November 22, 2022

Avenda Health, Inc.
% Brittany Berry-Pusey, Ph.D.
Co-Founder and COO
4130 Overland Avenue
CULVER CITY CA 90230

Re: K221624
Trade/Device Name: Avenda Health AI Prostate Cancer Planning Software
Regulation Number: 21 CFR 892.2060
Regulation Name: Radiological computer-assisted diagnostic software for lesions suspicious of cancer
Regulatory Class: Class II
Product Code: POK
Dated: October 23, 2022
Received: October 24, 2022

Dear Brittany Berry-Pusey:

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)*
K221624

Device Name
Avenda Health AI Prostate Cancer Planning Software

Indications for Use *(Describe)*
The Avenda Health AI Prostate Cancer Planning Software is an artificial intelligence (AI)-based decision support software, indicated as an adjunct to the review of magnetic resonance (MR) prostate images and biopsy findings in the prostate oncological workflow. The Avenda Health AI Prostate Cancer Planning Software is designed to support the prostate oncological workflow by helping the user with the segmentation of MR image features, including the prostate; in the evaluation, quantification, and documentation of lesions; and in pre-planning for diagnostic and interventional procedures such as biopsy and/or soft tissue ablation. The device is intended to be used by physicians trained in the oncological workflow in a clinical setting for planning and guidance for clinical, interventional, diagnostic, and/or treatment procedures of the prostate.
The Avenda Health AI Prostate Cancer Planning Software's lesion characterization functions are intended for use on patients with a pathology-confirmed Gleason Grade Group (GGG) ≥ 2 lesion and for whom corresponding biopsy coordinate information have been uploaded. These functions are indicated for the evaluation of the extent of known disease. Extent of known disease refers to the boundary of a pathology confirmed lesion of GGG ≥ 2 for a particular patient. Specifically, using prostate MR images, biopsy, pathology, and clinical data, the device creates and displays a cancer map that assigns a probability to each voxel within the prostate, indicating its probability for containing clinically significant prostate cancer (csPCa, defined as GGG ≥ 2). A user selects a threshold for the cancer map to create a boundary of the lesion. The lesion boundary is assigned an Encapsulation Confidence Score indicating the confidence that all csPCa is encapsulated within the boundary. The Encapsulation Confidence Score is from a lookup table generated by a database of cases with known ground-truth. When interpreted by a trained physician, this information may be useful in supporting lesion characterization and subsequent patient management.

The Avenda Health AI Prostate Planning Software may also be used as a medical image application, for the viewing, manipulation, 3D-visualization, and comparison of MR prostate images. The images can be viewed in a number of output formats including volume rendering. It enables visualization of information that would otherwise have to be visually compared disjointedly.

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.

510(k) Notification K221624

GENERAL INFORMATION [807.92(a)(1)]

Applicant:

Avenda Health, Inc.
4130 Overland Avenue
Culver City, CA 90230
USA

Contact Person:

Brittany Berry-Pusey, Ph.D.
Co-Founder and COO, Avenda Health, Inc.
Phone: 310-957-5202
Email: brit@avendahealth.com

Prepared By:

Veranex, Inc.
Regulatory, Clinical, and Quality Services
224 Airport Parkway, Suite 250
San Jose, CA 95110
USA

Date Prepared: November 18, 2022

DEVICE INFORMATION [807.92(a)(2)]

Trade Name:

Avenda Health AI Prostate Cancer Planning Software

Generic/Common Name:

Medical Image Software Application and Decision Support Software

Classification:

21 CFR§892.2060, Radiological computer-assisted diagnostic software for lesions suspicious of cancer

Product Code:

POK, Computer-Assisted Diagnostic Software For Lesions Suspicious For Cancer

5.0 510(k) SUMMARY

PREDICATE DEVICE [807.92(a)(3)]

Quantitative Insights, Inc. QuantX (DEN170022)

DEVICE DESCRIPTION [807.92(a)(4)]

