Cleerly, Inc.
% John Smith, M.D., J.D.
Partner
Hogan Lovells US LLP
555 Thirteenth Street, NW
WASHINGTON DC 20004

October 2, 2020

Re: K202280
Trade/Device Name: Cleerly Labs v2.0
Regulation Number: 21 CFR 892.2050
Regulation Name: Picture archiving and communications system
Regulatory Class: Class II
Product Code: LLZ
Dated: August 11, 2020
Received: August 11, 2020

Dear Dr. Smith:

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 (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 located 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.

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 803) for

devices or postmarketing safety reporting (21 CFR 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 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 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,

For

Thalia T. Mills, Ph.D.
Director
Division of Radiological Health
OHT7: Office of In Vitro Diagnostics
and Radiological Health
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: 06/30/2023
See PRA Statement below

510(k) Number *(if known)*

K202280

Device Name

Cleerly Labs v2.0

Indications for Use *(Describe)*

Cleerly Labs is a web-based software application that is intended to be used by trained medical professionals as an interactive tool for viewing and analyzing cardiac computed tomography (CT) data for determining the presence and extent of coronary plaques (i.e., atherosclerosis) and stenosis in patients who underwent Coronary Computed Tomography Angiography (CCTA) for evaluation of CAD or suspected CAD. This software post processes CT images obtained using any Computed Tomography (CT) scanner. The software provides tools for the measurement and visualization of coronary arteries.

The software is not intended to replace the skill and judgment of a qualified medical practitioner and should only be used by people who have been appropriately trained in the software's functions, capabilities and limitations. Users should be aware that certain views make use of interpolated data. This is data that is created by the software based on the original data set. Interpolated data may give the appearance of healthy tissue in situations where pathology that is near or smaller than the scanning resolution may be present.

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

X 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 K202280

Cleerly's Cleerly Labs v2.0

1. General Information

Table 1: Cleerly, Inc Information

Submitter	Cleerly, Inc.
Address	101 Greenwich St, Suite 11C New York, NY 10006
Phone/Fax #	479-221-3262
Contact Person	Kimberly Elmore
Date Prepared	September 22, 2020

2. Device Information

Table 2: Cleerly Labs v2.0 Information

Trade Name	Cleerly Labs v2.0 (K202280)
Common Name	System, Image Processing, Radiological
Regulation Number	21 CFR 892.2050 *Picture Archiving And Communications System*
Regulatory Class	Class II
Product Code	LLZ

3. Predicate Device Information

Table 3: Predicate Device Information

Trade Name	Cleerly Labs (K190868)
Common Name	System, Image Processing, Radiological
Regulation Number	21 CFR 892.2050 *Picture Archiving And Communications System*
Regulatory Class	Class II
Product Code	LLZ

No reference devices were used in this submission.

4. Device Description

Cleerly Labs is a post-processing web-based software application that enables trained medical professionals to analyze 2D/3D coronary images acquired from Coronary Computed Tomography Angiography (CCTA) scans. The software is a post-processing tool that aids in determining treatment paths for patients suspected to have coronary artery disease (CAD).

Cleerly Labs utilizes machine learning and simple rule-based mathematical calculation components which are performed on the backend of the software. The software applies deep learning methodology to identify high quality images, segment and label coronary arteries, and segment lumen and vessel walls. 2D and 3D images are presented to the user for review and manual editing. This segmentation is designed to improve efficiency for the user, and help shorten tedious, time-consuming manual tasks.

The user is then able to edit the suggested segmentation as well as adjust plaque thresholds, and demarcate stenosis, stents, and chronic total occlusions (CTOs) as well as select dominance and indicate coronary anomalies. Plaque, stenosis, and vessel measurements are output based the combination of user-editable segmentation and user-placed stenosis, stent, and CTO markers. These outputs are mathematical calculations and are not machine-learning based.

