Echo IQ Ltd
% J. David Giese
CEO & Co-Founder
Innolitics LLC
1101 West 34th St. #550
Austin, Texas 78705

October 4, 2024

Re: K241245
Trade/Device Name: EchoSolv AS
Regulation Number: 21 CFR 892.2060
Regulation Name: Radiological computer-assisted diagnostic software for lesions suspicious of cancer
Regulatory Class: Class II
Product Code: POK
Dated: May 3, 2024
Received: September 6, 2024

Dear J. David Giese:

We have reviewed your section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (the Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database available at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Additional information about changes that may require a new premarket notification are provided in the FDA guidance documents entitled "Deciding When to Submit a 510(k) for a Change to an Existing Device"

(https://www.fda.gov/media/99812/download) and "Deciding When to Submit a 510(k) for a Software Change to an Existing Device" (https://www.fda.gov/media/99785/download).

Your device is also subject to, among other requirements, the Quality System (QS) regulation (21 CFR Part 820), which includes, but is not limited to, 21 CFR 820.30, Design controls; 21 CFR 820.90, Nonconforming product; and 21 CFR 820.100, Corrective and preventive action. Please note that regardless of whether a change requires premarket review, the QS regulation requires device manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 21 CFR 820.70) and document changes and approvals in the device master record (21 CFR 820.181).

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR Part 803) for devices or postmarketing safety reporting (21 CFR Part 4, Subpart B) for combination products (see https://www.fda.gov/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR Part 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR Parts 1000-1050.

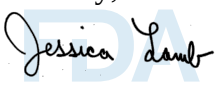
All medical devices, including Class I and unclassified devices and combination product device constituent parts are required to be in compliance with the final Unique Device Identification System rule ("UDI Rule"). The UDI Rule requires, among other things, that a device bear a unique device identifier (UDI) on its label and package (21 CFR 801.20(a)) unless an exception or alternative applies (21 CFR 801.20(b)) and that the dates on the device label be formatted in accordance with 21 CFR 801.18. The UDI Rule (21 CFR 830.300(a) and 830.320(b)) also requires that certain information be submitted to the Global Unique Device Identification Database (GUDID) (21 CFR Part 830 Subpart E). For additional information on these requirements, please see the UDI System webpage at https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/unique-device-identification-system-udi-system.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-

assistance/contact-us-division-industry-and-consumer-education-dice) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,



Jessica Lamb, Ph.D.
Assistant Director
Imaging Software Team
DHT8B: Division of Radiological Imaging Devices and Electronic Products
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Office of Product Evaluation and Quality
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 07/31/2026
See PRA Statement below.

Submission Number *(if known)*

K241245

Device Name

EchoSolv AS

Indications for Use *(Describe)*

EchoSolv AS is a machine learning (ML) and artificial intelligence (AI) based decision support software indicated for use as an adjunct to echocardiography for assessment of severe aortic stenosis (AS).
When utilized by an interpreting physician, this device provides information to facilitate rendering an accurate diagnosis of AS. Patient management decisions should not be made solely on the results of the EchoSolv AS analysis.
EchoSolv AS includes both the algorithm based AS phenotype analysis, and the application of recognized AS clinical practice guidelines.
Limitations: EchoSolv AS is not intended for patients under the age of 18 years or those who have previously undergone aortic valve replacement surgery

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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510(K) SUMMARY

1. SUBMITTER

Company	Echo IQ Ltd
Address	Suite 2.114, Level 1, 477 Pitt Street Sydney NSW 2000 Australia
Phone	+61 (02) 9159 3719
Contact Person	Dane Brescacin
Date Prepared	October 2, 2024

2. SUBJECT DEVICE

Device Name	EchoSolv AS
Classification Name	Radiological Computer-Assisted Diagnostic Software (CADx) for Lesions Suspicious for Cancer
Regulation	21 CFR 892.2060
Regulatory Class	Class II
Product Code	POK

3. PREDICATE DEVICE

Device Name	EchoGo Pro
Manufacturer	Ultromics Limited
510(k) Number	K201555

4. DEVICE DESCRIPTION

EchoSolv AS is a standalone, cloud-based decision support software which is intended to be used by board certified cardiologist to aid in the diagnosis of Severe Aortic Stenosis. EchoSolv AS analyzes basic patient demographic data and measurements obtained from a transthoracic echo examination to provide a categorical assessment as to whether the data are suggestive of a high, medium or low probability of Severe AS. EchoSolv AS is intended for patients who 18 years or older who have an echocardiogram performed as part of routine clinical care (i.e., for the evaluation of structural heart disease).

