Summary of Safety and Clinical Performance

for

SOFIA™ Catheter Family

SSCP22-0003

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DOCUMENT CHANGE HISTORY

SSCP Revision	Change Description	NB approved/verified
A	Initial Document	☒Yes ☐ No* Validation language: English
B	Updating using content provided in CER21-0000D, addition of SOFIA 88 information	☒ Yes ☐ No* Validation language: English
C	External standard references were revised per section 1.8. Add various missed sections to align with template.	☐Yes ☒ No* Validation language:
D	Revision update to reflect the latest template and information	☐ Yes ☒ No* Validation language:
E	Section 1.8: External standard references were revised.	☐ Yes ☒ No* Validation language:
F	Section 1.8: External standard references revised.	☐ Yes ☒ No* Validation language:

*Annual entries must be included. An entry stating such must be added if a revision is not required.

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1 SUMMARY OF SAFETY AND CLINICAL PERFORMANCE

This Summary of Safety and Clinical Performance (SSCP) is intended to provide public access to an updated summary of the main aspects of the safety and clinical performance of the device.

The SSCP is not intended to replace the Instructions For Use (IFU) as the main document to ensure the safe use of the device, nor is it intended to provide diagnostic or therapeutic suggestions to intended users or patients.

The following information is intended for users/healthcare professionals.

1.1 Device Identification and General Information

Table 1.1 Device Identification and General Information

Device Names	
Device Trade Name	SOFIA Catheter Family, SOFIA Catheter, SOFIA EX Catheter
EMDN Code	SOFIA Catheter: C0104020207 Peripheral Thrombectomy and Thromboaspiration Systems SOFIA EX Catheter: C0104020204 Peripheral Angiography Guide Catheters
Medical Device Nomenclature (EMDN)	C0104020207 Peripheral Thrombectomy and Thromboaspiration Systems C0104020204 Peripheral Angiography Guide Catheters
Device Class	Class III
Basic UDI-DI	37015174SOFIAJ9 (MicroVention Europe [MVE]) 08402732SOFIAGZ (MicroVention, Inc. [MVI])
Year when first certificate (CE) was issued for the device	SOFIA Catheter: 2013 SOFIA EX Catheter: 2019
Legal Manufacturer (MVI)	
Name & Address	MicroVention, Inc. 35 Enterprise Aliso Viejo, California, 92656 USA
Manufacturer SRN	US-MF-000016658
Authorized Representative	
Name & Address	MicroVention Europe SARL (referred to as MVE) 30 bis, rue du Vieil Abreuvoir 78100 Saint-Germain-en-Laye, France
Authorized Representative SRN	FR-AR-000004448
Legal Manufacturer (MVE)	
Name & Address	MicroVention Europe SARL 30 bis, rue du Vieil Abreuvoir 78100 Saint-Germain-en-Laye, France
Manufacturer SRN	FR-MF-000004449
Notified Body	
Name & Address	DQS Medizinprodukte GmbH August-Schanz-Straße 21 D-60433 Frankfurt am Main Germany
Notified Body Identification Number	0297

1.2 Intended Purpose of the Device

Table 1.2 Intended Use

Intended Purpose	
Intended Purpose	**SOFIA Catheters:** • The SOFIA Catheter is indicated for general intravascular use, including the neuro and peripheral vasculature. The SOFIA Catheter can be used to facilitate introduction of diagnostic or therapeutic agents. The SOFIA Catheter is not intended for use in coronary arteries. Moreover, the SOFIA Catheter is intended for use in removal/aspiration of emboli and thrombi from selected blood vessels in the arterial system, including the peripheral and neuro vasculatures. **SOFIA EX Catheters:** • The SOFIA EX Catheter is indicated for general intravascular use, including the neuro and peripheral vasculature. The SOFIA EX Catheter can be used to facilitate introduction of diagnostic agents or therapeutic devices. The SOFIA EX Catheter is not intended for use in coronary arteries.
Indications for Use	The SOFIA Catheter and SOFIA EX Catheter are indicated for general intravascular use, including the neuro and peripheral vasculature.
Target Population	**SOFIA Catheters:** • The intended patient population are those who need introduction of diagnostic or therapeutic agents in the vessels or removal of emboli or thrombi from vessels. The anatomic area of use of SOFIA Catheter is peripheral and neuro vasculature. The device does not apply to the coronary arteries. **SOFIA EX Catheters:** • The intended patient population are those who need introduction of diagnostic or therapeutic agents in the vessels. The anatomic area of use of SOFIA EX Catheter is peripheral and neuro vasculature. The device does not apply to the coronary arteries.
Contraindications and/or Limitations	There are no known contraindications.

