Cercare Medical ApS
℅ Jennifer Willner
President
JW Regulatory Consulting LLC
406 Wacouta Street, Suite 417
SAINT PAUL MN 55101

May 17, 2021

Re: K202793
Trade/Device Name: Cercare Medical Neurosuite (CMN) with Capillary Function
Regulation Number: 21 CFR 892.2050
Regulation Name: Medical Image Management and Processing System
Regulatory Class: Class II
Product Code: LLZ
Dated: September 18, 2020
Received: September 22, 2020

Dear Jennifer Willner:

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, PhD
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: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K202793

Device Name
Cercare Medical Neurosuite (CMN) with Capillary Function

Indications for Use *(Describe)*

Cercare Medical Neurosuite and associated modules, including the Capillary Function module, is an image processing software package to be used by trained professionals, including physicians and medical technicians.

The software package runs on standard off-the-shelf computer or a virtual platform, such as VMware, and can be used to perform image viewing, processing, and analysis of images. Data and images are acquired through DICOM (Digital Imaging and Communications in Medicine) compliant MR imaging devices.

Cercare Medical Neurosuite provides viewing capabilities, whereas the Capillary Function module provides analysis capabilities for functional and dynamic imaging datasets acquired with MRI including a Diffusion Weighted MRI (DWI) Module and a Dynamic Analysis Module (dynamic contrast-enhanced imaging data for MRI).

The Capillary Function module is used for visualization and analysis of dynamic imaging data, showing properties of changes in contrast over time. This functionality includes calculation of parameters related to tissue flow (perfusion) and tissue blood volume. In addition, the Capillary Function module's DWI technology is used to visualize local water diffusion properties from the analysis of diffusion-weighted MRI data.

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.

5.0 510(K) SUMMARY

510(k) Number: K202793

Date Prepared: May 14, 2021

Table 1: Submitter Information

Manufacturer:	Cercare Medical ApS Inge Lehmanns Gade 10 DK-8000 Aarhus C Denmark US FDA ERN: Pending	Manufacturer's Contact Person: Mikkel Bo Hansen Chief Scientific Officer Phone: +45 22890125 Email: mbh@cercare-medical.com

Table 2: Device Information

Trade Name	Cercare Medical Neurosuite (CMN) with Capillary Function
Common Name	CMN
Classification Name	Medical image management and processing system
Regulation	21 CFR 892.2050
Product Code	LLZ
Regulatory Classification:	Class II
Device Panel:	Radiology

Cercare Medical Neurosuite is substantially equivalent to iSchemaView's RAPID medical device (**Table 3**). Neither of these have been subject to a design-related recall.

Table 3: Predicate Devices

Predicate Device	Manufacturer	FDA 510(k)
RAPID	iSchemaView	K172477

5.1 Device Description

Cercare Medical Neurosuite is a software-only device designed to streamline medical image processing by providing for the visualization and study of medical images. CMN can be installed on a customer PC or it can be accessed remotely using remote desktop technologies. CMN provides viewing, quantification, analysis and reporting capabilities. CMN is not intended as a dedicated PACS system for long term persistent storage of patient data.

CMN is software that is intended for use by trained professionals, including physicians and medical technicians. The software provides cerebral image processing capabilities. CMN is intended to be used as decision support software only and the clinician continues to provide all treatment decisions.

The software is intended to visualize and study neuroimaging by image viewing and registration of medical images obtained with MRI (Magnetic Resonance Image) technology.

CMN accepts and produces data sets in the DICOM format. DICOM is a standard format for storing and transmitting medical image data in vendor neutral format and is managed by the DICOM Standards Committee.

CMN is a platform that allows for the addition of certain modules for further analysis. One of these modules included in this submission is Capillary Function.

CMN Capillary Function

Capillary Function, when activated in the installed Cercare Medical Neurosuite, provides further functionalities for reading, writing, visualizing and studying medical images.

Capillary Function provides perfusion post-processing technologies, where dynamically acquired perfusion MRI series can be processed to yield information relevant for assessment of the hemodynamic status of a patient.

Capillary Function generates hemodynamic markers, which can be used for management of diseases with possibly compromised hemodynamic function, such as ischemic stroke and tumors.

The generated output maps can be viewed by standard DICOM image viewers. In addition, Capillary Function includes the possibility for post-processing diffusion-weighted imaging (DWI) MRI data. Post-processing of DWI data results in maps reflective of local water diffusion properties. The post-processed DWI-derived maps can be viewed in standard DICOM image viewers. Capillary Function thus works with MRI technology.

5.2 Indications for Use

Cercare Medical Neurosuite and associated modules, including the Capillary Function module, is an image processing software package to be used by trained professionals, including physicians and medical technicians.