The Avenda Health AI Prostate Cancer Planning Software ("AI Prostate Cancer Planning Software" or "Software") is an artificial intelligence (AI)-based decision support software, indicated as an adjunct to the review of magnetic resonance (MR) prostate images and biopsy findings in the prostate oncological workflow. The Avenda Health AI Prostate Cancer Planning Software is designed to support the prostate oncological workflow by helping the user with the segmentation of MR image features, including the prostate; in the evaluation, quantification, and documentation of lesions; and in pre-planning for diagnostic and interventional procedures such as biopsy and/or soft tissue ablation. The device is intended to be used by physicians trained in the oncological workflow in a clinical setting for planning and guidance for clinical, interventional, diagnostic, and/or treatment procedures of the prostate. The software has three main features:

1. Artificial Intelligence (AI) Powered Prostate MRI Segmentation Tool,
2. AI Powered Lesion Contour Tool, and
3. Simulated Interventional Tool Placement.

The user can choose which subset of features of the Software to employ based on the specific oncological workflow. Not all features are required to be used for every workflow. Once the user has completed planning and has reviewed and verified the information, it can be exported into a supported file format such that it can be imported into a compatible interventional system or biopsy system.

INDICATIONS FOR USE [807.92(a)(5)]

The Avenda Health AI Prostate Cancer Planning Software is an artificial intelligence (AI)-based decision support software, indicated as an adjunct to the review of magnetic resonance (MR) prostate images and biopsy findings in the prostate oncological workflow. The Avenda Health AI Prostate Cancer Planning Software is designed to support the prostate oncological workflow by helping the user with the segmentation of MR image features, including the prostate; in the evaluation, quantification, and documentation of lesions; and in pre-planning for diagnostic and interventional procedures such as biopsy and/or soft tissue ablation. The device is intended to be used by physicians trained in the oncological workflow in a clinical setting for planning and guidance for clinical, interventional, diagnostic, and/or treatment procedures of the prostate.

The Avenda Health AI Prostate Cancer Planning Software's lesion characterization functions are intended for use on patients with a pathology-confirmed Gleason Grade Group (GGG)≥ 2 lesion and for whom corresponding biopsy coordinate information have been uploaded. These functions are indicated for the evaluation of the extent of known disease. Extent of known disease refers to the boundary of a pathology confirmed lesion of GGG≥ 2 for a particular patient. Specifically, using prostate MR images, biopsy, pathology, and clinical data, the device creates and displays a cancer map that assigns a probability to each voxel within the prostate, indicating its probability for containing clinically significant prostate cancer (csPCa, defined as GGG≥ 2). A user selects a threshold for the cancer map to create a boundary of the lesion. The

lesion boundary is assigned an Encapsulation Confidence Score indicating the confidence that all csPCa is encapsulated within the boundary. The Encapsulation Confidence Score is from a lookup table generated by a database of cases with known ground-truth. When interpreted by a trained physician, this information may be useful in supporting lesion characterization and subsequent patient management.

The Avenda Health AI Prostate Planning Software may also be used as a medical image application, for the viewing, manipulation, 3D-visualization, and comparison of MR prostate images. The images can be viewed in a number of output formats including volume rendering. It enables visualization of information that would otherwise have to be visually compared disjointedly.

COMPARISON OF TECHNOLOGICAL CHARACTERISTICS WITH THE PREDICATE DEVICES [807.92(a)(6)]

Avenda Health, Inc. believes that the Avenda Health AI Prostate Cancer Planning Software (the "Proposed Device") is substantially equivalent to the predicate device, Quantitative Insights, Inc. QuantX (DEN170022, "QuantX"). Like QuantX, the Proposed Device is used by physicians to support tasks within the oncological workflow. The range of functionalities supported by the Proposed Device, which include segmentation, lesion characterization, and image overlays (i.e., simulated tool placement to support subsequent treatment planning), in addition to basic magnetic resonance image (MRI) and medical information review functionalities, is similar to those available in the identified predicate device. QuantX is selected as the predicate device because, like the Proposed Device, its primary imaging functionality is to characterize lesions suspicious for cancer through an artificial intelligence-powered algorithm and provide information to support the physician user's interpretation of the patient's medical and imaging information. DynaCAD is selected as a reference device to support the performance testing methodology for the prostate segmentation function. The Proposed Device is substantially equivalent to the identified predicate device.

