CureMetrix, Inc.
% Mr. Kevin Harris
CEO
9404 Genesee Avenue, Suite 330
LA JOLLA CA 92037

March 8, 2019

Re: K183285
Trade/Device Name: cmTriage
Regulation Number: 21 CFR 892.2080
Regulation Name: Radiological computer aided triage and notification software
Regulatory Class: Class II
Product Code: QFM
Dated: February 4, 2019
Received: February 4, 2019

Dear Mr. Harris:

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

Thalia Mills, 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)*
K183285

Device Name

cmTriage

Indications for Use *(Describe)*

cmTriage is a passive notification for prioritization-only, parallel-workflow software tool used by radiologists to prioritize specific patients within the standard-of-care image worklist for 2D FFDM screening mammograms. cmTriage uses an artificial intelligence algorithm to analyze 2D FFDM screening mammograms and flags those that are suggestive of the presence of at least one suspicious finding at the exam level. These flags are viewed by the radiologist via their Picture Archiving and Communication System (PACS) worklist. The decision to use cmTriage codes and how to use cmTriage codes is ultimately up to the radiologist. cmTriage does not send a proactive alert directly to the radiologist.

Radiologists are responsible for reviewing each exam on a diagnostic viewer according to the current standard of care.

cmTriage is limited to the categorization of exams, does not provide any diagnostic information beyond triage and prioritization, does not remove images from the radiologist's worklist, and should not be used in lieu of full patient evaluation, or relied upon to make or confirm diagnosis.

cmTriage is for prescription use only.

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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510(k) Summary

Submitter	CureMetrix, Inc.
Contact Person	Kevin Harris 9404 Genesee Ave Suite 330 La Jolla, CA 92037 619-339-9889 Kevin@CureMetrix.com
Common Name	Radiological Computer-Assisted Triage and Notification Software
Trade Name	cmTriage™
Classification Name: Regulation: Code: Class:	 Radiological Computer-Assisted Prioritization Software 21 CFR 892.2080 QFM Class II
Predicate Device Name: Company: Code: 510(k):	 ContaCT Viz.AI QAS DEN170073
510(k) Submission Number:	K183285

Device Description

CureMetrix's cmTriage is a radiological computer-assisted triage and notification software device. Digital two-dimensional (2D) mammograms are captured by a Full-Field Digital Mammography (FFDM) system and deposited on the PACS. The CureMetrix image forwarding software, acting as a PACS listener, receives a copy of the mammography DICOM image(s), creates a local copy of the image(s), de-identifies the local copy, encrypts the local copy, transmits the local copy to the CureMetrix cloud, and then deletes the local copy.

Within the CureMetrix cloud, the cmTriage service receives the DICOM image(s), decrypts the image(s), groups them by study, analyzes the image(s) within the study, and produces a result for each study. The results are produced in the form of DICOM Structured Report (SR) file with a cmTriage result.

The result file is encrypted and transmitted from the CureMetrix cloud back to cmEdge where it is decrypted and re-associated with the original study. The DICOM SR is then routed to the PACS.

Once the PACS receives the DICOM SR, the file is opened, the cmTriage code ("Impression Description") is extracted for the exam, and the worklist column for the exam is updated. The cmTriage code will either indicate "Suspicious" or "" (blank).

Within the PACS worklist the cmTriage code can be displayed in a separate column. Each PACS may have different features and functionality depending on the manufacturer which are outside of the scope and control of CureMetrix and cmTriage. However, in general, at a minimum, the user is able to sort their worklist based on values in columns. This sorting functionality (if present) would allow the radiologist to group Suspicious exams together. The device does not alter the original medical image and is not intended to be used as a diagnostic device.

The standard of care for breast cancer screening in the US is quickly becoming one in which both FFDM and digital breast tomosynthesis (DBT) are acquired during the exam. However, cmTriage only operates on 2D images. If a site does not use FFDM and 2D but instead only uses 3D and DBT, they will not be able to use this current device.

In summary, the cmTriage device is intended to provide a passive notification through the PACS to the radiologist indicating the existence of a case that may potentially benefit from that radiologist's prioritization.

