February 17, 2023

EQUASHIELD Medical Ltd.
% Bosmat Friedman
Regulatory Consultant
ProMedoss, Inc.
3521 Hatwynn Rd.
Charlotte, North Carolina 28269

Re: K221513
Trade/Device Name: EQUASHIELD® Closed System Transfer Device
Regulation Number: 21 CFR 880.5440
Regulation Name: Intravascular Administration Set
Regulatory Class: Class II
Product Code: ONB
Dated: January 16, 2023
Received: January 17, 2023

Dear Bosmat Friedman:

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,

David Wolloscheck

David Wolloscheck, PhD
Acting Assistant Director
DHT3C: Division of Drug Delivery and
General Hospital Devices,
and Human Factors
OHT3: Office of GastroRenal, ObGyn,
General Hospital and Urology Devices
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: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
K221513

Device Name
EQUASHIELD® Closed System Transfer Device

Indications for Use *(Describe)*
Closed System Drug Transfer Device (CSTD) for safe preparation, reconstitution, compounding and administration of drugs, including antineoplastic and hazardous drugs. This closed system mechanically prohibits the transfer of environmental contaminants into the system and the escape of drug or vapor concentrations outside the system, thereby minimizing individual and environmental exposure to drug vapor, aerosols, and spills and also prevents microbial ingress up to 7 days. The system's closed Syringe Unit prevents intended and unintended syringe plunger detachment and can be used safely up to its maximal nominal volume with hazardous drugs

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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K221513 - 510(k) Summary

SUBMITTER

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Date Prepared:
February 17, 2023

DEVICE

Trade Name:
EQUASHIELD® Closed System Transfer Device

Common Name: Closed Antineoplastic and Hazardous Drug Reconstitution And Transfer System
Product Code: ONB
Regulation Name: Intravascular administration set
Regulation No: 880.5440
Class: 2
Review Panel: General Hospital

PREDICATE DEVICE

Predicate device:

- EQUASHIELD® Closed System Transfer Device, manufactured by EQUASHIELD Medical Ltd., cleared under K170706; Product Code: ONB.

DEVICE DESCRIPTION

The EQUASHIELD® Closed System Drug Transfer Device (CSTD) is intended for safe preparation, reconstitution, compounding and administration of drugs, including antineoplastic and hazardous drugs. This closed system mechanically prohibits the

transfer of environmental contaminants into the system and the escape of drug or vapor concentrations outside the system, thereby minimizing individual and environmental exposure to drug vapor, aerosols, and spills and also prevents microbial ingress up to 7 days. The system's closed Syringe Unit prevents intended and unintended syringe plunger detachment and can be used safely up to its maximal nominal volume with hazardous drugs.

EQUASHIELD® CSTD is a sterile, single use system. The various system components are listed in the table below:

Name	Description
Syringe Unit	Syringe for drug transfer
Vial Adaptor	Adaptor to the drug vial
Spike Adaptor & Spike Adaptor 180	Adaptor for the IV bag for injection and for infusion administration
Spike Adaptor W & Spike Adaptor W180	Adaptor for the IV bag for withdrawal
Luer Lock Adaptor 1	Adaptor for injection into IV lines
Luer Lock Adaptor 2	Adaptor for injection and withdrawal for IV lines
Female Luer Lock connector	Connector for standard IV tubing set ports
Protective Plug	A plug to protect connectors during transportation
Tubing sets	Accessory for injection into an IV line
Reconstitution Set Accessory	Accessory for reconstituting powdered drugs
Luer Lock Adaptor 1C	Adaptor for injection into catheters
Luer Lock Adaptor 1DC	Adaptor for medication transfer between EQUASHIELD® Syringe Units
Male Priming Connector	Connector for priming of IV line

The above components are combined to create a system and are not intended to be used individually.

The variable sterile air chamber integrated into the encapsulated syringe provides self-contained pressure equalization. The connector unit is welded to the syringe and uses the double-membrane method as high efficiency microbial barrier and for leak-proof and drug residual-free connections to the adaptors of the system. The double membrane prevents the transfer of environmental contaminants into the system and/or escape of drug or vapor concentrations outside the system, thereby minimizing individual and environmental exposure to drug vapor, aerosols, spills and also prevents microbial ingress up to 7 days. The purpose of this submission is to obtain FDA clearance for new system components and material changes for previously cleared components and to revise the indication for use for clarity with respect to the functionality of the Syringe Unit.