The software package runs on standard off-the-shelf computer or a virtual platform, such as VMware, and can be used to perform image viewing, processing, and analysis of images. Data and images are acquired through DICOM (Digital Imaging and Communications in Medicine) compliant imaging devices

Cercare Medical Neurosuite provides viewing capabilities, whereas the Capillary Function module provides analysis capabilities for functional and dynamic imaging datasets acquired with MRI including a Diffusion Weighted MRI (DWI) Module and a Dynamic Analysis Module (dynamic contrast-enhanced imaging data for MRI).

The Capillary Function module is used for visualization and analysis of dynamic imaging data, showing properties of changes in contrast over time. This functionality includes calculation of parameters related to tissue flow (perfusion) and tissue blood volume. In addition, the Capillary Function module's DWI technology is used to visualize local water diffusion properties from the analysis of diffusion-weighted MRI data.

5.3 Technological Characteristics

CMN with Capillary Function provides the following functions:

- processes DICOM images from multiple sources to provide visualization of changes of tissue perfusion, diffusion and change
- receives DICOM images from external DICOM image providers (modalities (MRI Scanners), PACS and Workstations) and sends DICOM images to external image consumers
- storage of status and results, and references therein, in a searchable database

CMN with Capillary Function is a DICOM-compliant PACS software that provides comprehensive functionality to transfer, process and display modality specific imaging data. CMN runs on standard off-the-shelf computer and networking hardware and is entirely independent from MRI or PACS platforms. It supports secure VPN networking or encapsulated Secure Shell (SSH), and seamlessly integrates into an existing radiological data network.

The primary users of CMN software are medical imaging professionals who analyze tissue using MRI images. The images generated by CMN provide additional diagnostic information, which is derived from the temporal/diffusion/density features of the native MRI image.

Differences in Technical Characteristics/Performance with Respect to the Predicate Device

CMN with Capillary Function is identical to the Predicate RAPID (K172477) with the exception of limited functionality regarding diffusion tensor analysis, venous output function (VOF) detection, and the ability to issue PACS queries. The Subject and Predicate devices are based on the same technological elements of viewing, processing and analyzing DICOM image data to assist the clinician during diagnostic procedures.

The following technological difference exists between the subject and predicate devices:

- The UI component of the Predicate Device is thin client-based running in web-browsers dissociated from the backend server. CMN also provides the ability to run a headless backend server for data management and processing. CMN does not however make its GUI available via a webserver, instead the CMN application can also act as a frontend, attaching to a remote CMN backend.
- The computation of perfusion markers rCBF, rCBV, MTT, and Tmax (delay) is believed to be implemented through a different algorithm than the predicate device.
- CMN provides additional perfusion markers (CTH, OEF (model-based), $rCMRO_2$ (model-based), rLeakage, and COV) not currently available in the Predicate Device. These markers originate from the same principles, namely the residue function part of the perfusion post-processing step.

These differences do not impact the intended use or raise new questions with the safety and performance of the device.

5.4 Performance Standards

CMN Capillary Function has been developed in conformance with the following standards and FDA guidance, as applicable:

- ISO 13485:2016, Quality management systems – Requirements for regulatory purposes
- ISO 14971:2012, Medical devices – Application of risk management to medical devices
- IEC 62304:2015, Medical device software – Software lifecycle processes
- IEC 82304-1:2016, Health Software Part 1: General Requirements for Product Safety
- IEC 62366-1:2015, Medical devices – Part 1: Application of usability engineering to medical devices
- NEMA PS 3.1-3.20:2016, Digital Imaging and Communications in Medicine (DICOM)
- Content of Premarket Submissions for Management of Cybersecurity in Medical Devices, October 2018
- Computer-Assisted Detection Devices Applied to Radiology Images and Radiology Device Data – Premarket Notification [510(k)] Submissions, July 2012

5.5 Performance Data

CMN with Capillary Function complies with DICOM (Digital Imaging and Communications in Medicine), developed by the American College of Radiology and the National Electrical Manufacturers Association – NEMA PS 3.1-3.20.

Cercare conducted extensive performance validation testing and software verification and validation testing of the CMN Capillary Function. This performance validation testing demonstrated that the CMN system provides accurate representation of key processing parameters under a range of clinically relevant parameters associated with the intended use of the software. Software performance, validation and verification testing demonstrated that the CMN system met all design requirements and specifications.

Comparative performance testing was performed for the Subject Device with respect to the Predicate Device through bench testing including simulated digital phantoms and retrospective clinical data. Whereas the latter was primarily used for visual inspection due to the relative nature of most perfusion image biomarkers, rigorous testing was conducted through digital phantoms where the true parameter combinations were known. The simulated phantom data included variations of hemodynamic parameter combinations, while simultaneously simulating various experimental conditions such as patient motion, signal-to-noise ratios, and diffusion gradient schemes. Both so-called structured digital phantoms and more human-like phantom testing and analyses were conducted and performance quantified through comparison of absolute bias, correlation coefficients, and multi-scale structural similarity index obtained for both devices. The established acceptance criteria were reached in all tests conducted.

Together with software verification and validation, the performance validation demonstrated that CMN with Capillary Function satisfies all design requirements and device specifications and is substantially equivalent to the Predicate device.

