p>
	Report	Enters the Report View.

## 45. Workspace buttons and functions

The workspace buttons are located at the bottom of the screen.



The workspace buttons allow you to scroll the frame stack/cine and navigate the image views.

The buttons and their function of the workspace are summarized in the table below.

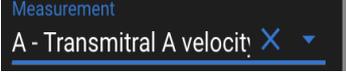
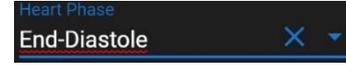
Icon	Name	Function
	Jump to the first frame	Scrolls back the image stack to the very first frame.
	Move back one frame	Moves to the previous frame.

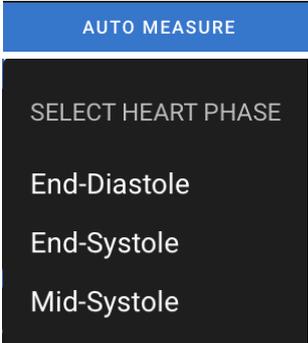
	Play cine	Auto plays the frame stack in a continuous loop.
	Move forward one frame	Moves to the next frame.
	Move to the last frame	Jumps to the last frame of the stack.
	Navigate to the previous image view	Opens the previous image view.
	Navigate to the next image view	Opens the next image view.

## 46. Left sidebar buttons and functions

Left sidebar contains all the necessary tools to effectively work with an echocardiogram study:

All the buttons and functions are summarized in the table below:

Icon	Name	Function
	Tags pop-up menu slot	Allows the user to select custom tags for the echocardiography studies. Press the arrow to select tags to be shown in the viewer
	View mode pop-up menu slot	Allows the user to select the view mode for the report.
	Annotation pop-up menu slot	Allows the user to select the annotations to make on the studies.
	Measurement pop-up menu slot	Allows you to select the particular measurements to be used on images.
	Heart phase pop-up menu slot	Allows to select heart phase for the current image frame. Applied to B-mode images.

Icon	Name	Function
	Heart phase select	Allows the user to move to either ES or ED frame if one is marked on that image.
	Annotation show/hide/edit	Shows the active annotations in your image view or frame and allows you to show or hide those annotations. When pressed, allows you to make that particular annotation.
	Auto measure	<p>Auto measure functionality is applicable for B-mode, continues wave (CW) and pulsed wave (PW) mode images. The image should be loaded before using this functionality. When “Auto measure” is pressed, submenu will appear allowing to choose the further settings which depends on image view and mode:</p> <ul style="list-style-type: none"> <li>• On CW image, in the submenu will appear “Aortic valve”, “Tricuspid Valve” and when selected appropriate measurements will be performed and displayed will perform AV Vmax, AV PG, AV MG, AV VTI measurements.</li> <li>• On PW image, in the submenu will appear “Pulmonary Valve”, and “Left Ventricle Outflow Tract”, “Lateral Mitral Annulus”, “Right Ventricular Lateral Wall”, “Septal Mitral Annulus”. For pulmonary valve the software will perform automatic ACT measure and for Left ventricle outflow tract the software will perform LVOT Vmax, LVOT PG, LVOT MG, LVOT VTI measurements After selecting the view – appropriate measurements will be performed and displayed.</li> <li>• On B-mode image which has view mode either PLA, A4CH, A2CH - submenu with choices of End-diastole, End-systole and Mid-systole will appear. When chosen, the appropriate measures will be calculated and displayed.</li> </ul>
	Distance measurement	Press it to manually measure distance between two points.

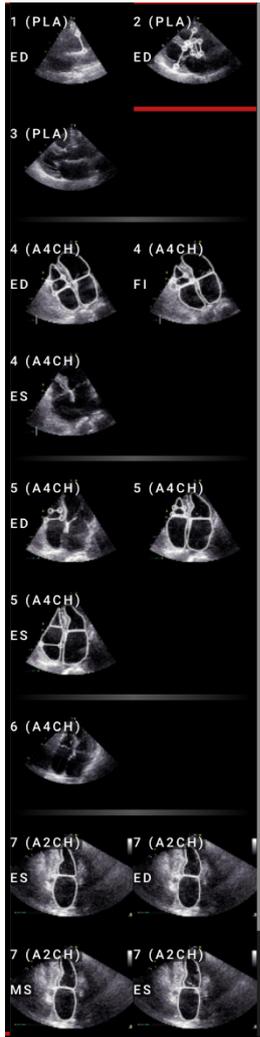
Icon	Name	Function
		
	Area measurement	Press it to manually measure the area of the region of interest.
	Volume measurement	Press It to manually measure the volume of the region of interest.
	Velocity measurement	Press it to manually measure the velocity of the region of interest.
	Anatomical structure menu buttons and drop-down dialogues	Allows you to manually choose the anatomical structure of interest and see the measurements performed for that structure.
	Drop-down menu dialogue of anatomical structures	Appears when an anatomical structure is chosen in the menu above. Shows all the supported measurements and the number of a frame a particular measurement was performed in.

## 47. Right Sidebar buttons and functions

Right Sidebar displays all image views of a particular study and allows easy navigation between them.

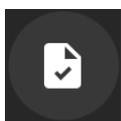
All the buttons and functions are summarized in the table below:

Icon	Name	Function
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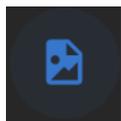
	<p>Image view display</p>	<p>Allows to select the image view of interest. Opens the image view of interest. The selection of image views can be scrolled from top to bottom and from left to the right.</p> <p>The image views are sorted automatically (PLA, A4CH etc and ES/ED/MS/None).</p>
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## 48. Study reporting

To enter the **Report View** press the View Study Report button in the Navigation bar.



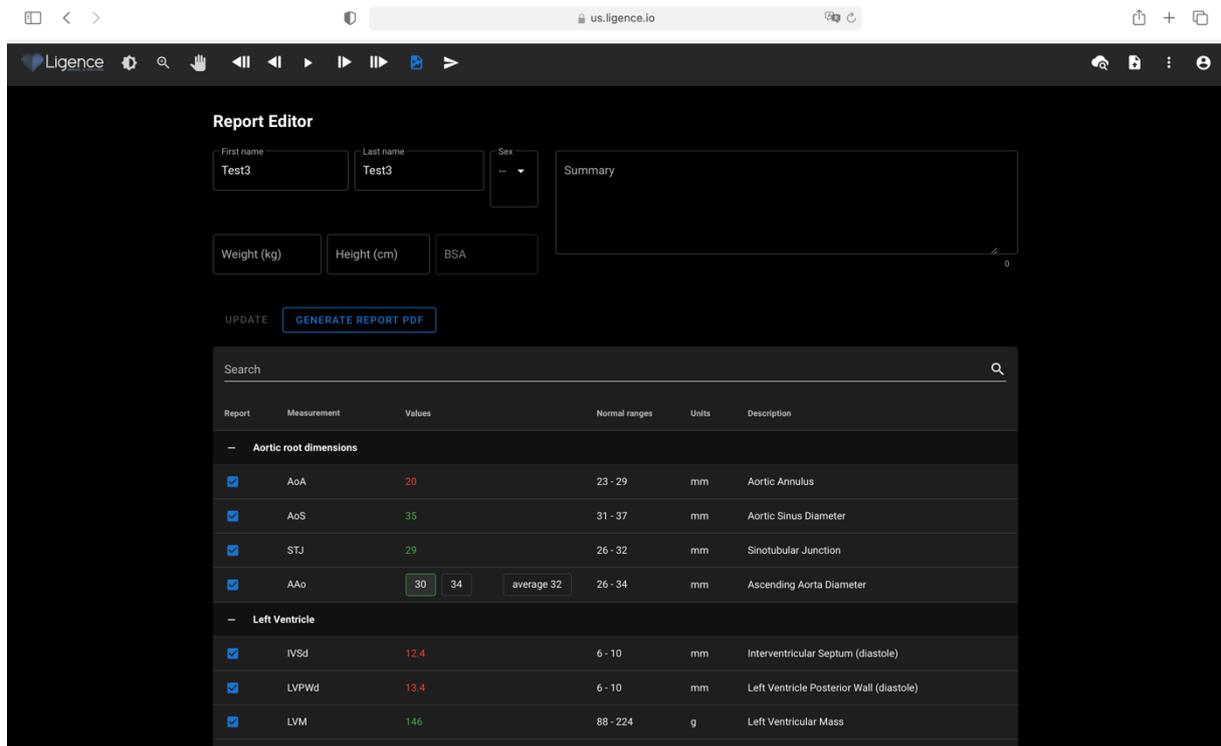
If you decide to go back to the Working View press the Back to study images button.



