February 14, 2025

Brainomix Limited
Delanyo Mensah
Regulatory Affairs Specialist
First Floor, Seacourt Tower
West Way
Oxford, OX2 0JJ
United Kingdom

Re: K243294
Trade/Device Name: Brainomix 360 e-ASPECTS
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 18, 2024
Received: January 17, 2025

Dear Delanyo Mensah:

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 (the 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 available 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.

Additional information about changes that may require a new premarket notification are provided in the FDA guidance documents entitled "Deciding When to Submit a 510(k) for a Change to an Existing Device" (https://www.fda.gov/media/99812/download) and "Deciding When to Submit a 510(k) for a Software Change to an Existing Device" (https://www.fda.gov/media/99785/download).

Your device is also subject to, among other requirements, the Quality System (QS) regulation (21 CFR Part 820), which includes, but is not limited to, 21 CFR 820.30, Design controls; 21 CFR 820.90, Nonconforming product; and 21 CFR 820.100, Corrective and preventive action. Please note that regardless of whether a change requires premarket review, the QS regulation requires device manufacturers to review and approve changes to device design and production (21 CFR 820.30 and 21 CFR 820.70) and document changes and approvals in the device master record (21 CFR 820.181).

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 Part 803) for devices or postmarketing safety reporting (21 CFR Part 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 Part 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR Parts 1000-1050.

All medical devices, including Class I and unclassified devices and combination product device constituent parts are required to be in compliance with the final Unique Device Identification System rule ("UDI Rule"). The UDI Rule requires, among other things, that a device bear a unique device identifier (UDI) on its label and package (21 CFR 801.20(a)) unless an exception or alternative applies (21 CFR 801.20(b)) and that the dates on the device label be formatted in accordance with 21 CFR 801.18. The UDI Rule (21 CFR 830.300(a) and 830.320(b)) also requires that certain information be submitted to the Global Unique Device Identification Database (GUDID) (21 CFR Part 830 Subpart E). For additional information on these requirements, please see the UDI System webpage at https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/unique-device-identification-system-udi-system.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR 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,

Jessica Lamb, Ph.D.
Assistant Director
Imaging Software Team
DHT8B: Division of Radiological Imaging
Devices and Electronic Products
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: 07/31/2026
See PRA Statement below.

510(k) Number *(if known)*
K243294

Device Name
Brainomix 360 e-ASPECTS

Indications for Use *(Describe)*
Brainomix 360 e-ASPECTS is a computer-aided diagnosis (CADx) software device used to assist the clinician in the assessment and characterization of brain tissue abnormalities using CT image data.

The software automatically registers images and uses an atlas to segment and analyze ASPECTS regions. Brainomix 360 e-ASPECTS extracts image data from individual voxels in the image to provide analysis and computer analytics and relates the analysis to the atlas defined ASPECTS regions. The imaging features are then synthesized by an artificial intelligence algorithm into a single ASPECTS (Alberta Stroke Program Early CT) score.

Brainomix 360 e-ASPECTS is indicated for evaluation of patients presenting for diagnostic imaging workup for evaluation of extent of disease. Extent of disease refers to the number of ASPECTS regions affected which is reflected in the total score. Brainomix 360 e-ASPECTS provides information that may be useful in the characterization of ischemic brain tissue injury during image interpretation (within 24 hours from time last known well).

Brainomix 360 e-ASPECTS provides a comparative analysis to the ASPECTS standard of care radiologist assessment by providing highlighted ASPECTS regions and an automated editable ASPECTS score for clinician review. Brainomix 360 e-ASPECTS additionally provides a visualization of the voxels contributing to and excluded from the automated ASPECTS score, and a calculation of the voxel volume contributing to ASPECTS score.

Limitations:
1. Brainomix 360 e-ASPECTS is not intended for primary interpretation of CT images. It is used to assist physician evaluation.
2. The Brainomix 360 e-ASPECTS score should be only used for ischemic stroke patients following the standard of care.
3. Brainomix 360 e-ASPECTS has only been validated and is intended to be used in patient populations aged over 21 years.
4. Brainomix 360 e-ASPECTS is not intended for mobile diagnostic use. Images viewed on a mobile platform are compressed preview images and not for diagnostic interpretation.
5. Brainomix 360 e-ASPECTS has been validated and is intended to be used on Siemens Somatom Definition scanners.

Contraindications/ Exclusions/Cautions:
• Patient motion: Excessive patient motion leading to artifacts that make the scan technically inadequate.
• Hemorrhagic Transformation, Hematoma.

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.

