Subtle Medical, Inc.
% Ms. Terese Bogucki
Regulatory Consultant
Decus Biomedical Inc.
2342 Shattuck Ave #333
BERKELEY CA 94704

November 30, 2018

Re: K182336
Trade/Device Name: SubtlePET
Regulation Number: 21 CFR 892.2050
Regulation Name: Picture Archiving and Communications System
Regulatory Class: Class II
Product Code: LLZ
Dated: August 27, 2018
Received: August 28, 2018

Dear Ms. Bogucki:

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/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); 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 http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). 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 (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Michael D. O'Hara For

Robert A. Ochs, Ph.D.
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: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K182336

Device Name
SubtlePET

Indications for Use *(Describe)*
SubtlePET is an image processing software intended for use by radiologists and nuclear medicine physicians for transfer, storage, and noise reduction of fluorodeoxyglucose (FDG) and amyloid PET images (including PET/CT and PET/MRI).

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.

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"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."

5 510(k) Summary

Table 5-1. Subject Device Overview.

Submitter's Name:	Subtle Medical, Inc.
Address:	880 Santa Cruz Ave, Suite 200 Menlo Park, CA 94025
Contact Person:	Terese Bogucki
Title:	Regulatory Consultant
Telephone Number:	650-488-7799
Fax Number:	650-227-2264
Email:	terri@decusbiomedical.com
Date Summary Prepared:	5-NOV-2018
Device Proprietary Name:	SubtlePET
Model Number:	V 1.0.0
Common Name:	SubtlePET
Regulation Number:	21 CFR 892.2050
Regulation Name:	Picture archiving and communications system
Primary Product Code:	LLZ
Secondary Product Code:	KPS
Device Class:	Class II
Predicate Device:	Trade name: Sapheneia Clarity Manufacturer: Sapheneia Commercial Products AB Address: Teknikringen 8 SE-583 30 Linkoping, Sweden Regulation Number: 21 CFR 892.2050 Regulation Name: Picture Archiving and Communications System Device Class: Class II Product Code: LLZ 510(k) Number: K063391 510(k) Clearance Date: April 26, 2007

5.1 Device Description

The SubtlePET image processing software reduces noise to increase image quality using a deep neural network-based algorithm.

The software employs a convolutional neural network-based method in a pixel's neighborhood to generate the value for each pixel. Using a residual learning approach, the software predicts the noise components and structural components. The software separates these components, which enhances the structure while simultaneously reducing the noise.

The workflow of the product can be easily adapted to existing radiology departmental workflow. The product acts as a DICOM node that receives DICOM 3.0 digital medical image data from the modality or another DICOM source, processes the data and then forwards the enhanced study to the selected destination. This destination can be any DICOM node, typically either the PACS system or a specific workstation.

5.2 Indications for Use

SubtlePET is an image processing software intended for use by radiologists and nuclear medicine physicians for transfer, storage, and noise reduction of fluorodeoxyglucose (FDG) and amyloid PET images (including PET/CT and PET/MRI).

5.3 Summary of Technological Characteristics Comparison

Table 5-2 shows the similarities and differences between the technological characteristics of the two products. The key difference is the imaging modality type. Testing demonstrates that the differences do not raise new questions of safety or effectiveness.

Table 5-2. Summary of Technological Characteristics Comparison.

Topic	Predicate Device	Subject Device
Physical Characteristics	Software package that operates on off-the-shelf hardware	Software package that operates on a virtual machine (VM)
Computer	PC Compatible	Virtual machine host-compatible system
Image Processing Enhancement Location	Onsite on the desktop computer server	Onsite on the facility VM and/or offsite on the cloud VM, depending on the site's configuration
DICOM Standard Compliance	The software processes DICOM compliant image data	Same
Operating System	Windows	CentOS 7 Linux

Topic	Predicate Device	Subject Device
Modalities	Multi-modality	Multi-modality; specifically processes PET, PET/CT and PET/MR images
User Interface	The software is designed for use on a radiology workstation. It is unknown whether there is a user interface.	None – enhanced images are viewed on existing PACS workstations
Protocols	Custom low dose protocols	Standard scanner protocols
Image Enhancement Algorithm Description	Sapheneia Clarity™ employs a sophisticated statistical analysis of the image structure in the neighborhood of each pixel. Using robust estimation methods the dominant structures are separated from the embedding noise. Once the structure has been determined, it is possible to strengthen the interesting parts while simultaneously reducing the noise.	The software employs a convolutional neural network-based method in a pixel's neighborhood to generate the value for each pixel. Using a residual learning approach, the software predicts the noise components and structural components. The software separates these components, which enhances the structure while simultaneously reducing the noise.
Image Acquisition	The acquisition remains the same, i.e. the image processing can be generated from multiple modalities and with predefined or specific acquisition protocol settings.	The acquisition remains the same.

5.4 Performance Data

Subtle Medical conducted the following non-clinical performance tests:

- Design traceability confirming all requirement tracing is complete from design inputs and verification/validation and that all risk controls are implemented
- Design verification testing which included confirming all labeling complies with 21CFR801 and all software requirements work as expected
- Design validation testing simulated intended use to confirm that the end-to-end functionality of the SubtlePET DICOM Dispatcher in conjunction with the SubtlePET algorithm meets the design requirements

- Noise reduction bench test utilizing representative cases of human data already gathered under the auspices of IRB-approved clinical protocols. The study showed a significant average increase in quantitative metrics for all cases demonstrating that the software reduced noise in PET scans.

Based upon the results of this testing, it was determined the SubtlePET performance was substantially equivalent to the predicate device.

5.5 Substantial Equivalence Conclusion

SubtlePET is an image enhancement software which has similar intended use and indications for use statement as the predicate device. The main difference in indications for use is that the predicate and subject devices apply enhancement to different multimodality image types. The two devices have similar technological characteristics: both algorithms are fixed image-domain nonlinear filtering that uses neighborhood information, and both methods have optimized parameters to ensure robustness and adaption to variable structures, tissues, noises and scales. This 510(k) submission includes information on the SubtlePET technological characteristics, as well as performance data and verification and validation activities demonstrating that SubtlePET is as safe and effective as the predicate, and does not raise different questions of safety and effectiveness.