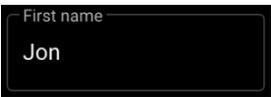
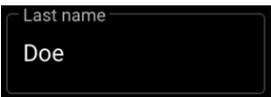
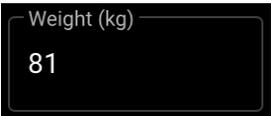
To send the report to your PACS/HER, press the Send Report button:

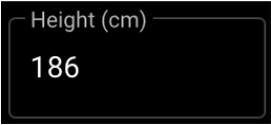
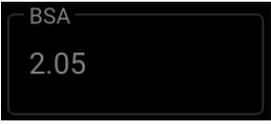
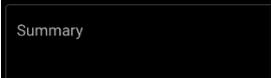


The Report View can be seen in the picture below.



All the buttons and functions of the Report View are summarized in the table below:

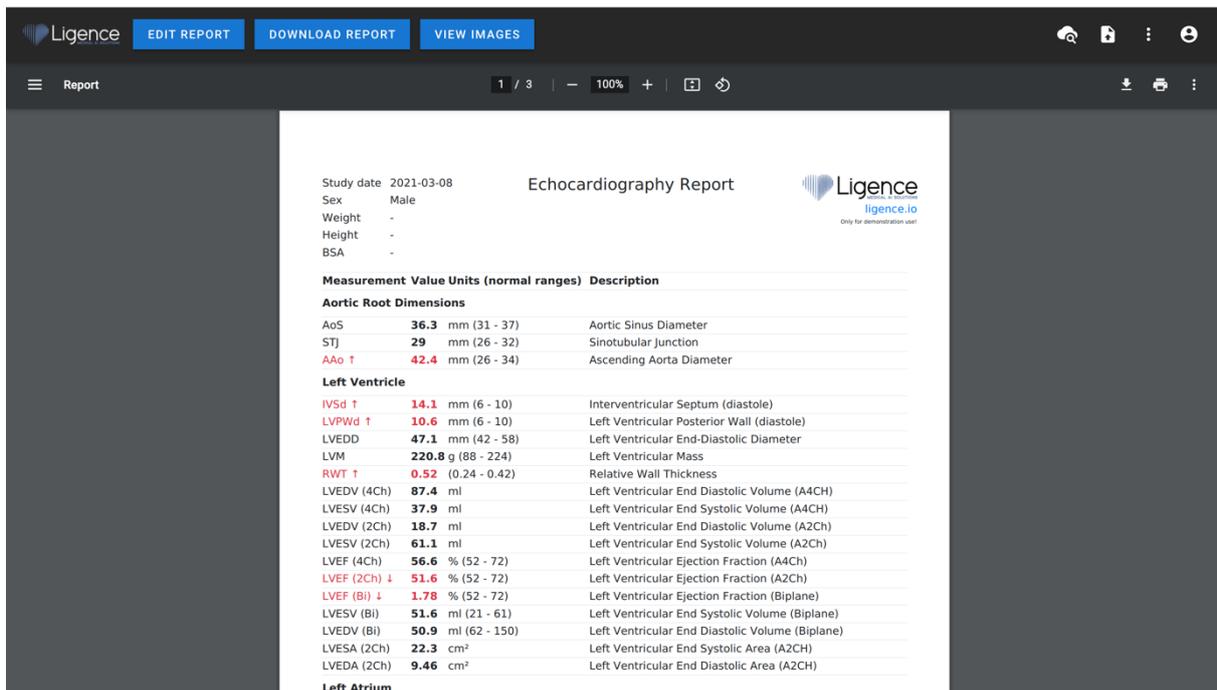
Icon	Name	Function
	First name	Allows you to enter patient first name.
	Last name	Allows you to enter patient last name.
	Patient ID	Allows you to enter patient ID
	Sex	Allows you to choose patient sex.
	Weight	Allows you to enter patient weight in kilograms.

Icon	Name	Function
	Height	Allows you to enter patient height in centimeters
	Body surface area (BSA)	Automatically displays body surface area when weight and height data is
	Summary field	Allows you to enter the summary report of your study. If left unentered, a report is generated automatically.
	Update	Press it to update and save changes in your report.
	Generate report PDF	Press it to generate the final report PDF. A Print Report View will be shown when pressed.
	Back to edit	Goes back from Print Report View to Report View.
		
Complete list of measurements and values		Shows the complete list of all measurements and the measured values. Allows you to choose which value or their average (if more than one is measured) to include into the final report.

Press the Generate Report PDF button to enter the Print Report View.

The Print Report View can be seen in the picture below:

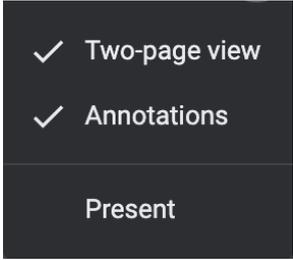
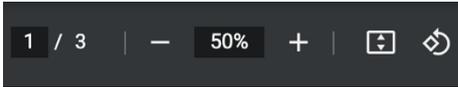
All the buttons and functions of the Print Report View are summarized in the table below:



The screenshot shows the 'Echocardiography Report' interface. At the top, there are three buttons: 'EDIT REPORT', 'DOWNLOAD REPORT', and 'VIEW IMAGES'. Below these, a table lists various measurements with their values, units, and descriptions. The table is organized into sections: 'Aortic Root Dimensions', 'Left Ventricle', and 'Left Atrium'. Values are color-coded: green for normal, red for high, and blue for low.

Measurement	Value	Units (normal ranges)	Description
<b>Aortic Root Dimensions</b>			
AoS	36.3	mm (31 - 37)	Aortic Sinus Diameter
STJ	29	mm (26 - 32)	Sinotubular Junction
AAo ↑	42.4	mm (26 - 34)	Ascending Aorta Diameter
<b>Left Ventricle</b>			
IVSd ↑	14.1	mm (6 - 10)	Interventricular Septum (diastole)
LVPWd ↑	10.6	mm (6 - 10)	Left Ventricular Posterior Wall (diastole)
LVEDD	47.1	mm (42 - 58)	Left Ventricular End-Diastolic Diameter
LVM	220.8	g (88 - 224)	Left Ventricular Mass
RWT ↑	0.52	(0.24 - 0.42)	Relative Wall Thickness
LVEDV (4Ch)	87.4	ml	Left Ventricular End Diastolic Volume (A4Ch)
LVESV (4Ch)	37.9	ml	Left Ventricular End Systolic Volume (A4Ch)
LVEDV (2Ch)	18.7	ml	Left Ventricular End Diastolic Volume (A2Ch)
LVESV (2Ch)	61.1	ml	Left Ventricular End Systolic Volume (A2Ch)
LVEF (4Ch)	56.6	% (52 - 72)	Left Ventricular Ejection Fraction (A4Ch)
LVEF (2Ch) ↓	51.6	% (52 - 72)	Left Ventricular Ejection Fraction (A2Ch)
LVEF (Bi) ↓	1.78	% (52 - 72)	Left Ventricular Ejection Fraction (Biplane)
LVESV (Bi)	51.6	ml (21 - 61)	Left Ventricular End Systolic Volume (Biplane)
LVEDV (Bi)	50.9	ml (62 - 150)	Left Ventricular End Diastolic Volume (Biplane)
LVESA (2Ch)	22.3	cm <sup>2</sup>	Left Ventricular End Systolic Area (A2Ch)
LVEDA (2Ch)	9.46	cm <sup>2</sup>	Left Ventricular End Diastolic Area (A2Ch)
<b>Left Atrium</b>			

Icon	Name	Function
	Edit Report	Returns to Report View.
 OR 	Download Report	Downloads study report to computer memory storage.
	View Images	Returns to Study View.
	PDF menu	Opens PDF menu.
	Thumbnail display	Shows thumbnails of all pages in the PDF file.
	Outline display	Shows PDF outline.