5.6 Substantial Equivalence

In comparison with the Predicate RAPID device (K172477), CMN with Capillary Function has the same intended use and similar indications, technological characteristics and principles of operation as described in the comparison table below.

Description	Subject Device	Predicate Device iSchemaView RAPID (K172477)
Product Name	CMN Capillary Function	RAPID
Product Code / Regulation	LLZ / 21CFR/892.2050	LLZ / 21CFR/892.2050
Indications for Use	CMN and associated modules, including the Capillary Function module, is an image processing software package to be used by trained professionals, including physicians and medical technicians. The software package runs on standard off-the-shelf computer or a virtual platform, such as VMware, and can be used to perform image viewing, processing and analysis of images. Data and images are acquired through DICOM compliant imaging devices. CMN provides viewing capabilities, whereas the Capillary Function module provides analysis capabilities for functional and dynamic imaging datasets acquired with MRI perfusion including a Diffusion Weighted MRI (DWI) Module and a Dynamic Analysis Module (dynamic contrast-enhanced imaging data for MRI). The Capillary Function module is used for visualization and analysis of dynamic imaging data, showing	iSchemaView RAPID 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 standard off-the-shelf computer or a virtual platform, such as VMware, and can be used to perform image viewing, processing and analysis of images. Data and images are acquired through DICOM compliant imaging devices The iSchemaView RAPID provides both viewing and analysis capabilities for functional and dynamic imaging datasets acquired with CT Perfusion (CT-P), CT Angiography (CTA), and MRI including a Diffusion Weighted MRI (DWI) Module and a Dynamic Analysis Module (dynamic 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.

Description	Subject Device	Predicate Device iSchemaView RAPID (K172477)
	properties of changes in contrast over time. This functionality includes calculation of parameters related to tissue flow (perfusion) and tissue blood volume. In addition, the Capillary Function module's DWI technology is used to visualize local water diffusion properties from the analysis of diffusion-weighted MRI data.	The Dynamic Analysis Module is used for visualization and analysis of dynamic imaging data, showing properties of changes in contrast over time. This functionality includes calculation of parameters related to tissue flow (perfusion) and tissue blood volume.
PACS Functionality		
Basic PACS Functions	View, process and analyze medical images. Communication of results through service class user protocols.	Yes
Computer Platform	Standard off-the-shelf PC workstation / server	Yes
	Virtual platform such as VMware	Yes
DICOM Compliance	Yes	Yes
Functional Overview	CMN is software package that provides for the visualization and study of changes of tissue in digital images captured by MRI. CMN provides viewing and quantification.	Same
Data Acquisition	Acquires medical image data from DICOM compliant imaging devices and modalities	Same
Data / Image Types	MRI via DICOM format	Same
Acquisition and Modalities Features		
MRI	Diffusion Weighted Image (DWI)	Yes
	Dynamic Analysis tissue flow (perfusion) and tissue blood volume	Yes
Computed Parameter Maps		
Diffusion MRI	Isotropic DWI (isoDWI)	Yes
	ADC	Yes
	Zero=gradient image (B=0 image)	Yes
Perfusion MRI	Relative cerebral blood flow (rCBF)	Yes

Description	Subject Device	Predicate Device iSchemaView RAPID (K172477)
	Relative cerebral blood volume (rCBV)	Yes
	Mean transit time (MTT)	Yes
	Delay	Yes Denoted Tmax in the predicate
	Capillary transit time heterogeneity (CTH)	No Derived from the impulse response function similar to MTT and CBF
	Coefficient of variation (COV)	No Derived from the impulse response function similar to MTT and CBF. Also denoted relative transit time heterogeneity (RTH) in the literature.
	Model-based oxygen extraction fraction (OEF (model-based))	No Derived from the impulse response function similar to MTT and CBF in conjunction with a substance extraction model
	Model-based relative cerebral metabolic rate of oxygen (rCMRO2 (model-based))	No Derived from the impulse response function similar to MTT and CBF in conjunction with a substance extraction model
	Relative extravasation correction (rLeakage)	No Possibility to correct for extravasation of contrast agent from the vasculature
Measurement Tools		
MRI Tools	Arterial input function (AIF)	Yes
	Time-course	Yes
	Brain mask	Yes
	Region of interest (ROI) and Volumetry	Yes
	Volumetric comparison between 2 ROIs	Yes
	Motion correction	Yes
	Export parameter maps PACS and DICOM file systems	Yes

Description	Subject Device	Predicate Device iSchemaView RAPID (K172477)
	Acquire, transmit, process, and store medical images	Yes

5.7 Conclusions

The CMN with Capillary Function performs as intended and presents no unacceptable risks to the intended patient population. The non-clinical bench data support the safety of the device and demonstrate that CMN performs as intended in the specified use conditions. CMN is substantially equivalent in intended use, technological characteristics, safety, and performance characteristics to the legally marketed Predicate device, RAPID (K172477).