Patient demographic and echo measurement data is automatically processed through the artificial intelligence algorithm which provides an output regarding the probability of a Severe AS phenotype to aid in the clinical diagnosis of Severe AS during the review of the patient echo study and generation of the final study report, according to current clinical practice guidelines. The software provides an output on the following assessments:

1. **Severe AS Phenotype Probability**

   Whether the patient has a high, medium, or low probability of exhibiting a Severe AS phenotype, based on analysis by the EchoSolv AS proprietary AI algorithm, that the determined predicted AVA is ≤1.0cm^2. The AI probability score requires a minimum set of data inputs to provide a valid output but is based on all available echocardiographic measurement data and does not rely on the traditional LVOT measurements used to in the continuity equation.

2. **Severe AS Guideline Assessment**

   Whether the patient meets the definition for Severe AS based on direct evaluation of provided echocardiogram data measurements (AV Peak Velocity, AV Mean Gradient and AV Area) with current clinical practice guidelines (2020 ACC/AHA Guideline for the Management of Patients with Valvular Heart Disease).

EchoSolv AS is intended to be used by board-certified cardiologists who review echocardiograms during the evaluation and diagnosis of structural heart disease, namely aortic stenosis. EchoSolv AS is intended to be used in conjunction with current clinical practices and workflows to improve the identification of Severe AS cases.

The EchoSolv AS AI Model was developed on a dataset consisting of 631,824 individuals with 1,077,145 transthoracic echocardiograms (TTE). The dataset was randomly split (ratio 70:30 based on individuals) into two separate groups, training and test set. Data from 442,276 individuals (70%) were entered into the AI model to train the device to detect severe AS cases. The remaining 189,548 individuals (30%) were reserved for internal testing. Individual patients appeared only once in either the training or test dataset but not both.

5. INDICATIONS FOR USE

EchoSolv AS is a machine learning (ML) and artificial intelligence (AI)-based decision support software indicated for use as an adjunct to echocardiography for assessment of severe aortic stenosis (AS).

When utilized by an interpreting physician, this device provides information to facilitate rendering an accurate diagnosis of AS. Patient management decisions should not be made solely on the results of the EchoSolv AS analysis.

EchoSolv AS includes both the algorithm based AS phenotype analysis, and the application of recognized Aortic Stenosis clinical practice guidelines.

Limitations: EchoSolv AS is not intended for patients under the age of 18 years or those who have previously undergone aortic valve replacement surgery.

6. SUBSTANTIAL EQUIVALENCE

6.1 COMPARISON OF INTENDED USE

This section summarizes the similarities and differences between EchoSolv AS and the predicated device in relation to intended use and indications for use, and a rationale on why the differences raise no new concerns for its safety and performance.

Both devices have the same intended use. Both devices are decision support software which are intended to, based on echocardiogram data, indicate whether there is evidence of a cardiovascular disease as an aid in diagnosis.

The subject device has a similar indication for use to the predicate device. Both devices are machine learning decision support software designed as adjuncts to echocardiography, aiding interpreting physicians in diagnosing specific cardiac conditions. The subject device is indicated for severe aortic stenosis (AS), while the predicate device is indicated for coronary artery disease (CAD). Neither device is meant for primary diagnosis, interpreting physicians retain responsibility for accurate diagnosis and patient management. EchoSolv AS is indicated for use in patients over 18 years old, while the predicate device does not specify age limitations within its intended patient population.

Any differences between the indications for use do not raise any new concerns with regards to safety and effectiveness. Both the subject and predicate device are intended to provide a categorical assessment as to whether the data is suggestive of a probability/possibility of the respective cardiac conditions and aid in the diagnosis.

6.2 COMPARISON OF TECHNICAL CHARACTERISTICS

This section summarizes the similarities and differences between EchoSolv AS and the predicated device in relation to technical characteristics, and a rationale on why the differences raise no new concerns for its safety and performance.

Form Factor and Algorithm Type: Both the subject and predicate device are Software as a Medical Device that incorporate a machine learning and artificial intelligence algorithm for their respective clinical decision support functionalities.

Device Input Modality: Both devices receive input from ultrasound (echocardiography) modalities. The subject device uses a resting transthoracic echocardiogram, the predicate device uses a stress transthoracic echocardiogram. Variations in the type of echocardiogram used are specific for the assessment of the cardiac condition specified in the respective indications for use.