INDICATIONS FOR USE

Characteristic	**Subject Device** **Equashield Closed System Drug Transfer Device** **K221513**	**Predicate Device** **Equashield Closed System Drug Transfer Device** **K170706**	**Comments**
Indication for Use	Closed System Drug Transfer Device (CSTD) for safe preparation, reconstitution, compounding and administration of drugs, including antineoplastic and hazardous drugs. This closed system mechanically prohibits the transfer of environmental contaminants into the system and the escape of drug or vapor concentrations outside the system, thereby minimizing individual and environmental exposure to drug vapor, aerosols, and spills and also prevents microbial ingress up to 7 days. The system's closed Syringe Unit prevents intended and unintended syringe plunger detachment and can be used safely up to its maximal nominal volume with hazardous drugs	Closed System drug Transfer Device (CSTD) for preparation, reconstitution, compounding and administration of drugs, including antineoplastic and hazardous drugs. This closed system mechanically prohibits the transfer of environmental contaminants into the system and the escape of drug or vapor concentrations outside the system, thereby minimizing individual and environmental exposure to drug vapor, aerosols, and spills and also prevents microbial ingress up to 7 days.	Different. Please see discussions of differences in Indications for Use statement, below the Summary of Technological Characteristics table
Prescription (Rx) or Over the Counter	Rx	Rx	Same

SUMMARY OF TECHNOLOGICAL CHARACTERISTICS

Characteristic	**CSTD System** **Proposed Device**	**CSTD System** **Predicate device (K170706)**	**Comments**
System components	- Vial Adaptors - Syringe Unit - Spike Adaptors for injection - Spike Adaptor for withdrawal - Luer Lock Adaptors - Female Luer Lock connectors - Luer Lock Adaptor DC - Luer Lock Adaptor C - Protective Plug - Y-Site Tubing (Accessory) - Secondary Tubing (Accessory) - Male Priming Connector	- Vial Adaptor - Syringe Unit - Spike Adaptor for injection - Spike Adaptor W- for withdrawal - Luer Lock Adaptor - Male Luer Lock Connector - Female Luer Lock Connector - Protective Plug - Y-Site Tubing (Accessory) - Secondary Tubing (Accessory) - Reconstitution Tubing (Accessory) - Catheter Luer Lock Adaptor - Syringe-Syringe Luer Lock Adaptor	Different. Please see comment # 1

Characteristic	CSTD System Proposed Device	CSTD System Predicate device (K170706)	Comments
Characteristics	Closed System used for antineoplastic and hazardous drug reconstitution, transfer and administration, in order to prevent contamination of the surrounding environment and of the drug	Closed System used for antineoplastic and hazardous drug reconstitution, transfer and administration, in order to prevent contamination of the surrounding environment and of the drug	Same
Principles of Operation	Multi-component system. Components are intended to be used as a system.	Multi-component system. Components are intended to be used as a system.	Same
Technological Characteristics	A leak-proof connector with a single use syringe permanently attached to it as part of the system.	A leak-proof connector with a single use syringe permanently attached to it as part of the system.	Same
	All system components are sealed with resealing membranes (Septum). When components are joined together the two membranes are pressed together and then pierced by needles. System has integrated closed pressure equalization.	All system components are sealed with resealing membranes (Septum). When components are joined together the two membranes are pressed together and then pierced by needles. System has integrated closed pressure equalization.	
	The system syringe is closed from all sides. The syringe barrel is sealed airtight also at its rear end, thereby isolating the plunger rod and the interior of the barrel.	The system syringe is closed from all sides. The syringe barrel is sealed airtight also at its rear end, thereby isolating the plunger rod and the interior of the barrel.	
System	A fully encapsulated Syringe Unit is the active transfer device of this closed system. The syringe barrel is sealed airtight also at its rear end, thereby isolating the plunger rod and the interior of the barrel. A leak-proof connector is permanently welded to the syringe. The closed pressure equalization system with a chamber containing sterile air is built-in the Syringe Unit and makes the system airtight consequently containing all aerosols, particles and vapors. For transfer of fluids the Syringe Unit connects to the passive Vial Adaptors, infusion bag and infusion tubing adaptors of the system, using the double membrane method to create a leak-proof and drug residual-free connection.	A fully encapsulated Syringe Unit is the active transfer device of this closed system. The syringe barrel is sealed airtight also at its rear end, thereby isolating the plunger rod and the interior of the barrel. A leak-proof connector is permanently welded to the syringe. The closed pressure equalization system with a chamber containing sterile air is built-in the Syringe Unit and makes the system airtight consequently containing all aerosols, particles and vapors. For transfer of fluids the Syringe Unit connects to the passive Vial Adaptors, infusion bag and infusion tubing adaptors of the system, using the double membrane method to create a leak-proof and drug residual-free connection.	Difference. Please see comment # 2
Materials within the drug path	Polypropylene, PVC, Silicone, 304 SST, POM, ABS, Polyisoprene, Hydrophobic filter	Polypropylene, PVC, Silicone, 304 SST, POM, ABS, Polyisoprene, Hydrophobic filter	Same
Drug compatibility	Compatible with hazardous drug usage	Compatible with hazardous drug usage	Same

