DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
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June 17, 2016

Quantib B.V.
Floor van Leeuwen
Quality & Regulatory Manager
Westblaak 106
3012 KM Rotterdam
NETHERLANDS

Re: K153351
Trade/Device Name: Quantib™ Brain 1
Regulation Number: 21 CFR 892.2050
Regulation Name: Picture Archiving and Communications System
Regulatory Class: Class II
Product Code: LLZ
Dated: May 19, 2016
Received: May 23, 2016

Dear Floor van Leeuwen:

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. 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); good manufacturing practice requirements as set forth in

the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. 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 http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Robert Ochs, Ph.D. For
Director
Division of Radiological Health
Office of In Vitro Diagnostics
and Radiological Health
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: January 31, 2017
See PRA Statement below.

510(k) Number *(if known)*
K-153351

Device Name
Quantib™ Brain 1

Indications for Use *(Describe)*

Quantib™ Brain is a non-invasive medical imaging processing application that is intended for automatic labeling, visualization, and volumetric quantification of segmentable brain structures from a set of magnetic resonance (MR) images. The Quantib™ Brain output consists of segmentations, visualizations and volumetric measurements of grey matter (GM), white matter (WM), and cerebrospinal fluid (CSF). The output also visualizes and quantifies white matter hyperintensity (WMH) candidates. Users need to review and if necessary, edit WMH candidates using the provided tools, before validation of the WMHs. It is intended to provide the trained medical professional with complementary information for the evaluation and assessment of MR brain images and to aid the trained medical professional in quantitative reporting. Quantib™ Brain is a post-processing plugin for the GE Advantage Workstation (AW 4.7) or AW Server (AWS 3.2) platforms.

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)

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510(k) Summary

I. SUBMITTER

Quantib B.V.
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3012 KM Rotterdam
Phone: (+31) 108 41 17 49
Contact Person: Floor van Leeuwen
Date Prepared: November 18th, 2015

II. DEVICE

Name of Device: Quantib™ Brain 1
Common or Usual Name: Quantib™ Brain
Classification Name: System, image processing, radiology (892.2050)
Regulatory Class: II
Product Code: Picture archiving and communication system (LLZ)

III. PREDICATE DEVICE

Device: QBrain®
Manufacturer: Medis medical imaging systems
510(k) Reg. No: K050703
This predicate has not been subject to a design-related recall.
Regulatory Class: II
Product Code: Picture archiving and communication system (LLZ)

IV. DEVICE DESCRIPTION

Quantib™ Brain is post-processing analysis software for the GE Advantage (AW 4.7) or AW Server (AWS 3.2) platforms using Volume Viewer Apps. 12.3 Ext 6. It is intended for automatic labeling, visualization, and volumetric quantification of identifiable brain structures from magnetic resonance images (a 3D T1-weighted MR image, with an additional T2-weighted FLAIR MR image for white matter hyperintensities (WMH) segmentation). The segmentation system relies on a number of atlases each consisting of a 3D T1-weighted MR image and a label map dividing the MR image into different tissue segments. Quantib™ Brain provides quantitative information on both the absolute and relative volume of the segmented regions. The automatic WMH segmentation is to be reviewed and if necessary, edited by the user before validation of the segmentation, after which volumetric information is accessible. It is intended to provide the trained medical professional with complementary information for the evaluation and assessment of MR brain images and to aid the radiology specialist in quantitative reporting.

V. INTENDED USE

Intended use Quantib™ Brain

Quantib™ Brain is a non-invasive medical imaging processing application that is intended for automatic labeling, visualization, and volumetric quantification of segmentable brain structures from a set of magnetic resonance (MR) images. The Quantib™ Brain output consists of segmentations, visualizations and volumetric measurements of grey matter (GM), white matter (WM), and cerebrospinal fluid (CSF). The output also visualizes and quantifies white matter hyperintensity (WMH) candidates. Users need to review and if necessary, edit WMH candidates using the provided tools, before validation of the WMHs. It is intended to provide the trained medical professional with complementary information for the evaluation and assessment of MR brain images and to aid the trained medical professional in quantitative reporting. Quantib™ Brain is a post-processing plugin for the GE Advantage Workstation (AW 4.7) or AW Server (AWS 3.2) platforms.

Intended us predicate device QBrain®

Intended use

The QBrain® software has been developed for the objective and reproducible analysis of MR images of the brain. It performs quantitative analyses on MR brain image based on automatic segmentation. More specifically, it quantifies the volumes of intracranial cavities, areas that contain cerebrospinal fluid (CSF), and white matter hyperintensities (lesions).