Device Output: Both devices provide a report with output analysis statements formatted in a highly similar manner. For both devices, the output is based on a machine learning and artificial intelligence algorithm which produces a categorical assessment of whether the data is suggestive of a probability/possibility of the intended cardiac disease to support the interpreting physician in the respective clinical workflow. These outputs are returned to the interpreting physician for review and to determine their applicability for use.

Software Integration: Both devices are standalone software applications that use the same method of integration (third-party systems) which allows for input datasets to be sent to their respective standalone software applications. In addition to the data ingest, the subject device allows users to upload csv files for assessment (retrospective analysis only) and also uses the same third-party integration systems to integrate outputs back into end user PACS or reporting software systems. However, this difference does not present any new issues related to safety and effectiveness as in output integration does not impact the clinical functionality or the intended use of the device.

Device Input: Both devices use echocardiogram data as a form of input; the subject device uses additional basic patient demographic inputs (age and body surface area (height and weight)). The subject device's input are measurements taken by a sonographer/echocardiographer from an echocardiogram for algorithm analysis. The predicate device provides software functionalities to compute measurements semi-automatically from the echocardiographic image for subsequent analysis by the algorithm. In both devices, the measurements are derived from a similar image modality (i.e., echocardiography), and all measurements are subject to review and approval by a trained clinical user prior to its input to the algorithm. The difference in how device input is acquired does not present new issues related to safety and effectiveness as both devices provide a categorical assessment as to whether the data indicated a possibility/probability to aid in the diagnosis of each device's respective cardiac conditions.

7. PERFORMANCE DATA

7.1 SOFTWARE VERIFICATION AND VALIDATION TESTING

Software verification and validation activities were performed and documented in accordance with the FDA Guidance "Content of Premarket Submissions for Device Software Functions". Based on this guidance, EchoSolv AS was assessed to represent a "Basic Documentation Level", since a failure or latent flaw of the device software function(s) would not present a hazardous situation with a probable risk of death or serious injury to either a patient, user of the device or others in the environment of use, prior to the implementation of risk control measures.

7.2 STANDALONE PERFORMANCE TESTING

Standalone performance testing was performed in accordance with 21 CFR §892.2060 special control 1(iv). The objective of the standalone performance testing was to assess the native system performance of the EchoSolv AS model in its ability to detect Severe AS.

Standalone performance of EchoSolv AS was performed and evaluated on an independent retrospective cohort study. Overall, 6,268 studies were included in the analysis (mean age 74.95±13.98 years, inclusive of 3,172 men (50.61%) and 3,095 women (49.38%), who were predominately Caucasian (78.61%) followed by African American (5.47%), Hispanic (2.49%) and Asian (1.82%) and Other (11.60%). One study did not have gender or ethnicity disclosed.

The reference standard was established using the assessment of the presence or absence of severe aortic stenosis (defined as an AVA≤1 cm^2) by US board certified cardiologists, who reviewed and verified the echocardiographic data and hemodynamic profile of the study cohort, and were blinded to the device output. Of the 6,262 studies, 2,483 (39.6%) had an AVA ≤1.0cm^2 and 3,779 (60.4%) had an AVA >1.0cm^2. A verification analysis of the reference standard was performed on an additional cohort, with results provided in the device labelling.

The primary endpoint of the study, a standalone Receiver Operating Characteristic (ROC) curve was generated. Area under the receiver operating characteristic (AUROC) curve were computed via the trapezoidal approximation with 95% confidence intervals (CIs). Diagnostic likelihood ratios (DLR) were calculated for each device output (low, medium and high), with 95% CIs. Cochrane-Armitage Trend Test was performed to test for a trend in probability across the device outputs. AUROC with 95% Cis were generated for the following subgroups: age, sex, ethnicity, LVEF and BMI.

The EchoSolv AS model achieved a native system performance of 0.948 (95% CI: 0.943-0.952) AUROC. Sensitivity and specificity at the high probability threshold were 0.801(95%CI: 0.786-0.818) and 0.923 (95%CI: 0.915-0.932), respectively At the low, medium and high probability outputs, the DLR were 0.067 (95% CI: 0.057-0.080), 0.935 (95%CI: 0.829-1.05) and 10.3 (95%CI: 9.22-11.50), respectively. The Cochran-Armitage Trend Test yielded a test statistic of 41.362 p: <0.0001.