Intended Use/Indications for Use

cmTriage is a passive notification for prioritization-only, parallel-workflow software tool used by radiologists to prioritize specific patients within the standard-of-care image worklist for 2D FFDM screening mammograms. cmTriage uses an artificial intelligence algorithm to analyze 2D FFDM screening mammograms and flags those that are suggestive of the presence of at least one suspicious finding at the exam level. These flags are viewed by the radiologist via their Picture Archiving and Communication System (PACS) worklist. The decision to use cmTriage codes and how to use cmTriage codes is ultimately up to the radiologist. cmTriage does not send a proactive alert directly to the radiologist.

Radiologists are responsible for reviewing each exam on a diagnostic viewer according to the current standard of care.

cmTriage is limited to the categorization of exams, does not provide any diagnostic information beyond triage and prioritization, does not remove images from the radiologist's worklist, and should not be used in lieu of full patient evaluation, or relied upon to make or confirm diagnosis.

cmTriage is for prescription use only.

Technological Characteristics

cmTriage is a software only device that can be segmented into three components: (1) Image Forwarding and Result File Receiving Software, (2) Image Processing and Analysis Software, and (3) Notification Result File.

The Image Forwarding and Result File Receiving Software is configured by the hospital to interact with a healthcare facility's PACS or local DICOM router and is responsible for automatically transmitting a copy of DICOM files from the local router through a secured channel to the Image Processing and Analysis Software based on DICOM metadata.

The Image Processing and Analysis Software component of the device is hosted in the cloud and is responsible for receiving, assembling, processing, analyzing and storing DICOM images. This software component includes the software algorithm that is responsible for identifying and quantifying image characteristics that are consistent with a suspicious region of interest in a screening mammogram. When the software algorithm detects imaging characteristics suggestive of a suspicious region of interest, the Image Processing and Analysis Software component sets a flag in the Notification Result File indicating that the exam is "Suspicious" and sends the file back to the Image Forwarding and Result File Receiving Software. While the software algorithm informs the notification process, no other diagnostic information is generated from the algorithm or available to the user beyond the notification.

The Notification Result File is a DICOM SR file that can be used by the PACS or viewing workstation to update the worklist with an indication of that reflects the cmTriage notification of either "Suspicious" or "" (blank).

Summary of Comparison to Predicate Device

Characteristic	Predicate: Viz.AI ContaCT	cmTriage	Similarities or Differences
FDA Clearance	DEN170073	TBD	
Clearance Date	2/13/18	TBD	
Product Code	QAS	QFR	
Class	II	II	Same
Regulation	892.2080	892.2080	Same
OTC vs. PUO	PUO	PUO	Same