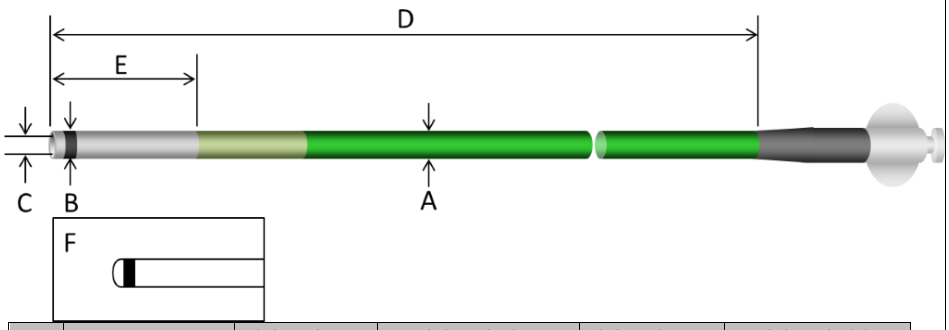
1.3 Device Description

Table 1.3 Device Description

Device Description	
Description of the Device	<u>Design and Specifications</u> The SOFIA Catheters are braid plus coil reinforced, single lumen, variable stiffness catheters with a shapeable distal segment. The distal segment is designed to facilitate vessel selection with a hydrophilic coating for navigation through the vasculature. A radiopaque marker is located at the distal end of the catheters for visualization under fluoroscopy (See figure below). The SOFIA EX Catheters are a single-lumen, flexible catheters equipped with a coil and braid reinforcement. The distal segment is designed to facilitate vessel selection with a hydrophilic coating for navigation through the vasculature. A radiopaque marker is

Device Description

located at the distal end of the catheters for visualization under fluoroscopy (See figure below).



	Parameter	SOFIA 5F	SOFIA 6F		SOFIA EX	SOFIA 88
A	Diameter (outer), proximal	0.068 in / 1.7 mm	0.0835 in / 2.1 mm		0.071 in / 1.8 mm	0.108 in / 2.74 mm
B	Diameter (outer), distal	0.067 in / 1.7 mm	0.0825 in / 2.1 mm		0.068 in / 1.7 mm	0.102 in / 2.59 mm
C	Diameter (inner)	0.055 in	0.070 in		0.058 in	0.088 in / 2.2 mm
D	Working length	115 - 125 cm	115 – 135 cm	95 – 105 cm	105, 115 cm	115, 120 cm
E	Distal section	17 cm	19 cm	6 cm	9 cm	14 cm
F	Tip configuration	Straight Shapeable			Straight	Straight

Operating Principles

Intravascularly, the SOFIA Catheter and the guidewire are inserted through a hemostatic valve attached to the femoral sheath using the accessory introducer sheath provided in the device packaging. The introducer sheath is removed when the distal shaft of the aspiration catheter is placed inside the patient body. The aspiration catheter is navigated through the neurovasculature to a location proximal to the lesion. A radiopaque marker located at the distal end of the catheter aids in attaining the desired position. The aspiration vacuum source is attached to the catheter, the catheter is advanced into the proximal end of the thrombus, and suction is initiated. The thrombus is then either aspirated through the catheter, or it becomes stuck at the catheter tip, and the catheter may be withdrawn back into the guide catheter.

Intravascularly, the SOFIA EX Catheter and the guidewire are inserted through a hemostatic valve attached to the femoral sheath using the Introducer Sheath provided in the package. The introducer sheath is removed from the SOFIA EX Catheter once the distal shaft of the SOFIA EX catheter is placed inside the patient body. The radiopaque marker which is located at the distal end of the catheter for visualization under fluoroscopy aids in attaining desired position. In order to navigate through intracranial vasculature, the microcatheter with the guidewire are inserted into the SOFIA EX Catheter. Under fluoroscopic guidance, the SOFIA EX Catheter is advanced or withdrawn over the microcatheter and the guidewire until desired position is attained.

Design Characteristics of the Device

SOFIA Catheters

The catheter body is constructed with a coil over the inner liner. Braiding covers the coil on the entire length of the catheter. A platinum/iridium alloy radiopaque marker band is located at the distal tip.