Icon	Name	Function
	Print Study	Print study on a printer.
	More	Opens more options for the PDF file
	<ul style="list-style-type: none"> <li>• Two-page view</li> <li>• Annotations</li> <li>• Present</li> </ul>	<ul style="list-style-type: none"> <li>• Changes PDF display to a two-page view.</li> <li>• Toggles on/off annotations.</li> <li>• Shows present view.</li> </ul>
	Other PDF options: <ul style="list-style-type: none"> <li>• Choose PDF page number</li> <li>• Choose zoom size</li> <li>• Expand/contract display</li> <li>• Rotate PDF</li> </ul>	<ul style="list-style-type: none"> <li>• Returns the desired PDF file page.</li> <li>• Zooms in/out the PDF file.</li> <li>• Expands/contracts PDF display</li> <li>• Rotates PDF by 90 degrees.</li> </ul>

## 49. Main Interface Functions

### Scroll stack

Scroll stack function: upon hovering on a displayed cine a user can use the computer mouse wheel (or two fingers on a trackpad) to scroll through a stack of images.

### Making measurements

Annotation function: when a certain annotation is selected the user can label separate frames. Annotations can be found in the annotation pop-up menu slot. When selecting measurements – the annotation label is selected automatically. There are 4 different types of annotations:

1. Lines
2. Polygons
3. Points
4. Text (for cycle marking or other important labels)

The annotations are used to label heart's anatomical structures using straight lines, polygons and points. There are two ways to make a line and polygons annotations:

2. Start by clicking left mouse button, then drag the mouse, but do not release left button, when you are at finish point, release left button and the annotation is complete.
3. Start by clicking left mouse button, then release the button, then move mouse to the finish point, then click left mouse button and release it, the annotation is complete.

Measurements are automatically saved after being drawn. After drawing annotation you can move annotation handles. Polygon annotation handles can be added, moved or removed after annotation is drawn. Press ctrl keyboard element and pushing on the handle to remove annotation. Press ctrl and push on the polygon line between handles – new handle should appear. Press left mouse button on the handle to move it.

### **Draw area measurement**

The annotation should be closed – have the same starting and ending point. You can do this by double clicking on a point where you want to complete the annotation or joining start and end points of the annotation by a single click.

### **Draw volume measurement**

The drawing procedure begins the same as with area measurement. After annotation is completed, an axis appears. The user can change axis peak point by moving it's handle.

Ligence Heart has pre-selected annotations for various measurements. The full list of manual and automated annotations supported by Ligence Heart can be found in ANNEX I.

### **Delete annotation**

Delete annotation: simply hover over the annotation you want to delete and press either “BACKSPACE”, “DELETE” key on your device keyboard.

### **Cancel drawing**

### **Press “ESC” key to stop drawing active annotation and remove it. Change annotation point**

Change annotation point: choose the point you want to change, press and hold the left mouse button and drag it to the point of your choice.

## **50. About**

About menu is found in the Legal and Helpful information dialogue in the Navigation bar.

Clicking About menu opens the information window which shows the relevant and latest information about the product and the manufacturer.



The displayed information on:

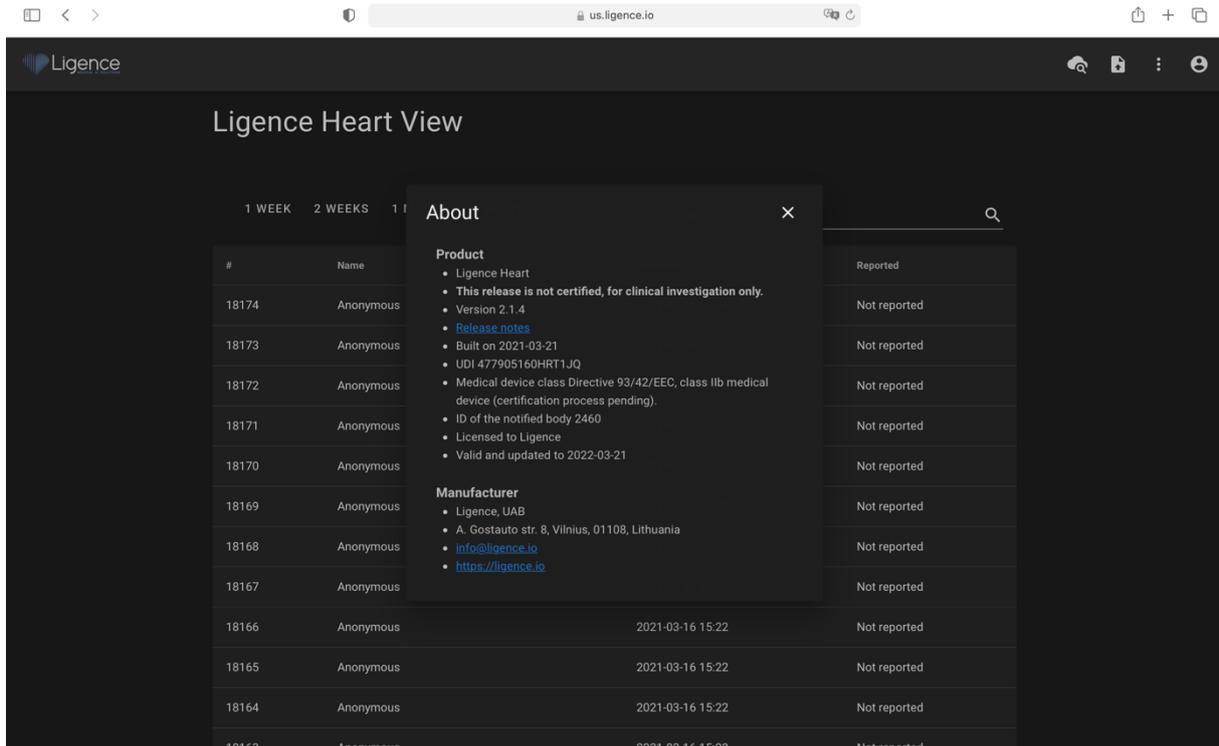
#### **Product:**

- Product name
- Disclaimer on the release version
- Software version
- Release notes
- Date built on
- UDI number
- Certificate
- Notified body ID
- License owner

- Next update

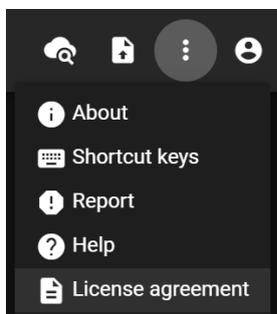
**Manufacturer:**

- Name of the manufacturer
- Address
- Email
- Website URL



## 51. End-User License Agreement

End-User License Agreement can be found in the Legal and Helpful Information dialogue in the Navigation bar.



You will be directed to the <https://www.Ligence.io/Ligence-heart-eula> site where you can read the End-User License Agreement.



**NOTE**

You are automatically agreeing with the terms and conditions of using the Ligence Heart software when starting to use it.

