March 31, 2023

Translational MRI, LLC
% Andrew Wu
General Manager, Software Consultant
Rook Quality Systems Taiwan Branch
Office 802, No. 502, Sec 2, Ren'ai Road, Linkou District
New Taipei City, 24
TAIWAN

Re: K211059
Trade/Device Name: CereFlow™ V1.2
Regulation Number: 21 CFR 892.2050
Regulation Name: Medical image management and processing system
Regulatory Class: Class II
Product Code: LLZ
Dated: February 15, 2023
Received: February 27, 2023

Dear Andrew Wu:

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,

Daniel M. Krainak, Ph.D.
Assistant Director
Magnetic Resonance and Nuclear Medicine Team
DHT8C: Division of Radiological Imaging
and Radiation Therapy Devices
OHT8: Office of 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)*
K211059

Device Name
CereFlow™ V1.2

Indications for Use *(Describe)*
CereFlow™ V1.2 is an image processing software package to be used by trained professionals including but not limited to physicians and medical technicians. The software runs on a standard "off-the-shelf" workstation and can be used to perform image viewing, processing, image collage and analysis of medical images. Data and images are acquired through DICOM compliant imaging devices and modalities.
CereFlow™ V1.2 provides visualization and automatic semi-quantitative quantification of Arterial Spin Labeling (ASL) data acquired from Magnetic Resonance Imaging (MRI) scanners at 1.5T and 3.0T.
CereFlow™ V1.2 is able to process single-delay and multi-delay ASL data to generate multiple perfusion parameters (Cerebral Blood Flow/CBF, Arterial Transit Time/ATT), and exports the results of ASL image analysis as DICOM images and in a report.

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.**

This section applies only to requirements of the Paperwork Reduction Act of 1995.

***DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.***

The burden time for this collection of information is estimated to average 79 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
*PRAStaff@fda.hhs.gov*

*"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."*

# 510(k) Summary

**Date Prepared**

Feb 13th, 2023

**Manufacturer and 510(k) Owner**

Translational MRI, LLC

3200 S Sepulveda Blvd Suite K30

Los Angeles, CA 90034

Official Contact: Zhihai Ricky Xiang

Telephone +1-530-760-9006

Email zhihaixiang@transmri.com

**Representative/Consultant**

Andrew Wu, General Manager |Principal Software Consultant

Rook Quality Systems Taiwan Branch

Office 802, No. 502, Sec 2, Ren'ai Road, Linkou District, New Taipei City, 244, R.O.C

Telephone: +886-912-258980

Email: andrew.wu@rookqs.com

**Device Information**

| | |
|---|---|
| Trade/Proprietary Name | CereFlow™ V1.2 |
| Classification Name | Medical image management and processing system |
| Regulation Number | 21 CFR 892.2050 |
| Product Code(s) | LLZ |
| Classification | Class II |
| Review Panel | Radiology Device |
| Use | Prescription |

**Indications for Use**

CereFlow™ V1.2 is an image processing software package to be used by trained professionals including but not limited to physicians and medical technicians. The software runs on a standard "off-the-shelf" workstation and can be used to perform image viewing, processing, image collage and analysis of medical images. Data and images are acquired through DICOM compliant imaging devices and modalities.

CereFlow™ V1.2 provides visualization and automatic semi-quantitative quantification of Arterial Spin Labeling (ASL) data acquired from Magnetic Resonance Imaging (MRI) scanners at 1.5T and 3.0T.

CereFlow™ V1.2 is able to process single-delay and multi-delay ASL data to quantify multiple perfusion parameters (Cerebral Blood Flow/CBF, Arterial Transit Time/ATT), and exports the results of ASL image analysis as DICOM images and in a report.

**Device Description**

CereFlow™ V1.2 is a medical viewing, analysis and processing, Medical Image Management and Processing System software implemented in Java and Java tools, compliant with the DICOM standard and running on standard PC (Windows 10 64-bit). CereFlow™ V1.2 is intended for visualization and automatic semi-quantitative quantification of arterial spin labeling (ASL) data acquired from MRI scanners at 1.5T and 3.0T. CereFlow™ V1.2 is able to process single-delay and multi-delay ASL data to generate multiple perfusion parameters (Cerebral Blood Flow/CBF, Arterial Transit Time/ATT), and exports the results of ASL image analysis as DICOM images and in a report.