Device Description	
	The catheter outer distal layer is lined with polyolefin elastomer (Engage) and has a hydrophilic coating for lubricious insertion and delivery. The distal lumen is lined with PTFE. The catheter inner diameter is 0.055" (1.4 mm) or 0.070" (1.78 mm). The semi-rigid proximal section transitions to a flexible distal section to facilitate advancement through vessels. A luer fitting on the catheter hub is used for the attachment of accessories. The hub/strain relief provides for the kink resistance from the proximal end. A steam shaping mandrel is provided with the catheter to be used by the physician for tip shaping for SOFIA 5F and 6F Catheters. An introducer sheath is included to introduce the catheter into the y-connector. The SOFIA Catheters are provided sterile and for single use. The catheters are placed in a dispenser tube (HDPE) and is placed on a packaging card (polyethylene) that is provided in a sterile barrier Tyvek pouch and placed in a carton box. The introducer is the accessory that is provided on the packaging card. It is made of polyether block amide (Pebax). The purpose is to provide support when introducing the distal tip of the catheter into the hemostatic valve. Once the SOFIA Catheter distal shaft is placed inside the patient body, the introducer is removed by peeling it away from the system. The introducer sheath is not intended for use inside the patient body. **SOFIA EX Catheters** The catheter body is constructed with a nitinol coil over the inner lumen liner comprised of polytetrafluoroethylene (PTFE). To provide additional shaft support, a stainless-steel wire braiding has been added over the nitinol coil from the proximal end to the distal end. A platinum/iridium alloy radiopaque marker band is located at the distal tip. This is all covered by an outer layer of varying durometers of materials. The outer layer consists of a range of durometers and lengths of polyolefin, polyurethane (Pellethane) and polyether block amide (Pebax) – distal and proximal, respectively. The most proximal outer shaft section consists of polyamide (Grilamid). The outer surface of the catheter (distal 55-65 cm) is coated with a hydrophilic coating to reduce friction during navigation in the vasculature. A luer fitting on the catheter hub is used for the attachment of accessories. The hub-strain relief provides for kink resistance from the proximal end. An introducer sheath (Pebax) is also included to facilitate the introduction of the catheter into the y-connector. The SOFIA EX Catheters are provided sterile and for single use. The catheters are placed in a dispenser tube (HDPE) and is placed on a packaging card (polyethylene) that is provided in a sterile barrier Tyvek pouch and placed in a carton box. The introducer is the accessory that is provided on the packaging card. It is made of polyether block amide (Pebax). The purpose is to provide support when introducing the distal tip of the catheter into the hemostatic valve. Once the SOFIA EX Catheter distal shaft is placed inside the patient body, the introducer is removed by peeling it away from the system. The introducer sheath is not intended for use inside the patient body.
Previous Generations or Variants, if applicable	The following SOFIA and SOFIA EX Catheter device configurations/variants are CE-Marked and are commercialized in the European Union: • SOFIA Distal Access Catheter • SOFIA Select Catheter • SOFIA PLUS Catheter • SOFIA Flow PLUS Catheter • SOFIA Guiding Catheter • SOFIA Flow Catheter • SOFIA EX Intracranial Support Catheter
Single use – sterilization method	Single use, EtO Sterilized

Device Description	
Description of Accessories	The SOFIA Catheter comes packaged and sterilized with a steam-shaping mandrel and an introducer sheath. The SOFIA EX Catheter comes packaged and sterilized with an introducer sheath. The SOFIA EX Catheter does not include a steam-shaping mandrel since the tip is not shapeable. (1) The physician may use the steam-shaping mandrel to shape the tip of the catheter. The introducer provides support when introducing the distal tip of the catheter into the hemostatic valve. Once the SOFIA Catheter distal shaft is placed inside the patient body, the introducer is removed by peeling it away from the system. The introducer sheath is not intended for use inside the patient body.
Description of other Devices or Products intended to be used in combination	The SOFIA Catheter is designed to be compatible with standard accessory devices for neurointerventional techniques, which include 6F or larger guiding sheath, ≤0.035" guidewire, and common rotating hemostasis valves (RHVs) and stopcocks. The SOFIA Catheter (not SOFIA EX) is also compatible with Class-I sterile (Is) aspiration accessory kits that provide a vacuum source for aspiration. The kits are manufactured by Merit Medical and distributed by MicroVention. Along with the catheter, these devices provide a vacuum source for the aspiration of emboli. The SOFIA Catheter includes IFUs for usage in conjunction with the Aspiration Tubing Kit and the Aspiration Syringe Kits.

1.4 Risks and Warnings

1.4.1 Residual Risks and Undesirable Effects

Hazards associated with the use of the SOFIA Catheter Family are assessed and risks of the resulting harms are minimized through the use of risk mitigation/control measures. All known foreseeable risks have been evaluated and mitigated.

Risks associated with the SOFIA Catheter Family include the following:

- Vessel or aneurysm perforation
- Vasospasm
- Hematoma at the site of entry
- Embolism
- Ischemia
- Intracerebral/intracranial hemorrhage
- Pseudo aneurysm
- Seizure
- Stroke
- Infection
- Vessel dissection
- Thrombus formation
- Death

1.4.2 Warnings and Precautions

The warnings / precautions for the SOFIA Catheter Family are

Warnings

SOFIA Catheters excluding SOFIA 88 Catheter:

- The SOFIA Catheter should only be used by physicians who have received appropriate training in interventional techniques.
- The SOFIA Catheter is provided sterile and non-pyrogenic. Do not use if the packaging is breached or damaged.
- Inspect the SOFIA Catheter prior to use. Do not use the device if any damages or irregularities are observed.
- Appropriate anti-coagulation and anti-platelet therapy should be administered per standard medical practice.
- The SOFIA Catheter should be manipulated under fluoroscopic guidance. Do not advance or withdraw the device when excessive resistance is met until the cause of resistance is determined.
- Do not use the SOFIA Catheter with Ethiodol or Lipiodol contrast media or other such contrast media which includes the components of those agents.
- Do not use organic solvents as the device may be damaged.
- Do not exceed 2070 kPa (300 psi) maximum recommended infusion pressure. Excess pressure may damage the device or injure the patient. Carefully monitor placement of the distal tip when using a power injector to infuse.
- Do not make more than 90 degree angle on the Shaping Mandrel. Steaming of the distal tip with more than 90 degree angle may result in damage to the device.
- Do not steam the same device more than once, which may result in damage to the device.
- Torquing the SOFIA Catheter excessively while kinked may damage the device resulting in separation of the device. Withdraw the entire device (the device, microcatheter, and guidewire) if the device is severely kinked.
- The Introducer Sheath is not intended for use inside the patient body. Ensure that the Introducer Sheath is removed from the SOFIA Catheter once the distal shaft of the SOFIA Catheter is placed inside the patient body.
- Excessive aspiration with the distal tip of the SOFIA Catheter covered by the vessel wall may cause vessel injury. Carefully investigate location of the distal tip under fluoroscopy prior to aspiration.
- Do not attempt to clear the inner lumen of the SOFIA Catheter by infusion while keeping the device in the patient body.
- When flow from the lumen stops or becomes stagnant during aspiration, do not attempt to clear the inner lumen of the SOFIA Catheter by infusion while keeping the device in the patient body.

SOFIA 88 Catheter:

- The SOFIA Flow 88 Aspiration Catheter should only be used by physicians who have received appropriate training in interventional techniques.
- The SOFIA Flow 88 Aspiration Catheter is provided sterile and non-pyrogenic. Do not use if the packaging is breached or damaged.
- Inspect the SOFIA Flow 88 Aspiration Catheter prior to use. Do not use the device if any damages or irregularities are observed.
- Appropriate anti-coagulation and anti-platelet therapy should be administered per standard medical practice.
- The SOFIA Flow 88 Aspiration Catheter should be manipulated under fluoroscopic guidance. Do not advance or withdraw the device when excessive resistance is met until the cause of resistance is determined.
- Do not use the SOFIA Flow 88 Aspiration Catheter with Ethiodol or Lipiodol contrast media or other such contrast media which includes the components of those agents.
- Do not use organic solvents as the device may be damaged.
- Do not use automated high-pressure contrast injection equipment with the SOFIA Flow 88 Aspiration Catheter as it may damage the device.
- Do not exceed 2070 kPa (300 psi) maximum recommended infusion pressure. Excess pressure may damage the device or injure the patient.
- Torquing the SOFIA Flow 88 Aspiration Catheter excessively while kinked may damage the device, resulting in separation of the device. Withdraw the entire device (the device, Compatible Catheter, and guidewire) if the device is severely kinked.
- The Introducer Sheath is not intended for use inside the patient body. Ensure that the Introducer Sheath is removed from the SOFIA Flow 88 Aspiration Catheter once the distal shaft of the SOFIA Flow 88 Aspiration Catheter is placed inside the patient body.
- Excessive aspiration with the distal tip of the SOFIA Flow 88 Aspiration Catheter covered by the vessel wall may cause vessel injury. Carefully investigate location of the distal tip under fluoroscopy prior to aspiration.
- Do not attempt to clear the inner lumen of the SOFIA Flow 88 Aspiration Catheter by infusion while keeping the device in the patient body.
- When flow from the lumen stops or becomes stagnant during aspiration, do not attempt to clear the inner lumen of the SOFIA Flow 88 Aspiration Catheter by infusion while keeping the device in the patient body.

SOFIA EX Catheters:

- The SOFIA EX Catheter should only be used by physicians who have received appropriate training in interventional techniques.
- The SOFIA EX Catheter is provided sterile and non-pyrogenic. Do not use if the packaging is breached or damaged.
- Inspect the SOFIA EX Catheter prior to use. Do not use the device if any damage or irregularities are observed.

- Appropriate anti-coagulation and anti-platelet therapy should be administered per standard medical practice.
- The SOFIA EX Catheter must be used under fluoroscopic guidance. Do not advance or withdraw the device when excessive resistance is met until the cause of resistance is determined.
- Do not use the SOFIA EX Catheter with Ethiodol or Lipiodol contrast media or other such contrast media which includes the components of those agents.
- Do not use organic solvents as the device may be damaged.
- Do not exceed 2070 kPa (300 psi) maximum recommended infusion pressure. Excess pressure may damage the device or injure the patient. Carefully monitor placement of the distal tip when using a power injector to infuse.
- Torqueing the SOFIA EX Catheter excessively while kinked may damage the device resulting in separation of the device. Withdraw the entire device (the device, microcatheter, and guidewire) if the device is severely kinked.
- The Introducer Sheath is not intended for use inside the patient body. Ensure that the Introducer Sheath is removed from the SOFIA EX Catheter once the distal shaft of the SOFIA EX Catheter is placed inside the patient body.