SUBSTANTIAL EQUIVALENCE

The Proposed Device and the predicate device have the same intended use and similar Indications for Use. Both devices also have similar technological characteristics, and any differences in technological characteristics do not raise different questions of safety and effectiveness. The results of performance bench, usability, and reader performance testing demonstrated that the Proposed Device meets the established specifications necessary for consistent performance to achieve its intended use as safely and as effectively as the predicate device. Further, the results of the performance bench, usability, and reader performance testing confirmed that the technological differences do not raise different questions of safety and effectiveness. As such, the Avenda Health AI Prostate Cancer Planning Software is substantially equivalent to the predicate device, QuantX (DEN170022).

PERFORMANCE DATA [807.92(b)]

All necessary testing was conducted on the Avenda Health AI Prostate Cancer Planning Software to support a determination of substantial equivalence to the predicate devices.

Non-clinical Testing Summary:

Avenda has performed software verification, validation, and usability testing to demonstrate that: 1) the device performs to its intended use in accordance with design specifications, and 2) the technological differences presented in the Proposed Device do not raise different questions of safety and effectiveness. These tests include:

- Software verification and validation demonstrated that the Proposed Device performs in accordance with its specification for every requirement and functionality.
- Standalone performance testing for the prostate segmentation and lesion contouring algorithms within standalone test datasets, established against clinically valid ground truths. Specifically, the prostate segmentation algorithm has been determined to accurately segment the prostate organ in T2-weighted MRI in a standalone test set of 137 patients. Furthermore, the lesion contouring algorithm has been validated for accuracy in contouring GGG ≥2 lesions in the intended use population within a representative, independent whole mount pathology dataset of N=50 patients.
- Human factors usability testing for the Proposed Device has demonstrated that representative intended users can use the device safely and effectively, without significant use-related risks.

Reader Study Summary:

A multi-reader, multi-case (MRMC) study was conducted for the Avenda Health AI Prostate Cancer Planning Software ("Proposed Device") to demonstrate that the device improves reader performance for prostate cancer lesion contouring in the intended use population.

Overall, the study dataset consisted of cases within a prostate whole mount pathology database derived from GGG 2-3 patients, which is representative of the device patient population. Each whole mount sample included 3D surfaces and pathology labels representing tumors as annotated on the whole mount prostatectomy slides, which are registered to preoperative T2-weighted MRI. Ten practicing urologists or radiologists from different institutions with a range of experience levels (2 to 23 years of clinical practice experience) participated in this reader study. Each reader reviewed each case. For each case, the reader created a prostate cancer lesion contour based both on standard of care (SOC) practices and with the assistance of the Proposed Device. The lesion contours created with each method were evaluated against whole mount pathology data as ground truth and subsequently compared to one another as well as hemi-gland contours, in order to assess the ability of the Proposed Device to improve reader ability in lesion contouring.

The study results demonstrated that lesion contours produced using the Proposed Device had superior sensitivity (mean 97.4% vs 38.2%, $p < 0.0001$) compared to SOC contours and superior specificity compared to hemi-gland contours (mean 72.1% vs 53.4%, $p < 0.0001$). Furthermore, lesion contours produced using the Proposed Device were superior to both SOC and hemi-gland contours using measures of balanced accuracy (mean 84.7% vs 67.2% & 75.9% respectively, $p < 0.0001$) and "clinical quality" (in 99% and 60% of cases respectively, $p < 0.0001$). On average, the readers achieved a complete csPCa encapsulation rate of 72.8% with the Proposed Device, and only 1.6% with SOC methods ($p < 0.0001$).

The outcomes of this study demonstrated improved reader performance, and showed that readers, when using the Proposed Device, can create lesion contours that better fully encapsulate csPCa

while excluding as much non-csPCa tissue as possible. The proposed device helps resolve the systematic underestimation of csPCa present with SOC manual contouring methods, while simultaneously sparing much of the benign tissue unnecessarily encapsulated with hemi-gland contours. These findings demonstrate that the Proposed Device improves reader performance as intended in the intended user population when used in accordance with the instructions for use.