Cleerly Labs provides a visualization of the Cleerly Labs analysis in the CORONARY Report. The CORONARY Report uses data previously acquired from the Cleerly Labs image analysis to generate a visually interactive and comprehensive report that details the atherosclerosis and stenosis findings of the patient. This report is not intended to be the final report (i.e., physician report) used in patient diagnosis and treatment. Cleerly Labs provides the ability to send the text report page of the CORONARY Report to the user's PACS system.

Cleerly Labs software does not perform any functions that could not be accomplished by a trained user with manual tracing method or other commercially available software. Rather, it represents a more robust semi-automatic software intended to enhance the performance of time-intensive, potentially error-prone, manual tasks, thereby improving efficiency for medical professionals in the assessment of coronary artery disease (CAD).

5. Intended Use / Indications for Use

Cleerly Labs is a web-based software application that is intended to be used by trained medical professionals as an interactive tool for viewing and analyzing cardiac computed tomography (CT) data for determining the presence and extent of coronary plaques (i.e. atherosclerosis) and stenosis in patients who underwent Coronary Computed Tomography Angiography (CCTA) for evaluation of CAD or suspected CAD. This software post processes CT images obtained using any Computed Tomography (CT) scanner. The software provides tools for the measurement and visualization of coronary arteries.

The software is not intended to replace the skill and judgment of a qualified medical practitioner and should only be used by people who have been appropriately trained in the software's functions, capabilities and limitations. Users should be aware that certain views make use of interpolated data. This is data that is created by the software based on the original data set. Interpolated data may give the appearance of healthy tissue in situations where pathology that is near or smaller than the scanning resolution may be present.

The underlined word is the only change compared to the intended use/indications for use of the predicate device (K190868) to indicate that coronary plaques are related to atherosclerosis. This change to the indications for use is not intended to expand or modify the indications for use of the device, but rather was made to support the terminology used within the CORONARY report, which refers to coronary plaques analysis as being findings related to atherosclerosis.

6. Software Functionality

In Cleerly Labs, users can edit the lumen and vessel walls of the suggested segmentation, and demarcate stenosis and stents, to more efficiently perform coronary analysis. Users are provided with navigation and editing/visualization tools to aid in image analysis. Plaque (i.e., atherosclerosis) and stenosis measurements are outputted based on the fully user-editable segmentation of the coronary artery. The user is also provided with the ability to indicate coronary anatomical findings.

Following the completion of study analysis, an interactive CORONARY Report is generated (the subject device of this submission). The CORONARY Report summarizes the analysis data from Cleerly Labs by reporting them as findings on atherosclerosis and stenosis, which may be used as supporting data in the evaluation of CAD. Components of the CORONARY Report include data visualization and reporting features. **Table 4** below compares the key features of the subject and predicate devices.

Table 4: Subject vs Predicate Device

Feature	Cleerly Labs v2.0 Device (Subject device)	Cleerly Labs Device (K190868)
Operating Platform	Client-Server Google Chrome Application	Client-Server Google Chrome Application
Image Input	DICOM 3.0 Compliant (or higher)	DICOM 3.0 Compliant (or higher)
Image Acquisition	CT Images	CT Images
Secured Network Sever Integration	Yes	No
Study Analysis Tools – Navigation	Yes	Yes
Study Analysis Tools – Editing/ Visualization	Yes	Yes
2D Imaging	Yes	Yes
3D Imaging	Yes	Yes
Multiplanar Reformat (MPR)	Yes	Yes
Segmentation of Region of Interest	Yes	Yes
Plaque Composition Overlay	Yes	Yes
Hounsfield Unit (HU)	Yes	Yes
Distance Measurements	Yes	Yes
Volumetric Measurements	Yes	Yes
Remodeling Index	Yes	Yes
Stenosis	Yes	Yes
Coronary Anatomical Findings	Yes	No

Feature	Cleerly Labs v2.0 Device (Subject device)	Cleerly Labs Device (K190868)
Coronary Report	Yes	No

7. Performance Data

Software verification and validation activities were performed in accordance with the standards identified in **Table 5** below, in addition to the FDA Guidance documents, "Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices" and "Content of Premarket Submission for Management of Cybersecurity in Medical Devices."