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K243294

510(K) Summary
Brainomix Limited – Brainomix 360 e-ASPECTS

Date Prepared:	13Feb2025
Applicant's Name:	Brainomix Limited
Applicant's Address:	First Floor, Seacourt Tower, West Way Oxford, OX2 0JJ United Kingdom
Official Contact:	Delanyo Mensah +44 (0) 7375 967 695 regulatory@brainomix.com
Device Proprietary Name:	Brainomix 360 e-ASPECTS
Regulation Name:	Radiological computer-assisted diagnostic software for lesions suspicious of cancer
Regulatory Class:	Class II
Product Code:	POK
Regulation Number:	21 C.F.R. §892.2060

1. Predicate Device

Brainomix 360 e-ASPECTS is Substantially Equivalent to the following Legally Marketed device:

Trade Name: Brainomix 360 e-ASPECTS
Manufacturer: Brainomix Limited
Regulation Number: 21 C.F.R. §892.2060
Regulatory Class: Class II
Regulation Name: Radiological computer-assisted diagnostic software for lesions suspicious of cancer
Product Code: POK
Submission Number: K221564

2. Reference Device

Trade Name: Rapid ASPECTS (v3)
Manufacturer: iSchemaView, Inc.
Regulation Number: 21 C.F.R. §892.2060
Regulatory Class: Class II
Regulation Name: Radiological computer-assisted diagnostic software for lesions suspicious of cancer
Product Code: POK
Submission Number: K232156

3. Device Description

Brainomix 360 e-ASPECTS (also referred to as e-ASPECTS in this submission) is a medical image visualization and processing software package compliant with the DICOM standard and running on an off-the-shelf physical or virtual server.

Brainomix 360 e-ASPECTS allows for the visualization, analysis and post-processing of DICOM compliant Non-contrast CT (NCCT) images which, when interpreted by a trained physician or medical technician, may yield information useful in clinical decision making.

Brainomix 360 e-ASPECTS is a stand-alone software device which uses machine learning algorithms to automatically process NCCT brain image data to provide an output ASPECTS score based on the Alberta Stroke Program Early CT Score (ASPECTS) guidelines.

The post-processing image results and ASPECTS score are identified based on regional imaging features and overlayed onto brain scan images. e-ASPECTS provides an automatic ASPECTS score based on the input CT data for the physician. The score includes which ASPECTS regions are identified based on regional imaging features derived from NCCT brain image data. The results are generated based on the Alberta Stroke Program Early CT Score (ASPECTS) guidelines and provided to the clinician for review and verification. At the discretion of the clinician, the scores may be adjusted based on the clinician's judgment.

Brainomix 360 e-ASPECTS can connect with other DICOM-compliant devices, for example to transfer NCCT scans from a Picture Archiving and Communication System (PACS) to Brainomix 360 e-ASPECTS software for processing.

Results and images can be sent to a PACS via DICOM transfer and can be viewed on a PACS workstation or via a web user interface on any machine contained and accessed within a hospital network and firewall and with a connection to the Brainomix 360 e-ASPECTS software (e.g. a LAN connection).

Brainomix 360 e-ASPECTS notification capabilities enable clinicians to preview images through a mobile application or via e-mail.

Brainomix 360 e-ASPECTS email notification capabilities enable clinicians to preview images via e-mail notification with result image attachments. Images that are previewed via e-mail are compressed, are for informational purposes only, and not intended for diagnostic use beyond notification.

Brainomix 360 e-ASPECTS is not intended for mobile diagnostic use. Notified clinicians are responsible for viewing non-compressed images on a diagnostic viewer and engaging in appropriate patient evaluation and relevant discussion with a treating physician before making care-related decisions or requests.

Brainomix 360 e-ASPECTS provides an automated workflow which will automatically process image data received by the system in accordance with pre-configured user DICOM routing preferences.

Once received, image processing is automatically applied. Once any image processing has been completed, notifications are sent to pre-configured users to inform them that the image processing

results are ready. Users can then access and review the results and images via the web user interface case viewer or PACS viewer.