Indications for use

QBrain® is able to read DCIOM MR image from all major MRI vendors. Mask data, generated by automatic segmentation and/or manual editing, and quantitative results ca be saved in separate files enabling the comparison of results from different users and easy export to standard spreadsheet software.

Neur-(radio)logists in hospitals and specialists in core labs use the QBrain stand-alone analytical software package in image post-processing. The provided objective and quantitative values support the diagnostic decision process or are used in the evaluation of follow-up studies about disease evolution and/or therapy response.

Intended use comparison

Both device and predicate device are designed to assist trained medical professionals, i.e. radiologists, in the evaluation and assessment of MR brain images with a set of tools for visualizing the location and quantification of brain structures. Both are intended to automate the current manual process of identifying, labeling, and quantifying the volume of segmentable brain structures identified on MR images.

VI. COMPARISON OF TECHNOLOGICAL CHARACTERISTICS

Both device and predicate device are software for the automatic labeling, visualization, and quantification (segmentation) of the volume of specific areas of the brain. Atlas-based segmentation is the technological principle for both devices.

Both devices require a 3D T1w MR image for tissue-type segmentation. To segment White Matter Hyperintensities (WMH), Quantib™ Brain requires an additional T2w FLAIR scan. Histogram analysis and trained classifiers are used in combination with atlas-based tissue segmentation to improve the accuracy and specificity of WMH segmentation.

Quantib™ Brain reports the following measurements: absolute volume and relative volume (relative to ICV) of grey matter (GM), white matter (WM), cerebrospinal fluid (CSF), and intracranial volume (ICV); brain volume (=GM+WM); total volume of WM hyperintensities (WMH); relative WMH volume (relative to WM); total number of WMH.

Following are the differences between Quantib™ Brain and the predicate device:

Quantib™ Brain	**K050703 QBrain®**
Brain tissue and WMH segmentation	Brain tissue segmentation (intracranial tissue volume GM+WM, CSF volume, lobe volumes, cerebellum volume). WMH segmentation (total WMH volume).
Absolute and relative volumes	Absolute volumes
Software plugs into the AW and AW server platforms	Stand-alone application

Table 5-1 Differences with predicate device

VII. PERFORMANCE DATA:

1. Quality and safety

Quantib™ Brain was designed in compliance with the following process standards:

- IS0 14971 – Medical devices - Application of risk management to medical devices
- IEC 62304 – Medical device software – Software life cycle processes

The following quality assurance measures were applied to Quantib™ Brain development:

- Risk and hazard analysis
- Design reviews
- Unit level testing
- Integration testing
- System testing
- Performance testing
- Usability engineering

2. Algorithm performance

To validate the quality of Quantib™ Brain volume measurements and segmentations, we compared the relative brain tissue volumes to relative volumes derived from manual segmentations for the same scan. We performed this analysis for GM, WM, CSF, ICV, and WMHs.

For the brain volumetry protocol (segmentation and measures of GM, WM, CSF, and ICV) the test set included 33 T1w MR images. The set was carefully selected to include data from multiple vendors and a series of representable scan settings. For each scan we selected six (6) slices for comparison. The results are summarized in Table 5-2.

	Dice index	Absolute difference of the relative volumes [pp]
CSF	0.78 ± 0.05	1.6 ± 1.0
GM	0.83 ± 0.02	2.8 ± 1.9
WM	0.86 ± 0.02	2.6 ± 1.6
ICV	0.97 ± 0.01	

Table 5-2 Results of comparison between manual and automatic brain tissue segmentation. Reported values are averages ± std. dev., computed over 6 segmented slices of 33 scans. The Dice index provides a measure for overlap of manual and automatic segmentations (1 = perfect overlap). The absolute differences of the relative volumes (of the brain tissues) are averages ± std. dev. in percentage points.

The test set for the WMH protocol included 30 3D T1w images with corresponding T2w FLAIR images. This set also represented various scan settings. WMHs were manually segmented on the T2w FLAIR images and compared to Quantib™ Brain automatic segmentation output. The average Dice overlap between the manual segmentations and Quantib™ Brain segmentations was 0.61 ± 0.13. The absolute difference of the relative volumes (for WMHs) was 0.6 ± 0.7 percentage points.

VIII. CONCLUSIONS

By virtue of its intended use and physical and technological characteristics, Quantib™ Brain is substantially equivalent to a device that has been approved for marketing in the United States. The performance data shows that Quantib™ Brain is as safe and effective as the predicate device.