Precautions

SOFIA Catheters (SOFIA 55/70/Flow 88 Catheter):

- Exercise care in handling the SOFIA Catheter to reduce the chance of accidental damage.
- Verify compatibility of the SOFIA Catheter when using other ancillary devices commonly used in intravascular procedures. The physician must be familiar with percutaneous, intravascular techniques and possible complications associated with the procedure.
- Use caution when manipulating the SOFIA Catheter in tortuous vasculature to avoid damage. Avoid advancing or withdrawal against resistance until the cause of resistance is determined.
- Presence of calcifications, irregularities, or other devices may damage the SOFIA Catheter and potentially affect its insertion or removal.
- Maintain perfusion of heparinized saline for inner lumen of the SOFIA Catheter to prevent thrombus formation.
- If removed from the patient, the hydrophilic coating on the SOFIA Catheter should be hydrated with heparinized saline. Do not allow the coating to dry.

SOFIA EX Catheters:

- Exercise care in handling the SOFIA EX Catheter to reduce the chance of accidental damage.
- Verify compatibility of the SOFIA EX Catheter when using other ancillary devices commonly used in intravascular procedures. The physician must be familiar with

percutaneous, intravascular techniques and possible complications associated with the procedure.

- Use caution when manipulating the SOFIA EX Catheter in tortuous vasculature to avoid damage. Avoid advancing or withdrawal against resistance until the cause of resistance is determined. Torqueing the device against resistance may result in damage to the vessel or device.
- Presence of calcifications, irregularities, or other devices may damage the SOFIA EX Catheter and potentially affect its insertion or removal.
- Maintain perfusion of heparinized saline for inner lumen of the SOFIA EX Catheter to prevent thrombus formation.
- If removed from the patient, the hydrophilic coating on the SOFIA EX Catheter should be hydrated with heparinized saline. Do not allow the coating to dry as this may impact the coating safety and performance.
- Avoid pre-soaking devices for long durations when the device is not in use as this may impact the coating safety and performance.
- Avoid wiping the device with dry gauze as this may damage the device coating. Avoid excessive wiping of the coated device.
- Excessive torquing of the catheter may cause damage which could result in kinking and possible separation along the catheter shaft. Should the system become severely kinked, withdraw the entire system if this occurs (SOFIA EX catheter, guidewire and catheter sheath introducer).
- Limit the exposure to X-ray radiation doses to patients and physicians by using sufficient shielding, reducing fluoroscopy times, and modifying X-ray technical factors, when possible. The risk of X-ray radiation exposure complications may increase as procedure time and number of procedures increase.

1.4.3 Potential Complications / Adverse Effects

The potential complications / adverse effects for the SOFIA Catheter Family are

SOFIA Catheters (SOFIA 55/70/Flow 88 Catheter):

Potential complications include, but are not limited to:

- Vessel or aneurysm perforation
- Vasospasm
- Hematoma at the site of entry
- Embolism
- Ischemia
- Intracerebral/intracranial hemorrhage
- Pseudo aneurysm

- Seizure
- Stroke
- Infection
- Vessel dissection
- Thrombus formation
- Death.

SOFIA EX Catheters:

Potential complications include but are not limited to:

- Vessel or aneurysm perforation,
- Vasospasm,
- Hematoma at the site of entry,
- Embolism,
- Ischemia
- Intracerebral/intracranial hemorrhage
- Pseudo aneurysm
- Seizure
- Stroke
- Infection
- Vessel dissection
- Thrombus formation
- Death

Potential X-ray radiation exposure related adverse events include but are not limited to

- Alopecia
- Burns ranging in severity from skin reddening to ulcers
- Cataracts
- Delayed neoplasia
- Tissue necrosis
- Risks associated with contrast dye.

1.4.4 Other Aspects of Safety

During the evaluation period of 01 January 2019 to 31 December 2023, 12 CAPAs have been closed, 2 remain in Effectiveness Check and one (1) remain in Implementation Phase. There was one (1) Field Action, which was initiated on 31 May 2023.

1.5 Summary of the Clinical Evaluation and PMCF

1.5.1 Equivalent Device Clinical Data

Clinical safety and performance were determined by the collection and analysis of available clinical data on the SOFIA Catheter Family products and did not rely on equivalence with any other product.

1.5.2 Pre-CE-Mark Clinical Data

There was no pre-market clinical investigation conducted for the SOFIA Catheter Family. SOFIA Catheters and SOFIA EX Catheters are legacy devices. SOFIA Catheters have been on the market since 2013, certified under Directly 93/42/EEC and SOFIA EX Catheter has been marketed and certified under Directive 93/42/EEC since 2019.