Intended Use. Indications for Use	ContaCT is a notification-only, parallel workflow tool for use by hospital networks and radiologists to identify and communicate images of specific patients to a radiologist, independent of standard of care workflow. ContaCT uses an artificial intelligence algorithm to analyze images for findings suggestive of a pre-specified clinical condition and to notify an appropriate medical radiologist of these findings in parallel to standard of care image interpretation. Identification of suspected findings is not for diagnostic use beyond notification. Specifically, the device analyzes CT angiogram images of the brain acquired in the acute setting, and sends notifications to neurovascular radiologist that a suspected large vessel occlusion has been identified and recommends review of those images. Images can be previewed through a mobile application. Images that are previewed through the mobile application are compressed and are for informational purposes only and not intended for diagnostic use beyond notification. Notified radiologists 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. ContaCT is limited to analysis of imaging data and should not be used in-lieu of full patient evaluation or relied upon to make or confirm diagnosis.	cmTriage is a passive notification for prioritization-only, parallel-workflow software tool used by radiologists to prioritize specific patients within the standard-of-care image worklist for 2D FFDM screening mammograms. cmTriage uses an artificial intelligence algorithm to analyze 2D FFDM screening mammograms and flags those that are suggestive of the presence of at least one suspicious finding at the exam level. These flags are viewed by the radiologist via their Picture Archiving and Communication System (PACS) worklist. The decision to use cmTriage codes and how to use cmTriage codes is ultimately up to the radiologist. cmTriage does not send a proactive alert directly to the radiologist. Radiologists are responsible for reviewing each exam on a diagnostic viewer according to the current standard of care. cmTriage is limited to the categorization of exams, does not provide any diagnostic information beyond triage and prioritization, does not remove images from the radiologist's worklist, and should not be used in lieu of full patient evaluation, or relied upon to make or confirm diagnosis. cmTriage is for prescription use only.	Similarities • Used by radiologists • Identifies specific patients • Operates in parallel to standard of care workflow • Uses artificial intelligence to analyze images • Looking for findings suggestive of a pre-specified clinical condition • Not intended for diagnostic use • Radiologists are responsible for viewing images on a diagnostic viewer • Limited to analysis of imaging data and should not be used in-lieu of full patient evaluation or relied upon to make or confirm diagnosis Noted difference: cmTriage notification is passive vs. proactive and cmTriage codes are accessed by radiologist through PACS worklist and used for prioritization.
Technical Method	The device provides triage or notification that is informed by machine learning, artificial intelligence or other image analysis algorithms	The device provides triage or notification that is informed by machine learning, artificial intelligence or other image analysis algorithms	Same
Target Area	The device operates on radiological images of the human body.	The device operates on radiological images of the human body.	Same
Anatomical Site	Head	Breast	Different anatomic site
Where Used	Hospital or Clinic	Hospital or Clinic	Same
User Population	Radiologist	Radiologist	Same
Software	Device is software only	Device is software only	Same
Software Level of Concern	Moderate	Moderate	Same
Communication with Patient	Communicates images of patients to a radiologist.	Does not communicate images of patients. cmTriage passively notifies the radiologist via the PACS worklist, whereas ContaCT notifies a pre-identified specialist via direct message.	Noted difference: No images are communicated from cmTriage to radiologist. Only cmTriage codes are returned for viewing within the PACS worklist.

Notification/ Priority	Yes	Yes	cmTriage prioritizes based on suspicious findings; ContaCT connects a specialist to a patient that may be in need of urgent treatment for stroke. ContaCT proactively notifies radiologist. cmTriage passively notifies and thus radiologist is responsible for accessing cmTriage codes via PACS worklist.
Preview Images	Presentation of notification and preview of the study for initial assessment not meant for diagnostic purposes. The device operates in parallel with the standard of care, which remains the default option for all cases.	Presentation of notification and preview of the study for initial assessment not meant for diagnostic purposes. The device operates in parallel with the standard of care, which remains the default option for all cases.	Same
Alteration of original image	No	No	Same
Image Viewing	Images previewed through a mobile app	Images viewed on existing viewing workstation	cmTriage codes are viewed through PACS worklist

Performance Data

CureMetrix conducted a retrospective, blinded, multi-center study of the cmTriage software. A statistical analysis was conducted to estimate to the number of cancer and normal studies required to achieve the stated primary endpoint 95% confidence interval (CI) and to ensure that our detailed statistical analyses are consistent with a priori estimates.

Sensitivity and Specificity targets were set based on the performance in the BCSC study. A primary endpoint goal established to validate that cmTriage operates at a 95% CI for both sensitivity and specificity above the 80% CI reported in the BCSC. Further the goal was refined to validate that at a sensitivity of 86.9% corresponding to the median sensitivity reported by the BCSC, the specificity would be comparable to the median specificity reported by the BCSC and above the bottom of the 80% CI. For cmTriage a sensitivity of 86.9% corresponds to a specificity of 88.5% -- comparable to the median specificity of 88.9% of the BCSC.

A secondary endpoint was established to determine time performance of cmTriage to ensure that mammograms can be processed, and notification results returned for use by radiologists within minutes which is clinically acceptable.

The population of cases (exams) was selected to represent a representative cross-section of patients based on age, density, and lesion type mix typically seen in a screening population. The population was enriched with biopsy confirmed cancers to more accurately measure the efficacy of the cmTriage software.