The core of e-ASPECTS algorithm (excluding image loading or result output format) can be summarised in the following 3 key steps of the processing pipeline:

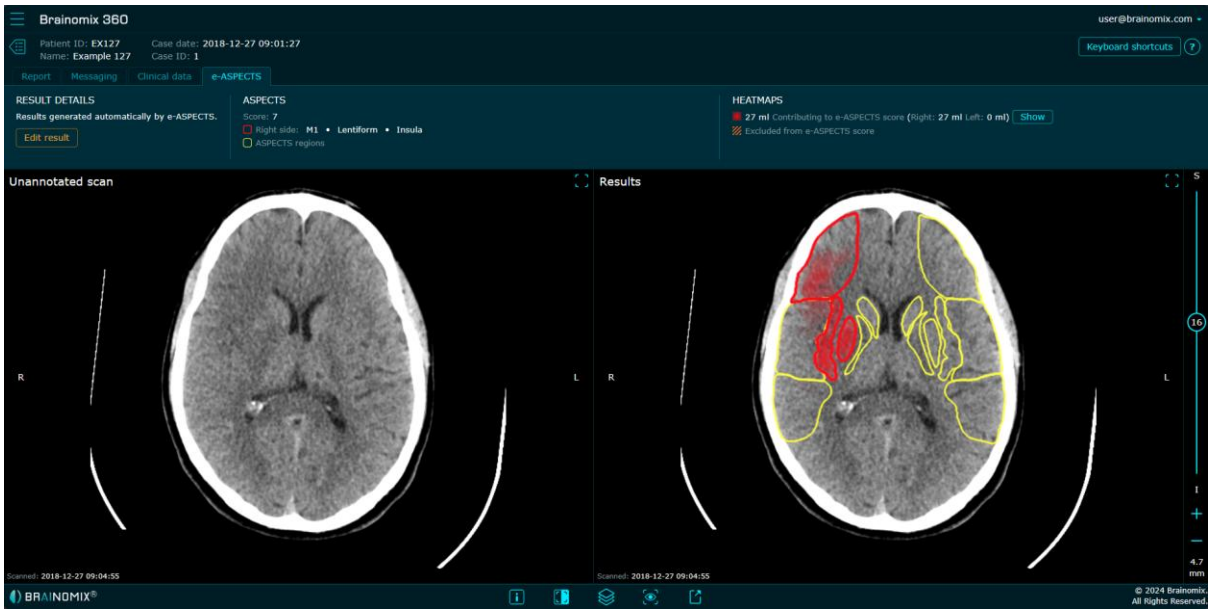
1. Pre-processing: brain extraction from the three dimensional (3D) non-enhanced contrast CT head dataset and its reorientation/normalization by 3D spatial registration to a standard template space.
2. Delineation of the 20 (10 for each cerebral hemisphere) pre-defined ASPECTS regions of interest on the normalized 3D image.
3. Image feature extraction and heatmap generation which consists of the computation of numerical values characterizing brain tissue, apply a trained predictive model to those features and generate a 3D heatmap from the models output for highlighting regions contributing towards the ASPECTS score.

The Brainomix 360 e-ASPECTS module is made available to the user through the Brainomix 360 platform. The Brainomix 360 platform is a central control unit which coordinates the execution image processing modules which support various analysis methods used in clinical practice today:

- Brainomix 360 e-ASPECTS (K221564) (predicate device)
- Brainomix 360 e-CTA (K192692)
- Brainomix 360 e-CTP (K223555)
- Brainomix 360 e-MRI (K231656)
- Brainomix 360 Triage ICH (K231195)
- Brainomix 360 Triage LVO (K231837)
- Brainomix 360 Triage Stroke (K232496)

4. Clinical Characteristics

The primary users of the Brainomix 360 platform are medical imaging professionals. The outputs generated by Brainomix 360 e-ASPECTS may be used by clinicians to inform onward treatment decisions as part of a wider set of other imaging to identify signs of ischemic damage on a per-voxel basis and relate these to ASPECTS regions to determine a per-ASPECTS region result and an overall ASPECTS score. Clinicians can edit the automated ASPECTS score based on their interpretation of both the unprocessed NCCT scan and the e-ASPECTS processing results. The following figure provides a general layout of the ASPECTS display image as provided from Brainomix 360 e-ASPECTS.



5. Intended Use / Indications for Use

Brainomix 360 e-ASPECTS is a computer-aided diagnosis (CADx) software device used to assist the clinician in the assessment and characterization of brain tissue abnormalities using CT image data.

The software automatically registers images and uses an atlas to segment and analyze ASPECTS regions. Brainomix 360 e-ASPECTS extracts image data from individual voxels in the image to provide analysis and computer analytics and relates the analysis to the atlas defined ASPECTS regions. The imaging features are then synthesized by an artificial intelligence algorithm into a single ASPECTS (Alberta Stroke Program Early CT) score.

Brainomix 360 e-ASPECTS is indicated for evaluation of patients presenting for diagnostic imaging workup for evaluation of extent of disease. Extent of disease refers to the number of ASPECTS regions affected which is reflected in the total score. Brainomix 360 e-ASPECTS provides information that may be useful in the characterization of ischemic brain tissue injury during image interpretation (within 24 hours from time last known well).