1.5.3 Clinical Data

Clinical evidence was identified, collected, and appraised from a variety of trusted sources including post-market studies and published peer reviewed literature.

There are five post-market clinical investigations conducted for the SOFIA Catheter Family (SESAME, ETIS, SOFAST/RESTORE (Cohort I/II), STABILISE, and ERASER). The SESAME, ETIS, STABILISE, and ERASER studies are completed, and the clinical results are included for clinical evidence for the SOFIA Catheter. Regarding the SOFAST (Cohort I)/RESTORE (Cohort II) study, the SOFAST cohort is completed, and the results are reported below; however, the RESTORE cohort is currently still ongoing and this will be included when the data is published.

The literature search presents relevant clinical data from the published scientific literature for the SOFIA Catheter Family. The literature search results from the 46 references demonstrate clinical use of the SOFIA Catheter Family for aspiration and general intravascular use, including the neuro and peripheral vasculature in 3,925 patients with an average follow up of 90 days in 1 randomized controlled study, 2 cohort studies, and 43 case series or case reports. The overall quality of the data from the published clinical studies was high.

The manufacturer's post-market surveillance (PMS) data show the use of the SOFIA Catheter Family in 583,966 cases 01 January 2019 to 31 December 2023; MicroVention received 1,133 product complaints concerning the SOFIA Catheter Family, resulting in a complaint rate of 0.19%. Of these complaints, 6 were considered MDV reportable including EU, for a reportable complaint rate of 0.001% and 47 were considered MDR reportable with a complaint rate of 0.008%.

1.5.4 Clinical Performance and Safety

Clinical data on the SOFIA Catheter Family from the published literature have been summarized above from 46 studies with a total population of 3,925 patients. The published clinical data show high rates of technical success (69.9-100%), recanalization (TICI 2b-3, 41-100%), first-pass effect (24.2-100%), NIHSS score (median) change from admission/baseline (9-18) to discharge/24-hr (2-12), and good clinical outcomes at 90 days (mRS 0-2, 30-100%). These rates are comparable

or better than the published literature for the SOTA for similar devices reporting rates of technical success (66-100%), recanalization (TICI 2b-3 66-100%), first-pass effect (44-100%), NIHSS score (median) change from admission/baseline (12.5-19) to discharge/24-hr (3.5-11), and good clinical outcomes at 90 days (mRS 0-2, 34-63.2%).

Published safety outcomes for the SOFIA Catheter Family, include rates of hemorrhagic complication (sICH ≤14.4%, with the exception of 74% in one study), vessel dissection/rupture/perforation (≤2.4%), emboli in new territory or ENT (≤14.3%), vasospasm (≤9.8%), and mortality (≤28.4%, with the exception of 47.4% in one small study of high risk patients), which are comparable to the published literature for the SOTA for similar devices also showing rates of hemorrhagic complications (sICH ≤15.8%), vessel dissection/rupture/perforation (≤3.9%), emboli in new territory (≤5.3%), vasospasm (≤8.9%), and mortality (12.7%-36%). Thus, the benefit-risk ratio for the SOFIA Catheter is comparable to the benefit-risk ratio according to the SOTA with only few exceptions. There were no new complaints identified for the SOFIA Catheter Family, and all risks were deemed acceptable though the risk management process.

1.5.5 Post-Market Clinical Follow-up

There is one ongoing Post-Market Clinical Follow-Up (PMCF) study; the cohort II (RESTORE) of the SOFAST/RESTORE study-SOFIA Aspiration System as First Line Technique (NCT04451525) is currently still ongoing and included in the latest PMCFP to monitor the progress. This is a prospective, multi-center, single arm, observational, Real-World Evidence (RWE) post-market study with two cohorts. The enrollment is expected to be completed in H1 FY25.

1.6 Possible Diagnostic or Therapeutic Alternatives

1.6.1 Treatment Options and Interventions

Treatment for AIS is aimed at restoring blood flow and reperfusion ischemic tissue, halting progression of infarction, and preventing recurrence.[1,2] Restoration is achieved medically using a thrombolytic drug or by intervention with endovascular treatment (EVT), or both. Approximately 25% of all ischemic stroke patients are eligible for medical thrombolysis, and 10-12% are eligible for EVT due to critical time window. The number of patients who can benefit from these treatments continues to increase as new studies demonstrate that not just time since stroke onset but also collateral circulation influences outcome.[3-5]

- **Thrombolytic drugs**: The most common treatment option for AIS is intravenous thrombolysis (IVT) using recombined tissue plasminogen activator (tPA) such as alteplase or Tenecteplase, or intra-arterial (IA) thrombolysis using urokinase.[4, 6-13]
    - Pros:
        - Effective in improving functional outcomes after ischemic stroke up to 4.5-9 hours after symptom onset