Characteristic	CSTD System Proposed Device	CSTD System Predicate device (K170706)	Comments
Device Type	Rx/Single Use	Rx/Single Use	Same
Target Users	Licensed Pharmacists/Health Care Professionals	Licensed Pharmacists/Health Care Professionals	Same
Environment	Hospitals and clinics	Hospitals and clinics	Same
Sterilization	EO/SAL 10^{-6} (Plug – Gamma)	EO/SAL 10^{-6} (Plug – Gamma)	Same

Discussions of differences in Indications for Use statement:

The EQUASHIELD® CSTD System has the same intended use and the same indications for use as the predicate, the previously cleared EQUASHIELD® CSTD System (K170706) except for the addition of a sentence to the indications for use to clarify the functionality of the Syringe Unit with respect to syringe plunger detachment.This is not a new feature to the product and was described in the predicate 510(k), even though it was not included in the indication for use of the predicate device.

Discussion of differences in technological characteristics:

Comment #1 The new components added to the CSTD family are (by Ref#):

- Vial Adaptor: VA-13C/2
- Spike Adaptors: SA-180 & SA-W180
- Luer Lock Adaptors: LL-2S & LL-2
- Male Priming Connector: MC-2
- Female Luer Lock connectors: FC-1S &FC-180
- Protective Plug: PP-2

The design and principle of operation of all new system components are based on the predicate components. All components have been tested and validated and perform as intended. Risk assessment identified no new or modified risks relative to predicate components. Differences do not raise new or different questions of safety or effectiveness

Comment #2 The subject device includes a number of new components that are each based on a variant of a component included in the cleared predicate system. All the new components have been validated and perform as intended. Risk assessment identified no new or modified risks of the proposed CSTD relative to the predicate. Differences do not raise new or different questions of safety or effectiveness

The proposed changes, which include changes relating to the materials used in some components and the inclusion of several additional components, have been assessed through bench testing, biocompatibility testing, drug compatibility testing, usability testing and a biological risk assessment. None of the proposed additions and modifications were found to raise new safety or effectiveness concerns and the results of the testing support the substantial equivalence claim. With respect to principles of operation, both systems are identical. Consequently, the EQUASHIELD® CSTD System is as safe and effective as its predicate without raising any new safety and/or effectiveness concerns.