Brainomix 360 e-ASPECTS provides a comparative analysis to the ASPECTS standard of care radiologist assessment by providing highlighted ASPECTS regions and an automated editable ASPECTS score for clinician review. Brainomix 360 e-ASPECTS additionally provides a visualization of the voxels contributing to and excluded from the automated ASPECTS score, and a calculation of the voxel volume contributing to ASPECTS score.

Limitations:

1. Brainomix 360 e-ASPECTS is not intended for primary interpretation of CT images. It is used to assist physician evaluation.
2. The Brainomix 360 e-ASPECTS score should be only used for ischemic stroke patients following the standard of care.

3. Brainomix 360 e-ASPECTS has only been validated and is intended to be used in patient populations aged over 21 years.
4. Brainomix 360 e-ASPECTS is not intended for mobile diagnostic use. Images viewed on a mobile platform are compressed preview images and not for diagnostic interpretation.
5. Brainomix 360 e-ASPECTS has been validated and is intended to be used on Siemens Somatom Definition scanners.

Contraindications/ Exclusions/Cautions:

- Patient motion: Excessive patient motion leading to artifacts that make the scan technically inadequate.
- Hemorrhagic Transformation, Hematoma.

6. Technological Characteristics

Brainomix 360 e-ASPECTS principal workflow for NCCT includes the following key steps:

- NCCT image loading.
- Automated image analysis and processing to identify and visualize the voxels which have been included in the ASPECTS score and the voxels which have been excluded from the ASPECTS score (also referred to as a 'heatmap').
- Automated image analysis and processing to register the subject image to an atlas to segment and highlight ASPECTS regions and to display whether or not each region is qualified as contributing to the ASPECTS score.
- Notifications and alerts sent to users.
- Generation of a summary results report.
- Presentation of results for review and analysis by users.

Once the user has been notified of availability of the ASPECTS results, including the ASPECTS score, indication of affected side, affected ASPECTS regions and voxel-wise analysis (shown as a heatmap of voxels 'contributing to e-ASPECTS score' and a heatmap of voxels 'excluded from e-ASPECTS score') can be exported as a report and/or sent to the PACS.

7. Performance Data

7.1 Summary of Digital Phantom Validation Activities

Digital phantom evaluation was performed to validate the "volume contributing to e-ASPECTS" output as calculated by Brainomix 360 e-ASPECTS where performance criteria were derived from the literature (Cereda, et al., 2016). For the comparison of the volumes computed by the sum of the voxels contributing to the e-ASPECTS score against the synthetic volumes (n=110, *synth* datasets) of the digital phantom values, 3 metrics were derived and assessed against a performance requirement value previously derived from the literature. Those metrics with their associated threshold were 1) absolute bias of the difference between volumes computed and ground truth (< 12 mL); 2) the standard

deviation (SD) of the difference between volumes computed and the ground truth (< 19 mL); and 3) Pearson's correlation between volume contributing to e-ASPECTS and known phantom volumes (> 0.86). The testing demonstrated that all 3 performance criteria were met and evidenced a good agreement between the synthetic digital phantom volumetric values (mL) and the calculated volumetric values (mL) by Brainomix 360 e-ASPECTS. This is summarized in Table 1 below.

Metric Name	Value	Criteria	Pass/Fail
Absolute Bias (upper 95% CI)	7.61	<12	Pass
Standard deviation (upper 95% CI)	1.99	<19	Pass
Pearson's correlation – r (lower 95% CI)	0.993	>0.86	Pass

Table 1 Summary of the results for performance evaluation with the 3 metrics (name, value, criteria)

7.2 Summary of Standalone Performance Testing

Standalone performance testing was conducted to comply with special controls for this device type. Standalone performance testing demonstrated that the proposed device provides accurate representation of key processing parameters under a range of clinically relevant parameters and perturbations associated with the intended use of the software. The stand-alone performance testing demonstrates the generalized performance for a range of typical patient demographics which is the same as for the predicate device. The standalone performance dataset was additionally enriched to include a greater number of cases within late time-window sub-groups and cases with and without large vessel occlusions. Ground truth was determined by the consensus of three board-certified US neuroradiologists.