## 52. User Registration



### NOTE

License registration is required for legal software use.

### How to register with Ligence Heart?

Please refer to your institution’s information technology department for your account login and password. The account logins and passwords are created and assigned by the administrator of your institution.

Please refer to your institution’s information technology department for your account login and password. The account logins and passwords are created and assigned by the administrator of your institution. The system administrator holds the responsibility to read and conform to the terms of EULA and ensure that the software is used according to the terms and conditions in his or her institution.

You can open the license agreement by pressing the Legal and helpful information button and then License agreement..

## 5. ANNEX I

### 1. List of Supported Manual Annotations

Abbreviation	Full name
DISTANCE	Distance
AREA	Area
VOLUME	Volume
VELOCITY	Velocity
LV-ENDO	Left ventricular endocardial border
LV-EPI	Left ventricular epicardial border
LA-ENDO	Left atrial endocardial border
LA-EPI	Left atrial epicardial border
RV-ENDO	Right ventricular endocardial border
RV-EPI	Right ventricular epicardial border
RA-ENDO	Right atrial endocardial border
RA-EPI	Right atrial epicardial border
RVOT-PROX	Right ventricular outflow tract proximal part (PLA)
RVOT-DIST	Right ventricular outflow tract distal part (PLA)
LVOTD	Left ventricle outflow tract diameter
LV-LW-MYO	Left ventricular lateral wall myocardium
IV-MYO	Intraventricular myocardium

Abbreviation	Full name
RV-DIAMETER	Right ventricle - distance 1 (Diameter)
RV-BASE	Right ventricle - distance 1 (Base)
RV-MIDDLE	Right ventricle - distance 3 (Mid)
RV-WT	Right ventricle wall thickness
RAD	Right atrial diameter minor axis
RAD-MAJ	Right atrial diameter major axis
LAD-MIN	Left atrial diameter minor axis
LAD-MAJ	Left atrial diameter major axis
PAA	Pulmonary Artery Annulus
PA-RB	Pulmonary Artery Right Branch
PA-LB	Pulmonary Artery Left Branch
LAD	Left atrial diameter
LVPW	Left ventricular posterior wall
LVD	Left ventricular diameter
IVS	Interventricular septum
AoS	Aortic sinus
STJ	Sinotubular junction
AAo	Ascending aorta
TAPSE	Tricuspid Annular Plane Systolic Excursion
FORWARD-FLOW	Forward flow wave in Spectral Doppler
DIRECT-FLOW	Direct flow wave in Spectral Doppler
REVERSE-FLOW	Reverse flow wave in Spectral Doppler
TAPSE	Tricuspid Annular Plane Systolic Excursion
IVC	Inferior Vena Cava
IVC-EXP	Inferior Vena Cava during expiration
IVC-INSP	Inferior Vena Cava during inspiration
HV	Hepatic Vein
S-PRIME	S prime peak
E-PRIME	E prime peak
A-PEAK	A wave peak
E-PEAK	E wave peak
E-BASE	E wave base (Deceleration time)

Abbreviation	Full name
PHT	Pressure half-time
MV	Mitral valve
MV-ANNULUS	Mitral valve annulus (MV-1 PLAX, MV-2 4CH, MV-BICOMMISSURAL 2CH)
MV-ANT-LEAFLET	Mitral valve anterior leaflet
MV-POST-LEAFLET	Mitral valve posterior leaflet
PV	Pulmonary valve
PV-ANNULUS	Pulmonary valve annulus (equivalent to RVOT-DIST)
PV-ANT-LEAFLET	Pulmonary valve anterior leaflet
PV-R-LEAFLET	Pulmonary valve right leaflet
PV-L-LEAFLET	Pulmonary valve left leaflet
AV	Aortic valve
AV-ANNULUS	Aortic valve annulus
Ao-ARCH	Aortic Arch
DAo	Descending Aorta
AV-RC-LEAFLET	Aortic valve right coronary leaflet
AV-LC-LEAFLET	Aortic valve left coronary leaflet
AV-NC-LEAFLET	Aortic valve non-coronary leaflet
TV	Tricuspid valve
TV-ANNULUS	Tricuspid valve annulus
TV-A-LEAFLET	Tricuspid valve anterior leaflet
TV-P-LEAFLET	Tricuspid valve posterior leaflet
TV-S-LEAFLET	Tricuspid valve septal leaflet
EFFUSION	Pericardial effusion
JET-AREA	Regurgitant flow jet area
JET-DIAMETER	Regurgitant Flow Jet Diameter
FLOW-DIAMETER	Regurgitant Flow Diameter
VENA-CONTRACTA	Vena contracta
PISA-RADIUS	Color Doppler flow convergence radius
AT	Acceleration time
DT	Deceleration time
ES	End-systole

Abbreviation	Full name
ED	End-diastole
MS	Mid-systole
MD	Mid-diastole
FI	Frame of interest
ALIASING	Aliasing velocity

### 53. List of Supported Automatic Annotations

Abbreviation	Full name
RAD	Right atrial diameter minor axis
AoA	Aortic annulus
AoS	Aortic sinus
STJ	Sinotubular junction
AAo	Ascending aorta
LAD	Left atrial diameter
LA-ENDO	Left atrial endocardial border
IVS	Interventricular septum
LVPW	Left ventricular posterior wall
LVD	Left ventricular diameter
LV-ENDO	Left ventricular endocardial border
RA-ENDO	Right atrial endocardial border
RV-BASE	Right ventricle - distance 1 (Base)
RV-MIDDLE	Right ventricle - distance 3 (Mid)
RVOT-PROX	Right ventricular outflow tract proximal part (PLA)
RV-ENDO	Right ventricular endocardial border
FORWARD-FLOW	Forward flow wave in Spectral Doppler
AT	Acceleration time
DT	Deceleration time
E	E wave peak
A	A wave peak

## 54. List of Supported View Modes

Abbreviation	Full name
A2CH	Apical 2 chamber
A3CH	Apical 3 chamber
A4CH	Apical 4 chamber
A5CH	Apical 5 chamber
OTHER	Do not fit any category
SCHEMA	Scheme, diagram or graph
MULTIPLANE	Multiple images
CLRWAV	Color flow Doppler aortic valve (parasternal long axis)
CLRWAV3CH	Color flow Doppler aortic valve (apical 3 chamber)
CLRWAV5CH	Color flow Doppler aortic valve (apical 5 chamber)
CLRWAVA	Color flow Doppler aortic valve (aortic level)
CLRWAVMV	Color flow Doppler aortic valve and mitral valve (parasternal long axis)
CLRWMV	Color flow Doppler mitral valve (parasternal long axis)
CLRWMV2CH	Color flow Doppler mitral valve (apical 2 chamber)
CLRWMV3CH	Color flow Doppler mitral valve (apical 3 chamber)
CLRWMV4CH	Color flow Doppler mitral valve (apical 4 chamber)
CLRWMV5CH	Color flow Doppler mitral valve (apical 5 chamber)
CLRWMVLV	Color flow Doppler mitral valve (parasternal short axis left ventricular level)
CLRWMVSUB	Color flow Doppler mitral valve (subcostal)
CLRWPVA	Color flow Doppler pulmonary valve (aortic level)
CLRWTV4CH	Color flow Doppler tricuspid valve (apical 4 chamber)
CLRWTV5CH	Color flow Doppler tricuspid valve (apical 5 chamber)
CLRWTVA	Color flow Doppler tricuspid valve (aortic level)
CLRWTVSUB	Color flow Doppler tricuspid valve (subcostal)
CLRWVS	Color flow Doppler ventricular septum
CWAV3CH	Continuous-wave Doppler aortic valve (apical 3 chamber)
CWAV5CH	Continuous-wave Doppler aortic valve (apical 5 chamber)
CWMV2CH	Continuous-wave Doppler mitral valve (apical 2 chamber)