  - Cons:
    - Short half-life, low recanalization rate of 30-40% for proximal occlusions and of <5% for distal ICA occlusion.
    - Its effectiveness may diminish with more proximal or larger occlusions
- **Endovascular treatment**: In mechanical thrombectomy, devices that remove blood clots from a large cerebral artery and to restore blood flow comprise mostly 2 types: stent retrievers and aspiration catheters.[14] The choice between stent retriever and direct aspiration is still primarily driven by institutional and operator preferences, as three randomized controlled trials demonstrated the noninferiority of either with similar procedural and clinical performance between the two techniques.[12] Those techniques can be used in conjunction with a proximal flow control by balloon guide catheters (BGC) temporally inflated in the parent vessel. The main goal of this technique is to limit adverse emboli in new-initially unaffected-territories (ENT).
  - Pros:
    - More distal access and better stent retrievers to safely remove the thrombi from brain vessels.
    - Compared to medical therapy with tPA alone, patients who received EVT were more likely to have a good functional outcome (typically mRS 0-2), without an increased rate of symptomatic intracerebral hemorrhage (sICH) or mortality
  - Cons:
    - Invasive nature of the treatment
- **Stent retrievers**: Stent retrievers (SR) are self-expandable wire mesh tube delivered by a microcatheter, intended to remove the clot that is trapped and withdrawn by pulling.[14] The use of stent retrievers to perform mechanical thrombectomy has become a rapidly emerging therapy for the treatment of AIS.[15]
  - Pros:
    - High rates of good clinical outcomes (mRS 0-2) seen in these trials
    - A good outcome increased with better recanalization
  - Cons:
    - Invasive nature of the treatment
- **Aspiration**: Direct aspiration of the thrombus can be used as an alternative technique when there are some vessel occlusions and thrombi that are resistant to procedures with stent retrievers even after repeated recanalization attempts.[16]
  - Pros:
    - No significant difference between the direct aspiration group and the SR group in rate of successful recanalization
    - Some trials report less complications such as intracranial hemorrhage
  - Cons:
    - Invasive nature of the treatment

- **Combination of stent retriever and direct aspiration**: There are attempts to enhance the rate of successful recanalization through a combination of SR thrombectomy and direct clot aspiration. The first is called the "switching strategy," which involves switching from forced arterial suction thrombectomy (FAST) using the Penumbra reperfusion catheter to Solitaire™ stent thrombectomy, and this has been suggested to provide better angiographic outcomes than a one technique-only strategy. Another is called "SOLUMBRA" technique, which involves the combination of stent retrievers and large-bore aspiration catheters.
    - Pros:
        - Potentially enhance the rate of successful recanalization through a combination of SR thrombectomy and direct clot aspiration
    - Cons:
        - Invasive nature of the treatment

1.6.2 Available Technologies

Intermediate/distal access catheters and aspiration catheters are well established medical devices with numerous types and styles available from a variety of manufacturers. Examples of catheters similar to the SOFIA Catheter Family are listed in **Table 1.4**.

Table 1.4 Similar Devices

Device	Manufacturer	Intended Use
Penumbra Reperfusion Catheter (ACE64/68)	Penumbra	Penumbra Reperfusion Catheters are intended for use in the revascularization of patients with acute ischemic stroke secondary to large vessel occlusion.
React 68 catheter	Medtronic	The React™ 68 Catheter is indicated for the introduction of interventional devices into the peripheral and neuro vasculature.
ZOOM 88	Imperative Care	The Zoom 88 Large Distal Platform is indicated for the introduction of interventional devices into the peripheral, coronary, and neuro vasculature.

1.7 Suggested Profile and Training for Users

This device should only be used by physicians who have undergone training in the use of the SOFIA Catheter Family devices according to the instructions for use.

1.8 Reference to any Harmonized Standards and CS

The SOFIA Catheter Family devices were designed, developed, and tested following the standards listed in **Table 1.5**.