The standalone performance testing dataset comprised 137 non-contrast CT scans from patients scanned for suspected acute ischemic stroke, from 3 different USA institutions. The data was distributed from Siemens (75), GE (32), Philips (16) and Toshiba (14). Patients were admitted between March 2012 and August 2023. The median age was 70 years, and 51% were female. The distribution by race/ethnicity was that 35.5%(50) of patients were white, 10.2% (14) were Black/African America, 5.8% (8) were Hispanic or Latino, 1 (0.7%) was Asian, 1 (0.7%) was American Indian/ Native American, 2.2% (3) were Other and 43.8% (60) were unknown. Median NIHSS was 18 with an interquartile range of 11 to 22. 91 patients (66%) presented within 6 hours of time last seen well, 21 (15%) presented between 6 and 16 hours, 13 (9.5%) presented between over 16 hours and 12 (9%) were unknown onset time. 80 patients (58%) had an acute ICA or MCA large vessel occlusion ('with LVO') and 57 (42%) did not ('without LVO').

Region-level sensitivity, specificity, and AUC were calculated. Overall performance in 137 showed an area under the curve (AUC) of 83% (95% CI: 80-86%), with a sensitivity of 69% (56-75%) and a specificity of 97% (80-97%). Case-level agreement, positive percentage agreement, and negative percentage agreement were analyzed for the overall cohort and for individual ASPECT regions and compared to pairwise agreement between the three truthers. The detailed results are reported in the labeling.

The standalone performance testing demonstrated that the e-ASPECTS performance generalized to a range of clinically-relevant subgroups (including stratification by time-window, LVO status, age, gender and clinical site). Consistent performance was also observed between the grouped cortical ASPECTS regions compared to grouped basal ganglia ASPECTS regions. Detailed performance testing results including these subgroups as well as performance for each ASPECTS region are reported in the labeling.

7.3 Summary of Reader Performance Testing

A multiple reader multiple case (MRMC) study was conducted to assess the impact of support from Brainomix 360 e-ASPECTS on reader performance. The reader study evaluated the performance of 7 clinical readers (1 'expert' neuroradiologist, and 6 'non-expert' radiologists or neurologists) when scoring the ASPECTS for 140 clinically-representative NCCT scans with and without the support of Brainomix 360 e-ASPECTS. Ground truth was determined by the consensus of three board-certified US neuroradiologists.

The reader study dataset comprised 140 NCCT scans from patients scanned in the clinical context of suspected acute stroke. Of these, 66 patients (47%) had confirmed LVO in the ICA or MCA M1; 56 (40%) had suspected stroke without LVO; and 18 (13%) were confounder or stroke mimic cases, with an alternative diagnosis to acute stroke and additional radiological findings. The median age was 68 years and 47% were female. Median NIHSS was 18 (interquartile range: 10-22). 78 patients (56%) were scanned within 6 hours of time since symptom onset (or last known well); 22 patients (16%) were between 6-16 hours; 12 patients (9%) were over 16 hours; and 28 patients (20%) had unknown time of onset. The data was distributed from Siemens (79), GE (36), Philips (19) and Toshiba (6).

Comparison of the area under the curve (AUC) for readers with and without e-ASPECTS support showed a statistically significant improvement of 6.4%, from 78% without e-ASPECTS to 85% with e-ASPECTS (p=.03), which was the primary outcome measure of the study. This was driven by an improvement in sensitivity (from 61% to 72%), and a small improvement in specificity (from 96% to 98%). Cohen's Kappa and weighted Kappa also improved significantly with versus without e-ASPECTS.

Subgroup analyses showed that the improvements were driven by change in performance by non-expert readers (radiologists and neurologists); the improvement was smaller but consistent positive in the expert reader (neuroradiologist). Stratification of cases was conducted and demonstrated an improvement in reader performance when aided by the device, though the performance improvement was not statistically significant, consistently across clinically-relevant subgroups, including by time since onset, LVO status, age, gender, and clinical site.

Out of 126 reads (18 confounder cases times seven readers), 18 reads (14.3%) changed when e-ASPECTS was used. 12 cases were not scored 10 with e-ASPECTS support compared to 10 without e-ASPECTS support. However, the misinterpretations by readers without e-ASPECTS support were of higher magnitude (ASPECTS scores of 4,5, or 6), compared to with e-ASPECTS (8 or 9), therefore no clinically significant impact was observed. Hence, the reads changed with versus without e-ASPECTS, as readers tended to be more accurate when e-ASPECTS support was available.

As the study used retrospective data, there were no specific safety endpoints in the reader study.

This study demonstrates substantial equivalence of the Brainomix 360 e-ASPECTS software for improving reader performance, compared to the predicate device. The results showed statistically significant improvement in the agreement between the readers and a reference standard when using the Brainomix 360 e-ASPECTS software compared to routine clinical practice.