CONCLUSIONS

The Avenda Health AI Prostate Cancer Planning Software (Proposed Device) and the predicate device QuantX (DEN170022) are both intended as a medical image software application for MRI which can be used to support the clinical workflow of oncological diagnostic and interventional procedures. The devices have the same intended use and similar Indications for Use. Both devices also have similar technological characteristics, and any differences in technological characteristics do not raise different questions of safety and effectiveness. The collective performance bench, usability, and reader performance testing results demonstrated that the Proposed Device performed to its intended use in accordance with its specifications, and confirmed the technological differences presented in the Proposed Device do not raise different questions of safety and effectiveness.

SUMMARY

The Avenda Health AI Prostate Cancer Planning Software is substantially equivalent to the identified predicate device.

Table 1: Substantial Equivalence Table

	Avenda Health AI Prostate Cancer Planning Software (Proposed Device)	**Predicate Device: Quantitative Insights, Inc. QuantX (DEN170022)**	**Rationale for Substantial Equivalence**
Indications for Use	The Avenda Health AI Prostate Cancer Planning Software is an artificial intelligence (AI)-based decision support software, indicated as an adjunct to the review of magnetic resonance (MR) prostate images and biopsy findings in the prostate oncological workflow. The Avenda Health AI Prostate Cancer Planning Software is designed to support the prostate oncological workflow by helping the user with the segmentation of MR image features, including the prostate; in the evaluation, quantification, and documentation of lesions; and in pre-planning for diagnostic and interventional procedures such as biopsy and/or soft tissue ablation. The device is intended to be used by physicians trained in the oncological workflow in a clinical setting for planning and guidance for clinical, interventional, diagnostic, and/or treatment procedures of the prostate. The Avenda Health AI Prostate Cancer Planning Software's lesion characterization functions are intended for use on patients with a pathology-confirmed Gleason Grade Group (GGG)≥ 2 lesion and for whom corresponding biopsy coordinate information have been uploaded. These functions are indicated for the evaluation of the extent of known disease. Extent of known disease refers to the boundary of a pathology confirmed lesion of GGG≥ 2 for a particular patient. Specifically, using prostate MR images,	QuantX is a computer-aided diagnosis (CADx) software device used to assist radiologists in the assessment and characterization of breast abnormalities using MR image data. The software automatically registers images, and segments and analyzes user-selected regions of interest (ROI). QuantX extracts image data from the ROI to provide volumetric analysis and computer analytics based on morphological and enhancement characteristics. These imaging (or radiomic) features are then synthesized by an artificial intelligence algorithm into a single value, the QI score, which is analyzed relative to a database of reference abnormalities with known ground truth. QuantX is indicated for evaluation of patients presenting for high-risk screening, diagnostic imaging workup, or evaluation of extent of known disease. Extent of known disease refers to both the assessment of the boundary of a particular abnormality as well as the assessment of the total disease burden in a particular patient. In cases where multiple abnormalities are present, QuantX can be used to assess each abnormality independently. This device provides information that may be useful in the characterization of breast abnormalities during image interpretation. For the QI score and component radiomic features, the QuantX device provides	Similar to the predicate device.

	Avenda Health AI Prostate Cancer Planning Software (Proposed Device)	Predicate Device: Quantitative Insights, Inc. QuantX (DEN170022)	Rationale for Substantial Equivalence
	biopsy, pathology, and clinical data, the device creates and displays a cancer map that assigns a probability to each voxel within the prostate, indicating its probability for containing clinically significant prostate cancer (csPCa, defined as GGG ≥2). A user selects a threshold for the cancer map to create a boundary of the lesion. The lesion boundary is assigned an Encapsulation Confidence Score indicating the confidence that all csPCa is encapsulated within the boundary. The Encapsulation Confidence Score is from a lookup table generated by a database of cases with known ground-truth. When interpreted by a trained physician, this information may be useful in supporting lesion characterization and subsequent patient management. The Avenda Health AI Prostate Planning Software may also be used as a medical image application, for the viewing, manipulation, 3D-visualization, and comparison of MR prostate images. The images can be viewed in a number of output formats including volume rendering. It enables visualization of information that would otherwise have to be visually compared disjointedly.	comparative analysis to lesions with known outcomes using an image atlas and histogram display format. QuantX may also be used as an image viewer of multi-modality digital images, including ultrasound and mammography. The software also includes tools that allow users to measure and document images, and output in a structured report. Limitations: QuantX is not intended for primary interpretation of digital mammography images.	
Regulation Number	§892.2060, Radiological computer-assisted diagnostic software for lesions suspicious of cancer.	§892.2060, Radiological computer-assisted diagnostic software for lesions suspicious of cancer.	Same as the predicate device.