The software consists of three modules, namely the interface module, the report module, and the database module. The interface module is responsible for interacting with users and helping them to manage cases easily. The report module is responsible for processing raw DICOM images and calculating parameters to generate ATT/CBF images which can be exported as DICOM images and in a report. Image pre-processing includes sorting and checking files to ensure designated protocols are used, having a complete set of reference (M0) image and label/control images, and implementing motion correction. The calculation of CBF and ATT parameters is implemented using the standard one-compartment perfusion model recommended by the consensus ASL white paper and standard nonlinear iterative curve-fitting approach for multi-delay ASL data. For single-delay ASL data, CBF is calculated according to the standard one-compartment perfusion model recommended by the ASL white paper.

The database module is responsible for managing cases including storing, sorting, query and deleting case data. The software applies an arrange of quality control parameters to ensure the quality of acquired ASL data and processed results. These quality control parameters can also be exported as a report.

The entire workflow is processed locally, and the report module shall only allow raw ASL imaging data importing from DICOM CD-R only. CereFlow™ V1.2 is not intended to interface with DICOM servers, MR scanners, or PACS over wired network. It is a standalone software application designed to run on a dedicated PC workstation.

CereFlow™ V1.2 is for prescription use. Information provided by CereFlow™ V1.2 is not intended in any way to eliminate, replace, or substitute for, in whole or in part, the healthcare provider's judgment and analysis of the patient's condition.

**Technological Characteristics**

The CereFlow™ V1.2 is a software-only device that runs on a workstation computer that meets the minimum requirements.

The CereFlow™ V1.2 receives DICOM datasets acquired from MRI scanners at 1.5T and 3.0T and provides visualization and automatic semi-quantitative quantification of ASL data to the physicians. The user can import single-delay and multi-delay ASL data, and export the results of ASL image analysis as DICOM images and in a PDF report.

CereFlow™ V1.2 does not contact the patient, nor does it control any life sustaining devices. Information provided by the CereFlow™ V1.2 is not intended in any way to eliminate, replace, or substitute for, in whole or in part, the healthcare provider's judgment and analysis of the patient's condition.

**Predicate Device Identification**

The CereFlow™ V1.2 is substantially equivalent to the Olea Sphere V3.0 (K152602).

The CereFlow™ V1.2 has the same intended use and similar indications, technological characteristics, and principles of operation to the device cleared in K152602. The differences in technological characteristics between the subject device and the predicate device do not raise new issues of safety and effectiveness. Therefore, K152602 is listed as the predicate device for the CereFlow™ V1.2.

**Equivalence to Predicate Device**

Translational MRI, LLC submits the following information to demonstrate that the CereFlow™ V1.2 is substantially equivalent to the following legally marketed predicate device:

| 510(k) Number | Predicate Device Name/Manufacturer | Primary Predicate |
|---|---|---|
| K152602 | Olea Sphere V3.0 | Yes |

Translational MRI, LLC intends to use the reference device listed below for validation purpose. Translational MRI, LLC intends to compare the performance (i.e. quantification accuracy of CBF maps) of CereFlow™ V1.2 to the performance of GE 3D ASL at each post-labeling delay using the ASL data acquired via GE scanner.

| 510(k) Number | Predicate Device Name/Manufacturer | Reference Device |
|---|---|---|
| K092925 | 3D ASL/GE Healthcare | Yes |

The subject device has the same intended use and similar technological characteristics (e.g. software for visualization and quantification of perfusion parameters of human brain acquired from MR scanners of high magnetic field strength (1.5T, 3.0T) using designated ASL protocol) to the device cleared in K152602. The differences in technological characteristics between the subject device and predicate device are explained below.