Abbreviation	Full name
CWMV4CH	Continuous-wave Doppler mitral valve (apical 4 chamber)
CWTRSUB	Continuous-wave Doppler tricuspid valve (subcostal)
CWTV4CH	Continuous-wave Doppler tricuspid valve (apical 4 chamber)
CWTV5CH	Continuous-wave Doppler tricuspid valve (apical 5 chamber)
CWTVPSAB	Continuous-wave Doppler tricuspid valve (basal level)
CWAVPLA	Continuous wave aortic valve (parasternal long axis)
MMTAPSE	M-Mode Tricuspid Annular Plane Systolic Excursion
PLA	Parasternal long axis
PSAAP	Parasternal short axis (apical level)
PSAB	Parasternal short axis base (aortic level)
PSAMID	Parasternal short axis (mid-level)
PSAMV	Parasternal short axis mitral valve
PWLVOT	Pulsed-wave Doppler left ventricular outflow tract
PWMV	Pulsed-wave Doppler mitral valve
PWPV	Pulsed-wave Doppler pulmonary valve
SUB4CH	Subcostal 4 chamber
SUBIVC	Subcostal inferior vena cava
SUBMMIVC	M-Mode subcostal inferior vena cava
SUPRACOSTALDESAO	Supracostal descending aorta
TDPWLMA	Tissue Doppler lateral mitral annulus
TDPWRVLW	Tissue Doppler right ventricular lateral wall
TDPWSMA	Tissue Doppler septal mitral annulus
CLRWDAO	Color flow descending aorta
CLRWIVSSUB	Color flow interventricular septum (subcostal)
CLRWIASSUB	Color flow interatrial septum (subcostal)
CLRWIAS4CH	Color flow interatrial septum (apical 4 chamber)
PWDAO	Pulsed-wave Doppler Descending Aorta
PWSVC	Pulsed-wave Doppler Superior Vena Cava
PWTV	Pulsed-wave Doppler Tricuspid Valve
A2CH	Apical 2 chamber

Abbreviation	Full name
A3CH	Apical 3 chamber
A4CH	Apical 4 chamber
A5CH	Apical 5 chamber
OTHER	Do not fit any category
CLRWAV	Color flow Doppler aortic valve (parasternal long axis)
CLRWAV3CH	Color flow Doppler aortic valve (apical 3 chamber)
CLRWAV5CH	Color flow Doppler aortic valve (apical 5 chamber)
CLRWAVA	Color flow Doppler aortic valve (aortic level)
CLRWAVMV	Color flow Doppler aortic valve and mitral valve (parasternal long axis)
CLRWMV	Color flow Doppler mitral valve (parasternal long axis)
CLRWMV2CH	Color flow Doppler mitral valve (apical 2 chamber)
CLRWMV3CH	Color flow Doppler mitral valve (apical 3 chamber)
CLRWMV4CH	Color flow Doppler mitral valve (apical 4 chamber)
CLRWMV5CH	Color flow Doppler mitral valve (apical 5 chamber)
CLRWMVLV	Color flow Doppler mitral valve (parasternal short axis left ventricular level)
CLRWMVSUB	Color flow Doppler mitral valve (subcostal)
CLRWPVA	Color flow Doppler pulmonary valve (aortic level)
CLRWTV4CH	Color flow Doppler tricuspid valve (apical 4 chamber)
CLRWTV5CH	Color flow Doppler tricuspid valve (apical 5 chamber)
CLRWTVA	Color flow Doppler tricuspid valve (aortic level)
CLRWTVSUB	Color flow Doppler tricuspid valve (subcostal)
CLRWVS	Color flow Doppler ventricular septum
CWAV3CH	Continuous-wave Doppler aortic valve (apical 3 chamber)
CWAV5CH	Continuous-wave Doppler aortic valve (apical 5 chamber)
CWMV2CH	Continuous-wave Doppler mitral valve (apical 2 chamber)
CWMV4CH	Continuous-wave Doppler mitral valve (apical 4 chamber)
CWTRSUB	Continuous-wave Doppler tricuspid valve (subcostal)
CWTV4CH	Continuous-wave Doppler tricuspid valve (apical 4 chamber)

Abbreviation	Full name
CWTV5CH	Continuous-wave Doppler tricuspid valve (apical 5 chamber)
CWTVPSAB	Continuous-wave Doppler tricuspid valve (basal level)
CWAVPLA	Continuous wave aortic valve (parasternal long axis)
MMTAPSE	M-Mode Tricuspid Annular Plane Systolic Excursion
PLA	Parasternal long axis
PSAAP	Parasternal short axis (apical level)
PSAB	Parasternal short axis base (aortic level)
PSAMID	Parasternal short axis (mid-level)
PSAMV	Parasternal short axis mitral valve
PWLVOT	Pulsed-wave Doppler left ventricular outflow tract
PWMV	Pulsed-wave Doppler mitral valve
PWPV	Pulsed-wave Doppler pulmonary valve
SUB4CH	Subcostal 4 chamber
SUBIVC	Subcostal inferior vena cava
SUBMMIVC	M-Mode subcostal inferior vena cava
SUPRACOSTALDESAO	Supracostal descending aorta
TDPWLMA	Tissue Doppler lateral mitral annulus
TDPWRVLW	Tissue Doppler right ventricular lateral wall
TDPWSMA	Tissue Doppler septal mitral annulus
CLRWDAO	Color flow descending aorta
CLRWIVSSUB	Color flow interventricular septum (subcostal)
CLRWIASSUB	Color flow interatrial septum (subcostal)
CLRWIAS4CH	Color flow interatrial septum (apical 4 chamber)
PWDAO	Pulsed-wave Doppler Descending Aorta
PWSVC	Pulsed-wave Doppler Superior Vena Cava
PWTV	Pulsed-wave Doppler Tricuspid Valve

## 55. List of View Modes Classified Automatically

These view modes are automatically classified in 2D TTE adult images:

Abbreviation	Full name
A2CH	Apical 2 chamber

Abbreviation	Full name
A4CH	Apical 4 chamber
PLA	Parasternal long axis
CWAV	Continuous wave Doppler aortic valve
PWLVTOT	Pulsed Wave Left Ventricle Outflow Tract
PWPV	Pulsed Wave Pulmonary Valve
TDPWRVLW	Tissue Doppler Right Ventricle Lateral Wall
TDPWLMA	Tissue Doppler Lateral Mitral Annulus
TDPWSMA	Tissue Doppler Septal Mitral Annulus
PWMV	Pulsed-wave Doppler mitral valve
PWDAO	Pulsed-wave Doppler Descending Aorta
OTHER	All the view modes that did not fit the above-mentioned categories are classified as other

## 56. List of Supported Manual Measurements

Abbreviation	Full name
A	Transmitral A velocity
AAo	Ascending Aorta Diameter
AAoi	Ascending Aorta Diameter Index
AoAr	Aortic Arch
AoAri	Aortic Arch Index
DAo	Descending Aorta
DAoi	Descending Aorta Index
ACT	Acceleration time
AMG	Aortic Mean Gradient
APG	Aortic Peak Gradient
AVA	Aortic valve area
AVAi	Aortic valve area index
AV Vmax	Aortic Peak Velocity
AV VTI	Aortic Valve Maximum Velocity Time Integral
AoA	Aortic Annulus
AoAi	Aortic Annulus Index
AoS	Aortic Sinus Diameter
AoSi	Aortic Sinus Diameter Index