The software was considered as a "moderate" level of concern, since "a malfunction of, or a latent design flaw in, the Software Device could lead to an erroneous diagnosis or a delay in delivery of appropriate medical care that would likely lead to Minor Injury."

During product development, potential hazards were controlled by a risk management plan including activities of risk analysis, risk mitigation, verification and risk-benefit analysis. Verification, validation and usability testing data demonstrated that the device meets all of its specification, including compliance with the following standards in **Table 5**.

Table 5: Standards applied to device development

Standard Designation Number and Date	Standard Developing Organization	Title of Standard	FDA Recognition Number
PS 3.1-3.20 (2016)	NEMA	Digital Imaging And Communications In Medicine (DICOM) Set	12-300
62304:2005/A1:2016	ANSI AAMI IEC	Medical Device Software - Software Life Cycle Processes [Including Amendment 1 (2016)]	13-79
14971 Third Edition 2019-12	ISO	Medical Devices - Application Of Risk Management To Medical Devices	5-125
62366-1 Edition 1.0 2015-02	IEC	Medical Devices - Part 1: Application Of Usability Engineering To Medical Devices [Including CORRIGENDUM 1 (2016)]	5-114
TIR 57:2016	AAMI	Principles for medical device security – Risk management	13-83

Additionally, the performance of the software was previously compared to ground truth results produced by expert readers (K190868). Pearson Correlation Coefficients and Bland-Altman Agreements between Cleerly

Labs and expert reader results are reproduced in **Table 6**. No algorithms or simple mathematical calculations that were already reviewed by the FDA in the original Cleerly Labs (K190868) submission were changed.

Table 6: Cleerly Labs Performance

Output	Pearson Correlation Coefficient	Bland-Altman Agreement
Lumen Volume	0.91	96%
Vessel Volume	0.93	97%
Total Plaque Volume	0.85	95%
Calcified Plaque Volume	0.94	95%
Non-Calcified Plaque Volume	0.74	95%
Low-Density-Non-Calcified Plaque Volume	0.53	97%

Non-Clinical Testing

Risk assessment, performance, cybersecurity, and usability of Cleerly Labs v2.0 have been evaluated and verified using the same approach as implemented for the predicate device and in accordance with software pre-defined specifications and applicable performance standards through software verification and validation testing.

The following is a summary of the nonclinical testing performed:

- Verification and validation testing confirmed that the software requirements fulfilled the pre-defined acceptance criteria.
- A usability test was conducted with intended users of the device to ensure the clinical acceptability of the device.
- A cybersecurity penetration test was conducted to ensure that there were no unidentified vulnerabilities and that the appropriate risk control measures were implemented to protect from known vulnerabilities when the device is subject to a source of threat.

The nonclinical verification and validation test results established that the device meets its design requirements and intended use. During the development, potential hazards were evaluated and controlled through risk management activities. The performance testing demonstrates that the device meets all its specifications.

Clinical Testing

No clinical testing was conducted to demonstrate safety or effectiveness as the device's non-clinical testing was sufficient to support the intended use of the device.

8. Cybersecurity

Cleerly Labs has implemented security features for device and data protection. Cybersecurity requirements, risk analysis, and mitigation was addressed in accordance with FDA guidance, "Content of Premarket Submission for Management of Cybersecurity in Medical Devices".

9. Conclusions

Cleerly Labs v2.0 is as safe and effective as the original Cleerly Labs (K190868). Cleerly Labs v2.0 has the same intended uses and similar indications, technological characteristics, and principles of operation as its predicate device. The minor difference in indications do not alter the intended use of the device and do not affect its safety and effectiveness when used as labeled. In addition, the minor technological differences between Cleerly Labs v2.0 and its predicate devices raise no new issues of safety or effectiveness. No changes have been made to machine learning algorithms or simple mathematical equations. Cleerly Labs v2.0 is as safe and effective as the original Cleerly Labs (K190868). Thus, Cleerly Labs v2.0 is substantially equivalent.