8. Prescriptive Statement

Caution: Federal law restricts this device to sale by or on the order of a physician.

9. Safety and Effectiveness

Brainomix 360 e-ASPECTS has been designed, verified and validated in compliance with 21 CFR, Part 820.30 requirements. The device has been designed to meet the requirements associated with ISO 14971:2019 (risk management).

10. Cybersecurity

Brainomix 360 e-ASPECTS has been designed to follow the FDA Cybersecurity Guidance and IEC 81001-5-1.

11. Substantial Equivalence

The subject device, Brainomix 360 e-ASPECTS, provides new claims based on the comprehensive software verification and validation activities performed. The substantial equivalence comparison table (below) summarizes and compares the characteristics of the proposed and the predicate device, along with the reference device.

The proposed device (Brainomix 360 e-ASPECTS), predicate (Brainomix 360 e-ASPECTS, K221564) and reference device (Rapid ASPECTS (v3), K232156) are software packages that assist the user (neuroradiologist/ clinician) in the assessment and characterization of brain tissue abnormalities using non-contrast CT brain image data. The proposed device includes similar NCCT processing features and technological characteristics as compared to the predicate device, which provides viewing, quantification, analysis and reporting capabilities based on acquired DICOM compliant medical image data. The proposed and predicate device segment and analyze ASPECTS regions to aid in evaluation of adult patients presenting for diagnostic imaging workup, for evaluation of extent of disease. Therefore, the proposed device has substantially similar intended use and indications for use compared to the predicate device.

Where the proposed device differs from the predicate device are:

- Voxel volume contributing to ASPECTS score: the proposed device displays a calculation of the volume of the voxels contributing to ASPECTS score which was not present in the predicate. The heatmap does not have an impact on clinical decisions beyond aiding the understanding of the automated ASPECTS score and as such, no risks associated with the use of the voxel volume feature have been identified. Validation of the heatmaps and resulting volumes of the

voxels identified as contributing towards the ASPECTS score has been extensively validated through digital phantom testing, which corroborates that the proposed device is safe and effective and does not raise different questions of safety and effectiveness.

- Removal of gating conditions: the proposed device removes a gating condition by which the user must confirm that the patient is confirmed with having an MCA or ICA occlusion. The performance of ASPECTS scoring was validated by comparing radiological ground truth in patients with suspected stroke and demonstrated that the proposed device improves the performance of representative users when evaluating ASPECTS in patients with suspected stroke. The dataset included cases with and without large vessel occlusion (LVO), and a subset of cases with alternative final diagnoses that are commonly encountered confounders in the population of suspected stroke patients. Therefore, the removal of the gating condition in proposed device does not raise new questions of safety or effectiveness compared to the predicate device.
- Extension of use to 24 hours: the proposed device extends the timeframe of the device's usefulness to 24 hours since the patient is last known to be well. This change does not introduce any new or unanswered questions of safety and effectiveness of the device as validated through clinical study. The study included data from a broad range of times after last known well, including patients with a time since onset unknown up to 24 hours.

12. Substantial Equivalence Comparison

A table comparing the key features of the subject and predicate devices is provided below.

Characteristics/ Parameter	Proposed Device Brainomix 360 e-ASPECTS (K243294)	Predicate Device Brainomix 360 e-ASPECTS (K221564)	Reference Device Rapid ASPECTS (v3) (K232156)
510(k) Number	K243294	K221564	K232156
Product Code	POK	POK	POK
Regulation Number	21 CFR §892.2060	21 CFR §892.2060	21 CFR §892.2060
Intended Use/Indications for Use	Brainomix 360 e-ASPECTS is a computer-aided diagnosis (CADx) software device used to assist the clinician in the assessment and characterization of brain tissue abnormalities using CT image data. The software automatically registers images and uses an atlas to segment and analyze ASPECTS regions. Brainomix 360 e-ASPECTS extracts image data from individual voxels in the image to provide analysis and computer analytics and relates the analysis to the atlas defined ASPECTS regions.	Brainomix 360 e-ASPECTS is a computer-aided diagnosis (CADx) software device used to assist the clinician in the assessment and characterization of brain tissue abnormalities using CT image data. The software automatically registers images and uses an Atlas to segment and analyze ASPECTS regions. Brainomix 360 e-ASPECTS extracts image data from individual voxels in the image to provide analysis and computer analytics and relates the analysis to the atlas defined ASPECTS regions.	Rapid ASPECTS is a computer-aided diagnosis (CADx) software device used to assist the clinician in the assessment and characterization of brain tissue abnormalities using CT image data. The Software automatically registers images and segments and analyzes ASPECTS Regions of Interest (ROIs). Rapid ASPECTS extracts image data for the ROI(s) to provide analysis and computer analytics based on morphological characteristics. The imaging features are then synthesized by an artificial