Abbreviation	Full name
Dec	Transmitral E velocity Deceleration time
E	Transmitral E velocity
E/A	E/A ratio
E/e'	E/e' average ratio
E' lat	E prime right ventricle lateral wall
FAC	Fractional Area Change
IVCcol (M)	Inferior vena cava collapse (MMode)
IVCde (M)	Inferior vena cava diameter during expiration (MMode)
IVCdi (M)	Inferior vena cava diameter during inspiration (MMode)
IVCcol (B)	Inferior vena cava collapse (BMode)
IVCde (B)	Inferior vena cava diameter during expiration (BMode)
IVCdi (B)	Inferior vena cava diameter during inspiration (BMode)
IVSd	Interventricular Septum (diastole)
LAD (PLA)	Left Atrial Diameter (PLA view)
LAD Major axis (A4)	Left Atrium Diameter Major Axis (A4Ch)
LAD Minor axis (A4)	Left Atrium Diameter Minor Axis (A4Ch)
LAEF	Left Atrial Ejection Fraction
LAV (Bi)	Left Atrial Volume (Biplane)
LAVi (Bi)	Left Atrial Volume Index (Biplane)
LAV (2A)	Left Atrial Volume (A2Ch)
LAVi (2A)	Left Atrial Volume Index (A2Ch)
LAV (4A)	Left Atrial Volume (A4Ch)
LAVi (4A)	Left Atrial Volume Index (A4Ch)
LAA (2A)	Left Atrial Area (A2Ch)
LAAi (2A)	Left Atrial Area Index (A2Ch)
LAA (4A)	Left Atrial Area (A4Ch)
LAAi (4A)	Left Atrial Area Index (A4Ch)
LVEDD	Left Ventricle End-Diastolic Diameter
LVEDDi	Left Ventricle End-Diastolic Diameter Index
LVEDV (Bi)	Left Ventricle End Diastolic Volume (Biplane)
LVEDVi (Bi)	Left Ventricle End Diastolic Volume Index (Biplane)

Abbreviation	Full name
LVEF (Bi)	Left Ventricular Ejection Fraction (Biplane)
LVEF (2Ch)	Left Ventricular Ejection Fraction (A2Ch)
LVEF (4Ch)	Left Ventricular Ejection Fraction (A4Ch)
LVESD	Left Ventricle End-Systolic Diameter
LVESDi	Left Ventricle End-Systolic Diameter Index
LVESV (Bi)	Left Ventricle End Systolic Volume (Biplane)
LVESVi (Bi)	Left Ventricle End Systolic Volume Index (Biplane)
LVESV (2Ch)	Left Ventricle End Systolic Volume (A2Ch)
LVESVi (2Ch)	Left Ventricle End Systolic Volume Index (A2Ch)
LVEDV (2Ch)	Left Ventricle End Diastolic Volume (A2Ch)
LVEDVi (2Ch)	Left Ventricle End Diastolic Volume Index (A2Ch)
LVM	Left Ventricular Mass
RWT	Relative Wall Thickness
LVMi	Left Ventricle Mass Index
LVOT VTI	Left Ventricle Outflow Tract Velocity Time Integral
LVOT Vmax	Left Ventricle Outflow Tract Peak Velocity
LVOT PG	Left Ventricle Outflow Tract Peak Gradient
LVOT MG	Left Ventricle Outflow Tract Mean Gradient
LVPWd	Left Ventricle Posterior Wall (diastole)
Le'	Lateral e' velocity
PA AD	Pulmonary Artery Annulus Diameter
PA LBD	Pulmonary Artery Left Branch Diameter
PA RBD	Pulmonary Artery Right Branch Diameter
TR Vmax	Peak Tricuspid Regurgitation Velocity
PV Vmax	Pulmonary Valve Peak Velocity
PV PG	Pulmonary Valve Peak Gradient
PV MG	Pulmonary Valve Mean Gradient
PV VTI	Pulmonary Valve Maximum Velocity Time Integral
PR Vmax	Pulmonary Regurgitation Peak Velocity
PR PG	Pulmonary Regurgitation Peak Gradient
PR MG	Pulmonary Regurgitation Mean Gradient
PR VTI	Pulmonary Regurgitation Maximum Velocity Time Integral

Abbreviation	Full name
PR JA	Pulmonary Regurgitation Jet Area
PR VC	Pulmonary Regurgitation Vena Contracta
RAA	Right Atrial Area
RAAi	Right Atrial Area Index
RA Minor (A4)	Right Atrial Minor Axis Dimension (A4Ch)
RA Minor i (A4)	Right Atrial Minor Axis Dimension Index (A4Ch)
RA Major (A4)	Right Atrial Major Axis Dimension (A4Ch)
RA Major i (A4)	Right Atrial Major Axis Dimension Index (A4Ch)
RAP	Mean right atrium pressure
HV	Hepatic Vein
RAVi	Right Atrium Volume Index (2D)
RVB	Right Ventricular Basal Diameter
RV EDAi	Right Ventricle End Diastolic Area index
RV EDVi	Right Ventricle End Diastolic Volume Index
RV ESAi	Right Ventricle End Systolic Area index
RV ESVi	Right Ventricle End Systolic Volume Index
RVL	Right Ventricular Length
RVM	Right Ventricular Middle Diameter
RVOT-PROX	Right Ventricular Outflow Tract Proximal Diameter (PLA)
RVOT-DIST	Right Ventricular Outflow Tract Distal Diameter (PLA)
RV WT	Right Ventricular Wall Thickness
S' RV	S prime right ventricle lateral wall
STJ	Sinotubular Junction
STJi	Sinotubular Junction Index
Se'	Septal e' velocity
TAPSE	Tricuspid Annular Plane Systolic Excursion
RA volume	Right Atrium Volume
RV EDA	Right Ventricle End Diastolic Area
RV ESA	Right Ventricle End Systolic Area
RV EDV	Right Ventricle End Diastolic Volume
RV ESV	Right Ventricle End Systolic Volume

Abbreviation	Full name
TR PG	Tricuspid Regurgitation peak gradient
AR Vmax	Aortic regurgitation - peak velocity
AR PG	Aortic regurgitation - peak gradient
AR PISA-r	Aortic regurgitation proximal isovelocity surface area - radius
AR PISA-Alias. Vel.	Aortic regurgitation proximal isovelocity surface area - aliasing velocity
AR EROA	Aortic regurgitation effective regurgitant orifice area
AR JA	Aortic regurgitation - jet area
AR VC	Aortic regurgitation - vena contracta
MV Vmax	Mitral valve - peak velocity
MV PG	Mitral valve - peak gradient
MV MG	Mitral valve - mean gradient
MV VTI	Mitral valve - velocity time integral
MR Vmax	Mitral regurgitation - peak velocity
MR PG	Mitral regurgitation - peak gradient
MR PISA-r	Mitral regurgitation proximal isovelocity surface area - radius
MR PISA-Alias. Vel.	Mitral regurgitation proximal isovelocity surface area - aliasing velocity
MR EROA	Mitral regurgitation effective regurgitant orifice area
MR JA	Mitral regurgitation - jet area
MR VC	Mitral regurgitation - vena contracta
TR PISA-r	Tricuspid regurgitation proximal isovelocity surface area - radius
TR PISA-Alias. Vel.	Tricuspid regurgitation proximal isovelocity surface area - aliasing velocity
TR EROA	Tricuspid regurgitation effective regurgitant orifice area
TR JA	Tricuspid regurgitation - jet area
TR VC	Tricuspid regurgitation - vena contracta
PR JA	Pulmonary regurgitation - jet area
PR VC	Pulmonary regurgitation - vena contracta
MV-ANNULUS PLA	Mitral valve annulus in parasternal long axis
MV-ANNULUS A4CH	Mitral valve annulus in apical 4 chamber view
MV-ANNULUS A2CH	Mitral valve diameter 2 chamber view