EchoSolv AS performed consistently across all subgroups, refer to the results in the table below.

Subgroups	Variations	N	AUROC (95% CI)
Age	18-65 years	1295	0.954 (0.941 - 0.966)
	≥65 years	4973	0.942 (0.936 - 0.948)
Sex	Male	3172	0.945 (0.937 - 0.952)
	Female	3095	0.954 (0.947 - 0.961)
Race	White	4927	0.949 (0.943 - 0.954)
	Black	343	0.953 (0.924 - 0.977)
	Asian	114	0.970 (0.938 - 0.992)
	Hispanic	156	0.965 (0.937 - 0.986)
	Other	727	0.921 (0.901 - 0.937)
LVEF	<30%	421	0.914 (0.883 - 0.941)
	≥30 to <50%	929	0.939 (0.925 - 0.953)
	≥50%	4887	0.950 (0.945 - 0.956)
BMI	18-25 kg/m^2	1866	0.952 (0.943 - 0.961)

	>25 to 30 kg/m^2	2075	0.951 (0.942 - 0.959)
	>30 to 35 kg/m^2	1121	0.936 (0.922 - 0.949)
	>35 kg/m^2	888	0.947 (0.932 - 0.960)
Inputs	Minimum inputs	6,268	0.931 (0.925 - 0.937)
	All available inputs	6,268	0.948 (0.942 - 0.952)

The predicate device achieved a native system performance of 0.927 AUROC. Based on the standalone performance testing, the EchoSolv AS model achieved a greater native system performance than that of the predicate device.

7.3 CLINICAL PERFORMANCE TESTING

Clinical performance testing was performed in accordance with 21 CFR §892.2060 special control 1(ii) and 1(iii). The objective of the performance testing was to evaluate the diagnostic performance of readers when interpreting TTE studies, with and without the assistance of EchoSolv AS. Clinical performance testing was performed at one investigational site in the US, to ensure the test data was independent from the training dataset.

Clinical performance of EchoSolv AS was evaluated in a fully-crossed, multi-reader multi case (MRMC) study. The study evaluated the performance of five readers (board-certified cardiologists) in their ability to identify severe AS in a dataset of 200 retrospective transthoracic echocardiogram (TTE) studies. The total test dataset was reviewed by two board certified cardiologists to confirm the presence and severity of Severe AS. The MRMC dataset consisted of 100 disease cases (confirmed Severe AS) and 100 control studies (confirmed no Severe AS). The dataset was inclusive of 101 women (50.5%) and 99 men (49.5%) with a mean age of 73.55±12.5 years, who were predominately Caucasian (86.5%), followed by African American (10.5%) and Hispanic or Latino (2.5%). One study (0.5%) did not have ethnicity disclosed.

The primary endpoint of the study, ROC curves were generated and compared between paired reads evaluated with and without EchoSolv AS. All AUROCs were computed via the trapezoidal approximation with 95% CIs. AUROC for unassisted and assisted reads were 0.865 (95%CI: 0.837-0.893) and 0.883 (95%CI: 0.857-0.909), respectively. When cardiologist readers were provided with EchoSolv AS to assist with their interpretation of a TTE, there was an improvement in all study endpoints: mean AUROC (0.018±0.010, 95%CI: 0.037-0.001; p=0.064). The predicate device showed a mean improvement of 0.054; both devices showed an improvement in reader AUROC and accuracy when assisted. Reader concordance (agreement) was evaluated using Fleiss' Kappa. Kappa for unassisted and assisted reads were 0.641 (95%CI: 0.597-0.685) and 0.667 (95%CI: 0.623-0.711), respectively. When assisted with EchoSolv AS, there was an improvement in reader concordance of 0.027.

The results of the standalone and reader performance testing demonstrated that the EchoSolv AS device meets established specifications necessary for consistent performance to achieve its intended use and confirmed that the technological difference do not raise any new questions of safety and effectiveness.

8. CONCLUSION OF SUBSTANTIAL EQUILAVENCE DETERMINATION

Non-clinical and clinical performance data demonstrates that the EchoSolv AS device is substantially equivalent to the predicate device Echo Go Pro (K201555). EchoSolv AS has the same intended use, and similar indications for use and technological characteristics as its predicate device. Any differences identified in the indications for use and technical characteristics do not impact the intended use of the device and does not raise any new questions relating to its safety and effectiveness when used as intended.

Therefore, it can be concluded that EchoSolv AS is substantially equivalent to the predicate device, EchoGo Pro.