- In the predicate device, the MR image acquired by protocols of conventional MRI, ASL, and Diffusion Weighted Imaging (DWI), whereas the subject device receives MR images only based on ASL protocol acquired from commercial MRI scanners at 1.5T and 3.0T. Hence, this technological difference does not raise new issues of safety and effectiveness as compared to the predicate device.
- In the predicate device, the image process algorithm can only process single-delay ASL data, whereas the subject device is able to process single-delay and multi-delay ASL data to generate multiple perfusion parameters (Cerebral Blood Flow/CBF, and Arterial Transit Time/ATT). Additional verification tests were carried out to demonstrate that the subject device yields accurate quantitative perfusion parameters using multi-delay ASL data. Hence, this technological difference does not raise new issues of safety and effectiveness as compared to the predicate device.
- In the predicate device, the software outputs the perfusion map and allows user to customize the segmentation masks based on user defined areas, whereas the subject device only outputs multi-parametric maps of the whole brain region. Hence this technological difference does not raise new issues of safety and effectiveness as compared to the predicate device
- The predicate device can be operational on Windows and Linux, while the subject device can be operational on Windows only. Hence, this technological difference does not raise new issues of safety and effectiveness as compared to the predicate device.
- The predicate device can acquire images from multiple modalities or network using DICOM protocol, while the subject device can only import DICOM images via DICOM CD-R. Hence, this technological difference does not raise new issues of safety and effectiveness as compared to the predicate device.

The subject device does not have the following functionalities whereas the predicate has:

- Permeability post-processing (the calculation of parameters related to leakage of injected contrast material from intravascular to extracellular space)
- Relaxometry post-processing (the calculation of parameters related to the MR longitudinal and transversal relaxation time and rate)
- Metabolic post-processing (the calculation of parameters related to the fat signal fraction based on a MR technique using opposed-phase imaging)

Translational MRI, LLC believes that the CereFlow™ V1.2 described in this notification and for use under the conditions of the proposed labeling is substantially equivalent to the legally marketed predicate device (K152602) based on the information summarized in the following Table 1 – Substantial Equivalence Summary.

Table 1 – Substantial Equivalence Summary

| | Subject Device | Primary Predicate Device |
|---|---|---|
| **Trade Name** | **CereFlow™ V1.2** | **Olea Sphere V3.0** |
| **Manufacturer** | **Translational MRI, LLC** | **Olea Medical** |
| **510(k) Number** | **K211059** | **K152602** |
| **Class** | II | II |
| **Device Classification Name** | Medical image management and processing system | Medical image management and processing system |
| **Regulation Number** | 892.2050 | 892.2050 |
| **Product Code** | LLZ | LLZ |
| **Indications for Use** | CereFlow™ V1.2 is an image processing software package to be used by trained professionals including but not limited to physicians and medical technicians. The software runs on a standard "off-the-shelf" workstation and can be used to perform image viewing, processing, image collage and analysis of medical images. Data and images are acquired through DICOM compliant imaging devices and modalities.<br><br>CereFlow™ V1.2 provides visualization and automatic semi-quantitative quantification of Arterial Spin Labeling (ASL) data acquired from Magnetic Resonance Imaging (MRI) scanners at 1.5T and 3.0T. It is recommended the minimal SNR of perfusion images in white matter should be equal to or larger than 1. | Olea Sphere V3.0 is an image processing software package to be used by trained professionals including but not limited to physicians and medical technicians. The software runs on a standard "off-the-shelf" workstation and can be used to perform image viewing, processing, image collage and analysis of medical images. Data and images are acquired through DICOM compliant imaging devices and modalities.<br><br>Olea SphereV3.0 provides both viewing and analysis capabilities of functional and dynamic imaging datasets acquired with MRI or other relevant modalities, including a Diffusion Weighted Imaging (DWI) / Fiber Tracking Module and a Dynamic Analysis Module (e.g. dynamic exogenous or endogenous contrast enhanced imaging data for MRI and CT). The DWI Module is used to visualize local water diffusion properties from the analysis of Diffusion Weighted MRI data. The Fiber Tracking feature utilizes the directional dependency of the diffusion to display the white matter structure in the brain or more generally the central nervous system. The Dynamic |