The quarantined test data were obtained from multiple clinical sites in the United States. The dataset consists of 1255 mammographic studies: 400 biopsy-proven cancer studies (278 studies of soft-tissue density and 122 studies of microcalcifications) and 855 normal studies (BIRADS 1 and 2 with two-year follow-up of negative diagnosis). Each mammographic study in the quarantined test dataset consists of at most 4 standard-view screening mammograms: (LCC), (LMLO), (RCC), (RMLO). By limiting each study to at most 4 standard-view screening mammograms, we emulate the workflow in standard clinical patient care where 4 standard-view screening mammographic images are acquired for each patient.

The quarantined test set was constructed to ensure that confounding factors present in the population were addressed in the data and consistent with the population of women undergoing breast cancer screening. Confounding factors that were considered include: 1) Lesion Type; 2) Lesion Size for Soft-Tissue Densities; 3 Age; and 4) Breast Density. To establish a population baseline for comparison, CureMetrix used the Breast Cancer Surveillance Consortium for age and lesion type and used an NIH study for density.

When the cmTriage software is set to a sensitivity of 84.4%, in direct comparison to the BCSC results, cmTriage has a stand-alone specificity of 94.0% and would indicate that only 4.1% of the total number of cases are incorrectly marked as "suspicious" on the test set. However, this is an enriched data set. Adjusting for a 0.5% cancer rate, at 84.4% sensitivity, CureMetrix would have indicated that a total of 6.4% of the exams are suspicious. Thus, in stand-alone mode CureMetrix is operating at higher specificity than radiologists. At the default sensitivity of 93% (specificity = 76.3%), cmTriage will incorrectly mark 16.1% of the normal cases as suspicious in this enriched test set. Adjusting for a 0.5% cancer rate, at 93% sensitivity, CureMetrix would have indicated that a total of 24% of the exams are suspicious.

Based on the results demonstrated above, the primary endpoints of sensitivity and specificity exceeded the targets. Sensitivity was observed at mean of 86.9% with a 95% confidence interval (CI) of 83.6% to 90.2%. Specificity was observed at a mean of 88.5% with a 95% CI of 86.4% to 90.7%. The low end of our 95% CI for sensitivity and specificity, 83.6% and 86.4% respectively, exceeded BCSC's low end of their 80% CI (80.7% and 82.6% for sensitivity and specificity, respectively).

A population-adjusted mark rate of 6.37% at 84.4% sensitivity was well below the target recall rate of 9.60% of radiologists at the same sensitivity.

Overall cmTriage was able to demonstrate an area under the curve (AUC) of 0.951 with a 95% CI of 0.937 to 0.964 on this dataset. This AUC held across densities: Density 1: AUC 0.964 with a 95% CI of 0.934 to 0.994; Density 2: AUC 0.964 with a 95% CI of 0.946 to 0.981; Density 3: AUC 0.940 with a 95% CI of 0.917 to 0.963; and Density 4: AUC 0.958 with a 95% CI of 0.92 to 0.995. This AUC also held across lesion types: Mass: AUC 0.941 with a 95% CI of 0.923 to 0.959; Calcifications: AUC 0.972 with a 95% CI of 0.958 to 0.985.

Lastly the timing performance for the device was shown to be an average of 3.35 minutes at a network speed of 10Mbits/s upload and 37Mbits/s download. This is well within the clinical operational expectations of breast cancer screening.

These data in combination establish effective triage for the image analysis algorithm and notification functionality of the cmTriage device as compared to the standard of care.

Conclusion

The subject cmTriage and the ContaCT predicate devices are both software only devices intended to aid in triage of radiological images of specific patients to a radiologist, independent of standard of care workflow. The labeling of both devices are limited to the categorization of exams and are not to be used in-lieu of full patient evaluation or relied upon to make or confirm diagnosis.

Both devices operate in parallel to the standard of care workflow in the sense that they do not change the original image, do not provide any marking on the output preview, and do not remove images from the standard of care "First in First out" (FIFO) queue, thus not disturbing standard interpretation of the images by trained clinicians. The minor differences between the subject device and the predicate raise no new issues of safety or effectiveness. In addition, performance testing demonstrates that the cmTriage performs as intended.

The cmTriage device is thus substantially equivalent to the ContaCT predicate.