Characteristics/ Parameter	Proposed Device Brainomix 360 e-ASPECTS (K243294)	Predicate Device Brainomix 360 e-ASPECTS (K221564)	Reference Device Rapid ASPECTS (v3) (K232156)
	The imaging features are then synthesized by an artificial intelligence algorithm into a single ASPECTS (Alberta Stroke Program Early CT) score. Brainomix 360 e-ASPECTS is indicated for evaluation of patients presenting for diagnostic imaging workup for evaluation of extent of disease. Extent of disease refers to the number of ASPECTS regions affected which is reflected in the total score. Brainomix 360 e-ASPECTS provides information that may be useful in the characterization of ischemic brain tissue injury during image interpretation (within 24 hours from time last known well). Brainomix 360 e-ASPECTS provides a comparative analysis to the ASPECTS standard of care radiologist assessment by providing highlighted ASPECTS regions and an automated editable ASPECTS score for clinician review. Brainomix 360 e-ASPECTS additionally provides a visualization of the voxels contributing to and excluded from the automated ASPECTS score and a calculation of the voxel volume contributing to ASPECTS score. **Limitations:** 1. Brainomix 360 e-ASPECTS is not intended for primary interpretation of CT images. It is used to assist physician evaluation. 2. The ASPECTS score should be only used for ischemic stroke patients following the standard of care. 3. Brainomix 360 e-ASPECTS has only been validated and is	The imaging features are then synthesized by an artificial intelligence algorithm into a single ASPECTS (Alberta Stroke Program Early CT) Score. Brainomix 360 e-ASPECTS is indicated for evaluation of patients presenting for diagnostic imaging workup with known MCA or ICA occlusion, for evaluation of extent of disease. Extent of disease refers to the number of ASPECTS regions affected which is reflected in the total score. Brainomix 360 e-ASPECTS provides information that may be useful in the characterization of ischemic brain tissue injury during image interpretation (within 6 hours from time last known well). Brainomix 360 e-ASPECTS provides a comparative analysis to the ASPECTS standard of care radiologist assessment by providing highlighted ASPECTS regions and an automated editable ASPECTS score for clinician review. Brainomix 360 e-ASPECTS additionally provides a visualization of the voxels contributing to the automated ASPECTS score and the voxels excluded from the automated ASPECTS score. **Limitations:** 1. Brainomix 360 e-ASPECTS is not intended for primary interpretation of CT images. It is used to assist physician evaluation. 2. Brainomix 360 e-ASPECTS has been validated in patients with known MCA or ICA occlusion prior to ASPECTS scoring.	intelligence algorithm into a single ASPECT (Alberta Stroke Program Early CT) Score. Rapid ASPECTS is indicated for evaluation of adult patients presenting for diagnostic imaging workup, for evaluation of extent of disease. Extent of disease refers to the number of ASPECTS regions affected which is reflected in the total score. This device provides information that may be useful in the characterization of early ischemic brain tissue injury for ischemic stroke patient (typically, < 24 hours since last known well) during image interpretation following the standard of care. Rapid ASPECTS provides a comparative analysis to the ASPECTS standard of care radiologist assessment using the ASPECTS atlas definitions and atlas display including highlighted ROIs and numerical scoring. Rapid ASPECTS presents the original and annotated images for concurrent reads. **Limitations**: 1. The ASPECTS score should be only used for ischemic stroke patients following the standard of care. 2. Rapid ASPECTS is an adjunct tool and is not intended to replace a clinicians review of the original imaging or their clinical judgement. 3. Physicians should not use the CAD generated output as the primary interpretation without their concurrence. **Contraindications/Exclusions/ Cautions**:

Characteristics/ Parameter	Proposed Device Brainomix 360 e-ASPECTS (K243294)	Predicate Device Brainomix 360 e-ASPECTS (K221564)	Reference Device Rapid ASPECTS (v3) (K232156)
	intended to be used in patient populations aged over 21 years. 4. Brainomix 360 e-ASPECTS is not intended for mobile diagnostic use. Images viewed on a mobile platform are compressed preview images and not for diagnostic interpretation. 5. Brainomix 360 e-ASPECTS has been validated and is intended to be used on Siemens Somatom Definition scanners. **Contraindications/ Exclusions/Cautions:** • Patient motion: Excessive patient motion leading to artifacts that make the scan technically inadequate • Hemorrhagic Transformation, Hematoma	3. Brainomix 360 e-ASPECTS is not suitable for use on brain scans displaying neurological pathologies other than acute stroke, such as tumors or abscesses, hemorrhagic transformation and hematoma. 4. Use of Brainomix 360 e-ASPECTS Module in clinical settings other than brain ischemia within 6 hours from time last known well, caused by known ICA or MCA occlusions has not been tested. 5. Brainomix 360 e-ASPECTS has been validated and is intended to be used on Siemens Somatom Definition scanners. 6. Brainomix 360 e-ASPECTS has only been validated and is intended to be used in patient populations aged over 21 years. 7. Brainomix 360 e-ASPECTS is not intended for mobile diagnostic use. Images viewed on a mobile platform are compressed preview images and not for diagnostic interpretation. **Contraindications/ Exclusions/Cautions:** • Patient motion: Excessive patient motion leading to artifacts that make the scan technically inadequate • Hemorrhagic Transformation, Hematoma	• Patient Motion: excessive motion leading to artifacts that make the scan technically inadequate. • Hemorrhagic Transformation, Hematoma • Very thin or no Ventricles
Environment of use	Clinical/Hospital environment	Clinical/Hospital environment	Clinical/Hospital environment
Energy used and/or delivered	None – software only application. The software application does not deliver or depend on energy delivered to or from patients	None – software only application. The software application does not deliver or depend on energy delivered to or from patients	None – software only application. The software application does not deliver or depend on energy delivered to or from patients

Characteristics/ Parameter	Proposed Device Brainomix 360 e-ASPECTS (K243294)	Predicate Device Brainomix 360 e-ASPECTS (K221564)	Reference Device Rapid ASPECTS (v3) (K232156)
Primary Users	Neuroradiologist/Clinician	Neuroradiologist/Clinician	Neuroradiologist/Clinician
Clinical Application /Anatomical region	Stroke/Head	Stroke/Head	Stroke/Head
Standard of Care	ASPECTS Scoring	ASPECTS Scoring	ASPECTS Scoring
Design: Modalities for image processing and visualization	CT	CT	CT
Technical Implementation	ML/AI/Random Forest	ML/AI/Random Forest	ML/AI/Random Forest
Image Overlay	ASPECTS regions, highlighted by algorithms. Voxel-wise analysis visualized as a heat map.	ASPECTS regions, highlighted by algorithms. Voxel-wise analysis visualized as a heat map.	ASPECTS Atlas ROIs, highlighted by algorithms
Gating Conditions	None	Users must confirm ICA or MCA occlusion prior to accessing Brainomix 360 e-ASPECTS results.	None
Design: PACS functionality	View process and analyze medical images. Performs standard PACS functions with respect to querying and listing.	View process and analyze medical images. Performs standard PACS functions with respect to querying and listing.	View process and analyze medical images. Performs standard PACS functions with respect to querying and listing.
Design: DICOM compliance	Yes	Yes	Yes
Design: Computer Platform	Standard off-the-shelf server or virtual server	Standard off-the-shelf server or virtual server	Standard off-the-shelf server or virtual server
Design: Data acquisition	Acquires medical image data from DICOM compliant imaging devices and modalities	Acquires medical image data from DICOM compliant imaging devices and modalities	Acquires medical image data from DICOM compliant imaging devices and modalities
Alters Standard of Care Workflow	In parallel to	In parallel to	In parallel to
Materials	N/A – Software only device	N/A – Software only device	N/A – Software only device
Biocompatibility	N/A – Software only device	N/A – Software only device	N/A – Software only device
Sterility	N/A – Software only device	N/A – Software only device	N/A – Software only device
Electrical Safety	N/A – Software only device	N/A – Software only device	N/A – Software only device
Mechanical Safety	N/A – Software only device	N/A – Software only device	N/A – Software only device
Chemical Safety	N/A – Software only device	N/A – Software only device	N/A – Software only device
Thermal Safety	N/A – Software only device	N/A – Software only device	N/A – Software only device
Radiation Safety	N/A – Software only device	N/A – Software only device	N/A – Software only device

13. Conclusion

The proposed device has the same intended use as the predicate and the reference device. The proposed and predicate/reference devices utilize similar NCCT image processing and technological

features. The extensions in the indications for use and differences in technological characteristics for the proposed device do not raise different questions of safety or effectiveness.

We conclude that the proposed device does not raise different questions with regards to safety and efficacy and demonstrates substantial equivalence to the predicate, Brainomix 360 e-ASPECTS (K221564) and reference, Rapid ASPECTS (v3) (K232156).