| | | |
|---|---|---|
| | CereFlow™ V1.2 is able to process single-delay and multi-delay ASL data to generate multiple perfusion parameters (Cerebral Blood Flow/CBF, Arterial Transit Time/ATT), and exports the results of ASL image analysis as DICOM images and in a report. | Analysis Module is used for visualization and analysis of dynamic imaging data, showing properties of changes in contrast while repeating acquisitions (e.g. over time with or without variable acquisition parameters) where such techniques are useful or necessary. This functionality is referred to as:<br><br>Perfusion Module – the calculation of parameters related to tissue blood flow (perfusion) and tissue blood volume.<br><br>Permeability Module – the calculation of parameters related to leakage of injected contrast material from intravascular to extracellular space.<br><br>Arterial Spin Labeling (ASL) Module - the calculation of Cerebral Blood Flow/CBF related to tissue flow based on a MR technique using the water in arterial blood as endogenous tracer to evaluate the perfusion.<br><br>Relaxometry Module – the calculation of parameters related to the MR longitudinal and transversal relaxation time and rate.<br><br>Metabolic Module – the calculation of parameters related to the fat signal fraction based on a MR technique using opposed-phase imaging. |
| **Physical Characteristics** | Same | Software package that operates on off-the-shelf workstation |
| **Computer** | Same | PC Compatible |

| | | |
|---|---|---|
| **Image Processing Location** | Same | Onsite on the desktop computer as local application |
| **DICOM Standard Compliance** | Same | The software processes DICOM compliant image data |
| **Computer OS Compatibility** | Windows | Windows, Linux |
| **Modalities** | Arterial Spin Labeling | Multi-modality |
| **User Interface** | Same | The software is designed for use on a radiology workstation. |
| **Protocols** | Same | Predefined or specific acquisition protocol settings |
| **Image Processing Algorithm Description** | Calculation of parameters related to blood flow based on a MR technique using the water in arterial blood as endogenous tracer to evaluate the perfusion.<br><br>Process single-delay and multi-delay ASL data to quantify multiple perfusion parameters (Cerebral Blood Flow/CBF, and Arterial Transit Time/ATT) | Calculation of parameters related to blood flow based on a MR technique using the water in arterial blood as endogenous tracer to evaluate the perfusion.<br><br>Process single-delay ASL data and quantify Cerebral Blood Flow/CBF |
| **Image Acquisition** | Same | The acquisition remains the same, i.e. the image processing can be generated from multiple modalities and with predefined or specific acquisition protocol settings. |
| **Region of Interest** | User cannot select region of interest. | User can customize the segmentation masks based their selected region of interest. |

**Performance Data**

The subject device is designed in conformance with:

- ACR/NEMA Digital Imaging Communications in Medicine (DICOM) Version 3.1
- ISO 14971:2019 – Medical Devices – Application of Risk Management to Medical Devices
- IEC 62304:2006/AMD 1:2015 – Medical Device Software – Software Life-Cycle Processes

All specifications of the CereFlow™ V1.2 were verified by a number of tests before release. Non-clinical testing including verification tests on:

- System-level, functional testing
    - DICOM images importation
    - Case management
    - Automatic semi-quantitative quantification
    - Multiple perfusion parameters calculation

    - Visualization of ASL image
    - Report generation
- Digital phantom validation study
- Instrumental validation studies

In addition, retrospective clinical studies were conducted to validate performance of the CereFlow™ V1.2 meeting the acceptance criteria.

Translational MRI, LLC believes that the aforementioned non-clinical and clinical testing demonstrates that the subject device is designed in such a way that, when used under the conditions and for the purposes intended, the safety and effectiveness, as well as the performance characteristic of the subject device is substantially equivalent to the predicate device.

**Substantial Equivalence Conclusion**

CereFlow™ V1.2 has the same intended use and performance characteristics as the predicate device. Based on the software verification performed, it can be concluded that the differences in technological characteristics between the CereFlow™ V1.2 and the predicate device do not raise different questions of safety and effectiveness under specified use conditions. The indications for use, technological characteristics, and performance characteristics for the CereFlow™ V1.2 are assessed to be substantially equivalent to the predicate device. There is no identified hazard that require additional benefit versus risk analysis in support of substantial equivalence.