	Avenda Health AI Prostate Cancer Planning Software (Proposed Device)	**Predicate Device: Quantitative Insights, Inc. QuantX (DEN170022)**	**Rationale for Substantial Equivalence**
Product Codes:	POK, Computer-Assisted Diagnostic Software For Lesions Suspicious For Cancer	POK, Computer-Assisted Diagnostic Software For Lesions Suspicious For Cancer	Same as the predicate device.
Primary Intended User	Trained physicians in the intended workflow (Radiologist/Urologist)	Trained physicians in the intended workflow (Radiologist)	Same as the predicate device – intended for use by the appropriate trained physicians.
Anatomical Site:	Prostate only	Breast only	Different, but same intended use and the differences do not raise different questions of safety or effectiveness.
Oncological Workflow of Interest	Prostate Cancer	Breast Cancer	Different, but same intended use within the workflow and the differences do not raise different questions of safety or effectiveness.
Clinical Workflow Steps Where Used:	Image Review and Workflow Support Interventional/Treatment Planning and Guidance for Diagnostic and Interventional Procedures	Image Review and Workflow Support	Similar to the predicate device.
Platform/Architecture	Cloud-only solution	Software-only platform	Similar – both devices are Web-based software devices.
DICOM Compatible	Yes	Yes	Same as the predicate device.
Type of Scans	MR, DICOM-compatible	MR, DICOM-compatible	Same as the predicate device.
Image Navigation Tools	• Pan, zoom, rotate, slice scroll (view multiple slices),	• Pan, zoom, rotate, change in contrast, slice scroll (view multiple slices)	Same as the predicate device.

	Avenda Health AI Prostate Cancer Planning Software (Proposed Device)	**Predicate Device: Quantitative Insights, Inc. QuantX (DEN170022)**	**Rationale for Substantial Equivalence**
	• Adjust window level, minimize/maximize		
Image Review tools:	• 2D • 3D • MPR	• 2D • 3D • MIPs	Similar to the predicate device.
Image Manipulation and Analysis	Interventional tool, trajectory, and damage volume overlay (overlay profiles customizable by the user)	Measure and document images	Different, but same intended use and the differences do not raise different questions of safety or effectiveness.
Image Segmentation:	Algorithm-driven segmentation of the prostate gland with the possibility of manual adjustment	Automated segmentation of the ROI	Similar to the predicate device.
Measurement Functionalities	Prostate gland: • Volume • ROIs within the prostate For each Lesion: • Location • Volume	For each lesion: • Volume • Surface Area	Similar to the predicate device.
CADx Task	Assessment and characterization of prostate lesions/abnormalities confirmed to contain csPCA through biopsy and MR image data.	Assessment and characterization of breast abnormalities using MR image data.	Similar to the predicate device with respect to analysis of image-based information for assessment of lesions.
Lesion Analysis Supported	Extent of Disease (boundary and total burden)	Risk Stratification, Classification, Extent of Disease (boundary and total burden)	Subset of the functionalities of the predicate device.

	Avenda Health AI Prostate Cancer Planning Software (Proposed Device)	**Predicate Device: Quantitative Insights, Inc. QuantX (DEN170022)**	**Rationale for Substantial Equivalence**
CADx Algorithm	Machine learning-based algorithm based on patient information and image morphological, intensity, and geometric characteristics.	Machine learning-based algorithm based on image morphological and enhancement characteristics.	Similar to the predicate device.
CADx Outputs	Cancer Estimation Map Default Lesion Contour Encapsulation Confidence Score	QI Score Similar Cases Database (via Image Atlas and Histogram Display)	The Proposed Device utilizes different outputs from the predicate device. As these outputs do not impact the intended use and are similarly supplementary to information reviewed by the physician as a part of standard of care, they do not raise different questions of safety or effectiveness.
User Must Approve/ Reject Results:	Yes	Yes	Same as the predicate device.
Export Formats:	● DICOM ● Planning assets ● Intervention plan for supported systems	● DICOM	Similar – both devices allow export of findings for use in future oncological steps.