Table 1.5 Harmonized Standards

Standard Number	Edition	Standard Title (equivalent edition)
EN ISO 13485	2016/A11:2021	Medical devices - Quality management systems - Requirements for regulatory purposes (ISO 13485:2016)
EN ISO 14971	2019/A11:2021	Medical devices - Application of risk management to medical devices (ISO 14971:2019)
EN IEC 60812	2018	Failure modes and effects analysis (FMEA and FMECA) (IEC 60812:2018)
EN 62366-1	2015/A1:2020	Medical devices - Part 1: Application of usability engineering to medical devices (IEC 62366-1:2015/A1:2020)
EN ISO 14155	2020	Clinical investigation of medical devices for human subjects - Good clinical practice (ISO 14155:2020)
ISO/TR 20416	2020	Medical devices - Post-market surveillance for manufacturers
EN ISO 15223-1	2021	Medical devices - Symbols to be used with information to be supplied by the manufacturer - Part 1: General requirements (ISO 15223-1:2021)
EN ISO 20417	2021	Medical devices - Information to be supplied by the manufacturer (ISO 20417:2021, Corrected version 2021-12)
EN ISO 11607-1	2020/A1:2023	Packaging for terminally sterilized medical devices - Part 1: Requirements for materials, sterile barrier systems and packaging systems (ISO 11607-1:2019/Amd 1:2023)
EN ISO 11607-2	2020/A1:2023	Packaging for terminally sterilized medical devices - Part 2: Validation requirements for forming, sealing and assembly processes (ISO 11607-2:2019/Amd 1:2023)
ISTA 3A	2018	Packaged-Products for Parcel Delivery System Shipment 70 kg (150 lbs) or Less
ASTM D4169	2023e1	Standard Practice for Performance Testing of Shipping Containers and Systems
ASTM D4332	2022	Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing
ASTM F88	2023	Standard Test Method for Seal Strength of Flexible Barrier Materials
ASTM F1886	2016	Standard Test Method for Determining Integrity of Seals for Flexible Packaging by Visual Inspection
ASTM F1929	2023	Standard Test Method for Detecting Seal Leaks in Porous Medical Packaging by Dye Penetration
ASTM F2096	2011R2019	Standard Test Method for Detecting Gross Leaks in Packaging by Internal Pressurization (Bubble Test)
ASTM F1980	2016	Standard Guide for Accelerated Aging of Sterile Barrier Systems for Medical Devices
EN ISO 10993-1	2020	Biological evaluation of medical devices - Part 1: Evaluation and testing within a risk management process (ISO 10993-1:2018, including corrected version 2018-10)

Standard Number	Edition	Standard Title (equivalent edition)
EN ISO 10993-3	2014	Biological evaluation of medical devices - Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity (ISO 10993-3:2014)
EN ISO 10993-4	2017	Biological evaluation of medical devices - Part 4: Selection of tests for interactions with blood (ISO 10993-4:2017)
EN ISO 10993-5	2009	Biological evaluation of medical devices - Part 5: Tests for in vitro cytotoxicity (ISO 10993-5:2009)
EN ISO 10993-10	2023	Biological evaluation of medical devices - Part 10: Tests for skin sensitization (ISO 10993-10:2021)
EN ISO 10993-11	2018	Biological evaluation of medical devices - Part 11: Tests for systemic toxicity (ISO 10993-11:2017)
EN ISO 10993-12	2021	Biological evaluation of medical devices - Part 12: Sample preparation and reference materials (ISO 10993-12:2021)
EN ISO 10993-23	2021	Biological evaluation of medical devices - Part 23: Tests for irritation (ISO 10993-23:2021)
EN ISO 14644-1	2015	Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration (ISO 14644-1:2015)
EN ISO 14644-2	2015	Cleanrooms and associated controlled environments - Part 2: Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration (ISO 14644-2:2015)
ANSI/AAMI ST72	2019	Bacterial endotoxins – Test methods, routine monitoring, and alternatives to batch testing
EN 556-1	2001/AC:2006	Sterilization of medical devices – Requirements for medical devices to be designated 'STERILE' – Part 1: Requirements for terminally sterilized medical devices
EN ISO 11737-1	2018/A1:2021	Sterilization of health care products - Microbiological methods - Part 1: Determination of a population of microorganisms on products (ISO 11737-1:2018/Amd 1:2021)
EN ISO 11737-2	2020	Sterilization of health care products - Microbiological methods - Part 2: Tests of sterility performed in the definition, validation and maintenance of a sterilization process (ISO 11737-2:2019)
ISO 11737-3	2023	Sterilization of health care products - Microbiological methods - Part 3: Bacterial Endotoxin testing
EN ISO 11138-1	2017	Sterilization of health care products - Biological indicators - Part 1: General requirements (ISO 11138-1:2017)
EN ISO 11135	2014/A1:2019	Sterilization of health-care products - Ethylene oxide - Requirements for the development, validation and routine control of a sterilization process for medical devices (ISO 11135:2014/Amd 1:2018)
EN ISO 10993-7	2008/A1:2022	Biological evaluation of medical devices - Part 7: Ethylene oxide sterilization residuals (ISO 10993-7:2008/Amd 1:2019)

Standard Number	Edition	Standard Title (equivalent edition)
EN ISO 10555-1	2013A1:2017	Intravascular catheters — Sterile and single-use catheters — Part 1: General requirements (ISO 10555-1:2013A1:2017)
EN ISO 80369-7	2021	Small-bore connectors for liquids and gases in healthcare applications - Part 7: Connectors for intravascular or hypodermic applications (ISO 80369-7:2021)
EN ISO 80369-20	2015	Small-bore connectors for liquids and gases in healthcare applications - Part 20: Common test methods (ISO 80369-20:2015)
ASTM E855	2021	Standard Test Methods for Bend Testing of Metallic Flat Materials for Spring Applications Involving Static Loading
ASTM F640	2023	Standard test methods for determining radiopacity for medical use

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1.9 References

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