Abbreviation	Full name
TV-ANNULUS	Tricuspid valve annulus
Distance	Distance
Area	Area
Volume	Volume
Velocity	Velocity
LVESA (4Ch)	Left Ventricle End Systolic Area (A4CH)
LVESAi (4Ch)	Left Ventricle End Systolic Area Index (A4CH)
LVEDA (4Ch)	Left Ventricle End Diastolic Area (A4CH)
LVEDAi (4Ch)	Left Ventricle End Diastolic Area Index (A4CH)
LVESV (4Ch)	Left Ventricle End Systolic Volume (A4CH)
LVEDV (4Ch)	Left Ventricle End Diastolic Volume (A4CH)
LVEDVi (4Ch)	Left Ventricle End Diastolic Volume Index (A4CH)
LVESVi (4Ch)	Left Ventricle End Systolic Volume Index (A4CH)
LVESA (2Ch)	Left Ventricle End Systolic Area (A2CH)
LVESAi (2Ch)	Left Ventricle End Systolic Area Index (A2CH)
LVEDA (2Ch)	Left Ventricle End Diastolic Area (A2CH)
LVEDAi (2Ch)	Left Ventricle End Diastolic Area Index (A2CH)
IVSs	Interventricular Septum (systole)
LVPWs	Left Ventricle Posterior Wall (systole)
LVOTDd	Left Ventricle Outflow Tract (diastole)
LVOTDs	Left Ventricle Outflow Tract (systole)
TR MG	Tricuspid Regurgitation mean gradient
TR VTI	Tricuspid regurgitation Velocity Time Integral
MR MG	Mitral regurgitation - mean gradient
MR VTI	Mitral regurgitation - Velocity Time Integral
TV Vmax	Tricuspid Valve Peak Velocity
TV PG	Tricuspid Valve Peak Gradient
TV MG	Tricuspid Valve Mean Gradient
TV VTI	Tricuspid Valve Velocity Time Integral
A	Transmitral A velocity
AAo	Ascending Aorta Diameter
AAoi	Ascending Aorta Diameter Index

Abbreviation	Full name
AoAr	Aortic Arch
AoAri	Aortic Arch Index
DAo	Descending Aorta
DAoi	Descending Aorta Index
ACT	Acceleration time
AMG	Aortic Mean Gradient
APG	Aortic Peak Gradient
AVA	Aortic valve area
AVAi	Aortic valve area index
AV Vmax	Aortic Peak Velocity
AV VTI	Aortic Valve Maximum Velocity Time Integral
AoA	Aortic Annulus
AoAi	Aortic Annulus Index
AoS	Aortic Sinus Diameter
AoS <sub>i</sub>	Aortic Sinus Diameter Index
Dec	Transmitral E velocity Deceleration time
E	Transmitral E velocity
E/A	E/A ratio
E/e'	E/e' average ratio
E' lat	E prime right ventricle lateral wall
FAC	Fractional Area Change
IVCcol (M)	Inferior vena cava collapse (MMode)
IVCde (M)	Inferior vena cava diameter during expiration (MMode)
IVCdi (M)	Inferior vena cava diameter during inspiration (MMode)
IVCcol (B)	Inferior vena cava collapse (BMode)
IVCde (B)	Inferior vena cava diameter during expiration (BMode)
IVCdi (B)	Inferior vena cava diameter during inspiration (BMode)
IVSd	Interventricular Septum (diastole)
LAD (PLA)	Left Atrial Diameter (PLA view)
LAD Major axis (A4)	Left Atrium Diameter Major Axis (A4Ch)
LAD Minor axis (A4)	Left Atrium Diameter Minor Axis (A4Ch)

Abbreviation	Full name
LAEF	Left Atrial Ejection Fraction
LAV (Bi)	Left Atrial Volume (Biplane)
LAVi (Bi)	Left Atrial Volume Index (Biplane)
LAV (2A)	Left Atrial Volume (A2Ch)
LAVi (2A)	Left Atrial Volume Index (A2Ch)
LAV (4A)	Left Atrial Volume (A4Ch)
LAVi (4A)	Left Atrial Volume Index (A4Ch)
LAA (2A)	Left Atrial Area (A2Ch)
LAAi (2A)	Left Atrial Area Index (A2Ch)
LAA (4A)	Left Atrial Area (A4Ch)
LAAi (4A)	Left Atrial Area Index (A4Ch)
LVEDD	Left Ventricle End-Diastolic Diameter
LVEDDi	Left Ventricle End-Diastolic Diameter Index
LVEDV (Bi)	Left Ventricle End Diastolic Volume (Biplane)
LVEDVi (Bi)	Left Ventricle End Diastolic Volume Index (Biplane)
LVEF (Bi)	Left Ventricular Ejection Fraction (Biplane)
LVEF (2Ch)	Left Ventricular Ejection Fraction (A2Ch)
LVEF (4Ch)	Left Ventricular Ejection Fraction (A4Ch)
LVESD	Left Ventricle End-Systolic Diameter
LVESDi	Left Ventricle End-Systolic Diameter Index
LVESV (Bi)	Left Ventricle End Systolic Volume (Biplane)
LVESVi (Bi)	Left Ventricle End Systolic Volume Index (Biplane)
LVESV (2Ch)	Left Ventricle End Systolic Volume (A2Ch)
LVESVi (2Ch)	Left Ventricle End Systolic Volume Index (A2Ch)
LVEDV (2Ch)	Left Ventricle End Diastolic Volume (A2Ch)
LVEDVi (2Ch)	Left Ventricle End Diastolic Volume Index (A2Ch)
LVM	Left Ventricular Mass
RWT	Relative Wall Thickness
LVMi	Left Ventricle Mass Index
LVOT VTI	Left Ventricle Outflow Tract Velocity Time Integral
LVOT Vmax	Left Ventricle Outflow Tract Peak Velocity
LVOT PG	Left Ventricle Outflow Tract Peak Gradient

Abbreviation	Full name
LVOT MG	Left Ventricle Outflow Tract Mean Gradient
LVPWd	Left Ventricle Posterior Wall (diastole)
Le'	Lateral e' velocity
PA AD	Pulmonary Artery Annulus Diameter
PA LBD	Pulmonary Artery Left Branch Diameter
PA RBD	Pulmonary Artery Right Branch Diameter
TR Vmax	Peak Tricuspid Regurgitation Velocity
PV Vmax	Pulmonary Valve Peak Velocity
PV PG	Pulmonary Valve Peak Gradient
PV MG	Pulmonary Valve Mean Gradient
PV VTI	Pulmonary Valve Maximum Velocity Time Integral
PR Vmax	Pulmonary Regurgitation Peak Velocity
PR PG	Pulmonary Regurgitation Peak Gradient
PR MG	Pulmonary Regurgitation Mean Gradient
PR VTI	Pulmonary Regurgitation Maximum Velocity Time Integral
PR JA	Pulmonary Regurgitation Jet Area
PR VC	Pulmonary Regurgitation Vena Contracta
RAA	Right Atrial Area
RAAi	Right Atrial Area Index
RA Minor (A4)	Right Atrial Minor Axis Dimension (A4Ch)
RA Minor i (A4)	Right Atrial Minor Axis Dimension Index (A4Ch)
RA Major (A4)	Right Atrial Major Axis Dimension (A4Ch)
RA Major i (A4)	Right Atrial Major Axis Dimension Index (A4Ch)
RAP	Mean right atrium pressure
HV	Hepatic Vein
RAVi	Right Atrium Volume Index (2D)
RVB	Right Ventricular Basal Diameter
RV EDAi	Right Ventricle End Diastolic Area index
RV EDVi	Right Ventricle End Diastolic Volume Index
RV ESAi	Right Ventricle End Systolic Area index
RV ESVi	Right Ventricle End Systolic Volume Index
RVL	Right Ventricular Length