PERFORMANCE DATA

Non-clinical testing:
Non-clinical tests were conducted to verify that the proposed device meets all design specifications and complies with applicable standards as follows:

- ISO 8536-4 Infusion equipment for medical use - Part 4: Systems for single use, gravity feed
- ISO 8536-10 Infusion Equipment for Medical Use - Part 10: Accessories for Fluid Lines for Single Use with Pressure Infusion Equipment
- ISO 80369-7 Small-bore connectors for liquids and gases in healthcare applications - Part 7: Connectors for intravascular or hypodermic applications
- ISO 1135-4 Transfusion equipment for medical use — Part 4: Transfusion sets for single use, gravity feed
- USP<788> and USP<790> Visible and Sub-visible Particulate Matters in Injections

Biocompatibility:
Biocompatibility testing was performed on the EQUASHIELD® CSTD components (finished and sterilized) as an Externally Communicating Device, Blood Path Indirect, Prolonged Contact (>24hrs to 30days) according to FDA Guidance "Use of International Standard ISO 10993-1, "Biological evaluation of medical devices - Part 1: Evaluation and testing within a risk management process" and ISO 10993-1 Biological evaluation of medical devices -- Part 1: Evaluation and testing within a risk management process. The following tests were conducted:

- Cytotoxicity
- Sensitization
- Irritation
- Acute systemic toxicity
- Material mediated pyrogenicity
- Hemocompatibility
- Subacute Toxicity (dual route repeated exposure method)

Sterility Shelf life and Shipping Simulation:

- The EQUASHIELD® CSTD is a sterile medical device. The sterilization process uses Ethylene Oxide (EtO) to achieve a sterility assurance level (SAL) of at least 10^{-6}. The validation process followed the "overkill" approach according to ISO 11135:2014 Sterilization of health-care products -- Ethylene oxide -- Requirements for the development, validation and routine control of a sterilization process for medical devices.
- Bacterial Endotoxin test (LAL) was performed and passed the acceptance criteria of USP<161>.
- Ethylene Oxide (EtO) and Ethylene Chlorhydrine (ECH) residuals were found to comply with ISO 10993-7:2008 Biological evaluation of medical devices - part 7: Ethylene oxide sterilization residuals for prolonged exposure devices.
- The shelf life of the EQUASHIELD® CSTD is 3 years, established using ASTM F1980-16 “Standard Guide for Accelerated Aging of Sterile Barrier Systems for

Medical Devices." The study included sterilized samples of the CSTD which was accelerated aged to the equivalent of 3 years. Performance, functional and package integrity tests were conducted following accelerated aging and transportation simulation and passed acceptance criteria.

- Packaging integrity was conducted after sterilization, accelerated aging and simulated transportation in accordance with ASTM D4169-16 under DC13. The tests included final, packed, and sterile samples of the EQUASHIELD CSTD which were tested for
    - Visual inspection – ASTM F1886
    - Dye test – ASTM F1929
    - Pell test – ASTM F88
    - Burst test – ASTM F2054
    - Bubble emission test – ASTM D3078
    - Sterility – USP<71>
    - Microbiological Barrier Test (for the package) – ASTM F1608

Microbial Ingress:
Microbial Ingress study was conducted per the 2008 FDA guidance, "Intravascular Administration Sets Premarket Notification Submissions [510(k)]." The study included sterile and aged EQUASHIELD® CSTD samples which were repeatedly accessed in a total of 10 times over the period of 7 days. None of the tested samples showed growth, therefore, the samples met the acceptance criteria and the EQUASHIELD® CSTD was verified to prevent microbial ingress after aging as labeled.

Drug Compatibility:
Hazardous drug compatibility testing was performed on the EQUASHIELD® CSTD using hazardous drugs commonly used clinically with CSTDs and that may react aggressively with polymers (such as N,N-dimethylacetamid, known as DMA). Compatibility was verified using chemical analytic experiments and mechanical, functional and performance testing. Study results showed that the EQUASHIELD® CSTD does not affect the drugs' stability and the drugs do not negatively impact the devices' mechanical, functions, or performance characteristics.

CONCLUSION

The EQUASHIELD® CSTD System has the same indications for use as the predicate, the previously cleared CSTD System (K170706) except for the addition of clarification text associated with a previously cleared feature of the syringe component. The proposed design changes, which include changes relating to the materials used in some components and the inclusion of several additional components, have been assessed through bench testing and biocompatibility testing. None of the proposed additions and modifications were found to raise new safety or effectiveness concerns and the results of the testing support substantial equivalence to the predicate system. With respect to principles of operation, both systems are identical. Consequently, the EQUASHIELD® CSTD System is substantially equivalent to its predicate.