Abbreviation	Full name
RVM	Right Ventricular Middle Diameter
RVOT-PROX	Right Ventricular Outflow Tract Proximal Diameter (PLA)
RVOT-DIST	Right Ventricular Outflow Tract Distal Diameter (PLA)
RV WT	Right Ventricular Wall Thickness
S' RV	S prime right ventricle lateral wall
STJ	Sinotubular Junction
STJi	Sinotubular Junction Index
Se'	Septal e' velocity
TAPSE	Tricuspid Annular Plane Systolic Excursion
RA volume	Right Atrium Volume
RV EDA	Right Ventricle End Diastolic Area
RV ESA	Right Ventricle End Systolic Area
RV EDV	Right Ventricle End Diastolic Volume
RV ESV	Right Ventricle End Systolic Volume
TR PG	Tricuspid Regurgitation peak gradient
AR Vmax	Aortic regurgitation - peak velocity
AR PG	Aortic regurgitation - peak gradient
AR PISA-r	Aortic regurgitation proximal isovelocity surface area - radius
AR PISA-Alias. Vel.	Aortic regurgitation proximal isovelocity surface area - aliasing velocity
AR EROA	Aortic regurgitation effective regurgitant orifice area
AR JA	Aortic regurgitation - jet area
AR VC	Aortic regurgitation - vena contracta
MV Vmax	Mitral valve - peak velocity
MV PG	Mitral valve - peak gradient
MV MG	Mitral valve - mean gradient
MV VTI	Mitral valve - velocity time integral
MR Vmax	Mitral regurgitation - peak velocity
MR PG	Mitral regurgitation - peak gradient
MR PISA-r	Mitral regurgitation proximal isovelocity surface area - radius
MR PISA-Alias. Vel.	Mitral regurgitation proximal isovelocity surface area - aliasing velocity

Abbreviation	Full name
MR EROA	Mitral regurgitation effective regurgitant orifice area
MR JA	Mitral regurgitation - jet area
MR VC	Mitral regurgitation - vena contracta
TR PISA-r	Tricuspid regurgitation proximal isovelocity surface area - radius
TR PISA-Alias. Vel.	Tricuspid regurgitation proximal isovelocity surface area - aliasing velocity
TR EROA	Tricuspid regurgitation effective regurgitant orifice area
TR JA	Tricuspid regurgitation - jet area
TR VC	Tricuspid regurgitation - vena contracta
PR JA	Pulmonary regurgitation - jet area
PR VC	Pulmonary regurgitation - vena contracta
MV-ANNULUS PLA	Mitral valve annulus in parasternal long axis
MV-ANNULUS A4CH	Mitral valve annulus in apical 4 chamber view
MV-ANNULUS A2CH	Mitral valve diameter 2 chamber view
TV-ANNULUS	Tricuspid valve annulus
Distance	Distance
Area	Area
Volume	Volume
Velocity	Velocity
LVESA (4Ch)	Left Ventricle End Systolic Area (A4CH)
LVESAi (4Ch)	Left Ventricle End Systolic Area Index (A4CH)
LVEDA (4Ch)	Left Ventricle End Diastolic Area (A4CH)
LVEDAi (4Ch)	Left Ventricle End Diastolic Area Index (A4CH)
LVESV (4Ch)	Left Ventricle End Systolic Volume (A4CH)
LVEDV (4Ch)	Left Ventricle End Diastolic Volume (A4CH)
LVEDVi (4Ch)	Left Ventricle End Diastolic Volume Index (A4CH)
LVESVi (4Ch)	Left Ventricle End Systolic Volume Index (A4CH)
LVESA (2Ch)	Left Ventricle End Systolic Area (A2CH)
LVESAi (2Ch)	Left Ventricle End Systolic Area Index (A2CH)
LVEDA (2Ch)	Left Ventricle End Diastolic Area (A2CH)
LVEDAi (2Ch)	Left Ventricle End Diastolic Area Index (A2CH)
IVSs	Interventricular Septum (systole)

Abbreviation	Full name
LVPWs	Left Ventricle Posterior Wall (systole)
LVOTDd	Left Ventricle Outflow Tract (diastole)
LVOTDs	Left Ventricle Outflow Tract (systole)
TR MG	Tricuspid Regurgitation mean gradient
TR VTI	Tricuspid regurgitation Velocity Time Integral
MR MG	Mitral regurgitation - mean gradient
MR VTI	Mitral regurgitation - Velocity Time Integral
TV Vmax	Tricuspid Valve Peak Velocity
TV PG	Tricuspid Valve Peak Gradient
TV MG	Tricuspid Valve Mean Gradient
TV VTI	Tricuspid Valve Velocity Time Integral
SV	Stroke Volume

## 57. List of Supported Automatic Measurements

Abbreviation	Full name
AoA	Aortic Annulus
AoAi	Aortic Annulus Index
AoS	Aortic Sinus Diameter
AoSi	Aortic Sinus Diameter Index
STJ	Sinotubular Junction
STJi	Sinotubular Junction Index
AAo	Ascending Aorta Diameter
AAoi	Ascending Aorta Diameter Index
LAD	Left Atrial Diameter (PLA view)
LAV	Left Atrial Volume
LAVi	Left Atrial Volume Index
LAEF	Left Atrial Ejection Fraction
LVM	Left Ventricular Mass
LVMI	Left Ventricle Mass Index
IVSd	Interventricular Septum (diastole)
LVPWd	Left Ventricle Posterior Wall (diastole)
RWT	Relative Wall Thickness

Abbreviation	Full name
LVEF	Left Ventricular Ejection Fraction (Biplane)
LVEF2A	Left Ventricular Ejection Fraction (A2Ch)
LVEF4A	Left Ventricular Ejection Fraction (A4Ch)
LVEDD	Left Ventricle End-Diastolic Diameter
LVEDDi	Left Ventricle End-Diastolic Diameter Index
LVESD	Left Ventricle End-Systolic Diameter
LVESDi	Left Ventricle End-Systolic Diameter Index
LVEDV	LV End Diastolic Volume (Biplane)
LVEDVi	LV End Diastolic Volume Index (Biplane)
LVESV	LV End Systolic Volume (Biplane)
LVESVi	LV End Systolic Volume Index (Biplane)
LVEDV4A	LV End Diastolic Volume (A4Ch)
LVEDVi4A	LV End Diastolic Volume Index (A4Ch)
LVESV4A	LV End Systolic Volume (A4Ch)
LVESVi4A	LV End Systolic Volume Index (A4Ch)
LVEDV2A	LV End Diastolic Volume (A2Ch)
LVEDVi2A	LV End Diastolic Volume Index (A2Ch)
LVESV2A	LV End Systolic Volume (A2Ch)
LVESVi2A	LV End Systolic Volume Index (A2Ch)
RAMAD	Right Atrial Minor Axis Dimension (a4ch)
RAMADi	Right Atrial Minor Axis Dimension Index
RAV	Right Atrium Volume
RAVi	Right Atrium Volume Index
RAA	Right Atrial Area
RVB	Right Ventricular Basal Diameter
RVM	Right Ventricular Middle Diameter
RVOTPD	Right Ventricular Outflow Tract Proximal Diameter (PLA)
RVEDA	Right Ventricle End Diastolic Area
RVEDAi	Right Ventricle End Diastolic Area index
RVESA	Right Ventricle End Systolic Area
RVESAi	Right Ventricle End Systolic Area index
FAC	Fractional Area Change

Abbreviation	Full name
AV Vmax	Aortic valve maximum velocity
AV PG	Aortic valve peak gradient
AV MG	Aortic valve mean gradient
AV VTI	Aortic valve velocity time integral
ACT	Acceleration Time
LVOT Vmax	Left Ventricular Outflow Tract Peak Velocity
LVOT PG	Left Ventricular Outflow Tract Peak Gradient
LVOT MG	Left Ventricular Outflow Tract Mean Gradient
LVOT VTI	Left Ventricular Outflow Tract Velocity Time Integral
SE	Septal e' velocity
LE	Lateral e' velocity